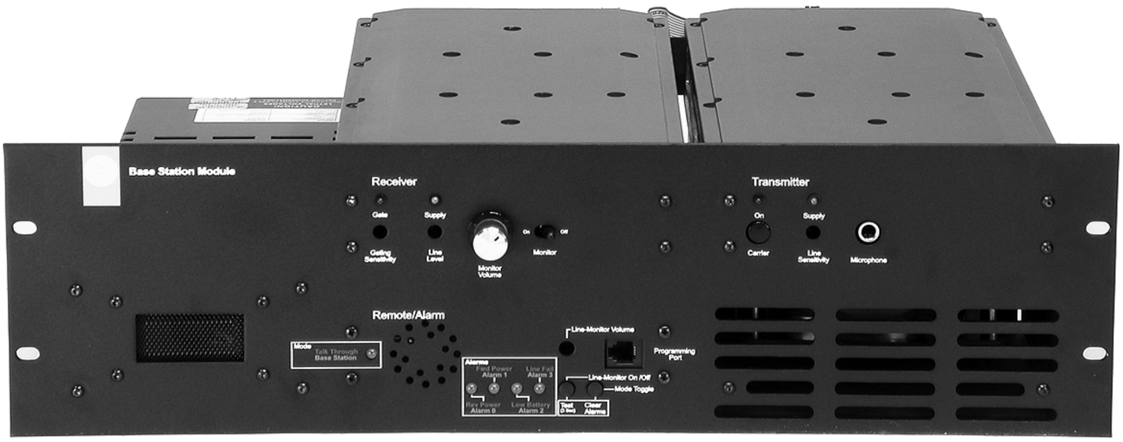
T800 SL2

Base Station Equipment

400 to 520MHz 25 Watt Continuous

Service Manual



August 2004

M8SL2-00-002-812

T800*II*

Corporate Head Office

Tait Electronics Ltd
175 Roydvale Avenue
P.O. Box 1645
Christchurch
New Zealand

Technical Support Enquiries

Phone: 64 3 357 9991
Fax: 64 3 358 0320
E-mail: support@taitworld.com

Internet

http://www.taitworld.com

New Zealand

Tait Communications Ltd
540 Wairakei Road
P.O. Box 1185
Christchurch
Phone: 64 3 357 2750
Fax: 64 3 358 2029
E-mail: headoffice@tcl.tait.co.nz

Australia

Tait Electronics (Aust) Pty Ltd
186 Granite Street
Geebung
Queensland 4034
P.O. Box 679
Virginia
Queensland 4014
Australia
Phone: 61 7 3865 7799
Toll Free: 1 300 304 344
Fax: 61 7 3865 7990
E-mail: australia@taitworld.com

North America

Regional Head Office
Canada

Tait Mobile Radio Inc.
Unit 5, 158 Anderson Avenue
Markham
Ontario L6E 1A9
Canada
Phone: 1 905 472 1100
Toll Free: 1 800 890 TAIT (8248)
Fax: 1 905 472 5300
E-mail: canada@taitworld.com

USA

Toll Free: 1 800 890 TAIT (8248)
E-mail: usa@taitworld.com

Latin America

E-mail: latinamerica@taitworld.com

North Asia

Regional Head Office
Hong Kong

Tait Mobile Radio (HK) Ltd
Unit 2216, North Tower
Concordia Plaza
No. 1 Science Museum Road
Tsim Sha Tsui East
Kowloon
Phone: 852 2369 3040
Fax: 852 2369 3009
E-mail: hongkong@taitworld.com

Beijing

Tait Mobile Radio (HK) Ltd
Beijing Representative Office
Room 610, Tower 2
Beijing Henderson Centre
No. 18 Jianguomennei Da Jie
Doncheng District
Beijing
China 100005
Phone: 86 10 6518 6290
Fax: 86 10 6518 6296
E-mail: beijing@taitworld.com

Taiwan

Tait Mobile Radio (Taiwan) Ltd
5Fl., No. 159, Keelung Road
Sec. 1
Taipei 110
Taiwan
Phone: 886 2 2768 6600
Fax: 886 2 2761 9970
E-mail: taiwan@taitworld.com

South East Asia

Regional Head Office
Singapore

Tait Electronics (Far East) Pte Ltd
491B River Valley Road
#09-02 Valley Point Office Tower
Singapore 248373
Phone: 65 471 2688
Fax: 65 479 7778
E-mail: singapore@taitworld.com

Thailand

Tait Mobile Radio Ltd
14/1 Suwan Tower
Third Floor
North Sathorn Road
Soi Saladaeng 1
Bangrak
Bangkok 10500
Thailand
Phone: 662 267 6290
Fax: 662 267 6293
E-mail: thailand@taitworld.com

Europe

Regional Head Office
United Kingdom

Tait Europe Ltd
Ermine Business Park
Ermine Road
Huntingdon
Cambridgeshire PE29 6WT
United Kingdom
Phone: 44 1480 52 255
Fax: 44 1480 411 996
E-mail: unitedkingdom@taitworld.com

France

Antenne Française
E-mail: france@taitworld.com

Germany

Zweigstelle Deutschland
E-mail: germany@taitworld.com

About This Manual

Scope

This manual contains general, technical and servicing information on T800 SL2 25W continuous base station which comprise the following equipment:

T800 SL2 25W base station	T855 receiver
	T854 25W continuous transmitter
	T803-02 tone remote (optional)
	T800-23-0011 Power supply

Format

We have published this manual in a ring binder so that "revision packages" containing additional information pertaining to new issues of PCBs can be added as required.

PCB Information

PCB information is provided for all current issue PCBs, and is grouped according to PCB. Thus, you will find the parts list, grid reference index (if necessary), PCB layouts and circuit diagram(s) for each individual PCB grouped together.

Errors

If you find an error in this manual, or have a suggestion on how it might be improved, please do not hesitate to contact Technical Support, Tait Electronics Ltd, Christchurch, New Zealand (full contact details are on page 2).

Updating Equipment and Manuals

In the interests of improving performance, reliability or servicing, Tait Electronics Ltd reserve the right to update their equipment and/or manuals without prior notice.

Copyright

Ordering Tait Service Manuals

You can order additional copies of this service manual from your nearest Tait Dealer or Customer Service Organisation. When ordering, make sure you quote the correct Tait product code ("M" number). Note that only the latest issue of the manual will be available for order.

Publication Information

T800 SL2 Service Manual	
Publication Date	Product Code
June 2002	M8SL2-00-001-812
August 2004	M8SL2-00-002-812

1 T800 Product Codes

The T800 product code provides information about the model, type and options fitted, according to the conventions described below

You can identify the unit's type by checking the product code printed on a label on the rear of the chassis (Figure 1.1 in Part A shows typical labels). You can further verify the type by checking the placement of an SMD resistor in the table that is screen printed onto the PCB..

T800 Series *II* - Product Numbering System

Model Type Options

T8XX-YY-ZZZZ

Frequency Band
2 66 to 88MHz
3 136 to 174MHz
5 400 to 520MHz
6 220 to 270MHz
7 330 to 380MHz
8 800 to 960MHz

* Only available in Frequency Bands 400-520MHz

Type
1 Exciter / Tx
*4 Tx 25watt Cont
5 Receiver
6 Transmitter
7 Exciter
8 50Watt PA
9 100Watt PA

Frequency Subband
1 Low Subband
2 Mid Subband
3 High Subband

Bandwidth / Frequency Stability
0 Wideband (25kHz)
3 Midband (20kHz)
5 Narrowband (12.5kHz)
6 USA/Singapore Markets Only

Type Approval Implication
Type Approval Relevant: T8XX-YY
Non-Type Approval Options: -ZZZZ

Customer Identification
00 Standard Tait Version
AA to ZZ Customer Identification
YA to YZ Language Identification
01 to 99 Common Tait Fitted Options (see Table1)

Fitted Options
00 Standard Product
01 to 99 Common Tait Fitted Options (see Table1)
AA to ZZ Custom Product / Option

Table1

Tait Std Options for T8xx-xx-	Description
-0000	Standard Tait
-0005	Cyclic Keying Disabled
-0200	2nd D-Range Kit, Factory Fitted (T800-03-0000 Fitted)
-0250	2nd D-Range Kit and RSSI options Factory Fitted. (Only on 330 ~ 520MHz)
-0300	Full Series 1 Compatible Ex/PA-Front Panel, No Cyclic Keying, Audio Linked, Guides Included.
-0400	Front Drive on Series 2 Ex / Pa's
-0600	Transmitter Full Quasi Synchronous (T800-06-0000 Fitted)
-0602	External Reference Kit Fitted but not Connected. (T800-06-0000 Partial Fitted)

2 T800 SL2 Product Range

The following table lists the range of standard T800 types (i.e. no options fitted) available at the time this manual was published. Consult your nearest Tait Dealer or Customer Service Organisation for more information

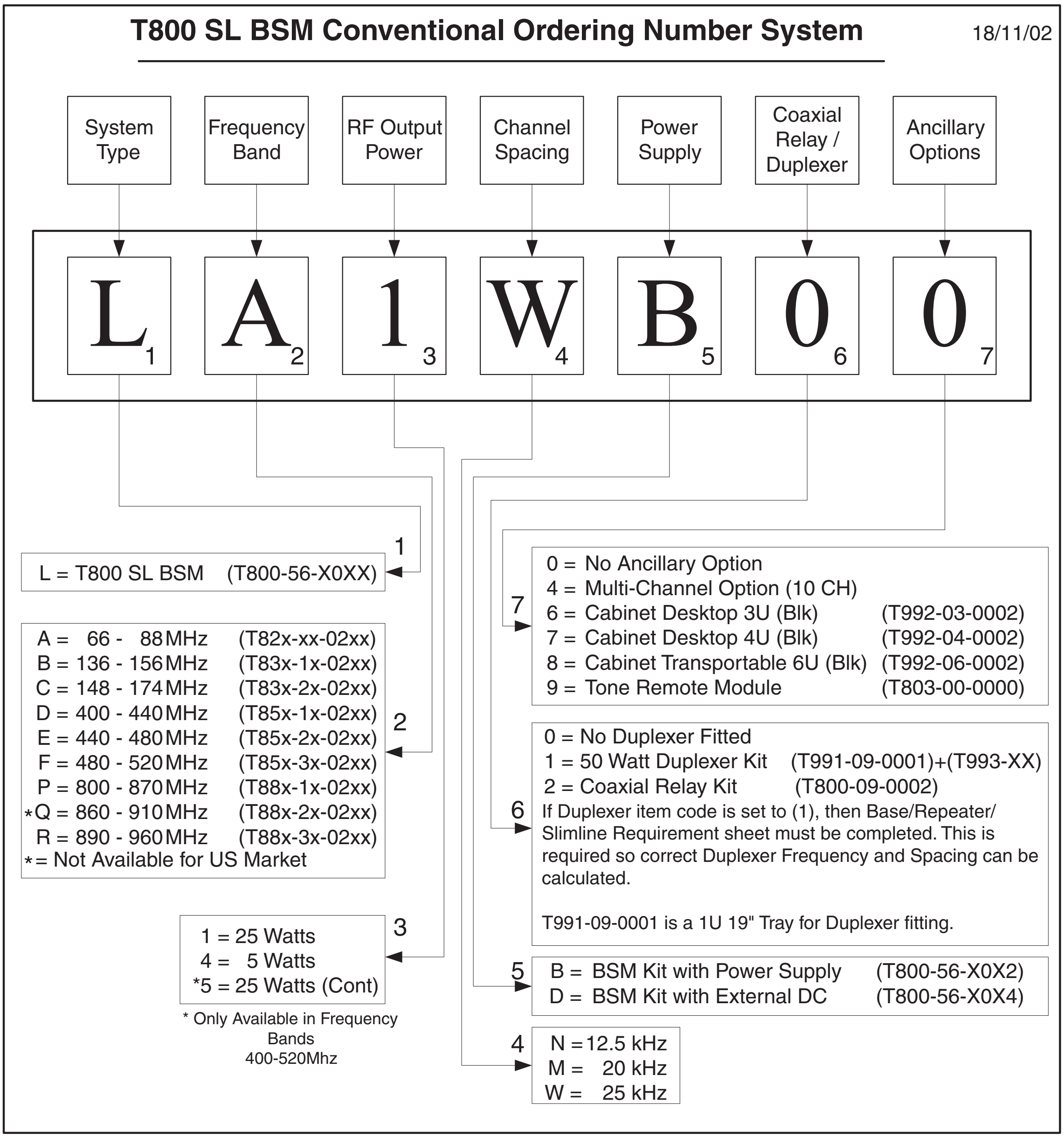


Table of Contents

This manual is divided into nine parts as listed below, with each part being further sub-divided into sections. There is a detailed table of contents at the start of each part and/or section.

Part A Introduction To Servicing

This part of the manual is divided into the sections listed below. These sections provide some general and advisory information on servicing procedures.

1 General

1.1 Additional Technical Information

If you have any questions about this manual or the equipment it describes, please contact your nearest Tait Dealer or Customer Service Organisation. If necessary, you can get additional technical help from Technical Support, Tait Electronics Ltd, Christchurch, New Zealand (full contact details are on page 2).

When requesting information, please quote either the manual product code (e.g. M8SL2-00-002-812), or the equipment product code, build revision number and serial number which are printed on a label on the back of the product (as shown in Figure 1.1).

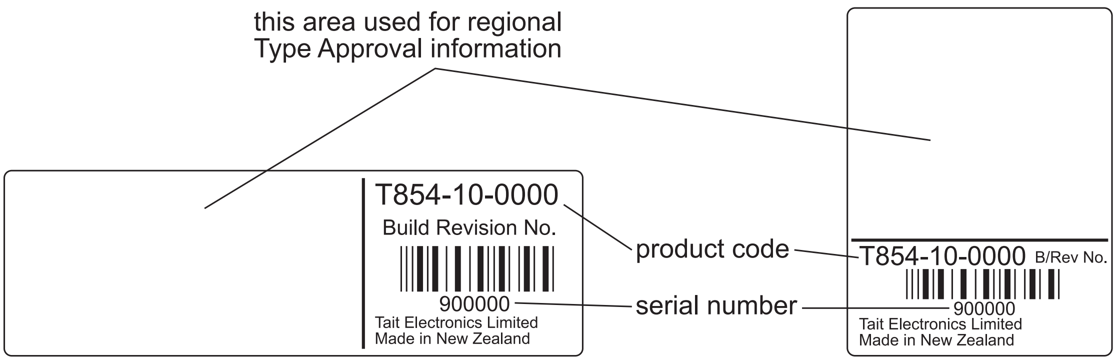


Figure 1.1 Typical Product Code and Serial Number Labels

If you require information about a particular PCB, please quote the full PCB internal part number (IPN) which is screen printed onto the top side of the board (refer to the appropriate PCB Information section in this manual for more details).

1.2 Caution: CMOS Devices

This equipment contains devices which are susceptible to damage from static charges. You must handle these devices carefully and according to the procedures described in the manufacturers' data books.

We recommend you purchase an antistatic bench kit from a reputable manufacturer and install and test it according to the manufacturer's instructions. Figure 1.2 shows a typical antistatic bench set-up.

You can obtain further information on antistatic precautions and the dangers of electrostatic discharge (ESD) from standards such as ANSI/ESD S20.20-1999 or BS EN 100015-4 1994.

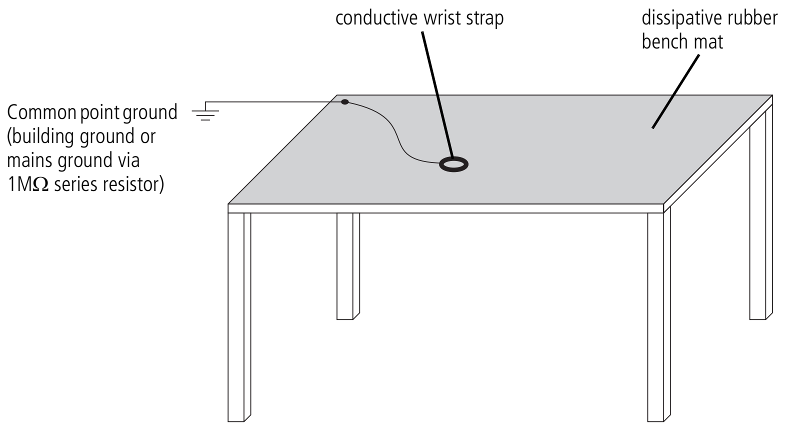


Figure 1.2 Typical Anti-static Bench Set-up

1.3 Caution: Aerial Load

The equipment has been designed to operate safely under a wide range of aerial loading conditions. However, we strongly recommend that the transmitter should always be operated with a suitable load to prevent damage to the transmitter output power stage.

1.4 Caution: Beryllium Oxide and Power Transistors

The RF power transistors in current use all contain some beryllium oxide. This substance, while perfectly harmless in its normal solid form, can become a severe health hazard when it has been reduced to dust. For this reason the RF power transistors should not be broken open, mutilated, filed, machined, or physically damaged in any way that can produce dust particles.

2 Mechanical

2.1 Torx Recess Head Screws

Torx recess head screws are becoming the standard screw head type in all T800 SL2 equipment, with Pozidriv and Philips recess head screws being used in fewer applications.

The Torx recess head has the advantage of improved screwdriver tip location, reducing the chances of screw head damage caused by the driver tip rotating within the recess. In addition, using a ball-tip Torx screwdriver allows you to drive a Torx head screw with the driver on a slight angle, which can be useful in situations where access is restricted.

It is important that you use the correct Torx screwdriver tip:

M3 screws	T10
M4 screws	T20

Figure 2.1 below shows a typical Torx recess head screw (actual hardware may differ slightly from this illustration due to variations in manufacturing techniques).

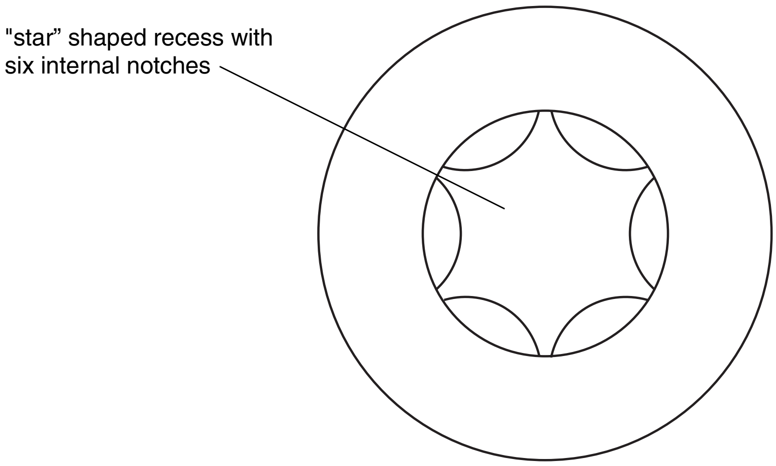


Figure 2.1 Torx Screw Identification

2.2 Pozidriv and Philips Recess Head Screws

Pozidriv and Philips recess head screws will continue to be used in T800 SL2 equipment in a few special applications. It is important that you use the correct type and size screwdriver for each screw type to avoid damaging the screw head.

It is particularly important that you do not use Philips screwdrivers on Pozidriv screw heads as the tapered driving flutes of the Philips screwdriver do not engage correctly with the parallel-sided slots in the Pozidriv screw head. This can result in considerable damage to the screw head if the screwdriver tip turns inside the recess.

Note: If you find you need excessive downwards pressure to keep the screwdriver tip in the Pozidriv screw head, you are probably using the wrong type and/ or size screwdriver.

Figure 2.2 below shows the main differences between typical Pozidriv and Philips screw heads and screwdriver tips (actual hardware may differ slightly from these illustrations due to variations in manufacturing techniques).

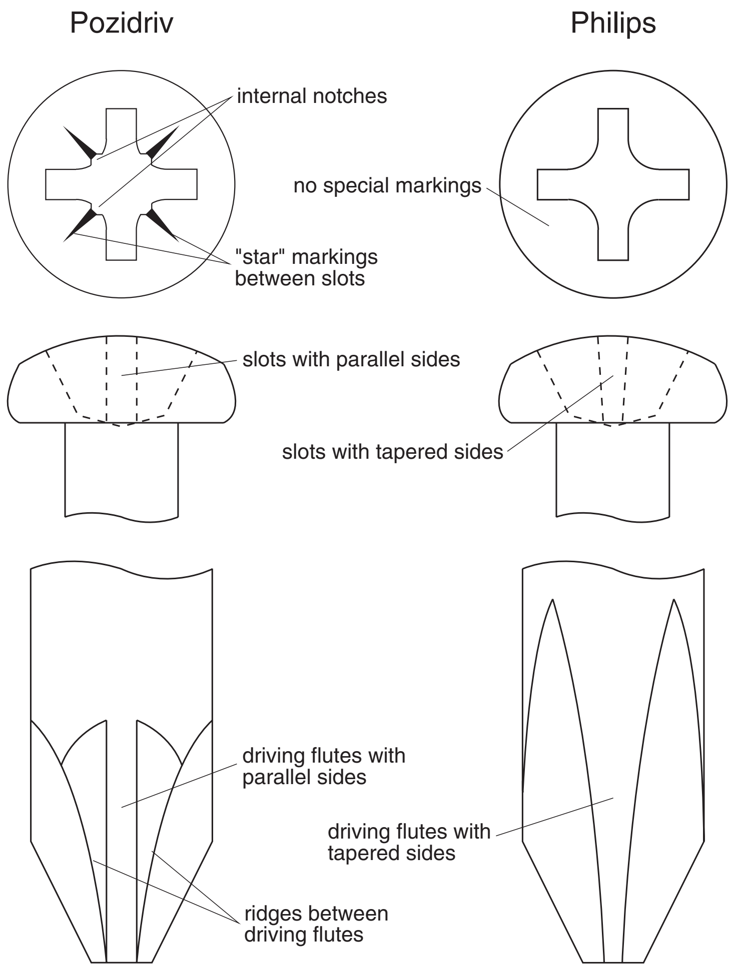


Figure 2.2 Pozidriv and Philips Screw and Screwdriver Identification

2.3 Disassembly/Reassembly

2.3.1 Receivers/Transmitters

To carry out alignment or change option links, you need to remove only the top cover, i.e. the one on the opposite side to the main D-range connector (D-range 1/PL100).

You need to remove the bottom cover to:

- access transmitter RF power transistors and many SMD components
- change solder blob links
- fit test leads to circuit block access points.

2.4 Cover Screw Torques

Receivers/Transmitters … 1.36Nm/12in.lbf.

3 Component Replacement

3.1 Leaded Components

Whenever you are doing any work on the PCB that involves removing or fitting components, you must take care not to damage the copper tracks. The two satisfactory methods of removing components from plated-through hole (PTH) PCBs are detailed below.

Note: The first method requires the use of a desoldering station, e.g. Philips SBC 314 or Pace MBT-100E.

3.1.1 Desoldering Iron Method

Place the tip over the lead and, as the solder starts to melt, move the tip in a circular motion.

Start the suction and continue the movement until 3 or 4 circles have been completed.

Remove the tip while continuing suction to ensure that all solder is removed from the joint, then stop the suction.

Before pulling the lead out, ensure it is not stuck to the plating.

If the lead is still not free, resolder the joint and try again.

Note: The desoldering iron does not usually have enough heat to desolder leads from the ground plane. Additional heat may be applied by holding a soldering iron on the tip of the desoldering iron (this may require some additional help).

3.1.2 Component Cutting Method

Cut the leads on the component side of the PCB.

Heat the solder joint ***sufficiently*** to allow ***easy*** removal of the lead by drawing it out from the component side: do ***not*** use undue force.

Fill the hole with solder and then clear with solderwick.

3.2 Surface Mount Devices

Caution: **Surface mount devices (SMDs) require special storage, handling, removal and replacement techniques. This equipment should be serviced only by an approved Tait Dealer or Customer Service Organisation equipped with the necessary facilities. Repairs attempted with incorrect equipment or by untrained personnel may result in permanent damage. If in doubt, contact your nearest Tait Dealer or Customer Service Organisation.**

3.3 Cased Mica Capacitors

Cased mica capacitors can be removed by heating the top with a heavy-duty soldering iron and gently lifting the capacitor off the PCB with a solder-resistant spike or equivalent.

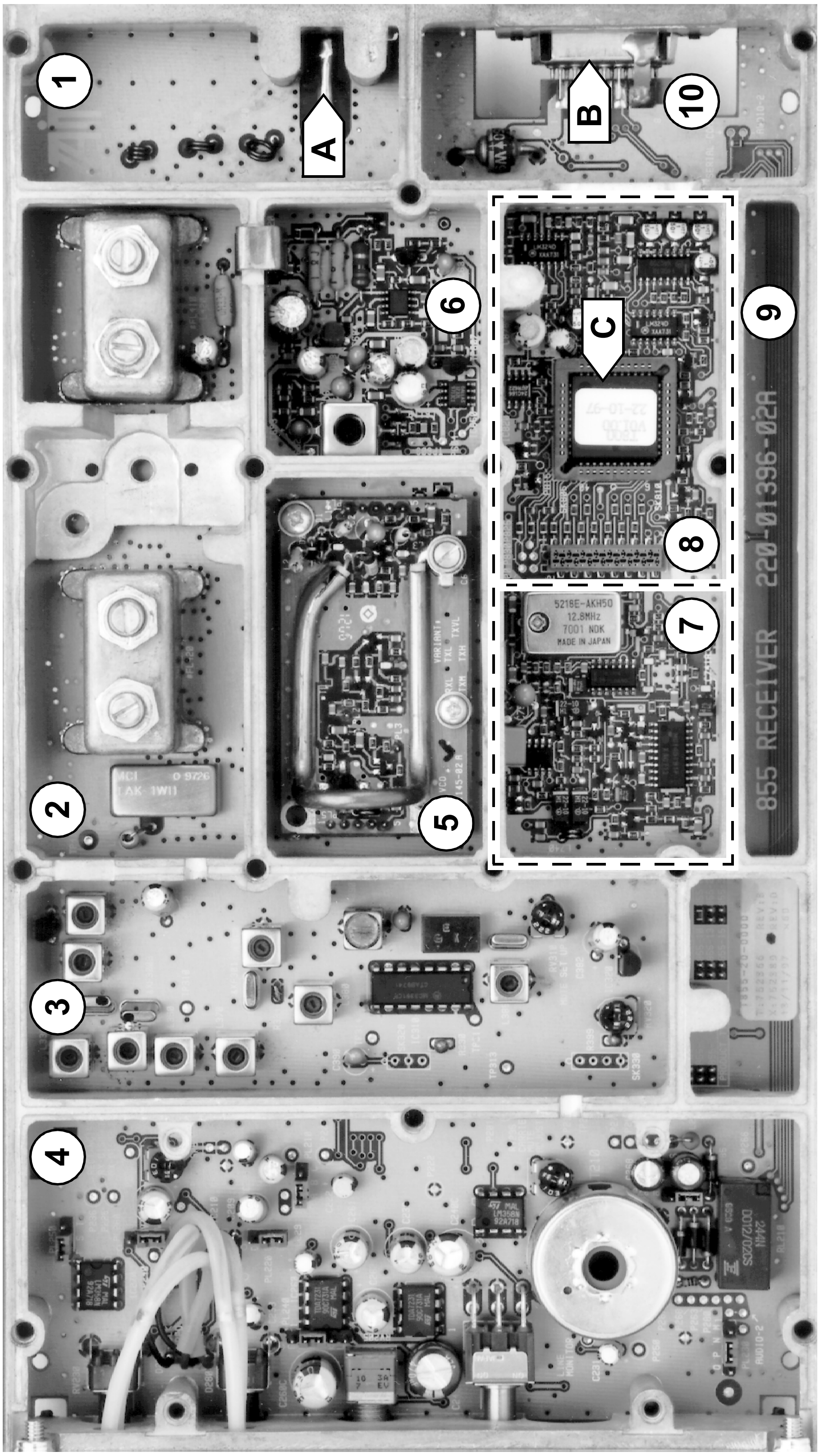
Part B T855 Receiver

This part of the manual is divided into six sections, as listed below. There is a detailed table of contents at the start of each section.

1 T855 General Information

This section provides a brief description of the T855 receiver, along with detailed specifications.

The following topics are covered in this section.



Key:

1 low pass filter
2 receiver front end
3 receiver IF
4 audio processor
5 VCO
6 regulators
7 synthesiser
8 microcontroller and CTCSS
9 duct for cabling to extra D-range (if fitted)
10 D-range
A RF input
B D-range connector ("D-range 1") incl. audio out and DC in (refer to Section 1.5 in Part G)
C microcontroller

Figure 1.1 T855 Main Circuit Block Identification

Supply LED

The Supply LED is lit when DC power is supplied to the receiver.

Gating Sensitivity

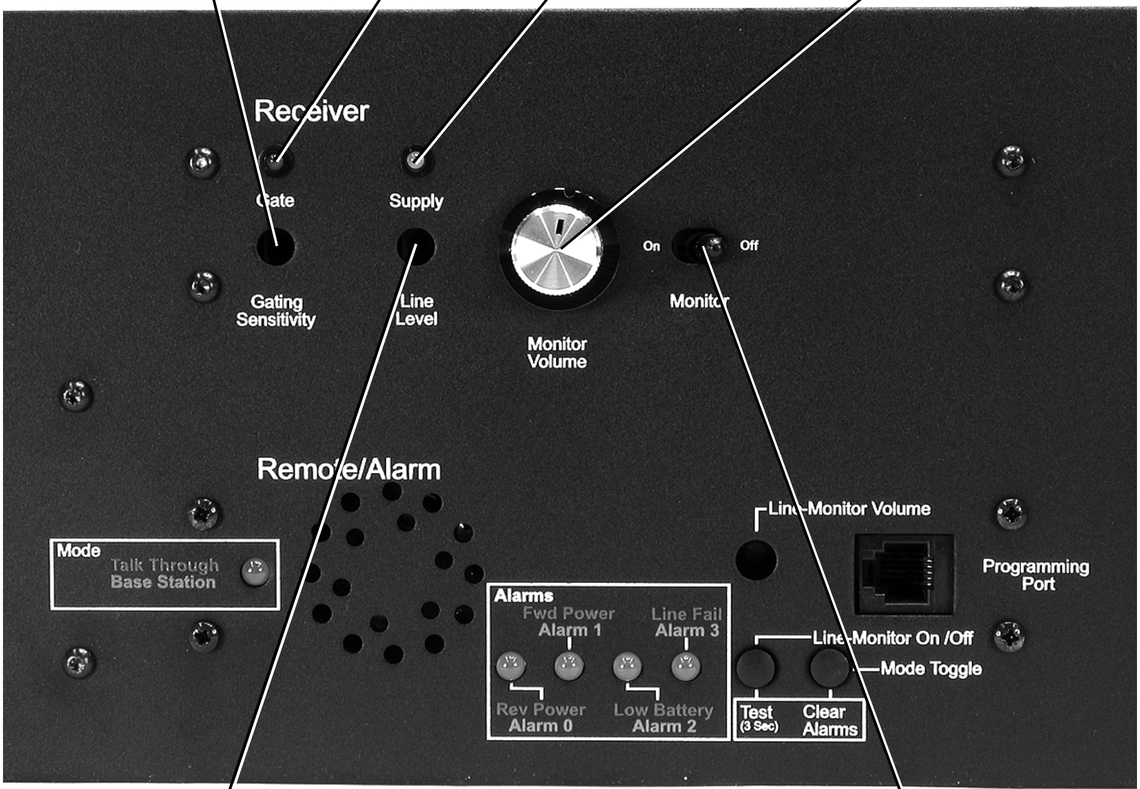
Sets the RF signal level required to open the mute gate and allow audio to pass to the output.

Gate LED

The Gate LED indicates the status of the mute circuit. The LED is lit when a signal above the mute threshold is received.

Monitor Volume

Adjusts the speaker volume if a speaker is connected.



Line Level

Sets the audio output line level.

Monitor

This switch opens the mute, allowing continuous monitoring of the audio signal:

On audio unmuted
Off audio muted.

Figure 1.2 T855 Front Panel Controls

1.1 Introduction

The T855 is a high performance microprocessor controlled FM base station receiver designed for single or multichannel operation in the 400 to 530MHz frequency range[1].

The receiver is a dual conversion superhet with a synthesised local oscillator. The first IF is 45.0MHz, allowing exceptionally high spurious signal rejection to be achieved in the receiver front end. The second IF section (455kHz) combines amplitude limiting, detection and audio preamplification within a single integrated circuit. It also drives carrier and noise level detectors for signal strength indication and gating the audio output. RSSI can be used to drive a carrier mute for audio output gating (link selectable) when the optional T800-04-0000 RSSI PCB is fitted.

The audio section output can be adjusted to deliver >+10dBm to a 600Ω balanced output, and 1W to a local monitor speaker. A flat or de-emphasised audio response is link selectable.

The synthesiser frequency is programmed via the serial communications port. Eight channel select lines are accessible via an additional D-range connector (D-range 2 – T800-03-0000) at the rear of the set.

All components except those on the VCO board are mounted on a single PCB. This is secured to a die-cast chassis which is divided into compartments to individually shield each section of circuitry. Access to both sides of the main PCB is obtained by removing each of the two chassis covers. There is provision within the chassis to mount small option PCBs.

The front panel controls include gating sensitivity, line level, monitor volume and a monitor mute switch.

1. Although capable of operating over the 400 to 530MHz frequency range, the T855 has a 5MHz switching range (see Section 1.2.3 and Section 3.1).

1.2 Specifications

1.2.1 Introduction

The performance figures given are minimum figures, unless otherwise indicated, for equipment tuned with the maximum switching range and operating at standard room temperature (+22°C to +28°C) and standard test voltage (13.8V_{DC}).

Where applicable, the test methods used to obtain the following performance figures are those described in the EIA and ETS specifications. However, there are several parameters for which performance according to the CEPT specification is given. Refer to Section 1.2.6 for details of test standards.

Details of test methods and the conditions which apply for Type Approval testing in all countries can be obtained from Tait Electronics Ltd.

The terms "wide bandwidth", "mid bandwidth" and "narrow bandwidth" used in this and following sections are defined in the following table.

	Channel Spacing	Modulation 100% Deviation	Receiver IF Bandwidth
Wide Bandwidth	25kHz	±5.0kHz	15.0kHz
Mid Bandwidth	20kHz	±4.0kHz	12.0kHz
Narrow Bandwidth	12.5kHz	±2.5kHz	7.5kHz

Sensitivity and distortion figures are stated for standard operating conditions which includes audio de-emphasis. Note that the sensitivity and distortion figures will be degraded when flat audio is selected.

	Link PL210[a]	Link PL220[a]
De-emphasised Audio	1-2 (A-B)	2-3 (E-F)
Flat Audio	2-3 (B-C)	1-2 (D-E)

a. The letters in this column refer to the identification letters screen printed onto the PCB beside each set of links.

1.2.2 General

Number Of Channels	… 128 (standard)[1]
Supply Voltage:	
Operating Voltage	… 10.8 to $16V_{DC}$
Standard Test Voltage	… $13.8V_{DC}$
Polarity	… negative earth only
Polarity Protection	… crowbar diode
Supply Current:	
Standby	… 350mA
Full Audio	… 800mA
Operating Temperature Range	… –20°C to +60°C

1.2.3 RF Section

Frequency Range	… 400 to 530MHz
Type	… dual conversion superheterodyne
Frequency Increment	… 5 or 6.25kHz
Switching Range	… 5MHz (i.e. ±2.5MHz from the centre frequency)
Input Impedance	… 50Ω
Frequency Stability	… ±1ppm, –20°C to +60°C
Signal Strength Indicator (RSSI optional)	… –115dBm to –70dBm, 0 to 5V at approx. 10dB/V

1. Additional channels may be factory programmed. Contact your nearest Tait Dealer or Customer Service Organisation.

IF Amplifiers:

Frequencies	… 45MHz and 455kHz
Bandwidths	
Narrow Bandwidth (NB)	… 7.5kHz
Mid Bandwidth (MB)	… 12kHz
Wide Bandwidth (WB)	… 15kHz

Sensitivity (De-emphasised Response):

Single Channel	… –117dBm
Bandspread (12dB Sinad)	… –115dBm (across switching range)

Sensitivity (Flat Response):

Single Channel	… –111dBm
Bandspread (12dB Sinad)	… –109dBm (across switching range)

Signal+Noise To Noise Ratio (Typical):

		De-emphasised	**Flat**
RF Level –107dBm	…	30dB (WB)	20dB (WB)
		25dB (NB)	15dB (NB)
RF Level –83dBm (CEPT)	…	54dB (MB)	49dB (MB)
		50dB (NB)	45dB (NB)
RF Level –57dBm (EIA)	…	55dB (WB)	55dB (WB)

Selectivity:

Narrow Bandwidth (±12.5kHz)	… 83dB minimum, 85dB typical (CEPT)
Mid Bandwidth (±20kHz)	… 87dB minimum, 90dB typical (CEPT)
Wide Bandwidth (±25kHz)	… 87dB minimum, 90dB typical (CEPT)

Offset Selectivity (Canada only)	… 20dB
Spurious Response Attenuation	… 100dB (typical)

Intermodulation Response Attenuation:

Narrow Bandwidth	… 80dB CEPT (typical)
Mid Bandwidth	… 75dB CEPT (typical)
Wide Bandwidth	… 85dB EIA (typical)

Blocking	… 100dB
Co-channel Rejection	… 6dB
Amplitude Characteristic	… 3dB

Spurious Emissions:

Conducted	… –90dBm to 4GHz
Radiated	… –57dBm to 1GHz
	–47dBm to 4GHz

1.2.4 Audio Section

1.2.4.1 General

Outputs Available	… line and monitor
Frequency Response	… flat or de-emphasised (750µs) (link selectable)
Flat Response:	
Bandwidth	… 67 to 3400Hz
Response	… within +1, –2dB of output level at 1kHz
De-emphasised Response:	
Bandwidth	… 300 to 3400Hz
Response	… within +1, –3dB of a –6dB/octave de-emphasis characteristic (ref. 1kHz)
Line Output:	
Power	… adjustable to >+10dBm
Load Impedance	… 600Ω
Distortion (at –70dBm signal level):	

		De-emphasised	Flat
Wide Bandwidth	…	≤2%	≤2%
Mid and Narrow Bandwidth	…	≤2%	≤4%

Monitor Output:	
Power	… 1W
Speaker Impedance	… 4Ω
Distortion (at –70dBm signal level, links set to de-emphasis)	… ≤3%

1.2.4.2 CTCSS

Linkable High Pass Filter:	
Bandwidth	… 350 to 3400Hz
Response	… within +1, –3dB of level at 1kHz
Hum And Noise (1kHz at 60% system deviation CTCSS at 10% system deviation)	… 30dB min. at 250.3Hz 35dB typical (67 to 240Hz)
Tone Detect:	
Tone Squelch Opening	… better than 6dB sinad 3dB sinad at 250.3Hz (typical) 4dB sinad at 100Hz (typical)
Tone Detect Bandwidth	… ±2.1Hz accept (typical) ±3.0Hz reject (typical)
Response Time	… 150ms open and close (typical)

1.2.4.3 Mute Operation

Systems Available	… noise mute and carrier mute

Noise Mute:

Operating Range	… 6 to 20dB sinad
Hysteresis	… 1.5 to 6dB
Threshold	… adjustable to –105dBm
Opening Time	… 20ms
Closing Time	… 50ms

Carrier Mute (Optional):

Operating Range	… –115 to –80dBm
Hysteresis	… 2 to 10dB
Opening Time	… 5ms
Closing Time	… 50ms

Note: The opening and closing times given above are for the standard setup (SL210 linked and SL220 not linked. Refer to Section 3.8).

1.2.5 Microprocessor Controller

Auxiliary Ports:

Open Drain Type	… capable of sinking 2.25mA via 2k2Ω
V_{ds} max.	… 5V

1.2.6 Test Standards

Where applicable, this equipment is tested in accordance with the following standards.

1.2.6.1 European Telecommunication Standard

ETS 300 086 January 1991

Radio equipment and systems; land mobile service; technical characteristics and test conditions for radio equipment with an internal or external RF connector intended primarily for analogue speech.

ETS 300 113 March 1996

Radio equipment and systems; land mobile service; technical characteristics and test conditions for radio equipment intended for the transmission of data (and speech) and having an antenna connector.

ETS 300 219 October 1993

Radio equipment and systems; land mobile service; technical characteristics and test conditions for radio equipment transmitting signals to initiate a specific response in the receiver.

ETS 300 279 February 1996

Radio equipment and systems; electromagnetic compatibility (EMC) standard for private land mobile radio (PMR) and ancillary equipment (speech and/or non-speech).

1.2.6.2 DTI CEPT Recommendation T/R-24-01

Annex I: 1988

Technical characteristics and test conditions for radio equipment in the land mobile service intended primarily for analogue speech.

Annex II: 1988

Technical characteristics of radio equipment in the land mobile service with regard to quality and stability of transmission.

1.2.6.3 Telecommunications Industry Association

ANSI/TIA/EIA-603-1992

Land mobile FM or PM communications equipment measurement and performance standards.

2 T855 Circuit Operation

This section provides a basic description of the circuit operation of the T855 receiver.

Note: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 4.02 and later of the software.

Refer to Section 6 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components and test points on the main PCB. The parts list and diagrams for the VCO PCB are in Part E.

The following topics are covered in this section.

2.1 Introduction

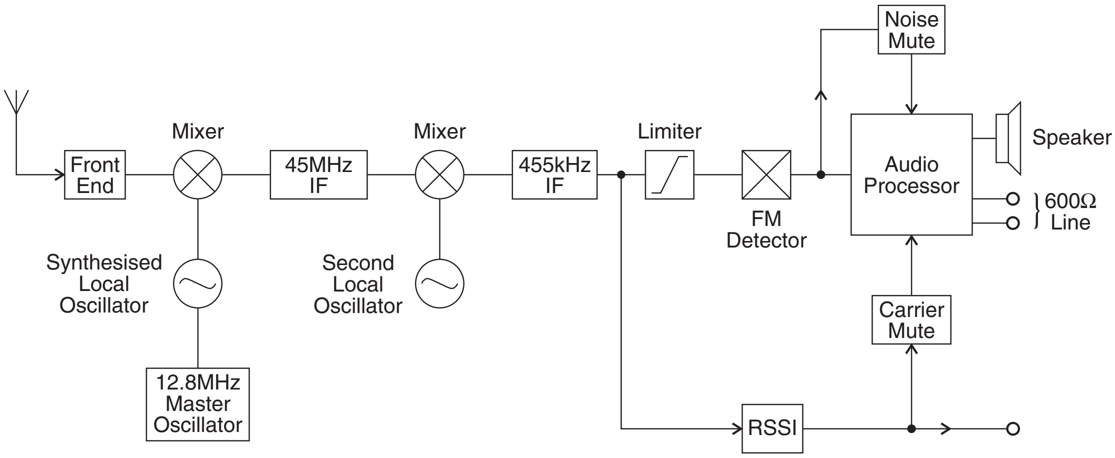


Figure 2.1 T855 High Level Block Diagram

The T855 receiver consists of a number of distinct stages:

- front end
- mixer
- synthesised local oscillator
- IF
- audio processor
- mute (squelch)
- regulator circuits
- received signal strength indicator (RSSI).

These stages are clearly identifiable in Figure 2.1. Refer to the circuit diagrams in Section 6 for further detail.

2.2 Receiver Front End

(Refer to the front end, IF section and audio processor circuit diagrams (sheets 4, 3 and 2 respectively) in Section 6.3.)

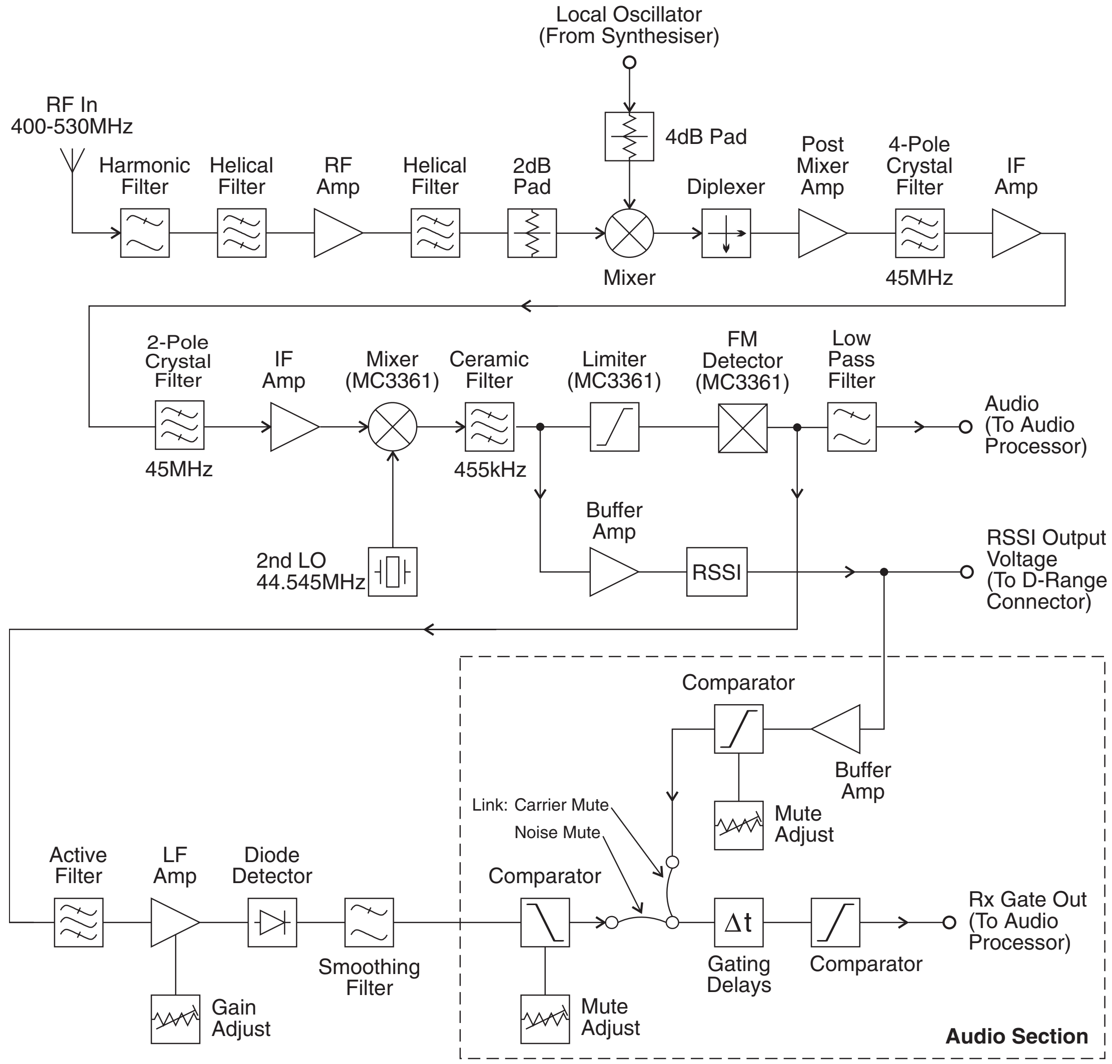


Figure 2.2 T855 Front End, IF and Mute Block Diagram

The incoming signal from the N-type antenna socket is fed through a 9-pole, low pass filter with a cut frequency of approximately 600MHz. This low loss filter (typically less than 0.5dB over 400 to 530MHz) provides excellent immunity to interference from high frequency signals.

The signal is then further filtered, using a high performance helical resonator doublet (FL410) which provides exceptional image rejection, before being amplified by approximately 8dB (Q410). The signal is then passed through a further helical filter doublet (FL420) before being presented to the mixer via a 2dB attenuator pad.

Each sub-block within the front end has been designed with 50Ω terminations for ease of testing and fault finding. The overall gain from the antenna socket to the mixer input is approximately 2dB.

2.3 Mixer

(Refer to the front end circuit diagram (sheet 4) in Section 6.3 and Figure 2.2.)

IC410 is a high level mixer requiring a local oscillator (LO) drive level of +17dBm (nominal). The voltage controlled oscillator (VCO) generates a level of +21dBm (typical) and this is fed to the mixer via a 5dB attenuator pad. A diplexer terminates the IF port of the mixer in a good 50Ω, thus preventing unnecessary intermodulation distortion.

2.4 IF Circuitry

(Refer to the IF section circuit diagram (sheet 3) in Section 6.3 and Figure 2.2.)

Losses in the mixer are made up for in a tuned, common gate, post mixer amplifier (Q310). Several stages of amplification and filtering are employed in the IF circuitry. The first crystal filter is a 4-pole device (&XF300) which is matched into 50Ω on both its input and output ports. This stage is followed by a common base amplifier (Q320) whose output is matched into a 2-pole crystal filter (&XF301). The signal is then amplified using a high gain MOSFET amplifier (Q350), after which the signal is mixed down to 455kHz with the second crystal local oscillator (44.5455MHz).

The 455kHz signal is filtered using a 6-pole ceramic filter (&XF302) before being limited and detected. Q340 provides a buffered 455kHz output for use with the optional RF level detector (RSSI)

The second IF mixer, limiter and detector is in a 16-pin IC (IC310). Quadrature detection is employed, using L390, and the recovered audio on pin 9 of IC310 is typically $1V_{pp}$ for 60% system deviation.

2.5 Noise Mute (Squelch)

(Refer to the audio processor and IF section circuit diagrams (sheets 2 and 3 respectively) in Section 6.3 and Figure 2.2.)

The noise mute operates on the detected noise outside the audio bandwidth. An operational amplifier in IC310 is used as an active band pass filter centred on 70kHz to filter out audio components. The noise spectrum is then further amplified in a variable gain, two-stage amplifier (Q350 and Q360) with additional filtering. The noise is then rectified (D310) and filtered to produce a DC voltage proportional to the noise amplitude. The lowest average DC voltage corresponds to a high RF signal strength and the highest DC voltage corresponds to no signal at the RF input.

The rectified noise voltage is compared with a threshold voltage set up on RV230, the front panel "Gating Sensitivity" potentiometer. Hysteresis is provided by the feedback resistor (R267) to prevent the received message from being chopped when the average noise voltage is close to the threshold. R281 and R280 determine the mute opening and closing times and, in combination with solder links SL210 and SL220, provide three time delay options (SL210 is linked as standard. Refer to Section 3.8). The mute control signal at pin 7 of IC270 is used to disable the speaker and line audio outputs. The speaker output can be separately enabled for test purposes by operating the front panel mute disable switch, SW201.

2.6 Carrier Mute

(Refer to the audio processor and IF section circuit diagrams (sheets 2 and 3 respectively) in Section 6.3 and Figure 2.2.)

A high level carrier mute facility is also available. The RSSI (refer to Section 2.12) provides a DC voltage proportional to the signal strength. This voltage is compared with a preset level, set up on RV235, and may be linked into the mute timing circuit using PL250. PL250 selects either the noise mute or the carrier mute. From this point both the noise and carrier mute circuits operate in the same manner, using common circuitry.

2.7 Audio Processor

(Refer to the audio processor circuit diagram (sheet 2) in Section 6.3.)

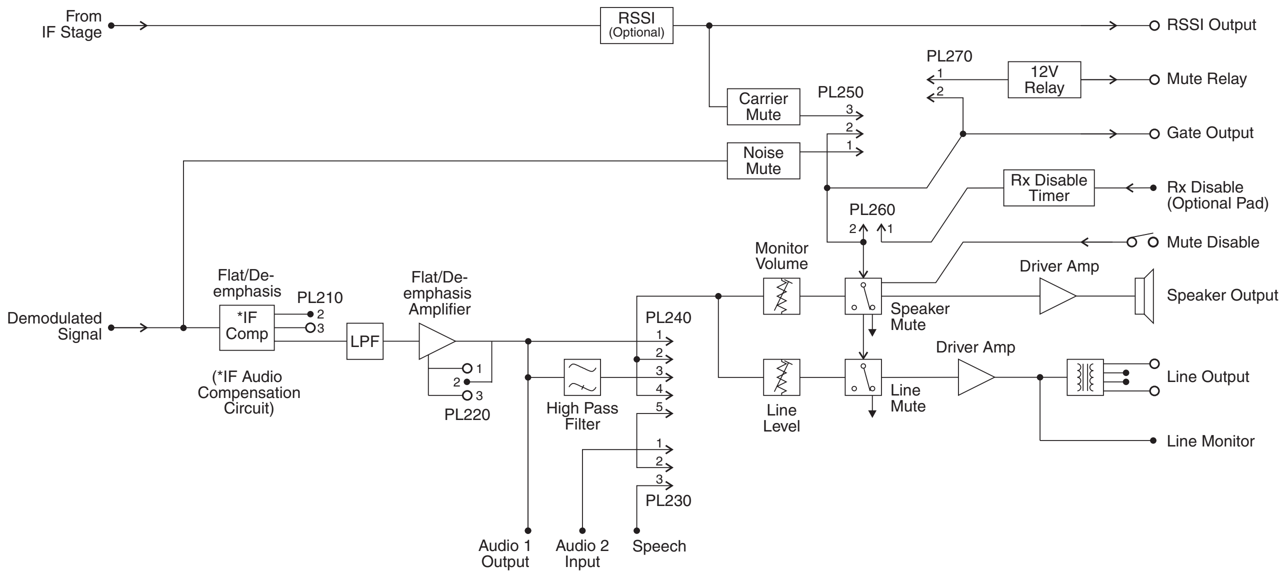


Figure 2.3 T855 Audio Processor Block Diagram

The recovered audio on pin 9 of IC310 is passed through a compensation network and processed in a third order elliptic active filter to give the required response. Linking (PL220 and PL210) is available to give either a flat or de-emphasised audio response, with de-emphasis giving a –6dB/octave roll off. The output of IC210 is split to provide separate paths for the speaker and line outputs. The “Audio 1”, Audio 2” and “Speech” lines allow access to the receiver’s audio path for external signalling purposes (refer to Section 3.5).

The signals are passed to audio drive amplifiers IC240 and IC260. Under muted conditions the inputs of these amplifiers are shunted to ground via transistors Q230 and Q290 respectively. The audio output of IC240 has a DC component which is removed by C249, and this then drives a speaker directly. The output of IC260 is fed into a line transformer to provide a balanced 2-wire or 4-wire, 600Ω output.

The speaker volume is set using the front panel “Monitor Volume” knob (RV205) and the line level is set using the recessed “Line Level” potentiometer (RV210).

The red front panel “Gate” LED (D250) indicates the status of the mute circuit. When a signal above the mute threshold is received, the LED is illuminated. The “Monitor” switch (SW201) on the front panel opens the mute, allowing continuous monitoring of the audio signal (on = audio unmuted; off = audio muted).

The mute control line is available on pad 234 ("RX GATE OUT") for control of external circuitry. A high (9V) on pad 234 indicates that the audio is disabled and a low (0V) indicates that a signal above the mute threshold level is being received.

The audio can also be disabled using the "RX-DISABLE" inputs, pads 225 or 228, having connected the "RX-DISABLE" link between pins 1 and 2 of PL260. An adjustable time delay (RV220) is provided on these lines. In order to disable the audio, either pad must be pulled to 0V.

An undedicated relay is provided (RL210) for transmitter keying or other functions and this can be operated from the mute line by linking PL270.

2.8 Power Supply And Regulators

(Refer to the regulators circuit diagram (sheet 6) in Section 6.3.)

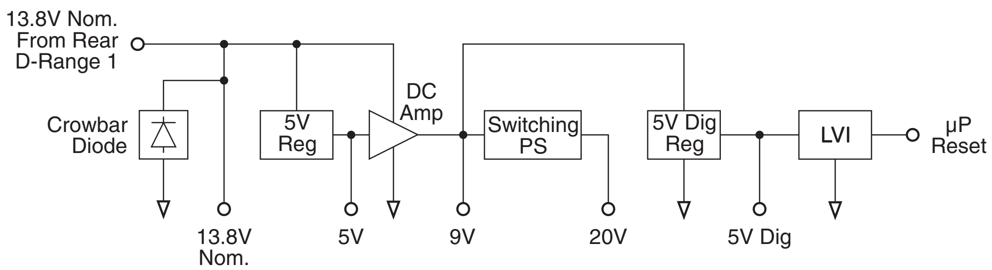


Figure 2.4 T855 Power Supply And Regulators Block Diagram

The T855 is designed to operate off a 10.8 to $16V_{DC}$ supply (13.8V nominal). A 5.3V regulator (IC630) runs directly from the 13.8V rail, driving much of the synthesiser circuitry. It is also used as the reference for a DC amplifier (IC640, Q630 and Q620) which provides a medium current capability 9V supply.

A switching power supply, based on Q670 and Q660, runs off the 9V supply and provides a low current capability +20V supply. This is used to drive the synthesiser loop filter (IC740), giving a VCO control voltage of up to 20V.

The 13.8V supply drives both output audio amplifiers without additional regulation. A separate 5V regulator (IC610) drives the microprocessor and associated digital circuitry. The output of this regulator is monitored by the Low Voltage Interrupt (LVI) circuit (IC650).

A crowbar diode is fitted for protection against connection to a power supply of incorrect polarity. It also provides transient overvoltage protection.

Note: A fuse must be fitted in the power supply line for the diode to provide effective protection.

2.9 Microcontroller

(Refer to the microcontroller circuit diagram (sheet 8) in Section 6.3.)

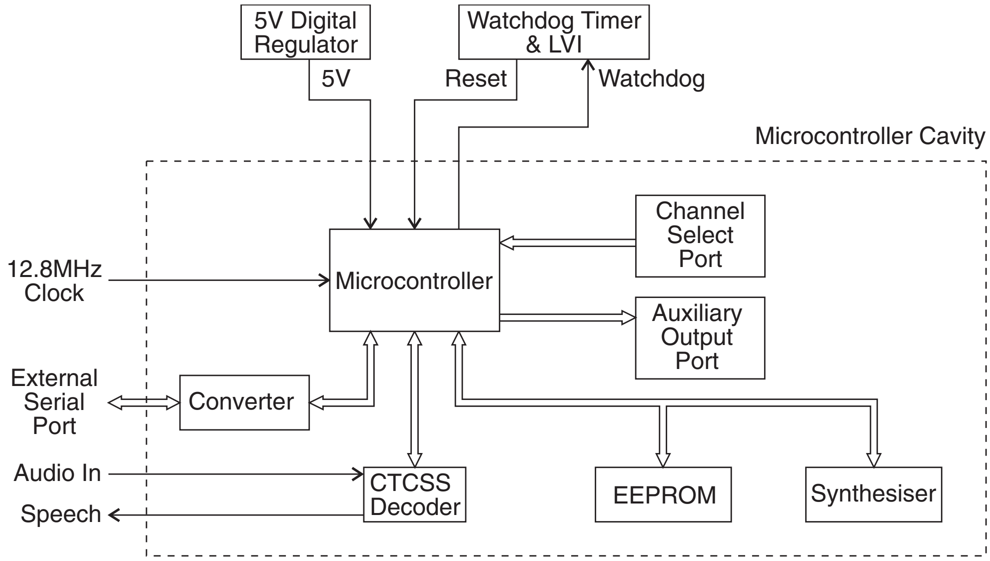


Figure 2.5 T855 Microcontroller Block Diagram

Overall system control of the T855 is accomplished by the use of a member of the 80C51 family of microcontrollers (IC810) which runs from internal ROM and RAM. Four ports are available for input/output functions.

Non-volatile data storage is achieved by serial communication with a 16kBit EEPROM (IC820). This serial bus is also used by the microcontroller to program the synthesiser (IC740).

The main tasks of the microcontroller are as follows:

- program the synthesiser;
- interface with the PGM800Win programming software at 9600 baud via the serial communication lines on D-range 1 (PL100) and D-range 2;
- monitor channel change inputs from D-range 2;
- generate timing waveforms for CTCSS detection;
- coordinate and implement timing control of the receiver;
- control the front panel “Supply” LED (refer to Section 5.3).

2.10 Synthesised Local Oscillator

(Refer to the synthesiser circuit diagram (sheet 7) in Section 6.3 and the VCO circuit diagram in Part E.)

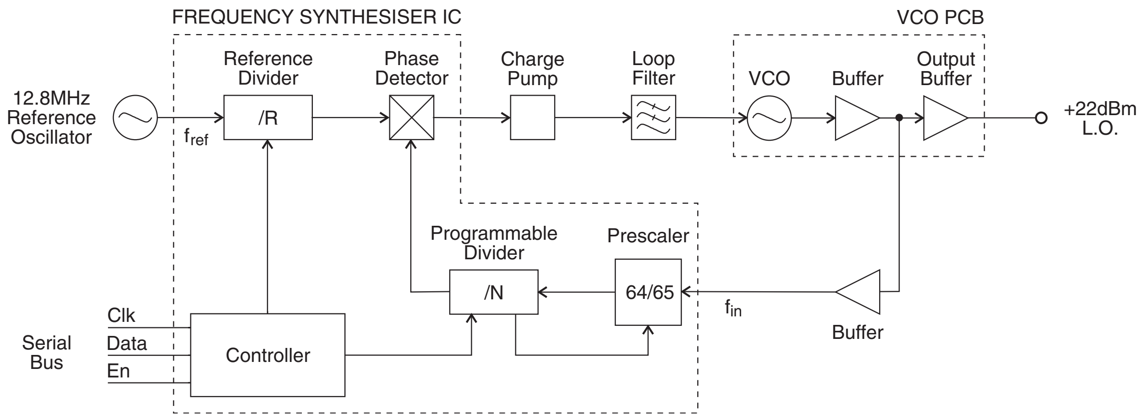


Figure 2.6 T855 Synthesiser Block Diagram

The synthesiser (IC740) employs a phase-locked loop (PLL) to lock a voltage controlled oscillator (VCO) to a given reference frequency. The synthesiser receives the divider information from the control microprocessor via a 3-wire serial bus (clock, data, enable). When the data has been latched in, the synthesiser processes the incoming signals from the VCO buffer (f_{in}) and the reference oscillator (f_{ref}).

A reference oscillator at 12.8MHz (IC700) is buffered (IC710) and divided down to 6.25kHz or 5kHz within the synthesiser IC (IC740).

A buffered output of the VCO is divided with a prescaler and programmable divider which is incorporated into the synthesiser chip (IC740). This signal is compared with the reference signal at the phase detector (also part of the synthesiser chip). The phase detector outputs drive a balanced charge pump circuit (Q760, Q770, Q775, Q780, Q785) and active loop filter (IC750, Q790) which produces a DC voltage between 0V and 20V to tune the VCO. This VCO control line is further filtered to attenuate noise and other spurious signals. Note that the VCO frequency increases with increasing control voltage.

2.11 VCO

(Refer to the VCO circuit diagram in Part E.)

The VCO transistor (Q1) operates in a common emitter, and uses a transmission line resonator (TL1). The transmission line is used in a two port configuration with varicaps positioned at one end. The VCO control voltage from the loop filter (IC750) is applied to the varicaps (D1 and D2) to facilitate tuning. The VCO output is coupled into a cascode amplifier stage (Q2 and Q3) which supplies +10dBm (nominal) output. Further amplification in Q5 brings the output drive level to +20dBm to drive the mixer.

A low level “sniff” is taken from the input to Q5 to drive the divider buffer to the synthesiser (IC740).

The VCO operates at the actual frequency required by the first mixer, i.e. there are no multiplier stages.

The VCO frequency spans from 355 to 395MHz, 395 to 435MHz or 435 to 485MHz according to product type. The VCO is tuned to 45MHz below the desired receive frequency (low side injection) to produce a 45MHz IF signal at the output of the mixer.

2.12 Received Signal Strength Indicator (RSSI)

(Refer to the T800-04-0000 RSSI PCB circuit diagram in Section 6.2 and the IF section circuit diagram (sheet 3) in Section 6.3.)

The RSSI option PCB plugs directly into the main PCB (support circuitry being fitted as standard). It is fitted to the T855 whenever receiver signal strength monitoring is required, e.g. trunking or voting. Its function is to provide a DC voltage proportional to the signal level at the receiver input. The DC voltage is available at D-range 1 (PL100 pin 5).

The RSSI also provides the capability for high level signal strength muting, which may be selected on PL250 (refer to Section 3.5). The mute threshold may be set between –115dBm and –70dBm by RV235.

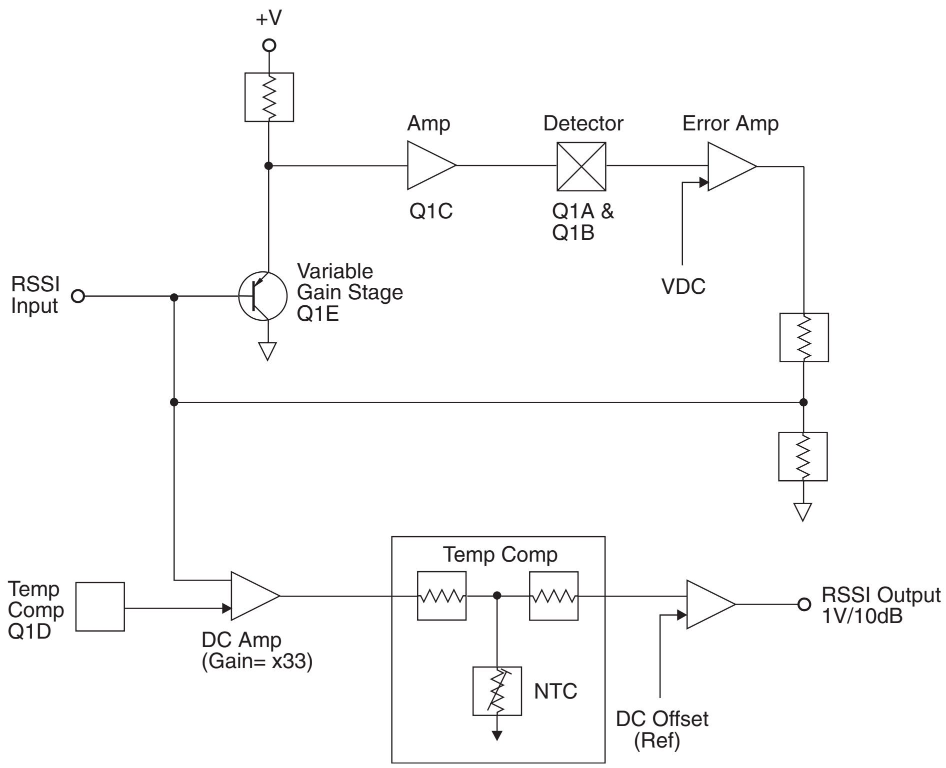


Figure 2.7 T855 RSSI Block Diagram (T800-04-0000 RSSI PCB)

The variable gain stage (Q1A) is a common emitter amplifier with its emitter grounded and the AGC control loop voltage applied to its base. Since the AGC loop will maintain a constant signal level at the collector, the gain of Q1 must be proportional to the incoming 455kHz signal level. The gain of Q1 is linearly proportional to its collector current which itself is exponentially related to the base-emitter voltage. Thus there is a logarithmic relationship between the base-emitter voltage and the gain. The circuit therefore produces a feedback voltage, and an output voltage, logarithmically related to the RF input signal.

The AGC loop is followed by a DC amplifier which provides level shifting, temperature compensation and gain to give a nominal 1V/10dB at the RSSI output. RV320 on the main PCB is used to set the RSSI voltage to a fixed value at a given RF input signal strength.

3 T855 Initial Tuning and Adjustment

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

The following section describes both short and full tuning and adjustment procedures and provides information on:

- channel programming
- selecting the required audio links
- synthesiser alignment
- receiver front end and IF alignment
- noise and carrier level mute adjustment
- setting the line and monitor output levels
- setting up the RSSI.

Note: Unless otherwise specified, the term “PGM800Win” used in this and following sections refers to version 4.02 and later of the software.

Refer to Figure 4.3 which shows the location of the main tuning and adjustment controls. Refer also to Section 6 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components and test points on the main PCB. The parts list and diagrams for the VCO PCB are in Part E.

3.1 Introduction

When you receive your T855 receiver it will be run up and working on a particular frequency (the “default channel")[1]. If you want to switch to a frequency that is within the 5MHz switching range (i.e. ±2.5MHz from the factory programmed frequency), you should only need to reprogram the receiver with the PGM800Win software (refer to the PGM800Win programming kit and Section 3.2 below).

However, if you want to switch to a frequency outside the 5MHz switching range, you will have to reprogram and re-tune the receiver to ensure correct operation. In this case you should carry out the short tuning procedure described in Section 3.4.

If you have carried out repairs or other major adjustments, you must carry out the full tuning and adjustment procedure described in this section (except for Section 3.4).

3.2 Channel Programming

You can program up to 128 channel frequencies into the receiver’s EEPROM memory (IC820) by using the PGM800Win software package and a PC. You can also use PGM800Win to select the receiver’s current operating frequency (or “default channel").

You can program the receiver via the programming port in the front panel. However, you can also program the receiver before it is installed in a rack frame as follows:

- by using a T800-01-0010 calibration test unit;
- via D-range 1;
- via D-range 2 (standard T800-03-0000 auxiliary D-range only);
- via SK805 (internal Micromatch connector).

If you do not use the T800-01-0010, you will have to connect the PC to the receiver via a module programming interface (such as the T800-01-0004).

For a full description of the channel programming procedure, refer to the PGM800Win programming software user’s manual.

Note: When an auxiliary D-range kit (D-range 2 – T800-03-0000) is fitted, you can also select a channel with an external switch, such as the DIP switch on a backplane PCB. Consult your nearest Tait Dealer or Customer Service Organisation for further details.

1. Use the “Read Module” function in PGM800Win to find out what the default channel is.

3.3 Test Equipment Required

You will need the following test equipment:

- computer with PGM800Win installed
- T800 programming kit
- module programming interface (e.g. T800-01-0004 – optional)
- 13.8V power supply
- digital multimeter
- audio signal generator
- RF signal generator
- audio voltmeter
- sinad meter

  } or RF test set (optional)
- oscilloscope
- distortion meter

  } not needed for short tuning procedure
- T800-01-0010 calibration test unit (optional)
- 4Ω speaker (not needed if the calibration test unit is used)

Figure 3.1 and Figure 3.2 show typical test equipment set-ups (with and without a T800-01-0010 calibration test unit).

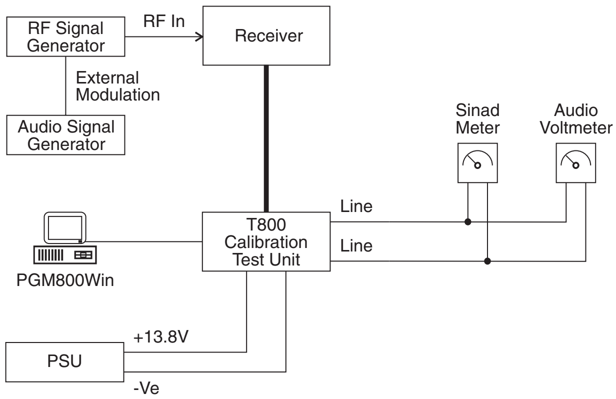


Figure 3.1 T855 Test Equipment Set-up For Short Tuning Procedure

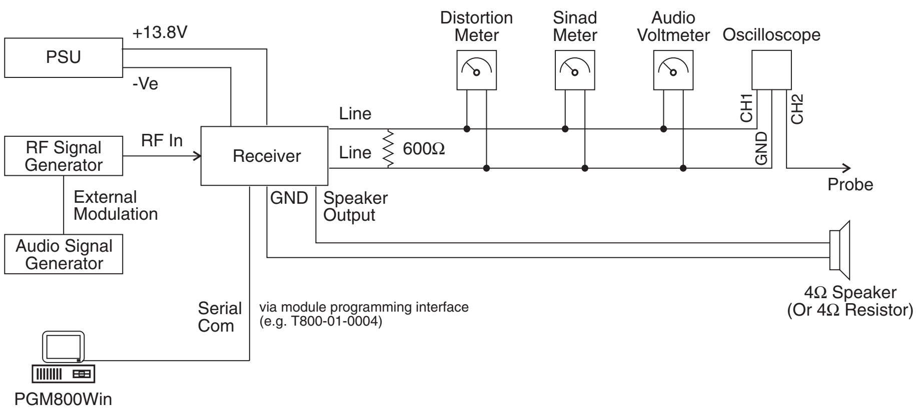


Figure 3.2 T855 Test Equipment Set-up For Full Tuning and Adjustment Procedure

3.4 Short Tuning Procedure

Use this procedure only if you want to reprogram the receiver to a frequency outside the 5MHz switching range and do not intend to carry out any other major adjustments or repairs.

3.4.1 Introduction

Reprogram the operating frequency as described in the PGM800Win programming kit (refer to Section 3.2).

Remove the top cover.

Set up the test equipment as described in Section 3.3.

Set the links in the audio processor section as required (refer to Section 3.5).

3.4.2 Synthesiser Alignment

- Connect a high impedance voltmeter to the long lead of L1 in the VCO (this measures the synthesiser loop voltage).

- **Single Channel** Tune VCO trimmer C6 for a synthesiser loop voltage of 10V.

  Multichannel Tune VCO trimmer C6 for a synthesiser loop voltage of 10V on the middle channel.

  If there is no middle channel, tune C6 so that the channels are symmetrically placed around a loop voltage of 10V.

  All channels should lie within the upper and lower limits of 16V and 3V respectively.

  Do not attempt to program channels with a greater frequency separation than the specified switching range of 5MHz.

3.4.3 Front End Alignment

Note 1: In this and following sections deviation settings are given first for wide bandwidth sets, followed by settings in brackets for mid bandwidth sets ( ) and narrow bandwidth sets [ ].

Note 2: For multichannel operation align the receiver on a frequency in the middle of the required band.

Set RV230 (front panel gating sensitivity) fully clockwise.

Inject a strong on-channel RF signal with ±3kHz deviation (±2.4kHz) [±1.5kHz] at

1kHz into the antenna socket and adjust the helical resonators #FL410 and #FL420 to give best sinad.

Continually decrease the RF level to maintain 12dB sinad.

Readjust FL410 and FL420 to give best sinad.

With PL210 and PL220 connected for de-emphasised audio response, the receiver sensitivity should be better than –117dBm, assuming that the audio levels are not being overdriven (refer to Section 3.4.5).

3.4.4 Mute Adjustment

3.4.4.1 Noise Mute

Connect pins 1 and 2 of PL250 to enable the noise mute.

Set the RF level to –105dBm with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Set RV230 (front panel gating sensitivity) fully anticlockwise.

Adjust RV310 (noise mute gain) fully clockwise to close the mute (if necessary turn off the RF signal and then turn it on again).

Rotate RV310 anticlockwise until the mute just opens.

Reset the signal generator for the required opening sinad and adjust RV230 clockwise until the mute just opens.

3.4.4.2 Carrier Level Mute

Connect pins 2 and 3 of PL250 to enable the carrier mute and disable the noise mute.

Apply an on-channel signal from the RF generator at the required mute opening level with ±3kHz deviation (±2.4kHz) [±1.5kHz] at ±1kHz.

Adjust RV235 (carrier mute) anticlockwise to close the mute (if necessary, momentarily turn off the RF), then slowly adjust it clockwise until the mute just opens. The mute should now open at this preset level.

3.4.5 Line Amplifier Output

Apply an on-channel signal from the RF generator at a level of –70dBm with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Adjust RV210 (front panel line level) to set the line level to the required output level.

3.4.6 CTCSS

3.4.6.1 Decoder Operation

Program a CTCSS tone on the default channel using PGM800Win.

Set the RF signal generator output to –70dBm.

Modulate the generator with both:

- a 1kHz tone at ±3kHz deviation (±2.4kHz) [±1.5kHz]
- and a CTCSS tone at the programmed frequency at ±500Hz deviation (±400Hz) [±300Hz].

Check that the receiver gate opens and the front panel “Gate” LED is on.

3.4.6.2 Opening Sinad

Adjust RV230 (front panel gating sensitivity) fully clockwise.

Reduce the RF signal level to –110dBm.

Observe the sinad meter and reduce the RF level until the receiver mute closes.

Slowly increase the signal level until the receiver mute just opens and stays open.

With PL240 pins 1 and 2 linked (G–H; high pass filter bypassed), check that the sinad is less than 6dB.

Reset the signal generator for the required opening sinad, adjust RV230 fully anti-clockwise, then clockwise until the mute just opens.

3.4.6.3 High Pass Filter

Set the audio processor links as follows:

Plug	Link		Function
PL210	1 – 2	A – B	de-emphasised response
PL230	2 – 3	N – P	audio from internal CTCSS speech filter
PL240	4 – 5	K – L	audio input via PL230 or I/O pad

Reset the RF signal generator output to –70dBm and note the line level (measurement A).

Reduce the 1kHz generator to zero output and measure the line level again (measurement B).

Check that measurement B is at least 30dB below measurement A.

3.4.7 RSSI (If Fitted)

The T800-04-0000 RSSI is an optional PCB which adds signal strength monitoring and high level mute facilities to the basic receiver.

Ensure the T800-04-0000 PCB is fitted in SK320 and SK330 in the IF compartment.

Apply an on-channel signal from the RF generator at a level of –110dBm with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Adjust RV320 (RSSI level) to give 2.0V RSSI output on pin 5 of D-range 1 (PL100) when measured with a high impedance DMM.

3.5 Audio Processor Links

3.5.1 General

Use the following table to set up the audio processor to the configuration you require. You should set the audio processor links before carrying out the receiver alignment. The factory settings are shown in brackets [ ].

Plug	Link[a]		Function
PL210	[1 – 2] 2 – 3	[A – B] B – C	de-emphasised response flat response
PL220	1 – 2 [2 – 3]	D – E [E – F]	flat response de-emphasised response
PL230[b]	1 – 2 [2 – 3] 3 – 4	M – N [N – P] P – Q	audio input via AUDIO-2 pad audio from internal CTCSS speech filter audio input via I/O pad P250
PL240[b]	1 – 2	G – H	bypass high pass filter
	[2 – 3] or 3 – 4	[H – J] or J – K	300Hz high pass filter in circuit
	4 – 5	K – L	audio input via PL230 or I/O pad
PL250	[1 – 2] 2 – 3	[R – S] S – T	noise mute carrier mute
PL260	1 – 2 [2 – 3]	U – V [V – W]	RX-DISABLE link not connected
PL270	[1 – 2] 2 – 3	[X – Y] Y – Z	relay link not connected

a. The letters in this column and in the table in Section 3.5.2 below refer to the identification letters screen printed onto the PCB beside each set of pins.

b. Refer to Section 3.5.2 for further details.

3.5.2 Audio Processor Linking Details For CTCSS

You must connect the audio processor links correctly according to the CTCSS option used, as shown in the table below.

CTCSS Option	PL230		PL240	
standard, no CTCSS	2 – 3	N – P	2 – 3	H – J
received CTCSS + speech passed to line output	3 – 4	P – Q	1 – 2	G – H
high pass filtered speech, internal CTCSS detection	2 – 3	N – P	4 – 5	K – L
external CTCSS detection	1 – 2	M – N	4 – 5	K – L

The conditions stated in the above table are defined as follows:

- standard, no CTCSS
  - no CTCSS or other sub-audio signalling used
  - audio bandwidth 300Hz to 3kHz
  - hum and noise –55dB
- received CTCSS tone + speech to line output
  - tone and speech transmitted down 600Ω line
  - audio bandwidth 10Hz to 3kHz
  - hum and noise –45dB
- high pass filtered speech + internal CTCSS detection
  - 400Hz to 3kHz
  - hum and noise –30dB with 250.3Hz tone present
- external CTCSS detection
  - decoding performed through the receiver (but externally)
  - speech injected back into receiver via “AUDIO-2" and sent down 600Ω line

Note 1: AUDIO-2 is available on D-range 1 (PL100) pin 7 via the link resistor R160. Although PL100 pin 7 is already assigned to SERIAL-COM, this can be disabled by removing R808.

Note 2: External CTCSS units can connect in series with the audio chain via AUDIO-1 and AUDIO-2.

3.6 Synthesiser Alignment

- Ensure that the receiver has been programmed with the required frequencies using the PGM800Win software.

- Connect a high impedance voltmeter to the long lead of L1 in the VCO (this measures the synthesiser loop voltage).

- **Single Channel** Tune VCO trimmer C6 for a synthesiser loop voltage of 10V.

  Multichannel Tune VCO trimmer C6 for a synthesiser loop voltage of 10V on the middle channel.

  If there is no middle channel, tune C6 so that the channels are symmetrically placed around a loop voltage of 10V.

  All channels should lie within the upper and lower limits of 16V and 3V respectively.

  Do not attempt to programme channels with a greater frequency separation than the specified switching range of 5MHz.

- The TCXO =(IC700) output frequency should be trimmed when the IF is tuned. Refer to Section 3.7.

3.7 Alignment Of Receiver Front End And IF

Note: In this and following sections deviation settings are given first for wide bandwidth sets, followed by settings in brackets for mid bandwidth sets ( ) and narrow bandwidth sets [ ].

Align the synthesiser as instructed in Section 3.6. For multichannel operation align the receiver on a frequency in the middle of the required band.

Set RV230 (front panel gating sensitivity) fully clockwise.

Inject a strong on-channel RF signal with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz into the antenna socket and adjust the helicals (#FL410 and #FL420) to give the best sinad.

Continually decrease the RF level to maintain 12dB sinad.

Roughly tune IF coils L310, L320, L330, L340, L350, L360, L370, L380, L385 and L390 for best sinad.

While maintaining a low level unmodulated RF input to the receiver, loosely couple into the first IF an additional high level signal at 45MHz, you will hear a beat note.

Trim the synthesiser TCXO (=IC710) for zero beat.

While maintaining the low level RF input to the receiver, loosely couple into the second IF an additional high level signal at 455kHz, you will hear a beat note.

Tune L385 for zero beat.

Note: If a second oscillator is not available, you can connect a frequency counter to IC710 pin 8 (i.e. after the TCXO buffer) via an oscilloscope probe to measure the TCXO frequency directly (12.8MHz). At this point the voltage level is approximately $4V_{pp}$.

Readjust the front end helicals (#FL410 and #FL420) to give the best sinad.

Change the RF signal level to –75dBm and modulate with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Connect an oscilloscope probe to SK320 pin 3 (RSSI 455kHz input) and connect plugs PL210 and PL220 to give a flat audio response (refer to Section 3.5).

Readjust L310, L320, L330, L340, L350, L360, L370 and L380 to give a maximum amplitude response on the oscilloscope with minimal amplitude modulation.

Note: If you would like a more accurate method of tuning the IF, refer to the sweep tuning method described in Section 5.5.5.

Further adjust these coils, along with L390, for minimum audio distortion, ensuring that the 455kHz level (on the oscilloscope) does not fall significantly.

Check that the distortion reading is:

wide bandwidth	≤2%
mid and narrow bandwidth	≤4%.

If required, reconnect plugs PL210 and PL220 to give a de-emphasised audio response and check that the distortion reading is ≤2% (all bandwidths).

Reduce the RF level until 12dB sinad is reached. The receiver sensitivity should be better than –117dBm (de-emphasised) or –111dBm (flat), assuming that the audio levels are not being overdriven (refer to Section 3.11).

3.8 Gating Delay

Two solder links (SL210 and SL220) are provided on the bottom of the PCB to allow three gate delay time options, as shown in the table below.

SL210	SL220	Closing Delay
linked	not linked	<50ms*
not linked	linked	<25ms
not linked	not linked	<20ms

*Factory setting.

3.9 Noise Mute Adjustment

Connect pins 1 and 2 of PL250 to enable the noise mute.

Align the receiver as instructed in Section 3.6 and Section 3.7.

Set the RF level to –105dBm with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Set RV230 (front panel gating sensitivity) fully anticlockwise.

Adjust RV310 (noise mute gain) fully clockwise to close the mute (if necessary turn off the RF signal and then turn it on again).

Rotate RV310 anticlockwise until the mute just opens.

Reset the signal generator for the required opening sinad and adjust RV230 clockwise until the mute just opens.

3.10 Carrier Level Mute

Connect pins 2 and 3 of PL250 to enable the carrier mute and disable the noise mute.

Apply an on-channel signal from the RF generator at the required mute opening level with ±3kHz deviation (±2.4kHz) [±1.5kHz] at ±1kHz.

Adjust RV235 (carrier mute) anticlockwise to close the mute (if necessary, momentarily turn off the RF), then slowly adjust it clockwise until the mute just opens. The mute should now open at this preset level.

3.11 Audio Processor

3.11.1 Line Amplifier Output

Apply an on-channel signal from the RF generator at a level of –70dBm with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Adjust RV210 (front panel line level) to give an output of +10dBm on the 600Ω line.

Check for any clipping or distortion on the oscilloscope.

Set the line level to the required output level.

3.11.2 Monitor Amplifier Output (Speaker Output)

Adjust RV205 (front panel monitor volume) to give an output of $2V_{rms}$ into a 4Ω resistive load.

Check for any clipping or distortion on the oscilloscope.

Switch to a 4Ω speaker and adjust RV205 to the required level.

3.12 CTCSS

3.12.1 Decoder Operation

Program a CTCSS tone on the default channel using PGM800Win.

Set the RF signal generator output to –70dBm.

Modulate the generator with both:

- a 1kHz tone at ±3kHz deviation (±2.4kHz) [±1.5kHz]
- and a CTCSS tone at the programmed frequency at ±500Hz deviation (±400Hz) [±300Hz].

Check that the receiver gate opens and the front panel “Gate” LED is on.

3.12.2 Opening Sinad

Adjust RV230 (front panel gating sensitivity) fully clockwise.

Reduce the RF signal level to –110dBm.

Observe the sinad meter and reduce the RF level until the receiver mute closes.

Slowly increase the signal level until the receiver mute just opens and stays open.

With PL240 pins 1 and 2 linked (G – H; high pass filter bypassed), check that the sinad is less than 6dB.

Reset the signal generator for the required opening sinad, adjust RV230 fully anti-clockwise, then clockwise until the mute just opens.

3.12.3 High Pass Filter

Set the audio processor links as follows:

Plug	Link		Function
PL210	1 – 2	A – B	de-emphasised response
PL230	2 – 3	N – P	audio from internal CTCSS speech filter
PL240	4 – 5	K – L	audio input via PL230 or I/O pad

Reset the RF signal generator output to –70dBm and note the line level (measurement A).

Reduce the 1kHz generator to zero output and measure the line level again (measurement B).

Check that measurement B is at least 30dB below measurement A.

3.13 RSSI

The T800-04-0000 RSSI is an optional PCB which adds signal strength monitoring and high level mute facilities to the basic receiver.

Ensure the T800-04-0000 PCB is fitted in SK320 and SK330 in the IF compartment.

Align the receiver as instructed in Section 3.6 and Section 3.7.

Apply an on-channel signal from the RF generator at a level of –110dBm with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Adjust RV320 (RSSI level) to give 2.0V RSSI output on pin 5 of D-range 1 (PL100) when measured with a high impedance DMM.

4 T855 Functional Testing

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

The following test procedures will confirm that the T855 has been tuned and adjusted correctly and is fully operational.

Note 1: In this and following sections deviation settings are given first for wide bandwidth sets, followed by settings in brackets for mid bandwidth sets ( ) and narrow bandwidth sets [ ].

Note 2: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 4.02 and later of the software.

Refer to Figure 4.3 for the location of the main tuning and adjustment controls, and to Section 3.3 for the test equipment set-up. Refer also to Section 6 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components and test points on the main PCB. The parts list and diagrams for the VCO PCB are in Part E.

The following topics are covered in this section.

4.1 Current Consumption

Connect the T855 to a 13.8V power supply.

Rotate RV230 (front panel gating sensitivity) anticlockwise until the “Gate” LED is extinguished.

Set switch SW201 (front panel monitor mute) to the ***on*** position.

Check that the current in the 13.8V power cable is less than 350mA.

Rotate the RV230 clockwise until the “Gate” LED is lit.

Rotate RV210 (front panel line level) and RV205 (front panel monitor volume) to give maximum outputs.

Check that the current is less than 800mA.

Reset the front panel controls to the required settings.

4.2 Sensitivity

If CTCSS is enabled, disable the CTCSS tone by either programming the T855 for “No Tone” on the set channel, or by pulling pin 10 of D-range 2 (CTCSS ENABLE) low.

Apply an on-channel signal from the RF generator with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Adjust the RF level to give 12dB audio sinad.

Check that the sensitivity is –117dBm or better.

4.3 Switching Range

Apply an on-channel signal from the RF generator at various frequencies within the 5MHz switching range (front end bandwidth), corresponding to pre-programmed channels.

Measure the sensitivity at each frequency as described in Section 4.2.

Ensure that the sensitivity is –115dBm or better across the whole switching range.

4.4 Audio Distortion

The level of distortion measured at the line output (refer to Figure 1.3 in Part G) gives an indication of the accuracy of the IF alignment.

Apply an accurate on-channel signal from the RF generator at a level of –70dBm with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Adjust RV210 (front panel line level) to give +10dBm into 600Ω.

Check that the distortion is approximately 1% THD.

Note: For a flat response, the distortion should always be better than 2% for wide bandwidth sets or 4% for mid and narrow bandwidth sets.

Adjust RV205 (front panel monitor volume) to give $2V_{rms}$ into a 4Ω resistive load.

Check that the distortion at the monitor output is better than 2% THD.

Reset the controls before proceeding to the next set of tests.

4.5 Ultimate Signal-To-Noise Ratio

Apply a signal from the RF generator at a level of –57dBm with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Select de-emphasis on the links provided in the audio processor (refer to Section 3.5), and link pins 2 and 3 of PL240 to include the 300Hz filter.

Adjust RV210 (front panel line level) to provide +10dBm output.

Switch off the modulation, checking that the residual noise is lower than –45dBm (–43dBm) [–39dBm] at the line output (this corresponds to S/N of 55dB (53dB) [49dB] and is in accordance with EIA measurement conditions).

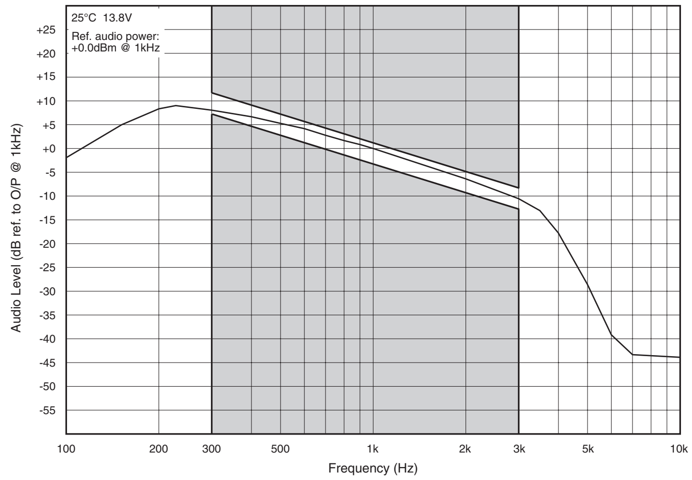
Note: You can make the measurement without the 300Hz high pass filter, but the result will be 10dB worse.

4.6 De-emphasised Audio Frequency Response

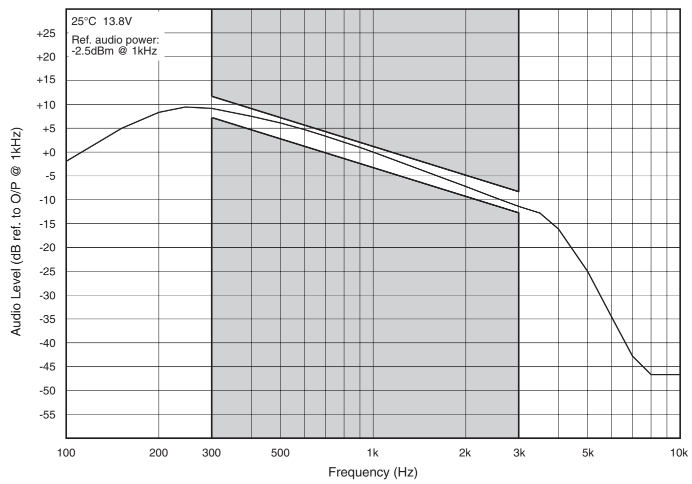
Set RV210 (front panel line level) to provide 0dBm output at 1kHz modulating frequency.

Sweep the modulating frequency, checking that the line audio response closely follows that shown in Figure 4.1 – the limits should not be exceeded.

Wide Bandwidth



Mid Bandwidth



Narrow Bandwidth

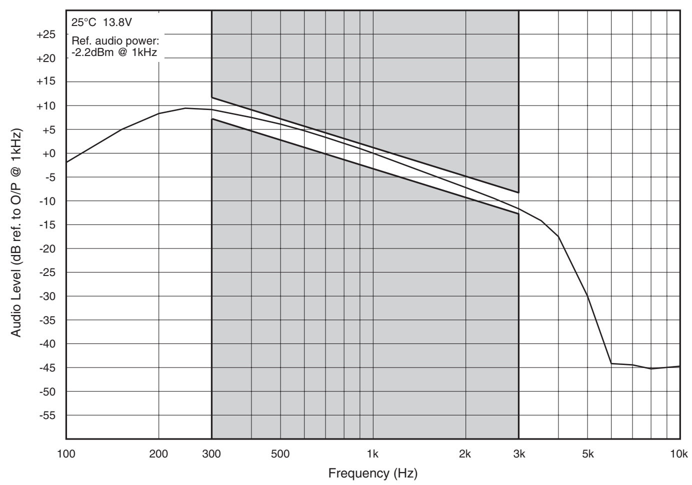


Figure 4.1 T855 De-emphasised Audio Frequency Response

4.7 Noise Mute (If Linked In)

Rotate RV230 (front panel gating sensitivity) fully anticlockwise.

Apply an on-channel signal from the RF generator at a level of –110dBm with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Increase the RF level in 1dB steps, checking that the mute opens for an RF input level of approximately –105dBm.

Turn the RF off and check that the mute closes.

Rotate RV230 clockwise and check that the mute opens.

Reset RV230 to give the required opening sinad.

Caution: **Some RF generators can cause a false opening of the mute because the generator produces a burst of noise when the attenuation range changes. To correct the problem you will have to change generators.**

4.8 RSSI (If Fitted)

Apply an on-channel signal from the RF generator at a level of –110dBm with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Using a high impedance DMM, check that the RSSI output voltage on pin 5 of D-range 1 (PL100) is 2V (nominal).

Vary the RF level in 5dB steps and check that the RSSI output voltage changes at a rate of approximately 10dB/V over the range of –115dBm to –70dBm (refer to Figure 4.2 for RSSI voltage vs signal strength).

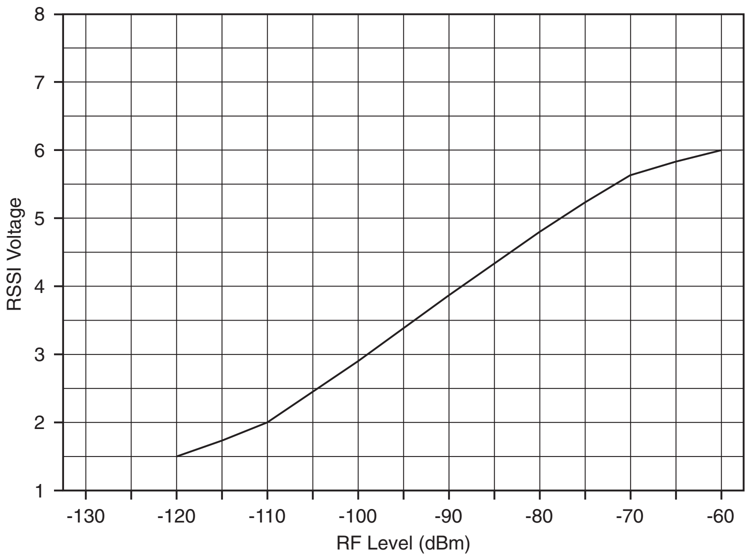


Figure 4.2 T855 RSSI Voltage vs Signal Strength

4.9 Carrier Level Mute (RSSI Fitted and Carrier Mute Linked In)

Apply an on-channel signal from the RF generator at a level of –120dBm with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Increase the RF level in 2dB steps and check that the mute opens at an RF level which corresponds with the preset level on RV235 (carrier mute), i.e. between –115dBm and –70dBm.

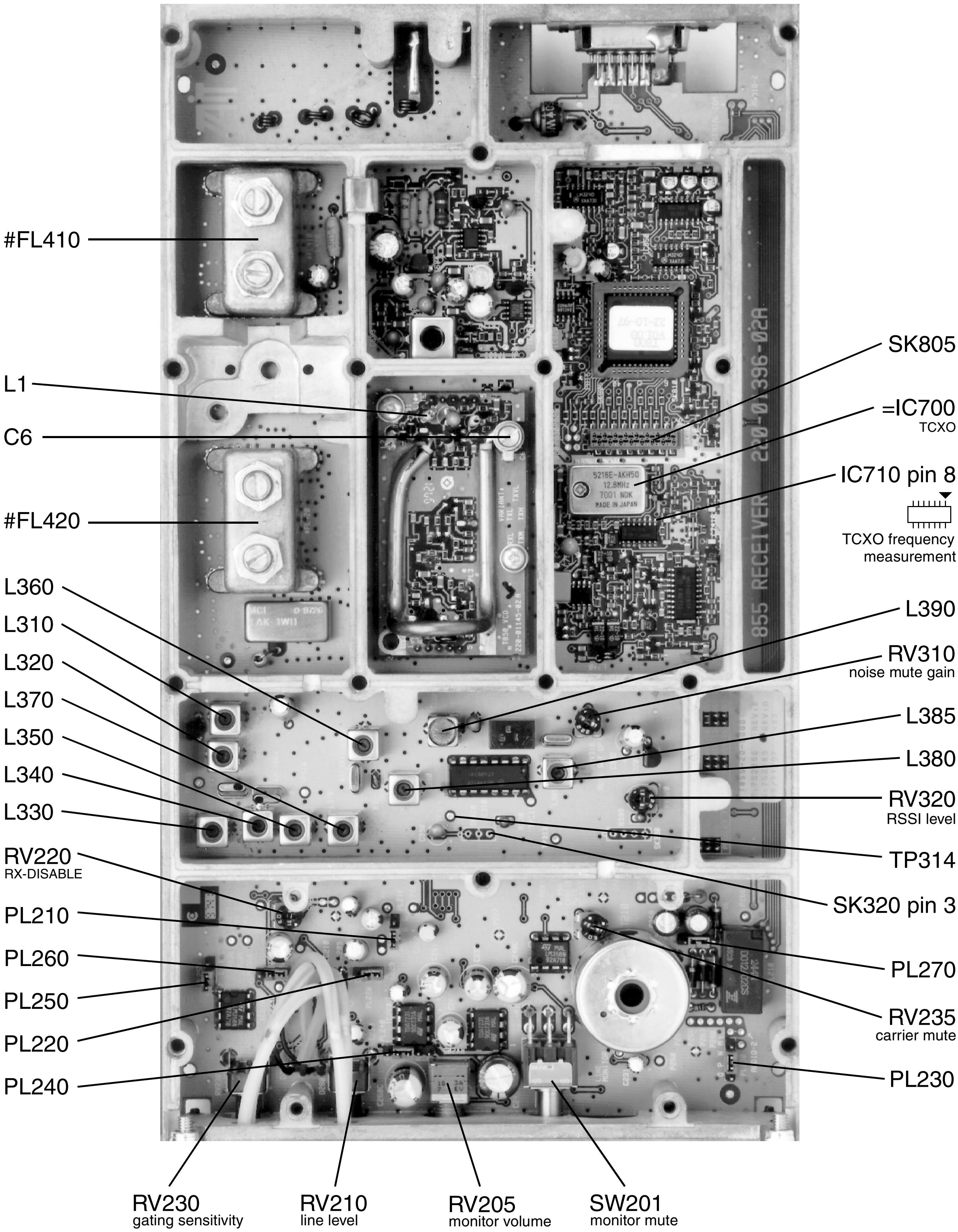


Figure 4.3 T854 Main Tuning and Adjustment Controls

5 T855 Fault Finding

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

The following test procedures and fault finding flow charts may be used to help locate a hardware problem, however they are by no means a complete fault finding procedure. If you still cannot trace the fault after progressing through them in a logical manner, contact your nearest Tait Dealer or Customer Service Organisation. If necessary, you can get additional technical help from Technical Support, Tait Electronics Ltd, Christchurch, New Zealand (full contact details are on page 2).

Note 1: In this and following sections deviation settings are given first for wide bandwidth sets, followed by settings in brackets for mid bandwidth sets ( ) and narrow bandwidth sets [ ].

Note 2: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 4.02 and later of the software.

Refer to Section 6 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components and test points on the main PCB. The parts list and diagrams for the VCO PCB are in Part E.

The following topics are covered in this section.

5.1 Visual Checks

Remove the covers from the T855 and inspect the PCB for damaged or broken components, paying particular attention to the surface mounted devices (SMDs).

Check for defective solder joints. If repair or replacement of components is considered necessary, refer to Section 3 of Part A.

5.2 Component Checks

If you suspect a transistor is faulty, you can assess its performance by measuring the forward and reverse resistance of the junctions. Unless the device is completely desoldered, first make sure that the transistor is not shunted by some circuit resistance. Use a good quality EVM (e.g. Fluke 75) for taking the measurements (or a 20kΩ/V or better multimeter, using only the medium or low resistance ranges).

The collector current drawn by multi-junction transistors is a further guide to their performance.

If an IC is suspect, the most reliable check is to measure the DC operating voltages. Due to the catastrophic nature of most IC failures, the pin voltages will usually be markedly different from the recommended values in the presence of a fault. The recommended values can be obtained from either the circuit diagram or the component data catalogue.

5.3 Front Panel LED Indicator

The green "Supply" LED on the front panel will flash according to the conditions described in the following table:

Flash Rate		Condition
fast	(1s on/1s off approx.)	receiver is linked with PGM800Win
slow	(1s on/1s off approx.)	VCO is out of lock – refer to Section 5.4.2
unequal	(1s on/1s off approx.)	microcontroller has detected an internal communications error – refer to Section 5.7.1

Where two or more conditions occur at the same time, the precedence is in the order shown above (i.e. receiver linked has the highest priority, followed by VCO error, then internal error).

5.4 DC Checks

5.4.1 Power Rails

Refer to the test points and options diagrams in Section 6 for test point locations, and to the regulator fault finding chart (Section 5.7.2) for fault diagnosis.

Check the 9V (TP602) and 13.8V (TP601) power supply test points in the regulator compartment with a DMM.

Check the 20V regulator output at the test point (TP603) in the regulator compartment.

Check the 5V regulator output at the test point (TP604) in the regulator compartment and on IC310 pin 4.

Check the 5V digital regulator output at the junction of C611A (+) and IC610 pin 2 in the regulator compartment.

5.4.2 VCO Locking

Using a DMM, monitor the VCO control voltage on the long lead of L1 on the VCO PCB.

If the synthesiser is locked and the VCO aligned, the voltage at this point should be between 3 and 16V.

If the VCO is not locked, refer to the synthesiser fault finding charts (Section 5.7.3).

5.4.3 Mute Operation

The front panel “Gate” LED will show the status of the mute circuitry and will turn on when a signal is received above the threshold level.

Check that PL250 is linked correctly:

noise mute	1–2
carrier mute	2–3.

Check that the mute gate opens as follows:

noise mute	rotate RV230 (front panel gating sensitivity) fully clockwise and check that the front panel “Gate” LED turns on;
carrier mute	rotate RV235 (carrier mute) fully clockwise and check that the front panel “Gate” LED turns on.

If the mute fails to operate correctly, refer to the noise mute fault finding chart (Section 5.7.4) or the carrier mute fault finding chart (Section 5.7.5).

5.5 RF Checks

5.5.1 VCO Frequency

Check that the VCO is phase locked (refer to Section 5.4.2).

Connect a frequency counter (level +20dBm) to the VCO input to the mixer (IC410).

Monitor the local oscillator frequency and check that it is 45MHz ***below*** the required receive frequency.

Refer to the synthesiser fault finding charts (Section 5.7.3) for further information.

5.5.2 RF Sensitivity

Ensure that the VCO is on the correct frequency and the receiver correctly aligned.

Check that the 12dB sinad sensitivity into the front end is as follows:

–117dBm (de-emphasised response)
–111dBm (flat response).

If the sensitivity is poor, you can trace the fault by measuring the sensitivity into successive circuit blocks. Prepare a test cable by connecting a 1nF capacitor to the end of a length of coax cable as shown in Figure 5.1.

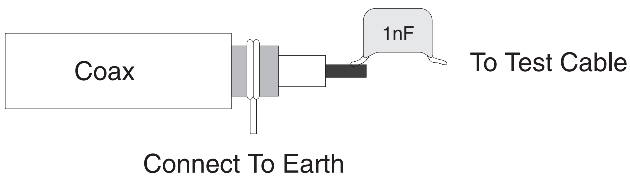


Figure 5.1 RF Test Cable

Note: Before using the test cable, ensure the coax braid is connected to an earth point on the PCB.

Using the RF test cable, apply a modulated 45MHz signal to the test breaks in the IF section, or an on-channel RF signal to the front end test breaks.

Check that the sensitivity at each test break is within 2dB of the levels shown on the circuit diagram.

Poor sensitivity indicates a fault in one of the circuit blocks following the test break.

Note: Poor sensitivity into the mixer can be caused by lack of drive level from the VCO (the drive level should be >+17dBm).

Refer to the receiver fault finding charts (Section 5.7.6) for further information.

5.5.3 Oscillator Stability

5.5.3.1 TCXO

While maintaining a low level unmodulated RF input to the receiver, loosely couple into the first IF an additional high level signal at 45MHz. You should now hear a constant low frequency beat note.

Tap the TCXO with a finger and replace it if the beat note permanently changes.

5.5.3.2 Second IF

While maintaining a low level unmodulated RF input to the receiver, loosely couple into the second IF an additional high level signal at 455kHz. You should now hear a constant low frequency beat note.

Adjust L385 for “zero beat".

5.5.4 Demodulator Output

Apply an on-channel RF signal modulated by 1kHz with ±3kHz (±2.4kHz) [±1.5kHz] deviation at an amplitude of –65dBm.

Connect an oscilloscope probe (DC coupled) to TP314 (audio output).

Check that an audio signal of approximately 800mV peak to peak is present.

Optimum tuning of the quad coil (L390) for minimum audio distortion (with a “flat” audio response) should coincide with maximum audio amplitude and a DC level of approximately 1.7V.

5.5.5 IF Distortion

If the audio distortion is still high after careful IF alignment (Section 3.7), sweep the IF to investigate the bandpass response.

Apply an on-channel RF signal modulated at 10Hz (sine wave) with ±12kHz (±9kHz) [±6kHz] deviation at an amplitude of –80dBm.

Connect the modulating 10Hz audio signal to the “X” input of an oscilloscope and observe the 455kHz IF input to SK320 pin 3 via a suitable RF probe on the “Y” input. Alternatively, if you have an RSSI PCB fitted, use an oscilloscope probe for the “Y” input to monitor the RSSI output voltage at pad P238 (RSSI test point) or pin 5 of D-range 1 (PL100). This will give a demodulated log response and only the top half of the wave forms shown in Figure 5.2 and Figure 5.3 will be displayed on the oscilloscope screen.

Note: The “X” input should be DC coupled.

Check that the swept response has a rounded top and no sharp non-linearities (refer to Figure 5.2).

Increase the RF level to –50dBm; the trace will now show the shape of the 455kHz ceramic filter (&XF302).

Check that the response has no sharp non-linearities.

If sharp non-linearities do occur, replace the filter and sweep again to confirm a satisfactory solution (refer to Figure 5.3).

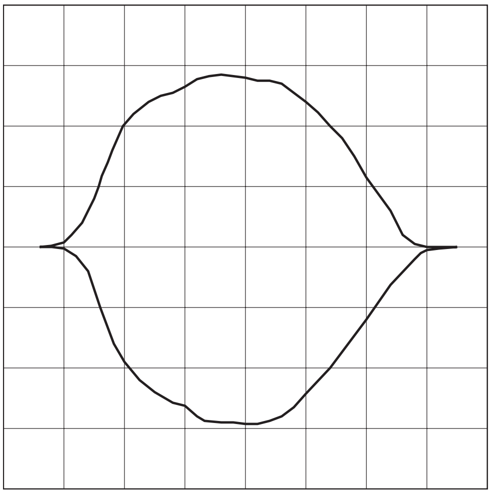


Figure 5.2 IF Swept Response

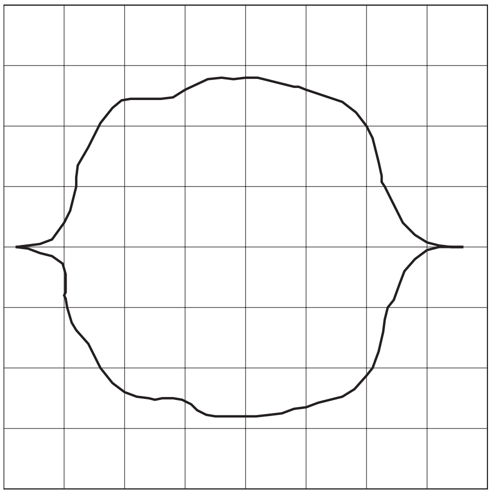


Figure 5.3 Ceramic Filter Swept Response

5.6 PGM800Win Generated Errors

The following errors are those most likely to occur using PGM800Win. Refer to the PGM800Win software user's manual for a complete list of error messages.

Channel Switch Set

The (programmed) default channel change was not accepted by the base station because a channel is selected externally. Try turning the external channel switch off to change the default channel in PGM800Win.

Synth Out Of Lock

The synthesiser received incorrect data, or the data was corrupted. Enter a frequency within the VCO switching range, or tune the VCO.

Internal Error

Data could not be read from the base station due to an internal error. Check for shorts or open circuits on the SDA, SCK, SYNTH and EPOT lines. The SDA, SCK and SYNTH are normally high.

Write/Read To An Unlinked Module

The link to the module does not exist. Undefined error.

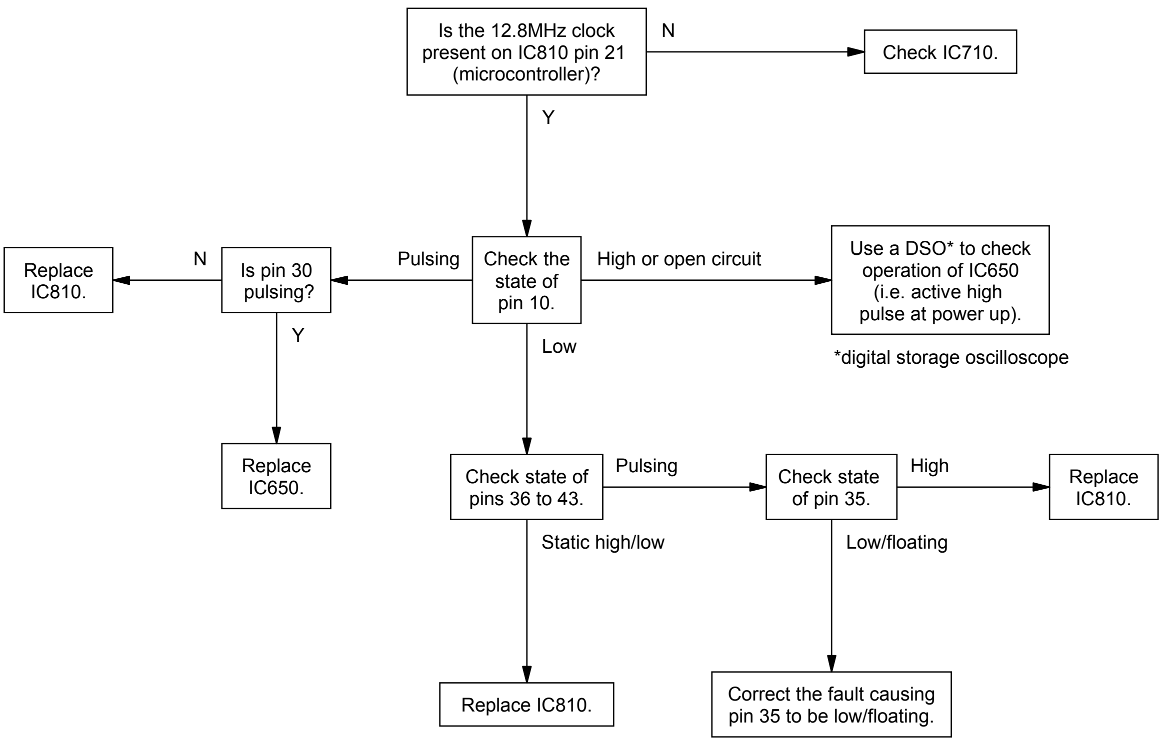
5.7 Fault Finding Charts

Note: The standard test point designations used in this section are as follows:

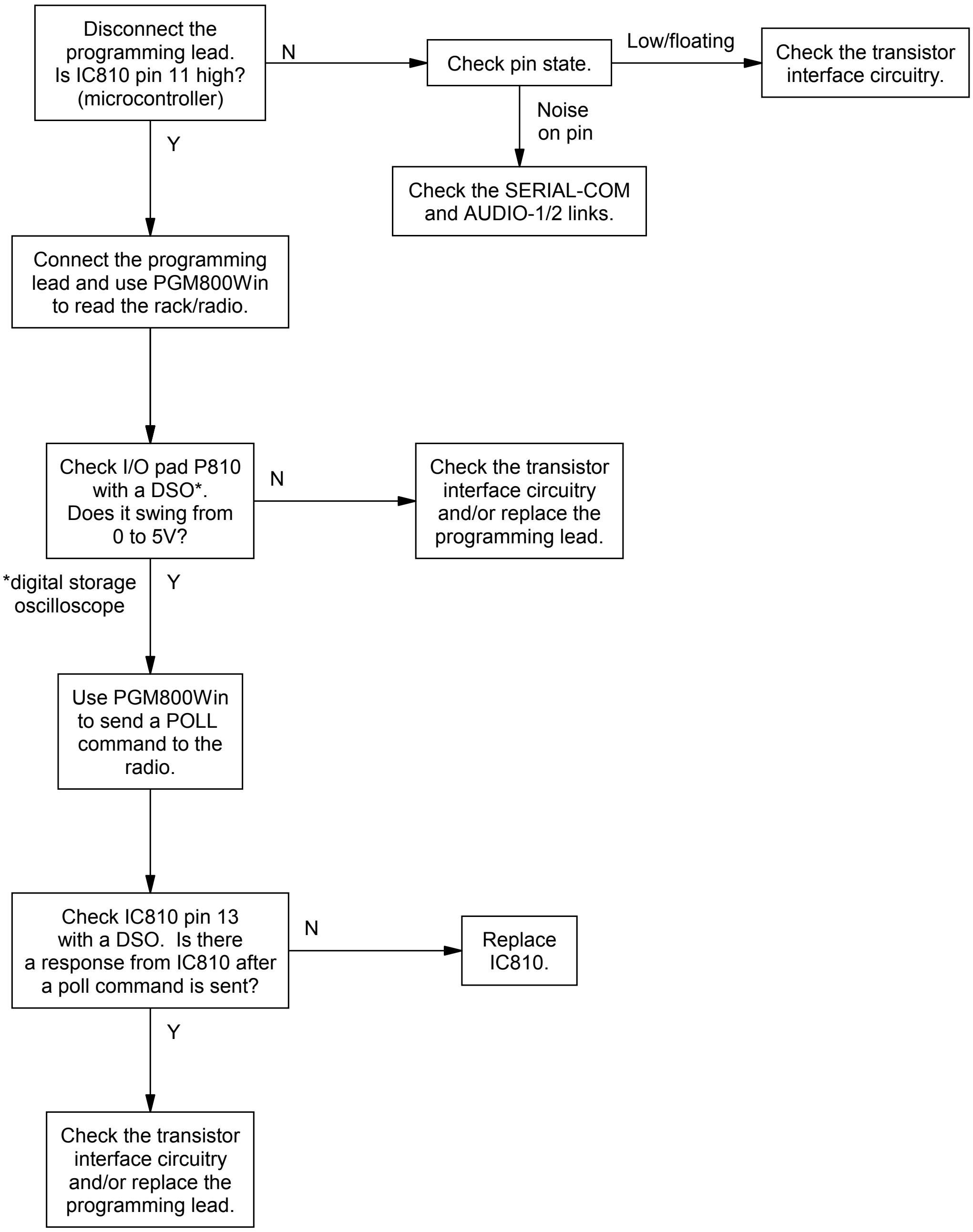
TP601	13.8V
TP602	9V
TP603	20V
TP604	5V

5.7.1 Microcontroller (IC810)

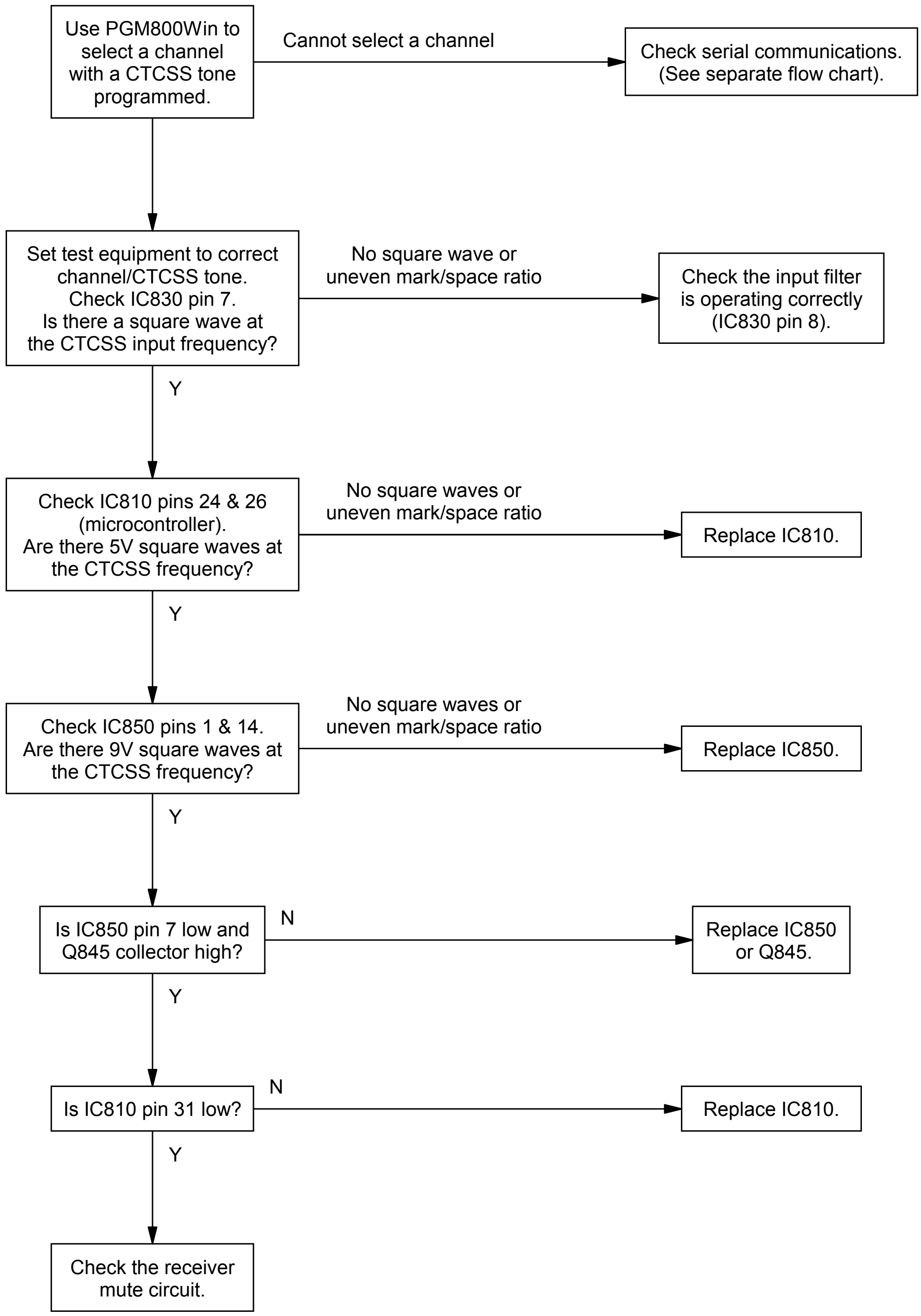
5.7.1.1 Basic Checks



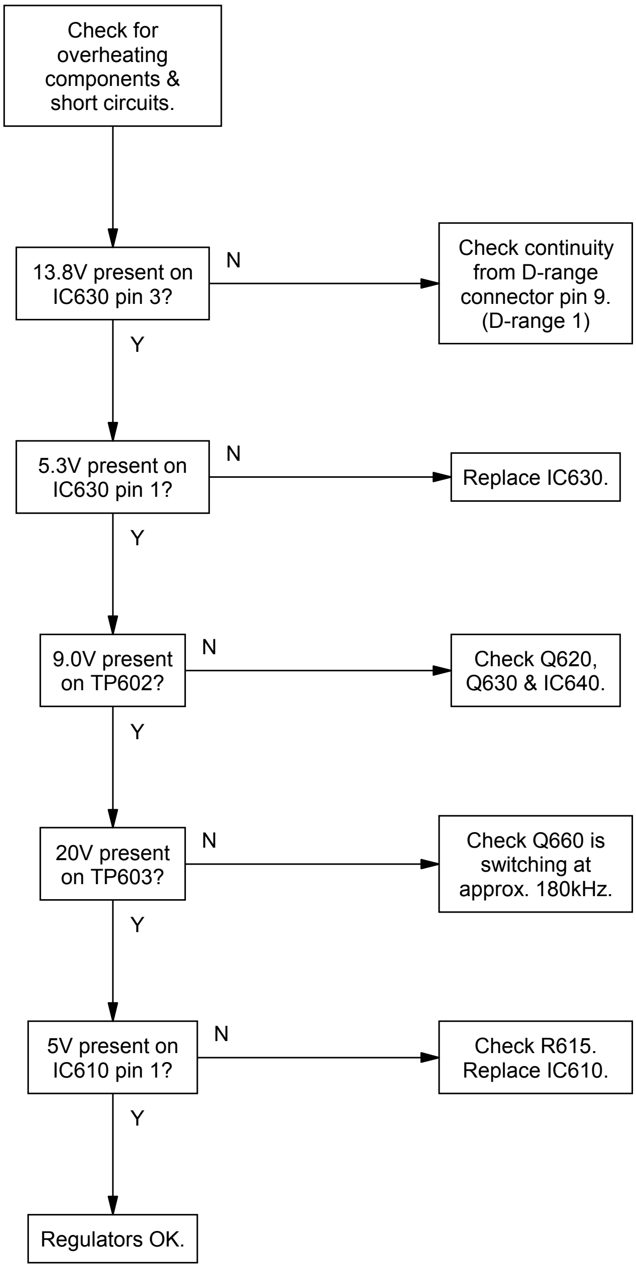
5.7.1.2 Serial Communication



5.7.1.3 CTCSS Decode

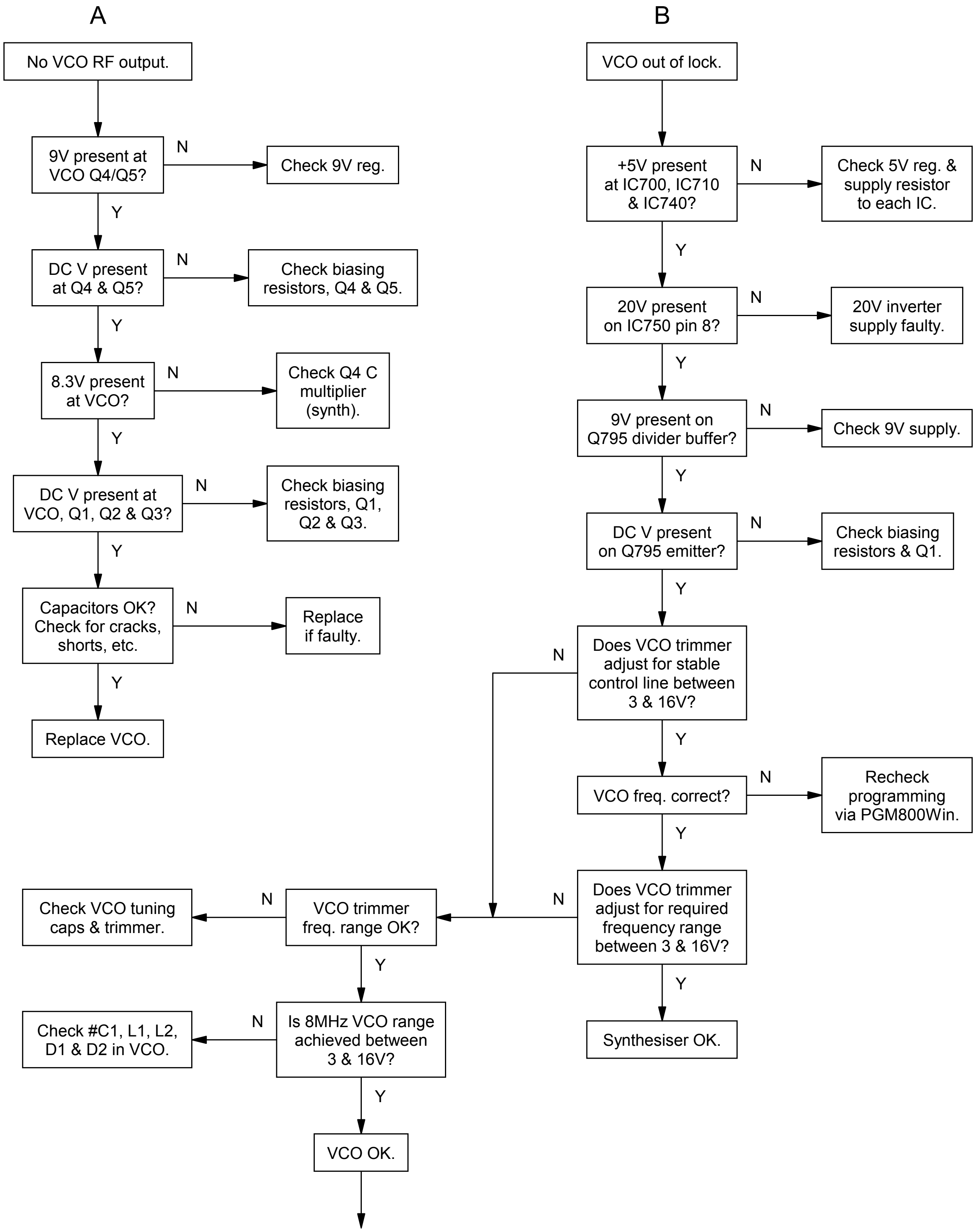


5.7.2 Regulator



5.7.3 Synthesiser

Refer to the synthesiser circuit diagram (sheet 7) in Section 6 and the VCO circuit diagram in Part E.



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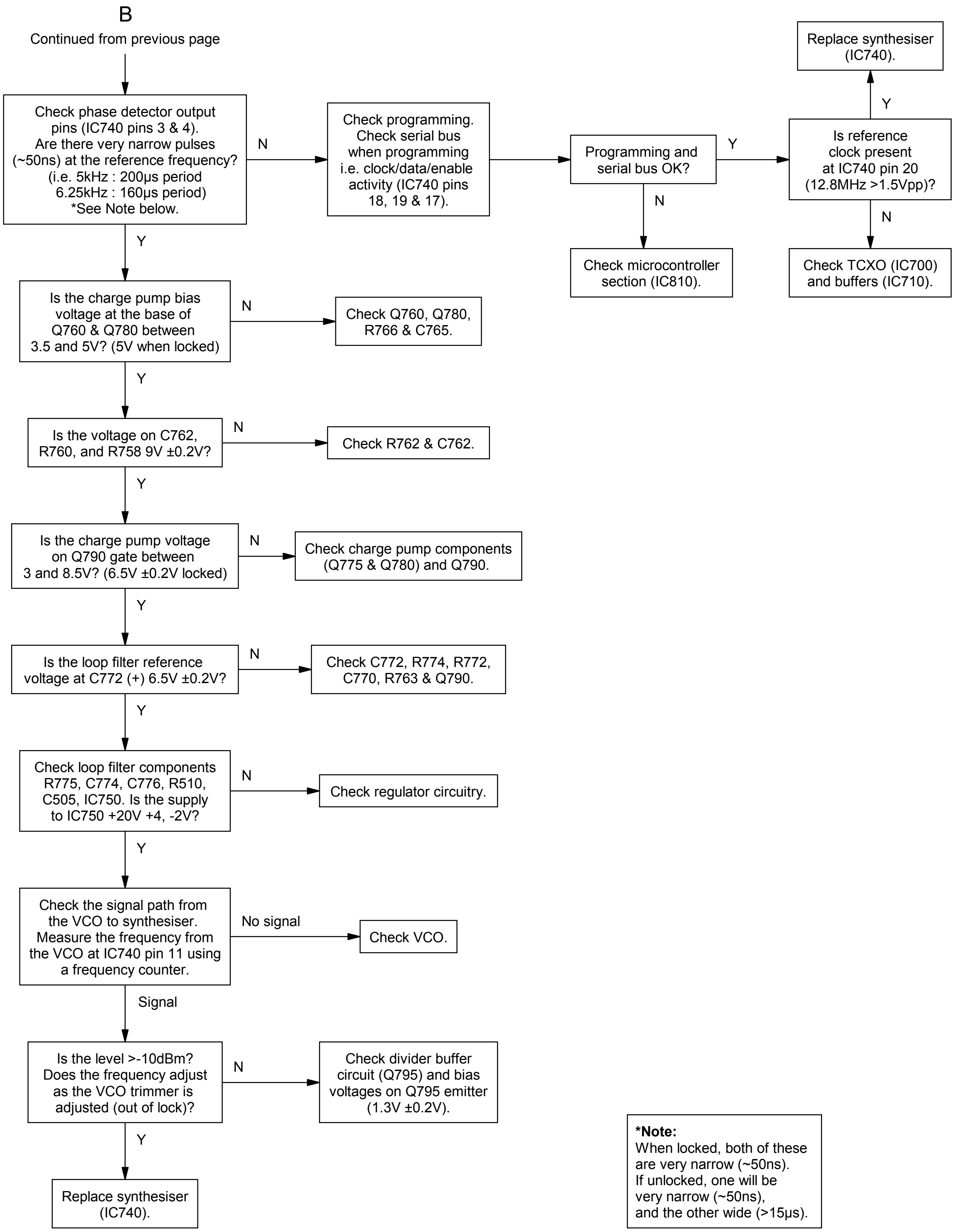
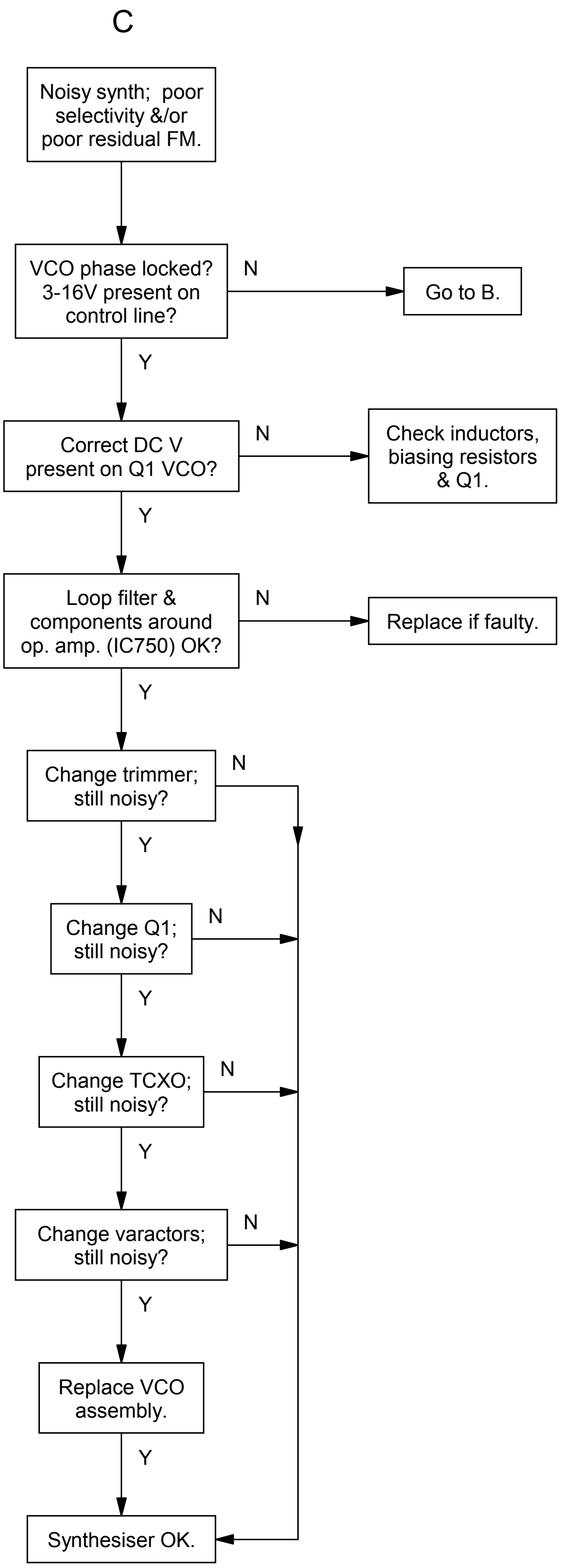
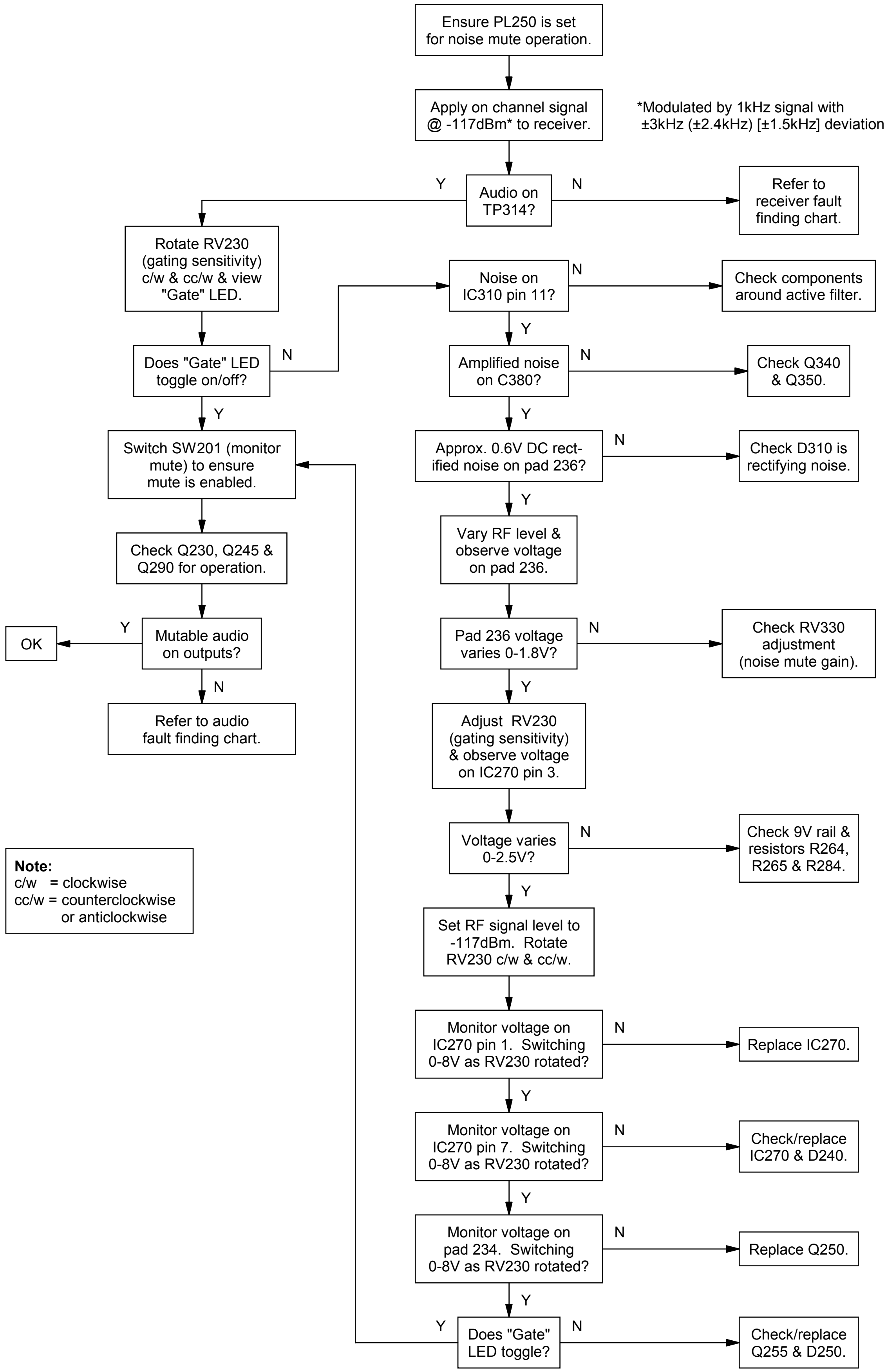
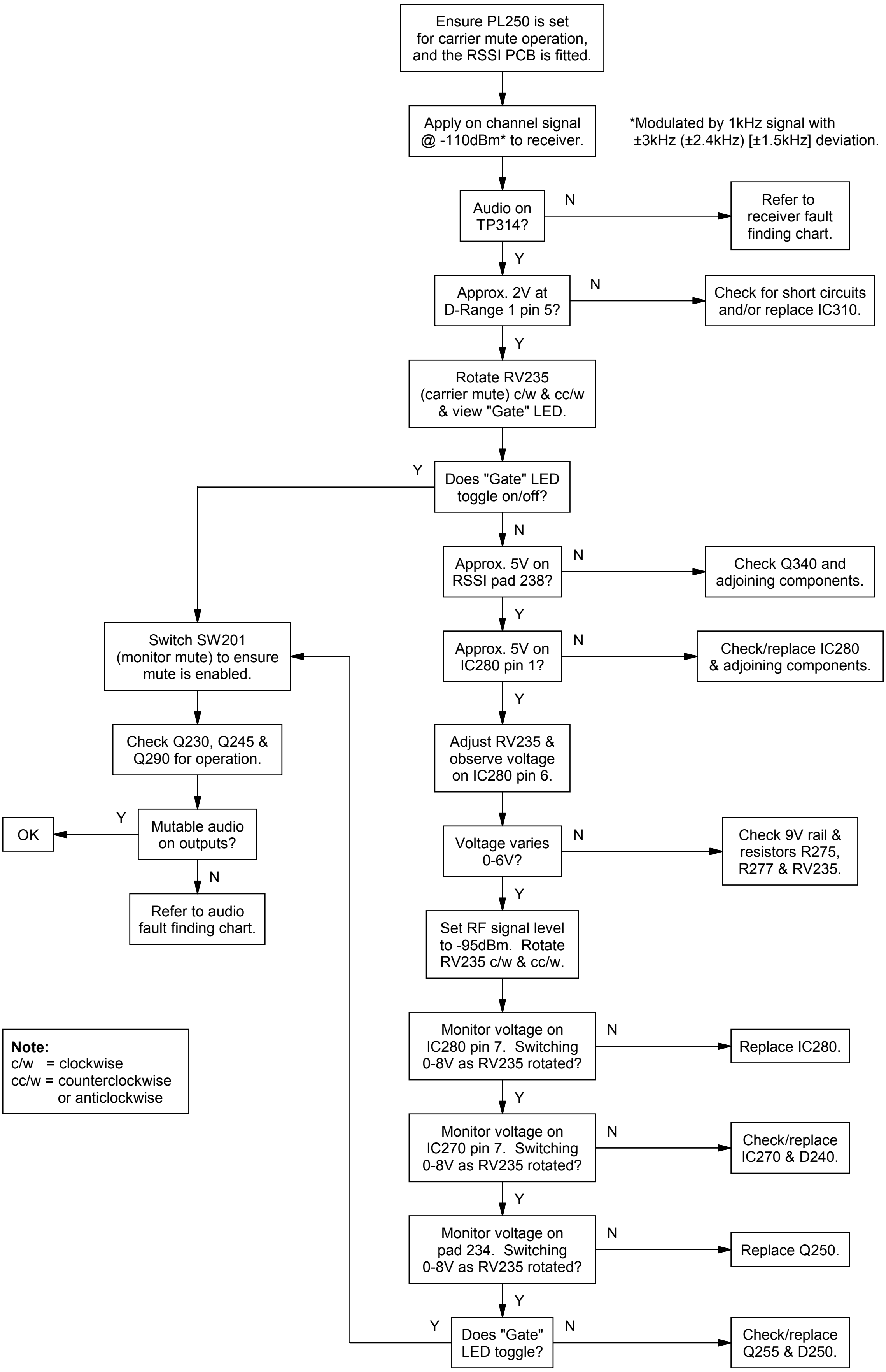

B
Continued from previous page
Check phase detector output pins (IC740 pins 3 & 4). Are there very narrow pulses (~50ns) at the reference frequency? (i.e. 5kHz : 200µs period 6.25kHz : 160µs period) *See Note below.
N
Check programming. Check serial bus when programming i.e. clock/data/enable activity (IC740 pins 18, 19 & 17).
Programming and serial bus OK?
Y
Is reference clock present at IC740 pin 20 (12.8MHz >1.5Vpp)?
Y
Replace synthesiser (IC740).
N
Check TCXO (IC700) and buffers (IC710).
N
Check microcontroller section (IC810).
Y
Is the charge pump bias voltage at the base of Q760 & Q780 between 3.5 and 5V? (5V when locked)
N
Check Q760, Q780, R766 & C765.
Y
Is the voltage on C762, R760, and R758 9V ±0.2V?
N
Check R762 & C762.
Y
Is the charge pump voltage on Q790 gate between 3 and 8.5V? (6.5V ±0.2V locked)
N
Check charge pump components (Q775 & Q780) and Q790.
Y
Is the loop filter reference voltage at C772 (+) 6.5V ±0.2V?
N
Check C772, R774, R772, C770, R763 & Q790.
Y
Check loop filter components R775, C774, C776, R510, C505, IC750. Is the supply to IC750 +20V +4, -2V?
N
Check regulator circuitry.
Y
Check the signal path from the VCO to synthesiser. Measure the frequency from the VCO at IC740 pin 11 using a frequency counter.
No signal
Check VCO.
Signal
Is the level >-10dBm? Does the frequency adjust as the VCO trimmer is adjusted (out of lock)?
N
Check divider buffer circuit (Q795) and bias voltages on Q795 emitter (1.3V ±0.2V).
Y
Replace synthesiser (IC740).
*Note:
When locked, both of these are very narrow (~50ns).
If unlocked, one will be very narrow (~50ns),
and the other wide (>15µs).


C
Noisy synth; poor selectivity &/or poor residual FM.
VCO phase locked? 3-16V present on control line?
N
Go to B.
Y
Correct DC V present on Q1 VCO?
N
Check inductors, biasing resistors & Q1.
Y
Loop filter & components around op. amp. (IC750) OK?
N
Replace if faulty.
Y
Change trimmer; still noisy?
N
Y
Change Q1; still noisy?
N
Y
Change TCXO; still noisy?
N
Y
Change varactors; still noisy?
N
Y
Replace VCO assembly.
Y
Synthesiser OK.

5.7.4 Noise Mute

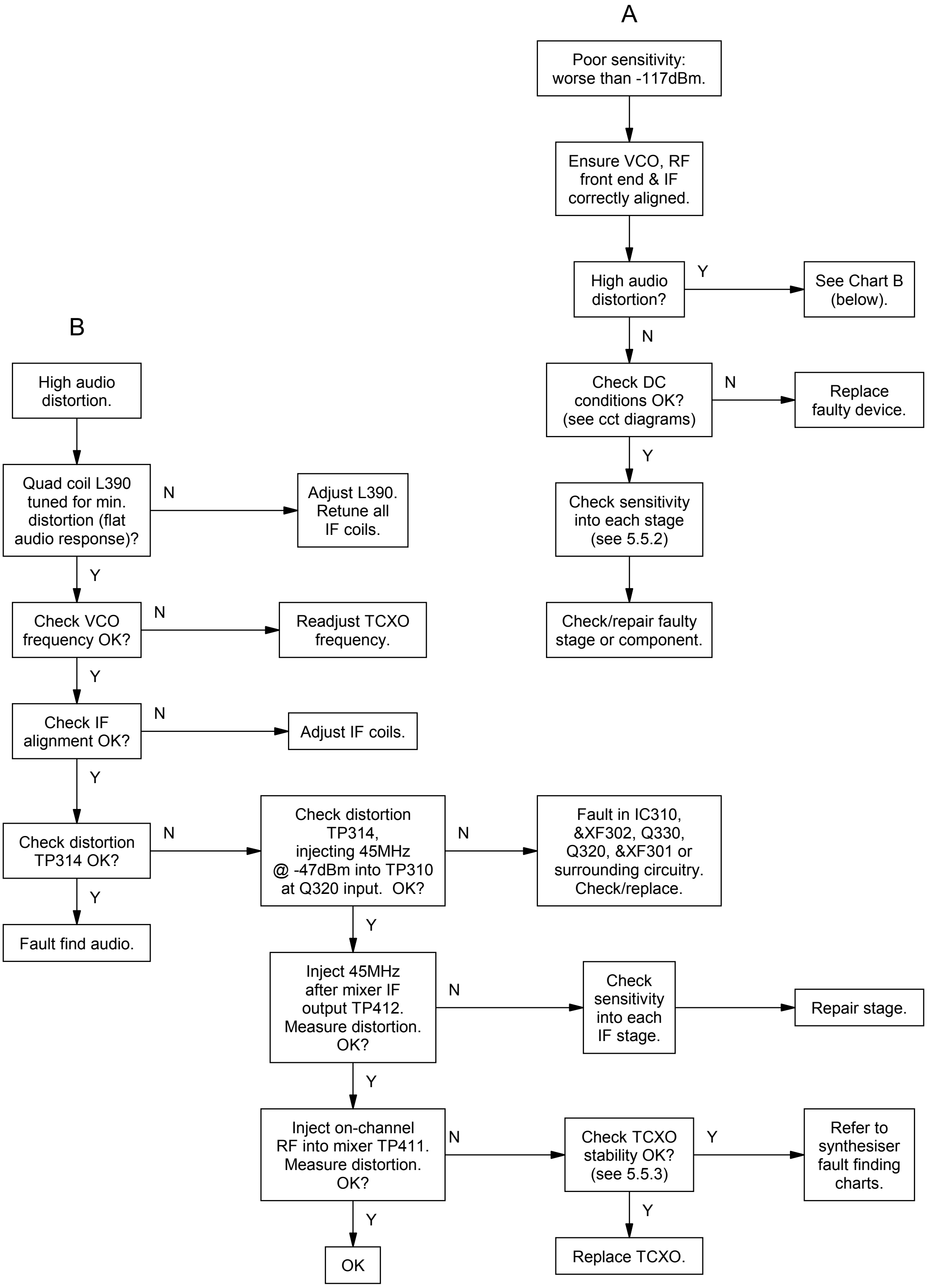


5.7.5 Carrier Mute

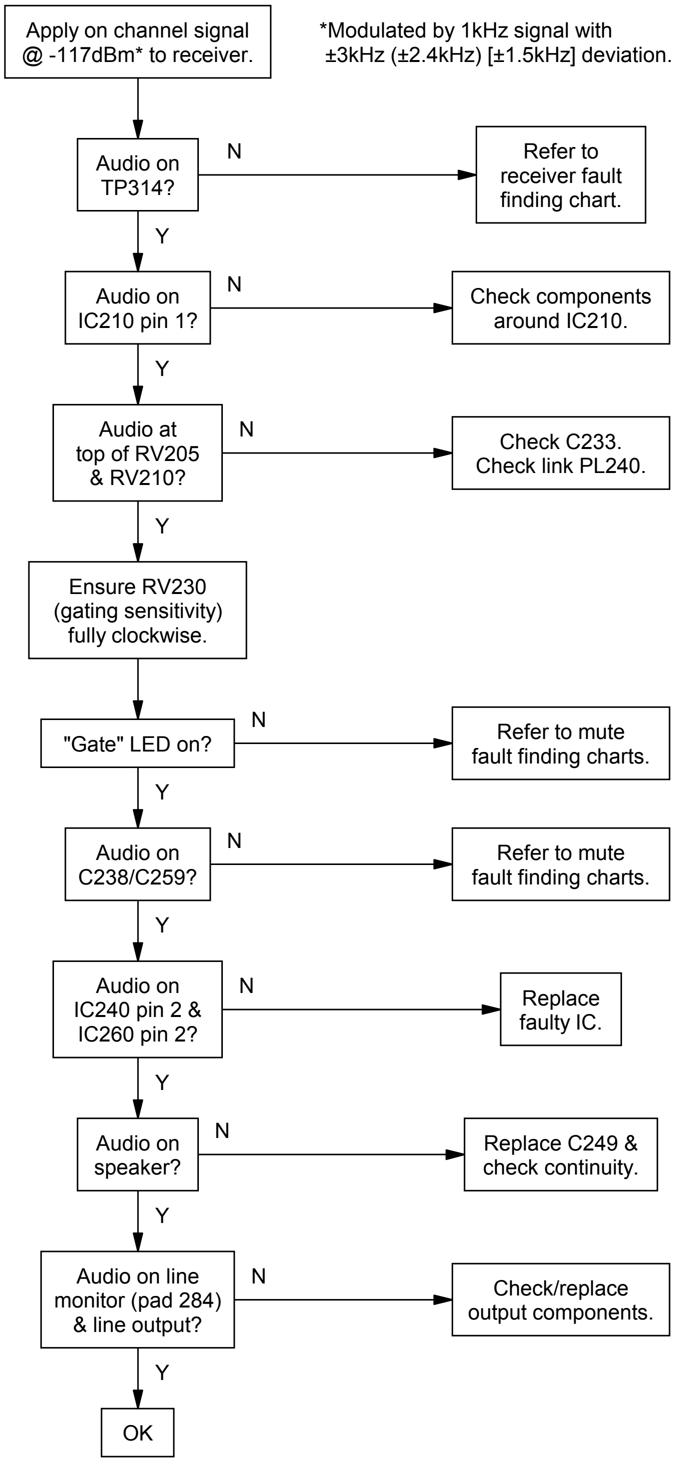


5.7.6 Receiver

Refer to the receiver IF and front end circuit diagrams (sheets 3 and 4) in Section 6.



5.7.7 Audio


Apply on channel signal @ -117dBm* to receiver.
*Modulated by 1kHz signal with ±3kHz (±2.4kHz) [±1.5kHz] deviation.
Audio on TP314?
N
Refer to receiver fault finding chart.
Y
Audio on IC210 pin 1?
N
Check components around IC210.
Y
Audio at top of RV205 & RV210?
N
Check C233. Check link PL240.
Y
Ensure RV230 (gating sensitivity) fully clockwise.
"Gate" LED on?
N
Refer to mute fault finding charts.
Y
Audio on C238/C259?
N
Refer to mute fault finding charts.
Y
Audio on IC240 pin 2 & IC260 pin 2?
N
Replace faulty IC.
Y
Audio on speaker?
N
Replace C249 & check continuity.
Y
Audio on line monitor (pad 284) & line output?
N
Check/replace output components.
Y
OK

6 T855 PCB Information

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

This section provides the following information on the T855 receiver:

- parts lists
- grid reference indexes
- mechanical assembly drawings
- PCB layouts
- test points and options connections drawings
- circuit diagrams.

6.1 Introduction

Product Type Identification

You can identify the receiver type by checking the product code printed on a label on the rear of the chassis (product codes are explained in Section 1 in the front matter of this manual, and Figure 1.1 in Part A shows typical labels). You can further verify the product type by checking the placement of an SMD resistor in the table that is screen printed onto the top side of the PCB, similar to the example drawn below. In this example, the resistor indicates that the product was built as a T855-10-XXXX.

855-30
855-35
855-
PRODUCT TYPE

PRODUCT TYPE	
855-10	855-20
855-13	855-23
855-15	855-25

Note: The only function of this resistor is to indicate the product type. It has no effect on the circuitry or operation of the receiver.

PCB Identification

All PCBs are identified by a unique 10 digit “internal part number” (IPN), e.g. 220-01390-02, which is screen printed onto the PCB (usually on the top side), as shown in the example below:

The last 2 digits of this number define the issue status, which starts at 00 and increments through 01, 02, 03, etc. as the PCB is updated. Some issue PCBs never reach full production status and are therefore not included in this manual. A letter following the 10 digit IPN has no relevance in identifying the PCB for service purposes.

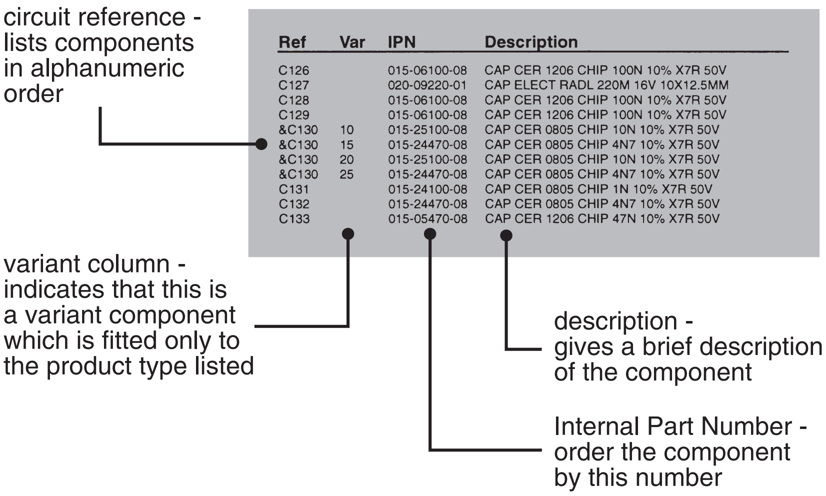
Note: It is important that you identify which issue PCB you are working on so that you can refer to the appropriate set of PCB information.

Parts Lists

The 10 digit numbers (000-00000-00) in this Parts List are “internal part numbers” (IPNs). We can process your spare parts orders more efficiently and accurately if you quote the IPN and provide a brief description of the part.

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns, as shown below:



The miscellaneous and mechanical section lists the variant and common parts in IPN order.

Variant Components

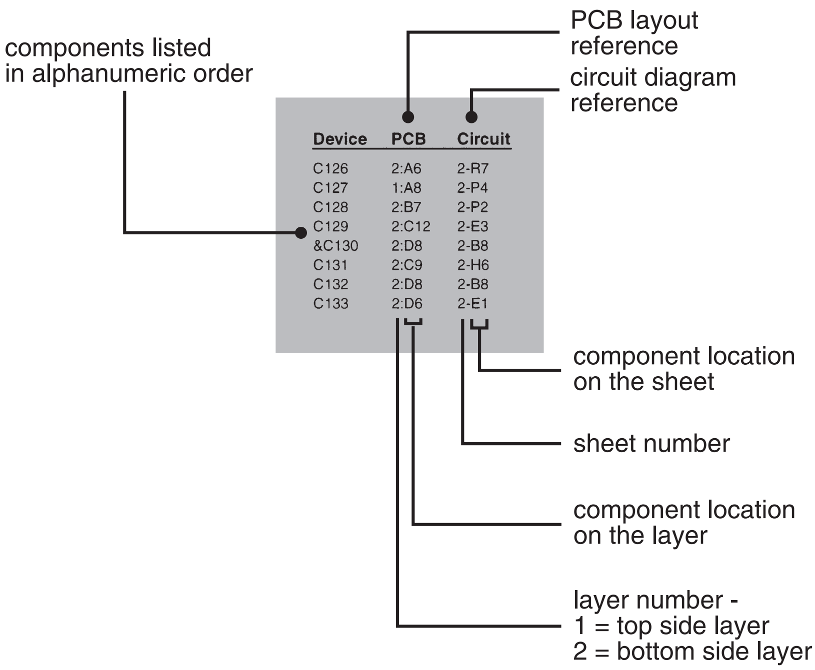
A variant component is one that has the same circuit reference but different value or specification in different product types. Where two products share the same PCB, the term “variant” is also used to describe components unplaced in one product. Variant components have a character prefix, such as “&”, “=” or “#”, before the circuit reference (e.g. &R100).

The table below explains the variant prefixes used in T800 SL2 products:

If the variant prefix is. . .	the component will. . .
&	change according to channel spacing
=	change according to frequency stability
#	change according to frequency range
%	change or be placed/unplaced for special applications
*	be unplaced in one product (where two products share the same PCB)

Grid Reference Index

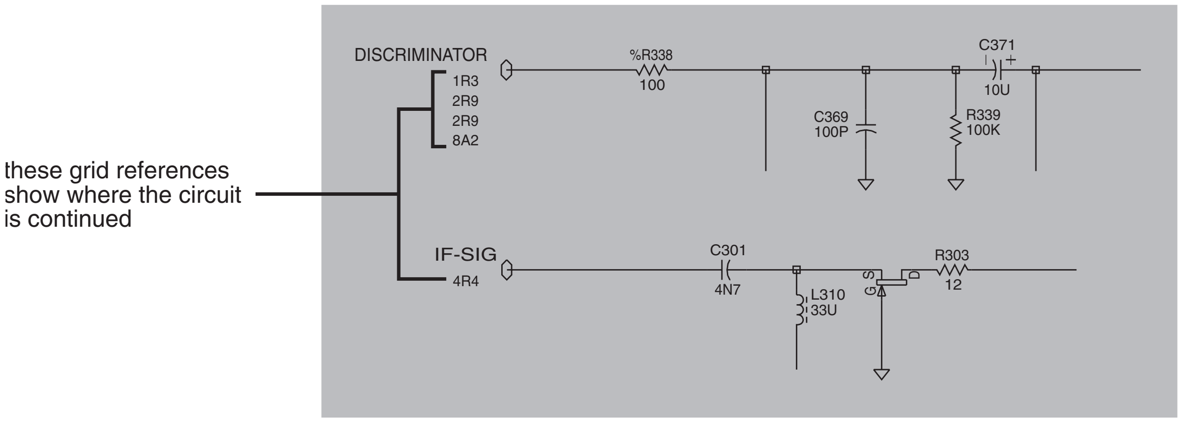
This section contains a component grid reference index to help you find components and labelled pads on the PCB layouts and circuit diagrams. This index lists the components and pads in alphanumeric order, along with the appropriate alphanumeric grid references, as shown below:



Using CAD Circuit Diagrams

Reading a CAD circuit diagram is similar to reading a road map, in that both have an alphanumeric border. The circuit diagrams in this manual use letters to represent the horizontal axis, and numbers for the vertical axis. These circuit diagram "grid references" are useful in following a circuit that is spread over two or more sheets.

When a line representing part of the circuitry is discontinued, a reference will be given at the end of the line to indicate where the rest of the circuitry is located, as shown below. The first digit refers to the sheet number and the last two characters refer to the location on that sheet of the continuation of the circuit (e.g. 1R3).



6.2 T800-04-0000 RSSI PCB

This section contains the following information.

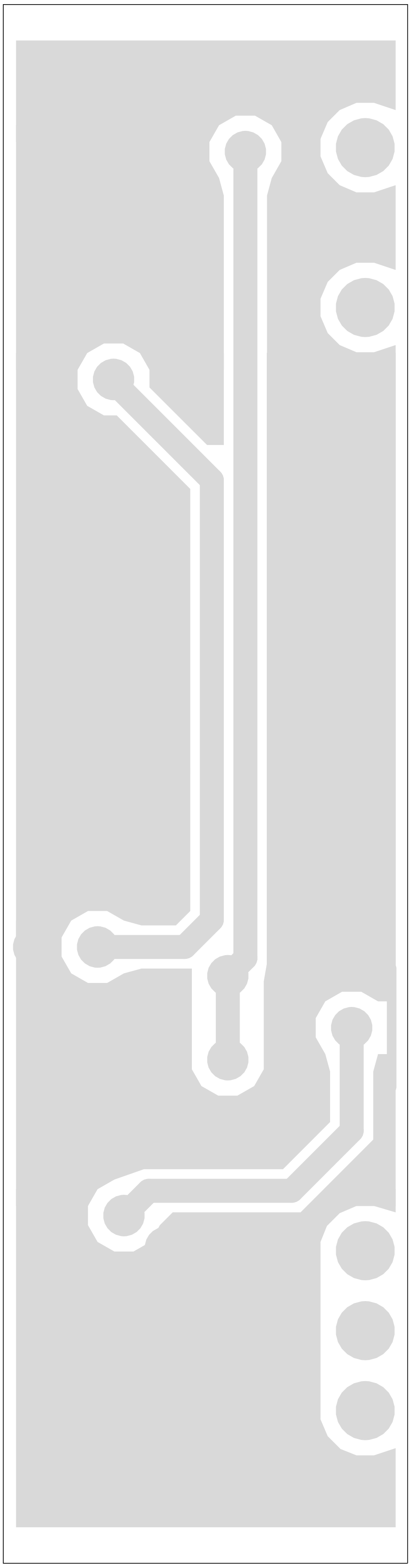
T800-04-0000 Parts List (IPN 220-01138-03)

How To Use This Parts List

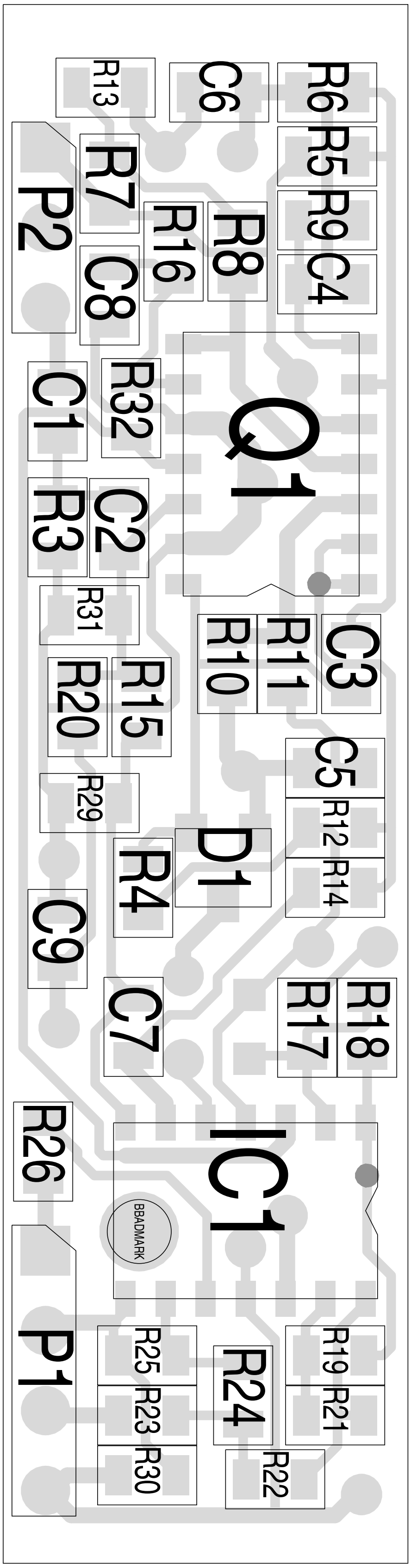
The components listed in this parts list are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns: the circuit reference, variant (if applicable), IPN and description. A number in the variant column indicates that this is a variant component which is fitted only to the product type listed.

This parts list is correct at the time of publishing, but is subject to change without notification. An up to date parts list can be obtained from your local Customer Service Organisation

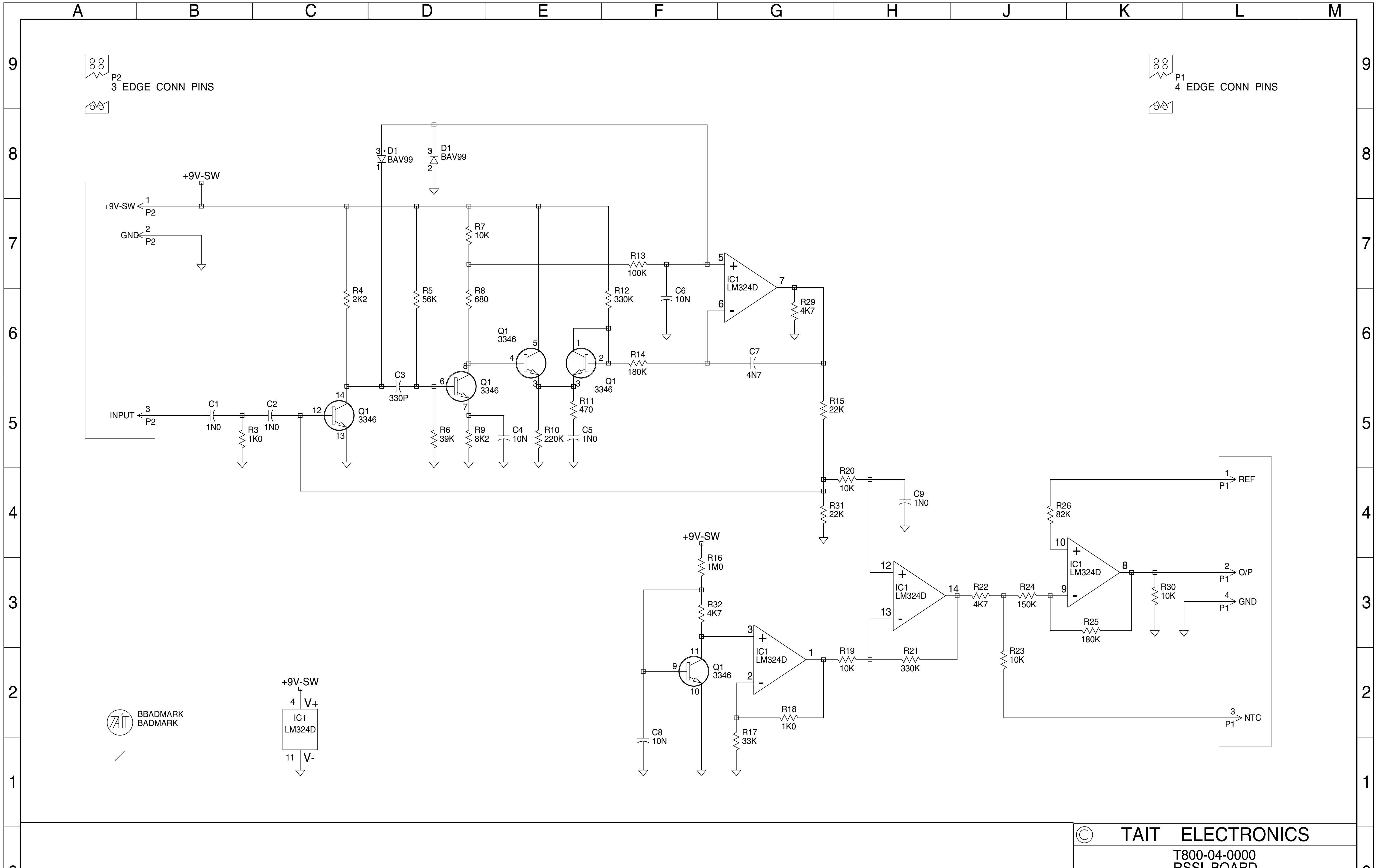
Ref	Var	IPN	Description
C1		015-24100-08	Cap Cer 0805 1n 10% X7r 50v
C2		015-24100-08	Cap Cer 0805 1n 10% X7r 50v
C3		015-23330-08	Cap Cer 0805 330p 10% X7r 50v
C4		015-25100-08	Cap Cer 0805 10n 10% X7r 50v
C5		015-24100-08	Cap Cer 0805 1n 10% X7r 50v
C6		015-25100-08	Cap Cer 0805 10n 10% X7r 50v
C7		015-24470-08	Cap Cer 0805 4n7 10% X7r 50v
C8		015-25100-08	Cap Cer 0805 10n 10% X7r 50v
C9		015-24100-08	Cap Cer 0805 1n 10% X7r 50v
D1		001-10000-99	Diode SMD BAV99 D-Sw SOT23
IC1		002-10003-24	IC SMD 324 4x 0-Amp S014
Q1		002-10033-46	IC SMD MC3346D Xst Aray S014
R3		036-14100-10	Res M/F SMD 0805 1k 1%
R4		036-14220-00	Res M/F SMD 0805 2k2 5%
R5		036-15560-10	Res M/F SMD 0805 56k 1%
R6		036-15390-10	Res M/F SMD 0805 39k 1%
R7		036-15100-10	Res M/F SMD 0805 10k 1%
R8		036-13680-10	Res M/F SMD 0805 680e 1%
R9		036-14820-10	Res M/F SMD 0805 8k2 1%
R10		036-16220-00	Res M/F SMD 0805 220k 5%
R11		036-13470-00	Res M/F SMD 0805 470e 5%
R12		036-16330-00	Res M/F SMD 0805 330k 5%
R13		036-16100-10	Res M/F SMD 0805 100k 1%
R14		036-16180-00	Res M/F SMD 0805 180k 5%
R15		036-15220-00	Res M/F SMD 0805 22k 5%
R16		036-17100-10	Res M/F SMD 0805 1M 1%
R17		036-15330-10	Res M/F SMD 0805 33k 1%
R18		036-14100-10	Res M/F SMD 0805 1k 1%
R19		036-15100-10	Res M/F SMD 0805 10k 1%
R20		036-15100-10	Res M/F SMD 0805 10k 1%
R21		036-16330-00	Res M/F SMD 0805 330k 5%
R22		036-14470-10	Res M/F SMD 0805 4k7 1%
R23		036-15100-10	Res M/F SMD 0805 10k 1%
R24		036-16150-00	Res M/F SMD 0805 150k 5%
R25		036-16180-00	Res M/F SMD 0805 180k 5%
R26		036-15820-00	Res M/F SMD 0805 82k 5%
R29		036-14470-10	Res M/F SMD 0805 4k7 1%
R30		036-15100-10	Res M/F SMD 0805 10k 1%
R31		036-15220-00	Res M/F SMD 0805 22k 5%
R32		036-14470-10	Res M/F SMD 0805 4k7 1%
		369-00020-36	Tape Vinyl Foam 2Side 25.4*3mm
		220-01138-03	PCB T700 RSSI Brd
		356-00010-52	Pin Edge Mtg 0.8mm PCB Wako



T800-04-0000 PCB (IPN 220-01138-03) - Top Side



T800-04-0000 PCB (IPN 220-01138-03) - Bottom Side



REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE
3A	ECO 770177	M.HALL				
2A	ECO 740091	MJ/TB	M.HALL	M.HALL	JACKSON	24/06/99
1A	ECO 770163 - MIGRATED TO UNICAD.	M.HALL	M.HALL	M.HALL	JACKSON	12/05/99

© TAIT ELECTRONICS

T800-04-0000
RSSI BOARD

IPN:	ISSUE:	ID:
220-01138-03	A	2.SC. 1

PROJECT:	DESIGNER:	FILE NAME:	FILE DATE:	NO.SHEETS:
T700	M.HALL	113803a	24-Aug-99	1

6.3 T855 Receiver PCB

This section contains the following information.

T855 Parts List (IPN 220-01396-03)

How To Use This Parts List

The components listed in this parts list are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns: the circuit reference, variant (if applicable), IPN and description. A number in the variant column indicates that this is a variant component which is fitted only to the product type listed.

This parts list is correct at the time of publishing, but is subject to change without notification. An up to date parts list can be obtained from your local Customer Service Organisation

Ref	Var	IPN	Description
C201		020-08100-04	CAP ELE RA 10M 16V 4X7MM
&C203	10	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C203	13	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C203	15	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C203	20	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C203	23	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C203	25	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C203	30	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C203	35	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C205	10	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C205	13	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C205	15	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C205	20	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C205	23	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C205	25	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C205	30	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C205	35	015-25100-08	CAP CER 0805 10N 10% X7R 50V
C207		020-07100-02	CAP ELE RA 1M 50V 5X11MM
C209		020-08470-02	CAP ELE RA 47M 16V 6X11MM
C210		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C211		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C213		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C215		015-21220-01	CAP CER 0805 2P2+-1/4P NPO 50V
C217		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C219		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C221		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C222		020-08100-04	CAP ELE RA 10M 16V 4X7MM
C223		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C225		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C227		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C229		020-08100-04	CAP ELE RA 10M 16V 4X7MM
C231		020-08100-04	CAP ELE RA 10M 16V 4X7MM
C233		020-08100-04	CAP ELE RA 10M 16V 4X7MM
C235		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C237		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C238		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C239		020-09100-03	CAP ELE RA 100M 16V 8X11MM
C240A		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C240B		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C240C		020-09220-01	CAP ELE RA 220M 16V 10X12.5MM
C249		020-09470-05	CAP ELE RAD 470M 16V 10X12.5MM
C251		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C253		020-09100-03	CAP ELE RA 100M 16V 8X11MM
C255		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C257		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C259		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C260A		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C260B		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C260C		020-09220-01	CAP ELE RA 220M 16V 10X12.5MM
C261		020-09100-03	CAP ELE RA 100M 16V 8X11MM
C262		020-09100-03	CAP ELE RA 100M 16V 8X11MM
C264		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C266		020-07470-91	CAP ELE RA 4M7 63V 6X11MM BI-P
C268		020-07470-91	CAP ELE RA 4M7 63V 6X11MM BI-P
C270		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C272		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C274		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C276		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C278		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C280		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C286		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C302		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C306		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C308		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C310		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C312		020-58100-03	CAP ELE AI RDL 10M 50V 5X11MM
C314		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C316		015-22150-01	CAP CER 0805 15P 5% NPO 50V
&C318	10	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C318	13	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C318	15	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C318	20	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C318	23	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C318	25	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C318	30	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C318	35	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C320	10	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C320	13	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C320	15	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C320	20	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C320	23	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C320	25	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C320	30	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C320	35	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C322	10	015-22150-01	CAP CER 0805 15P 5% NPO 50V
&C322	13	015-22150-01	CAP CER 0805 15P 5% NPO 50V
&C322	15	015-22150-01	CAP CER 0805 15P 5% NPO 50V
&C322	20	015-22150-01	CAP CER 0805 15P 5% NPO 50V
&C322	23	015-22150-01	CAP CER 0805 15P 5% NPO 50V
&C322	25	015-22150-01	CAP CER 0805 15P 5% NPO 50V
&C322	30	015-22150-01	CAP CER 0805 15P 5% NPO 50V
&C322	35	015-22150-01	CAP CER 0805 15P 5% NPO 50V
&C324	10	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C324	13	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C324	15	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C324	20	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C324	23	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C324	25	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C324	30	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C324	35	015-21390-01	CAP CER 0805 3P9+-1/4P NPO 50V
&C326	10	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C326	13	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C326	15	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C326	20	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C326	23	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C326	25	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C326	30	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
&C326	35	015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
C328		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C330		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C331		015-21220-01	CAP CER 0805 2P2+-1/4P NPO 50V
C332		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C334	10	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C334	13	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C334	15	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C334	20	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C334	23	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C334	25	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C334	30	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C334	35	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C336	10	015-22120-01	CAP CER 0805 12P 5% NPO 50V
&C336	13	015-22120-01	CAP CER 0805 12P 5% NPO 50V
&C336	15	015-22100-01	CAP CER 0805 10P+-1/2P NPO 50V
&C336	20	015-22120-01	CAP CER 0805 12P 5% NPO 50V
&C336	23	015-22120-01	CAP CER 0805 12P 5% NPO 50V
&C336	25	015-22100-01	CAP CER 0805 10P+-1/2P NPO 50V
&C336	30	015-22120-01	CAP CER 0805 12P 5% NPO 50V
&C336	35	015-22100-01	CAP CER 0805 10P+-1/2P NPO 50V
&C338	10	015-22120-01	CAP CER 0805 12P 5% NPO 50V
&C338	13	015-22120-01	CAP CER 0805 12P 5% NPO 50V
&C338	15	015-22120-01	CAP CER 0805 12P 5% NPO 50V
&C338	20	015-22120-01	CAP CER 0805 12P 5% NPO 50V
&C338	23	015-22120-01	CAP CER 0805 12P 5% NPO 50V
&C338	25	015-22100-01	CAP CER 0805 10P+-1/2P NPO 50V
&C338	30	015-22120-01	CAP CER 0805 12P 5% NPO 50V
&C338	35	015-22120-01	CAP CER 0805 12P 5% NPO 50V
&C340	10	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C340	13	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C340	15	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C340	20	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C340	23	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C340	25	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C340	30	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C340	35	015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C342		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C344		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C346		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C347		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C348		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C349		015-21270-01	CAP CER 0805 2P7+-1/4P NPO 50V
C350		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C352		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C354		025-08100-04	(L) CAP10M 35V 10%TANT2.5L/S
C355		025-08100-04	(L) CAP10M 35V 10%TANT2.5L/S
C356		015-22120-01	CAP CER 0805 12P 5% NPO 50V
C357		015-25100-08	CAP CER 0805 10N 10% X7R 50V

Ref	Var	IPN	Description
C358		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C359		025-08100-04	(L) CAP10M 35V 10%TANT2.5L/S
C360		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C361		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C362		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C364		015-22390-01	CAP CER 0805 39P 5% NPO 50V
C366		015-22390-01	CAP CER 0805 39P 5% NPO 50V
C367		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C368		015-05470-08	CAP CER 1206 47N 10% X7R 50V
C370		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C372		015-05470-08	CAP CER 1206 47N 10% X7R 50V
C374		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C376		015-23120-01	CAP CER 0805 120P 5% NPO 50V
C378		015-23120-01	CAP CER 0805 120P 5% NPO 50V
C380		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C382		020-58100-03	CAP ELE AI RDL 10M 50V 5X11MM
C384		015-05470-08	CAP CER 1206 47N 10% X7R 50V
C386		015-05470-08	CAP CER 1206 47N 10% X7R 50V
C388		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C390		025-08100-02	CAP TANT BEAD 10M 10% 16V
C392		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C394		015-05470-08	CAP CER 1206 47N 10% X7R 50V
C410		015-21180-01	CAP CER 0805 1P8+-1/4P NPO 50V
C420		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C430		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C440		020-58100-03	CAP ELE AI RDL 10M 50V 5X11MM
C450		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C470		015-22100-01	CAP CER 0805 10P+-1/2P NPO 50V
C480		015-22560-01	CAP CER 0805 56P 5% NPO 50V
C505		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C515		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C530		014-08220-01	(L)CAP TANT 22UF10V276MSER
C535		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C610A		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C610B		020-09100-04	CAP ELE RA 100M 10V 6.3X9MM
C611A		020-09100-04	CAP ELE RA 100M 10V 6.3X9MM
C611B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C623		015-23120-01	CAP CER 0805 120P 5% NPO 50V
C625		020-09470-07	CAPEL470M16V20%V 8*20 3.5L.ESR
C626		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C628		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C630		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C631A		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C631B		025-08100-02	CAP TANT BEAD 10M 10% 16V
C637		015-23120-01	CAP CER 0805 120P 5% NPO 50V
C640		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C651		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C658		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C660		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C665		020-58100-03	CAP ELE AI RDL 10M 50V 5X11MM
C670		025-07330-01	CAP TANT BEAD 3M3 35V
C673		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C677		020-07100-02	CAP ELE RA 1M 50V 5X11MM
C681		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C684		025-08100-02	CAP TANT BEAD 10M 10% 16V
C687		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C690		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C693		025-08100-02	CAP TANT BEAD 10M 10% 16V
C700		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C702		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C703		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C705		015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
C707		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C708		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C709		015-22100-01	CAP CER 0805 10P+-1/2P NPO 50V
C710A		014-07470-00	CAP TANT CHIP 4U7 3.5 X 2.8MM
C710B		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C710C		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C711		015-22220-01	CAP CER 0805 22P 5% NPO 50V
C712		015-22220-01	CAP CER 0805 22P 5% NPO 50V
C713		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C735		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C736		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C740A		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C740B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C741A		014-07470-00	CAP TANT CHIP 4U7 3.5 X 2.8MM
C741B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C742A		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C742B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C743		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C745		015-23120-01	CAP CER 0805 120P 5% NPO 50V
C750		025-08100-03	CAP 10M 35V 20% TANT 5MM L/S
C757		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C759		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C761		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C762		014-08220-01	(L)CAP TANT 22UF10V276MSER
C764		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C765		014-07470-00	CAP TANT CHIP 4U7 3.5 X 2.8MM
C767		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C769		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C770		014-08220-01	(L)CAP TANT 22UF10V276MSER
C772		014-08220-01	(L)CAP TANT 22UF10V276MSER
C774		022-06100-16	CAP METAL POLY 100N +-10% 100V
C776		015-24680-08	CAP CER 0805 6N8 10% X7R 50V
C782		015-23120-01	CAP CER 0805 120P 5% NPO 50V
C784		015-23120-01	CAP CER 0805 120P 5% NPO 50V
C786		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C788		015-23120-01	CAP CER 0805 120P 5% NPO 50V
C791		015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
C792		015-23120-01	CAP CER 0805 120P 5% NPO 50V
C810		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C812		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C813		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C814		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C815		015-05100-07	CAP 1206 CHIP NPO 10nF 25V
C816		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C818		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C819		015-22330-01	CAP CER 0805 33P 5% NPO 50V
C820		015-23220-01	CAP CER 0805 220P 5% NPO 50V
C822		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C824		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C826		015-05100-07	CAP 1206 CHIP NPO 10nF 25V
C828		015-05100-07	CAP 1206 CHIP NPO 10nF 25V
C830		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C832		016-07100-01	CAP EL 6X4 1M 20% 50V
C833		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C834		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C836		015-05100-07	CAP 1206 CHIP NPO 10nF 25V
C837		015-05100-07	CAP 1206 CHIP NPO 10nF 25V
C838		015-05100-07	CAP 1206 CHIP NPO 10nF 25V
C840		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C842		016-07100-01	CAP EL 6X4 1M 20% 50V
C844		016-07100-01	CAP EL 6X4 1M 20% 50V
C846		016-07100-01	CAP EL 6X4 1M 20% 50V
C848		016-07100-01	CAP EL 6X4 1M 20% 50V
C850		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C873		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C876		020-09100-04	CAP ELE RA 100M 10V 6.3X9MM
C879		020-08100-04	CAP ELE RA 10M 16V 4X7MM
C910		015-21330-01	CAP CER 0805 3P3+-1/4P NPO 50V
C920		015-21680-01	CAP CER 0805 6P8+-1/4P NPO 50V
C930		015-21820-01	CAP CER 0805 8P2+-1/4P NPO 50V
C940		015-21680-01	CAP CER 0805 6P8+-1/4P NPO 50V
C950		015-21330-01	CAP CER 0805 3P3+-1/4P NPO 50V
D111		001-00011-60	S) DIODE MR750 OR SR2607
D220		001-10000-56	S) DIODE SMD BAW56 D-SW SOT23
D230		001-10000-70	S) DIODE SMD BAV70 D-SW SOT23
D240		001-10000-99	S) DIODE SMD BAV99 D-SW SOT23
D250		008-00014-79	S)LED 3MM RED WITH WIRE
D260		001-10084-33	S)DIODE ZENSMD BZX84C3V3 SOT23
D270		001-10000-70	S) DIODE SMD BAV70 D-SW SOT23
D280		008-00014-80	S)LED 3MM GREEN WITH WIRE
D285		001-00011-70	S) DIODE 1N4001 1A/50V
D289		001-00011-70	S) DIODE 1N4001 1A/50V
D290		001-00011-70	S) DIODE 1N4001 1A/50V
D295		001-00011-70	S) DIODE 1N4001 1A/50V
D310		001-10000-56	S) DIODE SMD BAW56 D-SW SOT23
D350		001-10000-17	S) DIODE SMD DUAL BAT-17 SOT23
D610		001-10000-99	S) DIODE SMD BAV99 D-SW SOT23
D640		001-10000-70	S) DIODE SMD BAV70 D-SW SOT23
D730		001-10065-00	DIODE SHTKY SOD123 BAT65 BAT54
D740		001-10065-00	DIODE SHTKY SOD123 BAT65 BAT54
D820		001-10065-00	DIODE SHTKY SOD123 BAT65 BAT54
D860		001-10000-70	S) DIODE SMD BAV70 D-SW SOT23
D880		001-10000-70	S) DIODE SMD BAV70 D-SW SOT23
#FL410	10	051-00576-00	COIL HELIC 400-440MHz T855SII
#FL410	13	051-00576-00	COIL HELIC 400-440MHz T855SII
#FL410	15	051-00576-00	COIL HELIC 400-440MHz T855SII
#FL410	20	051-00577-00	COIL HELIC 440-480MHz T855SII
#FL410	23	051-00577-00	COIL HELIC 440-480MHz T855SII
#FL410	25	051-00577-00	COIL HELIC 440-480MHz T855SII
#FL410	30	051-00578-00	COIL HELIC 480-530MHz T855SII
#FL410	35	051-00578-00	COIL HELIC 480-530MHz T855SII
#FL420	10	051-00576-00	COIL HELIC 400-440MHz T855SII
#FL420	13	051-00576-00	COIL HELIC 400-440MHz T855SII
#FL420	15	051-00576-00	COIL HELIC 400-440MHz T855SII
#FL420	20	051-00577-00	COIL HELIC 440-480MHz T855SII
#FL420	23	051-00577-00	COIL HELIC 440-480MHz T855SII
#FL420	25	051-00577-00	COIL HELIC 440-480MHz T855SII
#FL420	30	051-00578-00	COIL HELIC 480-530MHz T855SII
#FL420	35	051-00578-00	COIL HELIC 480-530MHz T855SII
IC210		002-00012-40	S) IC 358 DUAL O-AMP
IC240		002-00014-05	S) IC TDA7231 1.6W AF PWR
IC260		002-00014-05	S) IC TDA7231 1.6W AF PWR
IC270		002-00012-40	S) IC 358 DUAL O-AMP
IC280		002-00012-40	S) IC 358 DUAL O-AMP
IC310		002-00014-73	S) IC MC3361CP IF AMP
IC320		002-00014-58	S) IC 78L05 5V 100MA REG TO92
IC410		002-00022-01	S)MIXER DBLE TAK BLNCD2-750MHZ
IC610		002-00014-58	S) IC 78L05 5V 100MA REG TO92
IC630		002-00014-62	S) IC 317L 100MA REG 3TER TO92
IC640		002-10003-58	S) IC SMD LM358 DUAL O-AMP
IC650		002-10012-32	SMD DS1232LPS-2 LP RESET&W-DOG
=IC700		539-00010-50	TCXO 12.8MHZ +-1PPM -20 +70C
IC710		002-74900-04	S) IC SMD 74HC04D 6X INV BUFFD
IC740		002-14519-10	S) IC MC145191F SMD SYNTH
IC750		002-10330-78	S) IC MC33078D 2X AMP LO NOISE
IC810		002-08951-20	S) IC AT89C51 PLCC44 MIC 12MHZ
IC820		002-12416-00	S)IC SMD AT24C16N-10SC EEPROM
IC830		002-10003-24	S) IC SMD 324 4X O-AMP SO14
IC840		002-10040-53	S)MC14053B SMD BREAK B4 MAKE
IC850		002-10003-24	S) IC SMD 324 4X O-AMP SO14

Ref	Var	IPN	Description
L230		056-00021-02	IND FXD 100UH AX
L310		050-00016-22	COIL TAIT NO 622 20-120M
L320		050-00016-22	COIL TAIT NO 622 20-120M
L330		050-00016-22	COIL TAIT NO 622 20-120M
L340		050-00016-22	COIL TAIT NO 622 20-120M
L350		050-00016-22	COIL TAIT NO 622 20-120M
L360		050-00016-22	COIL TAIT NO 622 20-120M
L370		050-00016-22	COIL TAIT NO 622 20-120M
L380		050-00016-22	COIL TAIT NO 622 20-120M
L385		050-00016-22	COIL TAIT NO 622 20-120M
L390		050-00016-31	COIL TAIT NO 631 455KHZ
L420		056-00021-04	IND FXD 330NH AX
L440		056-00021-04	IND FXD 330NH AX
L740		052-08125-15	COIL A/W 1.5T/2.5MM HOR 0.8MM
L910		052-08125-25	COIL A/W 2.5T/2.5MM HOR 0.8MM
L920		052-08140-15	COIL A/W 1.5T/4.0MM HOR 0.8MM
L930		052-08140-15	COIL A/W 1.5T/4.0MM HOR 0.8MM
L940		052-08125-25	COIL A/W 2.5T/2.5MM HOR 0.8MM
PL200		240-00020-72	HEADER 2W PCB MG ULTREX
PL210		240-00020-59	HEADER 3 W 1 R PCB MTG
PL220		240-00020-59	HEADER 3 W 1 R PCB MTG
PL230		240-00020-63	HEADER 4 W X1R PCB MTG
PL240		240-00020-58	HEADER 5 WX1 R PCB MTG
PL250		240-00020-59	HEADER 3 W 1 R PCB MTG
PL260		240-00020-59	HEADER 3 W 1 R PCB MTG
PL270		240-00020-59	HEADER 3 W 1 R PCB MTG
Q210		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q220		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q230		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q240		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q245		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q250		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q255		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q260		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q270		000-10008-17	S) XSTR SMD BC817-25 NPN SOT23
Q280		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q290		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q310		000-50020-18	S) XSTR AI BF247A JFETTO92 VHF
Q320		000-10008-92	S) XSTR SMD BFS17 NPN SOT23
Q350		000-10009-91	S) XSTR SMD BF991 DG MFET
Q340		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q350		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q360		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q410		000-10057-10	S) XSTR SMD BR571 NPN SOT23
Q540		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q620		000-00012-15	S) XSTR BD234 PNP AF PWR TO126
Q630		000-50011-30	S) XSTR AI BC557B PNP TO92 AF
Q660		000-10008-17	S) XSTR SMD BC817-25 NPN SOT23
Q670		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q750		000-10008-07	S) XSTR SMD BC807 PNP SOT23 AF
Q760		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q770		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q775		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q780		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q785		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q790		000-10003-12	S) XSTR SMD BFR31 N JFET SOT23
Q795		000-10057-10	S) XSTR SMD BR571 NPN SOT23
Q810		000-10008-17	S) XSTR SMD BC817-25 NPN SOT23
Q820		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q840		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q850		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q860		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q870		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q880		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q890		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q895		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
R160		036-12100-00	RES M/F 0805 10E 5%
R201		036-14470-00	RES M/F 0805 4K7 5%
&R202	10	036-14470-00	RES M/F 0805 4K7 5%
&R202	13	036-14470-00	RES M/F 0805 4K7 5%
&R202	15	036-14330-00	RES M/F 0805 3K3 5%
&R202	20	036-14470-00	RES M/F 0805 4K7 5%
&R202	23	036-14470-00	RES M/F 0805 4K7 5%
&R202	25	036-14330-00	RES M/F 0805 3K3 5%
&R202	30	036-14470-00	RES M/F 0805 4K7 5%
&R202	35	036-14330-00	RES M/F 0805 3K3 5%
R204		036-15100-00	RES M/F 0805 10K 5%
R205		036-16220-00	RES M/F 0805 220K 5%
R207		036-14820-00	RES M/F 0805 8K2 5%
&R209	10	036-15220-00	RES M/F 0805 22K 5%
&R209	13	036-15220-00	RES M/F 0805 22K 5%
&R209	15	036-15180-00	RES M/F 0805 18K 5%
&R209	20	036-15220-00	RES M/F 0805 22K 5%
&R209	23	036-15220-00	RES M/F 0805 22K 5%
&R209	25	036-15180-00	RES M/F 0805 18K 5%
&R209	30	036-15220-00	RES M/F 0805 22K 5%
&R209	35	036-15180-00	RES M/F 0805 18K 5%
R210		036-15150-00	RES M/F 0805 15K 5%
R211		036-15390-00	RES M/F 0805 39K 5%
R213		036-14270-00	RES M/F 0805 2K7 5%
R215		036-15150-00	RES M/F 0805 15K 5%
R218		036-14390-00	RES M/F 0805 3K9 5%
&R219	10	036-14820-00	RES M/F 0805 8K2 5%
&R219	13	036-14820-00	RES M/F 0805 8K2 5%
&R219	15	036-14470-00	RES M/F 0805 4K7 5%
&R219	20	036-14820-00	RES M/F 0805 8K2 5%
&R219	23	036-14820-00	RES M/F 0805 8K2 5%
&R219	25	036-14470-00	RES M/F 0805 4K7 5%
&R219	30	036-14820-00	RES M/F 0805 8K2 5%
&R219	35	036-14470-00	RES M/F 0805 4K7 5%
R221		036-15470-00	RES M/F 0805 47K 5%
R222		036-16100-00	RES M/F 0805 100K 5%
%R223		036-12100-00	RES M/F 0805 10E 5%
R224		036-14390-00	RES M/F 0805 3K9 5%
R225		036-13470-00	RES M/F 0805 470E 5%
R227		036-14100-00	RES M/F 0805 1K 5%
R229		036-14470-00	RES M/F 0805 4K7 5%
R230		036-14470-00	RES M/F 0805 4K7 5%
R232		036-15470-00	RES M/F 0805 47K 5%
R233		036-14820-00	RES M/F 0805 8K2 5%
R234		036-15470-00	RES M/F 0805 47K 5%
R236		036-15470-00	RES M/F 0805 47K 5%
R238		036-11470-00	RES M/F 0805 4E7 10%
R239		036-14100-00	RES M/F 0805 1K 5%
R241		036-14100-00	RES M/F 0805 1K 5%
R242		036-13100-00	RES M/F 0805 100E 5%
R244		036-14680-00	RES M/F 0805 6K8 5%
R245		036-14100-00	RES M/F 0805 1K 5%
R247		036-14220-00	RES M/F 0805 2K2 5%
R249		036-15100-00	RES M/F 0805 10K 5%
R251		036-15390-00	RES M/F 0805 39K 5%
R252		036-14470-00	RES M/F 0805 4K7 5%
R254		036-14820-00	RES M/F 0805 8K2 5%
R255		036-15470-00	RES M/F 0805 47K 5%
R256		036-14470-00	RES M/F 0805 4K7 5%
R258		036-15470-00	RES M/F 0805 47K 5%
R260		036-11470-00	RES M/F 0805 4E7 10%
R261		036-13150-00	RES M/F 0805 150E 5%
R262		036-14100-00	RES M/F 0805 1K 5%
R264		036-15270-00	RES M/F 0805 27K 5%
R265		036-13100-00	RES M/F 0805 100E 5%
R266		036-15220-00	RES M/F 0805 22K 5%
R267		036-16330-00	RES M/F 0805 330K 5%
R269		036-14220-00	RES M/F 0805 2K2 5%
R271		036-16100-00	RES M/F 0805 100K 5%
R272		036-15470-00	RES M/F 0805 47K 5%
R273		036-15150-00	RES M/F 0805 15K 5%
R275		036-13100-00	RES M/F 0805 100E 5%
R277		036-14560-00	RES M/F 0805 5K6 5%
R278		036-16220-00	RES M/F 0805 220K 5%
R280		036-16100-00	RES M/F 0805 100K 5%
R281		036-14470-00	RES M/F 0805 4K7 5%
R282		036-16100-00	RES M/F 0805 100K 5%
R284		036-13100-00	RES M/F 0805 100E 5%
R285		036-15470-00	RES M/F 0805 47K 5%
R287		036-15100-00	RES M/F 0805 10K 5%
R288		036-14470-00	RES M/F 0805 4K7 5%
R289		036-14680-00	RES M/F 0805 6K8 5%
R290		036-14100-00	RES M/F 0805 1K 5%
R292		036-14680-00	RES M/F 0805 6K8 5%
R293		036-13560-00	RES M/F 0805 560E 5%
R294		036-14100-00	RES M/F 0805 1K 5%
R295		036-14680-00	RES M/F 0805 6K8 5%
R296		036-14120-00	RES M/F 0805 1K2 5%
R297		030-52100-20	RES FILM AI 10E 5% 0.4W 4X1.6
R298		036-15470-00	RES M/F 0805 47K 5%
R299		036-15470-00	RES M/F 0805 47K 5%
R302		036-12390-00	RES M/F 0805 39E 5%
R304		036-14270-00	RES M/F 0805 2K7 5%
R306		036-12100-00	RES M/F 0805 10E 5%
R308		036-12100-00	RES M/F 0805 10E 5%
R310		036-10000-00	RES M/F 0805 ZERO OHM
R312		036-14330-00	RES M/F 0805 3K3 5%
R314		036-14470-00	RES M/F 0805 4K7 5%
R316		036-12470-00	RES M/F 0805 47E 5%
R318		036-15100-00	RES M/F 0805 10K 5%
R320		036-14390-00	RES M/F 0805 3K9 5%
R322		036-14820-00	RES M/F 0805 8K2 5%
R323		036-15100-00	RES M/F 0805 10K 5%
R324		036-15220-00	RES M/F 0805 22K 5%
R326		036-15100-00	RES M/F 0805 10K 5%
R328		036-14100-00	RES M/F 0805 1K 5%
R330		036-12470-00	RES M/F 0805 47E 5%
R332		036-13330-00	RES M/F 0805 330E 5%
R334		045-03150-01	RES NTC 150E 0.5W 5MM DISC
R336		036-13470-00	RES M/F 0805 470E 5%
R337		036-13220-00	RES M/F 0805 220E 5%
R338		036-14100-00	RES M/F 0805 1K 5%
R339		036-15100-00	RES M/F 0805 10K 5%
R340		036-10000-00	RES M/F 0805 ZERO OHM
R341		036-10000-00	RES M/F 0805 ZERO OHM
&R344	10	036-15560-00	RES M/F 0805 56K 5%
&R344	13	036-15560-00	RES M/F 0805 56K 5%
&R344	15	036-15820-00	RES M/F 0805 82K 5%
&R344	20	036-15560-00	RES M/F 0805 56K 5%
&R344	23	036-15560-00	RES M/F 0805 56K 5%
&R344	25	036-15820-00	RES M/F 0805 82K 5%
&R344	30	036-15560-00	RES M/F 0805 56K 5%
&R344	35	036-15820-00	RES M/F 0805 82K 5%
R346		036-12100-00	RES M/F 0805 10E 5%
R348		036-13220-00	RES M/F 0805 220E 5%
R350		036-15180-00	RES M/F 0805 18K 5%
R351		036-15100-00	RES M/F 0805 10K 5%

Ref	Var	IPN	Description
R352		036-16390-00	RES M/F 0805 390K 5%
R353		036-10000-00	RES M/F 0805 ZERO OHM
R354		036-17100-00	RES M/F 0805 1M 5%
R356		036-13180-00	RES M/F 0805 180E 5%
R358		036-12470-00	RES M/F 0805 47E 5%
R360		036-15150-00	RES M/F 0805 15K 5%
R362		036-14330-00	RES M/F 0805 3K3 5%
R364		036-14100-00	RES M/F 0805 1K 5%
R365		036-16150-00	RES M/F 0805 150K 5%
R366		036-14330-00	RES M/F 0805 3K3 5%
R367		036-16150-00	RES M/F 0805 150K 5%
R368		036-15220-00	RES M/F 0805 22K 5%
R370		036-16100-00	RES M/F 0805 100K 5%
R372		036-14270-00	RES M/F 0805 2K7 5%
R374		036-14100-00	RES M/F 0805 1K 5%
R376		036-10000-00	RES M/F 0805 ZERO OHM
R378		036-16100-00	RES M/F 0805 100K 5%
R380		036-15100-00	RES M/F 0805 10K 5%
R382		036-15470-00	RES M/F 0805 47K 5%
R384		036-15470-00	RES M/F 0805 47K 5%
R386		036-15120-00	RES M/F 0805 12K 5%
R388		036-15100-00	RES M/F 0805 10K 5%
R390		045-05100-01	RES NTC 10K 5% 5MM DISC
R392		036-10000-00	RES M/F 0805 ZERO OHM
R393		036-15100-00	RES M/F 0805 10K 5%
R394		036-12470-00	RES M/F 0805 47E 5%
R395		036-10000-00	RES M/F 0805 ZERO OHM
R396		036-13390-00	RES M/F 0805 390E 5%
R397		036-13820-00	RES M/F 0805 820E 5%
R398		036-14220-00	RES M/F 0805 2K2 5%
R399		045-05100-01	RES NTC 10K 5% 5MM DISC
R405		036-10000-00	RES M/F 0805 ZERO OHM
R410		036-10000-00	RES M/F 0805 ZERO OHM
R415		036-13330-00	RES M/F 0805 330E 5%
R420		036-12100-00	RES M/F 0805 10E 5%
R425		036-14100-00	RES M/F 0805 1K 5%
R430		036-13150-00	RES M/F 0805 150E 5%
R435		036-12100-00	RES M/F 0805 10E 5%
R440		036-10000-00	RES M/F 0805 ZERO OHM
R445		036-13470-00	RES M/F 0805 470E 5%
R450		036-12100-00	RES M/F 0805 10E 5%
R455		036-13470-00	RES M/F 0805 470E 5%
R460		036-13180-00	RES M/F 0805 180E 5%
R465		036-12330-00	RES M/F 0805 33E 5%
R470		036-13180-00	RES M/F 0805 180E 5%
R475		036-12470-00	RES M/F 0805 47E 5%
R510		036-14220-00	RES M/F 0805 2K2 5%
R515		036-12560-00	RES M/F 0805 56E 5%
R555		036-13470-00	RES M/F 0805 470E 5%
R615		036-13100-00	RES M/F 0805 100E 5%
R617		036-10000-00	RES M/F 0805 ZERO OHM
R619		032-31100-00	RES M/F PWR 1E0 5% 1W 12X4.5MM
R621		032-31100-00	RES M/F PWR 1E0 5% 1W 12X4.5MM
R625		036-14100-00	RES M/F 0805 1K 5%
R629		032-33270-00	RES M/F PWR 270E 5% 1W 12X4.5
R633		036-14680-00	RES M/F 0805 6K8 5%
R636		036-12330-00	RES M/F 0805 33E 5%
R637		036-12330-00	RES M/F 0805 33E 5%
R641		036-14150-00	RES M/F 0805 1K5 5%
R645		036-13470-00	RES M/F 0805 470E 5%
R649		036-14470-00	RES M/F 0805 4K7 5%
R653		036-15100-00	RES M/F 0805 10K 5%
R681		036-13100-00	RES M/F 0805 100E 5%
R685		036-15150-00	RES M/F 0805 15K 5%
R689		036-12100-00	RES M/F 0805 10E 5%
R693		036-16100-00	RES M/F 0805 100K 5%
R696		036-15560-00	RES M/F 0805 56K 5%
R701		036-12220-00	RES M/F 0805 22E 5%
R702		036-17100-00	RES M/F 0805 1M 5%
R703		036-17100-00	RES M/F 0805 1M 5%
R706		036-15150-00	RES M/F 0805 15K 5%
R707		036-15470-00	RES M/F 0805 47K 5%
R708		036-13100-00	RES M/F 0805 100E 5%
R709		036-13100-00	RES M/F 0805 100E 5%
R710		036-13100-00	RES M/F 0805 100E 5%
R711		036-13100-00	RES M/F 0805 100E 5%
R712		036-12100-00	RES M/F 0805 10E 5%
R742		036-13150-00	RES M/F 0805 150E 5%
R743		036-13150-00	RES M/F 0805 150E 5%
R744		036-12220-00	RES M/F 0805 22E 5%
R746		036-12220-00	RES M/F 0805 22E 5%
R747		036-12220-00	RES M/F 0805 22E 5%
R748		036-15470-00	RES M/F 0805 47K 5%
R749		036-15470-00	RES M/F 0805 47K 5%
R750		036-12220-00	RES M/F 0805 22E 5%
R752		036-12220-00	RES M/F 0805 22E 5%
R753		036-17100-00	RES M/F 0805 1M 5%
R754		036-14100-00	RES M/F 0805 1K 5%
R756		036-16470-00	RES M/F 0805 470K 5%
R757		036-16470-00	RES M/F 0805 470K 5%
R758		036-14120-00	RES M/F 0805 1K2 5%
R759		036-13330-00	RES M/F 0805 330E 5%
R760		036-13180-00	RES M/F 0805 180E 5%
R762		036-13100-00	RES M/F 0805 100E 5%
R763		036-13100-00	RES M/F 0805 100E 5%
R765		036-13680-00	RES M/F 0805 680E 5%
R766		036-14100-00	RES M/F 0805 1K 5%
R767		036-13680-00	RES M/F 0805 680E 5%
R769		036-13180-00	RES M/F 0805 180E 5%
R771		036-14820-00	RES M/F 0805 8K2 5%
R772		036-15220-00	RES M/F 0805 22K 5%
R774		036-14820-00	RES M/F 0805 8K2 5%
R775		036-15180-00	RES M/F 0805 18K 5%
R780		036-12680-00	RES M/F 0805 68E 5%
R782		036-12180-00	RES M/F 0805 18E 5%
R784		036-13120-00	RES M/F 0805 120E 5%
R785		036-14330-00	RES M/F 0805 3K3 5%
R786		036-12100-00	RES M/F 0805 10E 5%
R787		036-12100-00	RES M/F 0805 10E 5%
R790		036-13390-00	RES M/F 0805 390E 5%
R791		036-14100-00	RES M/F 0805 1K 5%
R804		036-15470-00	RES M/F 0805 47K 5%
R805		036-13470-00	RES M/F 0805 470E 5%
R808		036-12100-00	RES M/F 0805 10E 5%
R809		036-14470-00	RES M/F 0805 4K7 5%
R810		036-14470-00	RES M/F 0805 4K7 5%
R811		036-14470-00	RES M/F 0805 4K7 5%
R812		036-14470-00	RES M/F 0805 4K7 5%
R813		036-14470-00	RES M/F 0805 4K7 5%
R815		036-15470-00	RES M/F 0805 47K 5%
R816		036-16150-00	RES M/F 0805 150K 5%
R818		036-14470-00	RES M/F 0805 4K7 5%
R819		036-14470-00	RES M/F 0805 4K7 5%
R820		036-15470-00	RES M/F 0805 47K 5%
R821		036-15470-00	RES M/F 0805 47K 5%
R822		036-15470-00	RES M/F 0805 47K 5%
R823		036-15470-00	RES M/F 0805 47K 5%
R824		036-14220-00	RES M/F 0805 2K2 5%
R825		036-14220-00	RES M/F 0805 2K2 5%
R826		036-14220-00	RES M/F 0805 2K2 5%
R827		036-14220-00	RES M/F 0805 2K2 5%
R828		036-14220-00	RES M/F 0805 2K2 5%
R829		036-14220-00	RES M/F 0805 2K2 5%
R830		036-14220-00	RES M/F 0805 2K2 5%
R831		036-14220-00	RES M/F 0805 2K2 5%
R832		036-14220-00	RES M/F 0805 2K2 5%
R833		036-14220-00	RES M/F 0805 2K2 5%
R835		036-14220-00	RES M/F 0805 2K2 5%
R836		036-14220-00	RES M/F 0805 2K2 5%
R837		036-14220-00	RES M/F 0805 2K2 5%
R840		036-14220-00	RES M/F 0805 2K2 5%
R841		036-14220-00	RES M/F 0805 2K2 5%
R842		036-14220-00	RES M/F 0805 2K2 5%
R843		036-14220-00	RES M/F 0805 2K2 5%
R844		036-15470-00	RES M/F 0805 47K 5%
R845		036-16150-00	RES M/F 0805 150K 5%
R846		036-14470-00	RES M/F 0805 4K7 5%
R847		036-14470-00	RES M/F 0805 4K7 5%
R848		036-13470-00	RES M/F 0805 470E 5%
R849		036-13470-00	RES M/F 0805 470E 5%
R850		036-13470-00	RES M/F 0805 470E 5%
R851		036-13470-00	RES M/F 0805 470E 5%
R852		036-14470-00	RES M/F 0805 4K7 5%
R853		036-13470-00	RES M/F 0805 470E 5%
R854		036-16330-00	RES M/F 0805 330K 5%
R855		036-15470-00	RES M/F 0805 47K 5%
R856		036-16150-00	RES M/F 0805 150K 5%
R857		036-16150-00	RES M/F 0805 150K 5%
R858		036-15270-10	RES M/F 0805 27K 1%
R859		036-17120-10	RES MF 0805 CHIP 1M2 1%
R860		036-16820-10	RES MF 0805 CHIP 820K 1%
R861		036-14510-10	RES MF 0805 CHIP 5K1 1%
R863		036-14470-00	RES M/F 0805 4K7 5%
R865		036-14270-00	RES M/F 0805 2K7 5%
R866		036-16820-00	RES M/F 0805 820K 5%
R867		036-16820-00	RES M/F 0805 820K 5%
R868		036-14470-00	RES M/F 0805 4K7 5%
R869		036-15270-10	RES M/F 0805 27K 1%
R870		036-17120-10	RES MF 0805 CHIP 1M2 1%
R871		036-16820-10	RES MF 0805 CHIP 820K 1%
R872		036-14510-10	RES MF 0805 CHIP 5K1 1%
R873		036-14220-00	RES M/F 0805 2K2 5%
R875		036-14470-00	RES M/F 0805 4K7 5%
R876		036-16100-00	RES M/F 0805 100K 5%
R877		036-16100-00	RES M/F 0805 100K 5%
R878		036-16100-00	RES M/F 0805 100K 5%
R879		036-16100-00	RES M/F 0805 100K 5%
R881		036-15470-00	RES M/F 0805 47K 5%
R882		036-15470-00	RES M/F 0805 47K 5%
R884		036-16150-00	RES M/F 0805 150K 5%
R885		036-16150-00	RES M/F 0805 150K 5%
R886		036-15100-10	RES M/F 0805 10K 1%
R887		036-14100-10	RES M/F 0805 CHIP 1K 1%
R888		036-14820-10	RES M/F 0805 8K2 1%
R889		036-16100-00	RES M/F 0805 100K 5%
R890		036-16150-00	RES M/F 0805 150K 5%
R891		036-16100-00	RES M/F 0805 100K 5%
R892		036-16330-00	RES M/F 0805 330K 5%
R894		036-14470-00	RES M/F 0805 4K7 5%
R895		036-15100-00	RES M/F 0805 10K 5%
R897		036-15100-00	RES M/F 0805 10K 5%
R898		036-16470-00	RES M/F 0805 470K 5%
RL210		237-00010-22	RELAY 12V DPDT 8PIN DIL PCB MT
RV205		040-05100-22	POT 10K LOG DUAL PCB 6 OD SFT

Ref	Var	IPN	Description
RV210		040-05100-23	POT 10K LOG PCB 15MM SLOT SFT
RV220		042-05100-06	RES PRE 10K CAR 6MM FLAT
RV230		040-05100-21	POT 10K LIN PCB 15MM SLOT SFT
RV235		042-05100-06	RES PRE 10K CAR 6MM FLAT
RV310		042-04220-06	RES PRE 2K2 CAR 6MM FLAT
RV320		042-04220-06	RES PRE 2K2 CAR 6MM FLAT
SHLD610		062-00010-13	CAN 10MM SQ X 11MM CAN A4M1017
SK320		240-04020-64	SKT JACK 0.98MM PCB MTG 64 WAY
SK330		240-04020-64	SKT JACK 0.98MM PCB MTG 64 WAY
SK501		240-04021-77	SKT JACK 1.3 PCB MT 64W
SK502		240-04021-77	SKT JACK 1.3 PCB MT 64W
SK503		240-04021-77	SKT JACK 1.3 PCB MT 64W
SK504		240-04021-77	SKT JACK 1.3 PCB MT 64W
SK505		240-04021-77	SKT JACK 1.3 PCB MT 64W
SK513		240-04021-77	SKT JACK 1.3 PCB MT 64W
SK522		240-04021-77	SKT JACK 1.3 PCB MT 64W
SK531		240-04021-77	SKT JACK 1.3 PCB MT 64W
SK532		240-04021-77	SKT JACK 1.3 PCB MT 64W
SK533		240-04021-77	SKT JACK 1.3 PCB MT 64W
SK534		240-04021-77	SKT JACK 1.3 PCB MT 64W
SK535		240-04021-77	SKT JACK 1.3 PCB MT 64W
SK805		240-10000-07	CONN SMD SKT 16W 2R M-MATCH
SK810		240-04020-42	SKT 44 PIN SMD PLCC
SW201		230-00010-30	SWITCH TOG SPDT R-ANG PCB MTG
T210		053-00010-17	XFMR T4030 LINE MATCH POTCORE
T610		050-00016-50	COIL TAIT NO 650 455KHZ
&XF300A	10	276-00010-58	FLTR XTAL 45MHZ 15K 4POLE 1PR
&XF300A	13	276-00010-58	FLTR XTAL 45MHZ 15K 4POLE 1PR
&XF300A	15	276-00010-57	FLTR XTAL 45MHZ 7.5K 4POLE 1PR
&XF300A	20	276-00010-58	FLTR XTAL 45MHZ 15K 4POLE 1PR
&XF300A	23	276-00010-58	FLTR XTAL 45MHZ 15K 4POLE 1PR
&XF300A	25	276-00010-57	FLTR XTAL 45MHZ 7.5K 4POLE 1PR
&XF300A	30	276-00010-58	FLTR XTAL 45MHZ 15K 4POLE 1PR
&XF300A	35	276-00010-57	FLTR XTAL 45MHZ 7.5K 4POLE 1PR
&XF300B	10	276-00010-58	FLTR XTAL 45MHZ 15K 4POLE 1PR
&XF300B	13	276-00010-58	FLTR XTAL 45MHZ 15K 4POLE 1PR
&XF300B	15	276-00010-57	FLTR XTAL 45MHZ 7.5K 4POLE 1PR
&XF300B	20	276-00010-58	FLTR XTAL 45MHZ 15K 4POLE 1PR
&XF300B	23	276-00010-58	FLTR XTAL 45MHZ 15K 4POLE 1PR
&XF300B	25	276-00010-57	FLTR XTAL 45MHZ 7.5K 4POLE 1PR
&XF300B	30	276-00010-58	FLTR XTAL 45MHZ 15K 4POLE 1PR
&XF300B	35	276-00010-57	FLTR XTAL 45MHZ 7.5K 4POLE 1PR
&XF301	10	276-00010-56	FLTR XTAL 45MHZ 14KHZ BW 2 P
&XF301	13	276-00010-56	FLTR XTAL 45MHZ 14KHZ BW 2 P
&XF301	15	276-00010-54	FLTR XTAL 45MHZ 7.5KHZ 2POLE
&XF301	20	276-00010-56	FLTR XTAL 45MHZ 14KHZ BW 2 P
&XF301	23	276-00010-56	FLTR XTAL 45MHZ 14KHZ BW 2 P
&XF301	25	276-00010-54	FLTR XTAL 45MHZ 7.5KHZ 2POLE
&XF301	30	276-00010-56	FLTR XTAL 45MHZ 14KHZ BW 2 P
&XF301	35	276-00010-54	FLTR XTAL 45MHZ 7.5KHZ 2POLE
&XF302	10	276-00010-14	FLTR CER 455KHZ E 15KHZ B/W
&XF302	13	276-00010-76	FLTR CER 455KHZ F 12KHZ B/W
&XF302	15	276-00010-13	FLTR CER 455KHZ G 9KHZ B/W
&XF302	20	276-00010-14	FLTR CER 455KHZ E 15KHZ B/W
&XF302	23	276-00010-76	FLTR CER 455KHZ F 12KHZ B/W
&XF302	25	276-00010-13	FLTR CER 455KHZ G 9KHZ B/W
&XF302	30	276-00010-14	FLTR CER 455KHZ E 15KHZ B/W
&XF302	35	276-00010-13	FLTR CER 455KHZ G 9KHZ B/W
X310		274-00010-22	XTAL 44.545MHZ TE/22 HC45/U

T855 Mechanical and Miscellaneous Parts (220-01396-03)

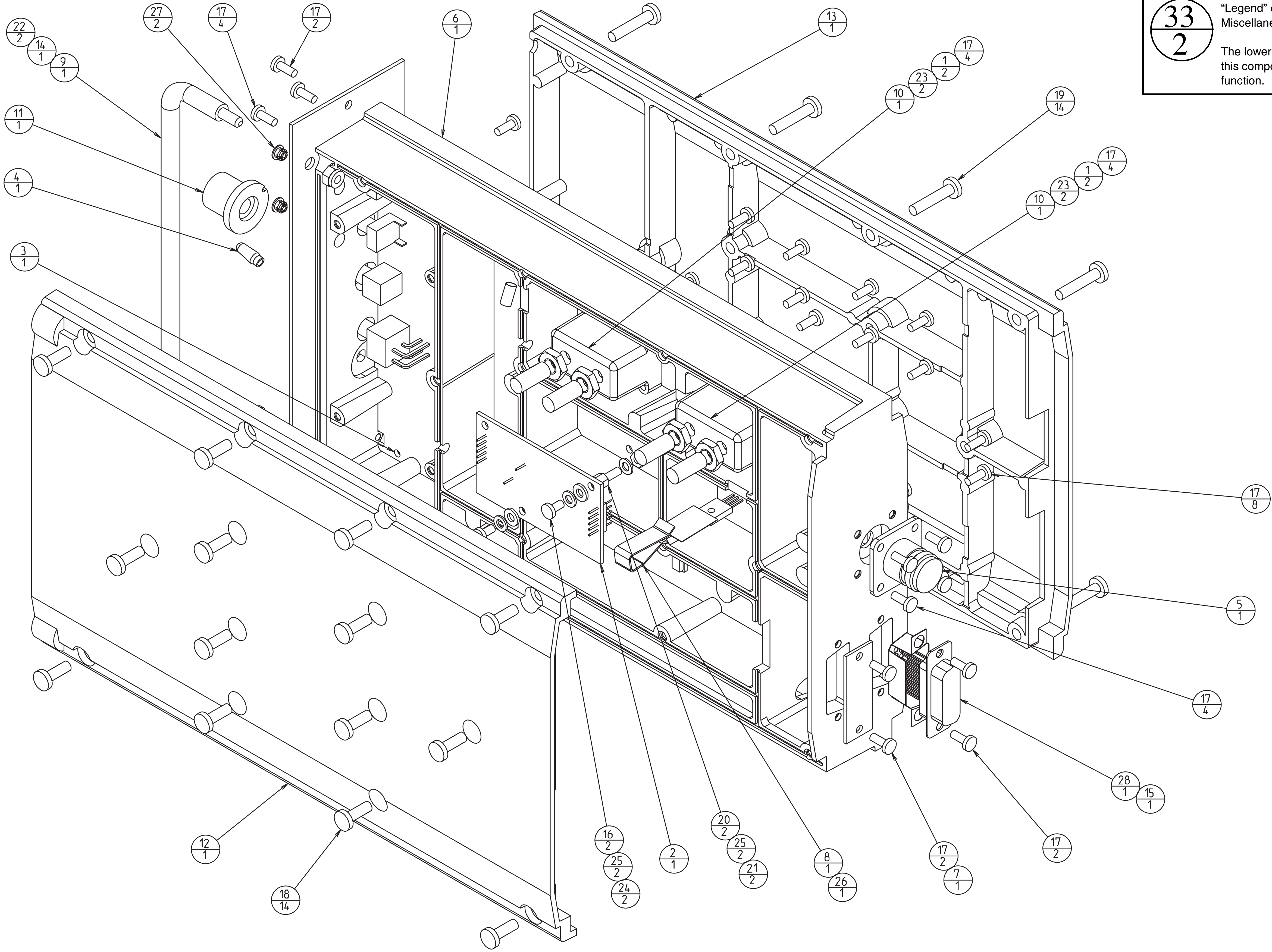
IPN	Legend	Description
066-00010-20	1	SLUG BRASS A4M764 HELIC RESNTR
070-01001-00	15/28	D-RANGE 15 WAY COMPL T800
070-02001-00		LED RED COMPL T800 RX/TX/EX
070-02002-00		LED GREEN COMPL T800 RX/TX/EX
200-00010-04		WIRE T/C 0.7
220-01145-02	2	PCB T855/856/857 VCO
220-01396-02	3	PCB T855 SERIES II
230-00010-31	4	SWITCH COVER FOR 230-00010-30
240-02100-06	5	SKT COAX N TYPE PNL MTG OP-TER
240-04020-62		SKT 2 W RECEP SHORTING LINK PL210/220/230/240/250/260/270
303-11169-03	6	CHASSIS PAINTED T800 SERIES
303-23118-00	7	COVER A3M2247 D RANGE T855/7
303-50074-00	8	CLIP A3M2246 SPRING CLAMP T857
308-01007-01	9	HANDLE BASE STATION SERIES II
308-01048-00	10	HOUSING A3M2378 DOUBLET H/RES
311-01015-00	11	KNOB 15MM & SKIRT 6MM SFT
312-01052-01	12	LID TOP PNTD A1M2364 T800
312-01053-01	13	LID BOTTOM PNTD A1M2364 T800
316-06622-00	14	PNL FRT RX T800 SL2
345-00040-10	16	SCRW M3X6MM P/POZ ST BZ
349-00020-36	17	LIM)SCREW TT M3X8m PANTORX BLK
349-00020-43	18	SCRW T/T M4X12MM P/POZ BZ
349-00020-45	19	SCRW T/T M4X20MM P/POZ BZ
350-00016-42	20	SPACER 5MM HI 8MM ST 2.5MM HO
352-00010-08	21	NUT M3 COLD FORM HEX ST BZ
352-00010-29	22	NUT M4 NYLOC HEX
352-00010-54	23	NUT BRASS HEX 1/4” UNF 3MM
353-00010-10	24	WSHR M3 FLAT 7MMX0.6MM ST BZ
353-00010-13	25	WSHR M3 S/PROOF INT BZ
356-00010-03		TAG SOLDER 3MM LONG M614/3.2 Main PCB to chassis earth strap (via D-range shield).
362-00010-23	26	GASKET SIL TO-220 CLIP MTG.
362-00010-33	27	GROMMET LED MTG 3MM
365-00011-53		LABEL 104X37MM
365-00100-09		LABEL WHITE VINYL 15X11MM S/A
365-00100-20		LABEL WHITE S/A 28X11MM
365-01541-00		LABEL TX/RX/EX TYPE APR/SER NO
399-00010-51		BAG PLASTIC 75X100MM
410-01081-01		CRT T800 SL2
410-01082-01		CRTN 10 T800 KIWI 423X410X360

Key

33
2

The upper number is the component identification number which appears in the "Legend" column of the Mechanical and Miscellaneous Parts on the facing page.

The lower number indicates how many of this component are used in this location or function.



T855 Mechanical Assembly
220-01396-03

T855 Grid Reference Index (IPN 220-01396-03)

How To Use This Grid Reference Index

The first digit in the PCB layout reference is a “1” or “2”, indicating the top or bottom side layout respectively, and the last two characters give the location of the component on that diagram.

The first digit in the circuit diagram reference is the sheet number, and the last two characters give the location of the component on that sheet.

Device	PCB	Circuit
C201	1:D7	2-B9
&C203	2:C6	2-B8
&C205	2:C6	2-B8
C207	1:D6	2-C8
C209	1:C7	2-E8
C210	2:C7	2-C7
C211	2:C7	2-D7
C213	2:C7	2-E7
C215	2:C7	2-E7
C217	2:C7	2-E7
C219	2:C6	2-H6
C221	2:C6	2-H6
C222	1:C6	2-J9
C223	2:C6	2-J8
C225	2:C6	2-J8
C227	2:C6	2-J8
C229	1:C6	2-K8
C231	1:B3	2-K8
C233	1:B7	2-J7
C235	2:C5	2-M6
C237	2:C6	2-M5
C238	2:C5	2-N7
C239	1:C5	2-P6
C240A	2:B5	2-Q8
C240B	2:B5	2-R8
C240C	1:C5	2-R8
C249	1:B5	2-Q7
C251	2:A5	2-R7
C253	1:C8	2-G5
C255	2:B7	2-L2
C257	2:B6	2-M2
C259	2:B6	2-M3
C260A	2:B6	2-P4
C260B	2:B6	2-P4
C260C	1:B6	2-P4
C261	1:C6	2-N2
C262	1:B5	2-P3
C264	2:B5	2-P2
C266	1:D2	2-R3
C268	1:D3	2-R3
C270	2:B8	2-E3
C272	2:B8	2-D1
C274	2:B8	2-E1
C276	2:C4	2-B0
C278	2:C4	2-C0
C280	2:C4	2-F1
C286	2:B8	2-F1
C302	2:F8	3-C9
C304	2:F8	3-C9
C306	2:F8	3-D8
C308	2:F8	3-E8
C310	2:F8	3-E8
C312	1:F7	3-F8
C314	2:F8	3-F8
C316	2:F9	3-F9
&C318	2:E8	3-A5
&C320	2:E8	3-B5
&C322	2:E8	3-C5
&C324	2:E7	3-E5
&C326	2:E7	3-E5
C328	2:E7	3-F5
C330	2:F7	3-F6
C331	2:F7	3-H5
C332	2:E7	3-G4
&C334	2:F7	3-H5
&C336	2:E7	3-H5
&C338	2:E7	3-J5
&C340	2:E7	3-J5
C342	2:E6	3-K5
C344	2:E6	3-K6
C346	2:E6	3-L5
C347	2:E4	3-M5
C348	2:E6	3-M5
C349	2:E6	3-L6
C350	2:E6	3-M6
C351	2:E4	3-M6
C352	2:E4	3-N5
C354	1:F5	3-N6
C355	1:F4	3-P6
C356	2:E5	3-N6
C357	2:E5	3-Q5
C358	2:F5	3-Q6
C359	1:F4	3-P6
C360	2:F4	3-R6
C361	2:F5	3-Q6
C362	2:E6	3-R4
C364	2:E5	3-A2
C366	2:E5	3-B2
C367	2:E5	3-Q5
C368	2:F5	3-C2
C370	2:E4	3-C1
C372	2:F3	3-E1
C374	2:F3	3-D3
C376	2:E3	3-E2
C378	2:F3	3-E2
C380	2:E3	3-F2
C382	1:F3	3-G3
C384	2:E4	3-H2
C386	2:E4	3-J2
C388	2:E5	3-M2
C390	1:E6	3-M2
C392	2:E4	3-N2
C394	2:F3	3-P2
C410	2:L8	4-E4
C420	2:L8	4-F5
C430	2:L8	4-G6
C440	1:M7	4-H6
C450	2:K8	4-G5
%C460	2:K8	4-H4
C470	2:G7	4-P5
C480	2:G8	4-Q5
C505	1:K6	5-L8
C515	1:H5	5-F3
C530	1:K5	5-K1
C535	1:K5	5-L1
C610A	1:M5	6-C8
C610B	1:M5	6-D8
C611A	1:L5	6-E8
C611B	1:M5	6-F8
C623	1:M6	6-N8
C625	1:M6	6-Q8
C626	1:M6	6-R8
C628	1:M6	6-R8
C630	1:M5	6-K4
C631A	1:M5	6-M6
C631B	1:N5	6-M6
C637	1:M6	6-P5
C640	1:M5	6-R5
C651	1:M5	6-M4
C658	1:M5	6-J1
C660	1:L5	6-K1
C665	1:L5	6-K1
C670	1:L6	6-L1
C673	1:L5	6-P2
C677	1:M6	6-P1
C681	1:M5	6-R3
C684	1:M6	6-R3
C687	1:L6	6-Q1
C690	1:L6	6-R1
C693	1:L6	6-R1
C700	1:J4	7-A8
C702	1:J4	7-B8
C703	1:J3	7-B7
C705	1:J3	7-B7
C707	1:J3	7-B5
C708	1:J3	7-B5
C709	1:H3	7-C5
C710A	1:H3	7-D8
C710B	1:H4	7-D8
C710C	1:J3	7-F8
C711	1:J2	7-E7
C712	1:H2	7-E7
C713	1:H2	7-F7
C735	1:J2	7-A1
C736	1:J2	7-B1
C740A	1:H2	7-B4
C740B	1:H2	7-B3
C741A	1:H2	7-C4
C741B	1:G2	7-C3
C742A	1:H2	7-D4
C742B	1:H3	7-D3
C743	1:H2	7-B1
C745	1:G3	7-D1
C750	1:H4	7-H7
C757	1:G4	7-G5
C759	1:G4	7-G4
C761	1:H3	7-J4
C762	1:G3	7-J4
C764	1:H3	7-J2
C765	1:G3	7-J2
C767	1:H3	7-K3
C769	1:H4	7-M4
C770	1:H3	7-N4
C772	1:G4	7-M2
C774	1:H4	7-N2
C776	1:H4	7-N1
C782	1:G2	7-N0
C784	1:G2	7-Q1
C786	1:G2	7-R1
C788	1:G3	7-P0
C791	1:G4	7-Q0
C792	1:G4	7-R0
C810	1:L4	8-K8
C812	1:K2	8-E5
C813	1:J3	8-H5
C814	1:L2	8-Q4
C815	1:N3	8-B2
C816	1:N3	8-B2
C818	1:N3	8-C1
C819	1:N3	8-D1
C820	1:N4	8-E1
C822	1:N3	8-D2
C824	1:N3	8-D2
C826	1:N3	8-D0
C828	1:N3	8-D0
C830	1:M4	8-F1
C832	1:M3	8-G2
C833	1:M4	8-G1
C834	1:M3	8-H2
C836	1:M3	8-G0
C837	1:M3	8-G0
C838	1:N4	8-H0
C840	1:M2	8-K1
C842	1:N2	8-L0
C844	1:N3	8-L0
C846	1:M2	8-M0
C848	1:N2	8-M0
C850	1:M2	8-N0
C873	1:M4	8-N2
C876	1:M4	8-P2
C879	1:M3	8-Q0
C910	2:P6	9-E6
C920	2:P6	9-F6
C930	2:P7	9-G6
C940	2:P7	9-H6
C950	2:N8	9-J6
D111	1:P4	1-R1
D220	2:D8	2-E4
D220	2:D8	2-E4
D230	2:C6	2-J4
D230	2:C6	2-J5
D240	2:C8	2-D2
D240	2:C8	2-D3
D250	1:B7	2-H1
D260	2:A7	2-H1
D270	2:B7	2-H1
D270	2:B7	2-J1
D280	1:B7	2-K1
D285	1:D2	2-L1
D289	1:C2	2-K0
D290	1:C2	2-L0
D295	1:C2	2-L0
D310	2:E4	3-G2
D310	2:E4	3-G1
D350	2:E4	3-M4

Device	PCB	Circuit
D350	2:E4	3-M4
D610	1:N5	6-L6
D610	1:N5	6-M6
D640	1:L5	6-M1
D640	1:L5	6-M2
D730	1:H3	7-H1
D730A	1:H3	7-G0
D740	1:H3	7-J2
D740A	1:H3	7-H0
D820	1:J3	8-B7
D820A	1:J3	8-N0
D860	1:M2	8-N0
D860	1:M2	8-N0
D880	1:M2	8-R2
D880	1:M2	8-R2
#FL410	1:M8	4-C5
#FL420	1:J8	4-K5
IC210	1:C7	2-C7
IC210	1:C7	2-F7
IC210	1:C7	2-G7
IC240	1:B5	2-P7
IC260	1:B6	2-N2
IC270	1:B8	2-F3
IC270	1:B8	2-E2
IC270	1:B8	2-B2
IC280	1:C4	2-E1
IC280	1:C4	2-B0
IC280	1:C4	2-D0
IC310	1:E5	3-Q5
IC310	1:E5	3-N5
IC310	1:E5	3-B2
IC320	1:F3	3-N2
IC410	1:G7	4-P5
IC610	1:M5	6-D8
IC630	1:N5	6-K5
IC640	1:M5	6-N5
IC640	1:M5	6-J0
IC640	1:M5	6-Q5
IC650	1:L5	6-E5
=IC700	1:J3	7-A8
IC710	1:H3	7-D7
IC710	1:H3	7-J0
IC710	1:H3	7-C6
IC710	1:H3	7-D6
IC710	1:H3	7-D6
IC710	1:H3	7-C6
IC710	1:H3	7-E8
IC740	1:H2	7-D1
IC750	1:H4	7-M3
IC750	1:H4	7-H6
IC750	1:H4	7-H5
IC820	1:L4	8-N5
IC830	1:N4	8-J0
IC830	1:N4	8-F1
IC830	1:N4	8-F0
IC830	1:N4	8-H2
IC830	1:N4	8-E2
IC840	1:M2	8-L0
IC850	1:M3	8-N1
IC850	1:M3	8-M2
IC850	1:M3	8-Q2
IC850	1:M3	8-M0
IC850	1:M3	8-M2
L230	1:D2	2-K2
L310	1:F8	3-D9
L320	1:F8	3-E8
L330	1:E8	3-B5
L340	1:E8	3-C5
L350	1:E7	3-D5
L360	1:F6	3-G5
L370	1:E7	3-J5
L380	1:E6	3-L6
L385	1:E4	3-M6

Device	PCB	Circuit
L390	1:F5	3-R6
L410	2:L9	4-F5
L420	1:M7	4-F6
L430	2:K8	4-H5
L440	1:G8	4-Q5
L740	1:G3	7-Q0
L910	1:P6	9-E7
L920	1:P6	9-F7
L930	1:P7	9-G7
L940	1:P8	9-H7
P100	1:Q6	1-R8
P160	1:P2	1-Q4
P170	1:P2	1-R4
P201	1:D4	2-A9
P204	1:D7	2-A9
P207	1:D6	2-A8
P210	1:D6	2-C7
P213	1:D3	2-A7
P216	1:B2	2-A7
P219	1:D7	2-A7
P222	1:C5	2-A6
P225	1:C8	2-A4
P228	1:D8	2-A4
P231	1:C7	2-A4
P234	1:B7	2-A3
P236	1:C8	2-A1
P238	1:D3	2-A1
P240	1:C8	2-G2
P242	1:C7	2-G1
P244	1:C7	2-G8
P246	1:C6	2-H9
P248	1:C6	2-H9
P250	1:B3	2-K8
P252	1:B2	2-L9
P254	1:B2	2-L9
P256	1:B2	2-L8
P258	1:D3	2-P8
P260	1:D3	2-P7
P263	1:B2	2-R6
P266	1:D2	2-R5
P268	1:B2	2-R5
P270	1:B2	2-R5
P280	1:B2	2-R4
P282	1:B2	2-R4
P284	1:B3	2-R4
P287	1:B2	2-R0
P810	1:K2	8-A5
P815	1:L4	8-C4
P820	1:K4	8-M8
P825	1:K4	8-M8
P830	1:K4	8-M8
P835	1:K4	8-M7
P840	1:K4	8-M7
PL100	1:P3	1-F0
PL200	1:A3	2-R7
PL210	1:C6	2-B8
PL220	1:C6	2-H7
PL230	1:B2	2-L8
PL240	1:B6	2-K7
PL250	1:C8	2-C2
PL260	1:C8	2-H3
PL270	1:C2	2-L1
Q210	2:C6	2-J8
Q220	2:C5	2-M6
Q230	2:C5	2-N6
Q240	2:C8	2-H4
Q245	2:B6	2-J4
Q250	2:B8	2-G2
Q255	2:B7	2-H2
Q260	2:B7	2-K0
Q270	2:C2	2-K0
Q280	2:B7	2-L2
Q290	2:B6	2-M2

Device	PCB	Circuit
Q310	1:F9	3-D9
Q320	2:F7	3-F5
Q350	2:E6	3-L5
Q340	2:E5	3-P5
Q350	2:F4	3-D2
Q360	2:E3	3-F2
Q410	2:L8	4-G5
Q540	1:K5	5-K2
Q620	1:N6	6-P8
Q630	1:M6	6-P5
Q660	1:L5	6-N1
Q670	1:L6	6-Q2
Q750	1:G4	7-G3
Q760	1:G3	7-H3
Q770	1:H3	7-H1
Q775	1:H3	7-K3
Q780	1:H3	7-K3
Q785	1:H3	7-K2
Q790	1:H4	7-L3
Q795	1:G3	7-P0
Q810	1:K2	8-C5
Q820	1:K2	8-C6
Q840	1:K2	8-F5
Q850	1:L2	8-G5
Q860	1:K4	8-B4
Q870	1:L4	8-C4
Q880	1:L2	8-L5
Q890	1:L4	8-K3
Q895	1:M3	8-P2
R160	1:P2	1-Q4
R201	2:D6	2-B8
&R202	2:D6	2-B7
R204	2:C6	2-C9
R205	2:C7	2-C8
R207	2:C7	2-D8
&R209	2:C7	2-D8
R210	2:C7	2-D8
R211	2:C7	2-E8
R213	2:C7	2-G6
R215	2:C6	2-G9
R218	2:C7	2-G8
&R219	2:C7	2-G7
R221	2:C7	2-H7
R222	2:C7	2-H7
%R223	2:D6	2-J9
R224	2:C6	2-J8
R225	2:C6	2-J8
R227	2:B7	2-J7
R229	2:C5	2-L6
R230	2:C6	2-M5
R232	2:B5	2-M7
R233	2:C5	2-M7
R234	2:C5	2-N7
R236	2:B5	2-N7
R238	2:A5	2-R6
R239	2:B5	2-R7
R241	2:D8	2-F5
R242	2:C8	2-F4
R244	2:C8	2-G4
R245	2:C8	2-G5
R247	2:B7	2-J4
R249	2:B6	2-J3
R251	2:B7	2-L3
R252	2:B7	2-L3
R254	2:B7	2-L3
R255	2:B6	2-M3
R256	2:B6	2-M3
R258	2:B6	2-N3
R260	2:B5	2-P2
R261	2:B4	2-Q3
R262	2:B3	2-Q3
R264	2:B8	2-A3
R265	2:B8	2-A2
R266	2:B8	2-B2
R267	2:C8	2-C3

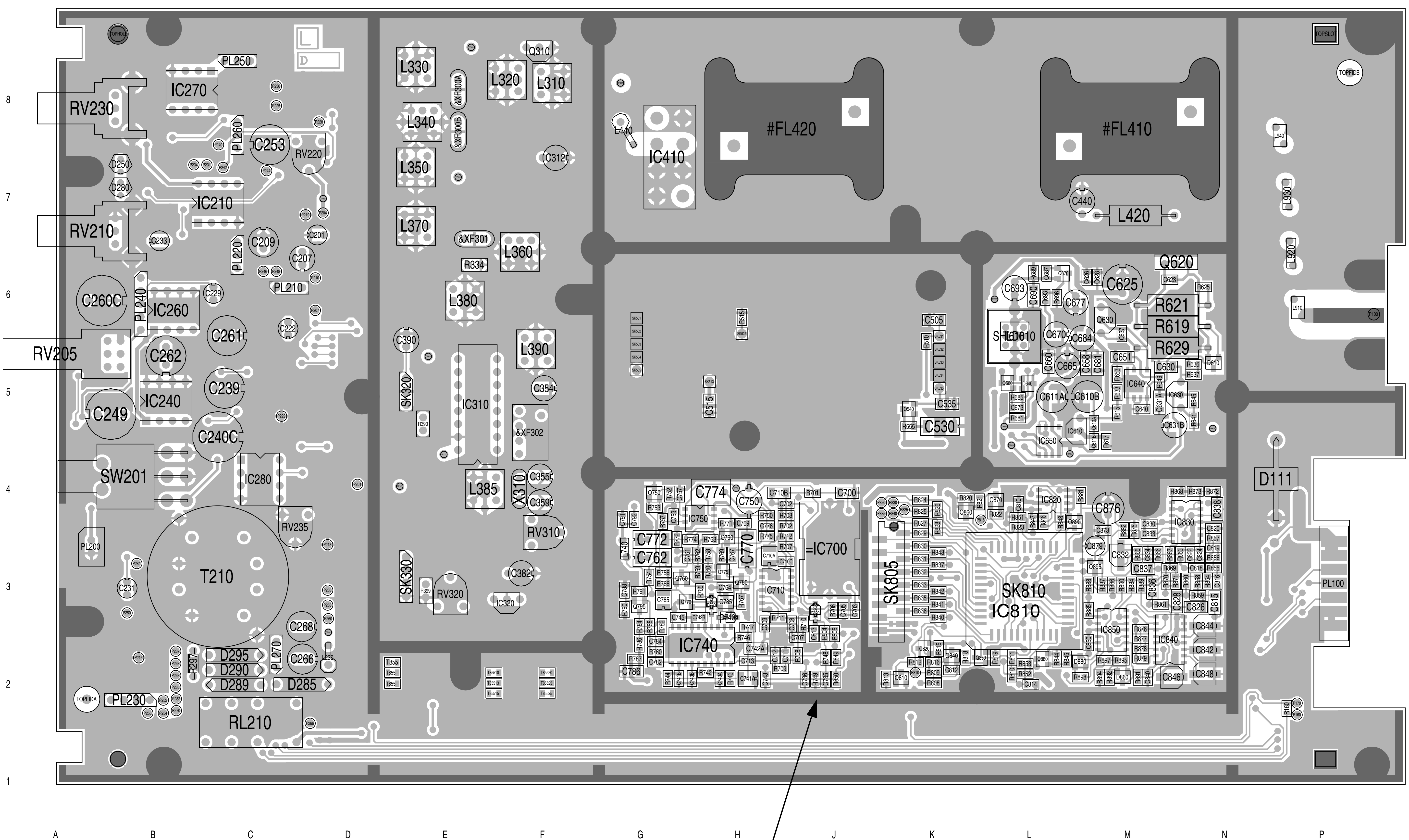
Device	PCB	Circuit
R269	2:C8	2-B1
R271	2:D3	2-A0
R272	2:C4	2-B1
R273	2:C4	2-C1
R275	2:C4	2-C1
R277	2:C4	2-C0
R278	2:C4	2-C1
R280	2:C8	2-D3
R281	2:C8	2-D2
R282	2:B8	2-E2
R284	2:C8	2-F3
R285	2:B8	2-F2
R287	2:B8	2-F2
R288	2:B8	2-F1
R289	2:B7	2-G3
R290	2:B7	2-G3
R292	2:C8	2-G2
R293	2:B7	2-H1
R294	2:C3	2-H0
R295	2:B7	2-J1
R296	2:A7	2-K1
R297	1:B2	2-M0
R298	2:D7	2-J0
R299	2:C7	2-J0
R302	2:F8	3-D8
R304	2:F8	3-E9
R306	2:F8	3-E8
R308	2:F7	3-F8
R310	2:E9	3-A5
R312	2:F7	3-F5
R314	2:E7	3-F4
R316	2:F7	3-G6
R318	2:F7	3-G5
R320	2:F7	3-G5
R322	2:E7	3-K5
R323	2:E6	3-K5
R324	2:E6	3-K5
R326	2:E6	3-K6
R328	2:E6	3-L6
R330	2:E6	3-M7
R332	2:E6	3-L5
R334	1:E6	3-L4
R336	2:E6	3-M4
R337	2:E4	3-M5
R338	2:F4	3-N6
R339	2:E5	3-N5
R340	2:F5	3-N5
R341	2:F5	3-Q5
&R344	2:F5	3-R6
R346	2:F5	3-R7
R348	2:E6	3-R5
%R349	2:E6	3-R4
R350	2:E5	3-A2
R351	2:E6	3-A2
R352	2:E5	3-B2
R353	2:F4	3-N6
R354	2:E5	3-B2
R356	2:F4	3-C2
R358	2:F3	3-D3
R360	2:F3	3-D2
R362	2:E4	3-D1
R364	2:F3	3-D1
R365	2:E5	3-Q4
R366	2:F3	3-D2
R367	2:E5	3-Q4
R368	2:E4	3-E1
R370	2:E3	3-E2
R372	2:E3	3-F3
R374	2:E4	3-F2
R376	2:E4	3-F1
R378	2:E3	3-G3
R380	2:E4	3-G2
R382	2:E4	3-H2
R384	2:E4	3-H2
R386	2:E5	3-L3
R388	2:E5	3-L3

Device	PCB	Circuit
R390	1:E5	3-L2
R392	2:E5	3-L2
R393	2:E5	3-P3
R394	2:E5	3-M2
R395	2:F3	3-N2
R396	2:E3	3-P2
R397	2:E3	3-Q2
R398	2:E3	3-Q1
R399	1:E3	3-P1
R405	2:N8	4-B5
R410	2:L8	4-E5
R415	2:L8	4-F4
R420	2:L8	4-G4
R425	2:L8	4-G5
R430	2:L8	4-G6
R435	2:M7	4-G6
R440	2:K8	4-J5
R445	2:H8	4-N4
R450	2:H8	4-N5
R455	2:H8	4-N4
R460	2:G7	4-P6
R465	2:G7	4-P6
R470	2:G7	4-P6
R475	2:G7	4-P4
R510	1:K6	5-J9
R515	1:H6	5-J5
R555	1:K5	5-K1
R615	1:M5	6-C9
R617	1:M5	6-F8
R619	1:M6	6-L8
R621	1:M6	6-L8
R625	1:N6	6-L7
R629	1:M5	6-P6
R633	1:M5	6-Q8
R636	1:N5	6-K6
R637	1:N5	6-K5
R641	1:N5	6-L4
R645	1:N5	6-L5
R649	1:M5	6-M5
R653	1:M5	6-Q4
R681	1:L5	6-L2
R685	1:L5	6-N2
R689	1:L6	6-Q3
R693	1:L6	6-Q1
R696	1:L6	6-Q1
R701	1:J4	7-A9
R702	1:J4	7-C9
R703	1:J4	7-C8
R706	1:J3	7-B6
R707	1:J3	7-C7
R708	1:J2	7-D7
R709	1:H2	7-E7
R710	1:J3	7-B6
R711	1:H3	7-B6
R712	1:J4	7-E9
R742	1:H2	7-B4
R743	1:H2	7-C5
R744	1:G2	7-D4
R746	1:H3	7-E4
R747	1:H3	7-E5
R748	1:J2	7-A1
R749	1:J2	7-B1
R750	1:H4	7-H7
R752	1:G4	7-F5
R753	1:G4	7-F3
R754	1:G3	7-F3
R756	1:G3	7-G5
R757	1:G4	7-H4
R758	1:H3	7-H4
R759	1:H3	7-J4
R760	1:H3	7-K4
R762	1:H3	7-K4
R763	1:H4	7-L4
R765	1:H3	7-H2
R766	1:G3	7-J3
R767	1:H3	7-K2

Device	PCB	Circuit
R769	1:H3	7-K3
R771	1:H4	7-L3
R772	1:G4	7-L2
R774	1:H4	7-L2
R775	1:H4	7-N2
R780	1:G2	7-P1
R782	1:G3	7-P0
R784	1:G3	7-P1
R785	1:G3	7-Q1
R786	1:G2	7-R1
R787	1:G2	7-R1
R790	1:G3	7-P0
R791	1:G3	7-Q0
R804	1:J3	8-C7
R805	1:J3	8-C7
R808	1:K2	8-B6
R809	1:K2	8-C6
R810	1:L2	8-D6
R811	1:L2	8-D6
R812	1:K2	8-C6
R813	1:K2	8-C5
R815	1:K2	8-E4
R816	1:K2	8-F4
R818	1:K2	8-F5
R819	1:L2	8-F5
R820	1:K4	8-B4
R821	1:L4	8-C4
R822	1:L4	8-D3
R823	1:L4	8-D4
R824	1:K4	8-L8
R825	1:K4	8-L8
R826	1:K4	8-L8
R827	1:K4	8-L7
R828	1:K4	8-L7
R829	1:K4	8-P9
R830	1:K3	8-P9
R831	1:K3	8-P9
R832	1:K3	8-P8
R833	1:K3	8-P8
R835	1:K3	8-P8
R836	1:K3	8-P8
R837	1:K3	8-P7
R840	1:K3	8-P7
R841	1:K3	8-P7
R842	1:K3	8-P6
R843	1:K3	8-P6
R844	1:L2	8-M5
R845	1:L2	8-M5
R846	1:L4	8-L6
R847	1:L4	8-M6
R848	1:L4	8-Q5
R849	1:J2	8-Q5
R850	1:J2	8-Q4
R851	1:L4	8-Q4
R852	1:L2	8-N4
R853	1:L2	8-Q4
R854	1:N3	8-C1
R855	1:N3	8-C2
R856	1:N3	8-D2
R857	1:N4	8-D2
R858	1:N3	8-C0
R859	1:N3	8-D0
R860	1:N3	8-E0
R861	1:M3	8-F0
R863	1:N3	8-F2
R865	1:M3	8-G2
R866	1:M3	8-H2
R867	1:M3	8-G1
R868	1:N4	8-G0
R869	1:M3	8-G0
R870	1:M3	8-H0
R871	1:N3	8-H0
R872	1:N4	8-H0
R873	1:N4	8-K0
R875	1:M4	8-J1
R876	1:M3	8-K1

Device	PCB	Circuit
R877	1:M2	8-K1
R878	1:M2	8-K0
R879	1:M2	8-K0
R881	1:M4	8-K2
R882	1:M4	8-L3
R884	1:M3	8-N3
R885	1:M3	8-N2
R886	1:M3	8-P3
R887	1:M3	8-P3
R888	1:M3	8-P2
R889	1:M3	8-M1
R890	1:M3	8-N1
R891	1:M2	8-M1
R892	1:M2	8-N0
R894	1:M2	8-P0
R895	1:M2	8-Q1
R897	1:M2	8-Q1
R898	1:M2	8-Q2
RL210	1:C2	2-P4
RL210	1:C2	2-K1
RL210	1:C2	2-P5
RV205	1:B5	2-M7
RV210	1:B7	2-K3
RV220	1:D7	2-F5
RV230	1:B8	2-A2
RV235	1:C4	2-C0
RV310	1:F4	3-E1
RV320	1:E3	3-Q2
SHLD610	1:L6	6-J3
SK320	1:E5	3-L1
SK330	1:E3	3-Q1
SK501	1:G6	5-D6
SK502	1:G6	5-D5
SK503	1:G6	5-D4
SK504	1:G5	5-D3
SK505	1:G5	5-D2
SK513	1:H5	5-G3
SK522	1:H6	5-K5
SK531	1:K6	5-N6
SK532	1:K5	5-N5
SK533	1:K5	5-N4
SK534	1:K5	5-N3
SK535	1:K5	5-N2
SK805	1:K3	8-Q9
SK805	1:K3	8-Q9
SK805	1:K3	8-Q7
SK805	1:K3	8-Q8
SK805	1:K3	8-Q6
SK805	1:K3	8-Q8
SK805	1:K3	8-Q6
SK805	1:K3	8-Q8
SK805	1:K3	8-Q7
SK805	1:K3	8-Q8
SK805	1:K3	8-Q7
SK805	1:K3	8-Q5
SK805	1:K3	8-Q7
SK805	1:K3	8-Q6
SK805	1:K3	8-Q9
SK805	1:K3	8-Q6
SK810	1:L3	8-H5
SL210	2:B8	2-E2
SL220	2:B8	2-D2
SW201	1:B4	2-A6
T210	1:C3	2-Q2
T610	1:L6	6-N2
TP201	1:D3	2-P8
TP202	1:D7	2-D9
TP309	1:E9	3-A5

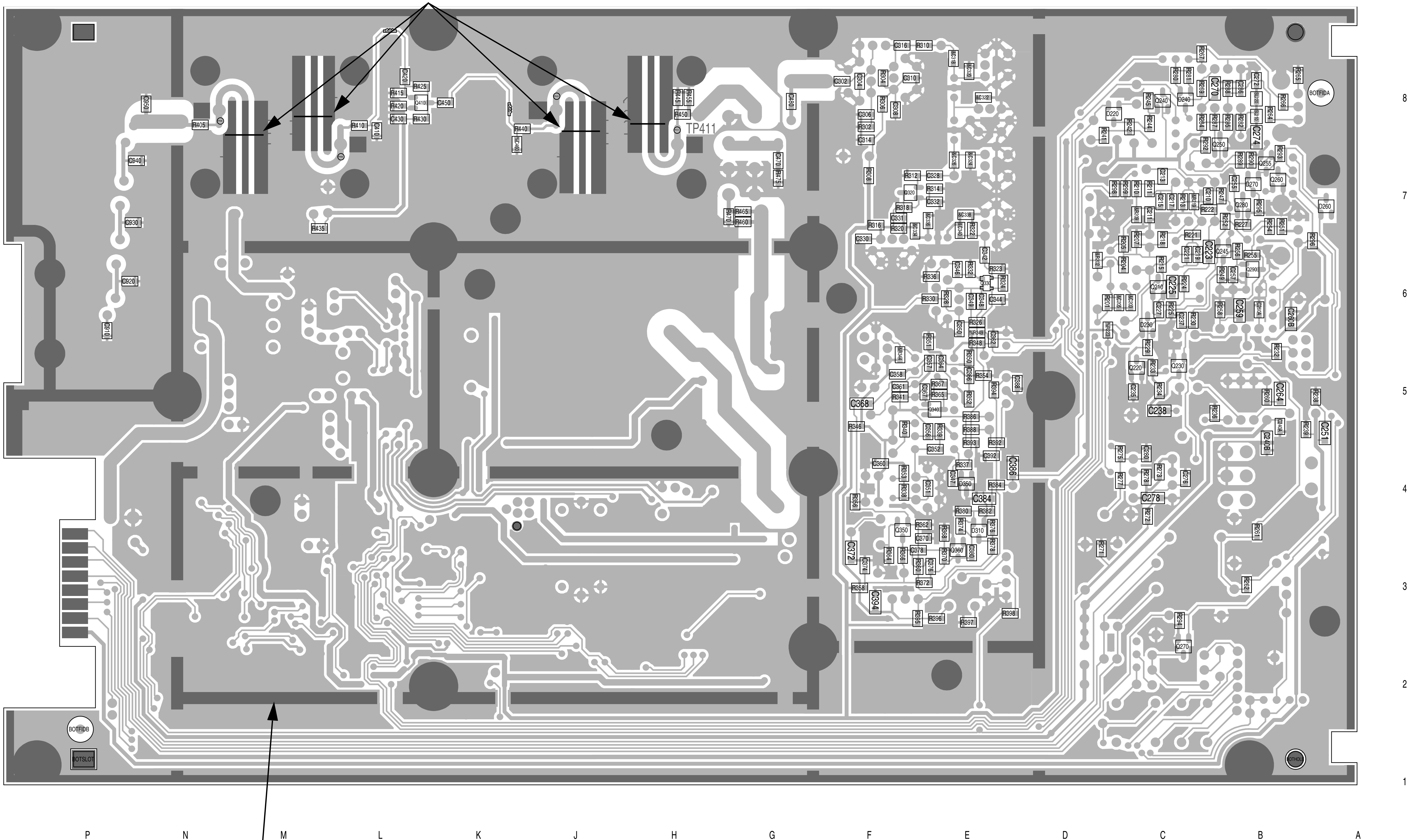
Device	PCB	Circuit
TP310	1:E7	3-E5
TP311	1:E4	3-M6
TP313	1:E4	3-J2
TP314	1:E5	3-R5
TP408	2:N8	4-B5
TP409	2:L7	4-D5
TP410	2:J8	4-J5
TP411	2:H8	4-M5
TP412	1:G8	4-Q5
TP601	1:N5	6-K9
TP602	1:L6	6-R9
TP603	1:L5	6-J2
TP604	1:L4	6-N6
TP607	1:L4	6-F9
TP710	1:H4	7-J5
X310	1:F4	3-M6
&XF300A	1:E8	3-C5
&XF300B	1:E8	3-D5
&XF301	1:E7	3-J5
&XF302	1:F5	3-P5



The darker shading shows the outline of the chassis.

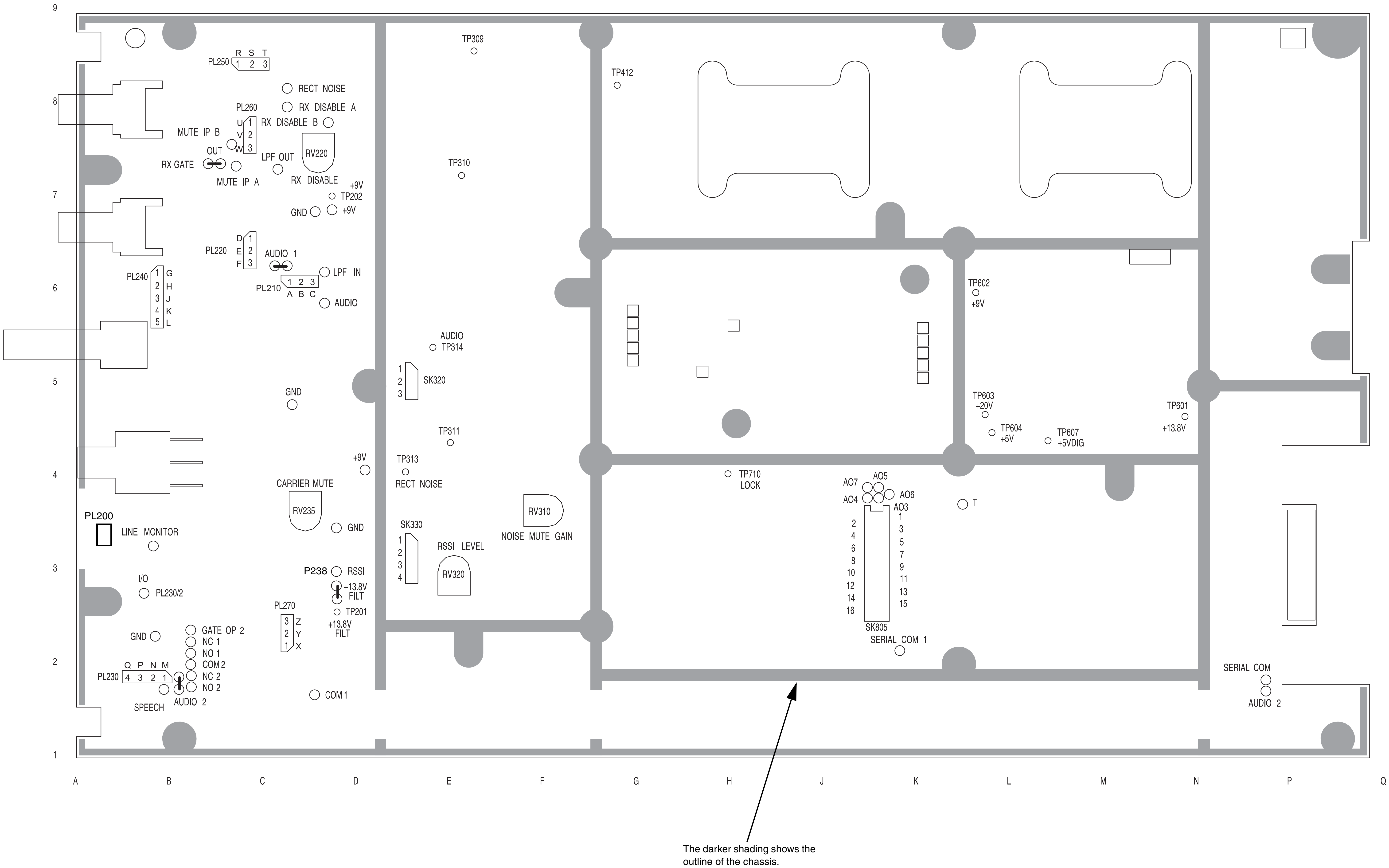
T855 PCB Layout – Top Side
220-01396-03

These link wires are positioned according to frequency range and should not be moved as their position is optimised in the factory.

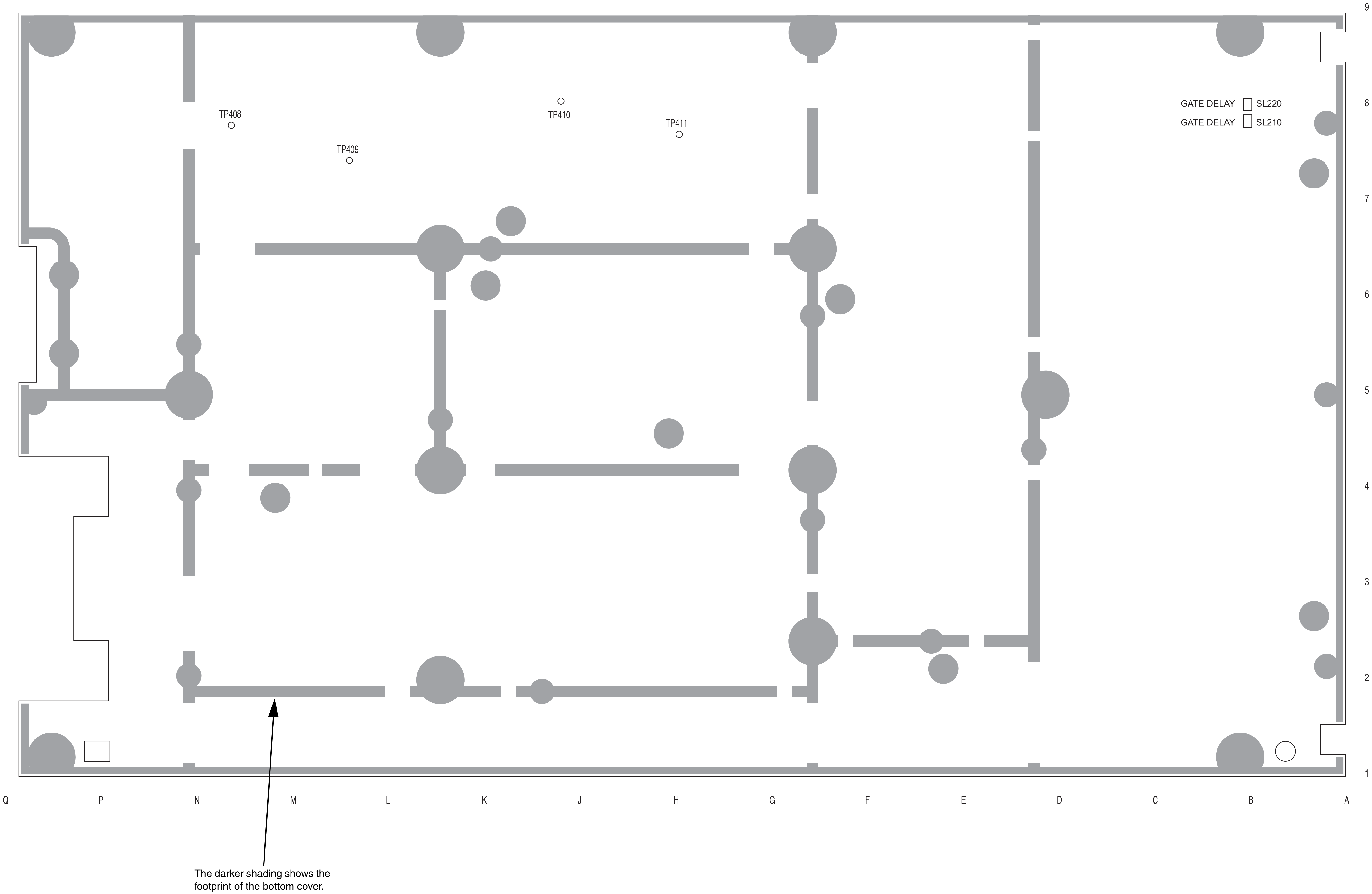


The darker shading shows the footprint of the bottom cover.

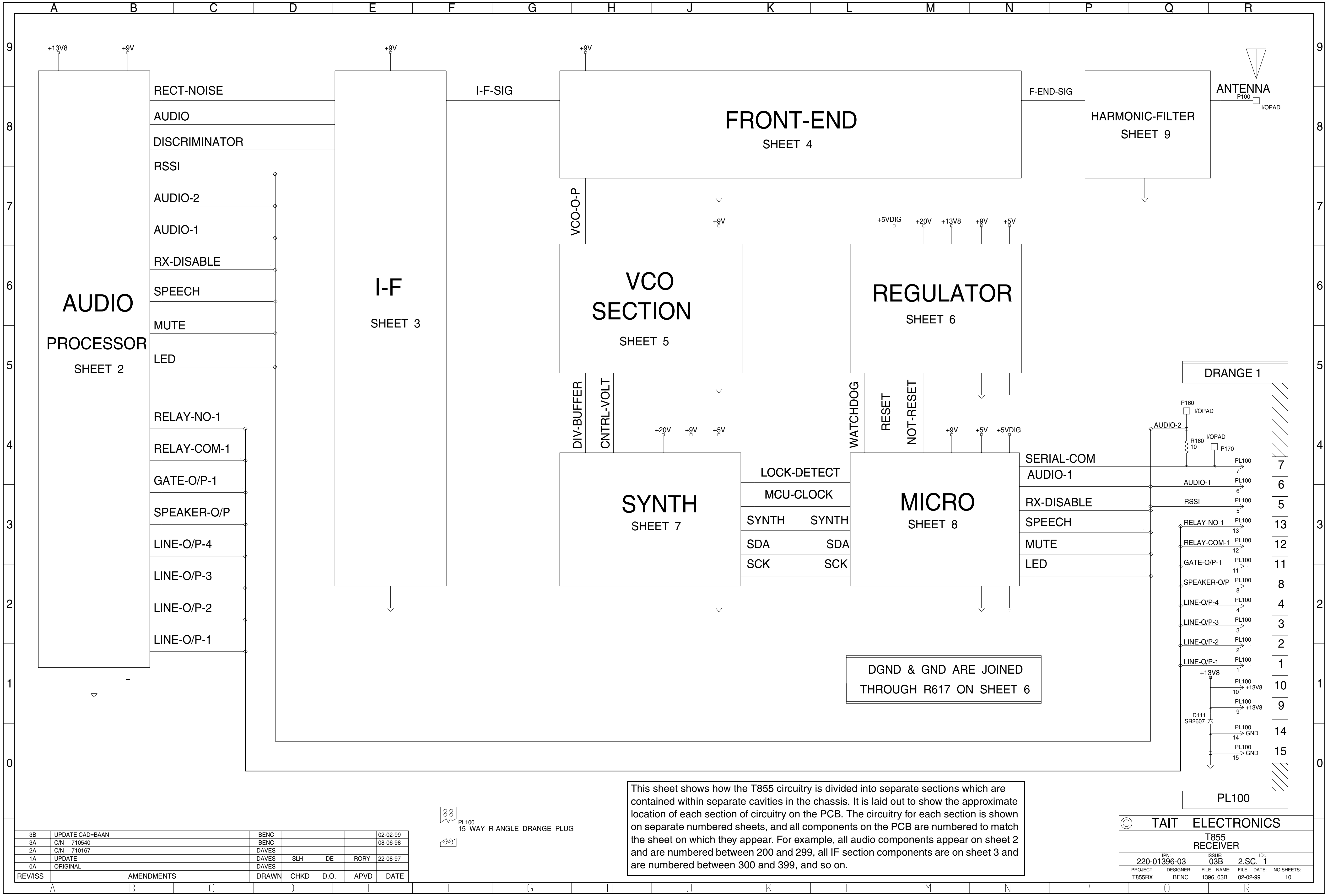
T855 PCB Layout – Bottom Side
220-01396-03

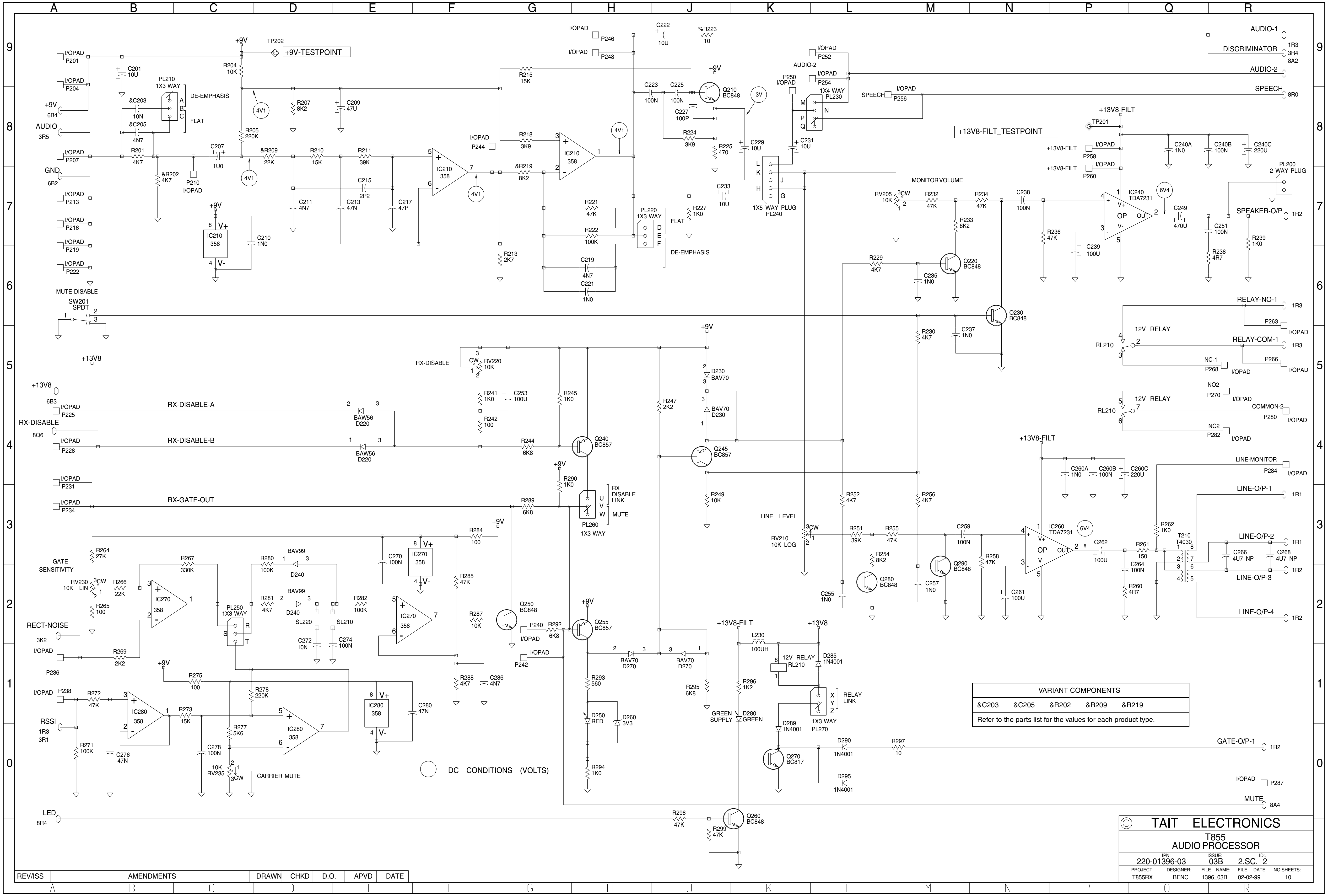


T855 Test Points and Options Connections – Top Side
220-01396-03

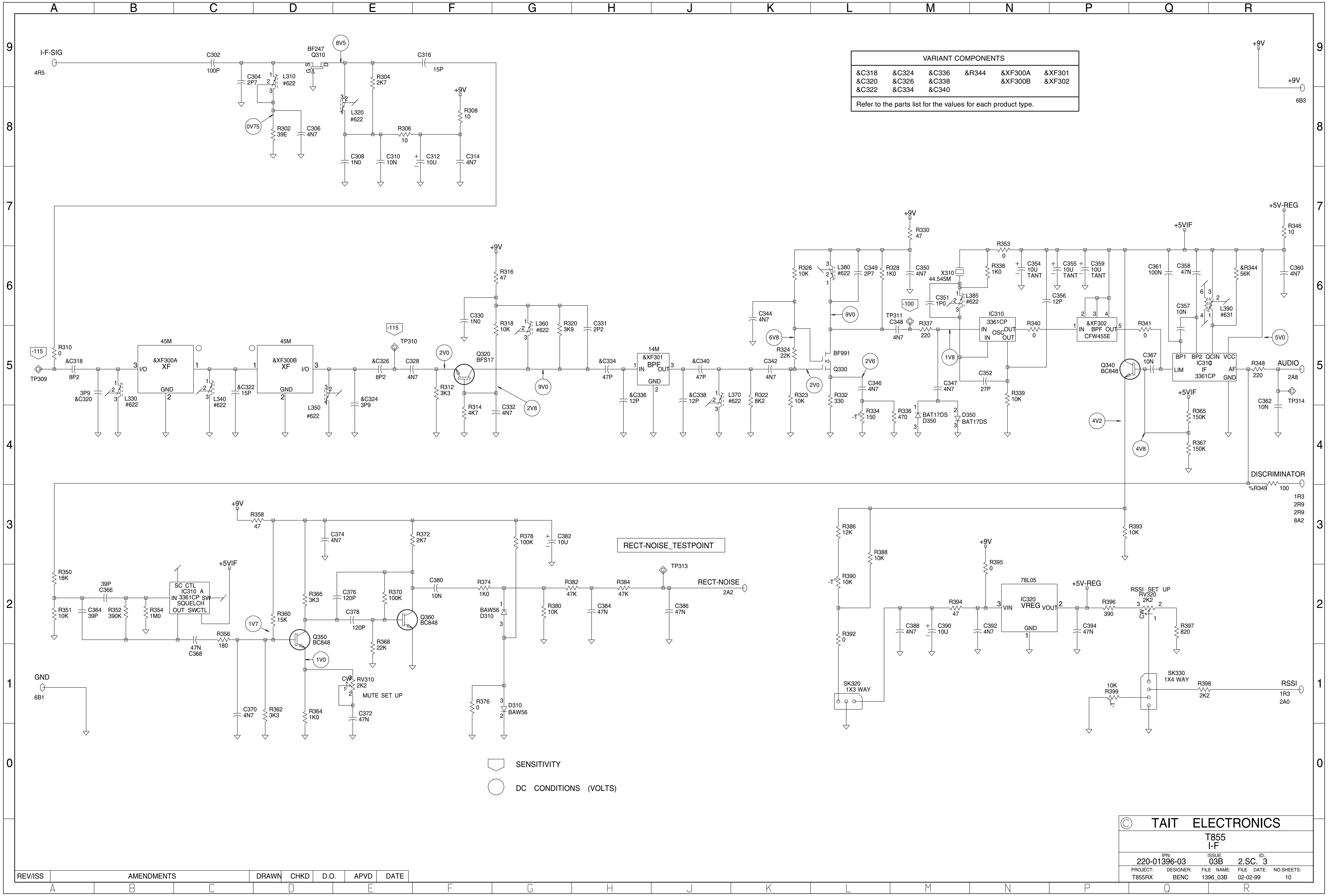


T855 Test Points and Options Connections – Bottom Side
220-01396-03

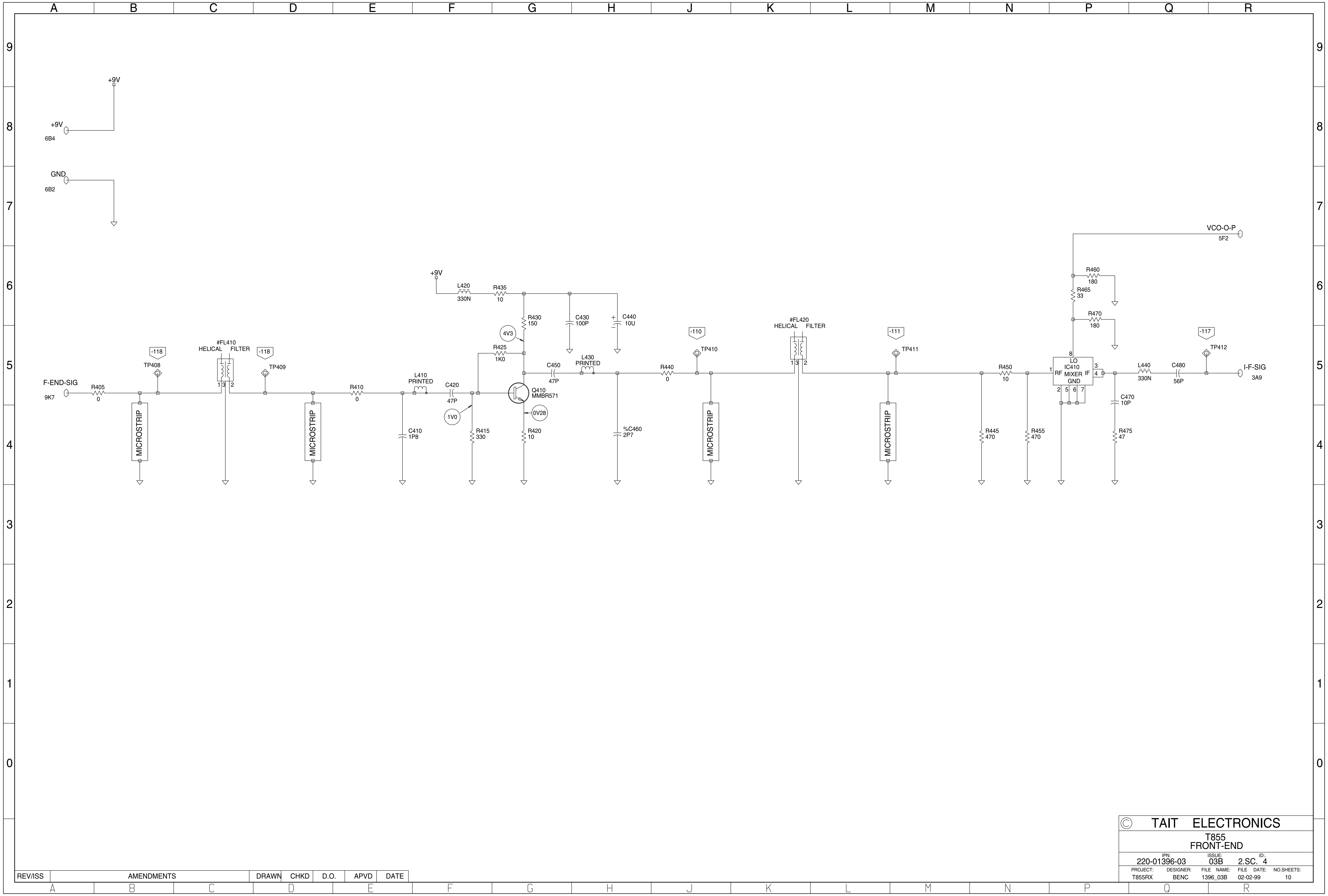

AUDIO
PROCESSOR
SHEET 2
+13V8
+9V
RECT-NOISE
AUDIO
DISCRIMINATOR
RSSI
AUDIO-2
AUDIO-1
RX-DISABLE
SPEECH
MUTE
LED
RELAY-NO-1
RELAY-COM-1
GATE-O/P-1
SPEAKER-O/P
LINE-O/P-4
LINE-O/P-3
LINE-O/P-2
LINE-O/P-1
I-F
SHEET 3
I-F-SIG
FRONT-END
SHEET 4
F-END-SIG
HARMONIC-FILTER
SHEET 9
ANTENNA
P100
I/OPAD
VCO-O-P
VCO
SECTION
SHEET 5
DIV-BUFFER
CNTRL-VOLT
REGULATOR
SHEET 6
+5VDIG
+20V
+13V8
+9V
+5V
WATCHDOG
RESET
NOT-RESET
SYNTH
SHEET 7
LOCK-DETECT
MCU-CLOCK
SYNTH
SDA
SCK
MICRO
SHEET 8
SERIAL-COM
AUDIO-1
RX-DISABLE
SPEECH
MUTE
LED
DRANGE 1
P160
I/OPAD
R160
10
P170
PL100
D111
SR2607
+13V8
GND
7
6
5
13
12
11
8
4
3
2
1
10
9
14
15
PL100
DGND & GND ARE JOINED
THROUGH R617 ON SHEET 6
PL100
15 WAY R-ANGLE DRANGE PLUG
This sheet shows how the T855 circuitry is divided into separate sections which are contained within separate cavities in the chassis. It is laid out to show the approximate location of each section of circuitry on the PCB. The circuitry for each section is shown on separate numbered sheets, and all components on the PCB are numbered to match the sheet on which they appear. For example, all audio components appear on sheet 2 and are numbered between 200 and 299, all IF section components are on sheet 3 and are numbered between 300 and 399, and so on.
3B UPDATE CAD=BAAN BENC 02-02-99
3A C/N 710540 BENC 08-06-98
2A C/N 710167 DAVES
1A UPDATE DAVES SLH DE RORY 22-08-97
0A ORIGINAL DAVES
REV/ISS AMENDMENTS DRAWN CHKD D.O. APVD DATE
© TAIT ELECTRONICS
T855
RECEIVER
IPN: 220-01396-03 ISSUE: 03B ID: 2.SC. 1
PROJECT: T855RX DESIGNER: BENC FILE NAME: 1396_03B FILE DATE: 02-02-99 NO.SHEETS: 10



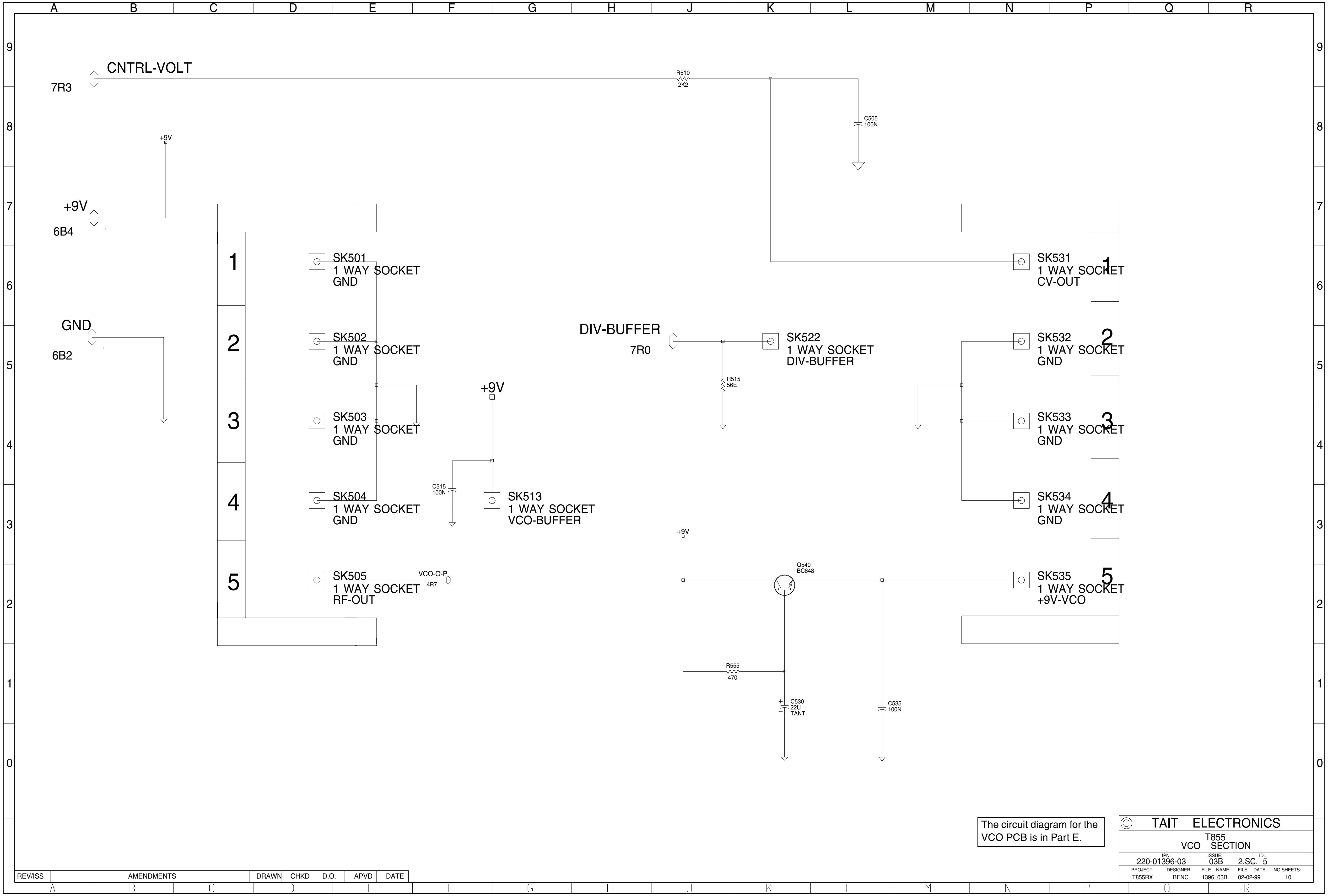
Sheet 2 – T855 Audio Processor
220-01396-03



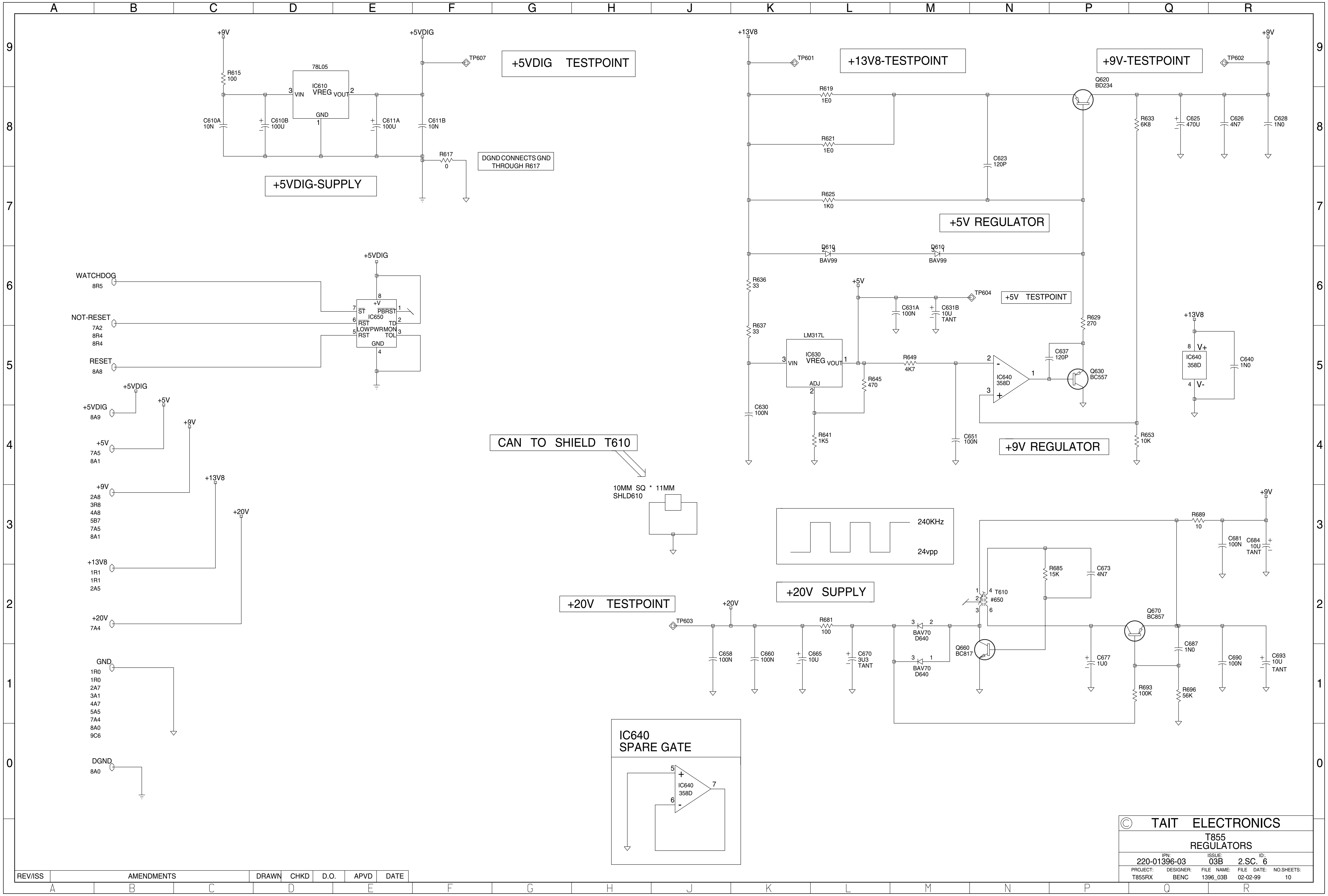
Sheet 3 – T855 IF Section
220-01396-03



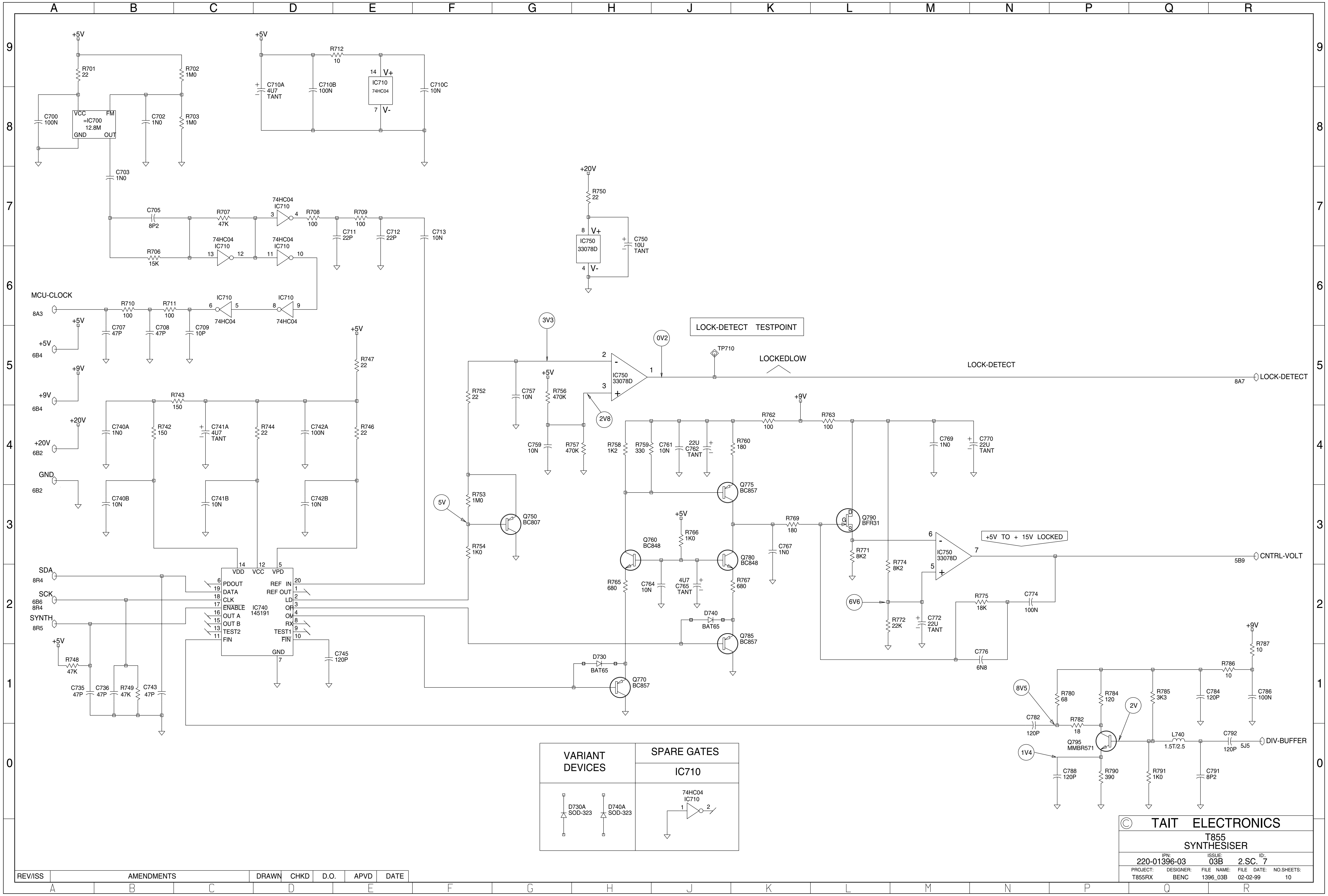
Sheet 4 – T855 Front End
220-01396-03



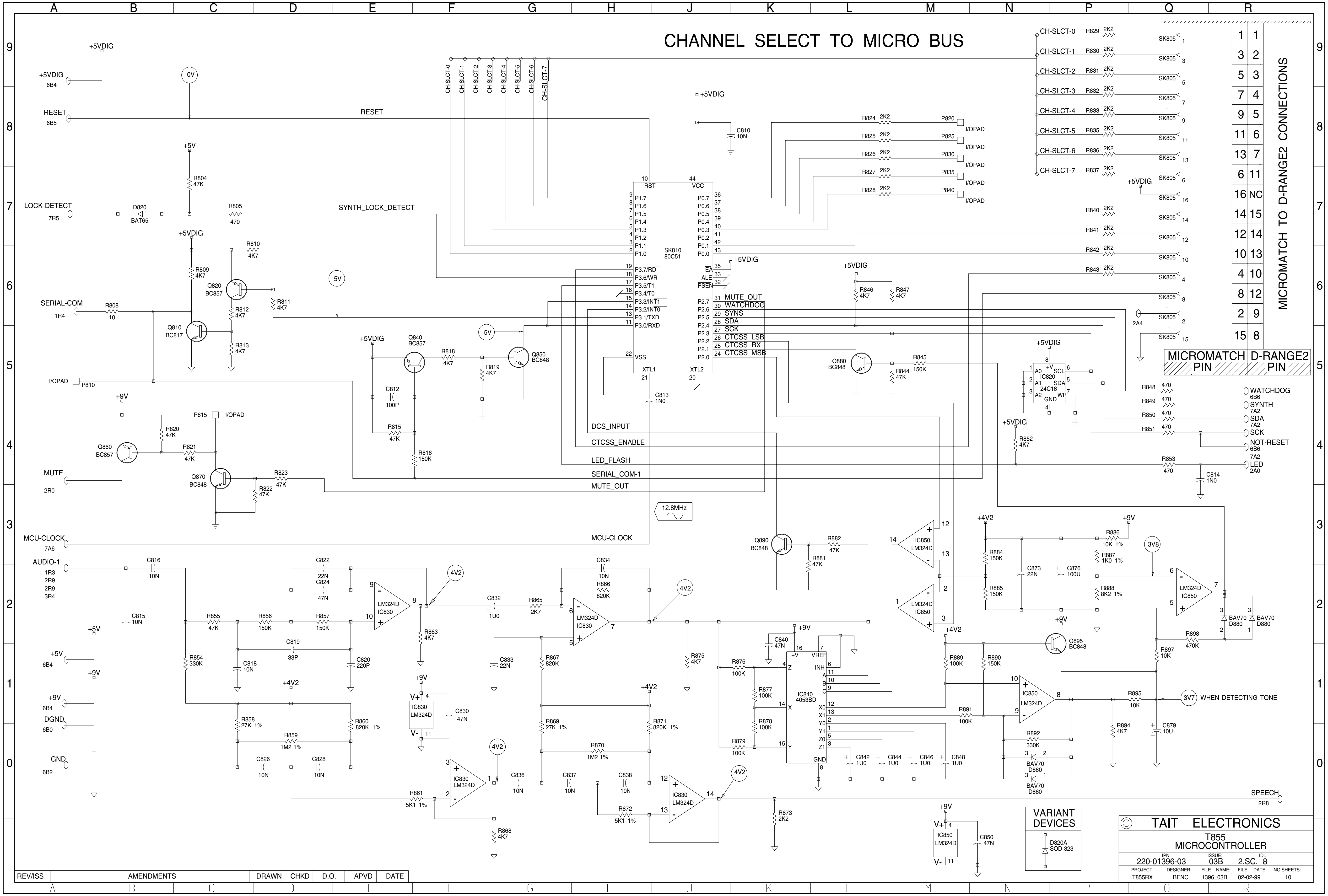
Sheet 5 – T855 VCO Section
220-01396-03



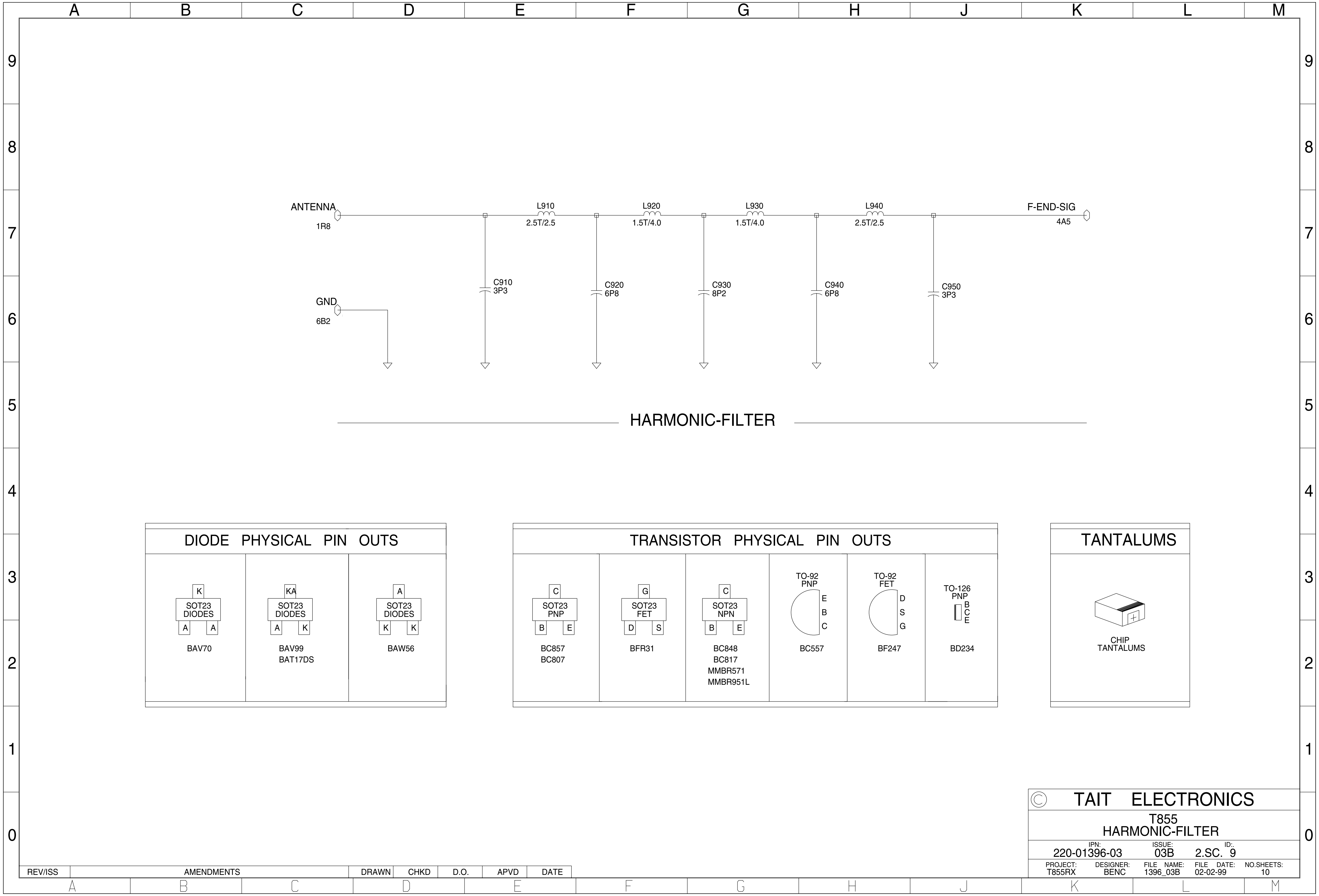
Sheet 6 – T855 Regulators
220-01396-03



Sheet 7 – T855 Synthesiser
220-01396-03



Sheet 8 – T855 Microcontroller
220-01396-03



Sheet 9 – T855 Harmonic Filter
220-01396-03

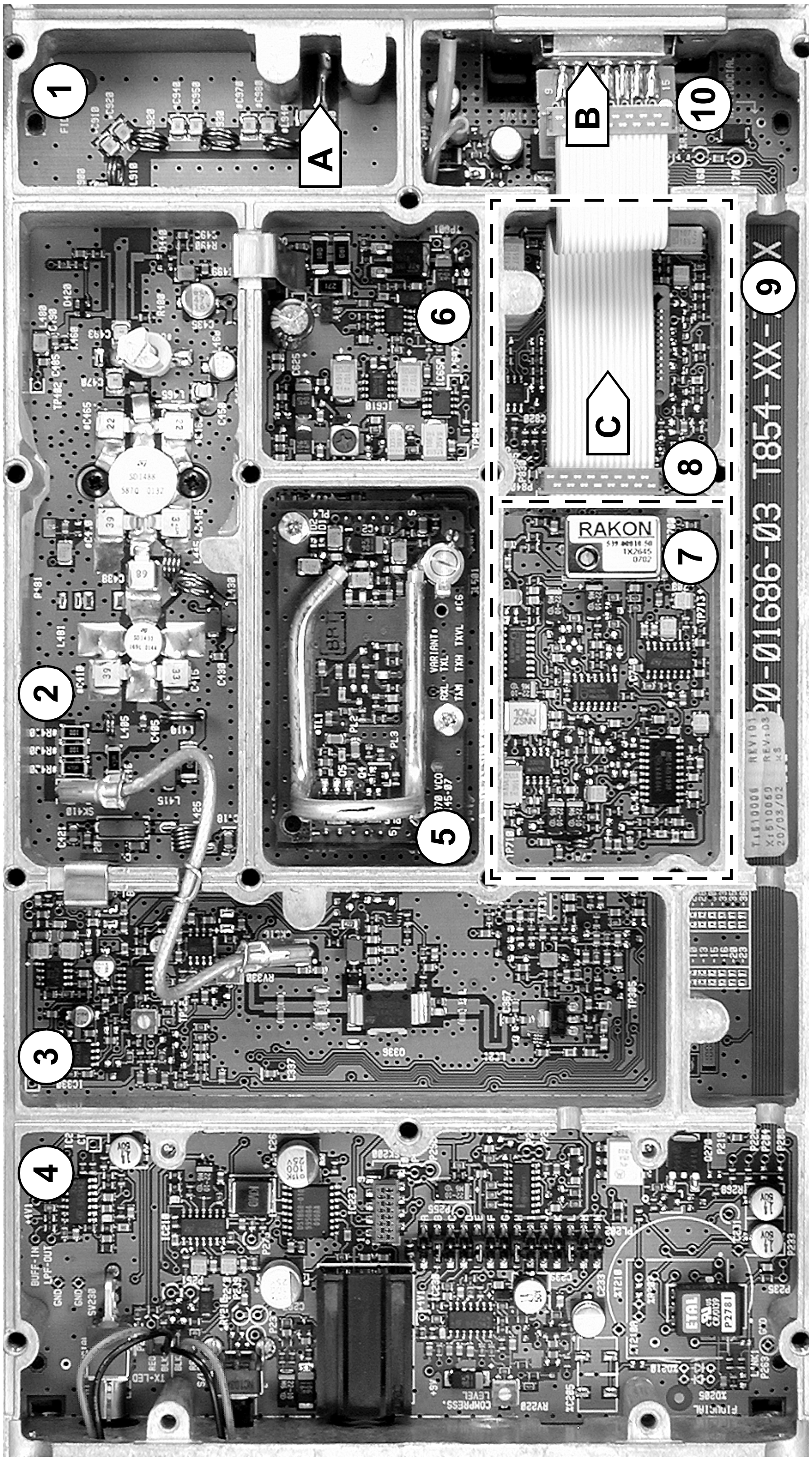
Part C T854 Transmitter

This part of the manual is divided into six sections, as listed below. There is a detailed table of contents at the start of each section.

1 T854 General Information

This section provides a brief description of the T854 transmitter, along with detailed specifications and a list of types available.

The following topics are covered in this section.



Key:

1 low pass filter
2 PA
3 exciter drive amplifier
4 audio processor
5 VCO
6 regulators
7 synthesiser
8 microcontroller and CTCSS
9 duct for cabling to extra D-range (if fitted)
10 D-range

A RF output
B D-range connector ("D-range 1") incl. audio in and DC in (refer to Section 1.5 in Part G)
C microcontroller

Figure 1.1 T854 Main Circuit Block Identification

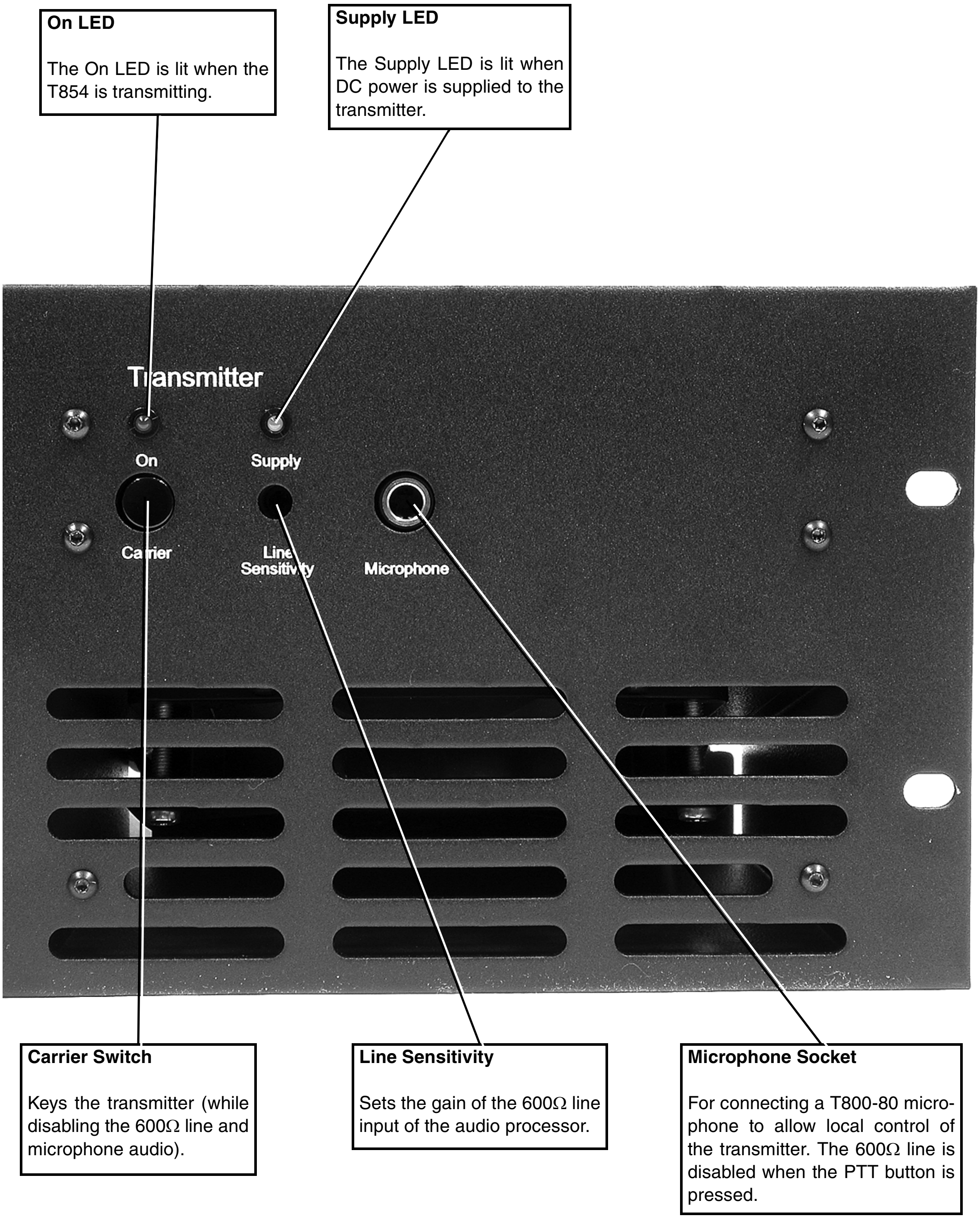


Figure 1.2 T854 Front Panel Controls

1.1 Introduction

The T854 is a synthesised, microprocessor controlled FM base station transmitter designed for single or multichannel operation in the 400 to 520MHz frequency range[1] with a standard power output of 25W. The RF section of the transmitter comprises a frequency synthesiser which provides 100mW of frequency modulated RF drive to a two stage, wide band driver stage followed by a 25W power amplifier. A thermal shutdown feature is provided in the T854 in case operating temperatures exceed acceptable levels.

The T854 is rated for a continuous output power of 25W at +60°C. This is achieved via a high capacity heatsink, electric fan and shroud. The fan forces air across the heatsink to dissipate the heat. The heatsink replaces one of the usual T800 covers.

A wide selection of audio characteristics may be obtained from the audio processor. Optional circuit blocks are an audio compressor and a pre-emphasis stage. They can be bypassed or linked to one or both audio inputs, and then back into the remaining audio circuitry in almost any combination. All audio processor options are link selectable.

The synthesiser frequency is programmed via the serial communications port. Eight channel select lines are accessible via an optional D-range connector (D-range 2 – T800-03-0000) at the rear of the set.

All components except those of the VCO are mounted on a single PCB. This is secured to a die-cast chassis which is divided into compartments to individually shield each section of circuitry. Access to the PCB is primarily through the top cover of the radio, as all components are mounted on the top side of the PCB. There is provision within the chassis to mount small option PCBs.

The front panel controls include line sensitivity, microphone socket and carrier switch. This switch turns on the carrier (unmodulated) as an aid to servicing.

1. Although capable of operating over the 400 to 520MHz frequency range, the T854 has an 8MHz switching range (see Section 1.2.3 and Section 3.1).

1.2 Specifications

1.2.1 Introduction

The performance figures given are minimum figures, unless otherwise indicated, for equipment tuned with the maximum switching range and operating at standard room temperature (+22°C to +28°C) and standard test voltage (13.8V_{DC}).

Where applicable, the test methods used to obtain the following performance figures are those described in the EIA and ETS specifications. However, there are several parameters for which performance according to the CEPT specification is given. Refer to Section 1.2.6 for details of test standards.

Details of test methods and the conditions which apply for Type Approval testing in all countries can be obtained from Tait Electronics Ltd.

The terms “wide bandwidth”, “mid bandwidth” and “narrow bandwidth” used in this and following sections are defined in the following table.

	Channel Spacing	Modulation 100% Deviation	Receiver IF Bandwidth
Wide Bandwidth	25kHz	±5.0kHz	15.0kHz
Mid Bandwidth	20kHz	±4.0kHz	12.0kHz
Narrow Bandwidth	12.5kHz	±2.5kHz	7.5kHz

1.2.2 General

Number Of Channels … 128 (standard)

Supply Voltage:

- Operating Voltage … 10.8 to 16V_{DC}
- Standard Test Voltage … 13.8V_{DC}
- Polarity … negative earth only
- Polarity Protection … crowbar diode
- Line Keying Supply (if required) … –50V_{DC}

Supply Current:

- Transmit – T854 … 5.5A (typical)
- Standby – T854 … 150mA (typical)

Operating Temperature Range … –30°C to +60°C

Time-Out Timer (optional) … 0 to 10 minutes adjustable in 10 second steps

Tail Timer	… 0 to 5 seconds adjustable in 20ms steps
Transmit Key Time	… Typically 35ms
Transmit Lockout Timer	… 0 to 1 minute adjustable in 10 second steps

1.2.3 RF Section

Frequency Range	… 400 to 520MHz
Modulation Type	… FM
Frequency Increment	… 5 or 6.25kHz
Switching Range	… 8MHz (i.e. ±4MHz from the centre frequency)
Load Impedance	… 50Ω
Frequency Stability	… ±1ppm, –30°C to +60°C
Adjacent Channel Power (full deviation):	
Wide Bandwidth (WB) (±25kHz/15kHz B/W)	… –75dBc
Mid Bandwidth (MB) (±20kHz/12kHz B/W)	… –70dBc
Narrow Bandwidth (NB) (±12.5kHz/7.5kHz B/W)	… –65dBc
Transmitter Switching	… complies with ETS 300 113

Transmitter Side Band Noise: (no modulation, 15kHz bandwidth)	
At ±25kHz	… –95dBc
At ±1MHz	… –105dBc
Intermodulation	… –40dBc with interfering signal of –30dBc
	… –70dBc with 25dB isolation and interfering signal of –30dBc (PA with output isolator)
T854 Mismatch Capability:	
Ruggedness	… refer to your nearest Tait Dealer or Customer Service Organisation
Stability	… 3:1 VSWR (all phase angles)
Radiated Spurious Emissions:	
Transmit	… –36dBm to 1GHz –30dBm 1GHz to 4GHz
Standby	… –57dBm to 1GHz –47dBm 1GHz to 4GHz
Conducted Spurious Emissions: (T854 Only)	
Transmit	… –36dBm to 1GHz –30dBm 1GHz to 4GHz
Standby	… –57dBm to 1GHz –47dBm 1GHz to 4GHz
Power Output:	
T854 – Rated Power	… 25W
– Range Of Adjustment	… 5 to 25W
Duty Cycle	… 100% at 25W at +60°C

1.2.4 Audio Processor

1.2.4.1 Inputs

Inputs Available	… line, microphone and CTCSS
Line Input:	
Impedance	… 600Ω (balanced)
Sensitivity (60% modulation at 1kHz)	
With Compressor	… –50dBm
Without Compressor	… –30dBm
Microphone Input:	
Impedance	… 600Ω

Sensitivity (60% modulation at 1kHz)	
With Compressor	… –70dBm
Without Compressor	… –50dBm

1.2.4.2 Modulation Characteristics

Frequency Response (below limiting)	… flat or pre-emphasised (optional)
Line And Microphone Inputs:	
Pre-emphasised Response	
Bandwidth	… 300Hz to 3kHz (WB and MB)
	… 300Hz to 2.55kHz (NB)
Below Limiting	… within +1, –3dB of a 6dB/octave pre-emphasis characteristic
Flat Response	… within +1, –2dB of output at 1kHz
Above Limiting Response	… within +1, –2dB of a flat response (ref. 1kHz)
Distortion	… 2% max.
Hum And Noise:	
Wide Bandwidth	… –55dB (300Hz to 3kHz [EIA]) typical
Mid Bandwidth	… –54dB (CEPT)(typical)
Narrow Bandwidth	… –50dB (CEPT)(typical)
Compressor (optional):	
Attack Time	… 10ms
Decay Time	… 800ms
Range	… 50dB

1.2.4.3 CTCSS

Standard Tones	… all 37 EIA group A, B and C tones plus 13 commonly used tones
Frequency Error (from EIA tones)	… 0.08% max.
Generated Tone Distortion	… 1.2% max.
Generated Tone Flatness	… flat across 67 to 250.3Hz to within 1dB
Modulation Level	… adjustable
Modulated Distortion	… <5%

1.2.5 Microcontroller

Auxiliary Ports:

Open Drain Type	… capable of sinking 2.25mA via 2.2kΩ
V_{ds} max.	… 5V

1.2.6 Test Standards

Where applicable, this equipment is tested in accordance with the following standards.

1.2.6.1 European Telecommunication Standard

ETS 300 086 January 1991

Radio equipment and systems; land mobile service; technical characteristics and test conditions for radio equipment with an internal or external RF connector intended primarily for analogue speech.

ETS 300 113 March 1996

Radio equipment and systems; land mobile service; technical characteristics and test conditions for radio equipment intended for the transmission of data (and speech) and having an antenna connector.

ETS 300 219 October 1993

Radio equipment and systems; land mobile service; technical characteristics and test conditions for radio equipment transmitting signals to initiate a specific response in the receiver.

ETS 300 279 February 1996

Radio equipment and systems; electromagnetic compatibility (EMC) standard for private land mobile radio (PMR) and ancillary equipment (speech and/or non-speech).

1.2.6.2 DTI CEPT Recommendation T/R-24-01

Annex I: 1988

Technical characteristics and test conditions for radio equipment in the land mobile service intended primarily for analogue speech.

Annex II: 1988

Technical characteristics of radio equipment in the land mobile service with regard to quality and stability of transmission.

1.2.6.3 Telecommunications Industry Association

ANSI/TIA/EIA-603-1992

Land mobile FM or PM communications equipment measurement and performance standards.

2 T854 Circuit Operation

This section provides a basic description of the circuit operation of the T854 transmitter.

Note: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 4.02 and later of the software.

Refer to Section 6 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components and test points on the main PCB. The parts list and diagrams for the VCO PCB are in Part E.

The following topics are covered in this section.

2.1 Introduction

The individual circuit blocks which make up the T854 are:

- synthesiser
- VCO
- audio processor
- drive amplifier
- voltage regulators.

Each of these circuit blocks is set in its own shielded compartment, formed as an integral part of the main chassis.

The configuration of the circuit blocks may be seen on a functional level in Figure 2.1 . Refer to the circuit diagrams in Section 6.2 for more detail.

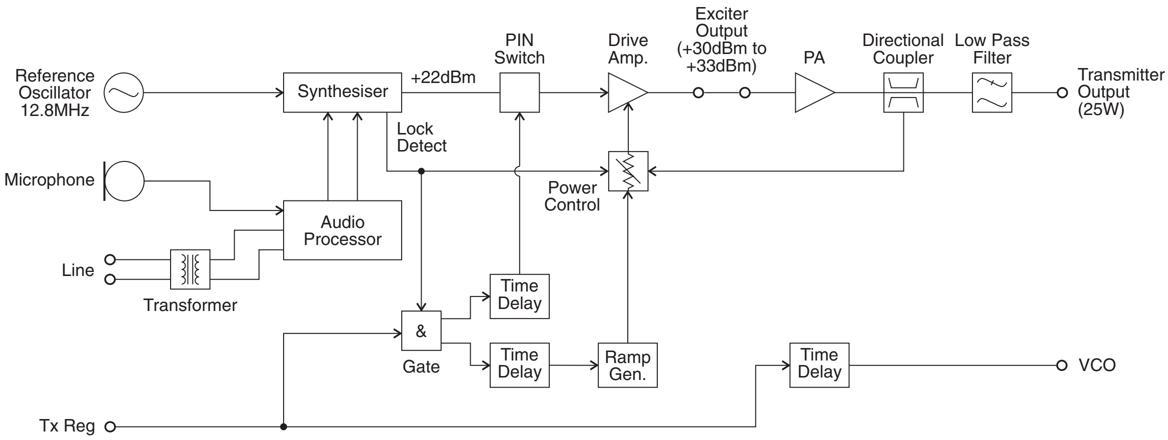


Figure 2.1 T854 High Level Block Diagram

2.2 Microcontroller

Refer to the microcontroller circuit diagram (Sheet 8 – T854 Microcontroller) in Section 6.2

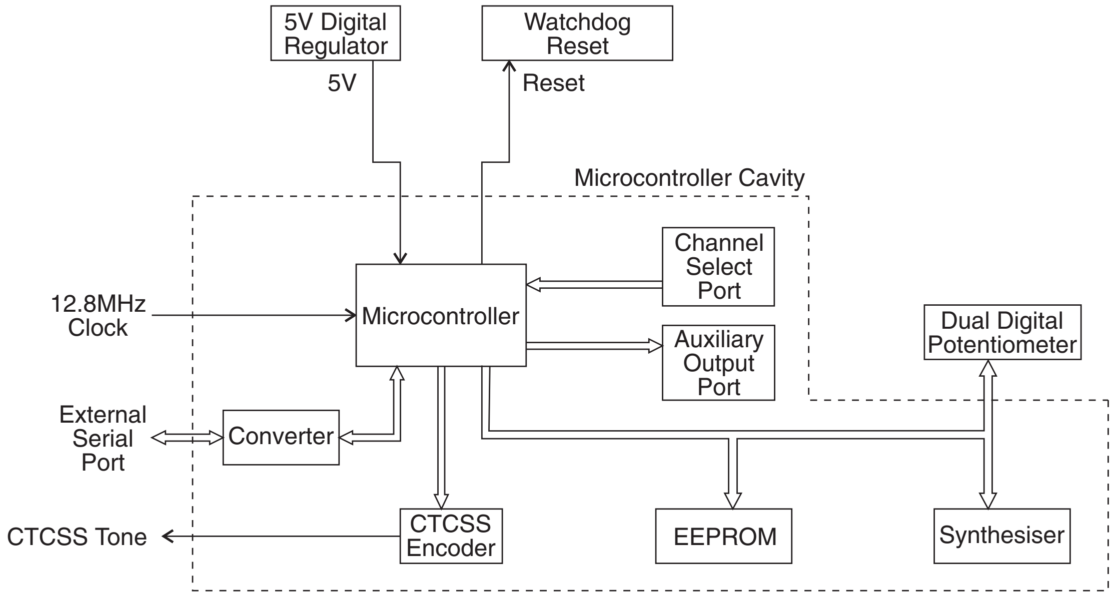


Figure 2.2 T854 Microcontroller Block Diagram

Overall system control of the T854 is accomplished by the use of a member of the 80C51 family of microcontrollers (IC810). It runs from internal ROM and RAM, thus leaving all four ports free for input/output functions.

Non-volatile data storage is achieved by serial communication with a 16kBit EEPROM (IC820). This serial bus is also used by the microcontroller to program the synthesiser (IC740) and deviation control EPOTS (IC220).

The main tasks of the microcontroller are as follows:

- program the synthesiser and EPOT;
- interface with the PGM800Win programming software at 9600 baud via the serial communication lines on D-range 1 (PL100) and D-range 2;
- monitor channel change inputs from D-range 2;
- generate timing waveforms for CTCSS encoding;
- coordinate and implement timing control of the transmitter.
- control the front panel “Supply” LED (refer to Section 5.3).

2.3 Synthesised Local Oscillator

Refer to the synthesiser circuit diagram (Sheet 7 – T854 Synthesiser) in Section 6.2 and the VCO circuit diagram in Part E.

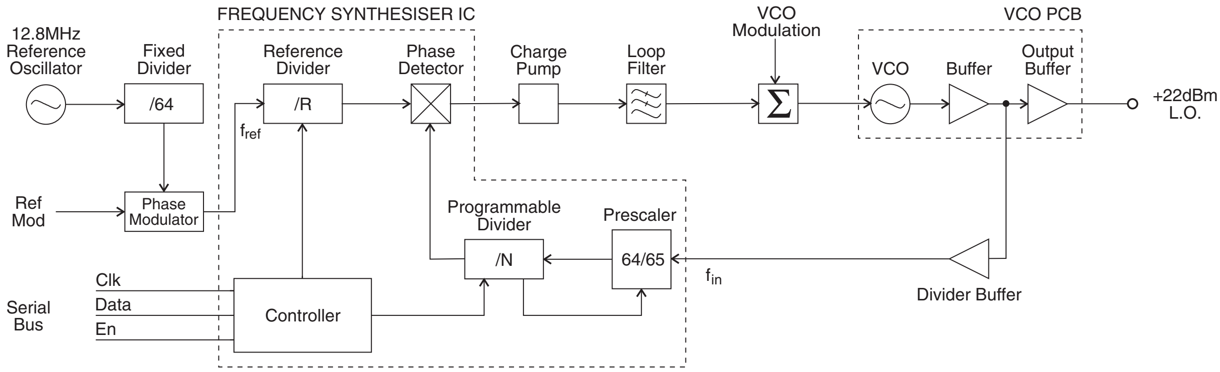


Figure 2.3 T854 Synthesiser Block Diagram

The synthesiser (IC740) employs a phase-locked loop (PLL) to lock a voltage controlled oscillator (VCO) to a given reference frequency. The synthesiser receives the divider information from the control microprocessor via a 3 wire serial bus (clock, data, enable). When the data has been latched in, the synthesiser processes the incoming signals from the VCO buffer (f_{in}) and the phase modulator (f_{ref}).

A reference oscillator at 12.8MHz (=IC700) is buffered (IC710 pins 3 and 4) and divided down to 200kHz (IC730). This 200kHz square wave is then summed with the modulating audio and passed to an integrator (IC720 pins 9 and 8, Q710, Q720). This produces a ramping waveform which is centred around a DC level determined by the incoming audio. IC720 pins 5 and 6 perform as a comparator, ultimately producing a phase-modulated 200kHz square wave. This is followed by another phase shifting stage (IC720 pins 3 and 4, Q730, Q740), before being divided down to 6.25kHz or 5kHz within the synthesiser IC (IC740).

A buffered output of the VCO (Q795) is divided with a prescaler and programmable divider which is incorporated into the synthesiser chip (IC740). This signal is compared with the phase modulated reference signal at the phase detector (also part of the synthesiser chip). The phase detector outputs drive a balanced charge pump circuit (Q760, Q770, Q775, Q780, Q785) and active loop filter (IC750 pins 5, 6 and 7, Q790) which produces a DC voltage between 0V and 20V to tune the VCO. This VCO control line is further filtered to attenuate noise and other spurious signals. Note that the VCO frequency increases with increasing control voltage.

If the synthesiser loop loses lock, a pulsed signal appears at LD (pin 2) of IC740. This signal is filtered and buffered by IC750 pins 1, 2 and 3, producing the Lock-Detect signal used to shut off the power supply to the drive amplifier. IC750 pin 1 is at 20V when the synthesiser is out of lock.

2.3.1 Two Point Modulation

Frequency modulation occurs by modulating both the VCO input and the synthesiser reference input. This process is called two point modulation and ensures a flat modulation response from 67Hz to 3kHz (2.55kHz for narrow bandwidth).

The PLL has a fast response time, allowing a Tx key-up time of <30ms. Because of this fast response time the PLL sees lower modulation frequencies superimposed on the VCO as an error and corrects for it, resulting in no modulation on the carrier. At modulation frequencies greater than 300Hz the loop cannot correct fast enough and modulation is seen on the carrier. The response of the loop to VCO modulation is shown by f_2 in Figure 2.4 below.

To achieve low frequency modulation, the reference oscillator is also modulated so that the phase detector of IC740 detects no frequency error under modulation. Thus, the synthesiser loop will not attempt to correct for modulation and the audio frequency response of the transmitter remains unaffected. The response of the loop to reference frequency modulation is shown by f_1 in Figure 2.4.

The reference modulation is controlled by a 256-step 10k electronic potentiometer (EPOT) which is adjustable via PGM800Win. The EPOT is made up of 256 resistive sections (representing approximately 39Ω each) which can be individually addressed by the microcontroller. Each section can be switched in or out of circuit to achieve the required total resistance, thus giving control of the reference modulation.

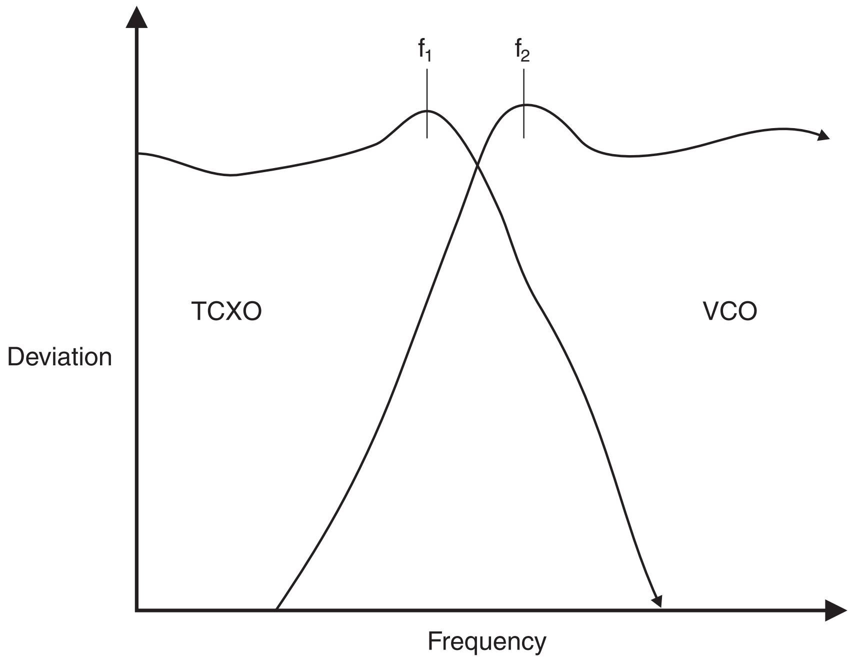


Figure 2.4 T854 Two Point Modulation

2.4 VCO

(Refer to the VCO circuit diagram in Part E.)

The VCO transistor (Q1) operates in a common emitter configuration, with an LC tank circuit coupled between its gate and drain to provide the feedback necessary for oscillation. The VCO control voltage from the loop filter (IC750) is applied to the varicaps (D1 and D2) to facilitate tuning within an 8MHz band of frequencies. A trimcap (C6) is used for coarse tuning of the VCO. The output from the oscillator circuit drives a cascode amplifier stage (Q2, Q3) which supplies +10dBm (typically) to a further stage of amplification, Q5. This is the final amplifier on the VCO PCB, and delivers +20dBm (typically) to the exciter drive amplifier.

A low level "sniff" is taken from the input to Q5 and used to drive the divider buffer for the synthesiser (IC740).

The VCO operates at the actual output frequency of the exciter, i.e. there are no multiplier stages. It is modulated by superimposing the audio signal onto the control voltage and by phase modulating the reference signal.

2.4.1 VCO Supply

The VCO is supplied from two switched +9V supplies under the control of the Tx-Reg. supply.

The VCO and buffer amplifier are supplied from one +9V switched supply by Q540 via the C multiplier (Q550, C530 on the T854 and C550 on the T857).

The output amplifier is supplied from the other +9V supply by Q520, Q530, and Q510.

A delay circuit holds the VCO on for a short time after the Tx-Reg. supply has been switched off. This is to allow the RF power circuits (both exciter and PA) to ramp down in the correct manner before the VCO is switched off.

2.5 Audio Processor

Refer to the audio processor circuit diagram (Sheet 2 – T854 Audio Processor) in Section 6.2.

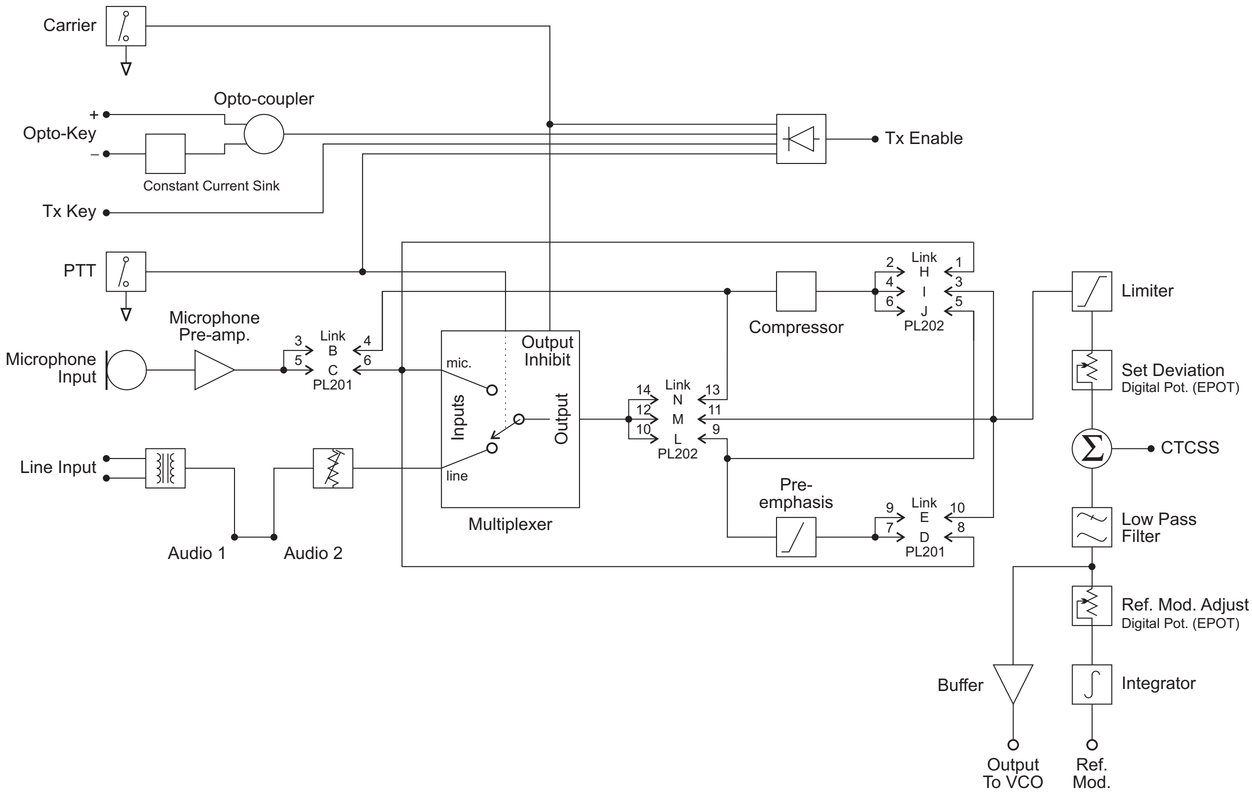


Figure 2.5 T854 Audio Processor Block Diagram

2.5.1 General

The audio processor comprises several link selectable circuit blocks which may be configured in a variety of combinations to suit individual requirements. The pre-emphasis network and compressor may be linked individually or cascaded between either or both audio inputs and the limiter.

Refer to Section 3.5.1 for linking details.

2.5.2 Audio Inputs

Two audio inputs are available: one from a 600Ω balanced (or unbalanced) line, and the other from a local microphone. The microphone signal is passed first to a pre-amplifier (Q210) and ultimately to a multiplexer (IC240), but in between may pass through the compressor (depending on the linking details). The line transformer is also connected to the multiplexer and is disabled by the microphone PTT switch.

A third input for external CTCSS tones is also provided.

2.5.3 Keying Inputs

There are four ways to key the exciter:

- pulling the Tx-Key line low (pin 13 on D-range 1 [PL100]) at the rear of the set);
- pushing the "Carrier" button on the front panel – this will inhibit all audio;
- using the PTT button on the local microphone, disabling audio from the line;
- via the opto-key inputs (pins 11 and 12 on D-range 1 [PL100]) when electrical isolation is required. This features a constant current sink (Q270) to ensure reliable activation of the opto-coupler (IC250) at low keying voltages.

2.5.4 Compressor (Automatic Level Control (ALC))

The input signal is fed via a current controlled attenuator (Q230, Q220) to a high gain stage (IC230) from which the output signal is taken. This signal is passed to a comparator (IC230) which toggles whenever the audio signal exceeds a DC threshold determined by RV220. Thus, the comparator produces a square wave whose mark-space ratio is determined by the amplitude of the audio signal. This square wave pumps up the reservoir capacitor (C233) which controls the attenuator (Q230, Q220), thus completing the feedback loop.

The compression level is set by adjustment of the comparator threshold (RV220).

Note: Although the high dynamic range of the compressor allows the use of very low audio signal levels, such conditions will be accompanied by a degradation of the signal-to-noise ratio. Very low audio input levels should therefore be avoided where possible.

2.5.5 Outputs To Modulators

The output signal from the limiter (IC210, IC230) is summed with a CTCSS tone at a summing amplifier (IC260). The signal is then low pass filtered (IC260) and split to supply the two modulators.

Since the VCO modulator is a true frequency modulator, its audio is simply buffered (IC260). The reference modulator, however, is a phase modulator and its audio must first be integrated (IC210).

It is vital that the audio levels to the modulators are accurately set, ***relative to each other***. Hence the inclusion of level adjustment in the reference modulator path. Once set, adjustments to absolute deviation may be made only by IC220, a 256-step 10k electronic potentiometer (EPOT), which is controlled via PGM800Win. The EPOT is made up of 256 resistive sections (representing approximately 39Ω each) which can be individually addressed by the microcontroller. Each section can be switched in or out of circuit to achieve the required total resistance, thus adjusting the absolute deviation level.

2.6 Power Supply and Regulator Circuits

Refer to the regulators circuit diagram (Sheet 6 – T854 Regulators) in Section 6.2.

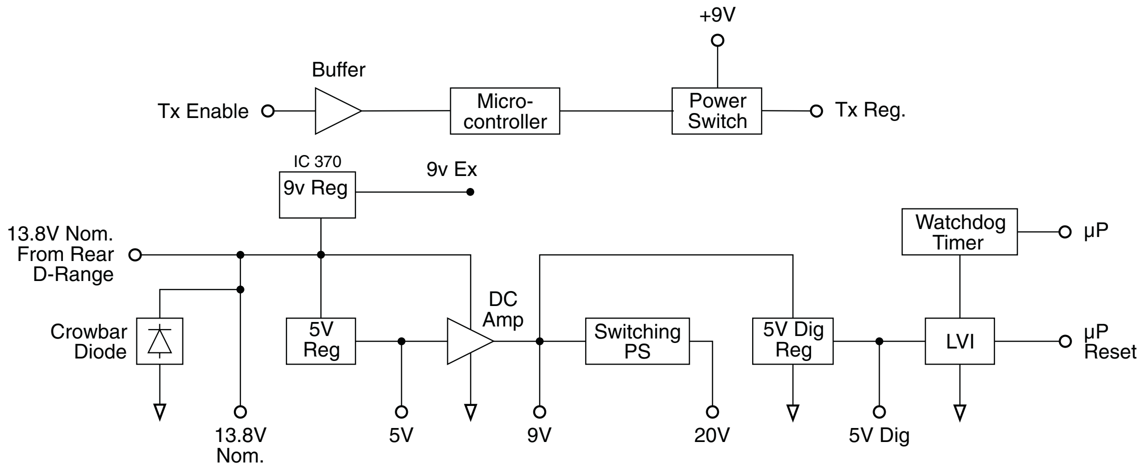


Figure 2.6 T854 Power Supply and Regulators Block Diagram

The T854 is designed to operate from a 10.8 to 16V_{DC} supply (13.8V nominal). A 5.3V regulator (IC630) runs directly from the 13.8V rail, driving much of the synthesiser circuitry. It is also used as the reference for a DC amplifier (IC640, Q630, Q620) which provides a medium current capability 9V supply. The T854 has a regulator (IC370) which produces 9V for use in the exciter and audio circuits.

A switching power supply (Q660, Q670) runs from the 9V supply and provides a low current capability +20V supply. This is used to drive the synthesiser loop filter (IC750), giving a VCO control voltage range of up to 20V.

Ultimate control of the transmitter is via the Tx-Reg. supply, switched from 9V by Q610. This is enabled via the Tx-Enable signal from the audio processor, and microprocessor.

A crowbar diode is fitted for protection against connection to a power supply of incorrect polarity. It also provides transient overvoltage protection.

Note: A fuse must be fitted in the power supply line for the diode to provide effective protection.

2.7 Transmit Timers

The transmit tail timer, transmit timeout timer and transmit lockout timer can all be set from PGM800Win. The fields for setting these are found on the system information page. These three timers operate as follows (refer also to Figure 2.7):

Timer	Function	Adjustment
Transmit Tail	Sets the tail time during which the transmitter stays keyed after the external key source has been removed.	0 to 5 seconds in 20ms steps
Transmit Timeout	Sets the maximum continuous transmission time. Once the timer has timed out, the transmitter must be keyed again, unless prevented by the transmit lockout timer.	0 to 600 seconds in 10 second steps
Transmit Lockout	Sets the period of time that must elapse after a timeout before the transmitter can re-transmit. Once the timer has timed out, the transmitter can be keyed again.	0 to 60 seconds in 10 second steps

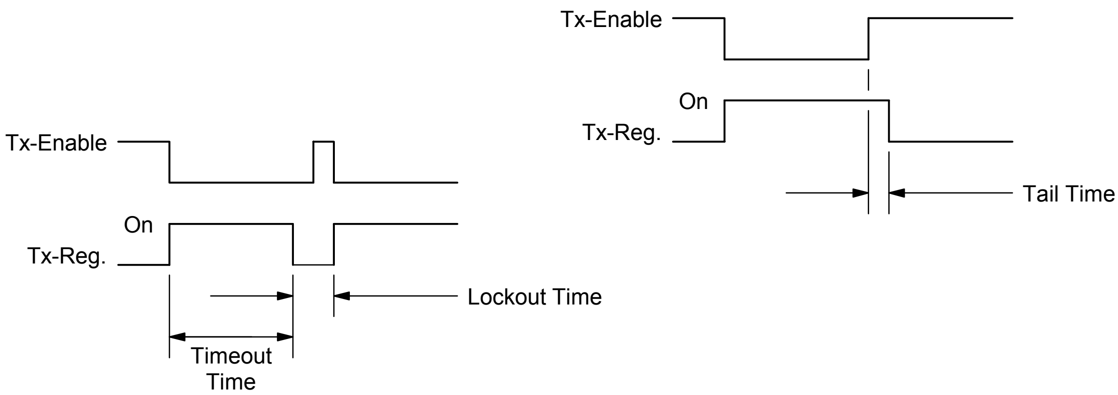


Figure 2.7 T854 Transmit Timers

2.8 T854 Drive Amplifier, Fan Control and PA

Refer to Figure 2.1 and the exciter and PA circuit diagrams (sheets 3 and 4) in Section 6.2.

The output power of the PA is maintained at a constant level via a power control loop applied to the two-stage, wide band exciter amplifier (Q337, Q336). The forward and reverse RF power levels are sensed via a dual directional coupler and detector diodes (D440, D420 in the PA cavity). The detected DC signals are buffered (IC330 pins 3 and 5) and then summed with the 'power control' level and fed to the control integrator (IC350 pin 6).

Note: Forward and reflected power signals are summed so that, under high VSWR, the power control will turn the output RF level down.

To reduce the spurious output level when the synthesiser is out-of-lock, the Tx-Reg. and Lock-Detect signals are gated to inhibit the PA control circuit and to switch off the RF signal at the input to the drive amplifier. This is achieved by a PIN switch attenuator (D340, D380, D360).

Cyclic keying control is provided by additional circuitry consisting of several time delay, ramp and gate stages:

- Q330, IC350 — power ramping
- Q326, Q325, Q341 — Tx-Reg. and $\overline{\text{Lock-Detect}}$ gate
- Q335, Q340, Q345 — delay and PIN switch drive.

This is to allow the RF power circuits (both exciter and PA) to ramp up and down in a controlled manner so that minimal adjacent channel interference is generated during the transition.

The output of the wide band amplifier is approximately 1W (+30dBm) for an input of 100mW (+20dBm) from the VCO, when the power control is set to maximum.

A temperature sensor (R481) in the PA cavity presents a voltage to the comparators of IC340 pin 2 and IC350 pin 2. The fan is switched on and off by the comparator of IC340 and the power fold-back is enabled by the comparator of IC350. Power fold-back reduces the output power to a preset level that protects the PA semiconductors from excessive temperatures. Under normal operating conditions, the fan will be activated before power fold-back can occur and it will prevent the temperature from reaching damaging levels. The voltage divider ratio of R311 and R312 sets the the temperature at which the fan is switched on and off. R306 and R340 set the temperature at which power is reduced. Depending on ambient temperature and ventilation, it may take several minutes of continuous operation for the fan to be activated.

#R517, #R518 and #R519 form an attenuator to provide good VCO/exciter isolation as well as the correct exciter drive level.

The attenuator (#R395, #R396 and #R397) aids in producing the correct exciter drive level to the PA over the three frequency ranges.

The RF output from the exciter is fed to the driver stage (Q410) and then to the final (Q420). DC is fed to the final via a low pass filter with special low frequency decoupling. CV475 tunes the output matching across the entire band.

3 T854 Initial Tuning and Adjustment

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

The following section describes both short and full tuning and adjustment procedures and provides information on:

- channel programming
- selecting required audio links
- synthesiser alignment
- PA alignment
- modulator adjustment
- limiter adjustment
- setting line level
- compressor adjustment
- timer adjustment.

Note: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 4.02 and later of the software.

Refer to Figure 4.4 which show the location of the main tuning and adjustment controls. Refer also to Section 6 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components and test points on the main PCB. The parts list and diagrams for the VCO PCB are in Part E.

3.1 Introduction

When you receive your T854 transmitter it will be run up and working on a particular frequency (the “default channel")[1]. If you want to switch to a frequency that is within the 8MHz switching range (i.e. ±4MHz from the factory programmed frequency), you should only need to reprogram the transmitter with the PGM800Win software (refer to the PGM800Win programming kit and Section 3.2 below).

However, if you want to switch to a frequency outside the 8MHz switching range, you will have to reprogram and re-tune the transmitter to ensure correct operation. In this case you should carry out the short tuning procedure described in Section 3.4.

If you have carried out repairs or other major adjustments, you must carry out the full tuning and adjustment procedure described in this section (except for Section 3.4).

3.2 Channel Programming

You can program up to 128 channel frequencies into the transmitter’s EEPROM memory (IC820) by using the PGM800Win software package and a PC. You can also use PGM800Win to select the transmitter’s current operating frequency (or “default channel").

If the transmitter is installed in a rack frame, you can program it via the programming port in the speaker panel. However, you can also program the transmitter before it is installed in a rack frame as follows:

- by using a T800-01-0010 calibration test unit;
- via D-range 1;
- via D-range 2 (standard T800-03-0000 auxiliary D-range only);
- via SK805 (internal Micromatch connector).

If you do not use the T800-01-0010, you will have to connect the PC to the transmitter via a module programming interface (such as the T800-01-0004).

For a full description of the channel programming procedure, refer to the PGM800Win programming software user’s manual.

Note: When an auxiliary D-range kit (D-range 2 – T800-03-0000) is fitted, you can also select a channel with an external switch, such as the DIP switch on a backplane PCB. Refer to your nearest Tait Dealer or Customer Service Organisation for further details.

1. Use the “Read Module” function in PGM800Win to find out what the default channel is.

3.3 Test Equipment Required

You will need the following test equipment:

- computer with PGM800Win installed
- T800 programming kit
- module programming interface (e.g. T800-01-0004 – optional)
- 13.8V power supply
- digital multimeter
- audio signal generator
- RF power meter
- audio voltmeter x 2
- modulation meter
- oscilloscope (digital preferred)
- 20dB or 40dB pad
- T800-01-0010 calibration test unit (optional)

(audio signal generator, RF power meter, audio voltmeter x 2, modulation meter, oscilloscope (digital preferred), 20dB or 40dB pad } or RF test set (optional))

Figure 3.1 and Figure 3.2 show typical test equipment set-ups.

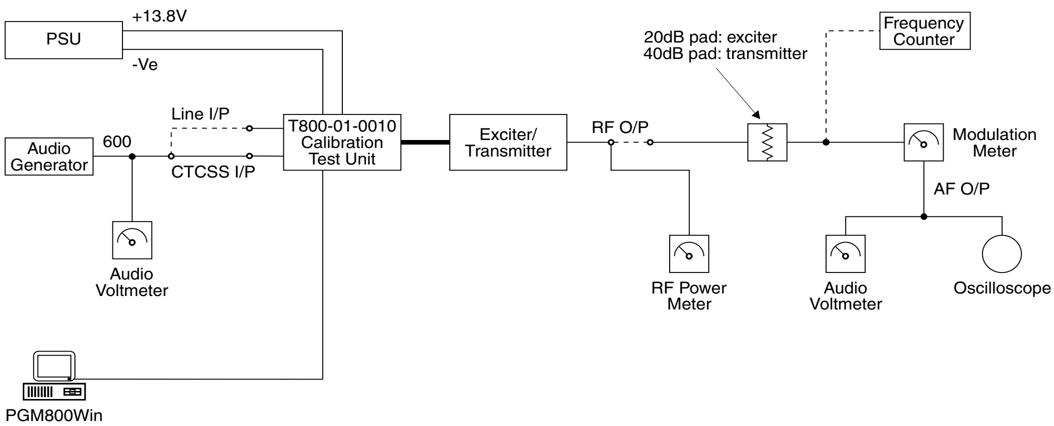


Figure 3.1 T854 Test Equipment Set-up With T800-01-0010

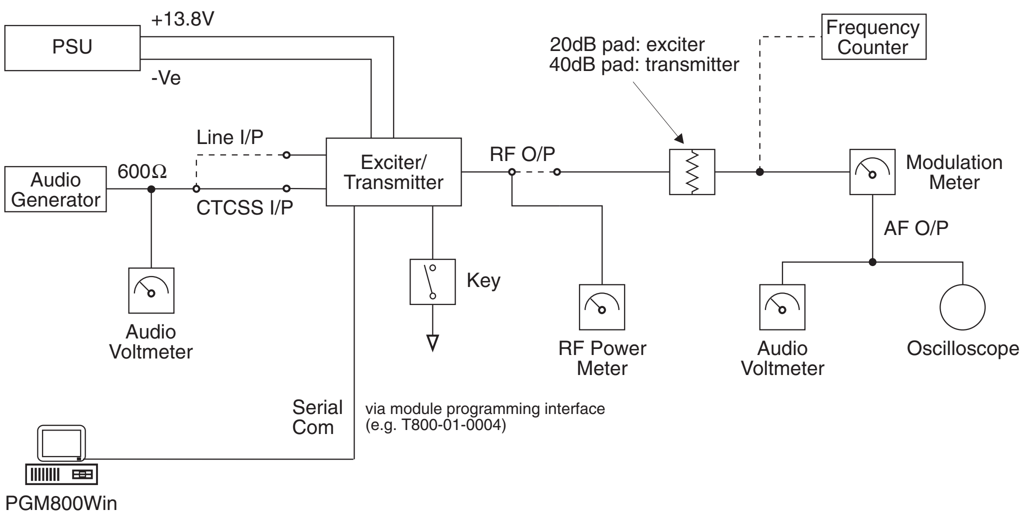


Figure 3.2 T854 Test Equipment Set-up Without T800-01-0010

3.4 Short Tuning Procedure

Use this procedure only if you want to reprogram the T854 to a frequency outside the 8MHz switching range and do not intend to carry out any other major adjustments or repairs.

3.4.1 Introduction

Reprogram the operating frequency as described in the PGM800Win programming kit (refer to Section 3.2).

Remove the top cover.

Set up the test equipment as described in Section 3.3.

Set the links in the audio processor section as required (refer to Section 3.5).

3.4.2 Synthesiser Alignment

- Connect a high impedance voltmeter to the long lead of L1 in the VCO (this measures the synthesiser loop voltage).
- Key the transmitter by earthing the Tx-Key line.
- **Single Channel** — Tune VCO trimmer C6 for a synthesiser loop voltage of 10V.

  Multichannel — Tune VCO trimmer C6 for a synthesiser loop voltage of 10V on the middle channel.

  If there is no middle channel, tune C6 so that the channels are symmetrically placed around a loop voltage of 10V.

  All channels should lie within the upper and lower limits of 16V and 3V respectively.

  Do not attempt to program channels with a greater frequency separation than the specified switching range of 8MHz.

3.4.3 Output Power Adjustment

Connect an RF power meter with suitable attenuation to the output socket and key the transmitter.

Turn RV310 (power control) fully clockwise.

Tune #CV475 (output power trim) for maximum output power and check that this is >30W.

Adjust RV310 for the required output power (between 5 and 25W).

Readjust #CV475 to reduce the supply current by up to 0.5A.

3.4.4 Two Point Modulation Adjustment

Note 1: In this and following sections deviation settings are given first for wide bandwidth sets, followed by settings in brackets for mid bandwidth sets ( ) and narrow bandwidth sets [ ].

Note 2: The reference modulation and limiter adjustments are controlled by 256-step electronic potentiometers (EPOTs), which are adjusted via the "Reference Modulation" and "Deviation" settings in PGM800Win. This allows the two point modulation and deviation settings to be adjusted for each channel.

Note 3: To optimise the modulation response across the switching range, repeat steps 1 to 4 below for each channel that will be used (usually needed only for data applications). In applications where the modulation response is less critical (e.g. voice use only), carry out steps 1 to 4 below on the middle channel and use the "EPOT Fill" option[1] in PGM800Win to copy the value to the other channels.

Note 4: If you are using an RF test set, turn the low pass filter off and set the high pass filter to 15kHz ***before*** beginning this procedure.

1. Inject an audio signal of 300Hz 1.5V_{rms} (+5dBm) into the CTCSS input (D-range 1 (PL100) pin 8).

   Key the transmitter by earthing the Tx-Key line.

2. Adjust the output from the audio generator to obtain ±3kHz (±2.4kHz) [±1.5kHz] deviation at 300Hz.

3. Change the input frequency to 100Hz and, using PGM800Win, adjust the value of the "Reference Modulation" EPOT setting for the current channel to obtain ±3kHz (±2.4kHz) [±1.5kHz] deviation (you can use either the mouse or up and down arrow keys).

4. Change the input frequency back to 300Hz.

   Repeat steps 2 and 3 above until the deviations achieved at the two input frequencies are within 0.2dB of each other. You will need to do this at least four times.

5. Sweep the audio between 50 and 300Hz for peaks.

Note: A peak between 50 and 300Hz will indicate a fault condition, i.e:

– incorrect set-up
or – modulation circuitry fault.

The specification window is ±1dB relative to 150Hz from 67 to 260Hz.

1. Use the "EDIT FILL" button on the tool bar or go to "Edit", "Fill", "Epot Settings" on the menu bar.

3.4.5 CTCSS Encoder (If Used)

Program a CTCSS tone on the default channel using PGM800Win.

If you are using an RF test set, turn off the 300Hz high pass filter.

Key the T854 with the front panel “Carrier” switch.

Adjust RV805 (CTCSS level adjust) to give ±500Hz (±350Hz) [±250Hz] deviation.

Set the maximum deviation as per Section 3.4.6.

3.4.6 FM Deviation (Limiter) Adjustment

Note: If the T854 will be used over the whole 8MHz switching range, you must set the deviation for each channel. However, if the module will be used on frequencies that cover only a 1MHz (or less) switching range, you can set the deviation on the middle channel and use this value for all other channels with the “EPOT Fill” option in PGM800Win.

Inject 1kHz at –10dBm into the line input (D-range 1 (PL100) pins 1 and 4; pins 2 and 3 shorted; refer to Section 1.5 of Part G).

Adjust RV210 (line sensitivity) fully clockwise and key the transmitter by earthing the Tx-Key line. Using PGM800Win, adjust the value of the “Deviation” EPOT setting for the current channel to obtain a deviation limit of ±4.7kHz (±3.8kHz) [±2.3kHz] (you can use either the mouse or up and down arrow keys).

Sweep the audio frequency from 100Hz to 4kHz and ensure that the maximum deviation does not exceed ±4.7kHz (±3.8kHz) [±2.3kHz]. Readjust “Deviation” if necessary via PGM800Win.

3.4.7 Line-in Level Adjustment

Remove the CTCSS signal (if used).

Set the injected signal at the line input to the required line level (typically –10 to –20dBm).

Adjust RV210 (line sensitivity) to provide ±3kHz (±2.4kHz) [±1.5kHz] deviation.

Reapply the CTCSS signal (if required).

3.5 Audio Processor Links

3.5.1 Link Details

Use the following table to set up the audio processor to the configuration you require. You should set the audio processor links before carrying out any of the tuning and adjustment procedures.

Plug	Link[a]		Function
PL201	1–2	A	not connected
	3–4[b]	B	microphone pre-amp output to compressor input
	5–6	C	microphone pre-amp output to multiplexer input
	7–8	D	pre-emphasis output to multiplexer input
	9–10[b]	E	pre-emphasis output to limiter input
	11–12	F	not connected
	13–14	G	not connected
PL202	1–2[b]	H	compressor output to multiplexer input
	3–4	I	compressor output to limiter input
	5–6	J	compressor output to pre-emphasis input
	7–8	K	not connected
	9–10[b]	L	multiplexer output to pre-emphasis input
	11–12	M	multiplexer output to limiter input
	13–14	N	multiplexer output to compressor input

a The letters in this column refer to the letters printed on the PCB beside each pair of pins. Note that the link names and pin numbers are different to earlier products. The lettering A to N is however the same.

b Factory Setting

3.5.2 Typical Options

microphone pre-amp	line input	PL201[a]	PL201	PL202	PL202
compressed and pre-emphasised	pre-emphasised	B[b]	E[b]	H[b]	L[b]
	unprocessed	B	D	J	M
	compressed and pre-emphasised	C	E	J	N
compressed and flat response	flat response	B	F	H	M

a The letters in this table refer to the letters printed on the PCB beside each pair of pins.

b Factory Setting

3.6 Synthesiser Alignment

1. Ensure that the T854 has been programmed with the required frequencies using PGM800Win software.

2. **Single Channel** Select a channel using PGM800Win.

   Multichannel Select the middle channel via PGM800Win.

3. Connect a high impedance voltmeter to the long lead of L1 in the VCO (this measures the synthesiser loop voltage).

4. Key the transmitter by earthing the Tx-Key line.

   Single Channel Tune VCO trimmer C6 for a synthesiser loop voltage of 10V.

   Multichannel Tune VCO trimmer C6 for a synthesiser loop voltage of 10V on the middle channel.

   If there is no middle channel, tune C6 so that the channels are symmetrically placed around a loop voltage of 10V.

   All channels should lie within the upper and lower limits of 16V and 3V respectively.

   Do not attempt to program channels with a greater frequency separation than the specified switching range (8MHz).

5. Measure the exciter output frequency and adjust the TCXO (=IC700) trimmer if required.

Caution: **This trimmer is susceptible to physical damage. Do not exert a downward force of more than 500g (1lb) when adjusting.**

3.7 PA Alignment

1. Check that the exciter is connected to the PA with the coaxial link.
2. Connect an RF power meter to the PA output (use an appropriate attenuator as necessary).
3. Turn RV310 (power control) fully clockwise.
4. Key the transmitter by earthing the Tx-Key line.
5. Tune #CV475 until maximum power is obtained. Check that the power exceeds 30W.
6. Adjust RV310 (power control) to 25W.
7. Readjust #CV475 to reduce the supply current by up to 0.5A.

3.8 Thermal Shutdown

1. Key the transmitter by earthing the Tx-Key line and set the output power to 25W as described in Section 3.7.
2. Short L481 to ground.
3. Set RV330 (shutdown power level) for an output power of 5W.

3.9 Audio Processor and CTCSS

3.9.1 Two Point Modulation

The T854 utilises two point modulation to obtain a wide audio bandwidth independent of the synthesiser loop filter response. This is achieved by simultaneously frequency modulating the VCO and phase modulating the synthesiser reference frequency. The relative signal levels fed to the two modulators are quite critical and cause interaction when setting up.

Both modulating signals require readjustment when the exciter is shifted in frequency greater than the switching range (i.e. $\Delta F > \pm 4MHz$).

Note 1: In this and following sections deviation settings are given first for wide bandwidth sets, followed by settings in brackets for mid bandwidth sets ( ) and narrow bandwidth sets [ ].

Note 2: The reference modulation and limiter adjustments are controlled by 256-step electronic potentiometers (EPOTs), which are adjusted via the “Reference Modulation” and “Deviation” settings in PGM800Win. This allows the two point modulation and deviation settings to be adjusted for each channel.

Note 3: To optimise the modulation response across the switching range, repeat steps 1 to 4 below for each channel that will be used (usually needed only for data applications). In applications where the modulation response is less critical (e.g. voice use only), carry out steps 1 to 4 below on the middle channel and use the “EPOT Fill” option[1] in PGM800Win to copy the value to the other channels.

Note 4: If you are using an RF test set, turn the low pass filter off and set the high pass filter to 15kHz ***before*** beginning this procedure.

3.9.2 Modulator Adjustment

1. Inject an audio signal of 300Hz 1.5V_{rms} (+5dBm) into the CTCSS input (D-range 1 (PL100) pin 8).

   Key the transmitter by earthing the Tx-Key line.

2. Adjust the output from the audio generator to obtain ±3kHz (±2.4kHz) [±1.5kHz] deviation at 300Hz.

3. Change the input frequency to 100Hz and, using PGM800Win, adjust the value of the “Reference Modulation” EPOT setting for the current channel to obtain ±3kHz (±2.4kHz) [±1.5kHz] deviation (you can use either the mouse or up and down arrow keys).

1. Use the “EDIT FILL” button on the tool bar or go to “Edit”, “Fill”, “Epot Settings” on the menu bar.

4. Change the input frequency back to 300Hz.

   Repeat steps 2 and 3 above until the deviations achieved at the two input frequencies are within 0.2dB of each other. You will need to do this at least four times.

5. Sweep the audio between 50 and 300Hz for peaks.

Note: A peak between 50 and 300Hz will indicate a fault condition, i.e:

– incorrect set-up
or – modulation circuitry fault.

The specification window is ±1dB relative to 150Hz from 67 to 260Hz.

3.9.3 CTCSS Encoder (If Used)

1. Program a CTCSS tone on the default channel using PGM800Win.

2. If you are using an RF test set, turn off the 300Hz high pass filter.

3. Key the T854 with the front panel “Carrier” switch.

4. Adjust RV805 (CTCSS level adjust) to give ±500Hz (±350Hz) [±250Hz] deviation.

5. Set the maximum deviation as per Section 3.9.4.

3.9.4 Limiter Adjustment

Note: If the T854 will be used over the whole 8MHz switching range, you must set the deviation for each channel. However, if the module will be used on frequencies that cover only a 1MHz (or less) switching range, you can set the deviation on the middle channel and use this value for all other channels with the “EPOT Fill” option in PGM800Win.

1. Set the links in the audio processor section as required (refer to Section 3.5).

2. Inject 1kHz at –10dBm into the line input (D-range 1 (PL100) pins 1 and 4; and pins 2 and 3 shorted; refer to Section 1.5 of Part G).

3. Adjust RV210 (line sensitivity) fully clockwise and key the transmitter by earthing the Tx-Key line. Using PGM800Win, adjust the value of the “Deviation” EPOT setting for the current channel to obtain a deviation limit of ±4.7kHz (±3.8kHz) [±2.3kHz] (you can use either the mouse or up and down arrow keys).

4. Sweep the audio frequency from 100Hz to 4kHz and ensure that the maximum deviation does not exceed ±4.7kHz (±3.8kHz) [±2.3kHz]. Readjust “Deviation” if necessary via PGM800Win.

3.9.5 Line Level Without Compressor

This section assumes that the compressor is not used. If the compressor is required, refer to Section 3.9.6.

1. Remove the CTCSS signal (if used).

2. Adjust the line sensitivity as follows:
   - set the injected signal at the line input to the required line level (typically –10 to –20dBm)
   - adjust RV210 (line sensitivity) to provide ±3kHz (±2.4kHz) [±1.5kHz] deviation

3. Reapply the CTCSS signal (if required).

3.9.6 Compressor

The compressor may be used on the line input only, the microphone input only, or on both the line and microphone inputs. If the compressor is used, refer to one of the following sections as appropriate.

3.9.6.1 Compressor On Line Input Only

1. Set RV210 (line sensitivity) fully clockwise and key the transmitter by earthing the Tx-Key line.

2. Reduce the line level to –50dBm at 1kHz and set RV220 (compression level) fully clockwise.

3. Check that ±3kHz deviation (±2.4kHz) [±1.5kHz] is still available.

4. Slowly increase the audio input level until the demodulated waveform shows significant signs of clipping (approximately ±4.5kHz (±3.6kHz) [±2.3kHz] deviation).

5. Adjust RV220 anticlockwise until the demodulated waveform is just clipping (approximately ±4kHz (±3.2kHz) [±2kHz] deviation).

6. Increase the input level to –10dBm and check that the test tone is still held just into clipping. The input line level should be typically –10 to –20dBm.

3.9.6.2 Compressor On Microphone Input Only

1. Key the transmitter by earthing the Tx-Key line and plug a microphone jack into the front panel socket.

2. Adjust RV220 (compression level) fully clockwise.

3. Acoustically couple the microphone to a tone box (1kHz) and close the PTT switch.

4. Increase the audio level until the demodulated waveform shows significant signs of clipping (approximately ±4.5kHz (±3.6kHz) [±2.3kHz] deviation).

5. Adjust RV220 anticlockwise until the demodulated waveform is just clipping (approximately ±4kHz (±3.2khz) [±2kHz] deviation).

6. Increase the audio level by 10dB and verify that the test tone is held just into clipping.

7. Whistle steadily into the microphone, checking that approximately ±4kHz (±3.2khz) [±2kHz] deviation is produced. The modulated waveform should be basically sinusoidal.

8. Speak into the microphone, checking that the modulation peaks reach about ±5kHz (±4kHz) [±2.5kHz] deviation.

9. As the line is to be used without compression, set RV210 (line sensitivity) as described in Section 3.9.5.

3.9.6.3 Compressor On Both Line and Microphone Inputs

Set up as described in Section 3.9.6.1.

3.10 Power Alarms (if used)

When fitted to the T854 transmitter an alarm board monitors the transmitter output power and generates a low forward-power and/or high reverse-power alarm as appropriate.

This is achieved by monitoring the output voltages of the transmitters forward and reverse power directional coupler. A comparison between these voltage levels and user defined reference voltages generates alarm conditions accordingly. The low forward power output signal is also gated with the Tx-enable input to ensure that no alarm is generated when the transmitter is not transmitting. The high reverse power alarm output is not gated. The alarm signal is output on the T854 Aux D-range.

There are two alarms boards currently available, the recently introduced and improved T800-10-0520 Tx-Alarm/Channel Select board and the older T1500-52-0000, which it replaces. The alarm outputs of both the these boards are compatible with the T1511-20-0000 CCM module and the T803-02 Tone Remote and Alarm interface.

The following table indicates the SL2 backplane configuration required.

Alarm board	SL2 Backplane		Notes
	Link 9	Link 10	
T1500-52-0000 (PCB 220-01426-04)	2 – 3	2 – 3	See Section 3.10.1 T1500-52-0000 Tx Alarm/Multi-channel Kit
T800-10-0520 (plug-in alarm board)	2 – 3	2 – 3	See Section 3.10.2 T800-10-0520 Tx-Alarm/Channel-Select Kit
No internal alarm board fitted but FWD and REV power sense voltages output directly on T854 Aux D-range. Could be used for an externally fitted RF power indicator/alarm.	1 – 2	1 – 2	**Cannot be used to trigger T803-02 RF power alarms.** On the T854 for S/N 13098764 or earlier: – remove R840 and R841 – fit R308 and R310 (both 10kΩ)

3.10.1 T1500-52-0000 Tx Alarm/Multi-channel Kit

When fitted, the T1500-52-0000 Tx alarm PCB monitors the transmitter output power and generates a low forward and/or high reverse power alarm signal as appropriate.

Alarm outputs are compatible with the T1511-20-0000 CCM module. On-board LED indication of alarms is also provided for trouble shooting and setup purposes.

Parts Supplied

The T1500-52-0000 should contain:

- T1500-52-0000 Alarm PCB and mounting screws.
- D-range and PCB interface.

3.10.1.1 Installation

To install this kit you will require the following tools:

- T1500-52-0000 Tx alarm/Multi-channel alarm kit
- Philips screwdriver
- Soldering iron
- Small sidecutters

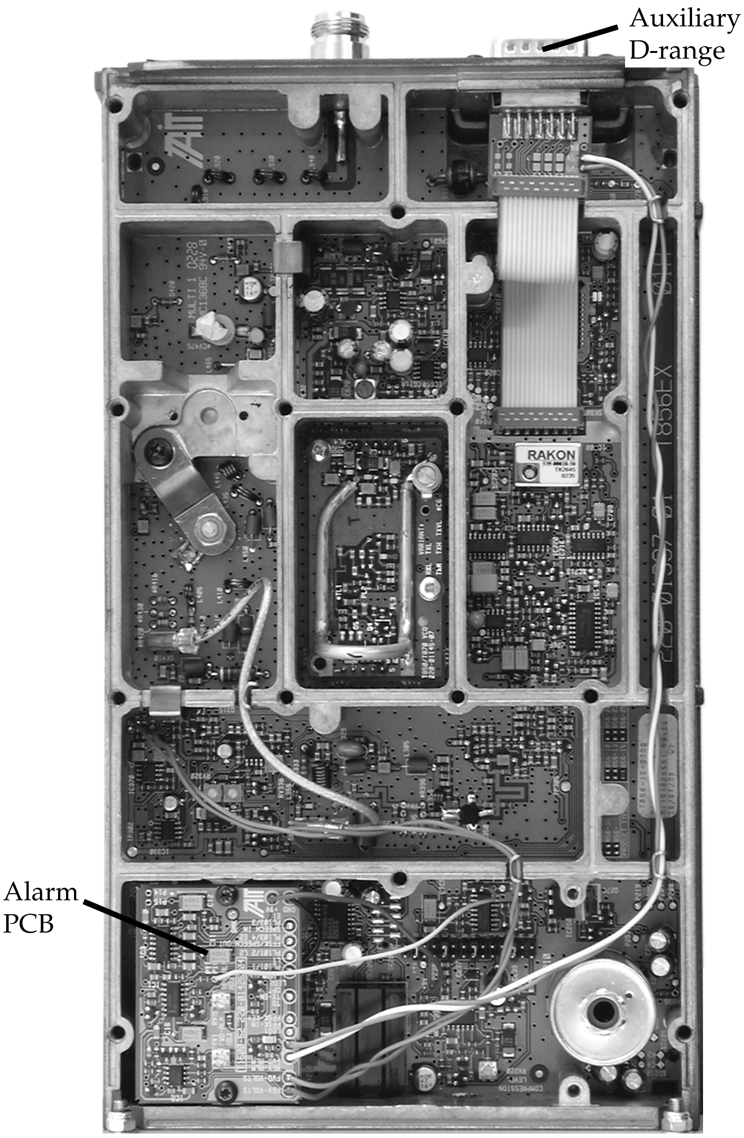


Figure 3.3 Example Transmitter (T856) Fitted with Alarm Kit

T800 connection pads		T1500-52-0000 PCB connection pads	Rear D-range pin number and PCB label	Wire colour
+9V	P230	+9V	—	Red
GND	P259	GND	—	Black
Fwd Pwr TP T826: T836: T854/T856:	 R302 (via end) TP310 TP306	Fwd Volts	—	Green
Rev Pwr TP T826: T836: T854/T856:	 R301 (via end) TP309 TP307	Rev Volts	—	Orange
—		Fwd pwr alarm	Pin 13 – Fwd	Blue
—		Rev pwr alarm	Pin 14 – Rev	White
Tx Enb	D240 pin 3	PTT	—	Yellow

1. Remove the top and bottom cover from the T854 transmitter.

2. Remove the Aux D-range and replace with the supplied D-range socket.

3. Connect the T1500-52-0000 wires to the D-range PCB, audio processor and exciter compartments as shown in the table above.

4. Fit cable clamps to all points where wires pass through the radio's chassis.

5. Fit the wire clamp to the forward and reverse voltage input wires at the point were they cross over between compartments.

6. Mount the T1500-52-0000 component side up on the chassis lugs provided in the audio compartment, at the top (Carrier button) end.

Note: Take care not to knock the T1500-52-0000 PCB while the covers are off. A sharp knock on the SMD electro capacitors will damage the board.

7. Fit a ribbon cable if multi-channel operation is required.

8. Run up the board according to the test section below.

9. Ensure that the cable clamps hold down all wires safely so that they will not be pinched. Replace both covers.

3.10.1.2 T1500-52-0000 Testing/Alignment

Equipment required

- 50Ω power meter
- 3 or 6dB attenuator as needed.

Forward alarm

1. Connect the power meter to the transmitter output.

2. Key up the transmitter and set the output power to the desired low forward power alarm threshold point.

3. Adjust the "Fwd-alarm adjust" preset until the forward alarm LED just comes ON.

4. Reset the output power to the operational output level. Check the alarm output is now OFF.

5. Turn the transmitter OFF.

Reverse alarm

1. Connect the power meter to the transmitter output.

2. Key up the transmitter and set the output power level to the operational output level.

3. Replace the power meter with the appropriate valued open ended attenuator. This should generate the desired return loss/reflected power for the desired high reverse power alarm threshold point.

4. Adjust the “Rev-alarm adjust” preset until the alarm LED just comes ON.

5. Turn the transmitter OFF.

3.10.2 T800-10-0520 Tx-Alarm/Channel-Select Kit

When fitted to a T854 transmitter, the T800-10-0520 Tx-Alarm/Channel-Select plug-in board provides the following features:

- The plug-in board monitors the transmitter’s output power, and generates a low forward-power and/or high reverse-power alarm as appropriate.
- The plug-in board also includes channel select switches that enables the user to manually set the operational channel of the T854.

The plug-in board provides the same alarm outputs as the T1500-52-0000:

- Forward Power Alarm: Aux D-range pin 13
- Reverse Power Alarm: Aux D-range pin 14

Note: AUX-OUT-0 is disabled when the plug-in board is installed.

The Tx-Alarm function is achieved by comparing the output voltages of the transmitter’s directional coupler to user-defined reference levels.

The low forward-power alarm output is gated with the Tx-Enable input, to ensure that no alarm is generated when the transmitter is not transmitting. The high reverse-power alarm is not gated.

Note: The plug-in board does not require additional wiring. It can be set up on the bench. This is possible because the Tx-Enable line is accessed from inside the T854, rather than from the backplane PCB (as on the T1500-52-0000).

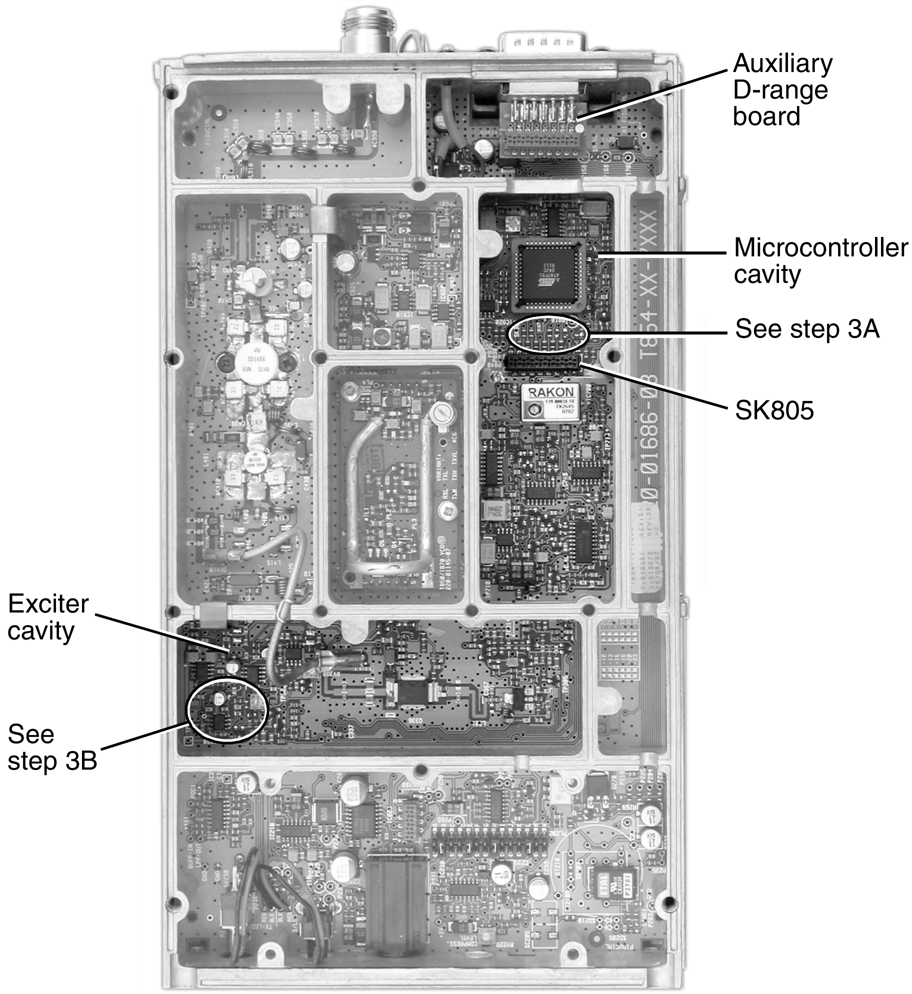
Parts Supplied

T800-10-0520 Tx-Alarm/Channel-Select Kit should contain the following:

- T800-10-0520 plug-in board

3.10.2.1 Installation

To install this kit you will require a small flat-bladed screwdriver or similar.



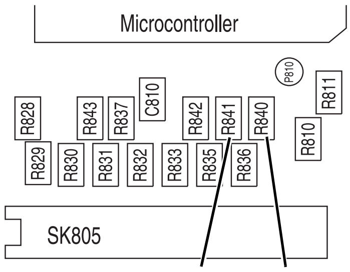
1. Remove the top cover from the T854 Transmitter.

2. The auxiliary D-Range board is connected to the microcontroller cavity by a ribbon-cable. Remove the ribbon-cable.

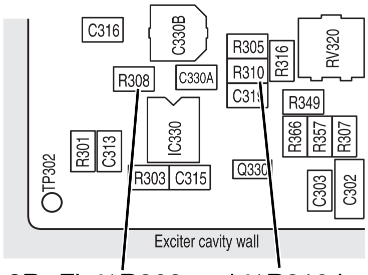
3. **For T854 transmitters with a serial number of 13098764 or earlier:**
   These transmitters are not by default configured to work with the plug-in board. The directional coupler voltages must be routed to SK805.

Note: This step disables AUX-OUT-1 and AUX-OUT-2.

Remove and fit the following resistors:



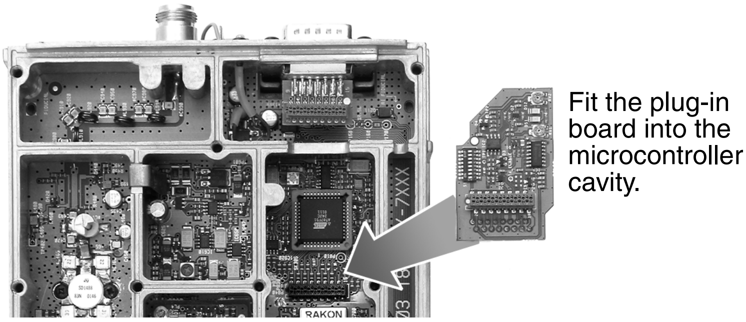
3A: Remove R841 and R840 from the microcontroller cavity.



3B: Fit %R308 and %R310 in the exciter cavity. Use 10kΩ SMD0805 (IPN: 036-15100-10).

4. Double-sided tape is attached to the bottom side of the plug-in board. Remove the protective film from the double-sided tape to expose its adhesive surface.

5. The plug-in board is mounted in the T854 microcontroller cavity. Plug J1, the connector on the bottom side of the plug-in board, into SK805 on the T854 main board.



6. Firmly press down on the edges of the plug-in board so that the double sided tape bonds to the top of the microcontroller.

7. Connect the ribbon-cable between J2 on the plug-in board, and the auxiliary D-Range board.

3.10.2.2 T800-10-0520 Testing/Alignment

Equipment required

- 50Ω power meter
- Suitable attenuator, e.g. 3dB.

Forward alarm

1. Connect the power meter to the transmitter output.

2. Key up the transmitter and set the output power to the desired low forward-power alarm threshold-point.

3. Adjust RV2, the forward-power alarm preset, until the forward alarm LED (DS2) just turns ON.

4. Reset the power to the operational output level. Verify that the alarm output is now OFF.

5. Turn the transmitter OFF.

Reverse alarm

1. Connect the power meter to the transmitter output.

2. Key up the transmitter and set the output power level to the operational output level.

3. Unkey the transmitter.

4. Replace the power meter with the appropriate valued open-ended attenuator. This should generate the desired return loss/reflected power for the desired high reverse-power alarm threshold-point.

5. Key up the transmitter.

6. Adjust RV1, the reverse-power alarm preset, until the reverse alarm LED (DS1) just comes ON.

7. Turn the transmitter OFF.

Channel Select Setup

In the default state of the plug-in board, no channel is selected (channel select disabled).

1. The desired channel can be selected by S1. Set the switches on S1 to the desired channel number, in binary format.

Note: The switch on position is a binary ‘0’ and the off position a binary ‘1’.

2. To disable channel select, set all switches back to the off position.

4 T854 Functional Testing

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

The following test procedures will confirm that the T854 has been tuned and adjusted correctly and is fully operational.

Note 1: In this and following sections deviation settings are given first for wide bandwidth sets, followed by settings in brackets for mid bandwidth sets ( ) and narrow bandwidth sets [ ].

Note 2: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 4.02 and later of the software.

Refer to Figure 4.4 for the location of the main tuning and adjustment controls, and to Section 3.3 for the test equipment set-up. Refer also to Section 6 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components and test points on the main PCB. The parts list and diagrams for the VCO PCB are in Part E.

The following topics are covered in this section.

4.1 Current Consumption

1. Connect the T854 to a 13.8V power supply.
2. Connect an RF power meter to the T854 output socket.
3. Check that the current in the 13.8V power cable is less than 150mA.
4. Key the T854 by earthing the Tx-Key line (the carrier “On” LED should light).
5. Adjust RV310 (power control) to obtain 25W output power.
6. Check that the current is less than 5.5A

4.2 Output Power

1. Connect an RF power meter with suitable attenuation to the T854 output socket.
2. Key the T854 by earthing the Tx-Key line.
3. Check that the output power adjusts to ≥25W with RV310 (power control) turned fully clockwise

4.3 Output Frequency

Connect the T854 output to a frequency counter via a 40dB attenuator pad. Measure the output frequency and, if necessary, adjust the TCXO (=IC700) to trim to the nominal frequency (±100Hz).

4.4 Timers

The transmit tail timer, transmit timeout timer and transmit lockout timer can all be set from PGM800Win. The fields for setting these are found on the system information page. These three timers operate as follows (refer also to Figure 4.1):

Timer	Function	Adjustment
Transmit Tail	Sets the tail time during which the transmitter stays keyed after the external key source has been removed.	0 to 5 seconds in 20ms steps
Transmit Timeout	Sets the maximum continuous transmission time. Once the timer has timed out, the transmitter must be keyed again, unless prevented by the transmit lockout timer.	0 to 300 seconds in 20 second steps
Transmit Lockout	Sets the period of time that must elapse after a timeout before the transmitter can re-transmit. Once the timer has timed out, the transmitter can be keyed again.	0 to 60 seconds in 10 second steps

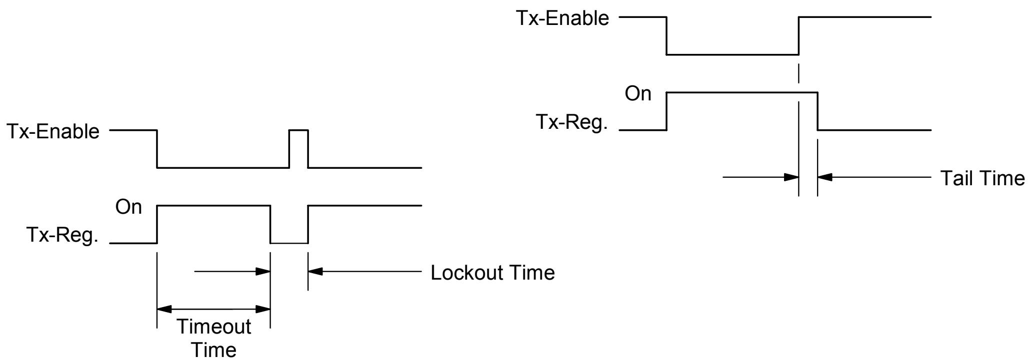


Figure 4.1 T854 Transmit Timers

4.5 Frequency Response

If the T854 has been correctly adjusted, the pre-emphasis and limiting responses should closely match those shown in Figure 4.2 and Figure 4.3 respectively.

Note: The limits shown on these graphs should not be exceeded.

1. If you are using an RF test set, turn off all filters.

2. Measure the pre-emphasis response as follows:

   Reduce the line level to give ±1kHz (±0.8kHz) [±0.5kHz] deviation at 1kHz.

   Sweep the modulation frequency.

   The response should closely match that shown in Figure 4.2.

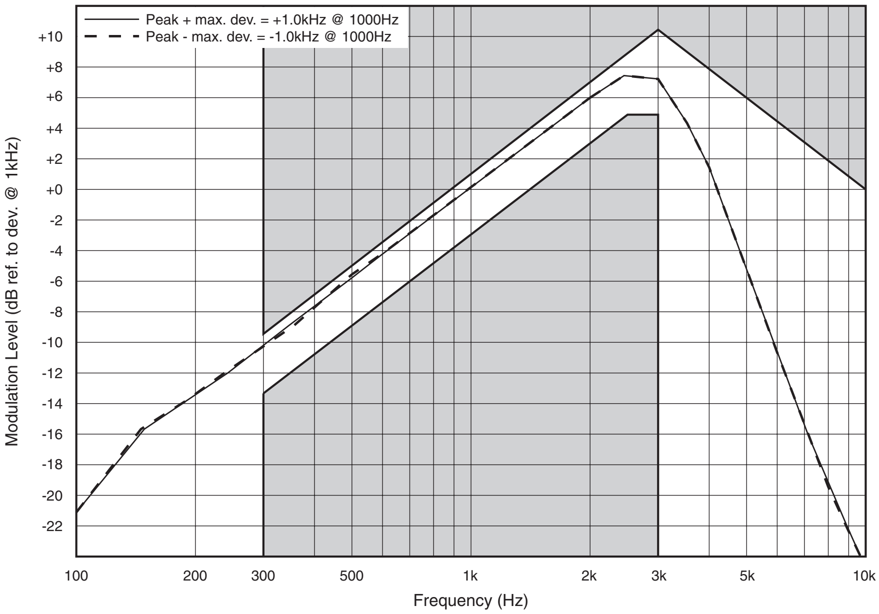
3. Measure the limiting response as follows:

   Set the line level to give ±3kHz (±2.4kHz) [±1.5kHz] deviation at 1kHz.

   Increase the line level 20dB and sweep the modulation frequency.

The response should closely match that shown in Figure 4.3.

Wide Bandwidth



Mid Bandwidth

The mid bandwidth graph is the same shape as the wide bandwidth graph. The deviation figures are as follows:

peak + max. deviation = +0.8kHz
peak – max. deviation = –0.8kHz.

Narrow Bandwidth

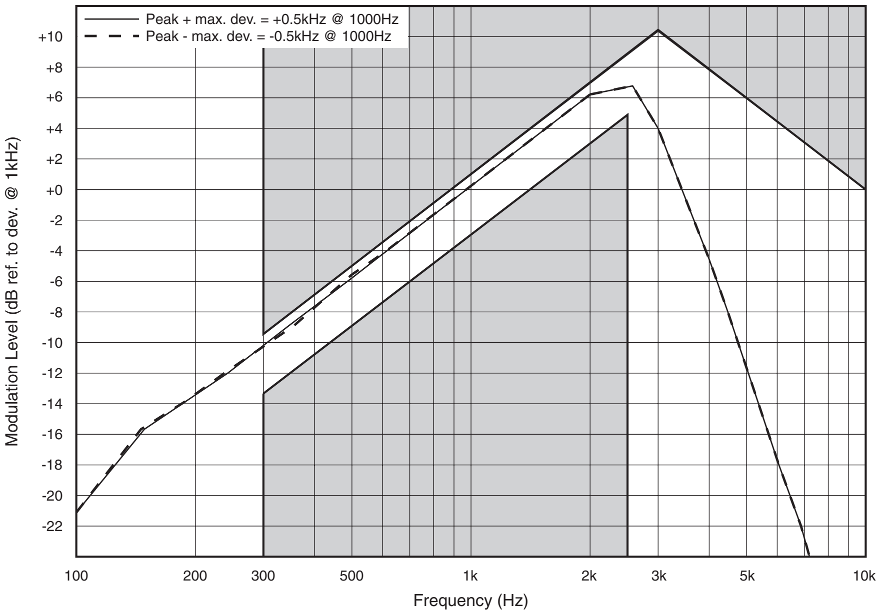
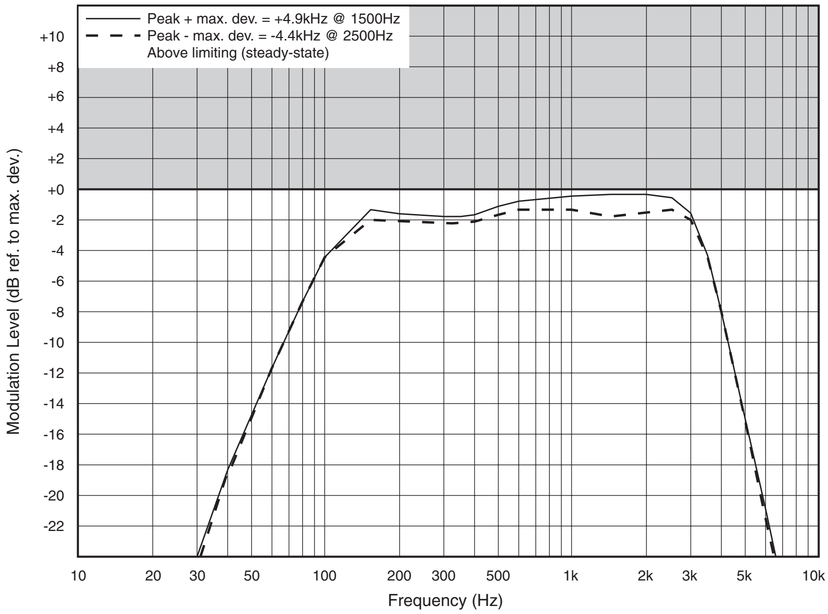


Figure 4.2 T854 Pre-emphasis Response

Wide Bandwidth



Mid Bandwidth

The mid bandwidth graph is the same shape as the wide bandwidth graph. The deviation figures are as follows:

peak + max. deviation = +4kHz
peak – max. deviation = –4kHz.

Narrow Bandwidth

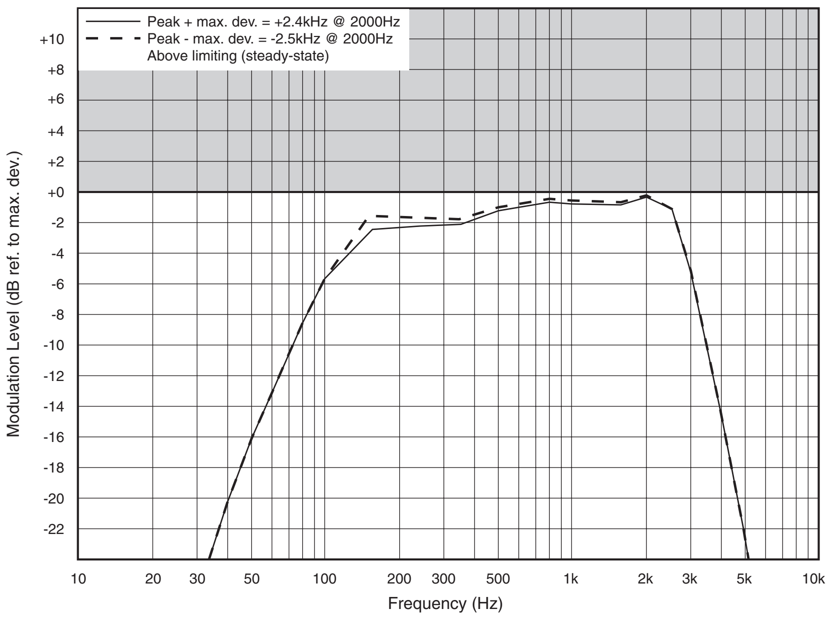


Figure 4.3 T854 Limiting Response

4.6 Audio Level Input Sensitivity

1. Adjust RV210 (line sensitivity) fully clockwise.

2. Check that the input sensitivities are better than those specified below:

Line Input	600Ω, ±3kHz (±2.4kHz) [±1.5kHz] deviation at 1kHz:	
	with compressor	–50dBm
	without compressor	–30dBm
Microphone Input	600Ω, ±3kHz (±2.4kHz) [±1.5kHz] deviation at 1kHz:	
	with compressor	–75dBm
	without compressor	–55dBm
CTCSS Input	1kHz deviation at 150Hz	500mV$_{rms}$

Note: A degraded signal to noise ratio can be expected with the compressor selected. The extent of the degradation is dependent on the audio input level.

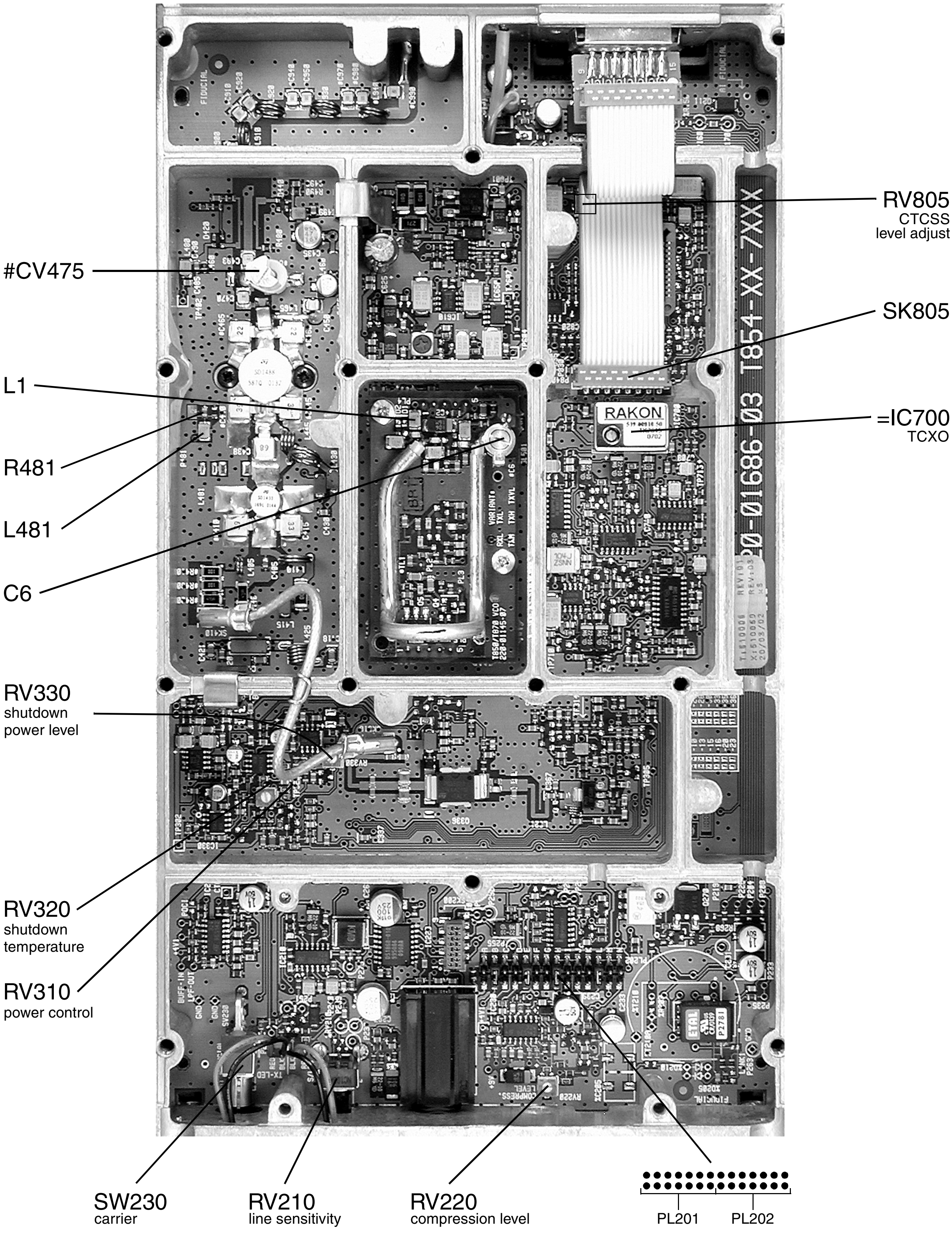


Figure 4.4 T854 Main Tuning and Adjustment Controls

5 T854 Fault Finding

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

The following test procedures and fault finding flow charts may be used to help locate a hardware problem, however they are by no means a complete fault finding procedure. If you still cannot trace the fault after progressing through them in a logical manner, contact your nearest Tait Dealer or Customer Service Organisation. If necessary, you can get additional technical help from Technical Support, Tait Electronics Ltd, Christchurch, New Zealand (full contact details are on page 2).

Note 1: In this and following sections deviation settings are given first for wide bandwidth sets, followed by settings in brackets for mid bandwidth sets ( ) and narrow bandwidth sets [ ].

Note 2: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 4.02 and later of the software.

Refer to Section 6 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components and test points on the main PCB. The parts list and diagrams for the VCO PCB are in Part E.

The following topics are covered in this section

5.1 Visual Checks

Remove the top cover from the T854 and inspect the PCB for damaged or broken components, paying particular attention to the surface mounted devices (SMDs).

Check for defective solder joints. If repair or replacement is considered necessary, refer to Section 3 of Part A.

5.2 Component Checks

If you suspect a transistor is faulty, you can assess its performance by measuring the forward and reverse resistance of the junctions. Unless the device is completely desoldered, first make sure that the transistor is not shunted by some circuit resistance. Use a good quality EVM (e.g. Fluke 75) for taking the measurements (or a 20kΩ/V or better multimeter, using only the medium or low resistance ranges).

The collector current drawn by multi-junction transistors is a further guide to their performance.

If an IC is suspect, the most reliable check is to measure the DC operating voltages. Due to the catastrophic nature of most IC failures, the pin voltages will usually be markedly different from the recommended values in the presence of a fault. The recommended values can be obtained from either the circuit diagram or the component data catalogue.

5.3 Front Panel LED Indicator

The green “Supply” LED on the T854 front panel will flash according to the conditions described in the following table:

Flash Rate		Condition
fast	($^1/_3$ s on/ $^1/_3$ s off approx.)	T854 is linked with PGM800Win
unequal	($^1/_3$ s on/1s off approx.)	microcontroller has detected an internal communications error – refer to Section 5.7.1

Where two or more conditions occur at the same time, the precedence is in the order shown above (i.e. T854 linked has the highest priority, followed by internal error).

5.4 DC Checks

5.4.1 Power Rails

Refer to the test points and options diagrams in Section 6 for test point locations, and to the regulator fault finding chart (Section 5.7.2) for fault diagnosis.

Check the 13.8V (TP601) and 9V (TP602) supplies at their test points in the regulator compartment with a DMM.

Check the 5V (TP604) and 20V (TP603) rails at their respective test points in the regulator compartment.

Check that Tx-Reg. (TP305 in the exciter compartment) comes up to 8.8V when the exciter is keyed.

Check the +5V digital regulator output (TP607 in the regulator compartment).

Check the 9V supply (IC370 pin 1) with a DMM.

Check for short circuits.

5.4.2 VCO Locking

Key the exciter.

Using a DMM, monitor the VCO control voltage between between L1 and PL14 pin1 on the VCO PCB.

If the synthesiser is locked and the VCO aligned, the voltage at this point should be between 3 and 16V.

If the VCO is not locked, refer to the synthesiser fault finding chart (Section 5.7.3).

5.5 RF Checks

In-circuit RF levels may be measured with an RF probe on which the earth lead has been shortened to a minimum (i.e. 13mm). Refer to the circuit diagrams for typical levels.

Figure 5.1 shows a suitable RF probe circuit.

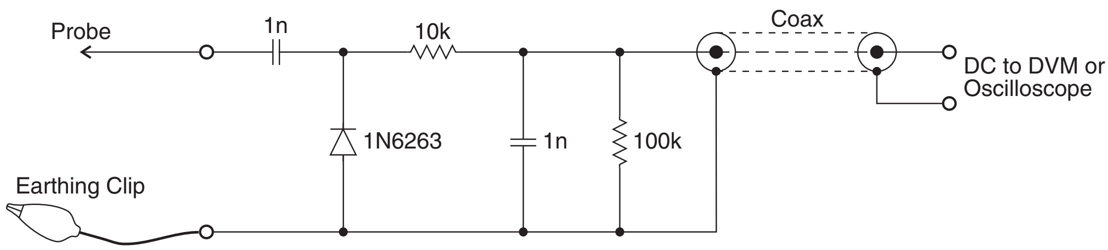


Figure 5.1 RF Diode Probe Circuit

5.5.1 T854 Drive Power

Refer to the drive amplifier fault finding chart (Section 5.7.4).

Ensure that the VCO locks (refer to Section 5.4.2).

Connect the drive output to a power meter and key the transmitter.

Check that the exciter output power (SK310) is >1.5W.

Note: If the synthesiser is out of lock, the lock detector (synthesiser IC740 and comparator IC750) will prevent the RF signal from reaching the PA by switching the supply to the exciter amplifier (Q336, Q337).

5.5.2 T854 PA Output Power

Reconnect the drive output to the PA input.

Connect the PA to a power meter and key the transmitter.

Check that the output power is >30W with RV310 (power control) adjusted fully clockwise.

5.5.3 Audio And Modulation

Refer to the audio processor fault finding chart (Section 5.7.6).

Set up the audio processor as described in Section 3.9.

Check that the demodulated RF output has the frequency response referred to in Section 4.5 with at least ±5kHz (±4kHz) [±2.5kHz] deviation available at 1kHz modulating frequency.

If the above result is not achieved, either the dual point modulation is incorrectly adjusted or a fault condition exists.

5.6 PGM800Win Generated Errors

The following errors are those most likely to occur using PGM800Win. Refer to the PGM800Win software user's manual for a complete list of error messages.

Channel Switch Set

The programmed default channel change was not accepted by the base station because a channel is selected externally. Try turning the external channel switch off to change the default channel in PGM800Win.

Synth Out Of Lock

The synthesiser received incorrect data, or the data was corrupted. Enter a frequency within the VCO switching range, or tune the VCO.

Internal Error

Data could not be read from the base station due to an internal error. Check for shorts or open circuits on the SDA, SCK, SYNTH and EPOT lines. The SDA, SCK and SYNTH are normally high, and the EPOT is normally low.

Write/Read To An Unlinked Module

The link to the module does not exist. Undefined error.

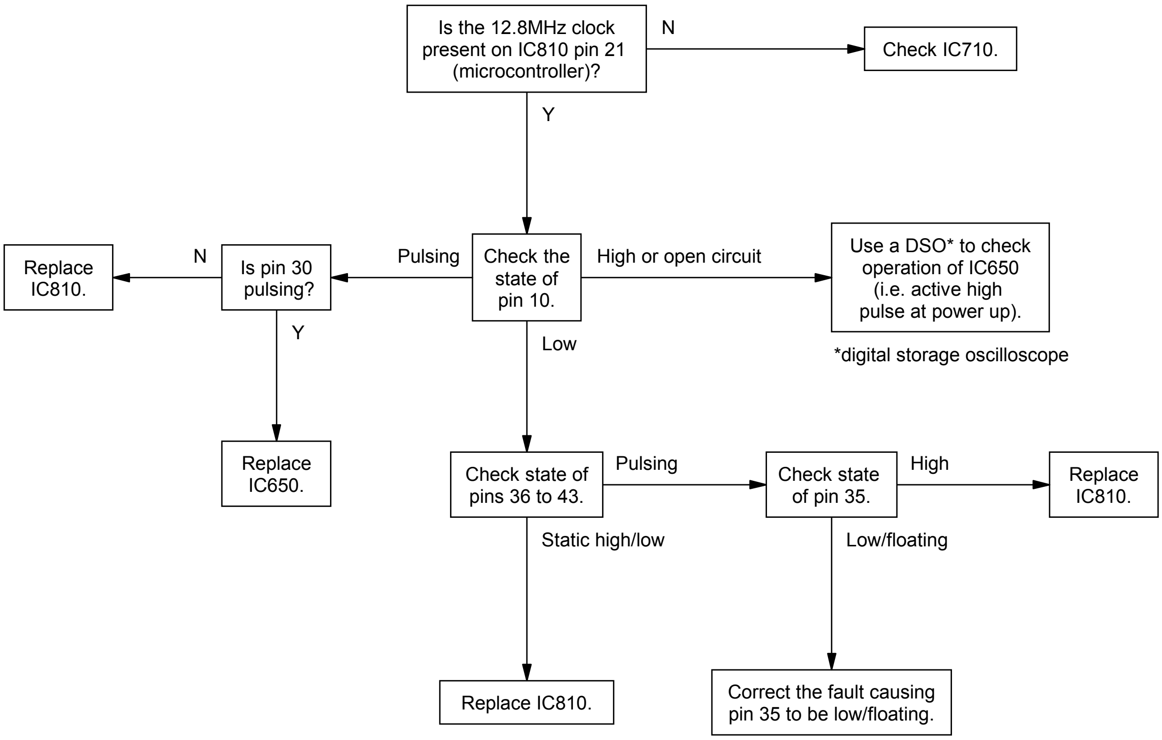
5.7 Fault Finding Charts

Note: The standard test point designations used in this section are as follows:

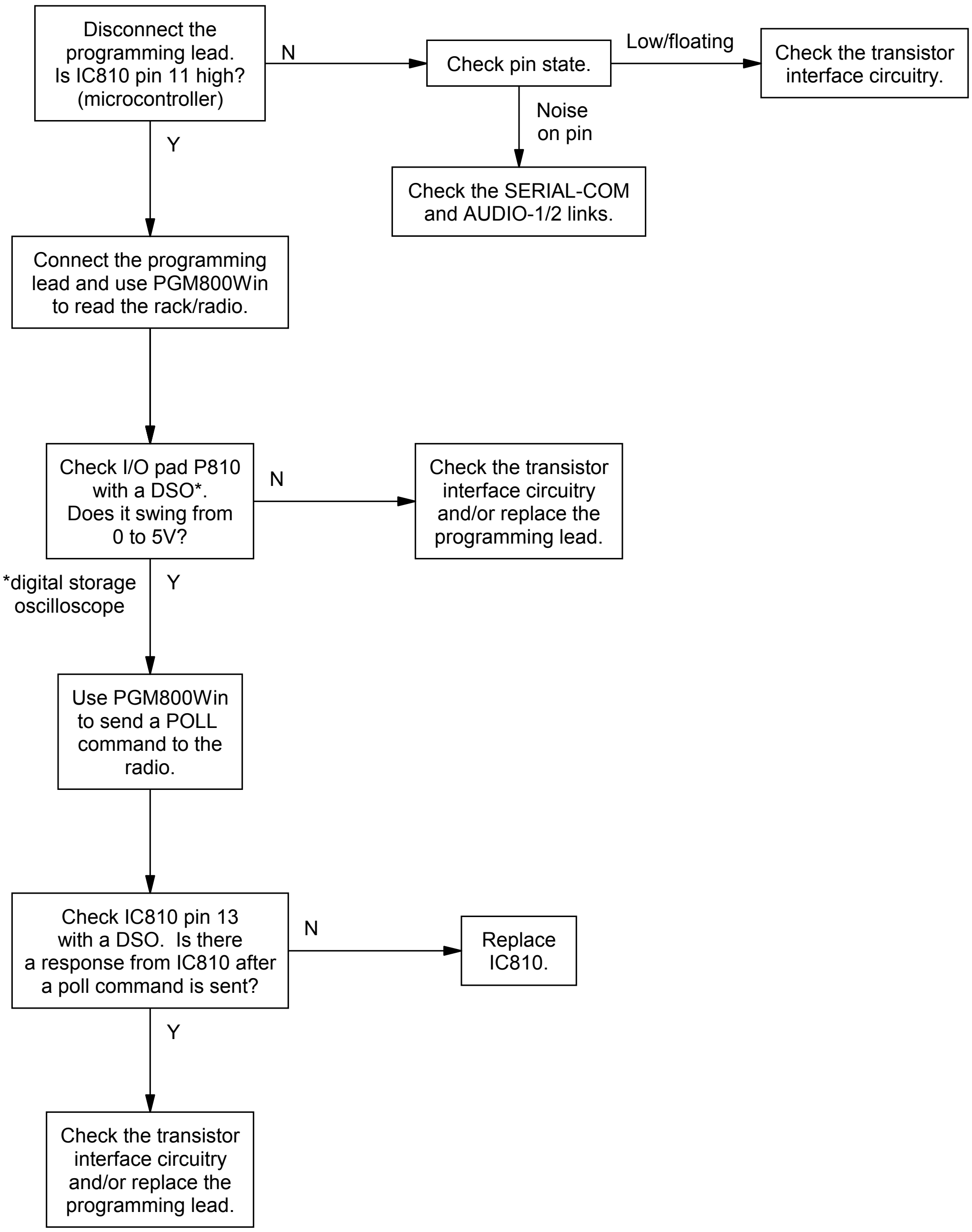
TP601	13.8V
TP602	9V
TP603	20V
TP604	5V

5.7.1 Microcontroller (IC810)

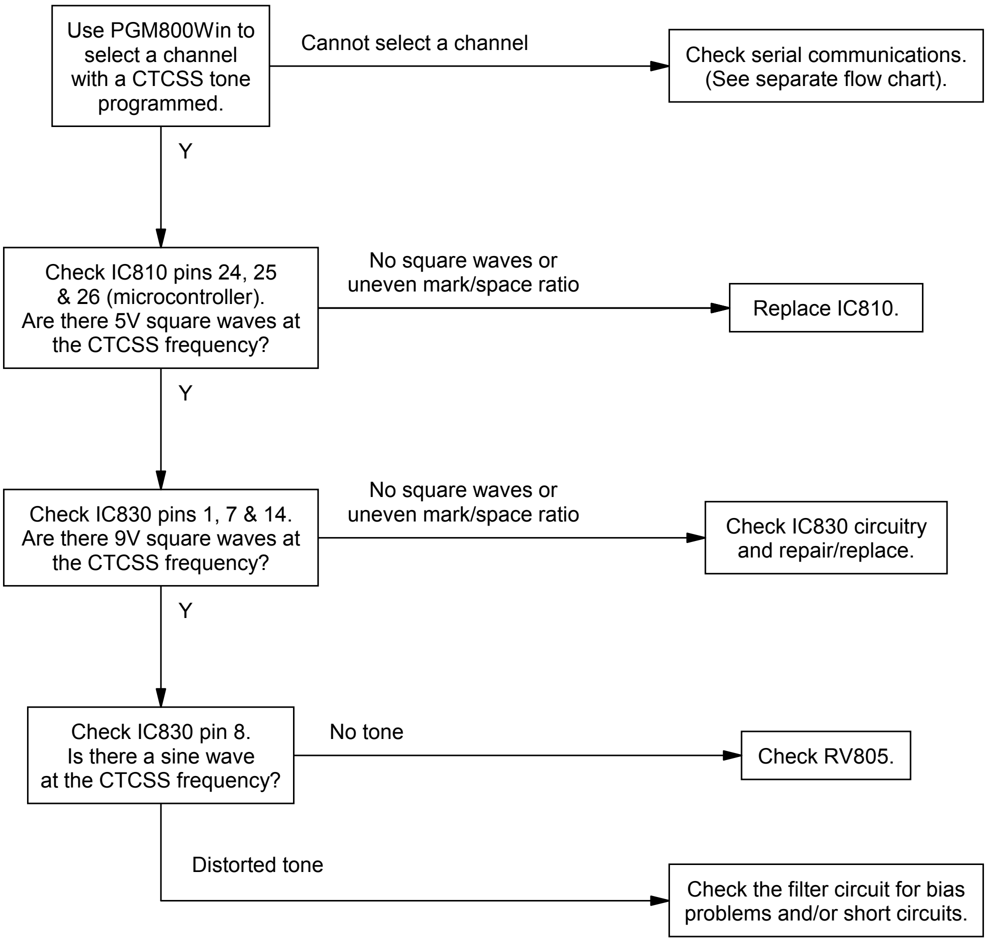
5.7.1.1 Basic Checks



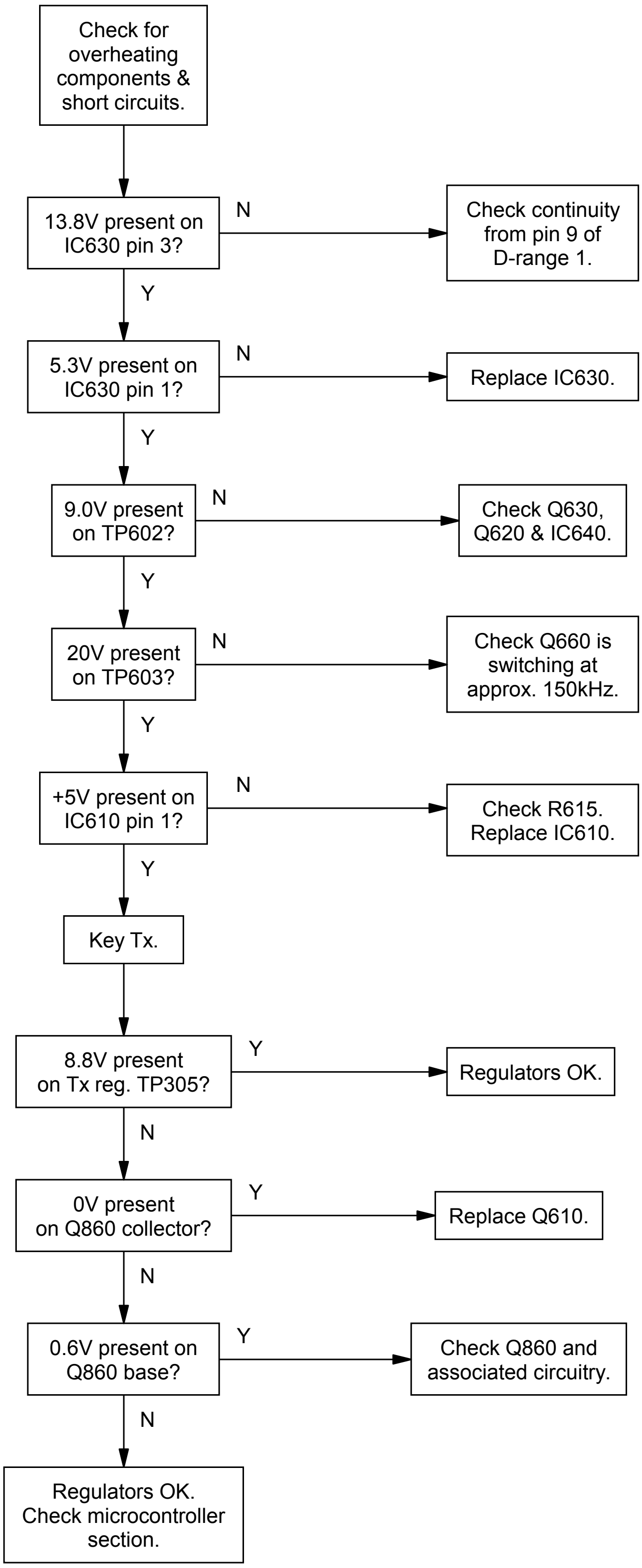
5.7.1.2 Serial Communication



5.7.1.3 CTCSS Encode

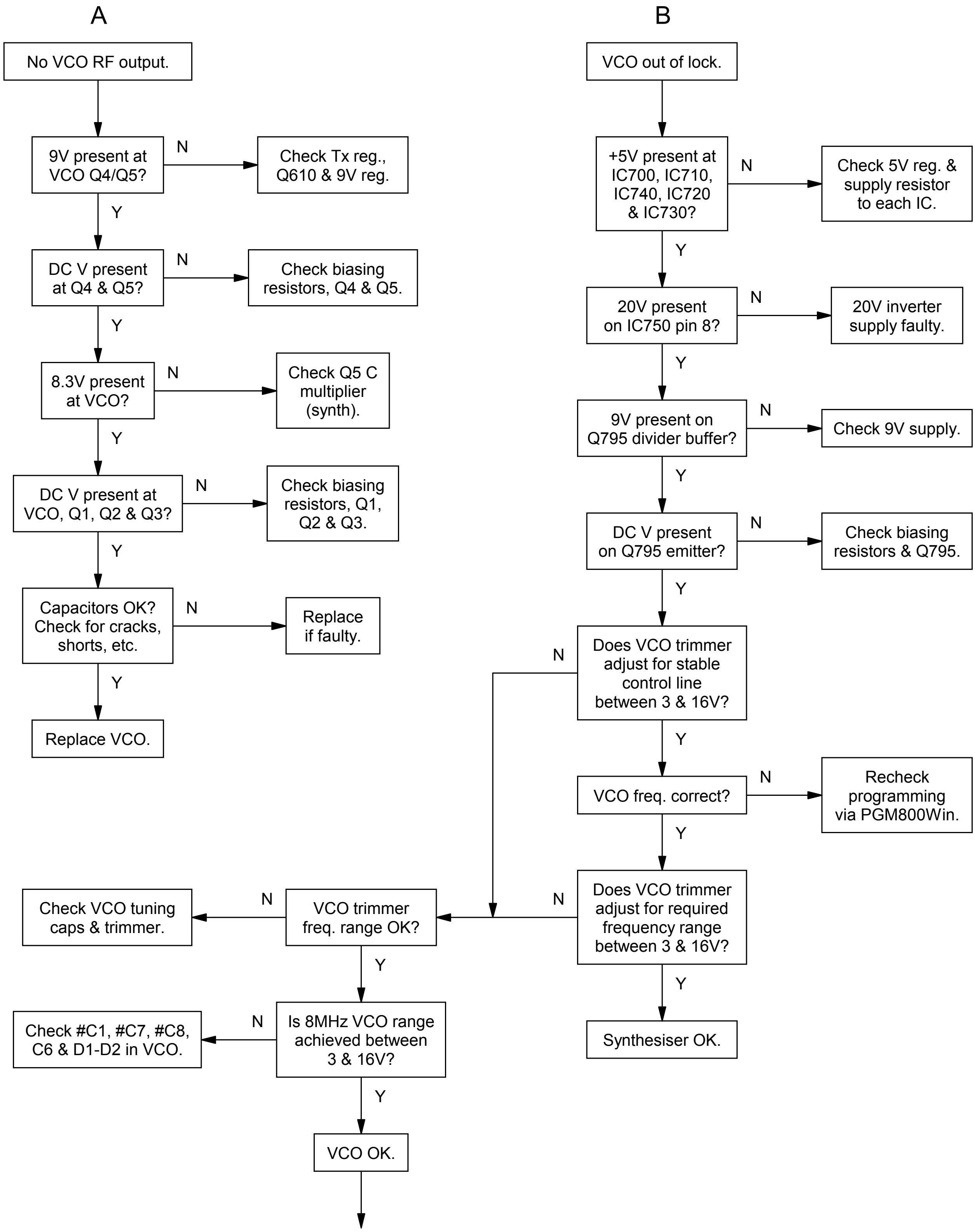


5.7.2 Regulator



5.7.3 Synthesiser

Refer to the synthesiser circuit diagram (sheet 7) in Section 6 and the VCO circuit diagram in Part E.



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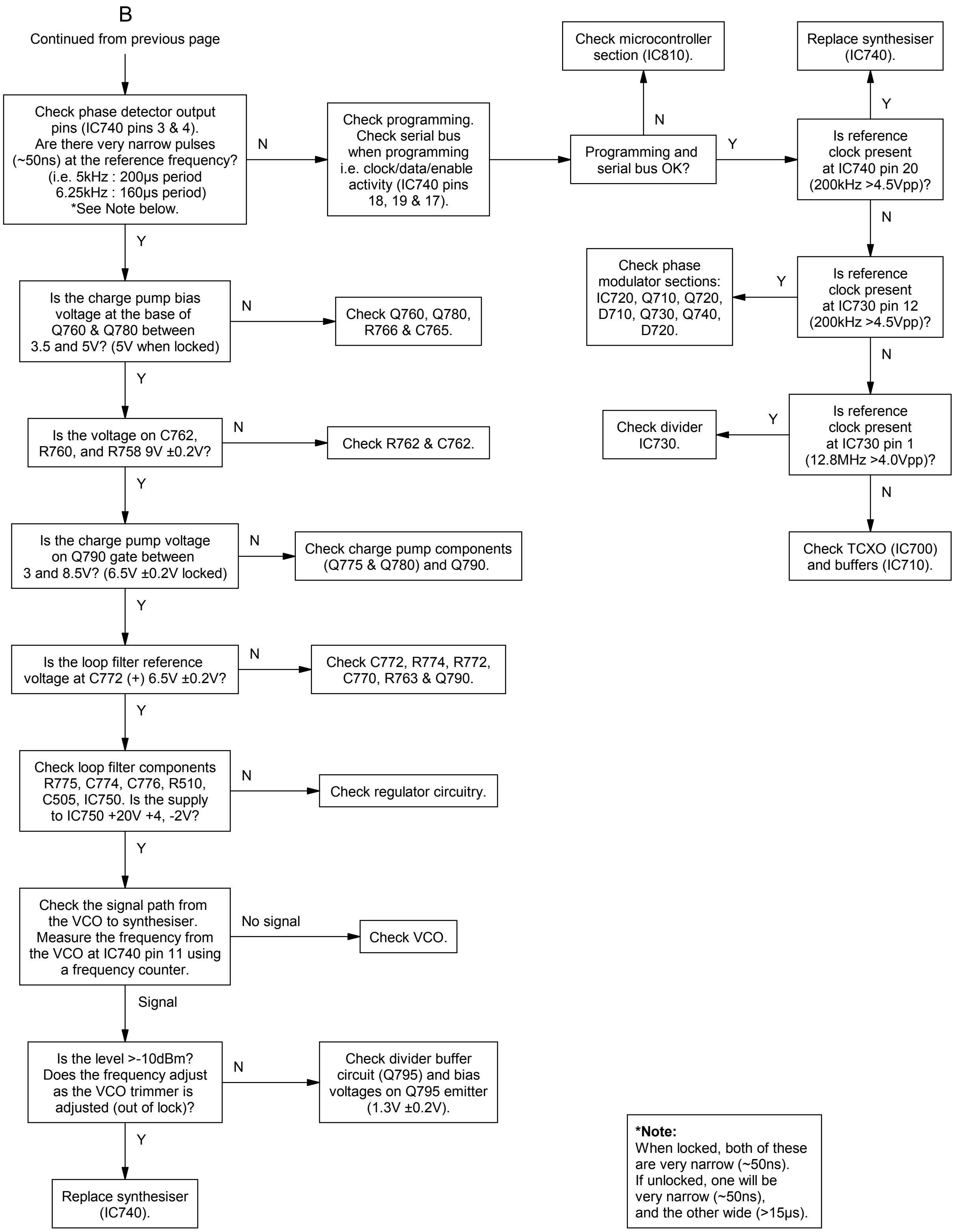
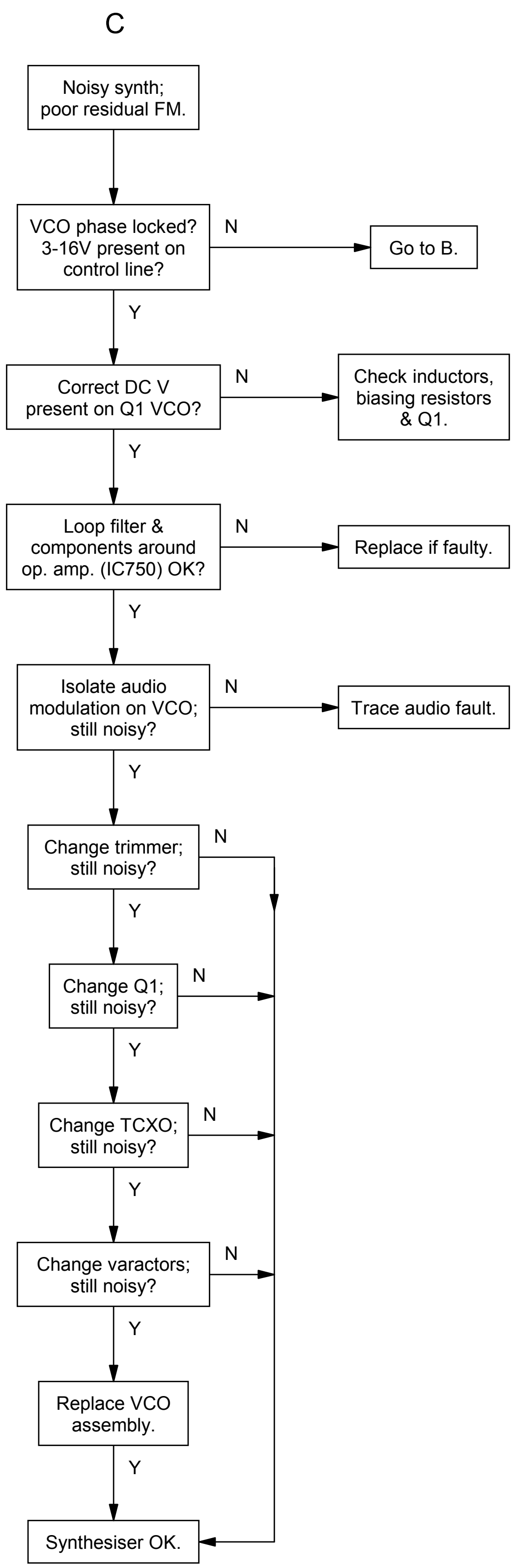
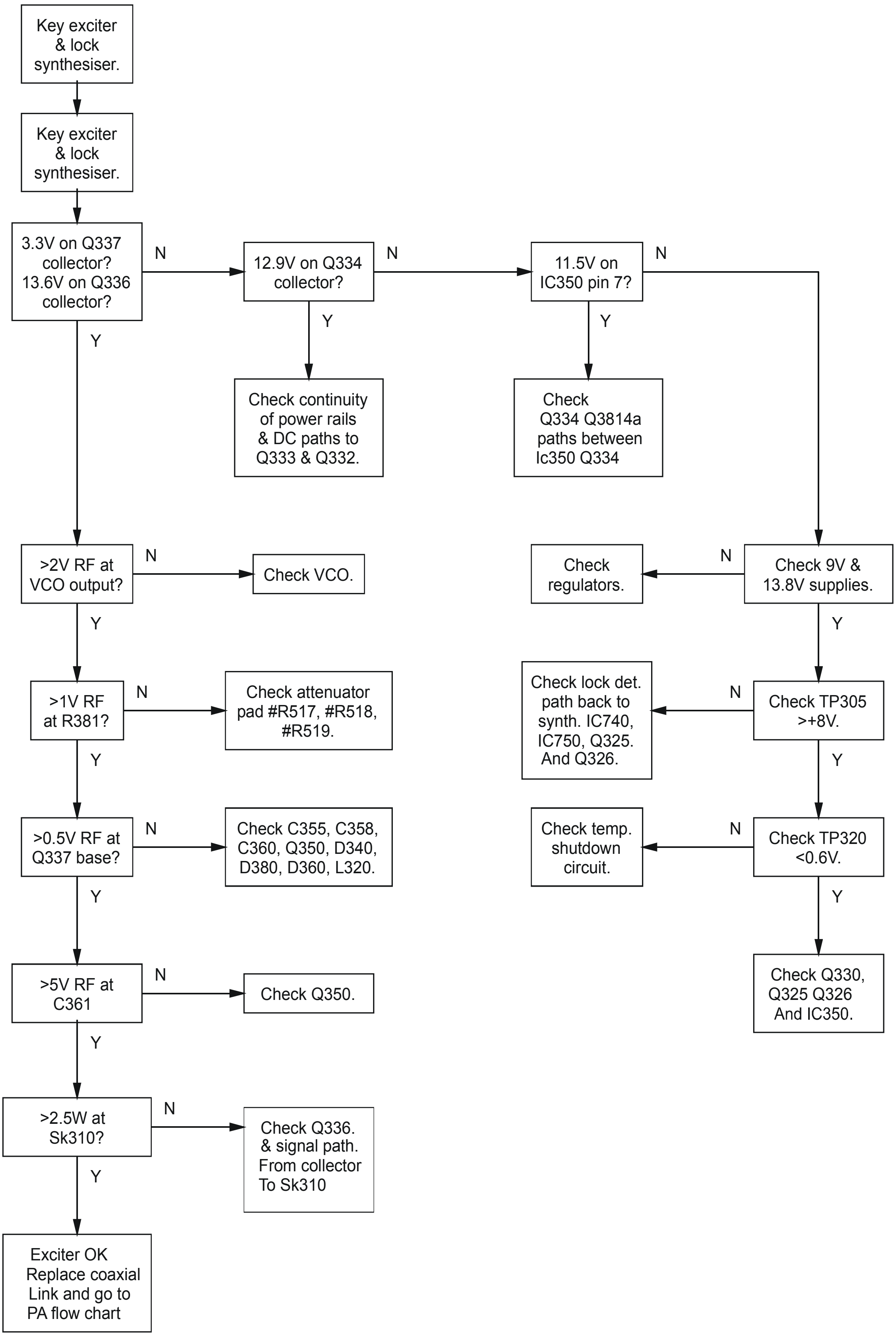

B
Continued from previous page
Check phase detector output pins (IC740 pins 3 & 4). Are there very narrow pulses (~50ns) at the reference frequency? (i.e. 5kHz : 200µs period 6.25kHz : 160µs period) *See Note below.
N
Check programming. Check serial bus when programming i.e. clock/data/enable activity (IC740 pins 18, 19 & 17).
Programming and serial bus OK?
N
Check microcontroller section (IC810).
Y
Is reference clock present at IC740 pin 20 (200kHz >4.5Vpp)?
Y
Replace synthesiser (IC740).
N
Is reference clock present at IC730 pin 12 (200kHz >4.5Vpp)?
Y
Check phase modulator sections: IC720, Q710, Q720, D710, Q730, Q740, D720.
N
Is reference clock present at IC730 pin 1 (12.8MHz >4.0Vpp)?
Y
Check divider IC730.
N
Check TCXO (IC700) and buffers (IC710).
Y
Is the charge pump bias voltage at the base of Q760 & Q780 between 3.5 and 5V? (5V when locked)
N
Check Q760, Q780, R766 & C765.
Y
Is the voltage on C762, R760, and R758 9V ±0.2V?
N
Check R762 & C762.
Y
Is the charge pump voltage on Q790 gate between 3 and 8.5V? (6.5V ±0.2V locked)
N
Check charge pump components (Q775 & Q780) and Q790.
Y
Is the loop filter reference voltage at C772 (+) 6.5V ±0.2V?
N
Check C772, R774, R772, C770, R763 & Q790.
Y
Check loop filter components R775, C774, C776, R510, C505, IC750. Is the supply to IC750 +20V +4, -2V?
N
Check regulator circuitry.
Y
Check the signal path from the VCO to synthesiser. Measure the frequency from the VCO at IC740 pin 11 using a frequency counter.
No signal
Check VCO.
Signal
Is the level >-10dBm? Does the frequency adjust as the VCO trimmer is adjusted (out of lock)?
N
Check divider buffer circuit (Q795) and bias voltages on Q795 emitter (1.3V ±0.2V).
Y
Replace synthesiser (IC740).
*Note:
When locked, both of these are very narrow (~50ns).
If unlocked, one will be very narrow (~50ns), and the other wide (>15µs).


C
Noisy synth; poor residual FM.
VCO phase locked? 3-16V present on control line?
N
Go to B.
Y
Correct DC V present on Q1 VCO?
N
Check inductors, biasing resistors & Q1.
Y
Loop filter & components around op. amp. (IC750) OK?
N
Replace if faulty.
Y
Isolate audio modulation on VCO; still noisy?
N
Trace audio fault.
Y
Change trimmer; still noisy?
N
Y
Change Q1; still noisy?
N
Y
Change TCXO; still noisy?
N
Y
Change varactors; still noisy?
N
Y
Replace VCO assembly.
Y
Synthesiser OK.

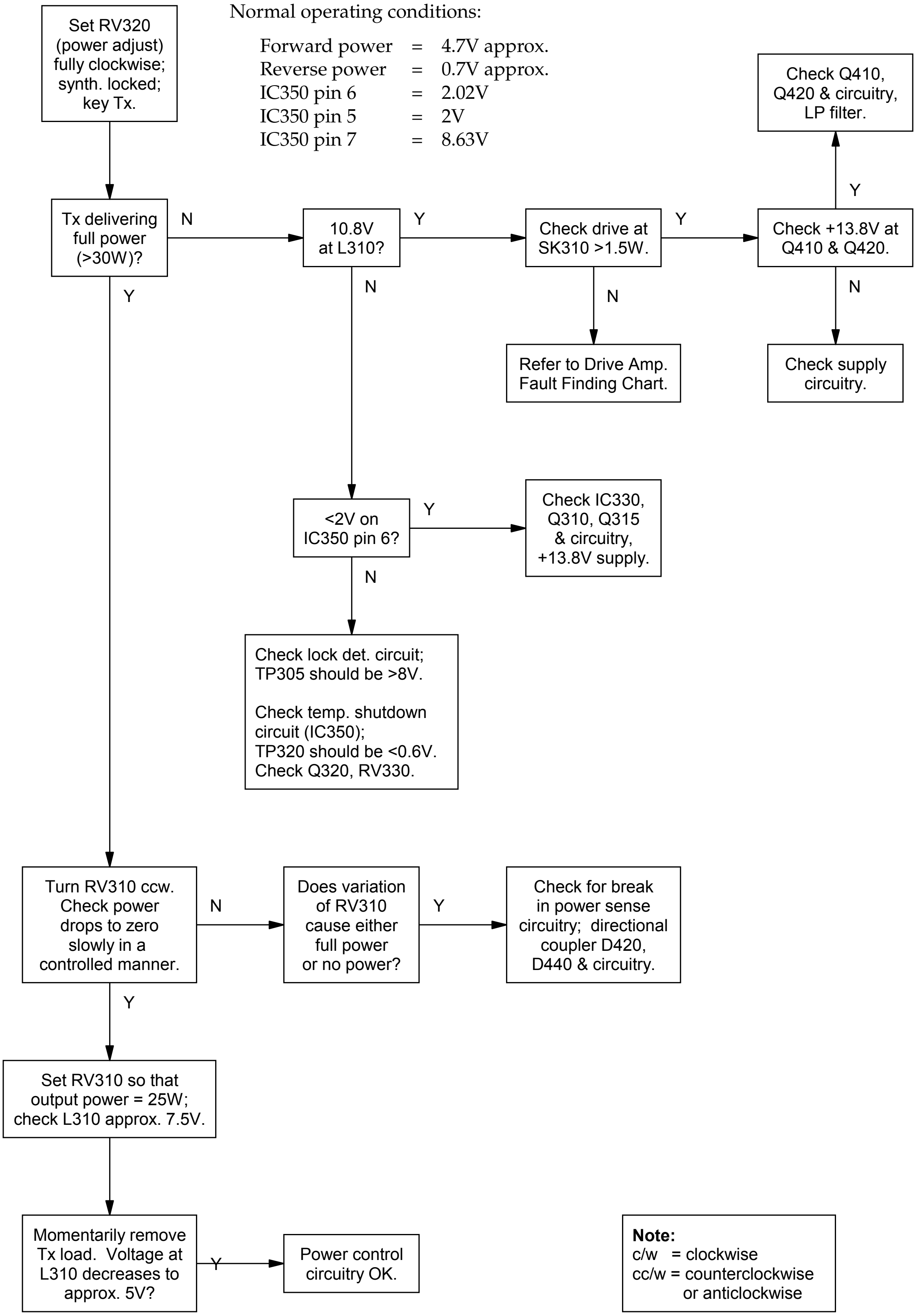
5.7.4 T854 Drive Amplifier



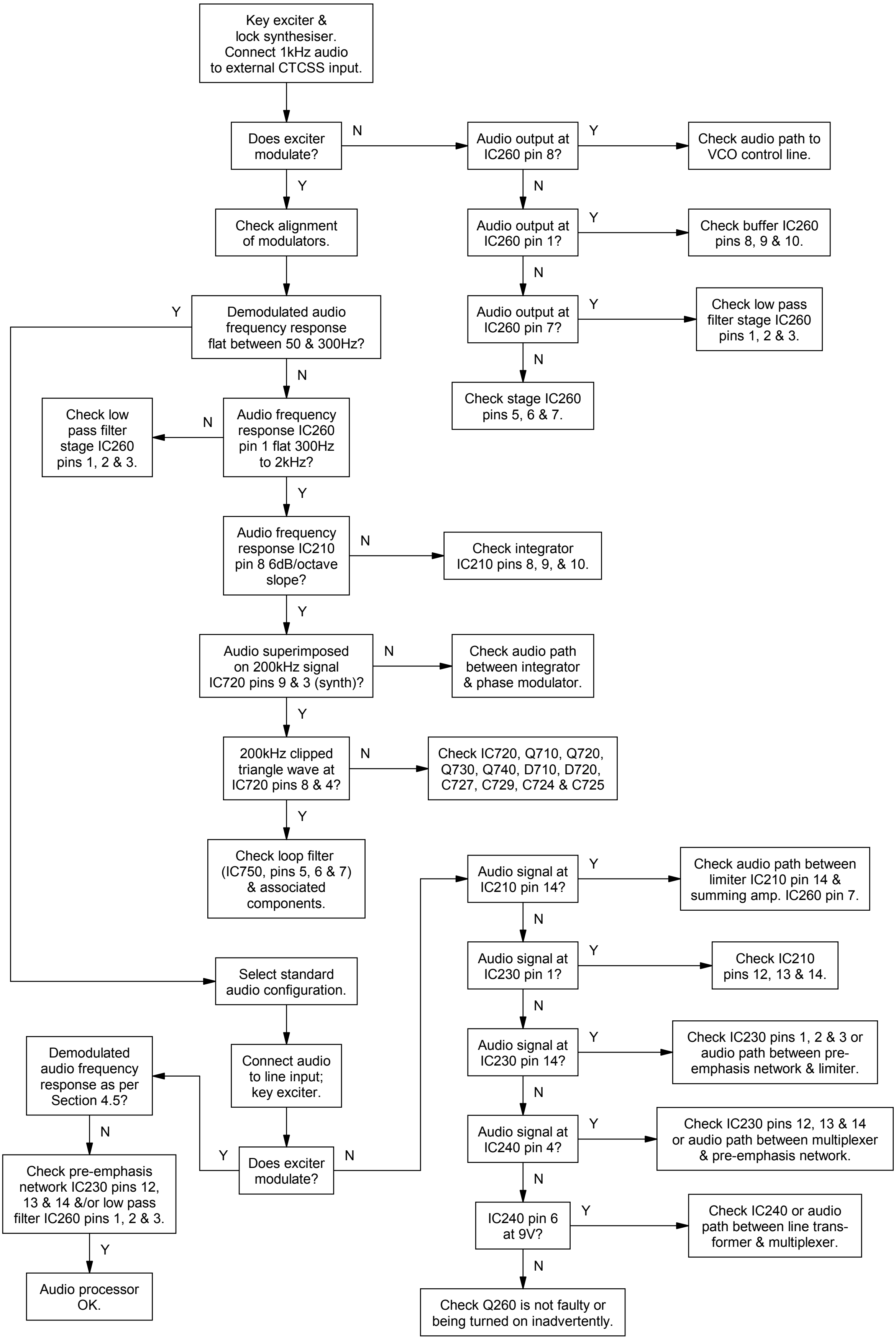
5.7.5 T854 PA and Power Control

Normal operating conditions:

Forward power	=	4.7V approx.
Reverse power	=	0.7V approx.
IC350 pin 6	=	2.02V
IC350 pin 5	=	2V
IC350 pin 7	=	8.63V



5.7.6 Audio Processor



5.8 To Replace The T854 PA Transistors (Q410 and Q420)

Caution: **Failure to comply with the following procedure can result in failure of the device due to poor heatsinking, or worse, can endanger the health of the assembler if the beryllium oxide die carrier is smashed during assembly.**

Caution: **As the location of certain components in the PA is critical to performance, it is important that any components removed or disturbed are refitted in *exactly* the same position.**

Before attempting to remove a transistor, measure the distance between the capacitors and transistor body to the nearest 0.5mm (measurement "A" in Figure 5.2) so that the capacitors can be replaced in *exactly* the same position. These measurements are shown in Figure 5.2 for the 6LFL package, however the same procedure applies for the SOE (stud) package.

Caution: **Do not apply too much heat or pressure to the PCB pads and tracks as you may damage them or lift them from the PCB, causing permanent damage to the transmitter.**

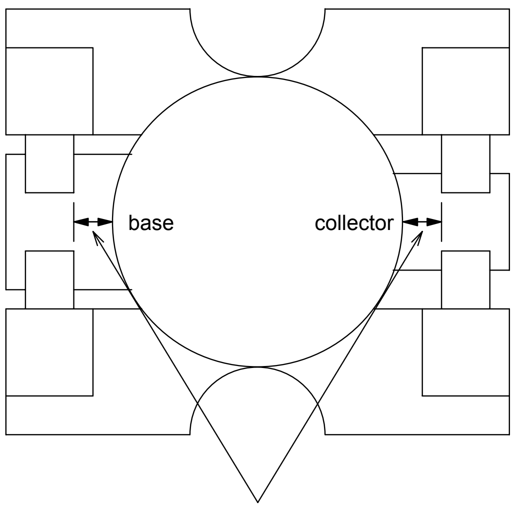


Figure 5.2 Typical Transistor/Capacitor Spacing (Not To Scale)

Desolder and remove the components from around the transistor.

Q420 Only: Desolder and remove the two solder tags.

Desolder the transistor tabs by heating with a soldering iron and lifting away from the PCB with a screwdriver or thin stainless steel spike, then remove the device.

Q410 Only: Unscrew the transistor stud nut and remove the device.

Remove any excess solder from the PCB pads with solder wick.

Trim the tabs of the replacement transistor so that the device sits neatly on the PCB pads provided.

Lightly tin the underside of the transistor tabs. Remove any excess solder to leave a thin, even layer on the tabs.

Apply a small amount of heatsink compound (Dow-Corning 340 or equivalent) to the transistor mounting surface. Sufficient compound should be used to ensure an even film over the entire mounting surface.

Place the transistor on the PCB in the correct orientation and ensure the tabs are flush to the surface.

Q410 Only: Lightly solder one tab to the PCB, then torque down the retaining nut to the correct torque (0.7Nm/6in.lbf.).

Caution: **Do not solder all the tabs before torquing down otherwise the device may be broken.**

Q420 Only: Refit the solder tags.

Solder all transistor tabs to the PCB.

Replace each component in exactly the same position as noted previously.

6 T854 PCB Information

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in** Part A **for more information on anti-static procedures when handling these devices.**

This section provides the following information on the T854 transmitter:

- parts lists
- grid reference indexes
- mechanical assembly drawings
- PCB layouts
- test points and options connections drawings
- circuit diagrams.

6.1 Introduction

Product Type Identification

You can identify the transmitter type by checking the product code printed on a label on the rear of the chassis (product codes are explained in Section 1 of the front matter in this manual, and Figure 1.1 in Part A shows typical labels). You can further verify the product type by checking the placement of an SMD resistor in the table that is screen printed onto the top side of the PCB, similar to the example drawn below. In this example, the resistor indicates that the product was built as a T854-10-XXXX.

854-30
854-35
854-
PRODUCT TYPE

PRODUCT TYPE	
854-10	854-20
854-13	854-23
854-15	854-25

Note: The only function of this resistor is to indicate the product type. It has no effect on the circuitry or operation of the transmitter.

PCB Identification

All PCBs are identified by a unique 10 digit “internal part number” (IPN), e.g. 220-01390-02, which is screen printed onto the PCB (usually on the top side), as shown in the example below:

The last 2 digits of this number define the issue status, which starts at 00 and increments through 01, 02, 03, etc. as the PCB is updated. Some issue PCBs never reach full production status and are therefore not included in this manual. A letter following the 10 digit IPN has no relevance in identifying the PCB for service purposes.

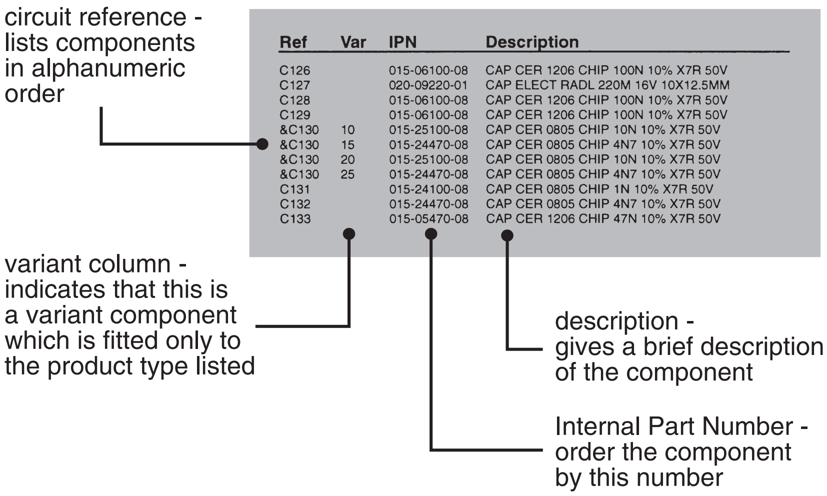
Note: It is important that you identify which issue PCB you are working on so that you can refer to the appropriate set of PCB information.

Parts Lists

The 10 digit numbers (000-00000-00) in this Parts List are “internal part numbers” (IPNs). We can process your spare parts orders more efficiently and accurately if you quote the IPN and provide a brief description of the part.

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns, as shown below:



The miscellaneous and mechanical section lists the variant and common parts in IPN order.

Variant Components

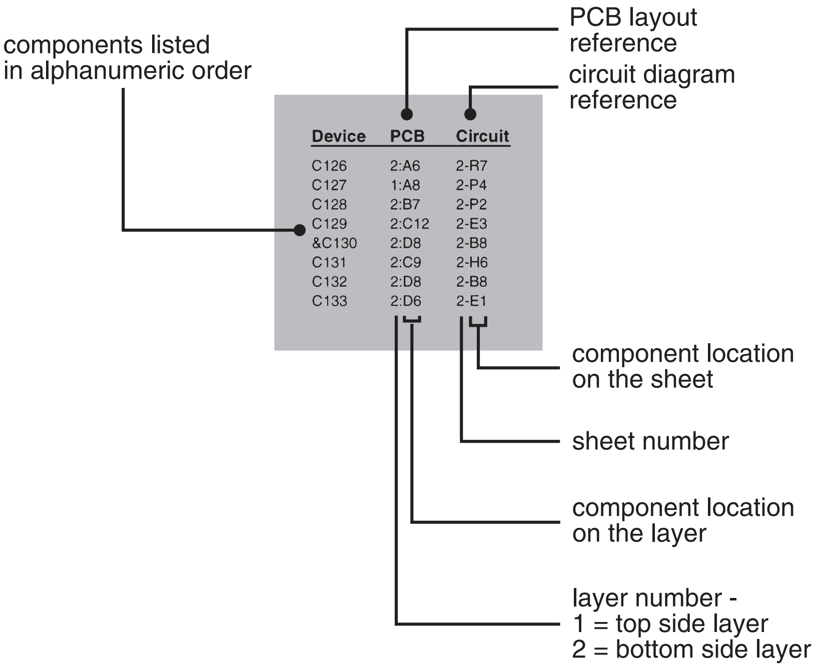
A variant component is one that has the same circuit reference but different value or specification in different product types. Where two products share the same PCB, the term “variant” is also used to describe components unplaced in one product. Variant components have a character prefix, such as “&”, “=” or “#”, before the circuit reference (e.g. &R100).

The table below explains the variant prefixes used in T800 SL2 products:

If the variant prefix is. . .	the component will. . .
&	change according to channel spacing
=	change according to frequency stability
#	change according to frequency range
%	change or be placed/unplaced for special applications
*	be unplaced in one product (where two products share the same PCB)

Grid Reference Index

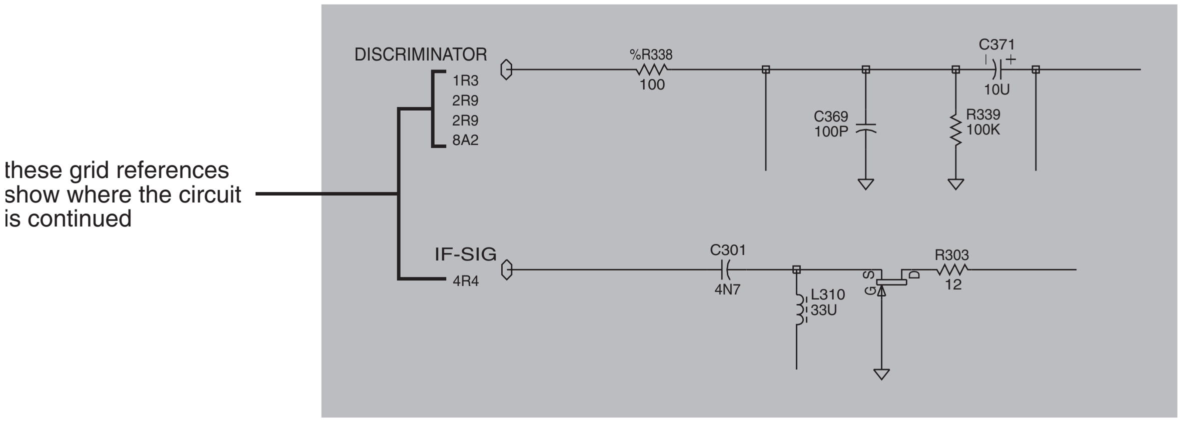
This section contains a component grid reference index to help you find components and labelled pads on the PCB layouts and circuit diagrams. This index lists the components and pads in alpha-numeric order, along with the appropriate alphanumeric grid references, as shown below:



Using CAD Circuit Diagrams

Reading a CAD circuit diagram is similar to reading a road map, in that both have an alphanumeric border. The circuit diagrams in this manual use letters to represent the horizontal axis, and numbers for the vertical axis. These circuit diagram “grid references” are useful in following a circuit that is spread over two or more sheets.

When a line representing part of the circuitry is discontinued, a reference will be given at the end of the line to indicate where the rest of the circuitry is located, as shown below. The first digit refers to the sheet number and the last two characters refer to the location on that sheet of the continuation of the circuit (e.g. 1R3).



6.2 T854 Transmitter PCB

This section contains the following information.

T854 Parts List (IPN 220-01686-03)

How To Use This Parts List

The components listed in this parts list are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns: the circuit reference, variant (if applicable), IPN and description. A number in the variant column indicates that this is a variant component which is fitted only to the product type listed.

This parts list is correct at the time of publishing, but is subject to change without notification. An up to date parts list can be obtained from your local Customer Service Organisation

Ref	Var	IPN	Description
C100			015-23150-01CAP CER 0805 150P 5% NPO 50V
C101			016-08470-01CAP ELEC SMD 47UF 6*4 16V
C102			016-08470-01CAP ELEC SMD 47UF 6*4 16V
C103			015-24100-08CAP CER 0805 1N 10% X7R 50V
C201			016-07470-06CAP ELEC SMD BI-P 4U7 50V 20%
C202			016-07470-06CAP ELEC SMD BI-P 4U7 50V 20%
%C203A			015-25150-08CAP CER 0805 15N 10% X7R 50V
%C203B			015-25150-08CAP CER 0805 15N 10% X7R 50V
C207			014-07470-01CAP TANT SMD 4U7 25V 10% B
C209			015-25470-08CAP CER 0805 47N 10% X7R 50V
C210			015-26100-08CAP CER 0805 100N 10% X7R 50V
C211			015-26100-08CAP CER 0805 100N 10% X7R 50V
C213			014-08100-00CAP TANT SMD 10U 16V 20% 267C
C215			014-08220-01CAP TANT SMD 22U 10V 10% C
C217			015-24220-08CAP CER 0805 2N2 10% X7R 50V
C219			015-24100-08CAP CER 0805 1N 10% X7R 50V
C221		014-08220-01	CAP TANT SMD 22U 10V 10% C
C223		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C225		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C227		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C229		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C230		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C232		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C233		016-08470-01	CAP ELEC SMD 47UF 6*4 16V
C235		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C237		014-07100-02	CAP TANT SMD 1U0 16V 20% A
C239		016-07470-06	CAP ELEC SMD BI-P 4U7 50V 20%
C240		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C241		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C242		014-08100-00	CAP TANT SMD 10U 16V 20% 267C
C243		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C245		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C247		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C249		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C251		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C253		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C255		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C257		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C259		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C260		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C261		014-07470-01	CAP TANT SMD 4U7 25V 10% B
C263		016-09100-05	CAP ELEC SMD 100U 25V 20%
%C265		016-07470-06	CAP ELEC SMD BI-P 4U7 50V 20%
C267		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C269	10	015-21150-01	CAP CER 0805 1P5+-0.25 NPO 50V
&C269	13	015-21150-01	CAP CER 0805 1P5+-0.25 NPO 50V
&C269	15	015-21470-01	CAP CER 0805 4P7+-0.25 NPO 50V
&C269	16	015-21470-01	CAP CER 0805 4P7+-0.25 NPO 50V
&C269	20	015-21150-01	CAP CER 0805 1P5+-0.25 NPO 50V
&C269	23	015-21150-01	CAP CER 0805 1P5+-0.25 NPO 50V
&C269	25	015-21470-01	CAP CER 0805 4P7+-0.25 NPO 50V
&C269	26	015-21470-01	CAP CER 0805 4P7+-0.25 NPO 50V
&C269	30	015-21150-01	CAP CER 0805 1P5+-0.25 NPO 50V
&C269	35	015-21470-01	CAP CER 0805 4P7+-0.25 NPO 50V
&C269	36	015-21470-01	CAP CER 0805 4P7+-0.25 NPO 50V
&C271	10	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C271	13	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C271	15	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C271	16	015-22560-01	CAP CER 0805 56P 5% NPO 50V
&C271	20	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C271	23	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C271	25	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C271	26	015-22560-01	CAP CER 0805 56P 5% NPO 50V
&C271	30	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C271	35	015-22470-01	CAP CER 0805 56P 5% NPO 50V
&C271	36	015-22560-01	CAP CER 0805 47P 5% NPO 50V
C273		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C275		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C277		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C279		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C281		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C283		015-21470-05	CAP CER 0805 4P7+-0.1PF 200V
C285		015-21470-05	CAP CER 0805 4P7+-0.1PF 200V
C287		016-09100-05	CAP ELEC SMD 100U 25V 20%
&C289	10	015-25470-08	CAP CER 0805 47N 10% X7R 50V
&C289	13	015-25470-08	CAP CER 0805 47N 10% X7R 50V
&C289	15	015-25470-08	CAP CER 0805 47N 10% X7R 50V
&C289	16	015-26100-08	CAP CER 0805 100N 10% X7R 50V
&C289	20	015-25470-08	CAP CER 0805 47N 10% X7R 50V
&C289	23	015-25470-08	CAP CER 0805 47N 10% X7R 50V
&C289	25	015-25470-08	CAP CER 0805 47N 10% X7R 50V
&C289	26	015-26100-08	CAP CER 0805 100N 10% X7R 50V
&C289	30	015-25470-08	CAP CER 0805 47N 10% X7R 50V
&C289	35	015-25470-08	CAP CER 0805 47N 10% X7R 50V
&C289	36	015-26100-08	CAP CER 0805 100N 10% X7R 50V
C291		014-08220-01	CAP TANT SMD 22U 10V 10% C
C293		015-27100-10	CAP CER 0805 1M+80-20% Y5V 16V
%C294		015-22470-01	CAP CER 0805 47P 5% NPO 50V
%C295		013-06470-00	CAP SMD POLY 470N 63V 10%
C300		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C301		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C302		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C303		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C305		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C306		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C307		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C311		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C313		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C315		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C316		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C319		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C325		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C327		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C330A		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C330B		016-07100-01	CAP ELEC SMD 1M 6*4 20% 50V
C331		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C332		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C333		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C334		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C335		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C337		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C338		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C339		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C340A		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C340B		016-07100-01	CAP ELEC SMD 1M 6*4 20% 50V
C341		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C342		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C343		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C344		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C345		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C346		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C347		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C348		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C349		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C350A		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C350B		016-07100-01	CAP ELEC SMD 1M 6*4 20% 50V
C351		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C352		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C353		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C354		015-22220-01	CAP CER 0805 22P 5% NPO 50V
C355		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C356		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C361		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C362		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C364		015-22120-01	CAP CER 0805 12P 5% NPO 50V
C365	10	015-22330-01	CAP CER 0805 33P 5% NPO 50V
C365	13	015-22330-01	CAP CER 0805 33P 5% NPO 50V
C365	15	015-22330-01	CAP CER 0805 33P 5% NPO 50V
C365	16	015-22330-01	CAP CER 0805 33P 5% NPO 50V
C365	20	015-22330-01	CAP CER 0805 33P 5% NPO 50V
C365	23	015-22330-01	CAP CER 0805 33P 5% NPO 50V
C365	25	015-22330-01	CAP CER 0805 33P 5% NPO 50V
C365	26	015-22330-01	CAP CER 0805 33P 5% NPO 50V
C365	30	015-22270-01	CAP CER 0805 27P 5% NPO 50V
C365	35	015-22270-01	CAP CER 0805 27P 5% NPO 50V
C365	36	015-22270-01	CAP CER 0805 27P 5% NPO 50V
C367		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C368		015-21470-05	CAP CER 0805 4P7+-0.1PF 200V
C370A		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C370B		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C370C		014-07470-01	CAP TANT SMD 4U7 25V 10% B
C371		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C372		014-07470-01	CAP TANT SMD 4U7 25V 10% B
C373		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C374		015-02330-06	CAP CER 1210 33P NPO 500V
C375		015-02330-06	CAP CER 1210 33P NPO 500V

Ref	Var	IPN	Description
C376		015-22220-01	CAP CER 0805 22P 5% NPO 50V
C377		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C378	10	015-22120-01	CAP CER 0805 12P 5% NPO 50V
C378	13	015-22120-01	CAP CER 0805 12P 5% NPO 50V
C378	15	015-22120-01	CAP CER 0805 12P 5% NPO 50V
C378	16	015-22120-01	CAP CER 0805 12P 5% NPO 50V
C378	20	015-22120-01	CAP CER 0805 12P 5% NPO 50V
C378	23	015-22120-01	CAP CER 0805 12P 5% NPO 50V
C378	25	015-22120-01	CAP CER 0805 12P 5% NPO 50V
C378	26	015-22120-01	CAP CER 0805 12P 5% NPO 50V
C378	30	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
C378	35	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
C378	36	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
C380		015-22680-01	CAP CER 0805 68P 5% NPO 50V
C381		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C382		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C383		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C384		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C385		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C386		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C387		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C388		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C389		015-23150-01	CAP CER 0805 100N 10% X7R 50V
C391		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C392		015-23150-05	CAP 0805 150P 1% 200V GRM40
C393		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C405	10	015-22120-01	CAP 0805 12P 5% NPO 50V
C405	13	015-22120-01	CAP 0805 12P 5% NPO 50V
C405	15	015-22120-01	CAP 0805 12P 5% NPO 50V
C405	16	015-22120-01	CAP 0805 12P 5% NPO 50V
C405	20	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
C405	23	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
C405	25	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
C405	26	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
C405	30	015-21680-02	CAP 0805 6P8 0.1 NPO 50V
C405	35	015-21680-02	CAP 0805 6P8 0.1 NPO 50V
C405	36	015-21680-02	CAP 0805 6P8 0.1 NPO 50V
#C410	10	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C410	13	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C410	15	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C410	16	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C410	20	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C410	23	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C410	25	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C410	26	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C410	30	029-02240-02	CAP MICA 5MM CASE 24P 5%
#C410	35	029-02240-02	CAP MICA 5MM CASE 24P 5%
#C410	36	029-02240-02	CAP MICA 5MM CASE 24P 5%
C415	10	029-02330-02	CAP MICA 5MM CASE 33P 5%
C415	13	029-02330-02	CAP MICA 5MM CASE 33P 5%
C415	15	029-02330-02	CAP MICA 5MM CASE 33P 5%
C415	16	029-02330-02	CAP MICA 5MM CASE 33P 5%
C415	20	029-02330-02	CAP MICA 5MM CASE 33P 5%
C415	23	029-02330-02	CAP MICA 5MM CASE 33P 5%
C415	25	029-02330-02	CAP MICA 5MM CASE 33P 5%
C415	26	029-02330-02	CAP MICA 5MM CASE 33P 5%
C415	30	029-02240-02	CAP MICA 5MM CASE 24P 5%
C415	35	029-02240-02	CAP MICA 5MM CASE 24P 5%
C415	36	029-02240-02	CAP MICA 5MM CASE 24P 5%
C418		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C419		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C420		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C421		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C430		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C435		016-08470-01	CAP ELEC SMD 47UF 6*4 16V
C438		029-02680-02	CAP MICA 5MM CASE 68P 5%
#C439	10	015-04100-06	CAP CER 1210 1NF NPO200V GRM42
#C439	13	015-04100-06	CAP CER 1210 1NF NPO200V GRM42
#C439	15	015-04100-06	CAP CER 1210 1NF NPO200V GRM42
#C439	16	015-04100-06	CAP CER 1210 1NF NPO200V GRM42
#C439	20	not fitted	
#C439	23	not fitted	
#C439	25	not fitted	
#C439	26	not fitted	
#C439	30	not fitted	
#C439	35	not fitted	
#C439	36	not fitted	
#C440	10	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C440	13	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C440	15	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C440	16	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C440	20	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C440	23	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C440	25	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C440	26	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C440	30	029-02330-02	CAP MICA 5MM CASE 33P 5%
#C440	35	029-02330-02	CAP MICA 5MM CASE 33P 5%
#C440	36	029-02330-02	CAP MICA 5MM CASE 33P 5%
#C445	10	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C445	13	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C445	15	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C445	16	029-02390-02	CAP MICA 5MM CASE 39P 5%
#C445	20	029-02330-02	CAP MICA 5MM CASE 33P 5%
#C445	23	029-02330-02	CAP MICA 5MM CASE 33P 5%
#C445	25	029-02330-02	CAP MICA 5MM CASE 33P 5%
#C445	26	029-02330-02	CAP MICA 5MM CASE 33P 5%
#C445	30	029-02330-02	CAP MICA 5MM CASE 33P 5%
#C445	35	029-02330-02	CAP MICA 5MM CASE 33P 5%
#C445	36	029-02330-02	CAP MICA 5MM CASE 33P 5%
C450		015-03100-02	CAP CER 1210 100P NPO5%200VHIQ
C455		016-07470-04	CAP ELEC SMD 4U7 50V 20%
#C460	10	029-02220-02	CAP MICA 5MM CASE 22P 5%
#C460	13	029-02220-02	CAP MICA 5MM CASE 22P 5%
#C460	15	029-02220-02	CAP MICA 5MM CASE 22P 5%
#C460	16	029-02220-02	CAP MICA 5MM CASE 22P 5%
#C460	20	029-02270-02	CAP MICA 5MM CASE 27P 5%
#C460	23	029-02270-02	CAP MICA 5MM CASE 27P 5%
#C460	25	029-02270-02	CAP MICA 5MM CASE 27P 5%
#C460	26	029-02270-02	CAP MICA 5MM CASE 27P 5%
#C460	30	029-02220-02	CAP MICA 5MM CASE 22P 5%
#C460	35	029-02220-02	CAP MICA 5MM CASE 22P 5%
#C460	36	029-02220-02	CAP MICA 5MM CASE 22P 5%
#C465	10	029-02220-02	CAP MICA 5MM CASE 22P 5%
#C465	13	029-02220-02	CAP MICA 5MM CASE 22P 5%
#C465	15	029-02220-02	CAP MICA 5MM CASE 22P 5%
#C465	16	029-02220-02	CAP MICA 5MM CASE 22P 5%
#C465	20	029-02270-02	CAP MICA 5MM CASE 27P 5%
#C465	23	029-02270-02	CAP MICA 5MM CASE 27P 5%
#C465	25	029-02270-02	CAP MICA 5MM CASE 27P 5%
#C465	26	029-02270-02	CAP MICA 5MM CASE 27P 5%
#C465	30	029-02220-02	CAP MICA 5MM CASE 22P 5%
#C465	35	029-02220-02	CAP MICA 5MM CASE 22P 5%
#C465	36	029-02220-02	CAP MICA 5MM CASE 22P 5%
C470		015-03100-03	CAP CER 100P 5% 500VHIQ GRM111
#C480	10	not fitted	
#C480	13	not fitted	
#C480	15	not fitted	
#C480	16	not fitted	
#C480	20	015-01470-02	CAP CER 1210 4P7 NPO5% 200VHIQ
#C480	23	015-01470-02	CAP CER 1210 4P7 NPO5% 200VHIQ
#C480	25	015-01470-02	CAP CER 1210 4P7 NPO5% 200VHIQ
#C480	26	015-01470-02	CAP CER 1210 4P7 NPO5% 200VHIQ
#C480	30	015-01470-02	CAP CER 1210 4P7 NPO5% 200VHIQ
#C480	35	015-01470-02	CAP CER 1210 4P7 NPO5% 200VHIQ
#C480	36	015-01470-02	CAP CER 1210 4P7 NPO5% 200VHIQ
C481		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C485		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C490		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C493		015-03100-03	CAP CER 100P 5% 500VHIQ GRM111
C496		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C499		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C503		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C504		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C505		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C507		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C508		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C509		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C510		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C511		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C512		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C513		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C514		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C515		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C516		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C517		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C518		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C519		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C525		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C530		014-08220-01	CAP TANT SMD 22U 10V 10% C
C535		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C536		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C537		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C605		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C607		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C608		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C610A		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C610B		014-09100-00	CAP TANT SMD 100U 16V 20% E
C611A		014-09100-00	CAP TANT SMD 100U 16V 20% E
C611B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C623		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C625		020-09470-07	CAP ELEC RDL 470M 16V 20%
C626		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C628		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C630		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C631A		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C634		014-08100-00	CAP TANT SMD 10U 16V 20% 267C
C636		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C638		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C640		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C655		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C660		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C665		014-08100-03	CAP TANT SMD 10U 35V 20% D
C670		014-07330-10	CAP TANT SMD 3U3 35V 10% C
C673		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C677		014-07100-02	CAP TANT SMD 1U0 16V 20% A
C681		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C684		014-08100-00	CAP TANT SMD 10U 16V 20% 267C
C687		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C690		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C693		014-08100-00	CAP TANT SMD 10U 16V 20% 267C
C700		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C703		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C706		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C708		014-07470-01	CAP TANT SMD 4U7 25V 10% B
C709		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C710		015-25100-08	CAP CER 0805 10N 10% X7R 50V

Ref	Var	IPN	Description
C711		015-21820-02	CAP 0805 8P2 0.1 NPO 50V
C712		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C714		014-07470-01	CAP TANT SMD 4U7 25V 10% B
C719		014-07470-01	CAP TANT SMD 4U7 25V 10% B
C720		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C722		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C724		014-08220-01	CAP TANT SMD 22U 10V 10% C
C725		014-08220-01	CAP TANT SMD 22U 10V 10% C
C726		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C727		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C729		015-23100-01	CAP CER 0805 100P 5% NPO 50V
%C733		015-23470-08	CAP CER 0805 470P 10% X7R 50V
C735		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C736		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C740A		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C740B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C741A		014-07470-01	CAP TANT SMD 4U7 25V 10% B
C741B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C742A		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C742B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C743		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C745		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C750		014-08100-03	CAP TANT SMD 10U 35V 20% D
C757		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C759		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C761		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C762		014-08220-01	CAP TANT SMD 22U 10V 10% C
C764		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C765		014-07470-01	CAP TANT SMD 4U7 25V 10% B
C767		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C769		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C770		014-08220-01	CAP TANT SMD 22U 10V 10% C
C772		014-08220-01	CAP TANT SMD 22U 10V 10% C
C774		013-06100-10	CAP SMD PPS 100N 50VDC 10%
C776		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C782		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C784		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C785		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C786		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C788		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C790		015-21820-02	CAP 0805 8P2 0.1 NPO 50V
C792		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C810		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C812		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C813		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C822		014-07470-01	CAP TANT SMD 4U7 25V 10% B
C823		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C824		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C826		015-23220-01	CAP CER 0805 220P 5% NPO 50V
C827		015-22330-01	CAP CER 0805 33P 5% NPO 50V
C828		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C830		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C838		014-09100-00	CAP TANT SMD 100U 16V 20% E
C841		014-09100-00	CAP TANT SMD 100U 16V 20% E
C844		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C880		015-23150-01	CAP CER 0805 150P 5% NPO 50V
#C900	10	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C900	13	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C900	15	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C900	16	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C900	20	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C900	23	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C900	25	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C900	26	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C900	30	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C900	35	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C900	36	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C910	10	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C910	13	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C910	15	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C910	16	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C910	20	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C910	23	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C910	25	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C910	26	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C910	30	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C910	35	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C910	36	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C920	10	015-01470-06	CAP CER 1210 4P7 NPO 500VGRM42
#C920	13	015-01470-06	CAP CER 1210 4P7 NPO 500VGRM42
#C920	15	015-01470-06	CAP CER 1210 4P7 NPO 500VGRM42
#C920	16	015-01470-06	CAP CER 1210 4P7 NPO 500VGRM42
#C920	20	015-01330-06	CAP CER 1210 3P3 NPO500VGRM42
#C920	23	015-01330-06	CAP CER 1210 3P3 NPO500VGRM42
#C920	25	015-01330-06	CAP CER 1210 3P3 NPO500VGRM42
#C920	26	015-01330-06	CAP CER 1210 3P3 NPO500VGRM42
#C920	30	015-01330-06	CAP CER 1210 3P3 NPO500VGRM42
#C920	35	015-01330-06	CAP CER 1210 3P3 NPO500VGRM42
#C920	36	015-01330-06	CAP CER 1210 3P3 NPO500VGRM42
#C940	10	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C940	13	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C940	15	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C940	16	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C940	20	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C940	23	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C940	25	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C940	26	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C940	30	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C940	35	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C940	36	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C950	10	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C950	13	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C950	15	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C950	16	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C950	20	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C950	23	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C950	25	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C950	26	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C950	30	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C950	35	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C950	36	015-01560-06	CAP CER 1210 5P6 NPO 500VGRM42
#C970	10	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C970	13	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C970	15	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C970	16	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C970	20	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C970	23	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C970	25	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C970	26	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C970	30	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C970	35	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C970	36	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C980	10	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C980	13	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C980	15	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C980	16	015-01470-06	CAP CER 1210 4P7 NPO500VGRM42
#C980	20	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C980	23	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C980	25	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C980	26	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C980	30	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C980	35	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C980	36	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C990	10	015-01330-06	CAP CER 1210 3P3 NPO 500VGRM42
#C990	13	015-01330-06	CAP CER 1210 3P3 NPO 500VGRM42
#C990	15	015-01330-06	CAP CER 1210 3P3 NPO 500VGRM42
#C990	16	015-01330-06	CAP CER 1210 3P3 NPO 500VGRM42
#C990	20	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C990	23	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C990	25	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C990	26	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C990	30	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C990	35	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#C990	36	015-01390-06	CAP CER 1210 3P9 NPO 500VGRM42
#CV475	10	028-02160-00	CAP TRIM VERT 1.9P~16.1P
#CV475	13	028-02160-00	CAP TRIM VERT 1.9P~16.1P
#CV475	15	028-02160-00	CAP TRIM VERT 1.9P~16.1P
#CV475	16	028-02160-00	CAP TRIM VERT 1.9P~16.1P
#CV475	20	028-02100-11	CAP TRIM VERT 1.6P~11.4P
#CV475	23	028-02100-11	CAP TRIM VERT 1.6P~11.4P
#CV475	25	028-02100-11	CAP TRIM VERT 1.6P~11.4P
#CV475	26	028-02100-11	CAP TRIM VERT 1.6P~11.4P
#CV475	30	028-02100-11	CAP TRIM VERT 1.6P~11.4P
#CV475	35	028-02100-11	CAP TRIM VERT 1.6P~11.4P
#CV475	36	028-02100-11	CAP TRIM VERT 1.6P~11.4P
D111		001-10015-50	DIODE SMD 1.5SMC22AT3 TVS/ZEN
D211		008-00014-80	LED 3MM GRN W/WIRE
D212		008-00014-79	LED 3MM RED W/WIRE
D220		001-10000-99	DIODE SMD BAV99 D-SW SOT23
D230		001-10010-40	DIODE SMD BZG03-C33 33V ZEN
D240		001-10000-56	DIODE SMD BAW56 D-SW SOT23
D245		001-10000-56	DIODE SMD BAW56 D-SW SOT23
D250		001-10000-56	DIODE SMD BAW56 D-SW SOT23
D260		001-10000-56	DIODE SMD BAW56 D-SW SOT23
D270		001-10000-99	DIODE SMD BAV99 D-SW SOT23
D340		001-10000-18	DIODE SMD BAT18 S-SW SOT23
D360		001-10000-18	DIODE SMD BAT18 S-SW SOT23
D380		001-10000-18	DIODE SMD BAT18 S-SW SOT23
D381		001-10084-51	DIODE SMD BZX84C5V1 ZEN SOT23
D420		001-10066-00	DIODE HSMS2815 SCH
D440		001-10066-00	DIODE HSMS2815 SCH
D510		001-10000-70	DIODE SMD BAV70 D-SW SOT23
D610		001-10000-99	DIODE SMD BAV99 D-SW SOT23
D620		001-10000-70	DIODE SMD BAV70 D-SW SOT23
D630		001-10000-70	DIODE SMD BAV70 D-SW SOT23
D640		001-10000-70	DIODE SMD BAV70 D-SW SOT23
D645		001-10010-40	DIODE SMD BZG03-C33 33V ZEN
D710		001-10000-99	DIODE SMD BAV99 D-SW SOT23
D720		001-10000-99	DIODE SMD BAV99 D-SW SOT23
D730		001-10165-00	DIODE BAT165 SCH SOD323
D732		001-10165-00	DIODE BAT165 SCH SOD323
D810		001-10165-00	DIODE BAT165 SCH SOD323
D635A		001-10165-00	DIODE BAT165 SCH SOD323
IC210		002-10003-24	IC SMD 324 4X 0-AMP SO14
IC220		002-10126-70	IC SMD DS1267S10K 2XDIG POT
IC230		002-10003-24	IC SMD 324 4X 0-AMP SO14
IC240		002-10040-53	IC SMD 4053B BREAK B4 MAKE
IC250		002-10020-50	IC SMD 4N25A OPTO-C
IC260		002-10003-24	IC SMD 324 4X 0-AMP SO14
IC330		002-10003-58	IC SMD LM358 DUAL 0-AMP
IC340		002-10003-58	IC SMD LM358 DUAL 0-AMP
IC350		002-10003-58	IC SMD LM358 DUAL 0-AMP
IC370		002-12951-00	IC SMD LP2951CM ADJ VLTGE REG

Ref	Var	IPN	Description
IC610		002-10078-05	IC SMD 78L05 5V REG
IC630		002-12523-17	IC LM317L REG TO252 0.5A
IC640		002-10003-58	IC SMD LM358 DUAL 0-AMP
IC650		002-10012-32	IC DS1232LPS-2 LO-P RESET&WDOG
0		539-00010-50	TCXO 12.8MHZ +-1PPM -30 +70C
IC710		002-74900-04	IC SMD 74HC04D 6X INV BUFFD
IC720		002-74910-04	IC SMD 74HCU04 6X INV
IC730		002-10045-20	IC SMD 74HC4520T 2XCTR 4BIT
IC740		002-14519-30	IC MC145193F SMD SYNTH
IC750		002-10330-78	IC MC33078D 2X AMP LO-N
IC810		002-08951-20	IC AT89C51 PLCC44 MIC 12MHZ
IC820		002-12416-00	IC SMD AT24C16N-10SC EEPROM
IC830		002-10003-24	IC SMD 324 4X 0-AMP SO14
L302		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L304		052-57320-30	COIL A/W SMD 3T/2MM .57MM
L305		059-16330-05	IND SMD 0805CS 330NH 5%
L320		056-10330-02	IND SMD 1210 330NH 10% SIMID02
L326		059-16270-10	IND SMD 1008CS 270NH 5%
L327		065-10004-20	BEAD FER SMD CBD 4.6/3/3-4S2
L328		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L333		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L334		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L405		052-08125-15	COIL A/W 1.5T/2.5MM HOR 0.8MM
L410		052-08160-15	COIL A/W 1.5T/6.0MM HOR 0.8MM
L415		065-10004-20	BEAD FER SMD CBD 4.6/3/3-4S2
L420		065-10009-20	BEAD FER SMD BDS3/3/8.9-4S2
L425		052-08340-50	COIL A/W SMD 5T/4.0MM 0.8MM
L430		065-10004-20	BEAD FER SMD CBD 4.6/3/3-4S2
L435		052-08160-15	COIL A/W 1.5T/6.0MM HOR 0.8MM
L445		052-08130-35	COIL A/W 3.5T/3.0MM HOR 0.8MM
L450		065-10004-20	BEAD FER SMD CBD 4.6/3/3-4S2
L460		065-10004-20	BEAD FER SMD CBD 4.6/3/3-4S2
L465		051-00005-53	COIL TAIT#553 A/W 10MM LNK
L475		051-00005-56	COIL#556 13MM FRMD CU STIRP
L480		056-10330-02	IND SMD 1210 330NH 10% SIMID02
L481		056-10330-02	IND SMD 1210 330NH 10% SIMID02
L485		056-10330-02	IND SMD 1210 330NH 10% SIMID02
L520		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L521		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L522		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L601		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L750		052-08125-15	COIL A/W 1.5T/2.5MM HOR 0.8MM
#L910	10	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L910	13	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L910	15	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L910	16	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L910	20	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L910	23	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L910	25	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L910	26	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L910	30	052-08150-15	COIL A/W 1.5T/5.0MM HOR 0.8MM
#L910	35	052-08150-15	COIL A/W 1.5T/5.0MM HOR 0.8MM
#L910	36	052-08150-15	COIL A/W 1.5T/5.0MM HOR 0.8MM
#L920	10	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L920	13	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L920	15	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L920	16	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L920	20	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L920	23	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L920	25	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L920	26	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L920	30	052-08145-15	COIL A/W 1.5T/4.5MM HOR 0.8MM
#L920	35	052-08145-15	COIL A/W 1.5T/4.5MM HOR 0.8MM
#L920	36	052-08145-15	COIL A/W 1.5T/4.5MM HOR 0.8MM
#L930	10	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L930	13	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L930	15	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L930	16	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L930	20	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L930	23	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L930	25	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L930	26	052-08155-15	COIL A/W 1.5T/5.5MM HOR 0.8MM
#L930	30	052-08145-15	COIL A/W 1.5T/4.5MM HOR 0.8MM
#L930	35	052-08145-15	COIL A/W 1.5T/4.5MM HOR 0.8MM
#L930	36	052-08145-15	COIL A/W 1.5T/4.5MM HOR 0.8MM
#L940	10	052-08150-15	COIL A/W 1.5T/5.0MM HOR 0.8MM
#L940	13	052-08150-15	COIL A/W 1.5T/5.0MM HOR 0.8MM
#L940	15	052-08150-15	COIL A/W 1.5T/5.0MM HOR 0.8MM
#L940	16	052-08150-15	COIL A/W 1.5T/5.0MM HOR 0.8MM
#L940	20	052-08150-15	COIL A/W 1.5T/5.0MM HOR 0.8MM
#L940	23	052-08150-15	COIL A/W 1.5T/5.0MM HOR 0.8MM
#L940	25	052-08150-15	COIL A/W 1.5T/5.0MM HOR 0.8MM
#L940	26	052-08150-15	COIL A/W 1.5T/5.0MM HOR 0.8MM
#L940	30	052-08140-15	COIL A/W 1.5T/4.0MM HOR 0.8MM
#L940	35	052-08140-15	COIL A/W 1.5T/4.0MM HOR 0.8MM
#L940	36	052-08140-15	COIL A/W 1.5T/4.0MM HOR 0.8MM
P100		240-02100-06	SKT COAX N TYPE PNL MTG OPNTRM
PL100		070-01001-00	DRNG 15WAY CMPLT T800
PL201		240-00021-03	HDR 2X7W SMD
PL202		240-00021-03	HDR 2X7W SMD
Q100		000-10029-55	XSTR SMD MJD2955 PNP 20W
Q101		000-10008-17	XSTR SMD BC817-25 NPN SOT23
Q102		000-10008-57	XSTR SMD BC857 PNP SOT23 SS
Q210		000-10008-47	XSTR SMD BC847B NPN SOT23
Q211		006-13000-00	SID P0300 ITU/UL/IEC DO214
Q220		000-10008-17	XSTR SMD BC817-25 NPN SOT23
Q230		000-10008-47	XSTR SMD BC847B NPN SOT23
Q240		000-10008-47	XSTR SMD BC847B NPN SOT23
Q250		000-10008-17	XSTR SMD BC817-25 NPN SOT23
Q260		000-10008-57	XSTR SMD BC857 PNP SOT23 SS
Q270		000-10004-10	XSTR SMD MJD41C NPN SW DPAK
Q320		000-10008-47	XSTR SMD BC847B NPN SOT23
Q325		000-10008-47	XSTR SMD BC847B NPN SOT23
Q326		000-10008-47	XSTR SMD BC847B NPN SOT23
Q330		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q331		000-10085-70	XSTR BC856 PNP DUAL SOT363
Q332		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q333		000-00011-91	XSTR BD139 NPN AF PWR TO126
Q334		000-10008-47	XSTR SMD BC847B NPN SOT23
Q335		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q336		000-10055-03	XSTR PD55003 3W 12.5V SO10RF
Q337		000-10059-10	XSTR SMD BFG591 7G NPN SOT223
Q340		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q341		000-10008-47	XSTR SMD BC847B NPN SOT23
Q345		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q410		000-00022-75	XSTR SD1433 NPN SMTG 10W
Q420		000-00022-80	XSTR SD1488 NPN 6LFL 40W
Q505		000-10008-47	XSTR SMD BC847B NPN SOT23
Q510		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q520		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q530		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q540		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q550		000-10008-47	XSTR SMD BC847B NPN SOT23
Q610		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q620		000-00033-12	XSTR BD242 TO220 PNP ISO
Q630		000-10003-00	XSTR SMD BSR30 PNP AF SOT89
Q660		000-10008-17	XSTR SMD BC817-25 NPN SOT23
Q670		000-10008-57	XSTR SMD BC857 PNP SOT23 SS
Q710		000-10008-47	XSTR SMD BC847B NPN SOT23
Q720		000-10008-57	XSTR SMD BC857 PNP SOT23 SS
Q730		000-10008-47	XSTR SMD BC847B NPN SOT23
Q740		000-10008-57	XSTR SMD BC857 PNP SOT23 SS
Q750		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q760		000-10008-47	XSTR SMD BC847B NPN SOT23
Q770		000-10008-57	XSTR SMD BC857 PNP SOT23 SS
Q775		000-10008-57	XSTR SMD BC857 PNP SOT23 SS
Q780		000-10008-47	XSTR SMD BC847B NPN SOT23
Q785		000-10008-57	XSTR SMD BC857 PNP SOT23 SS
Q790		000-10003-12	XSTR SMD BFR31 N JFET SOT23
Q795		000-10009-30	XSTR SMD BFR93A NPN SOT23
Q810		000-10008-47	XSTR SMD BC847B NPN SOT23
Q820		000-10008-17	XSTR SMD BC817-25 NPN SOT23
Q830		000-10008-57	XSTR SMD BC857 PNP SOT23 SS
Q840		000-10008-57	XSTR SMD BC857 PNP SOT23 SS
Q850		000-10008-47	XSTR SMD BC847B NPN SOT23
Q860		000-10008-47	XSTR SMD BC847B NPN SOT23
R100		036-01100-10	RES 2512 1E 5% 1W
R101		036-15120-00	RES M/F SMD 0805 12K 5%
R102		036-14390-10	RES M/F SMD 0805 3K9 1%
R103		036-15120-00	RES M/F SMD 0805 12K 5%
R160		036-12100-10	RES M/F SMD 0805 10E 1%
R202		036-14100-10	RES M/F SMD 0805 1K 1%
%R203B		036-10000-00	RES M/F SMD 0805 0E 0.125W
%R203E		036-13560-10	RES M/F SMD 0805 560E 1%
R204		036-14220-00	RES M/F SMD 0805 2K2 5%
R205		036-13220-10	RES M/F SMD 0805 220E 1%
R206		036-14100-10	RES M/F SMD 0805 1K 1%
R207		036-14390-10	RES M/F SMD 0805 3K9 1%
R208		036-13560-10	RES M/F SMD 0805 560E 1%
R209		036-15100-10	RES M/F SMD 0805 10K 1%
R210		036-14220-00	RES M/F SMD 0805 2K2 5%
%R211		036-10000-00	RES M/F SMD 0805 0E 0.125W
R212		036-16100-10	RES M/F SMD 0805 100K 1%
R213		036-15100-10	RES M/F SMD 0805 10K 1%
R214		036-14820-10	RES M/F SMD 0805 8K2 1%
R215		036-16100-10	RES M/F SMD 0805 100K 1%
R216		036-16100-10	RES M/F SMD 0805 100K 1%
R217		036-14100-10	RES M/F SMD 0805 1K 1%
R218		036-16150-00	RES M/F SMD 0805 150K 5%
R219		036-14220-00	RES M/F SMD 0805 2K2 5%
%R220		036-10000-00	RES M/F SMD 0805 0E 0.125W
R221		036-14150-10	RES M/F SMD 0805 1K5 1%
R223		036-17100-10	RES M/F SMD 0805 1M 1%
R224		036-14680-10	RES M/F SMD 0805 6K8 1%
R225		036-17100-10	RES M/F SMD 0805 1M 1%
R226		036-15100-10	RES M/F SMD 0805 10K 1%
R227		036-14220-00	RES M/F SMD 0805 2K2 5%
R229		036-16470-00	RES M/F SMD 0805 470K 5%
R230		036-16100-10	RES M/F SMD 0805 100K 1%
R231		036-15100-10	RES M/F SMD 0805 10K 1%
R232		036-16330-00	RES M/F SMD 0805 330K 5%
R233		036-16100-10	RES M/F SMD 0805 100K 1%
R235		036-14470-10	RES M/F SMD 0805 4K7 1%
R236		036-10000-00	RES M/F SMD 0805 0E 0.125W
R237		036-15470-10	RES M/F SMD 0805 47K 1%
R238		036-15470-10	RES M/F SMD 0805 47K 1%
R239		036-14150-10	RES M/F SMD 0805 1K5 1%
R240		036-10000-00	RES M/F SMD 0805 0E 0.125W
R241		036-14470-10	RES M/F SMD 0805 4K7 1%
R242		036-14220-00	RES M/F SMD 0805 2K2 5%
R243		036-10000-00	RES M/F SMD 0805 0E 0.125W
R244		036-15100-10	RES M/F SMD 0805 10K 1%

Ref	Var	IPN	Description
R245		036-16100-10	RES M/F SMD 0805 100K 1%
R247		036-15100-10	RES M/F SMD 0805 10K 1%
R248		036-16100-10	RES M/F SMD 0805 100K 1%
R249		036-16100-10	RES M/F SMD 0805 100K 1%
R251		036-16100-10	RES M/F SMD 0805 100K 1%
R253		036-16100-10	RES M/F SMD 0805 100K 1%
R254		036-16100-10	RES M/F SMD 0805 100K 1%
R255		036-15100-10	RES M/F SMD 0805 10K 1%
R256		036-15560-10	RES M/F SMD 0805 56K 1%
R257		036-16560-00	RES M/F SMD 0805 560K 5%
R258		036-16150-00	RES M/F SMD 0805 150K 5%
R259		036-15220-00	RES M/F SMD 0805 22K 5%
R260		036-15470-10	RES M/F SMD 0805 47K 1%
R262		036-15470-10	RES M/F SMD 0805 47K 1%
R263		036-14470-10	RES M/F SMD 0805 4K7 1%
&R264	10	036-15220-00	RES M/F SMD 0805 22K 5%
&R264	13	036-15220-00	RES M/F SMD 0805 22K 5%
&R264	15	036-15270-10	RES M/F SMD 0805 27K 1%
&R264	16	036-15180-10	RES M/F SMD 0805 18K 1%
&R264	20	036-15220-00	RES M/F SMD 0805 22K 5%
&R264	23	036-15220-00	RES M/F SMD 0805 22K 5%
&R264	25	036-15270-10	RES M/F SMD 0805 27K 1%
&R264	26	036-15180-10	RES M/F SMD 0805 18K 1%
&R264	30	036-15220-00	RES M/F SMD 0805 22K 5%
&R264	35	036-15270-10	RES M/F SMD 0805 27K 1%
&R264	36	036-15180-10	RES M/F SMD 0805 18K 1%
&R265	10	036-15150-10	RES M/F SMD 0805 15K 1%
&R265	13	036-15150-10	RES M/F SMD 0805 15K 1%
&R265	15	036-15180-10	RES M/F SMD 0805 18K 1%
&R265	16	036-15150-10	RES M/F SMD 0805 15K 1%
&R265	20	036-15150-10	RES M/F SMD 0805 15K 1%
&R265	23	036-15150-10	RES M/F SMD 0805 15K 1%
&R265	25	036-15180-10	RES M/F SMD 0805 18K 1%
&R265	26	036-15150-10	RES M/F SMD 0805 15K 1%
&R265	30	036-15150-10	RES M/F SMD 0805 15K 1%
&R265	35	036-15180-10	RES M/F SMD 0805 18K 1%
&R265	36	036-15150-10	RES M/F SMD 0805 15K 1%
&R266	10	036-15470-10	RES M/F SMD 0805 47K 1%
&R266	13	036-15470-10	RES M/F SMD 0805 47K 1%
&R266	15	036-15560-10	RES M/F SMD 0805 56K 1%
&R266	16	036-15470-10	RES M/F SMD 0805 47K 1%
&R266	20	036-15470-10	RES M/F SMD 0805 47K 1%
&R266	23	036-15470-10	RES M/F SMD 0805 47K 1%
&R266	25	036-15560-10	RES M/F SMD 0805 56K 1%
&R266	26	036-15470-10	RES M/F SMD 0805 47K 1%
&R266	30	036-15470-10	RES M/F SMD 0805 47K 1%
&R266	35	036-15560-10	RES M/F SMD 0805 56K 1%
&R266	36	036-15470-10	RES M/F SMD 0805 47K 1%
R267		036-14220-00	RES M/F SMD 0805 2K2 5%
R268		036-13100-10	RES M/F SMD 0805 100E 1%
R269		036-15100-10	RES M/F SMD 0805 10K 1%
R270		036-14120-00	RES M/F SMD 0805 1K2 5%
R271		036-17100-10	RES M/F SMD 0805 1M 1%
R272		036-13560-10	RES M/F SMD 0805 560E 1%
R273		036-15120-00	RES M/F SMD 0805 12K 5%
R274		036-15150-10	RES M/F SMD 0805 15K 1%
R275		036-14270-10	RES M/F SMD 0805 2K7 1%
R276		036-10000-00	RES M/F SMD 0805 0E 0.125W
R277		036-16100-10	RES M/F SMD 0805 100K 1%
%R278		036-16100-10	RES M/F SMD 0805 100K 1%
R279		036-17100-10	RES M/F SMD 0805 1M 1%
R280		036-15100-10	RES M/F SMD 0805 10K 1%
R282		036-15560-10	RES M/F SMD 0805 56K 1%
R283		036-15560-10	RES M/F SMD 0805 56K 1%
R284		036-17100-10	RES M/F SMD 0805 1M 1%
R285		036-10000-00	RES M/F SMD 0805 0E 0.125W
R286		036-14220-00	RES M/F SMD 0805 2K2 5%
R287		036-15100-10	RES M/F SMD 0805 10K 1%
R288		036-15180-10	RES M/F SMD 0805 18K 1%
R289		036-16100-10	RES M/F SMD 0805 100K 1%
&R290	10	036-13560-10	RES M/F SMD 0805 560E 1%
&R290	13	036-13560-10	RES M/F SMD 0805 560E 1%
&R290	15	036-13560-10	RES M/F SMD 0805 560E 1%
&R290	16	036-13680-10	RES M/F SMD 0805 680E 1%
&R290	20	036-13560-10	RES M/F SMD 0805 560E 1%
&R290	23	036-13560-10	RES M/F SMD 0805 560E 1%
&R290	25	036-13560-10	RES M/F SMD 0805 560E 1%
&R290	26	036-13680-10	RES M/F SMD 0805 680E 1%
&R290	30	036-13560-10	RES M/F SMD 0805 560E 1%
&R290	35	036-13560-10	RES M/F SMD 0805 560E 1%
&R290	36	036-13680-10	RES M/F SMD 0805 680E 1%
%R291		036-10000-00	RES M/F SMD 0805 0E 0.125W
R292		036-14470-10	RES M/F SMD 0805 4K7 1%
R293		036-15470-10	RES M/F SMD 0805 47K 1%
R294		036-14470-10	RES M/F SMD 0805 4K7 1%
R295		036-14270-10	RES M/F SMD 0805 2K7 1%
R296		036-14100-10	RES M/F SMD 0805 1K 1%
R297		036-14560-00	RES M/F SMD 0805 5K6 5%
%R298		036-16100-10	RES M/F SMD 0805 100K 1%
R299		036-14270-10	RES M/F SMD 0805 2K7 1%
R300		036-14100-10	RES M/F SMD 0805 1K 1%
R301		036-15100-10	RES M/F SMD 0805 10K 1%
R302		036-14100-10	RES M/F SMD 0805 1K 1%
R303		036-15100-10	RES M/F SMD 0805 10K 1%
R304		036-15470-10	RES M/F SMD 0805 47K 1%
R305		036-15330-10	RES M/F SMD 0805 33K 1%
R306		036-16100-10	RES M/F SMD 0805 100K 1%
R307		036-15100-10	RES M/F SMD 0805 10K 1%

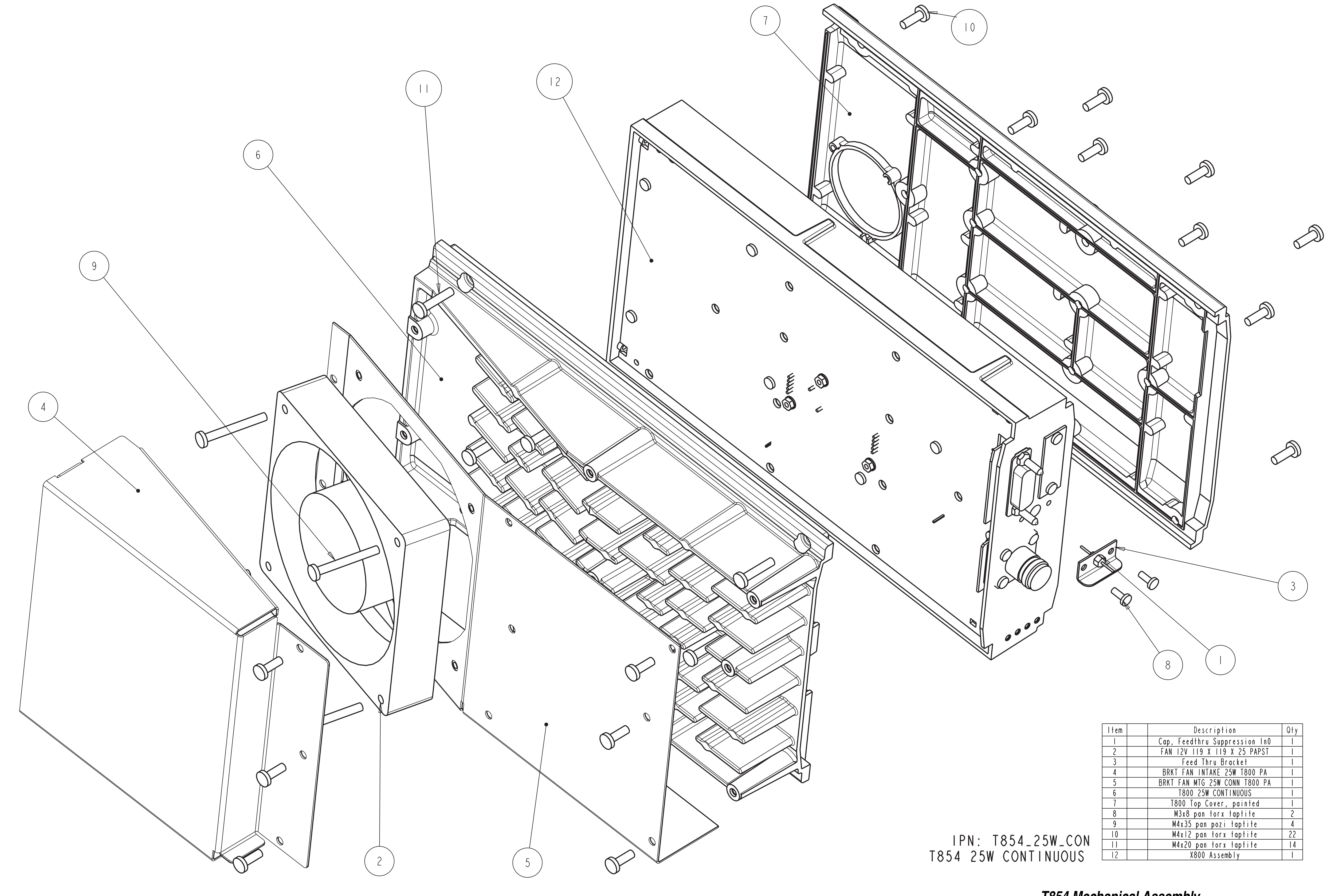
Ref	Var	IPN	Description
R309		036-16220-00	RES M/F SMD 0805 220K 5%
R311		036-16100-10	RES M/F SMD 0805 100K 1%
R312		036-15150-10	RES M/F SMD 0805 15K 1%
R313		036-16470-00	RES M/F SMD 0805 470K 5%
R316		036-16270-00	RES M/F SMD 0805 270K 5%
R319		036-15470-10	RES M/F SMD 0805 47K 1%
R320		036-14470-10	RES M/F SMD 0805 4K7 1%
R323		036-13220-10	RES M/F SMD 0805 220E 1%
R324		036-13100-10	RES M/F SMD 0805 100E 1%
R325		036-14100-10	RES M/F SMD 0805 1K 1%
R326		036-11330-00	RES M/F SMD 0805 3E3 5%
R327		036-12220-00	RES M/F SMD 0805 22E 5%
R328		036-12820-00	RES M/F SMD 0805 82E 5%
R329		036-13470-00	RES M/F SMD 0805 470E 5%
R330		036-13220-10	RES M/F SMD 0805 220E 1%
R331		036-12180-00	RES M/F SMD 0805 18E 5%
R332		036-13330-00	RES M/F SMD 0805 330E 5%
R334		036-12680-00	RES M/F SMD 0805 68E 5%
R336		036-10000-00	RES M/F SMD 0805 0E 0.125W
R337		036-12100-10	RES M/F SMD 0805 10E 1%
R338		036-13120-00	RES M/F SMD 0805 120E 5%
R339		036-14100-10	RES M/F SMD 0805 1K 1%
R340		036-14560-00	RES M/F SMD 0805 5K6 5%
R341		036-16220-00	RES M/F SMD 0805 220K 5%
R342		036-12470-00	RES M/F SMD 0805 47E 5%
R343		036-15100-10	RES M/F SMD 0805 10K 1%
R344		036-14150-10	RES M/F SMD 0805 1K5 1%
R345		036-14680-10	RES M/F SMD 0805 6K8 1%
R346		036-14330-10	RES M/F SMD 0805 3K3 1%
R347		036-16150-00	RES M/F SMD 0805 150K 5%
R348		036-12100-10	RES M/F SMD 0805 10E 1%
R349		036-14330-10	RES M/F SMD 0805 3K3 1%
R350		036-13220-10	RES M/F SMD 0805 220E 1%
R351		036-16100-10	RES M/F SMD 0805 100K 1%
R352		036-12680-00	RES M/F SMD 0805 68E 5%
R353		036-15100-10	RES M/F SMD 0805 10K 1%
R355		036-14150-10	RES M/F SMD 0805 1K5 1%
R356		036-16100-10	RES M/F SMD 0805 100K 1%
R357		036-15470-10	RES M/F SMD 0805 47K 1%
R359		036-15470-10	RES M/F SMD 0805 47K 1%
R360		036-14150-10	RES M/F SMD 0805 1K5 1%
R361		036-12680-00	RES M/F SMD 0805 68E 5%
R362		036-16180-00	RES M/F SMD 0805 180K 5%
R363		036-15470-10	RES M/F SMD 0805 47K 1%
R364		036-15470-10	RES M/F SMD 0805 47K 1%
R365		036-15560-10	RES M/F SMD 0805 56K 1%
R366		036-15100-10	RES M/F SMD 0805 10K 1%
R367		036-15100-10	RES M/F SMD 0805 10K 1%
R368		036-15220-00	RES M/F SMD 0805 22K 5%
R369		036-16100-10	RES M/F SMD 0805 100K 1%
R370		036-12100-10	RES M/F SMD 0805 10E 1%
R371		036-16100-10	RES M/F SMD 0805 100K 1%
R372		036-14680-10	RES M/F SMD 0805 6K8 1%
R373		036-13820-00	RES M/F SMD 0805 820E 5%
R374		036-14120-00	RES M/F SMD 0805 1K2 5%
R376		036-14150-10	RES M/F SMD 0805 1K5 1%
R378		036-00220-10	RES 1206 0E22 1% 0.25W
R379		036-13100-10	RES M/F SMD 0805 100E 1%
R380		036-11180-10	RES M/F SMD 0805 1E8 1%
R381		036-14150-10	RES M/F SMD 0805 1K5 1%
R382		036-12470-00	RES M/F SMD 0805 47E 5%
R383		036-15150-10	RES M/F SMD 0805 15K 1%
R384		036-13560-10	RES M/F SMD 0805 560E 1%
R387		036-13330-00	RES M/F SMD 0805 330E 5%
#R410	10	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R410	13	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R410	15	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R410	16	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R410	20	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R410	23	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R410	25	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R410	26	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R410	30	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R410	35	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R410	36	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R430	10	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R430	13	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R430	15	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R430	16	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R430	20	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R430	23	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R430	25	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R430	26	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R430	30	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R430	35	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
#R430	36	036-00120-05	RES 2010 0E12 1% 0.5W METAL ST
R450		036-03130-10	RES 2512 30E 5% 1W
#R451	10	036-03118-10	RES 2512 18R 5% 1W
#R451	13	036-03118-10	RES 2512 18R 5% 1W
#R451	15	036-03118-10	RES 2512 18R 5% 1W
#R451	16	036-03118-10	RES 2512 18R 5% 1W
#R451	20	not fitted	
#R451	23	not fitted	
#R451	25	not fitted	
#R451	26	not fitted	
#R451	30	not fitted	
#R451	35	not fitted	
#R451	36	not fitted	

Ref	Var	IPN	Description
R460		036-14470-10	RES M/F SMD 0805 4K7 1%
R470		036-13100-10	RES M/F SMD 0805 100E 1%
R471		015-23150-01	CAP CER 0805 150P 5% NPO 50V
R472		036-13560-10	RES M/F SMD 0805 560E 1%
R473		036-13470-00	RES M/F SMD 0805 470E 5%
R480		036-13100-10	RES M/F SMD 0805 100E 1%
R481		045-04470-00	RES NTC SMD 4K7 5% 20MW
R490		036-14470-10	RES M/F SMD 0805 4K7 1%
R501		036-15100-10	RES M/F SMD 0805 10K 1%
R502		036-15100-10	RES M/F SMD 0805 10K 1%
R503		036-14560-00	RES M/F SMD 0805 5K6 5%
R504		036-13330-00	RES M/F SMD 0805 330E 5%
R505		036-15150-10	RES M/F SMD 0805 15K 1%
R510		036-14150-10	RES M/F SMD 0805 1K5 1%
R513		036-15100-10	RES M/F SMD 0805 10K 1%
R514		036-12330-00	RES M/F SMD 0805 33E 5%
R515		036-12560-00	RES M/F SMD 0805 56E 5%
#R517	10	036-13150-10	RES M/F SMD 0805 150E 1%
#R517	13	036-13150-10	RES M/F SMD 0805 150E 1%
#R517	15	036-13150-10	RES M/F SMD 0805 150E 1%
#R517	16	036-13150-10	RES M/F SMD 0805 150E 1%
#R517	20	036-13330-00	RES M/F SMD 0805 330E 5%
#R517	23	036-13330-00	RES M/F SMD 0805 330E 5%
#R517	25	036-13330-00	RES M/F SMD 0805 330E 5%
#R517	26	036-13330-00	RES M/F SMD 0805 330E 5%
#R517	30	036-13330-00	RES M/F SMD 0805 330E 5%
#R517	35	036-13330-00	RES M/F SMD 0805 330E 5%
#R517	36	036-13330-00	RES M/F SMD 0805 330E 5%
#R518	10	036-12330-00	RES M/F SMD 0805 33E 5%
#R518	13	036-12330-00	RES M/F SMD 0805 33E 5%
#R518	15	036-12330-00	RES M/F SMD 0805 33E 5%
#R518	16	036-12330-00	RES M/F SMD 0805 33E 5%
#R518	20	036-12180-00	RES M/F SMD 0805 18E 5%
#R518	23	036-12180-00	RES M/F SMD 0805 18E 5%
#R518	25	036-12180-00	RES M/F SMD 0805 18E 5%
#R518	26	036-12180-00	RES M/F SMD 0805 18E 5%
#R518	30	036-12180-00	RES M/F SMD 0805 18E 5%
#R518	35	036-12180-00	RES M/F SMD 0805 18E 5%
#R518	36	036-12180-00	RES M/F SMD 0805 18E 5%
#R519	10	036-13150-10	RES M/F SMD 0805 150E 1%
#R519	13	036-13150-10	RES M/F SMD 0805 150E 1%
#R519	15	036-13150-10	RES M/F SMD 0805 150E 1%
#R519	16	036-13150-10	RES M/F SMD 0805 150E 1%
#R519	20	036-13330-00	RES M/F SMD 0805 330E 5%
#R519	23	036-13330-00	RES M/F SMD 0805 330E 5%
#R519	25	036-13330-00	RES M/F SMD 0805 330E 5%
#R519	26	036-13330-00	RES M/F SMD 0805 330E 5%
#R519	30	036-13330-00	RES M/F SMD 0805 330E 5%
#R519	35	036-13330-00	RES M/F SMD 0805 330E 5%
#R519	36	036-13330-00	RES M/F SMD 0805 330E 5%
R520		036-13150-10	RES M/F SMD 0805 150E 1%
R523		036-16120-10	RES M/F SMD 0805 120K 1%
R525		036-15470-10	RES M/F SMD 0805 47K 1%
R530		036-15220-00	RES M/F SMD 0805 22K 5%
R535		036-15100-10	RES M/F SMD 0805 10K 1%
R540		036-14220-00	RES M/F SMD 0805 2K2 5%
R545		036-14470-10	RES M/F SMD 0805 4K7 1%
%R550		036-14120-00	RES M/F SMD 0805 1K2 5%
R555		036-14470-10	RES M/F SMD 0805 4K7 1%
R560		036-13470-00	RES M/F SMD 0805 470E 5%
R609		036-14100-10	RES M/F SMD 0805 1K 1%
R613		036-13560-10	RES M/F SMD 0805 560E 1%
R615		036-13100-10	RES M/F SMD 0805 100E 1%
R617		036-10000-00	RES M/F SMD 0805 0E 0.125W
R619		036-01100-10	RES 2512 1E 5% 1W
R621		036-01100-10	RES 2512 1E 5% 1W
R625		036-14100-10	RES M/F SMD 0805 1K 1%
R629		036-03270-10	RES 2512 270E 5% 1W
R633		036-14680-10	RES M/F SMD 0805 6K8 1%
R637		036-12220-00	RES M/F SMD 0805 22E 5%
R638		036-12220-00	RES M/F SMD 0805 22E 5%
R640		036-12100-10	RES M/F SMD 0805 10E 1%
R641		036-14150-10	RES M/F SMD 0805 1K5 1%
R645		036-13470-00	RES M/F SMD 0805 470E 5%
R649		036-14470-10	RES M/F SMD 0805 4K7 1%
R651		036-10000-00	RES M/F SMD 0805 0E 0.125W
R652		036-10000-00	RES M/F SMD 0805 0E 0.125W
R653		036-15100-10	RES M/F SMD 0805 10K 1%
R657		036-15100-10	RES M/F SMD 0805 10K 1%
R661		036-15100-10	RES M/F SMD 0805 10K 1%
R665		036-16100-10	RES M/F SMD 0805 100K 1%
R669		036-15470-10	RES M/F SMD 0805 47K 1%
R673		036-16100-10	RES M/F SMD 0805 100K 1%
R677		036-15470-10	RES M/F SMD 0805 47K 1%
R681		036-13100-10	RES M/F SMD 0805 100E 1%
R685		036-15150-10	RES M/F SMD 0805 15K 1%
R689		036-12100-10	RES M/F SMD 0805 10E 1%
R693		036-16100-10	RES M/F SMD 0805 100K 1%
R696		036-15560-10	RES M/F SMD 0805 56K 1%
R701		036-12220-00	RES M/F SMD 0805 22E 5%
R702		036-15470-10	RES M/F SMD 0805 47K 1%
R703		036-15470-10	RES M/F SMD 0805 47K 1%
%R704		036-10000-00	RES M/F SMD 0805 0E 0.125W
R706		036-15150-10	RES M/F SMD 0805 15K 1%
R707		036-16100-10	RES M/F SMD 0805 100K 1%
R708		036-16470-00	RES M/F SMD 0805 470K 5%
R709		036-12100-10	RES M/F SMD 0805 10E 1%
R710		036-13100-10	RES M/F SMD 0805 100E 1%
R711		036-13100-10	RES M/F SMD 0805 100E 1%
R712		036-12100-10	RES M/F SMD 0805 10E 1%
R713		036-10000-00	RES M/F SMD 0805 0E 0.125W
%R715		036-14100-10	RES M/F SMD 0805 1K 1%
R717		036-14270-10	RES M/F SMD 0805 2K7 1%
R718		036-15270-10	RES M/F SMD 0805 27K 1%
R719		036-15270-10	RES M/F SMD 0805 27K 1%
R720		036-15390-10	RES M/F SMD 0805 39K 1%
R721		036-15100-10	RES M/F SMD 0805 10K 1%
R722		036-15100-10	RES M/F SMD 0805 10K 1%
R723		036-14270-10	RES M/F SMD 0805 2K7 1%
R725		036-15390-10	RES M/F SMD 0805 39K 1%
%R726		036-13100-10	RES M/F SMD 0805 100E 1%
R727		036-15100-10	RES M/F SMD 0805 10K 1%
R728		036-15100-10	RES M/F SMD 0805 10K 1%
R730		036-13470-00	RES M/F SMD 0805 470E 5%
R731		036-13470-00	RES M/F SMD 0805 470E 5%
R732		036-13470-00	RES M/F SMD 0805 470E 5%
R742		036-13150-10	RES M/F SMD 0805 150E 1%
R743		036-13150-10	RES M/F SMD 0805 150E 1%
R744		036-12220-00	RES M/F SMD 0805 22E 5%
R746		036-12220-00	RES M/F SMD 0805 22E 5%
R747		036-12220-00	RES M/F SMD 0805 22E 5%
R748		036-15470-10	RES M/F SMD 0805 47K 1%
R749		036-15470-10	RES M/F SMD 0805 47K 1%
R750		036-12220-00	RES M/F SMD 0805 22E 5%
R752		036-12220-00	RES M/F SMD 0805 22E 5%
R753		036-17100-10	RES M/F SMD 0805 1M 1%
R754		036-14100-10	RES M/F SMD 0805 1K 1%
R756		036-16100-10	RES M/F SMD 0805 100K 1%
R757		036-16100-10	RES M/F SMD 0805 100K 1%
R758		036-14120-00	RES M/F SMD 0805 1K2 5%
R759		036-13330-00	RES M/F SMD 0805 330E 5%
R760		036-13180-00	RES M/F SMD 0805 180E 5%
R762		036-13100-10	RES M/F SMD 0805 100E 1%
R763		036-13100-10	RES M/F SMD 0805 100E 1%
R765		036-13680-10	RES M/F SMD 0805 680E 1%
R766		036-14100-10	RES M/F SMD 0805 1K 1%
R767		036-13680-10	RES M/F SMD 0805 680E 1%
R769		036-13180-00	RES M/F SMD 0805 180E 5%
R771		036-14820-10	RES M/F SMD 0805 8K2 1%
R772		036-15220-00	RES M/F SMD 0805 22K 5%
R774		036-14820-10	RES M/F SMD 0805 8K2 1%
R775		036-15180-10	RES M/F SMD 0805 18K 1%
R777		036-14220-00	RES M/F SMD 0805 2K2 5%
R780		036-12680-00	RES M/F SMD 0805 68E 5%
R782		036-12180-00	RES M/F SMD 0805 18E 5%
R784		036-13120-00	RES M/F SMD 0805 120E 5%
R785		036-14330-10	RES M/F SMD 0805 3K3 1%
R786		036-12100-10	RES M/F SMD 0805 10E 1%
R787		036-12100-10	RES M/F SMD 0805 10E 1%
R790		036-13390-10	RES M/F SMD 0805 390E 1%
R791		036-14100-10	RES M/F SMD 0805 1K 1%
R801		036-16150-00	RES M/F SMD 0805 150K 5%
R802		036-15470-10	RES M/F SMD 0805 47K 1%
R808		036-12100-10	RES M/F SMD 0805 10E 1%
R809		036-14470-10	RES M/F SMD 0805 4K7 1%
R810		036-14470-10	RES M/F SMD 0805 4K7 1%
R811		036-14470-10	RES M/F SMD 0805 4K7 1%
R812		036-14470-10	RES M/F SMD 0805 4K7 1%
R813		036-14470-10	RES M/F SMD 0805 4K7 1%
R815		036-15470-10	RES M/F SMD 0805 47K 1%
R816		036-16150-00	RES M/F SMD 0805 150K 5%
R818		036-14470-10	RES M/F SMD 0805 4K7 1%
R819		036-14470-10	RES M/F SMD 0805 4K7 1%
R821		036-15470-10	RES M/F SMD 0805 47K 1%
R822		036-15470-10	RES M/F SMD 0805 47K 1%
R824		036-14220-00	RES M/F SMD 0805 2K2 5%
R825		036-14220-00	RES M/F SMD 0805 2K2 5%
R826		036-14220-00	RES M/F SMD 0805 2K2 5%
R827		036-14220-00	RES M/F SMD 0805 2K2 5%
R828		036-14220-00	RES M/F SMD 0805 2K2 5%
R829		036-14220-00	RES M/F SMD 0805 2K2 5%
R830		036-14220-00	RES M/F SMD 0805 2K2 5%
R831		036-14220-00	RES M/F SMD 0805 2K2 5%
R832		036-14220-00	RES M/F SMD 0805 2K2 5%
R833		036-14220-00	RES M/F SMD 0805 2K2 5%
R835		036-14220-00	RES M/F SMD 0805 2K2 5%
R836		036-14220-00	RES M/F SMD 0805 2K2 5%
R837		036-14220-00	RES M/F SMD 0805 2K2 5%
R840		036-14220-00	RES M/F SMD 0805 2K2 5%
R841		036-14220-00	RES M/F SMD 0805 2K2 5%
R842		036-14220-00	RES M/F SMD 0805 2K2 5%
R843		036-14220-00	RES M/F SMD 0805 2K2 5%
R845		036-13470-00	RES M/F SMD 0805 470E 5%
R847		036-13470-00	RES M/F SMD 0805 470E 5%
R848		036-14470-10	RES M/F SMD 0805 4K7 1%
R849		036-13470-00	RES M/F SMD 0805 470E 5%
R850		036-13470-00	RES M/F SMD 0805 470E 5%
R853		036-14470-10	RES M/F SMD 0805 4K7 1%
R854		036-14470-10	RES M/F SMD 0805 4K7 1%
R855		036-14470-10	RES M/F SMD 0805 4K7 1%
%R857		036-10000-00	RES M/F SMD 0805 0E 0.125W
R859		036-16150-00	RES M/F SMD 0805 150K 5%
R861		036-16150-00	RES M/F SMD 0805 150K 5%
R863		036-16150-00	RES M/F SMD 0805 150K 5%
R865		036-16100-10	RES M/F SMD 0805 100K 1%
R867		036-16100-10	RES M/F SMD 0805 100K 1%

Ref	Var	IPN	Description
R871		036-15470-10	RES M/F SMD 0805 47K 1%
R872		036-14470-10	RES M/F SMD 0805 4K7 1%
R873		036-15330-10	RES M/F SMD 0805 33K 1%
R874		036-14470-10	RES M/F SMD 0805 4K7 1%
R875		036-15470-10	RES M/F SMD 0805 47K 1%
R876		036-14470-10	RES M/F SMD 0805 4K7 1%
R877		036-14470-10	RES M/F SMD 0805 4K7 1%
R879		036-15100-10	RES M/F SMD 0805 10K 1%
R880		036-14470-10	RES M/F SMD 0805 4K7 1%
R882		036-13470-00	RES M/F SMD 0805 470E 5%
R325A		036-14100-10	RES M/F SMD 0805 1K 1%
R340C		036-13220-10	RES M/F SMD 0805 220E 1%
%RV210		040-05100-23	POT 10K LOG PCB 15MM SSHAFT
RV220		042-05500-05	RES PRE SMD 50K CER 4MM SQ
RV320		042-05100-05	RES PRE SMD 10K CER 4MM SQ
RV330		042-06500-05	RES PRE SMD 500K CER 4MM SQ
RV805		042-05200-05	RES PRE SMD 20K CER 4MM SQ
SK200		240-10000-05	CONN SMD 8W 2R SKT M/MATCH
SK205		240-02020-05	SKT STEREO PH JACK PCB MTG
SK310		240-02100-44	SKT COAX MINI ANGLED PCB MTG
SK410		240-02100-44	SKT COAX MINI ANGLED PCB MTG
SK501		240-04021-77	SKT 64W JACK 1.3 PCB MTG
SK502		240-04021-77	SKT 64W JACK 1.3 PCB MTG
SK503		240-04021-77	SKT 64W JACK 1.3 PCB MTG
SK504		240-04021-77	SKT 64W JACK 1.3 PCB MTG
SK505		240-04021-77	SKT 64W JACK 1.3 PCB MTG
SK513		240-04021-77	SKT 64W JACK 1.3 PCB MTG
SK522		240-04021-77	SKT 64W JACK 1.3 PCB MTG
SK531		240-04021-77	SKT 64W JACK 1.3 PCB MTG
SK532		240-04021-77	SKT 64W JACK 1.3 PCB MTG
SK533		240-04021-77	SKT 64W JACK 1.3 PCB MTG
SK534		240-04021-77	SKT 64W JACK 1.3 PCB MTG
SK535		240-04021-77	SKT 64W JACK 1.3 PCB MTG
SK536		240-04021-77	SKT 64W JACK 1.3 PCB MTG
SK805		240-10000-07	CONN SMD 16W 2R SKT M/MATCH
SK810		240-04020-42	SKT 44 PIN SMD PLCC
SW230		232-00010-26	SW PUSH SPDT RA PCB MTG
%T210B		054-00010-18	XFMR LINE SMD 600 OHM P2781
T610		050-15119-52	COIL SMD 680UH XFMR 5119-T052

T854 Mechanical and Miscellaneous Parts

IPN	Legend	Description
012-04100-05	1	CAP F/THRU 1N SUPN FLTR SMTG
070-01002-00		DRNG STD AUX T800 SII
201-00030-02		WIRE T/C 7/0.2MM PVC RED
219-02605-00		COAX 120MM 2 MINI PIN CRIMP
219-02638-00		SII AUX DRNG LOOM ASSY
220-01686-03		PCB T854 25W CONTINUOUS
232-00020-26		SW BUTT 232-00010-26
240-00026-32		PLG 32W 1ROW PCB MTG
240-04020-62		SKT 2W 0.1” RECEP SHORTING LNK
258-00010-08	2	FAN 12V 119 X 119 X 25 PAPST
302-05204-00	3	BRKT A3M2314 F/THRU MTG T859
302-05258-00	4	BRKT FAN INTAKE 25W T800 PA
302-05259-00	5	BRKT FAN MTG 25W CONN T800 PA
303-11226-00		CHASS 25W CONN T800 PA
303-50074-00		CLIP SPRING XSTR CLAMP T857
303-50078-00		CLIP 0.1 SPRING WIRE CBL CLAMP
308-13142-00	6	HSINK T800 25U CONTINUOUS
349-00020-09		SCRW 4-40*3/8” T/T P/P BLK
349-00020-36	8	SCRW M3*8MM T/T P/T BLK
349-00020-49	9	SCRW M4*35MM T/T P/P BZ
349-20430-00	10	SCRW M4*12MM T/T P/T BLK
352-00010-08		NUT M3 COLD FORM HEX S/T BZ
352-00010-35		NUT 8-32 UNC HEX XSTR MTG
353-00010-13		WSHR M3 S/PROOF INT BZ
356-00010-01		TAG SOLDER 3MM SHORT M6132/3.2
362-00010-23		INSULR GSK SIL CLIP MTG TO-220
369-00010-14		TIE CBL NYLON 100*2.6MM
400-00020-07		SLEEVING 2MM SIL RUBBER



Item		Description	Qty
1		Cap, Feedthru Suppression In0	1
2		FAN 12V 119 X 119 X 25 PAPST	1
3		Feed Thru Bracket	1
4		BRKT FAN INTAKE 25W T800 PA	1
5		BRKT FAN MTG 25W CONN T800 PA	1
6		T800 25W CONTINUOUS	1
7		T800 Top Cover, painted	1
8		M3x8 pan torx taptite	2
9		M4x35 pan pozi taptite	4
10		M4x12 pan torx taptite	22
11		M4x20 pan torx taptite	14
12		X800 Assembly	1

IPN: T854_25W_CON
T854 25W CONTINUOUS

T854 Mechanical Assembly
220-01686-03

T854 Grid Reference Index (IPN 220-01686-03)

How To Use This Grid Reference Index

The first digit in the PCB layout reference is a “1” or “2”, indicating the top or bottom side layout respectively, and the last two characters give the location of the component on that diagram.

The first digit in the circuit diagram reference is the sheet number, and the last two characters give the location of the component on that sheet.

Device	PCB	Circuit
C100	1:P5	1-A0
C101	1:P5	1-A0
C102	1:P4	1-C1
C103	1:P5	1-B0
C201	1:C1	2-B3
C202	1:C1	2-C3
%C203A	1:C1	2-B2
%C203B	1:A2	2-D2
%C204	1:B3	2-F3
%C205	1:A3	2-E3
C207	1:C7	2-G0
C209	1:C6	2-T0
C210	1:C7	2-J0
C211	1:B7	2-H3
C213	1:A6	2-C5
C215	1:A6	2-D5
C217	1:B6	2-C5
C219	1:B6	2-C5
C221	1:C5	2-L8
C223	1:D4	2-J6
C225	1:B3	2-N7
C227	1:B4	2-O6
C229	1:B4	2-O6
C230	1:B4	2-J0
C232	1:B4	2-P6
C233	1:B3	2-P7
C235	1:B5	2-N5
C237	1:B4	2-N5
C239	1:B4	2-O4
C240	1:D2	2-T6
C241	1:B4	2-P5
C242	1:B4	2-P5
C243	1:B4	2-R5
C245	1:C5	2-B5
C247	1:C5	2-B5
C249	1:D4	2-E6
C251	1:C4	2-C9
C253	1:D3	2-E8
C255	1:D3	2-E8
C257	1:D4	2-C8
C259	1:C7	2-J2
C260	1:C8	2-I0
C261	1:C7	2-K2
C263	1:D6	2-M2
%C265	1:D8	2-M1
C267	1:C8	2-O2
&C269	1:C8	2-O2
&C271	1:C8	2-P2
C273	1:C8	2-P2
C275	1:C3	2-E7
C277	1:B4	2-I4
C279	1:B5	2-I4
C281	1:B5	2-I3
C283	1:B5	2-J2
C285	1:C7	2-K2
C287	1:C6	2-L3
&C289	1:C8	2-Q2
C291	1:C7	2-T2
C293	1:D7	2-T2
%C294	1:C7	2-U2
%C295	1:C7	2-U2
C300	1:F8	3-B8
C301	1:F9	3-B7
C302	1:E8	3-A6
C303	1:E8	3-A6
C305	1:F7	3-E5
C306	1:F7	3-F7
C307	1:F7	3-F7
C311	1:E7	3-B3
C313	1:E9	3-C8
C315	1:E8	3-C7
C316	1:E9	3-E9
C319	1:E8	3-E8
C325	1:E7	3-D4
C327	1:F7	3-C4
C330A	1:E8	3-G8
C330B	1:E8	3-G8
C331	1:F3	3-B2
C332	1:F8	3-B4
C333	1:F3	3-B0
C334	1:F7	3-C4
C335	1:F7	3-F5
%C336	1:F7	3-F5
C337	1:E6	3-J2
C338	1:E7	3-G3
C339	1:E7	3-G3
C340A	1:E8	3-L8
C340B	1:F8	3-L8
C341	1:E7	3-H3
C342	1:E7	3-H3
C343	1:F3	3-J3
C344	1:F3	3-J4
C345	1:F3	3-K4
C346	1:F3	3-K4
C347	1:F3	3-L4
C348	1:F3	3-M4
C349	1:F3	3-M4
C350A	1:F7	3-J8
C350B	1:F7	3-J8
C351	1:F4	3-E1
C352	1:F4	3-F0
C353	1:F4	3-G0
C354	1:F4	3-G0
C355	1:F4	3-G1
C356	1:F3	3-H2
C361	1:E4	3-K1
C362	1:E3	3-J1
C363	1:E4	3-K1
C364	1:E4	3-L1
C365	1:E4	3-L1
C366	1:E4	3-M1
C367	1:E4	3-L1
C368	1:E5	3-M1
C369	1:E6	3-P1
C370A	1:F8	3-K7
C370B	1:F8	3-L7
C370C	1:F8	3-L7
C371	1:F8	3-N7
C372	1:F9	3-P7
C373	1:F9	3-P7
C374	1:E6	3-P1
C375	1:E6	3-P1
C376	1:E6	3-Q1
C377	1:E6	3-Q1
C378	1:F6	3-R1
C380	1:F6	3-R1
C381	1:E3	3-M2
C382	1:E3	3-M2
C383	1:F3	3-B2
C384	1:F5	3-N3
C385	1:F3	3-C0
C386	1:F5	3-P3
C387	1:E4	3-H5
C388	1:F5	3-K5
C389	1:F5	3-K6
C390	1:F8	3-H7
C391	1:F8	3-H7
C392	1:F5	3-P2
C393	1:F5	3-P2
C394	1:F5	3-J5
C405	1:H8	4-D4
#C410	1:J8	4-E3
C415	1:J7	4-F3
C418	1:G7	4-C6
C419	1:G8	4-C6
C420	1:G8	4-D6
C421	1:G8	4-E6
C430	1:J7	4-H6
C435	1:M7	4-J6
C438	1:K8	4-G4
#C439	1:J8	4-F5
#C440	1:K8	4-H4
#C445	1:K7	4-J4
C450	1:L7	4-K5
C455	1:M7	4-L5
#C460	1:L7	4-K4
#C465	1:L8	4-L4
C470	1:L8	4-M4
#C480	1:M8	4-N4
C481	1:K8	4-P7
C485	1:M9	4-M5
C490	1:M9	4-N5
C493	1:M8	4-N4
C496	1:N7	4-P3
C499	1:N7	4-Q3
C503	1:K6	5-L9
C504	1:K6	5-M6
C505	1:K6	5-N7
C507	1:K6	5-B5
C508	1:K6	5-C0
C509	1:K6	5-D0
C510	1:J5	5-D1
C511	1:J5	5-D0
C512	1:J5	5-D1
C513	1:J5	5-H1
C514	1:J5	5-J1
C515	1:K5	5-H0
C516	1:H5	5-H4
C517	1:H5	5-H4
C518	1:H5	5-J3
C519	1:H5	5-J5
C525	1:K4	5-K5
C530	1:K5	5-L4
C535	1:K5	5-L2
C536	1:K5	5-N2
C537	1:K5	5-N2
C605	1:L6	6-C8
C607	1:L6	6-D8
C608	1:L6	6-D8
C610A	1:M5	6-F8
C610B	1:L5	6-F8
C611A	1:M6	6-H8
C611B	1:M5	6-H8
C623	1:N6	6-P7
C625	1:M6	6-Q6
C626	1:M6	6-Q6
C628	1:M6	6-Q6
C630	1:M5	6-J5
C631A	1:N5	6-L6
C634	1:N5	6-L5
C636	1:M5	6-M5
C638	1:M5	6-N5
C640	1:M5	6-R4
C655	1:M4	6-C1
C660	1:L5	6-Q1
C665	1:L5	6-P1
C670	1:L5	6-N1
C673	1:L5	6-K2
C677	1:L6	6-K1
C681	1:L6	6-J2
C684	1:L6	6-H2
C687	1:L6	6-J1
C690	1:L6	6-J1
C693	1:L6	6-H1
C700	1:K4	7-A8
C703	1:J3	7-B7
C706	1:J2	7-A5
C708	1:J2	7-D9
C709	1:K4	7-E9
C710	1:J3	7-D8
C711	1:J3	7-B7
C712	1:H2	7-D7
%C713	1:H2	7-E6
C714	1:J2	7-E8
C719	1:J4	7-F8
C720	1:J4	7-F8
C722	1:J4	7-G8
C724	1:J4	7-H6
C725	1:J3	7-J6
C726	1:J4	7-J6
C727	1:J3	7-K8
C729	1:J3	7-M8
%C733	1:H2	7-E3
C735	1:J2	7-A1
C736	1:J2	7-B1
C740A	1:H2	7-B4

Device	PCB	Circuit
C740B	1:H2	7-B3
C741A	1:H2	7-C4
C741B	1:G2	7-C3
C742A	1:H2	7-D4
C742B	1:H3	7-D3
C743	1:H2	7-B1
C745	1:G3	7-D1
C750	1:G4	7-K0
C757	1:G4	7-F4
C759	1:G4	7-F5
C761	1:G3	7-K4
C762	1:G3	7-K4
C764	1:H3	7-K2
C765	1:G3	7-K2
C767	1:H3	7-L3
C769	1:H4	7-M4
C770	1:H4	7-N4
C772	1:G4	7-M2
C774	1:H4	7-N2
C776	1:H4	7-N2
C782	1:G2	7-P1
C784	1:G2	7-Q1
C785	1:G3	7-P1
C786	1:G2	7-R1
C788	1:G3	7-P0
C790	1:G3	7-Q0
C792	1:G4	7-R1
C810	1:L3	8-H8
C812	1:L2	8-D5
C813	1:K2	8-G5
C822	1:N2	8-Q1
C823	1:M3	8-Q1
C824	1:M2	8-Q1
C826	1:N3	8-P0
C827	1:N3	8-P1
C828	1:N3	8-P0
C830	1:N3	8-J0
C838	1:N4	8-N0
C841	1:N2	8-K2
C844	1:M2	8-J2
C880	1:M2	8-K3
#C900	1:N8	9-C6
#C910	1:P8	9-D6
#C920	1:P8	9-E6
C930	2:P8	9-E7
#C940	1:P7	9-F6
#C950	1:P7	9-G6
C960	2:P7	9-G7
#C970	1:P7	9-H6
#C980	1:P6	9-J6
#C990	1:P6	9-K6
CTCSSM	1:D8	2-M1
#CV475	1:M8	4-M4
D111	1:P4	1-R1
%D205	1:B2	2-D3
%D210	1:B2	2-D3
D211	1:B7	2-U6
D212	1:B7	2-T5
D220	1:B4	2-R5
D220	1:B4	2-R7
D230	1:B7	2-U5
D240	1:D4	2-E7
D240	1:D4	2-E7
D245	1:D4	2-H7
D245	1:D4	2-H7
D250	1:D3	2-E8
D250	1:D3	2-E8
D260	1:C2	2-C8
D260	1:C2	2-B8
D270	1:C2	2-C7
D270	1:C2	2-B7
D340	1:F4	3-F1
D360	1:F4	3-F1
D380	1:F4	3-G1
D381	1:F5	3-J5
D420	1:M8	4-Q5
D420	1:M8	4-N5
D440	1:N7	4-P4
D440	1:N7	4-P4
D510	1:K6	5-K9
D510	1:K6	5-K8
D610	1:N6	6-N7
D610	1:N6	6-N7
D620	1:N4	6-B1
D620	1:N4	6-B1
D630	1:M5	6-E2
D630	1:M5	6-E2
D635A	1:M5	6-F2
D640	1:L5	6-N1
D640	1:L5	6-N1
D645	1:M5	6-R4
D710	1:J3	7-L8
D710	1:J3	7-L8
D720	1:J3	7-N8
D720	1:J3	7-N8
D730	1:H3	7-J1
D732	1:H3	7-K2
D810	1:M2	8-B2
IC210	1:C7	2-J0
IC210	1:C7	2-U2
IC210	1:C7	2-G0
IC210	1:C7	2-K1
IC210	1:C7	2-K2
IC220	1:C6	2-T2
IC220	1:C6	2-T0
IC220	1:C6	2-L3
IC230	1:B4	2-I0
IC230	1:B4	2-I4
IC230	1:B4	2-I2
IC230	1:B4	2-Q5
IC230	1:B4	2-O5
IC240	1:C4	2-J5
IC250	1:D3	2-D7
IC260	1:C8	2-S2
IC260	1:C8	2-H0
IC260	1:C8	2-T3
IC260	1:C8	2-P2
IC260	1:C8	2-N2
IC330	1:E8	3-D8
IC330	1:E8	3-D7
IC330	1:E8	3-H8
IC340	1:F8	3-B3
IC340	1:F8	3-M8
IC340	1:F8	3-M8
IC350	1:F7	3-F6
IC350	1:F7	3-C5
IC350	1:F7	3-K8
IC370	1:F9	3-M6
IC610	1:L5	6-G8
IC630	1:N5	6-K5
IC640	1:M5	6-M5
IC640	1:M5	6-Q4
IC640	1:M5	6-E1
IC650	1:L5	6-C4
=IC700	1:K3	7-A8
IC710	1:J2	7-D8
IC710	1:J2	7-C6
IC710	1:J2	7-D7
IC710	1:J2	7-D5
IC710	1:J2	7-E6
IC710	1:J2	7-C5
IC710	1:J2	7-D6
IC720	1:H3	7-N6
IC720	1:H3	7-J0
IC720	1:H3	7-M7
IC720	1:H3	7-L7
IC720	1:H3	7-K7
IC720	1:H3	7-E8
IC720	1:H3	7-J0
IC730	1:J4	7-H8
IC730	1:J4	7-G7
IC740	1:H2	7-D1
IC750	1:H4	7-M3
IC750	1:H4	7-G5
IC750	1:H4	7-K0
IC820	1:L4	8-K5
IC830	1:N3	8-L0
IC830	1:N3	8-H0
IC830	1:N3	8-L0
IC830	1:N3	8-Q0
IC830	1:N3	8-L1
L302	1:F9	3-B5
L303	1:F8	3-L8
L304	1:E4	3-K2
L305	1:E3	3-J1
L320	1:F4	3-G2
L321	1:E4	3-L1
L322	1:E5	3-M1
L323	1:E6	3-P1
L324	1:E6	3-Q1
L325	1:E7	3-Q1
L326	1:F6	3-P2
L327	1:F6	3-P3
L328	1:F8	3-H7
L333	1:E7	3-H4
L334	1:F3	3-B0
L405	1:H8	4-C3
L410	1:H7	4-D4
L415	1:H7	4-D3
L418	1:H8	4-F4
L420	1:G8	4-D6
L425	1:G7	4-C6
L430	1:J7	4-G6
L435	1:J7	4-F6
L440	1:K8	4-G4
L445	1:K7	4-G4
L450	1:J7	4-G3
L455	1:K8	4-J4
L460	1:M7	4-J6
L465	1:L7	4-J5
L470	1:L8	4-K4
L475	1:L8	4-L4
L480	1:M9	4-N6
L481	1:K8	4-Q7
L485	1:N7	4-Q4
L520	1:K6	5-C1
L521	1:K5	5-M3
L522	1:H5	5-J4
L601	1:L6	6-D8
L701	1:G3	7-Q1
#L910	1:P8	9-C8
#L920	1:P8	9-E8
#L930	1:P7	9-G8
#L940	1:P6	9-J8
LINK1	1:B2	2-E3
P100	1:Q6	1-R8
P150	1:P2	1-Q4
P160	1:P2	1-Q4
P170	1:P2	1-Q3
P204	1:D1	2-A3
P208	1:D1	2-A3
P215	1:D4	2-A7
P217	1:D4	2-A7
P219	1:D2	2-A8
P225	1:D2	2-A7
P230	1:B5	2-M9
P231	1:D7	2-M9
P233	1:C1	2-F3
P235	1:C1	2-F3
P237	1:B7	2-G3
P239	1:B6	2-M9
P240	1:B7	2-M9
P245	1:B8	2-S5
P249	1:B7	2-V5
P251	1:B7	2-V5
P255	1:C4	2-L1
P257	1:C2	2-L1
P259	1:B8	2-L0
P261	1:B8	2-L0
P263	1:B1	2-L0
P267	1:C9	2-Q2
P269	1:C9	2-S3
P271	1:C9	2-R2
P273	1:C9	2-S3
P275	1:C7	2-U2
P290	1:D5	2-R1
P291	1:D5	2-S1
P805	1:M2	8-A2
P810	1:L3	8-B6
P820	1:L4	8-J8
P825	1:L4	8-J8
P830	1:L4	8-J8
P835	1:L4	8-J7
P840	1:L4	8-J7
PL100	1:P3	1-E1
PL201	1:C4	2-K5
PL202	1:C3	2-K4
Q100	1:N4	1-B0
Q101	1:N4	1-B0
Q102	1:P4	1-C1
Q210	1:B6	2-D5
Q211	1:P2	2-B3
Q220	1:B4	2-O6
Q230	1:B4	2-P7
Q240	1:B7	2-U6
Q250	1:B7	2-U5
Q260	1:C4	2-C9
Q270	1:D2	2-D7
Q320	1:E7	3-D4
Q325	1:E7	3-F3
Q326	1:E7	3-G3
Q330	1:E8	3-F4
Q331	1:F5	3-J6
Q331	1:F5	3-K6
Q332	1:F6	3-J6
Q333	1:F8	3-H6
Q334	1:F5	3-J5
Q335	1:F3	3-K4
Q336	1:E5	3-N1
Q337	1:E3	3-J1
Q340	1:F3	3-L4
Q341	1:E3	3-K3
Q345	1:F3	3-M3
Q410	1:J8	4-F4
Q420	1:K8	4-J4
Q505	1:J6	5-K8
Q510	1:J5	5-E1
Q520	1:H5	5-J4
Q530	1:K5	5-H1
Q540	1:K5	5-L3
Q550	1:K5	5-L4
Q610	1:L6	6-D8
Q620	1:N6	6-P6
Q630	1:M6	6-N5
Q660	1:L5	6-M1
Q670	1:L6	6-K1
Q710	1:J3	7-K8
Q720	1:J4	7-K8
Q730	1:J3	7-M8
Q740	1:J3	7-M8
Q750	1:G4	7-F4
Q760	1:H3	7-J3
Q770	1:H3	7-J1
Q775	1:H3	7-K3
Q780	1:H3	7-K3
Q785	1:H3	7-K2
Q790	1:H3	7-M3
Q795	1:G3	7-P1
Q810	1:M2	8-C3

Device	PCB	Circuit
Q820	1:L2	8-C5
Q830	1:L2	8-C6
Q840	1:L2	8-E5
Q850	1:M2	8-E5
Q860	1:L4	8-B3
R100	1:P5	1-B1
R101	1:P4	1-C1
R102	1:P4	1-B0
R103	1:N3	1-C0
%R150	1:P2	1-R4
R160	1:P2	1-R3
%R200	1:B2	2-C3
%R200A	1:B2	2-C4
%R201	1:B3	2-E3
R202	1:C1	2-F3
%R203	1:B3	2-C2
%R203A	1:B3	2-C2
%R203B	1:C3	2-B2
%R203C	1:D1	2-B3
%R203D	1:D1	2-B3
%R203E	1:A2	2-F3
R204	1:C7	2-F0
R205	1:C7	2-H0
R206	1:B6	2-D6
R207	1:B6	2-D5
R208	1:B6	2-C5
R209	1:B6	2-C5
R210	1:B6	2-D5
%R211	1:B2	2-E3
R212	1:C4	2-I6
R213	1:D4	2-L8
R214	1:D4	2-L8
R215	1:C4	2-J6
R216	1:B4	2-N7
R217	1:B4	2-P7
R218	1:B3	2-P7
R219	1:B3	2-Q7
%R220	1:B2	2-E3
R221	1:B7	2-U6
%R222	1:B7	2-H3
R223	1:B4	2-N5
R224	1:B4	2-N5
R225	1:B4	2-O5
R226	1:B4	2-O4
R227	1:B4	2-O4
%R228	1:A2	2-E3
R229	1:A4	2-P6
R230	1:B4	2-P6
R231	1:B4	2-P5
R232	1:B4	2-P5
R233	1:B4	2-P5
%R234	1:B7	2-H3
R235	1:B4	2-Q5
R236	1:C5	2-J5
R237	1:B7	2-U6
R238	1:B7	2-U6
R239	1:B8	2-T5
R240	1:D2	2-B8
R241	1:B8	2-T5
R242	1:B7	2-T5
R243	1:D2	2-B7
R244	1:C6	2-B5
R245	1:D4	2-J6
%R246	1:D9	2-P1
R247	1:C3	2-B9
R248	1:C3	2-C9
R249	1:D4	2-C9
R251	1:C4	2-K6
R253	1:C7	2-K2
R254	1:C6	2-K2
R255	1:C7	2-L1
R256	1:D8	2-M2
R257	1:D8	2-M1
R258	1:D8	2-M1
R259	1:D8	2-M1

Device	PCB	Circuit
R260	1:C8	2-M2
R262	1:D8	2-N2
R263	1:D8	2-N2
&R264	1:C8	2-O2
&R265	1:C8	2-O2
&R266	1:C8	2-P2
R267	1:C8	2-Q2
R268	1:C2	2-C7
R269	1:C2	2-C8
R270	1:C3	2-D8
R271	1:C3	2-D7
R272	1:C4	2-I4
R273	1:B4	2-I5
R274	1:B5	2-I4
R275	1:B5	2-J5
R276	1:D4	2-F7
%R276A	1:D2	2-B4
R277	1:B5	2-I3
R278	1:B5	2-I2
R279	1:B5	2-J2
R280	1:B5	2-J2
R282	1:D7	2-J3
R283	1:C7	2-J3
R284	1:C7	2-K2
R285	1:C9	2-R2
R286	1:C7	2-K3
R287	1:C8	2-S2
R288	1:C6	2-L3
R289	1:C9	2-R2
&R290	1:C8	2-Q2
%R291	1:C9	2-R2
R292	1:C9	2-S3
R293	1:C9	2-S3
R294	1:D8	2-T3
R295	1:D8	2-U3
R296	1:D6	2-T2
R297	1:C7	2-T2
%R298	1:C7	2-U2
R299	1:C6	2-V2
R300	1:F8	3-B9
R301	1:E9	3-C8
R302	1:F9	3-B7
R303	1:E8	3-C7
R304	1:E8	3-E9
R305	1:E8	3-E7
R306	1:E7	3-B6
R307	1:E8	3-B6
%R308	1:E8	3-E9
R309	1:F8	3-F7
%R310	1:E8	3-E8
R311	1:E8	3-B3
R312	1:E7	3-B3
R313	1:E7	3-B3
R316	1:E8	3-E6
R319	1:F7	3-E5
R320	1:F6	3-J5
R323	1:E3	3-J1
R324	1:F7	3-F5
R325	1:F8	3-G5
R325A	1:F6	3-H5
R326	1:E5	3-M1
R327	1:E4	3-H1
R328	1:E3	3-H1
R329	1:E3	3-J2
R330	1:E8	3-H9
R331	1:F4	3-H1
R332	1:F4	3-H1
R334	1:F3	3-B1
R336	1:E3	3-M2
R337	1:F5	3-Q2
R338	1:F9	3-B5
R339	1:E7	3-B5
R340	1:E7	3-B4
R340C	1:F8	3-M9
R341	1:F7	3-D4
R342	1:E5	3-N3

Device	PCB	Circuit
R343	1:F7	3-D5
R344	1:F5	3-N3
R345	1:F5	3-K5
R346	1:F5	3-K6
R347	1:F7	3-E3
R348	1:E3	3-H5
R349	1:E8	3-F3
R350	1:F8	3-K9
R351	1:E7	3-H2
R352	1:F3	3-B2
R353	1:E7	3-G3
R354	1:F3	3-C2
R355	1:E7	3-F3
R356	1:D7	3-G3
R357	1:E8	3-F4
R359	1:E7	3-H3
R360	1:F3	3-J3
R361	1:E7	3-H3
R362	1:F3	3-J4
R363	1:F3	3-J4
R364	1:E3	3-K3
R365	1:F3	3-J3
R366	1:E8	3-F4
R367	1:F3	3-K4
R368	1:F4	3-L3
R369	1:F3	3-L4
R370	1:F8	3-K8
R371	1:E8	3-N7
R372	1:E8	3-N7
R373	1:E8	3-N7
R374	1:E9	3-N6
R376	1:F3	3-L2
R378	1:F6	3-K7
R379	1:F5	3-J7
R380	1:F8	3-J7
R381	1:F4	3-E1
R382	1:F4	3-F1
R383	1:F4	3-F0
R384	1:F4	3-G1
R387	1:E4	3-H1
#R410	1:H8	4-B4
#R420	1:H8	4-B3
#R430	1:H8	4-B4
#R440	1:H8	4-C3
R450	1:H7	4-D3
#R451	1:J8	4-F5
R460	1:M8	4-P5
R470	1:N8	4-P5
R471	1:N8	4-Q5
R472	1:N8	4-Q5
R473	1:N8	4-R6
R480	1:M8	4-N4
R481	1:K8	4-P7
R490	1:N7	4-P3
R501	1:J6	5-J8
R502	1:J6	5-J8
R503	1:J6	5-K8
R504	1:K6	5-K9
R505	1:K6	5-L8
R510	1:K6	5-L8
R513	1:J5	5-G1
R514	1:K6	5-N6
R515	1:H6	5-H5
#R517	1:G5	5-F2
#R518	1:G5	5-F3
#R519	1:G5	5-G2
R520	1:K6	5-C1
R523	1:J5	5-D1
R525	1:J5	5-D1
R530	1:J5	5-E1
R535	1:J5	5-F1
R540	1:H5	5-K4
R545	1:K5	5-H0
%R550	1:K5	5-K2
%R551	1:K5	5-L2
R555	1:K5	5-L3

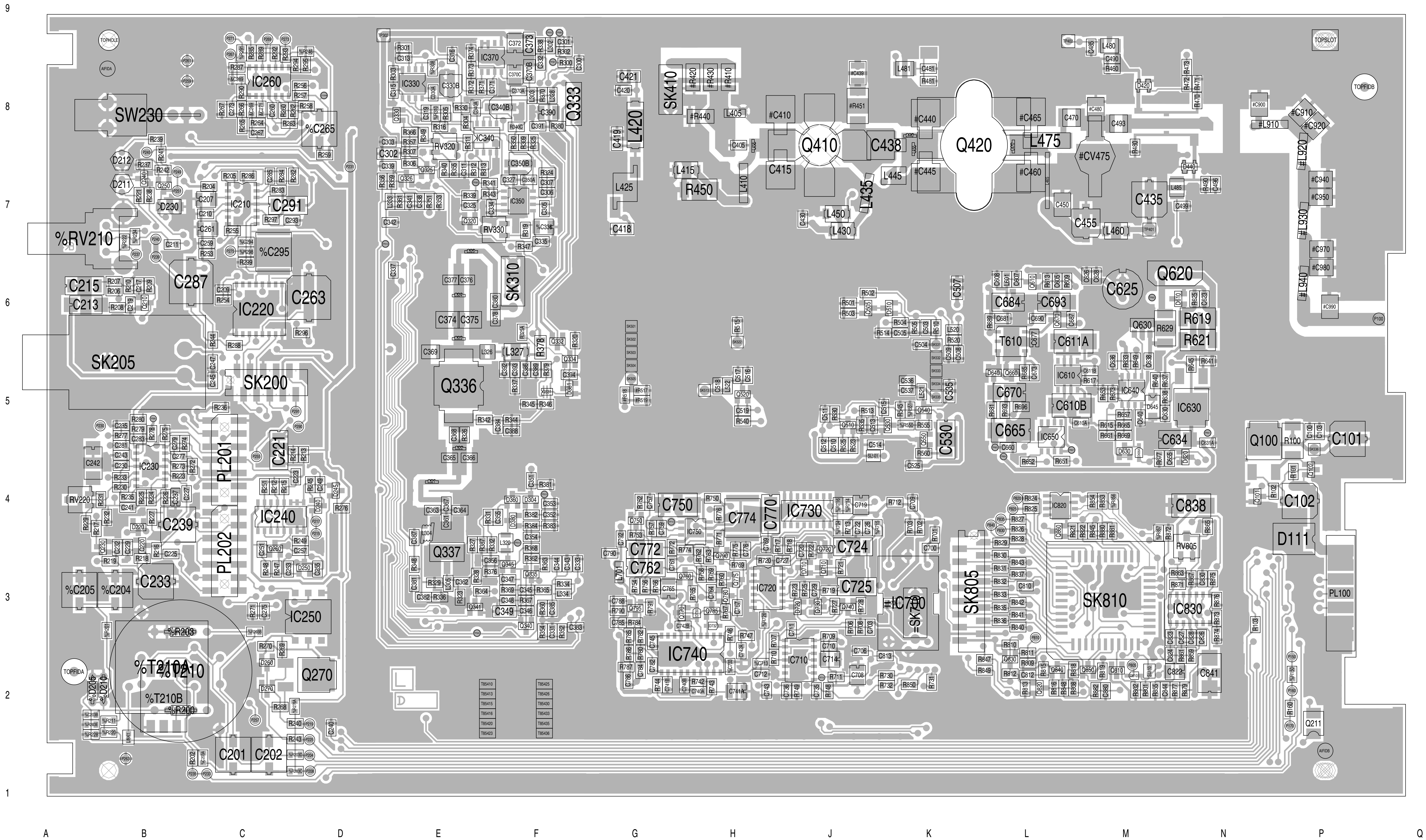
Device	PCB	Circuit
R560	1:K4	5-L5
R609	1:L6	6-B8
R613	1:L6	6-C8
R615	1:M5	6-F9
R617	1:M5	6-H8
R619	1:N6	6-P7
R621	1:N6	6-P7
R625	1:N6	6-P7
R629	1:M6	6-N6
R633	1:M5	6-P5
R637	1:M5	6-J6
R638	1:M5	6-J6
R640	1:M5	6-Q4
R641	1:N5	6-K5
R645	1:N5	6-L5
R649	1:M5	6-M5
R651	1:L4	6-B4
R652	1:L4	6-B4
R653	1:M5	6-P5
R657	1:M5	6-C1
R661	1:M5	6-D2
R665	1:M5	6-D1
R669	1:M5	6-D2
R673	1:M5	6-D0
R677	1:M4	6-F2
R681	1:L5	6-P1
R685	1:L5	6-L2
R689	1:L6	6-J3
R693	1:L5	6-N1
R696	1:L5	6-N0
R701	1:K4	7-A9
R702	1:K4	7-B9
R703	1:K4	7-B8
%R704	1:J4	7-G8
=R705	1:K3	7-A7
R706	1:J3	7-B6
R707	1:H3	7-C7
R708	1:J3	7-B6
R709	1:J3	7-D9
R710	1:H2	7-D7
R711	1:J2	7-B5
R712	1:K4	7-E9
R713	1:J4	7-F8
%R714	1:J4	7-F8
%R715	1:K4	7-H6
%R716	1:J4	7-F7
R717	1:H4	7-H7
R718	1:J4	7-H7
R719	1:J3	7-J7
R720	1:H3	7-K7
R721	1:J3	7-K9
R722	1:J4	7-K8
R723	1:J3	7-L7
R725	1:J3	7-M7
%R726	1:H3	7-M6
R727	1:J3	7-M9
R728	1:J3	7-M8
R730	1:K2	7-A2
R731	1:K2	7-A2
R732	1:K2	7-A2
R742	1:H2	7-C4
R743	1:H2	7-C4
R744	1:G2	7-D4
R746	1:H3	7-D4
R747	1:H3	7-D4
R748	1:J2	7-A1
R749	1:J2	7-B1
R750	1:H4	7-K0
R752	1:G4	7-F4
R753	1:G4	7-F4
R754	1:G3	7-F4
R756	1:G3	7-F5
R757	1:G4	7-F5
R758	1:H3	7-J4
R759	1:H3	7-J4
R760	1:H3	7-K4

Device	PCB	Circuit
R762	1:H3	7-L4
R763	1:H3	7-L4
R765	1:H3	7-J2
R766	1:G3	7-K3
R767	1:H3	7-K2
R769	1:H3	7-L3
R771	1:H4	7-M3
R772	1:G4	7-M2
R774	1:H4	7-M3
R775	1:H4	7-N2
R777	1:H4	7-Q2
R780	1:G2	7-P1
R782	1:G3	7-P1
R784	1:G3	7-P1
R785	1:G3	7-Q1
R786	1:G2	7-Q1
R787	1:G2	7-R2
R790	1:G3	7-P0
R791	1:G3	7-Q0
R801	1:M2	8-C3
R802	1:M2	8-C2
R808	1:M2	8-B5
R809	1:L2	8-C6
R810	1:L3	8-C6
R811	1:L2	8-D6
R812	1:L2	8-C5
R813	1:L2	8-C5
R815	1:L2	8-D5
R816	1:L2	8-D5
R818	1:M2	8-E5
R819	1:M2	8-E4
R821	1:L4	8-B3
R822	1:M4	8-C3
R824	1:L4	8-J8
R825	1:L4	8-J8
R826	1:L4	8-J8
R827	1:L4	8-J7
R828	1:L4	8-J7
R829	1:L4	8-P9
R830	1:L3	8-P9
R831	1:L3	8-P9
R832	1:L3	8-P8
R833	1:L3	8-P8
R835	1:L3	8-P8
R836	1:L3	8-P8
R837	1:L3	8-P7
R840	1:L3	8-M7
R841	1:L3	8-M7
R842	1:L3	8-P6
R843	1:L3	8-P6
R845	1:M4	8-R4
R847	1:L2	8-R3
R848	1:L2	8-K3
R849	1:L2	8-R3
R850	1:K2	8-R3
R853	1:M4	8-L6
R854	1:M4	8-L6
R855	1:M2	8-Q0
%R856	1:M4	8-R2
%R857	1:M4	8-Q2
R859	1:N2	8-P1
R861	1:N2	8-P1
R863	1:N3	8-N1
R865	1:N4	8-N0
R867	1:N3	8-N1
R871	1:N3	8-M2
R872	1:M4	8-L1
R873	1:N3	8-M1
R874	1:N3	8-L0
R875	1:N3	8-M0
R876	1:N3	8-L0
R877	1:N2	8-K2
R879	1:N2	8-J2
R880	1:M4	8-J6
R881	1:M4	8-L6
R882	1:M2	8-K3

Device	PCB	Circuit
%RV210	1:B7	2-G3
RV220	1:A4	2-P6
RV320	1:E8	3-F3
RV330	1:F7	3-D5
RV805	1:N4	8-N1
SK200	1:C5	2-R1
SK205	1:B5	2-A5
SK310	1:F6	3-R1
SK410	1:G8	4-A4
SK501	1:G6	5-E7
SK502	1:G6	5-E6
SK503	1:G6	5-E5
SK504	1:G5	5-E4
SK505	1:G5	5-E3
SK513	1:H5	5-H3
SK522	1:H6	5-L6
SK531	1:K6	5-P7
SK532	1:K5	5-P6
SK533	1:K5	5-P5
SK534	1:K5	5-P4
SK535	1:K5	5-P3
SK536	1:P5	1-A0
=SK710	1:K3	7-A7
SK805	1:K3	8-Q5
SK805	1:K3	8-Q9
SK805	1:K3	8-Q9
SK805	1:K3	8-Q9
SK805	1:K3	8-Q6
SK805	1:K3	8-Q6
SK805	1:K3	8-Q6
SK805	1:K3	8-Q6
SK805	1:K3	8-Q7
SK805	1:K3	8-Q7
SK805	1:K3	8-Q7
SK805	1:K3	8-Q7
SK805	1:K3	8-Q8
SK805	1:K3	8-Q8
SK805	1:K3	8-Q8
SK805	1:K3	8-Q8
SK810	1:M3	8-G5
SL501	1:J4	5-G1
SL810	1:M2	8-B3
SW230	1:B8	2-B9
%T210	1:B2	2-C3
%T210A	1:B2	2-D2
%T210B	1:B2	2-D1
T610	1:L6	6-M2
T85410	1:F2	1-F0
T85413	1:F2	1-F0
T85415	1:F2	1-G0
T85416	1:F2	1-G0
T85420	1:F2	1-H0
T85423	1:F2	1-H0
T85425	1:F2	1-H0
T85426	1:F2	1-J0
T85430	1:F2	1-J0
T85433	1:F2	1-K0
T85435	1:F2	1-K0
T85436	1:F2	1-L0
TP206	1:B5	2-M8
TP302	1:D9	3-A7
TP305	1:E3	3-J4
TP306	1:F9	3-B8
TP307	1:F8	3-B9
TP310	1:D7	3-D2
TP312	1:F9	3-A5
TP313	1:F4	3-L3
TP314	1:F4	3-L3
TP320	1:E7	3-C5
TP401	1:M7	4-G7
TP402	1:L9	4-P6
TP601	1:N5	6-J6
TP602	1:M6	6-Q6
TP603	1:L5	6-Q1

Device	PCB	Circuit
TP604	1:L4	6-L6
TP607	1:L5	6-J9
TP710	1:G4	7-G5
TP715	1:J2	7-B5

Device	PCB	Circuit



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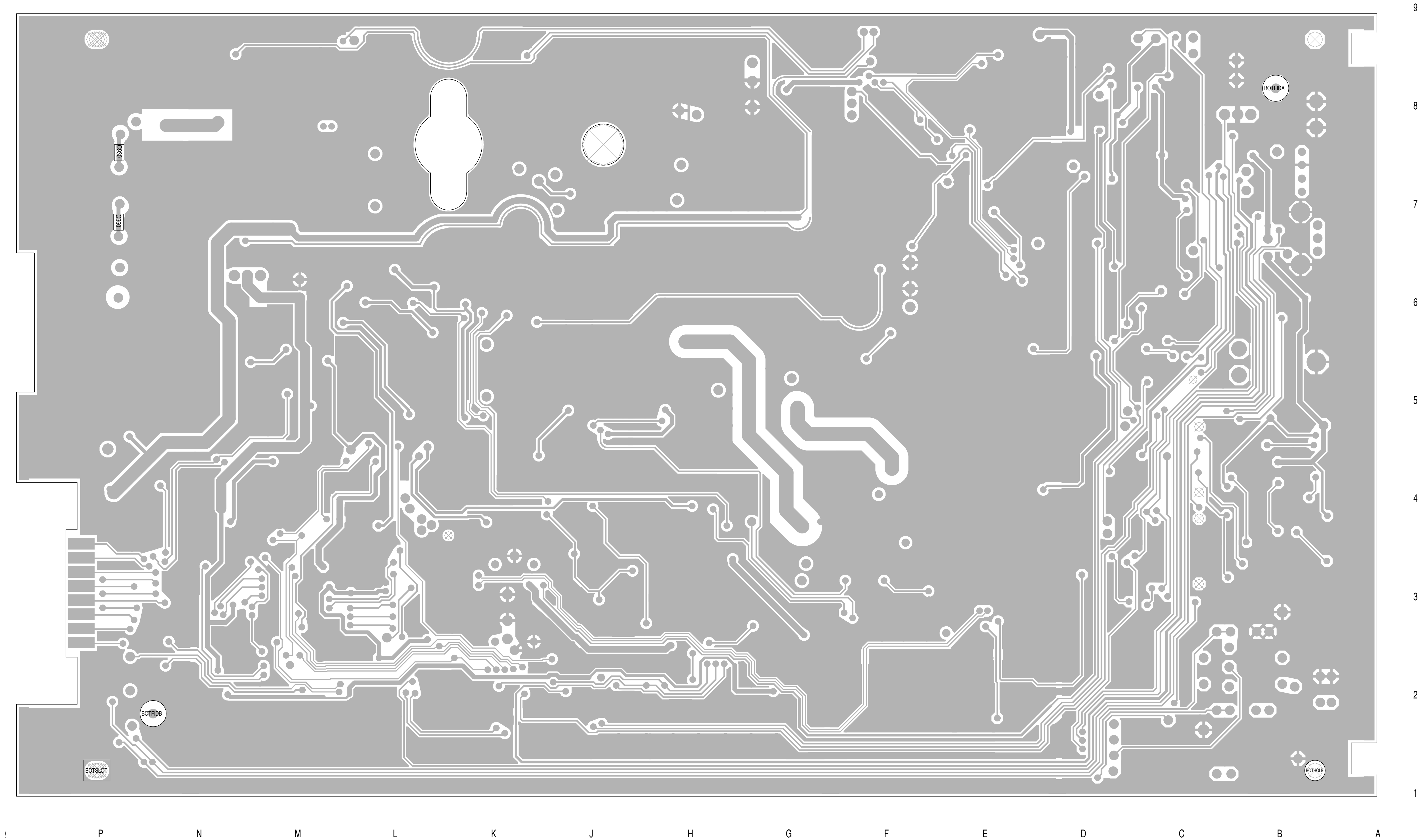
T854-XX-7XXX PCB LAYOUT - TOP SIDE				

T854 PCB Layout – Top Side
220-01686-03



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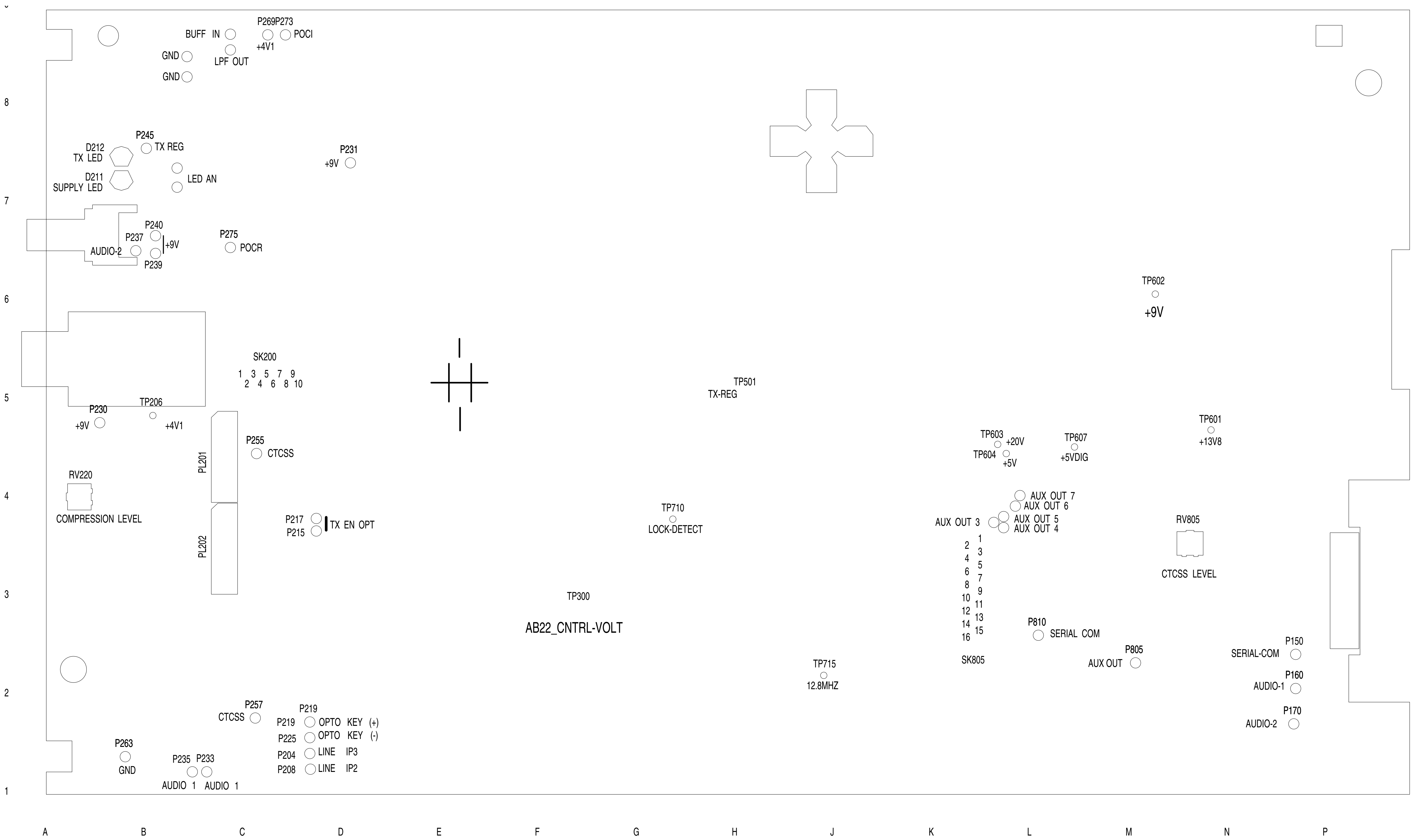
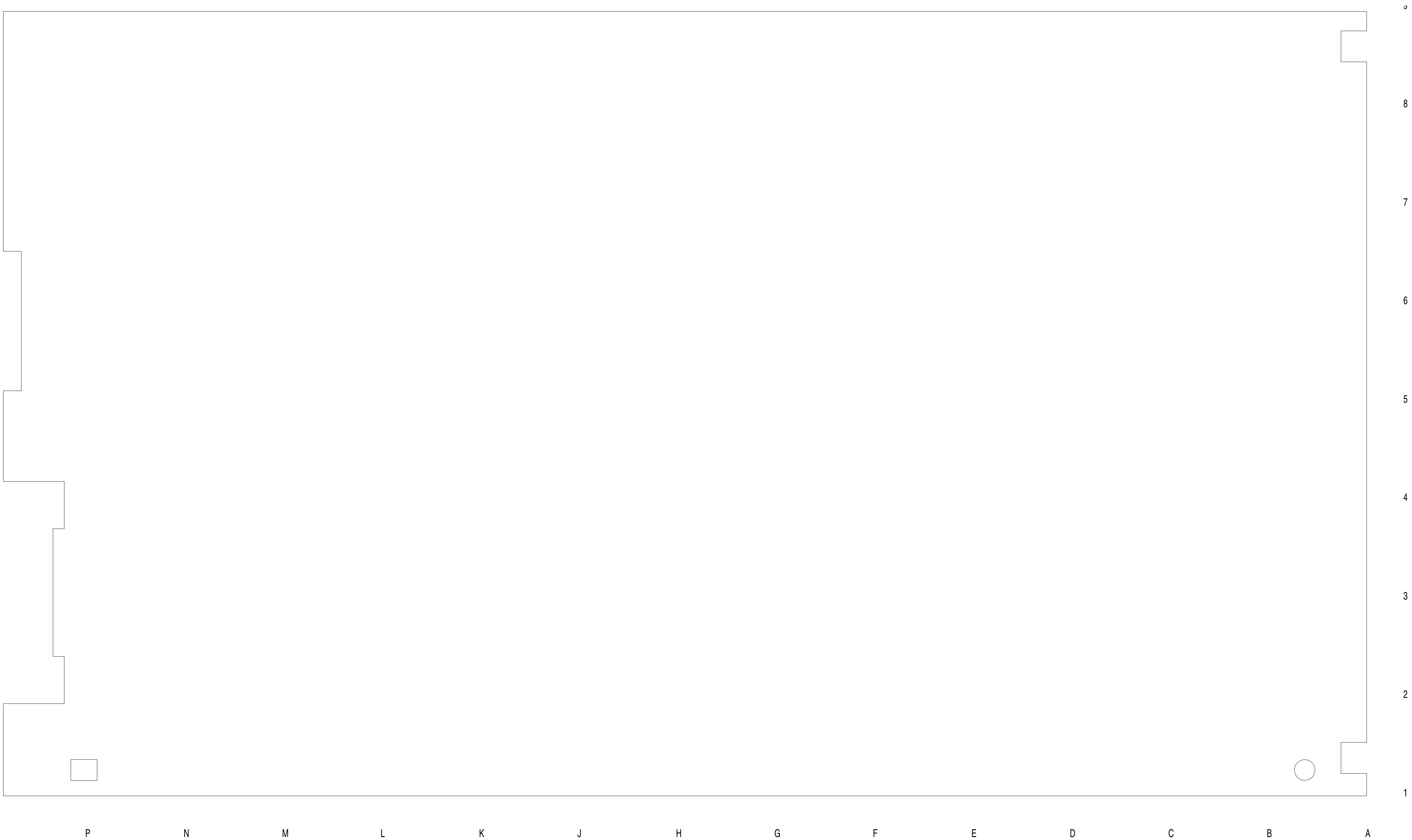
T854 PCB Layout – Bottom Side
220-01686-03



T854 Test Points & Options Connections – Top Side
220-01686-03



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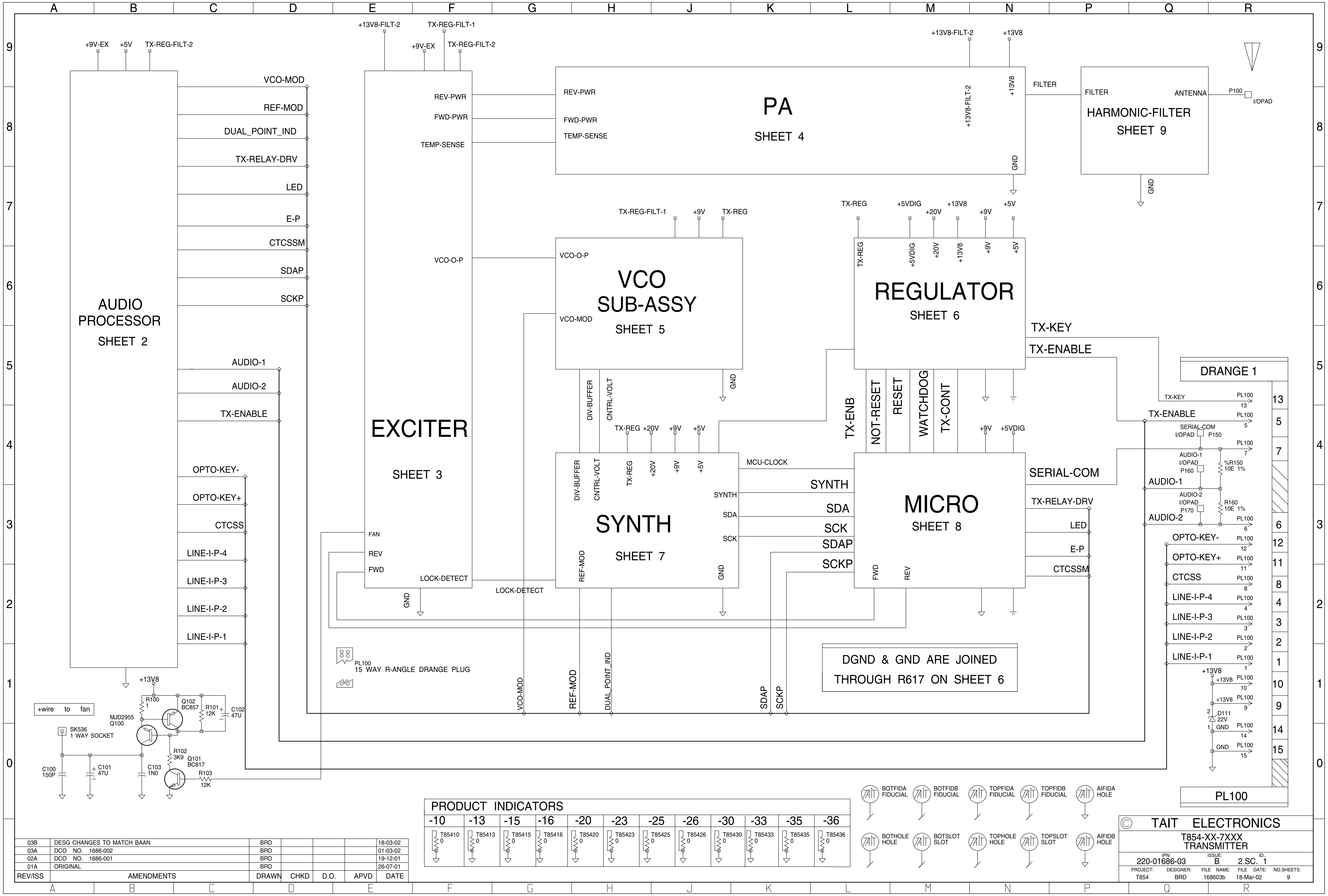

REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE
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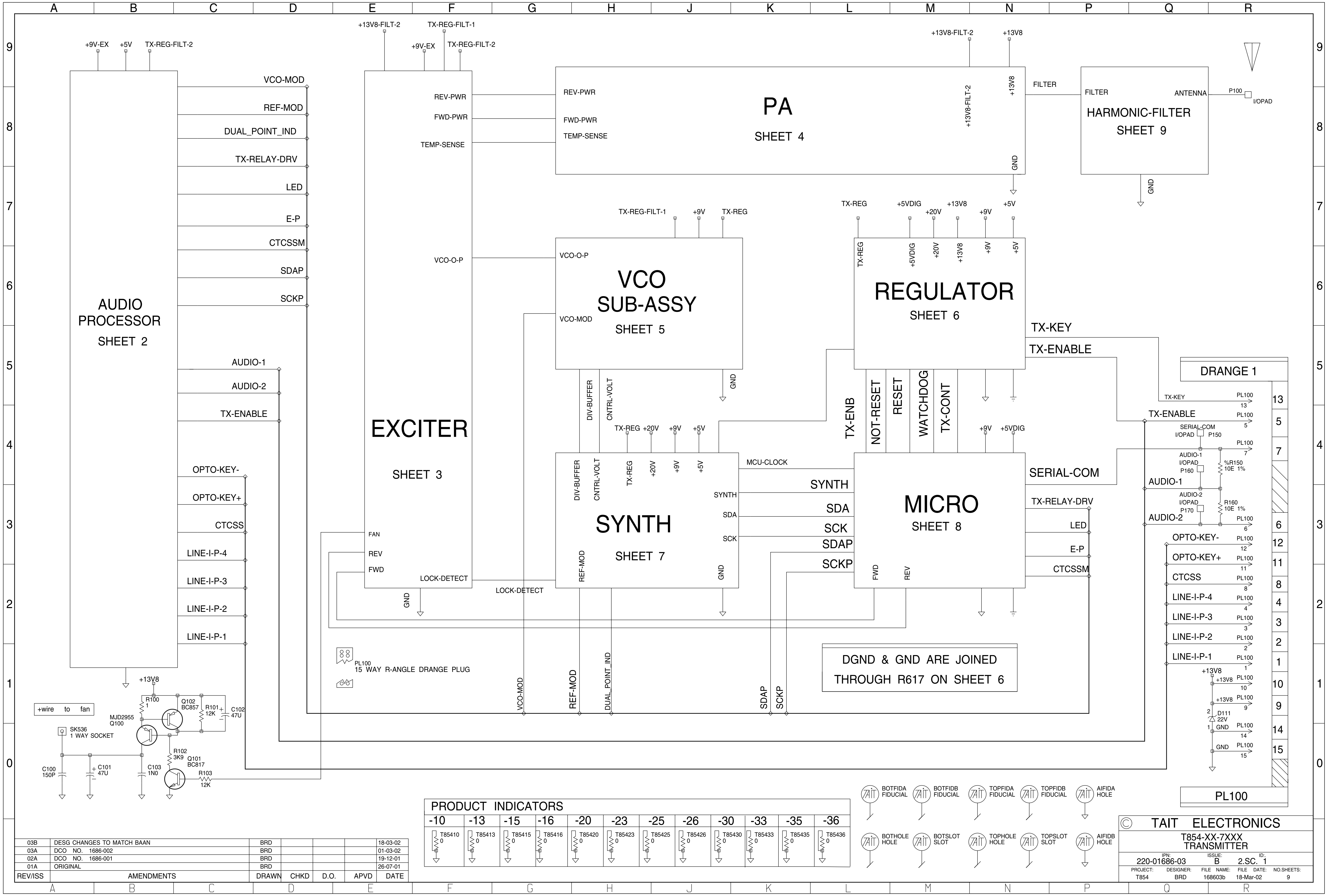
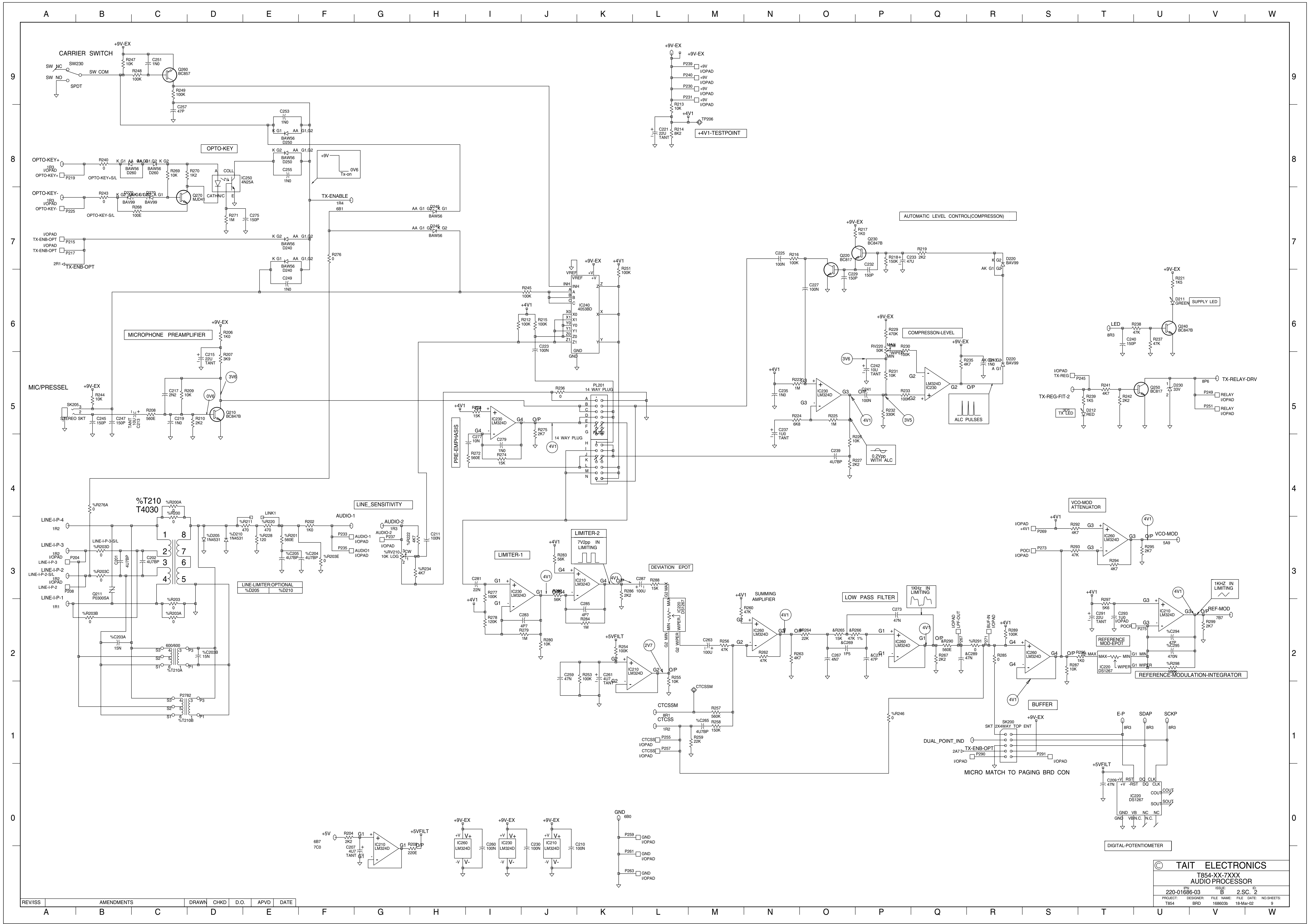
03A	DCO NO. 1686-002	BRD				01-03-02
02A	DCO NO. 1686-001	BRD				19-12-01
01A	ORIGINAL	BRD				26-07-01

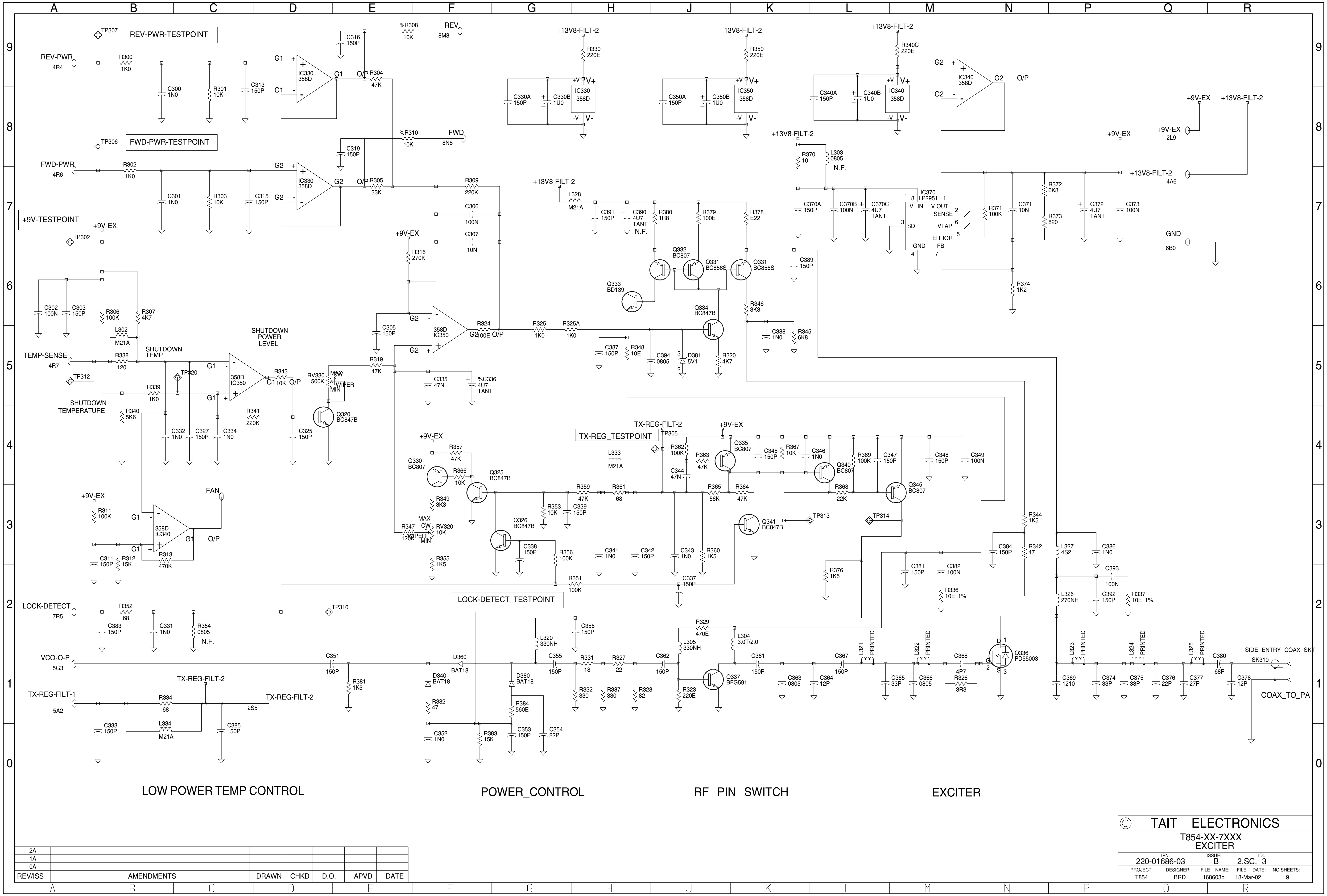
Sheet 1 – T854 Transmitter Overview
220-01686-03



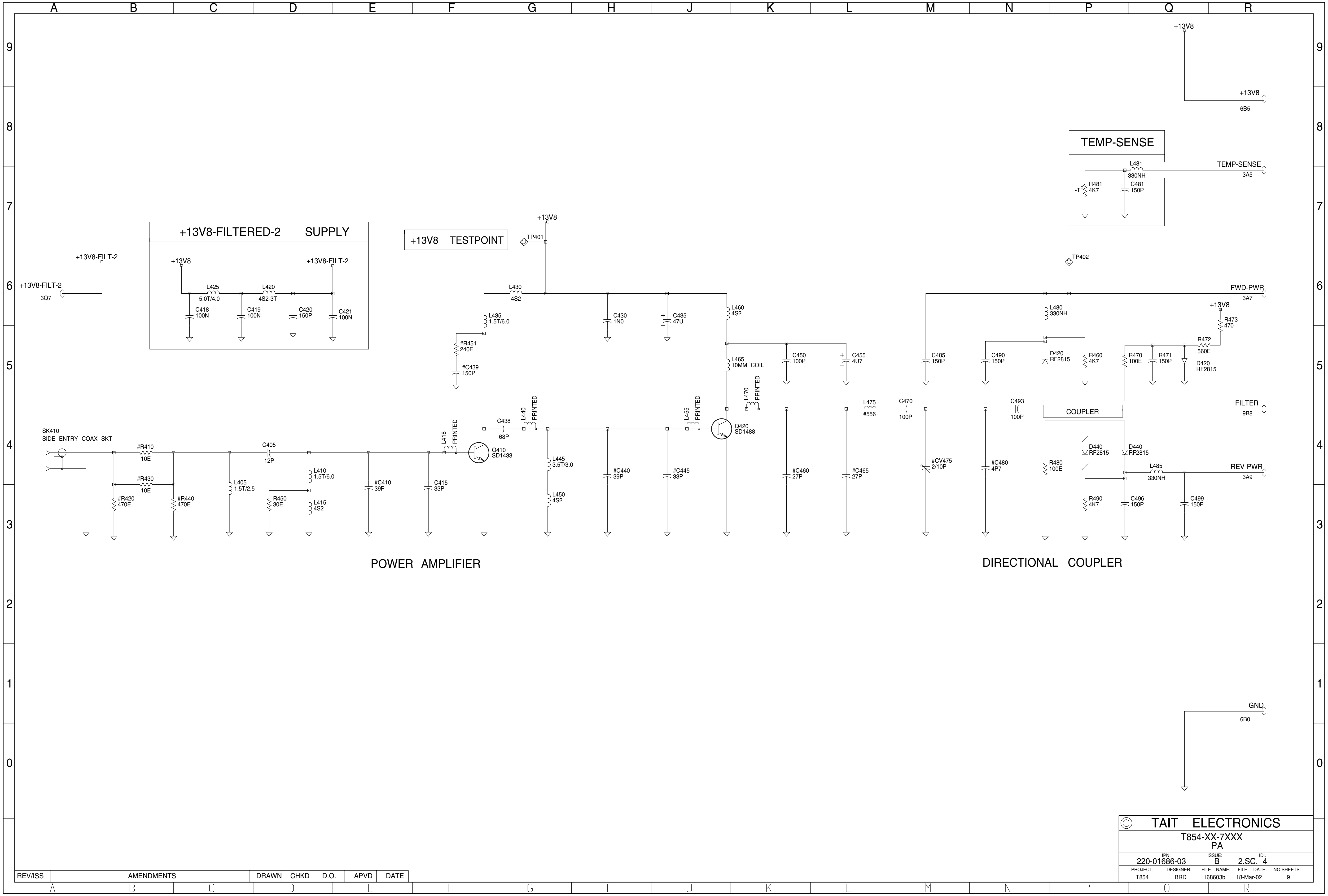
Sheet 1 – T854 Transmitter Overview
220-01686-03



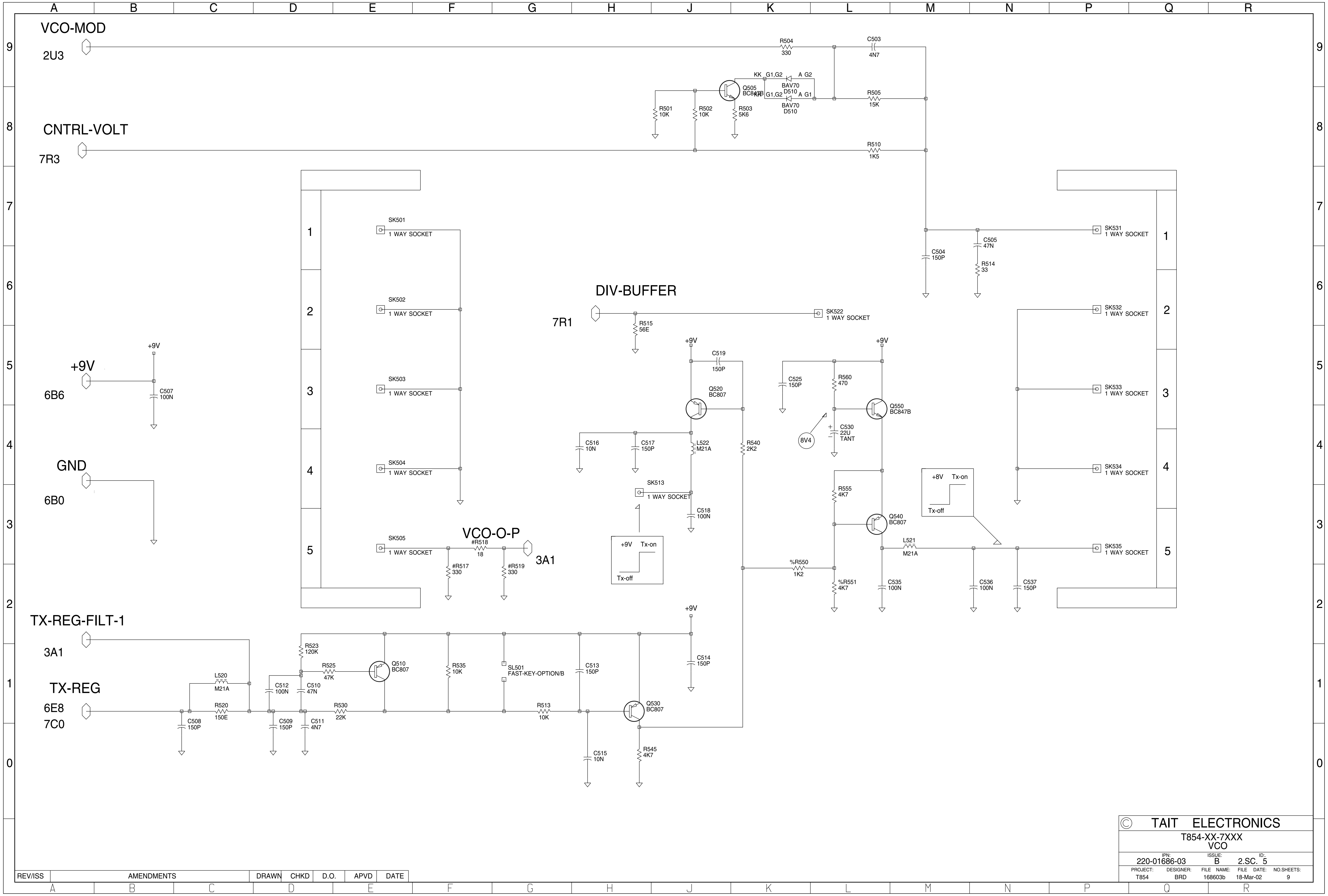
Sheet 2 – T854 Audio Processor
220-01686-03



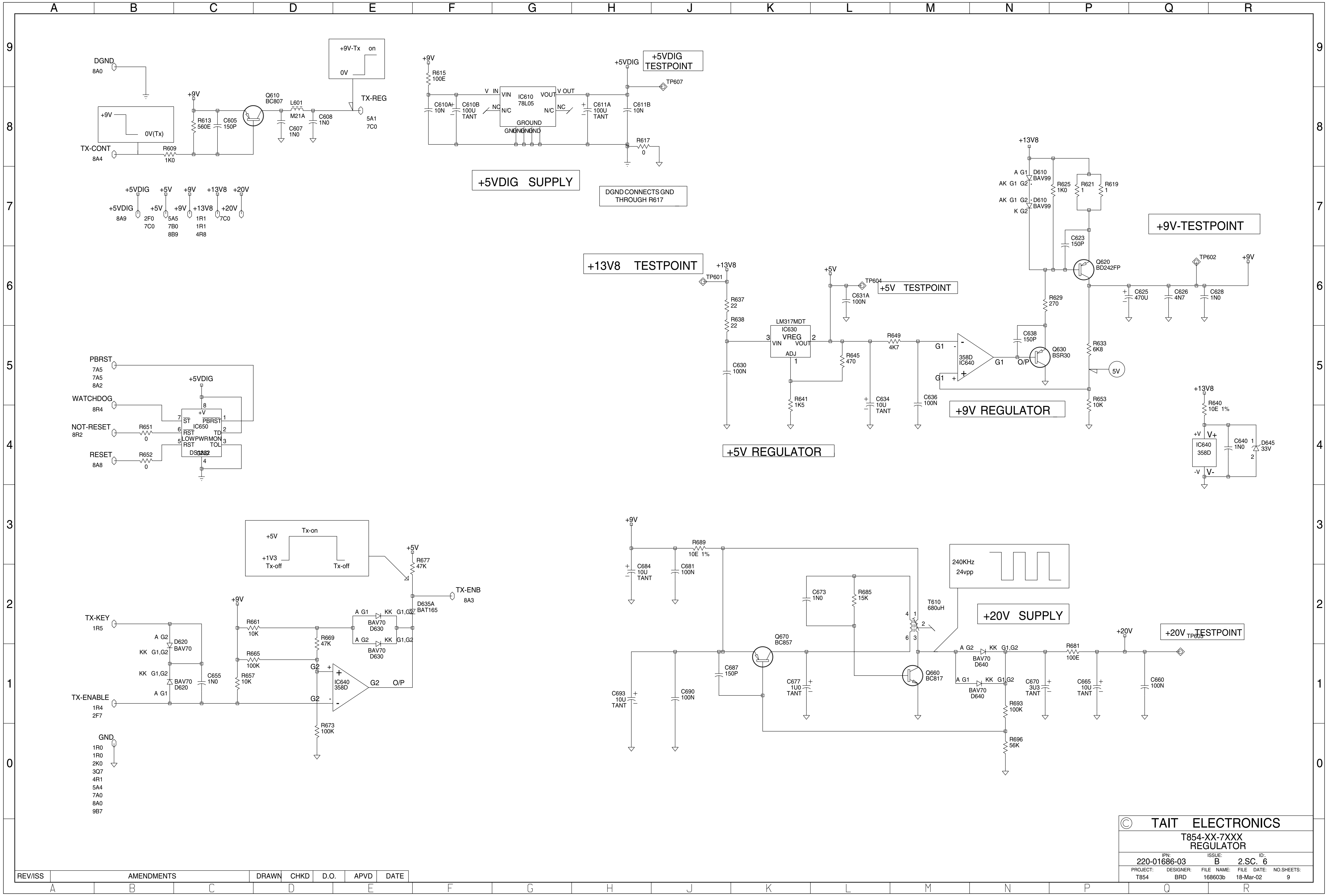
Sheet 3 – T854 Exciter
220-01686-03



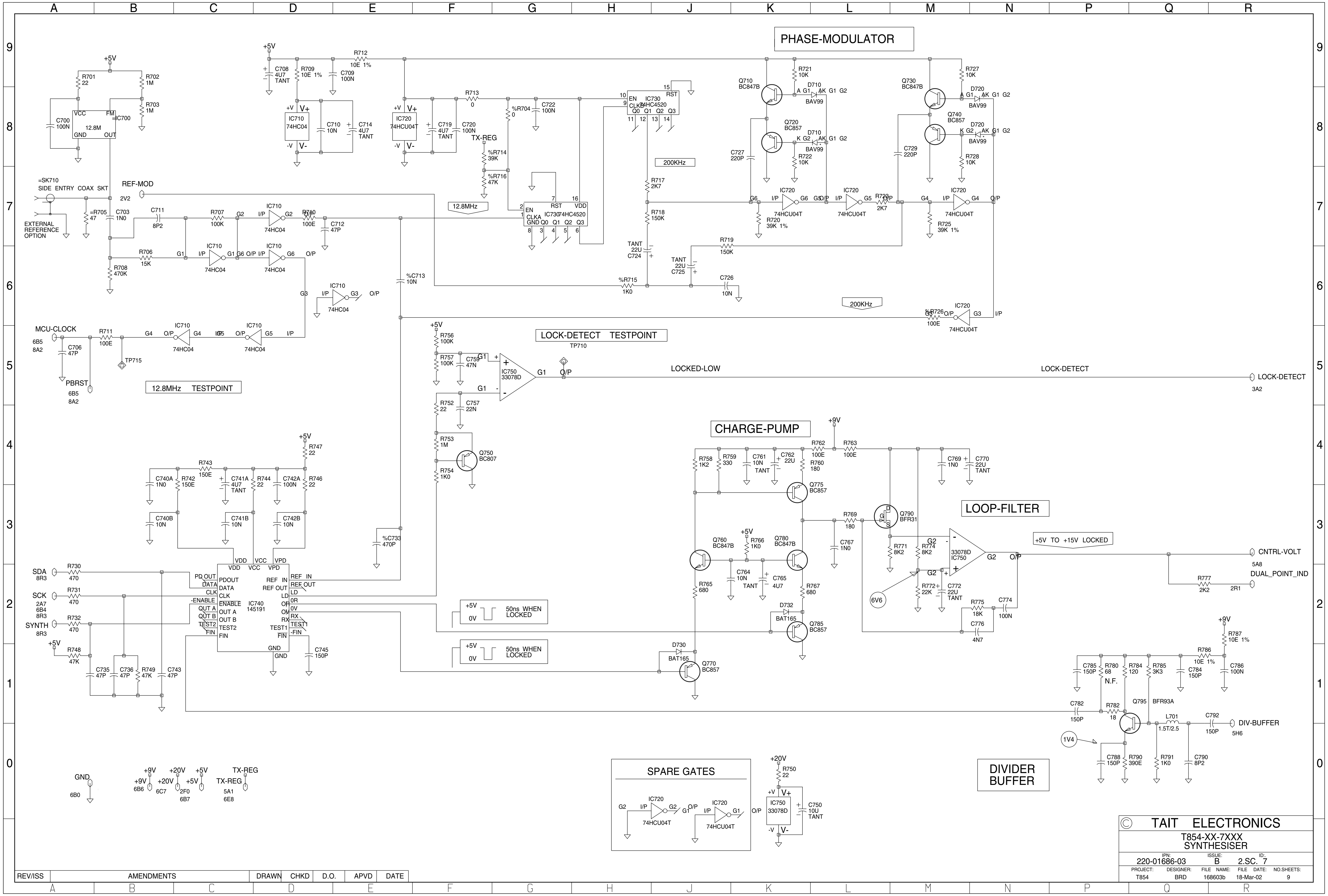
Sheet 4 – T854 PA
220-01686-03



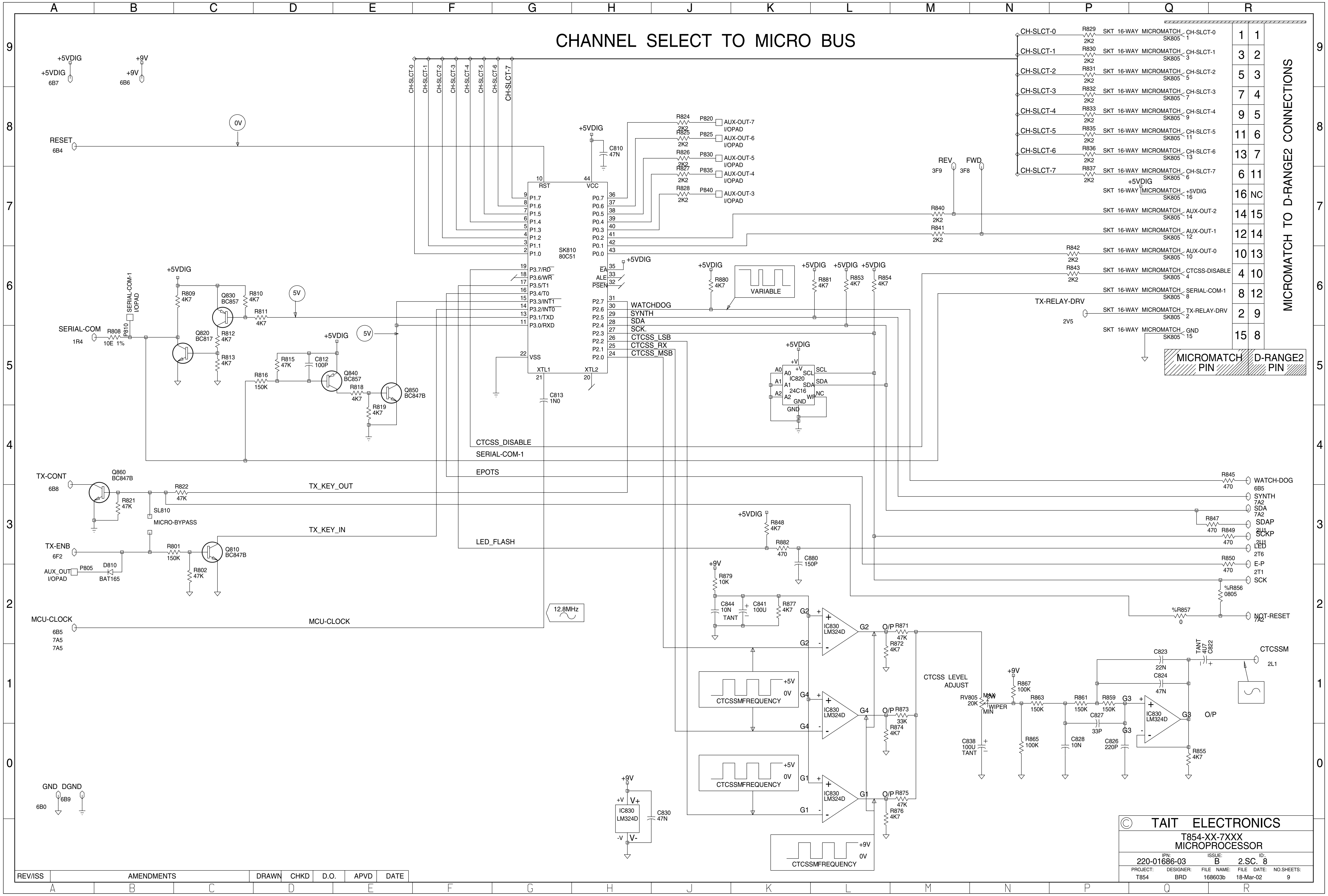
Sheet 5 – T854 VCO Section
220-01686-03



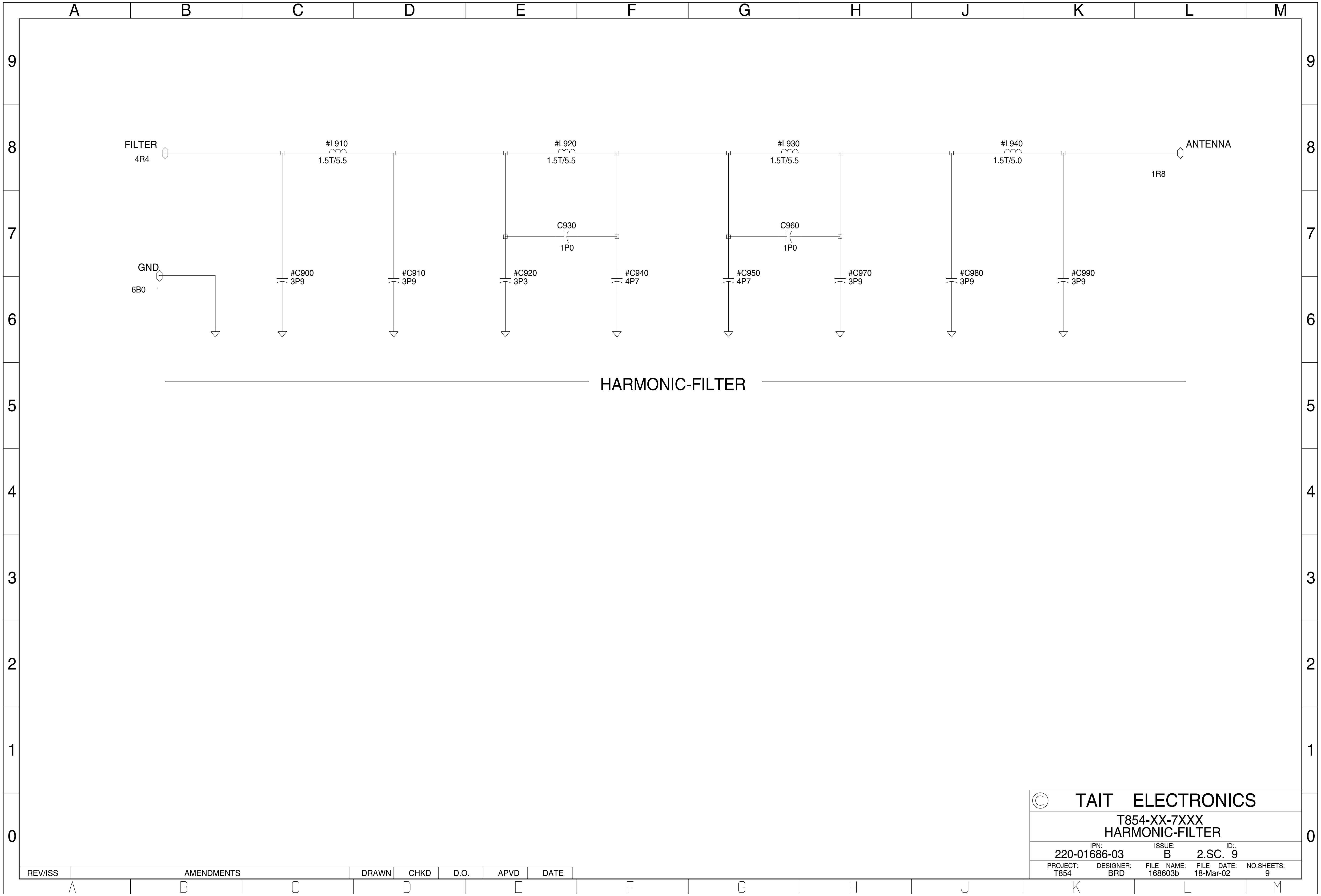
Sheet 6 – T854 Regulators
220-01686-03



Sheet 7 – T854 Synthesiser
220-01686-03



Sheet 8 – T854 Microcontroller
220-01686-03



Sheet 9 – T854 Harmonic Filter
220-01686-03

Part D T803-02-9000 Tone Remote

This part of the manual is divided into four sections as listed below. There is a detailed table of contents at the start of each section.

1 General Information

This section provides a brief description of the T803 tone remote, along with detailed specifications and information on system configuration.

The following topics are covered in this section.

1.1 Introduction

The T803-02 is a tone-operated Remote Controller otherwise known as a Tone Remote. Features include alarm monitoring, voting tone generation and simple high site control. It interfaces either a 2-wire or 4-wire line circuit to the T800 SL2 Base Station and thus enables a dispatch console (also known as a desktop controller) to monitor and control the remote basestation. The T803-02 interfaces with the SL2 receiver and transmitter via the backplane PCB (X800-56-PCB3) and two small flat cable looms plugged into the D-ranges on the back. The T803 is configured using the Tait PGM800Win programming software (V4.02 and later) on a PC.

1.1.1 Tone Remote

The T803 tone remote enables a remotely located user to:

- key the transmitter
- defeat the receiver's CTCSS mute (to monitor a channel)
- change the set channel (up to 256 channels)
- change between base station and repeater modes (repeater knockdown)
- monitor and cancel alarms
- turn repeater site equipment on or off (highsite control)
- loop back line audio (4-wire line interface only)

This is achieved using three industry-standard tone signalling plans for ease of integration into existing control systems and choice of vendor for office/control room equipment. These plans are:

- **EIA tone remote using a single function tone.**
  In this system when the control room user presses the transmit key, the line control equipment sends a 120ms long burst of high level guard tone (HLGT – usually 2175Hz at +10dBM to line). This is followed by a single 40ms function tone at 0dBm to line. The available tone set is 650Hz to 2050Hz in 100Hz steps. This function tone can change channel, monitor the radio channel (defeat receiver CTCSS) or a variety of other functions. Following these initial tone bursts a low level guard tone (LLGT – usually 2175Hz at –20dBm) is sent to line and speech is gated onto line (at approx 0dBm peak level). This continues until the user releases the transmit key. This removes speech from the line and low level guard tone ceases.

- **EIA enhanced tone remote using two function tones.**
  This is a variant of the above system where two function tones are sent one after the other in the period between the high level guard tone and the low level guard tone. The tone set is also expanded (650Hz to 2050Hz in 100Hz steps) to give 225 possible combinations which can be allocated to various actions. The duration of both high level guard tone and function tones can be varied.

- **Simple Transmitter keying using low level guard tone.**
  This is used where complex functionality is not required. One application is to key a link transmitter where the high level guard tone, the function tones, speech and low level guard tones are transparently carried to an end base station. Note that in

this application the notch filters (which ordinarily remove the key tone from the audio path) must be turned off using PGM800Win so that the keying signal is propagated to the end transmitter.

1.1.2 Alarm Monitoring and Confirmations

The T803 monitors three T800 sub-rack alarms (transmitter forward and reverse power, and low battery/power supply), one line alarm (line fail indication) and four external closure alarms. If alarms are triggered the T803 can be programmed to generate tone sequences (DTMF, Selcall or function tones) and/or enable auxiliary outputs, to alert system users of a problem. The tone sequences can be sent to line and/or radio.

Additionally the T803-02 can be programmed to respond to as many as eight different non-alarm triggers. These can be used as confirmation that an event has occurred. Confirmations can be programmed to occur in the event of power-up, channel change and/ or the detection of up to six user defined function tones. In the same way as for alarms, the T803 can generate tone sequences and/or enable auxiliary outputs as a response to a confirmation.

1.1.3 Voting Tones

The T803 can also generate voting tones where a 4-wire line interface is used. Voting systems are used where several base station receivers are tuned to the same radio channel and located at different sites, sending audio back to a central control where the best quality audio must be selected or “voted upon”. Tone on Idle or Sliding Voting Tones can be generated to interface a T800 sub-rack to a wide variety of industry standard Radio Voting systems.

In Tone on Idle applications, a tone (normally the same frequency as LLGT) is transmitted to line when the T800 receiver is muted. When the tone disappears, control room equipment can perform signal to noise measurements on incoming audio lines and select the best for feeding to the control room user.

In Sliding Voting Tone systems, a tone is transmitted to line whose frequency is proportional to the T800 receiver’s RSSI. Control room equipment determines which receiver has the highest RSSI and thus selects which line carries the highest quality incoming audio.

1.1.4 Other Features

- Programmable Morse Code Encoder for automatic station identification (CWID)
- User programmable Line levels
- Programmable Transmit and Receive audio path delays
- Programmable (on/off) notch filtering.

1.1.5 Front Panel Operating Controls

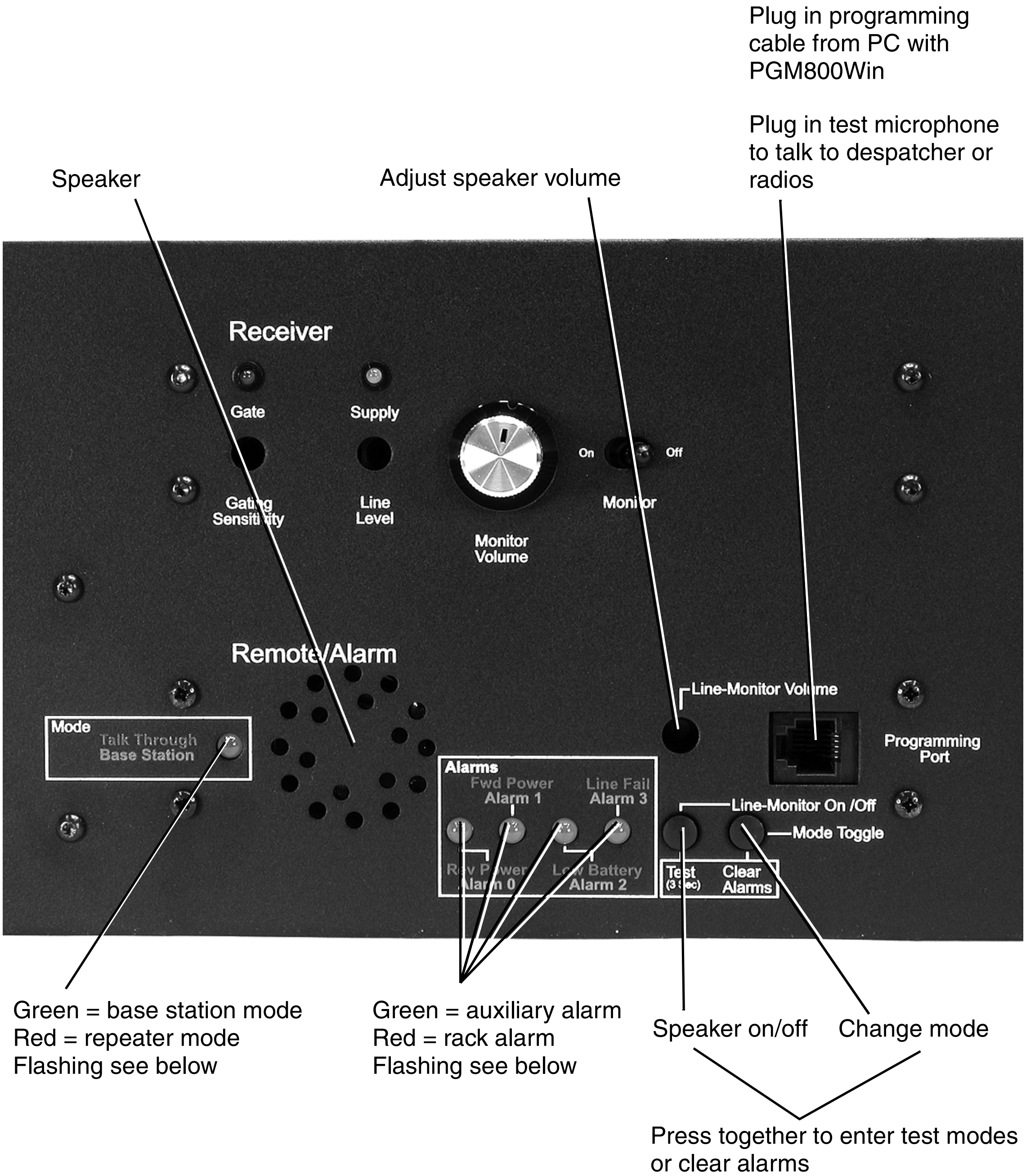


Figure 1.1 Front Panel Layout

1.1.5.1 Mode LED

The colour of the Mode LED on the front panel indicates the T803 mode of operation:

- Green = Base station mode
- Red = Repeater (talk through) mode

The LED flashes in different ways, depending on the particular condition.

Flash Rate		Condition
	equal 0.3s on/ 0.3s off	Module is linked with PGM800Win
	long flash 1 s on/0.3 s off	Microcontroller has detected an internal communications error
	short off 0.3 s on/0.08 s off	Speaker is on.

Where two or more conditions occur at the same time, the precedence is in the order shown above (i.e. module linked has the highest priority, followed by microcontroller error, then speaker on).

1.1.5.2 Alarm LEDs

The alarm LED turns on only when its alarm condition has been latched. The colour of the LED indicates the source of the alarm trigger:

- Green = Auxiliary alarm
- Red = Rack alarm

The LED flashes in different ways as indicated below.

Flash Rate and Colour		Alarm
	green very short off 0.32s on/0.01s off	Rack
	red short off 0.32s on/0.1s off	Auxiliary
	alternating red and green 0.32s on/0.1s off/ 0.32s on/0.1s off	Rack and Auxiliary

Press the Monitor and Mode Toggle buttons together to reset all alarms.

1.2 Specifications

1.2.1 Introduction

The performance figures given are minimum figures, unless otherwise indicated, for equipment operating at standard room temperature (+22°C to +28°C) and standard test voltage (13.8V_{DC}).

Details of test methods and the conditions which apply for Type Approval testing in all countries can be obtained from Tait Electronics Ltd.

1.2.2 General

Supply Voltage:

Operating Voltage	… 10.8 to 16V_{DC}
Standard Test Voltage	… 13.8V_{DC}
Polarity	… negative earth only

Supply Current	… 250mA max.
Operating Temperature Range	… –30 to +60°C.

1.2.3 Line

1.2.3.1 Input levels

Line-In (Level required to produce a transmitter output at 60% full system deviation):

Programmable	… –27dBm to +3dBm
Maximum input peak	… +7dB relative to programmed level

1.2.3.2 Output levels

Line-Out (Radio receiver level to T803 must be 230mV_{rms})

Programmable	… –27dBm to –1dBm
Dynamic range	… +7dB relative to programmed level
Maximum output peak	… +5.5dBm

For compliance with TIA/EIA-IS-968, CS-03 (Canada), PTC200 (New Zealand) and HKTA 2023 (Hong Kong):

Programmable Line Output level must be set to ≤ –10dBm.

For compliance with ACA TS002 (Australia):

Programmable Line Output level must be set to ≤ –11dBm.

For compliance with TS PSTN1 (Singapore):

Programmable Line Output level must be set to ≤ –7dBm.

1.2.4 Radio Levels

From Radio Receiver (for 1kHz tone at 60% full system deviation) (Note: This input of theT803 is high impedance)	… 230mV$_{rms}$ at input of T803

To Radio Transmitter:

From Line-In	… –4.4dBm
From Radio Receiver	… –4.4dBm (With receiver level to T803 set to 230mV$_{rms}$)

1.2.5 Tone Remote

Keytone Sensitivity	… 29dB less than programmed Line-In level
Keytone Accept Bandwidth	… ±0.75% typical (±16Hz at 2175Hz) (Speech at –10dBm, keytone at –30dBm)

Talkoff
(Max. difference between speech and keytone)

2-wire mode	… 32dB typical
4-wire mode	… 35dB typical
Programmable Guardtone Frequencies	… 1950, 2100, 2175, 2325, 2500, 2600, 2800, 2900, 2970, 3000 and 3100Hz
Programmable High Level Guard Tone Duration	… 60 to200ms
Function Tone Frequencies	… 650Hz to 2050Hz in 100Hz steps
Function Tone Accept Bandwidth	… ±24Hz typical
Maximum Number of Function Tones	… 2
Programmable Function Tone Duration	… 20 to 100ms

1.2.6 Audio Response

Frequency Response	… ±1dB 300Hz to 3kHz except at notch frequency

Notch Filter Bandwidth at –38dB	… ±0.6% typical (±13Hz at 2175Hz)
Notch Filter Bandwidth at –3dB	… ±1.28% typical (±28Hz at 2175Hz)
Notch Filter Attenuation	… 38dB
Audio Distortion:	
From Line	… <2.5%
From Receiver	… <2%
Programmable Audio Delay:	
Minimum	… 0ms
Maximum	… 500ms
Step	… 1ms

1.2.7 Alarms

Supply Voltage Alarm Threshold	
Firmware up to version 2.10	… 10.7V ±0.05V
Firmware version 2.11 or later	… programmable 10.7V to 14.1V (0.2V steps)
RF Power Alarm Thresholds	… adjusted inside transmitter or PA
Line Fail Alarm Timer	… off or 1 minute to 4 hours
Auxiliary Alarm	
Input Trigger	… First and subsequent falling edges
Input Threshold	… <1.5V (or to 0V via 3.3KΩ resistor)
Maximum Input Voltage	… 5V
Alarm/Confirmation Sequence	… 0 to 14 tones to radio and/or line (and/or Aux output when enabled)
Programmable Signalling Standards	… Selcall (CCIR, EIA, EEA, ZVEI, and DZVEI) DTMF and EIA Tone Remote function tone format.
Tone Carrier Deviation (for test tone set at 60%)	… 70% nom. system deviation at 1kHz
Alarm Pip Tone Frequency/Duration	… 600Hz/200ms on tail of audio

1.2.8 Morse Code

Sending Speed	… 20 words per minute (PARIS)
Maximum Code Length	… 15.36 seconds

Tone Frequency	… 1200Hz
Valid Station ID	… alphanumeric only
Repetition Rate	… off or 1 to 60 minutes
Carrier Deviation (for test tone set at 60%)	… 20% nominal system deviation

1.2.9 Voting

Programmable Tone-On-Idle Frequencies	… 1950, 2100, 2175, 2325, 2500, 2600, 2800, 2900, 2970, 3000 and 3100Hz
Programmable Sliding Voting Tone Frequencies	… 2700 to 3500Hz
Voting Tone Level To Line	… –40dBr to –1dBr (Adjustable relative to Line-Out setting)

1.2.10 Miscellaneous

Auxiliary Output Rating	… open collector, 50V, 250mA (at25°C)
Momentary Monitor (CTCSS Defeat) Time	… off or 1 to 20 seconds

1.3 System Configuration

The following flow chart will help you to configure your T800 SL2 system to utilise the features of the T803 Tone Remote. Refer to Section 1.3.1 for details on the product types mentioned in this chart.

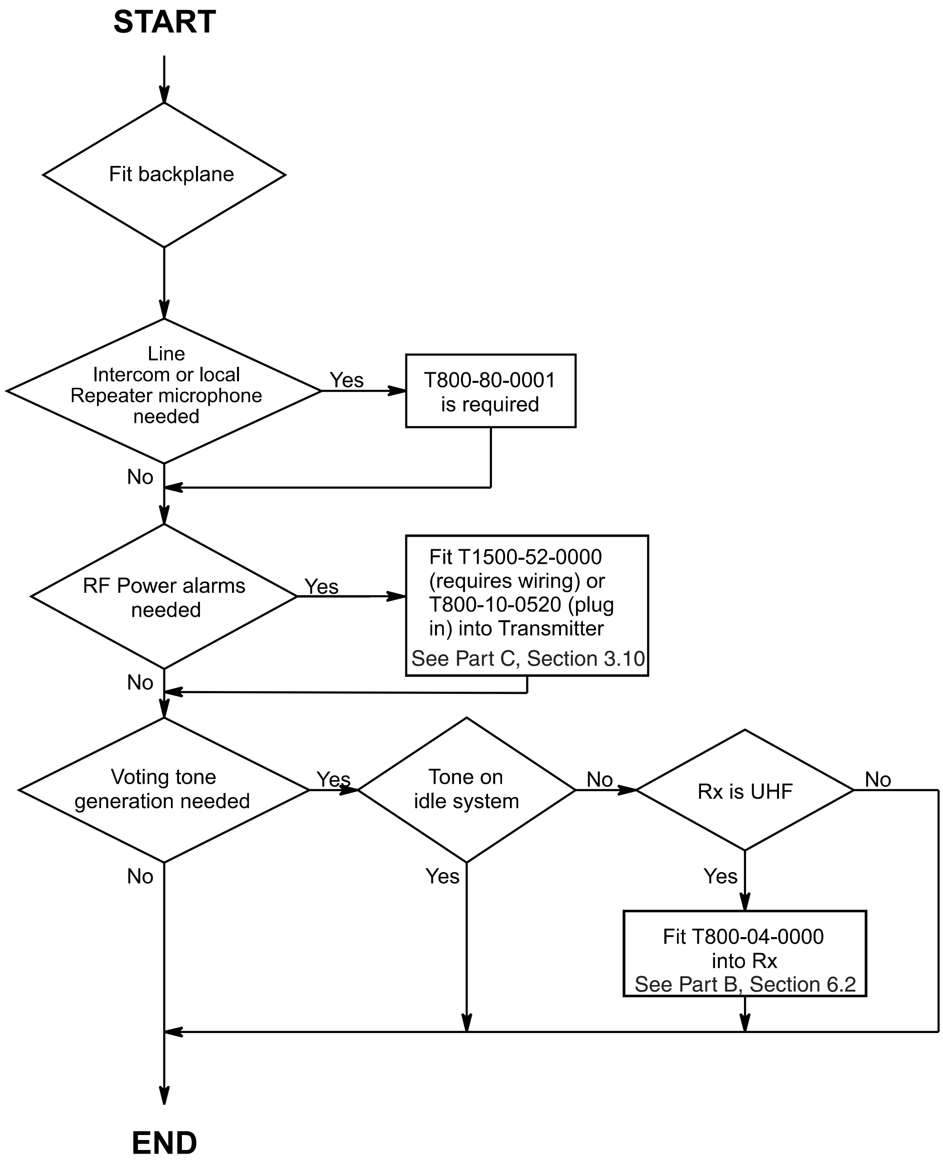


Figure 1.2 T803 System Configuration

1.3.1 Product Codes

The following table provides a brief description of the products mentioned in Figure 1.2. Consult your nearest Tait Dealer or Customer Service Organisation for more information on these products.

Product Code	Description
T800-04-0000	T800 UHF RSSI kit.
T800-80-0001	T803 test microphone. Used for line intercom and to talk on air.
T1500-52-0000	Tx alarm and multichannel kit (wired connection).
T800-10-0520	Tx Alarm kit (plug in).

1.4 Regulatory Information

1.4.1 Canada

This product meets:

- Industry Canada Telecommunications Apparatus Compliance Specification CS-03. Registration No. 737A-10118A.
- Canadian ICES-003 (Radiated and conducted emissions, and electromagnetic susceptibility specifications) for Class A digital apparatus.

1.4.2 United States Of America

A copy of the Declaration of Conformity is available at www.taitworld.com

This equipment complies with TIA/EIA/IS-968, Part 15 Class A of 47CFR and Part 68 of 47CFR as detailed below.

- **TIA/EIA/IS-968** (Telecommunications - Telephone Terminal Equipment - Technical Requirements). Adopted criteria of the Administrative Council on Terminal Attachments (ACTA).
- **Part 15 Class A of 47CFR** (Radiated and conducted emissions, and electromagnetic susceptibility specifications) of the FCC rules for the United States. Operation is subject to the following conditions:
  1. This device may not cause harmful interference, and
  2. This device must not accept any interference received, including interference that may cause undesired operation.

Warning:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide a reasonable protection against harmful interference when the equipment is operated in a commercial enviroment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

- **Part 68 of 47CFR** (Connection of terminal equipment to the telephone network) of the Federal Communications Commission (FCC) rules and the requirements adopted by ACTA. On the rear face of this equipment is a label that contains, among other information, the product identifier i.e. US: 6FPNZL-34203-OT-N. If requested this number must be provided to the telephone company.

Warnings:

If this equipment, *T803 Tone remote and Alarm Interface*, causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could effect the operation of the equipment. If this happens the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information

If trouble is experienced with this equipment, *T803 Tone remote and Alarm Interface*, for repair or warranty information, please contact:

Tait North America Inc
Building 1, Suite 450
15740 Park Row
Houston, Texas, 77084, USA
Phone: 0800 320 4037
Fax: 281 829-3320
Mobile: 713-703-4991

Only approved Tait Dealer or Customer Service Organisations equipped with the necessary facilities should perform any servicing. Repairs attempted with incorrect equipment or untrained personnel may result in permanent damage. If the equipment, *T803 Tone Remote and Alarm Interface*, is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

1.4.2.1 Facility Interface and Service Order Codes

Unit Configuration	Function	USOC Jack type	REN[a]	FIC[b]	SOC[c]
T803 2-wire	2-wire leased line	RJ-11C	—	Metallic	7.0Y
T803 4-wire	4-wire leased line	RJ61X	—	Metallic	7.0Y

a. Ringer Equivalence Number

b. Facility Interface Code

c. Service Order Code

1.4.3 Europe

For Declaration of Conformity refer to eudocs.taitworld.com

According to the requirements of the EC Council Directive:
1999/5/EC Radio Equipment and Telecommunications Terminal Equipment Directive,

The T803-02-0000 Tone Remote and Alarm Interface complies with;

- EN60950 : 2000 Electrical Safety
- EN 301 489-5 Radiated and conducted emissions, and electromagnetic susceptibility specifications. Compliance to this standard is subject to the fitting of an additional EMC filter to the 2-wire/4-wire line interface. For more information see the following section.

1.4.3.1 Additional EMC filter fitting instructions

Applicability

In order for the T803-02 to comply with the RF electromagnetic field immunity requirements of the EMC standard EN 301 489-05 (07-2000), an additional filter must be fitted to the 2-wire or 4-wire line when the unit is installed. This filter, a clamp-on ferrite, helps prevent electromagnetic energy from being coupled into the product.

Required Component

The T803-02 Tone Remote and Alarm Interface unit is supplied together with the following separate EMC Filter:

IPN	069-00010-31
Description	Clamp-on ferrite EMC filter for 13mm diameter cable
Manufacturer and part number	Fair-Rite Part No. 0431 164181

Instructions

1. The clamp-on ferrite must be located on the 2-wire or 4-wire line as close as possible to the T803. If the ferrite is not located within 10cm of the line socket, there is no guarantee that the T803 complies with the EMC standards.

2. Only one turn of the 2-wire or 4-wire line is required through the ferrite. However, two turns are recommended (see Figure 1.3) as this provides extra immunity while also securing the ferrite in position.

3. Ensure that the 2-wire or 4-wire line does not impede the closing of the ferrite clamp.

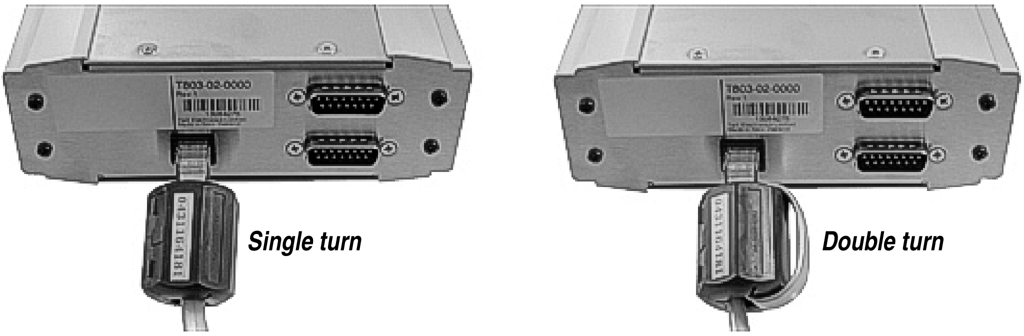


Figure 1.3 Single and double turn of line through filter

Technical Support

Contact your local Tait Electronics agent or Customer Service Organisation or visit Tait Electronics Technical Support at support.taitworld.com.

1.4.4 New Zealand

This product complies with the following standards:

- PTC200 Requirements for analogue telecommunications equipment.
- AS/NZS 3548 Class A Radiated and conducted emissions specifications

Warning:

T803-02-0000 for use in New Zealand

"The grant of a Telepermit for any item of terminal equipment indicates only that Telecom New Zealand has accepted that the item complies with minimum conditions for connection to its network. It indicates no endorsement of the product by Telecom New Zealand, nor does it provide any sort of warranty. Above all, it provides no assurance that any item will work correctly in all respects with another item of Telepermitted equipment of a different make or model, nor does it imply that any product is compatible with all Telecom New Zealand's Network services."

"This equipment does not fully met Telecom New Zealand's impedance requirements. Performance limitations may occur when used in conjunction with some parts of the network. Telecom New Zealand will accept no responsibility should difficulties arise in such circumstances.”

1.4.5 Australia

This product complies with the following standards:

- AS/ACIF S006 - 2001 Telecommunications technical standard
- AS/ NZS 3260 Electrical safety
- AS/NZS 3548 Class A Radiated and conducted emissions specifications

1.4.6 Hong Kong

This product complies with the Network Connection specification HKTA 2023

1.4.7 Singapore

This product complies with the Type Approval specification IDA TS PSTN1

2 Circuit Operation

This section provides a description of the circuit and operation of the T803-02 tone remote.

Note: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 4.02 or later of the programming software.

Refer to Section 4 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components and test points on the main PCB.

The following topics are covered in this section.

2.1 Circuit Overview

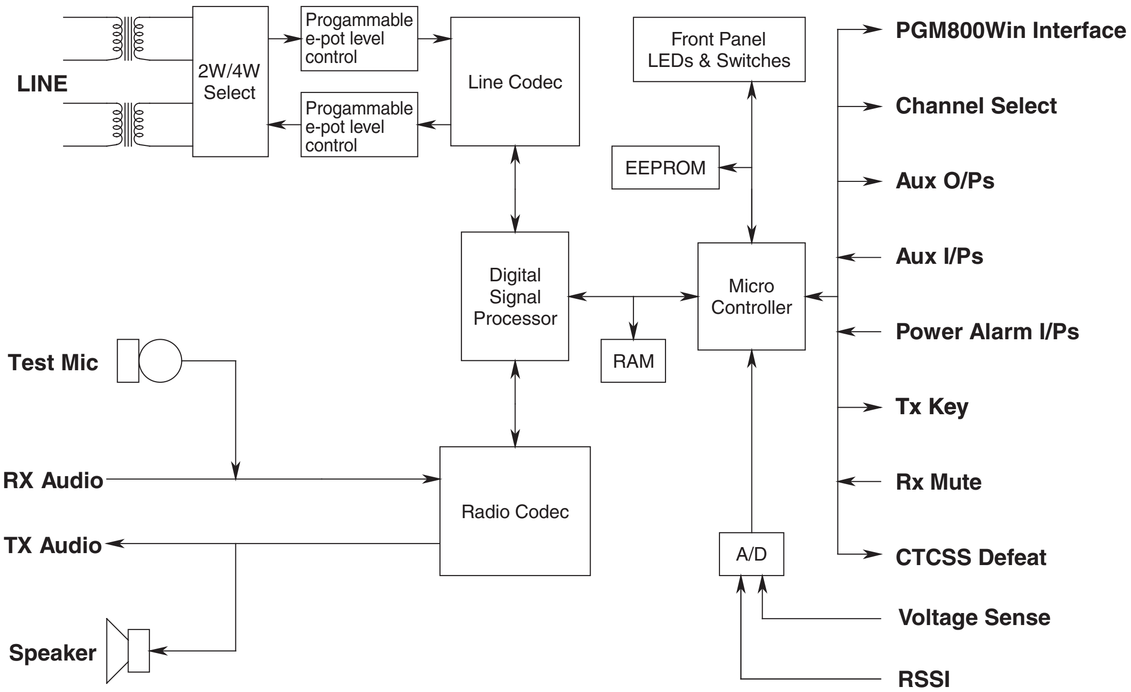


Figure 2.1 High Level Block Diagram

The T803 is connected to a leased line from control room equipment by means of an RJ45 connector. 600R transformers are used to couple the audio into and out of the T803. On the secondary of these line matching transformers are analogue transmission switches which configure the line interface as either 2-wire or 4-wire compatible. Audio from line is passed through a programmable electronic potentiometer (e-pot) level control circuit before entering a CODEC where it is digitised. Audio to line is output from the same line CODEC, via a second programmable e-pot level control circuit.

The line CODEC is connected to a digital signal processor (DSP) which is also connected to a similar radio CODEC (the CTCSS CODEC is not used in this application). The radio CODEC receives audio from the T800 receiver and sends audio to the T800 transmitter to which it is connected via the special backplane PCB. Receiver audio is low frequency filtered to extend the radio CODEC's effective frequency range.

The DSP processes the digitised audio streams from the CODECs in accord with instructions sent to it by the T803's microcontroller. The DSP can:

- detect high level guard tone, low level guard tone and function tones coming from line, notch filter line in and receiver audio (used to eliminate low level guard tone from line out and transmitter audio);
- generate Selcall DTMF/function tone alarms and pip tones to Line-Out and transmitter audio;
- generate voting tones to Line-Out;
- generate morse code to transmitter audio;
- cross connect line and radio audio paths;
- adjusts the Line-In and Line-Out levels;

- mute audio from Line-In and receiver;
- delay the audio.

The microcontroller boot loads the DSP, interfaces with the user via the front panel switches and LEDs, interfaces with PGM800Win and runs the T803 state machines (alarm monitoring, alarm tone generation, high level guard tone/function tone/low level guard tone timing, RSSI/voting tone conversion etc.).

2.2 Tone Detection

In the quiescent state, audio on the Line-In pair is passed through the DSP (IC300) unfiltered to the T803 loudspeaker (which is connected to Tx audio – TP203). The audio is bandpass filtered to detect guard tone. In normal operation (keytone and function tone operation) the tone detector threshold is set for high level guard tone (HLGT).

If HLGT is detected, the DSP signals this detection to the micro using the TONE_DETECT line (TP300 is pulled low). The micro instructs the DSP, using the asynchronous serial communications connection (TP306) between them, to switch on the in line guard tone notch filter, lower the threshold of the guard tone detector (so that it can detect low level guard tone – LLGT) and turn on the function tone detectors.

Where the T803 is operating in 2-wire mode and receiver audio (RX audio) is being gated to line, the micro will soft mute the RX audio first). The micro then starts an internal timer, the duration of which is set by the HLGT and function tone times programmed by PGM800Win.

If a function tone is detected, the DSP signals the micro using the CALL_UP line (TP301 pulled low). The micro then interrogates the DSP via the serial communications connection to find out what frequency was detected.

If no tones are detected and the timer expires, the micro resets the DSP to its quiescent state. If two different frequencies are detected or if only one function tone frequency is decoded and the timer expires, the micro decodes them/it into an action by reading data programmed into the EEPROM (IC312) by PGM800Win. The micro then keys on the transmitter (PTT line) and instructs the DSP to turn off the function tone detectors and the talk-through gate (if it was on). If the function tone sequence decodes into a channel number that is different from the currently set channel, the micro will output the channel number on CH0 – CH7 for 250ms. This change may be latched into the T800 radios providing the sub-rack PCB channel select switches do not create a conflict.

As long as the DSP is detecting LLGT (indicated by a low level on TP300) the micro will keep the transmitter keyed on. When the DSP fails to detect LLGT the micro turns off the transmitter key and returns the DSP to the quiescent state.

When the T803 is programmed for keytone-only operation, the micro keying of the transmitter follows the state of the TONE_DETECT line from the DSP.

In the quiescent state when the receiver mute line (RX_MUTE) goes low, the micro instructs the DSP to gate audio from the receiver to Line-Out. If the line interface is 2-wire, Line-In and Line-Out are joined and the Rx audio will pass through the line internally to the loudspeaker. It will therefore also reach the guard tone detector. Rx audio is therefore notch filtered at the guard tone frequency to prevent false guard tone detection. If the line interface is 4-wire this filtering is unnecessary but the talk-through gate must be turned on to send Rx audio to the loudspeaker. If the T803 is in repeater mode the transmitter is keyed and will remain so until the RX_MUTE line goes high. Note that the T803 will not key the transmitter if the receiver's CTCSS is defeated (CD_OUT is low) to prevent receiver channel noise being transmitted.

From the description above of the keytone/function tone detection it can be seen that keying from line has priority over repeater mode keying and audio gating.

2.3 Alarm Monitoring

The T803 microprocessor monitors eight alarm sources:

- Transmitter forward power
- Transmitter reverse power
- low battery
- line fail
- four external closure alarms

When an alarm is triggered it is latched as indicated by the corresponding LED on the front panel. If the T803 is keying the transmitter or sending receiver audio to the line the latched alarm is ignored. Once the T803 re-enters the idle state the latched alarms are actioned. The microprocessor reads the EEPROM to determine what tone sequence the user programmed and instructs the DSP accordingly. If the tone sequence is to be sent to the transmitter, it is keyed 500ms before the tones are generated. Additionally the user may program any of the 4 auxiliary output ports as a response to an alarm event. The micro will activate (pull low) these outputs if enabled. If several alarms are latched together they are actioned in the order of priority:

1. External closure alarms 0 to 3
2. Reverse power
3. Forward power
4. Low battery
5. Line fail

If the programmed alarm action is a pip tone, the micro will instruct the DSP to append 200ms burst of 600Hz tone to each transmission (to line and/or radio).

Note: Sub-rack alarms (Fwd and Rev Power, Low battery or Line fail) cannot be re-triggered until they are cleared. The 4 external closure alarms however will re-send any user programmed tone sequence if re-triggered when already latched.

2.3.1 Alarm Triggers

The alarms are triggered according to their type.

<table>
<tr><th>Priority</th><th>Alarm Type</th><th>Trigger Type</th><th>Re-triggerable when latched</th><th>LED colour</th></tr>
<tr><td>1</td><td>Auxiliary Input 0 to Input 3</td><td>External closure. Sampled every 50ms</td><td>Yes</td><td>Green</td></tr>
<tr><td>2</td><td>Reverse Power</td><td rowspan="2">Sampled every 50ms while the T803 is keying the transmitter. Incororates a 2s settling time.</td><td rowspan="2">No</td><td rowspan="2">Red</td></tr>
<tr><td>3</td><td>Forward Power</td></tr>
<tr><td>4</td><td>Low Battery</td><td>Voltage must be below the programmed threshold for 25s of a 30s period.</td><td>No</td><td>Red</td></tr>
<tr><td>5</td><td>Line Fail</td><td>Programmable non-activity time period</td><td>No</td><td>Red</td></tr>
</table>

Table 2.1 Alarm Summary Table

External Closure Alarm (Auxiliary Input Alarms)

The 8 bit input latch (IC202) is sampled every 50ms. If two successive samples are the same value then the state of the closure alarms is tested (This has the effect of debouncing the alarm inputs). If any alarm is low then those alarms are latched.

RF Power Alarm

The forward and reverse power alarms are only tested when the T803 is keying the transmitter. The alarms must be active (low) for two seconds before they are latched. The two seconds sampling period allows for settling time inherent in some older T800 PA designs. Note that if a Transmitter fitted with a T1500-52-0000 PCB is being used, rack backplane links LK1 and LK2 must be fitted at power up.

Low Battery Alarm

The 13.8V supply line voltage is measured by the A/D converter (IC208) every 50ms. If the voltage is below the programmed alarm threshold (±0.05V) for more than 25 seconds of a 30 second sampling period, the alarm is latched. The long sampling period allows for load fluctuation effects on the supply.

Programmable low voltage threshold is only available in T803 firmware version 2.11 or later. Prior to this, the threshold was fixed at 10.7V ±0.05V.

Line Fail Alarm

If no keying from line occurs within the period programmed by the user from PGM800Win, the microprocessor latches this alarm, saves the mode status and puts the T803 into repeater mode. Note that programming zero as the line fail time disables this alarm.

2.4 Confirmations

Additional to alarms the T803 microprocessor also monitors eight non-alarm triggers known as Confirmations:

- Power-up
- Channel change
- Up to six user defined function tone inputs

The T803 micro responds to a confirmation trigger in the same way as it does to an alarm trigger – depending on what has been programmed into the EEPROM, a tone sequence may be sent, an auxiliary output enabled and/or a pip tone enabled. These are all actioned by the micro with the same rules as for alarm triggers. The only difference is that there are no LEDs associated with confirmations.

If several confirmations are triggered together they are actioned in the following order of priority: Power-up, Channel change and then User Confirmation 0 to 5. If several alarms and confirmations are triggered together the Power-up confirmation, if enabled, is always actioned first, followed by any alarms and then any other confirmations, both in their normal priority order.

Note: Confirmations will re-send any user programmed tone sequence if re-triggered.

2.5 Clearing Alarms and Confirmations

The alarms can be cleared by either pressing both front panel switches together or sending the T803 a correctly programmed (“Clear Alarms”) function tone. All alarms are cleared together. Clearing alarms turns off all LEDs, cancels any associated pip tones and resets auxiliary outputs. If an alarm condition is still valid when it is cleared, it will be re-latched and the user-programmed action will be executed. If required, pip tones can be cleared separately (leaving alarms latched) by using a “Clear Alarm/Confirmation Pip tones” function tone.

When the Line fail alarm is cleared, the T803 will revert to the mode it was in (Basestation or Repeater) before the alarm was triggered. A keying sequence from line can also clear this alarm in the same way except that the pip tone will not be cleared if used by other latched alarms. Line fail is the only alarm that can be cleared individually in this way.

Confirmations can not be cleared by a single command like the Alarms. Confirmation pip tones are cancelled by using a “Clear Alarm/Confirmation Pip tones” programmed function tone and the auxiliary outputs are individually reset by using a “Turn OFF Auxiliary output (x)” function tone.

It is possible to have more than one Alarm or Confirmation using the pip tone. In this situation the clearing behaviour must be carefully considered:

- Line Fail Pip – Cleared by line keying-sequence only if pip tone is not ‘active’ for other Alarms and/or Confirmations.

- Alarm Pips (including Line Fail) – Cleared by “Clear Alarms” command only if confirmation pips are not ‘active’. Always cleared by “Clear Alarm/Confirmation Pip tones“ command.
- Confirmation Pips – Cleared by “Clear Alarm/Confirmation Pip tones” command.

Additionally, it is also possible to have a single auxiliary output assigned to more than one alarm or confirmation. However, be aware that any command that resets auxiliary outputs, such as “Clear Alarms” or “Toggle Auxiliary Output (x)”, will not make any check for multiple use – auxiliary outputs will be reset regardless.

2.6 Voting Tone Operation

When the T803 is programmed to generate a tone on idle, the microprocessor monitors the receiver Mute-In signal. When it is high (receiver muted) the DSP is instructed to generate a voting tone to Line-Out. When receiver Mute-In is low the voting tone is turned off. To prevent false detection of the idle tone at the far end voting equipment, the DSP filters energy at the idle tone frequency from the receiver audio transmitted to Line-Out.

If the T803 is programmed to generate a Sliding (or Simoco compatible) Voting Tone the microprocessor reads the receiver RSSI level every 6ms using the A/D converter and sends this value to the DSP. The DSP generates a voting tone to Line-Out. The tone frequency is proportional to the RSSI level. To prevent incorrect operation of the far end voting equipment, the DSP low pass filters the receiver audio transmitted to Line-Out.

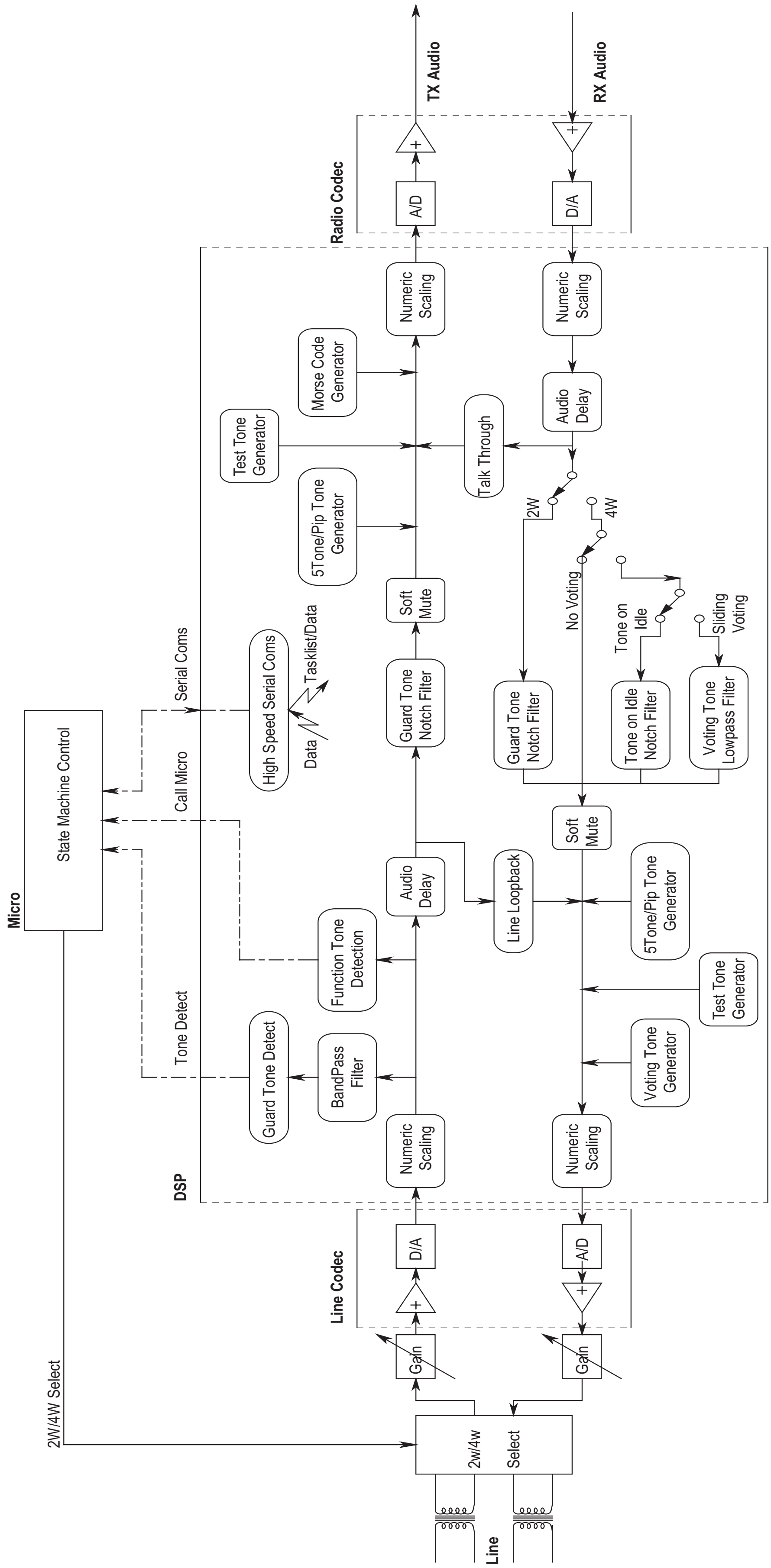


Figure 2.2 Signal Flow

3 Installation and Configuration

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for anti-static procedures for handling these devices.**

This section of the manual describes how to install and configure the T803 in a T800 SL2 sub-rack and test that it is functioning correctly. It also provides a brief fault finding procedure.

Note: Unless otherwise specified, the term “PGM800Win” used in this and following sections refers to version 4.02 or later of the programming software.

Refer to Section 4 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components and test points on the main PCB.

The following topics are covered in this section.

3.1 Installation

3.1.1 Backplane Configuration

To support the T803-02 Tone Remote an X800-56-PCB3 backplane should be fitted to the T800 SL2. The backplane should be configured as described in the following table. These are the default factory settings (for SL2 with T803).

Link	Setting	Function	Notes
LN1 and LN2	Not fitted as standard	Talk-through audio path (balanced)	
LN3	Not fitted as standard	Talk-through Rx-gate to Tx-Key	
LN4	Link pins 2 – 3	For Serial Comms with the T803	See SW2 settings below
LN5 and LN12	Not required for T803	Associated with TX-Relay-Driver output from transmitter	
LN6	Not required for T803	Determines I/O on pin 11 of SK6	See Section 6.2 in Part G
LN7	Not required for T803	External CTCSS Audio to Transmitter	
LN8	Link pins 1 – 2	Unbalanced Rx Audio ('Audio1') to T803. Not to be used when CTCSS is present on RX audio as internal CTCSS filtering cannot be applied to this path. For CTCSS use the option below.	Adjust level using RV2. Level to T803 independent of Rx Line Level control. See Section 3.2.4.3
	Link Pins 2 – 3 and Pins 4 – 5 (recommended)	Changes the balanced Rx Line audio output to unbalanced for the T803. This option should be used when CTCSS is present on RX audio so that the internal CTCSS filtering can be applied.	Level to T803 controlled by RX Line Level control. Note: Balanced Rx to TX audio becomes unavailable with this setup. See Section 3.2.4.3
LN9	Link pins 2 – 3	FWD power alarm signal to T803.	Internal alarm board must be fitted to T854. See Section 3.10 in Part C
LN10	Link pins 2 – 3	REV power alarm signal to T803.	
LN11	Fitted	RX CTCSS disable	See Section 6.2 in Part G

Switch	Setting	Function	Notes
SW1	Set all switches to OFF	Channel select via T803 and or PGM800Win	
SW2	Set switch 4 and 5 to ON	For Serial Comms with the Tx, Rx and T803	See LN4 settings above
SW3	Set switch 1 to ON	Rx Audio to T803	See LN8 settings
	Set switch 2 and 3 to ON	Balanced audio from T803 to transmitter	
	Set switch 4 to ON	RSSI from receiver to T803	
	Set switch 5 to ON	Tx-Key from T803	
	Set switch 6 to ON	Rx-Gate to T803	

Note: For correct power alarm operation these links should be correctly set before power-up.

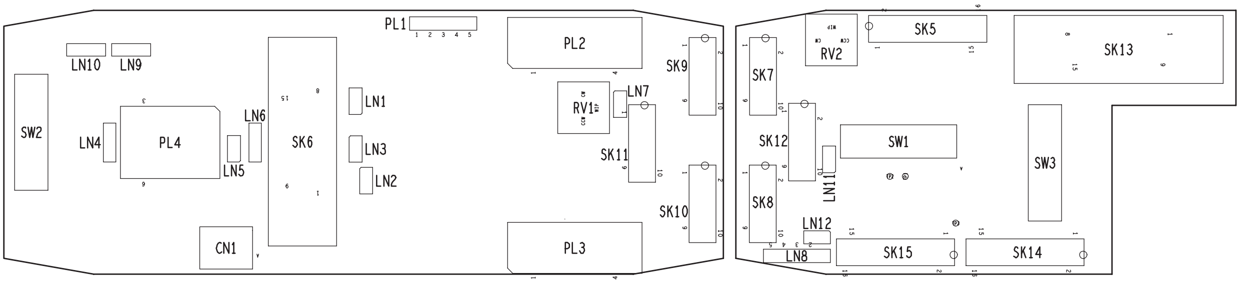


Figure 3.1 X800-56-PCB3 backplane connectors, links and switches

3.1.2 Auxiliary Inputs/Outputs

The 15-way female D-range connector (SK13) located on the X800-56-PCB3 backplane board allows for external connection to a number of T803 inputs and outputs. These include the four T803 alarm inputs and the four T803 auxiliary outputs. Refer to Section 6.2 in Part G for backplane circuit and overlay diagrams.

The table below indicates the pin assignments of SK13

Pin	Name	Signal path	Logic	Description and specifications
1	+13.8V	Output	—	+13.8V_{DC} output. Maximum current = 900mA
2	RX-AUDIO-1-1	Receiver output – with SW3-1 in ON position (normal)	—	Unbalanced audio output from the receiver. Should only be used with high impedance loads (>10kW)
		T803 input – with SW3-1 in OFF position	—	Unbalanced high impedance audio input (>10kW) to the T803. Level required for correct T803 operation = 230mV_{rms}
3	TX_EX LINE1_1	T803 output	—	Parallel connection to the 600Ω balanced Tx Audio path between the T803 and the Transmitter. Connection to these lines must be done using a high impedance load to not upset the match/levels. Output level = –4.4dBm (when the T803 Line-In level is properly set-up or when the T803 is in Test Mode).
4	TX_EX LINE4_1		—	
5	TONE REMOTE ALARM 0	T803 input	5V CMOS 0V = active	T803 Alarm Input0. Maximum input voltage = 5V
6	TONE REMOTE ALARM 1			T803 Alarm Input1. Maximum input voltage =5V
7	TONE REMOTE ALARM 2			T803 Alarm Input2. Maximum input voltage =5V
8	TONE REMOTE ALARM 3			T803 Alarm Input3. Maximum input voltage =5V
9	RX-GATE-1	Receiver output with SW3-6 in ON position (normal).	Open collector 0V = audio	Max applied voltage = 40V Maximum sink current = 150mA
		T803 input with SW3-6 in OFF position.	5V logic < 1.5V = audio	Maximum applied voltage = 5V
10	TX_KEY_1	T803 output	Open collector 0V = active	Maximum applied voltage = 50V Maximum sink current = 250mA
11	TONE REMOTE AUX0	T803 output	Open collector 0V = active	T803 Auxiliary Output 0. Maximum applied voltage = 50V Maximum sink current = 250mA
12	TONE REMOTE AUX1			T803 Auxiliary Output 1. Maximum applied voltage = 50V Maximum sink current = 250mA
13	TONE REMOTE AUX2			T803 Auxiliary Output 2. Maximum applied voltage = 50V Maximum sink current = 250mA
14	TONE REMOTE AUX3			T803 Auxiliary Output 3. Maximum applied voltage = 50V Maximum sink current = 250mA
15	GND	—	—	Ground

3.1.2.1 Auxiliary Alarms Inputs

The T803-02 has 4 closure alarm inputs. On every falling edge the associated alarm is (re)triggered, and sent when the T803 becomes idle. Alarm0 has higher priority than Alarm3, in that the alarm will be actioned first.

Maximum input voltage = 5V

Note: The behaviour is different from the T803-00 as it will resend any user programmed tone sequence if re-triggered when already latched.

3.1.2.2 Auxiliary Control Outputs

The 4 Auxiliary outputs are of common collector type (they will only sink current), and are rated to a maximum of 50V and 250mA. The outputs can be controlled via a function tone sequence (Enable, Toggle, or Disable) or enabled on an alarm or confirmation.

3.1.3 Line Interface

The following table describes the pin configuration for interfacing with the T803 on 4-wire and 2-wire networks.

RJ45 pins	4-Wire	2-Wire
3	LineOut+	NC
4	LineIn+	Line-In/Out
5	LineIn-	Line-In/Out
6	LineOut-	NC

The T803 accommodates an input signal range of 28dB. Normally this is sufficient, however by shorting JP200 (found on the T803 PCB) an extra 15dB gain is added.

3.2 T803 Configuration

Before using the T803, line input (the level from the receiver) and output level (the level presented to the radio transmitter) need to be properly configured.

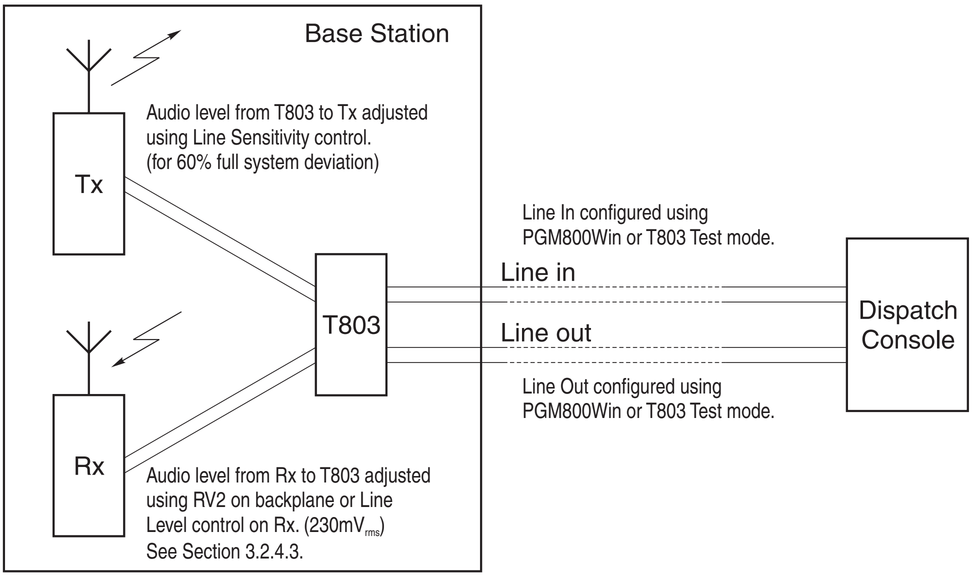


Figure 3.2 T803 setup

The Line-In/Line-Out levels can be set up using either the programming application (PGM800Win) or the test modes of the T803 (accessed via the buttons on the front panel. See Section 3.2.3). The advantage of the test mode method is that it can provide a direct test of the system. The programming method is required when access to the dispatch console is difficult.

Using the test modes, the T803 levels are set up using actual signals present on the line. For the Line-In level, the test tone and keytone, are generated by the dispatch console and sent to the T803 via the leased line (or an audio generator could be used with the line loss simulated). For the Line-Out level, the test tone is generated by the T803.

Programming the Line-In/Line-Out levels using PGM800Win does not require any connection to the line. However, input/output specifications of the dispatch console and actual line loss must be known so that the T803 levels can be properly calculated and programmed.

Setting up receiver and transmitter levels can only be done using T803 test modes and/or measurement. These levels are not programmable.

3.2.1 Equipment Setup for Level Configuration.

Configuring the T803 Line levels (using PGM800Win or Test Mode) and radio receiver or transmitter levels requires the sub-rack and test equipment to be set up as shown below.

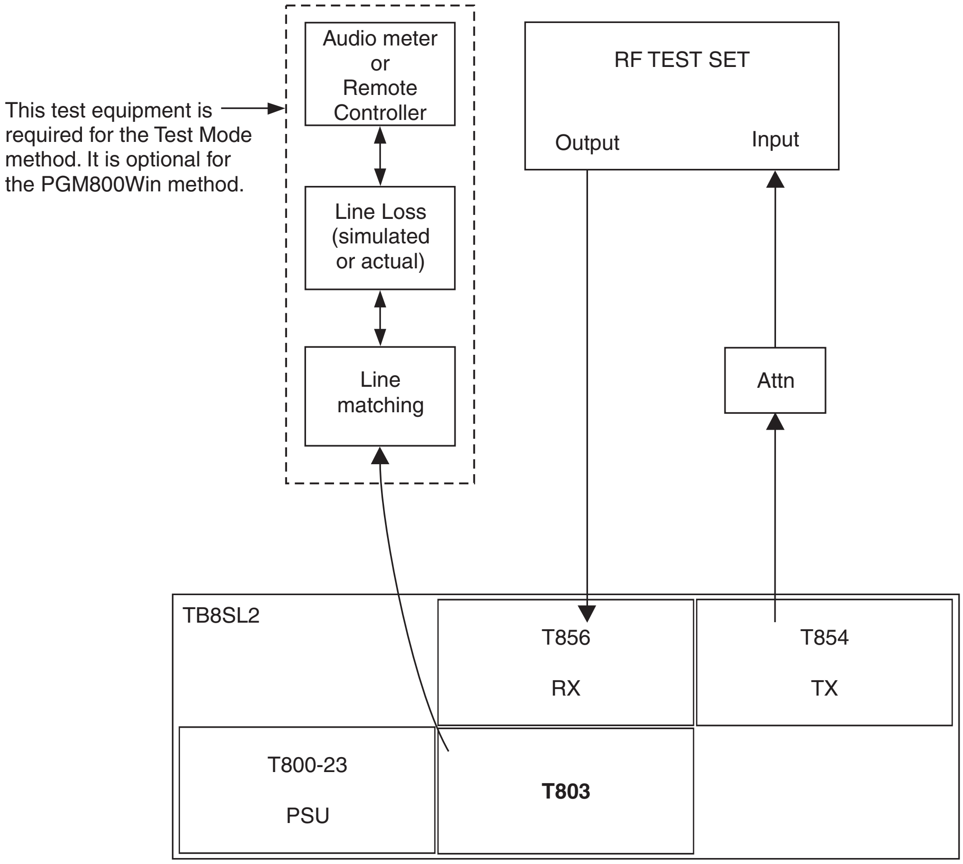


Figure 3.3 Rack and test equipment setup

Remove any coaxial relay or duplexer in the T800 modules' RF path and connect them directly to an RF Test Set. Ensure that transmitter or PA RF output is sufficiently attenuated to prevent damage to the test set.

Run up the receiver and transmitter as instructed in Part B and C of this manual.

3.2.2 Use of Test Microphone

The T803 test microphone is used to communicate both on air to radios and down the line to dispatch consoles. It plugs into the RJ11 connector on the front panel which doubles as a programming port. It is electrically connected in parallel with the receiver (microphone with receiver audio and PTT button with receiver mute).

Most dispatch consoles are equipped with an intercom facility whereby speech can be sent to line without a keytone. This enables the dispatcher to talk to service personnel at the repeater site using the T803's built in speaker without broadcasting speech to air. The service personnel can talk back to the dispatcher using the T803 test microphone (the PTT must be pressed to gate microphone speech).

Note: If the T803 is in repeater mode, PTT on the test microphone will key-on the transmitter and thus broadcast test speech to air.

3.2.3 Test Modes

The T803 has three test modes to assist with setting levels:

- Test Tone Mode
- Line-In Level Configuration Mode
- Line-Out Level Configuration Mode[1]

To enter the test modes, press the Monitor and Mode Toggle buttons on the front panel simultaneously for three seconds. The alarm LEDs will start flashing colours and travelling up and down the display to indicate Test Tone Mode. The T803 will key-on the transmitter and encode a 1kHz test tone to the transmitter for one minute. The test tone can also be heard on the T803 speaker.

While still in Test Tone Mode, simultaneously pressing the Monitor and Mode Toggle buttons briefly will change the mode to Line-In Level Configuration Mode. All the LEDs will be on — either entirely red or entirely green.

- Green = Keytone present. T803 will key-on the transmitter.
- Red = No keytone present

While still in Line-In Level Configuration Mode, simultaneously pressing the Monitor and Mode Toggle buttons again will change the mode to Line-Out Configuration Mode[1]. To indicate this, all the LEDs will be orange.

Note: After entering each mode, a one to two second pause is required before attempting the simultaneous press to enter the next mode (or to exit).

While in Line-In or Line-Out Configuration Mode, the Monitor and Mode Toggle buttons operate as 'gain' adjust buttons. A short press on the Monitor button will increase the Line-In/Line-Out gain and toggle the top alarm LED on or off, indicating a level increase. The LED will no longer toggle (it will stay on) when the top of the range has been reached. Conversely the Mode Toggle button will decrease the gain and toggle the bottom alarm LED. Again, the LED stays on when the bottom of the range has been reached. In both of these modes Line-In audio can be heard on the monitor speaker.

To exit Line-Out Configuration Mode, briefly press both buttons again. Alternatively, the unit will automatically return to normal operation mode after one minute. (This occurs in all three test modes).

Note: These levels are always preserved on exit. Take care not to change them unintentionally during simultaneous button press.

1. Line-Out Configuration Mode is only available in T803 firmware version 2.07 or later. For firmware versions prior to 2.07, a simultaneous button press while in Line-In Configuration Mode will exit Test Mode .

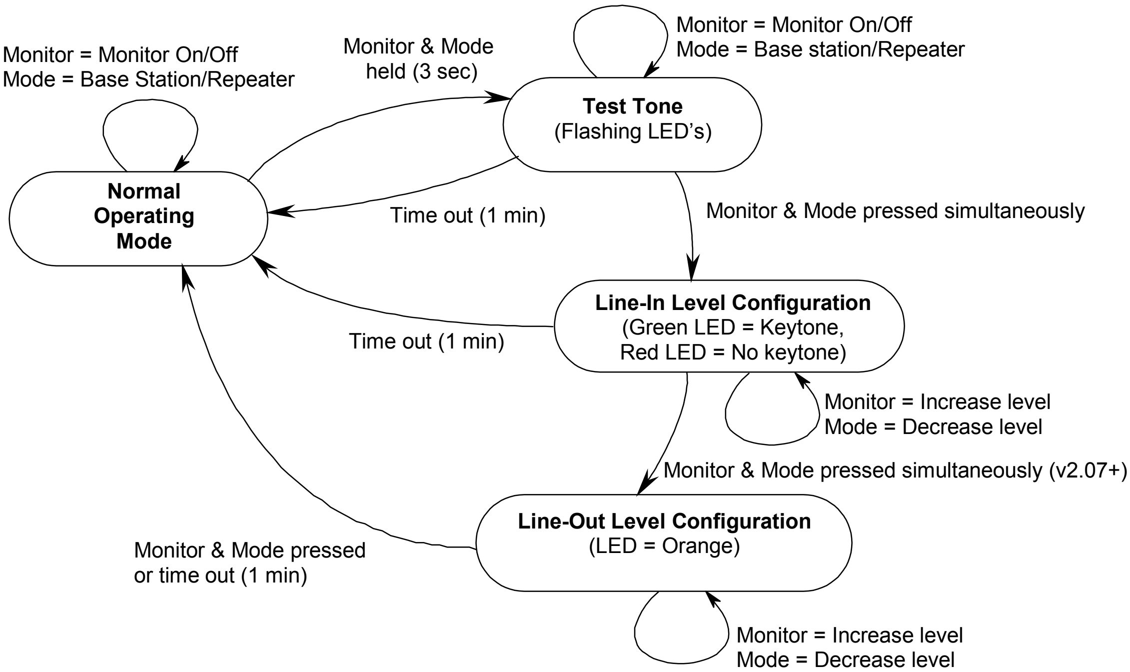


Figure 3.4 Cycle of switching between the modes

3.2.4 Level Configuration

Before proceeding with any level configuration the transmitter and receiver must be run-up and configured for the application. Also, ensure that the equipment has been set up correctly as indicated in Section 3.2.1. It is important that the T800 Transmitter output is connected to the Test Set (through an attenuator as required) because it will often be keyed during these level setting procedures.

The following levels need to be set:

- Tx Audio – Audio level from T803 to transmitter (balanced)
- Line-In level
- Rx Audio – Audio level from receiver to T803 (unbalanced)
- Line-Out level

The only consideration of order is that the Tx Audio level needs to be configured before the Line-In level can be done.

3.2.4.1 Tx Audio – Audio Level from T803 to Transmitter

The level of audio received from the T803 is adjusted at the input of the transmitter.

1. Set the T803 into Test Tone Mode (See Section 3.2.3)

2. Adjust the Line Sensitivity Control on the front panel of the transmitter to give a reading on the RF Test Set of 60% full system deviation (compensate for any CTCSS tone deviation).

	Narrow Band	Wide Band
Channel Spacing	12.5kHz	25kHz
Maximum deviation (specifications)	2.5kHz	5kHz
60% of maximum deviation	1.5kHz	3.0kHz

3.2.4.2 Line-In Level

The Line-In level can be set up in two ways:

- On the T803 in Level Configuration Mode
- Using PGM800Win programming software.

Using Level Configuration Mode:

Note: The Tx audio level must be set up before starting this procedure (Section 3.2.4.1).

1. Set the T803 into Line-In Level Configuration Mode (See Section 3.2.3).

2. Connect a dispatch console to the far end of the line, or simulate the console and line loss using an audio generator.

3. Press the PTT on the dispatch console. This will send a keytone to the T803. Ensure the console also sends a test tone at speech level to line (this tone is required for this method of configuring the Line-In level).

4. The alarm LEDs on the front panel of the T803 should change to green (indicating that a keytone has been detected) for as long as the PTT is pressed.

5. Adjust the Line-In level by pressing the Monitor button (increases the level) or the Mode Toggle button (decreases the level) until the transmitter deviation reading, monitored on the RF Test Set, indicates 60% full system deviation (compensate for any CTCSS tone deviation).

6. Press the PTT on the dispatch console again, but this time use speech instead of the test tone. Ensure the LEDs on the T803 remain constant on green during speech transmission. If not see Section 3.3.1 (point 7) on how to troubleshoot for Talkoff.

Note: The monitor speaker is forced on in this mode so that the test-microphone may be used as an intercom to communicate to the dispatcher room (See Section 3.2.2).

Using PGM800 software:

1. Determine the output level of the console. This may be a preset or default value specified in the console's manual or a value programmed by the operator.

2. Determine the actual line-loss between the console and the T803.

3. Calculate T803 Line-In Level as follows:
   T803 Line-In Level = console output level (dBm) – Line-loss (dB)

4. Program the T803 with the calculated level.

Example case:
Console output level =–13dBm
Measured Line loss = 6.5dBm
T803 Line-In level =–13 – 6.5 = –19.5dBm

3.2.4.3 Rx Audio – Audio Level from Receiver to T803

The Rx Audio level is adjusted using either the Line Level control on the front of the receiver or the RV2 potentiometer on the backplane, depending on the configuration of the link LN8 on the backplane.

The recommended (and default) configuration of LN8 is with pins 2–3 and 4–5 linked. With this configuration the balanced audio from the receiver (Rx-Line-1 and Rx-Line-4) is changed to unbalanced audio for the T803 (this means the Rx Line output can no longer be used as direct balanced audio to the transmitter). The level to the T803 is adjusted using the Line Level control on the front of the receiver. The advantage of using this path is that it allows CTCSS filtering to be applied (using the receiver's internal CTCSS filter. See Section 3.5 in Part B).

Alternatively if CTCSS is not used, the receiver unbalanced audio output (Rx-Audio-1) can be used to provide audio to the T803 by linking pins 1–2 on LN8. In this case the level to the T803 is adjusted using the RV2 potentiometer on the backplane. This audio path is not suitable for CTCSS systems because complete CTCSS filtering cannot be applied. The only filtering directly available is the optional receiver de-emphasis filtering. See Section 3.5 in Part B. The T803 does however apply a 160Hz to 3kHz high pass filter resulting in an overall audio response for this path very similar to the default high pass filtered receiver balanced Line output. See the table below.

Receiver/T803 system	Backplane links (LN8)	Adjustment of Rx Audio to T803	Audio Frequency Response
With CTCSS on Rx audio	Link pins 2–3 and pins 4–5	Line Level control on the front of the Receiver	Receiver internal CTCSS filter should be included in the path (see Section 3.5 in Part B) 400Hz to 3kHz
No CTCSS on Rx audio	Link pins 2–3 and pins 4–5	Line Level control on the front of the receiver	Receiver internal CTCSS filter not in path but high pass filter in path (Rx default setup) 220Hz to 3kHz
No CTCSS on Rx audio	Link pins 1–2	RV2 on the backplane	T803 high pass filter only 160Hz to 3kHz

The table above shows that configuring LN8 with links 2−3 and 4−5 could be used for systems with or without CTCSS. Configuring LN8 with link 1−2 in normally only used with systems without CTCSS on the Rx audio.

Procedure

Before commencing this procedure set up the receiver audio processing, such as de-emphasis and CTCSS filtering, as required for the application. See Section 3.5 in Part B. This is important for the T803 Telecom line compliance. See the Caution below.

CAUTION: The Rx audio level must not exceed 230mV$_{rms}$ at 60% full system deviation. This will ensure that the actual T803 Line-Out level corresponds to the programmed value and thus ensures levels do not exceed the power level requirements of the Telecommunications line.

There are three possible ways to monitor the Rx Audio level during adjustment:

- Direct measurement of receiver audio on the backplane
- Indirectly, using transmitter deviation
- Indirectly, using the T803 Line-Out level

Direct measurement of receiver audio on the backplane:

1. Use the RF Test Set to generate an on-channel signal to un-mute the receiver.
2. Modulate the RF carrier with a 1020Hz tone[1] at 60% full system deviation, adding CTCSS tone for a CTCSS system (ensure that CTCSS filtering is applied in the receiver as required for the application. See Section 3.5 in Part B).
3. Monitor the audio level from the receiver on the X800-56-PCB3 backplane at pin2 of LN8, with the links (jumpers) in place as directed in Section 3.1.1. Use a high impedance meter such as an oscilloscope for the measurement.

1. A 1020Hz tone is used (rather than 1kHz) because some Test Sets can produce unstable deviation readings

4. For LN8 with pins 2−3 and 4−5 linked, adjust the line level control on the front of the receiver for an audio level of 230mV_{rms}.

   For LN8 with pins 1−2 linked, adjust RV2 on the backplane for an audio level of 230mV_{rms}.

Using transmitter deviation:

This method is not suitable for simplex configured repeaters.

1. Use the RF Test Set to generate an on-channel signal to un-mute the receiver.

2. Modulate the RF carrier with a 1020Hz tone1 at 60% full system deviation, adding CTCSS tone for a CTCSS system (ensure that CTCSS filtering is applied in the receiver as required for the actual working system. See Section 3.5 in Part B).

3. Put the T803 unit into Talk Through Mode (also known as Repeater Mode) using the Mode Toggle button[1]. The Mode LED should be red, constant or flashing, and the transmitter should be keyed on.

4. For LN8 with pins 2−3 and 4−5 linked, adjust the Line Level control on the front of the receiver to produce 60% full system deviation at the transmitter RF output as measured on the test set.

5. For LN8 with pins 1−2 linked, adjust RV2 on the backplane to produce 60% full system deviation at the transmitter RF output as measured on the test set.

Note: De-Emphasis should be off on the test set receiver.

Using the T803 Line-Out level:

1. Use the RF test set to generate an on-channel signal to un-mute the receiver.

2. Modulate the RF carrier with a 1020Hz tone[2] at 60% full system deviation, adding CTCSS tone for a CTCSS system (ensure that CTCSS filtering is applied in the receiver as required for the actual working system. See Section 3.5 in Part B).

3. Put the T803 into Base Station Mode using the Mode Toggle button[1]. The Mode LED should be green (constant or flashing).

4. For LN8 with pins 2−3 and 4−5 linked, monitor the T803 Line-Out level (600Ω balanced audio) and by adjusting the Line Level control on the front of the receiver, set this level to equal the programmed 'Line-Out Level' as set in PGM800Win.

   For LN8 with pins 1−2 linked, monitor the T803 Line-Out level (600Ω balanced audio) and by adjusting RV2 on the backplane, set this level to equal the programmed 'Line-Out Level' as set in PGM800Win.

1. The Mode Toggle button may be disabled from PGM800Win
2. A 1020Hz tone is used (rather than 1kHz) because some Test Sets can produce unstable deviation readings

3.2.4.4 Line-Out Level

The Line-Out Level can be set up in two ways:

- On the T803 in Level Configuration Mode
- Using PGM800Win programming software (version 4.02 or later).

Using Level Configuration Mode (T803 firmware version 2.07 or later):

1. Set the T803 into Line-Out Level Configuration Mode (See Section 3.2.3).
2. Use the RF Test Set to generate an on-channel signal to un-mute the receiver.
3. Modulate the RF carrier with a 1020Hz tone at 60% full system deviation, adding CTCSS tone if necessary (ensure that CTCSS tone is removed from the receiver audio output by selecting the correct links inside the receiver).
4. Monitor the T803 Line-Out level and adjust by pressing the Monitor button (increases the level) or the Mode Toggle button (decreases the level) until the level is acceptable at the dispatch console.

Note: The monitor speaker is forced on in this mode so the test-microphone may be used as an intercom to communicate to the dispatcher room (See Section 3.2.2).

Using PGM800Win software:

1. Determine the input level required at the dispatch console. This may be a preset or default value specified in the console's manual or a value programmed by the operator.
2. Determine the actual line-loss between the console and the T803.
3. Calculate T803 Line-Out Level as follows:
   T803 Line-Out Level = console input level (dBm) + Line-loss (dB)
4. Program the T803 with the calculated level.

Example case:
    Console input level = –13dBm
    Measured Line loss = 6.5dBm
    T803 Line-Out level = –13 + 6.5 = –6.5dBm

3.3 Fault Finding

1. Connect the T803 to its companion dispatch console via the leased line. Check that speech sent from the console can be heard on the T803 speaker (un-mute speaker if required).

One possible cause of incorrect operation is that the line connections have become transposed in the wiring network or that the dispatch terminal uses different Send/Receive pairs.

2. Use the dispatch console to key-on the transmitter. If the transmitter does not key-on, check that the console and T803 have been compatibly programmed.
   - check 2-wire or 4-wire
   - check the keytone frequency
   - check if function tones are used
   - check high level guard tone and function tone periods (if used) are the same

   Finally check that the console is sending appropriate signal levels and that tone durations are correct (which are often variable), and that the line is not causing unacceptable attenuation or distortion.

3. If the console can key the transmitter but not change Repeater/Basestation Mode, auxiliary outputs, receiver defeat or cancel alarms, carry out the checks in Step 2 above, but pay particular attention to the function tone programming.

   If changing channels is a problem check that the appropriate channel selection DIP switches (SW1) on the rack backplane are off.

3.3.1 Troubleshooting

1. Sometimes misses function tone command

Set up the Line-In level so that the function tones are about $2V_{pp}$ at TP204.

2. Misses function tone sequence on very fast key repetition

A minimum of 200ms pause is required between pressing buttons on the console. Some consoles do not limit the maximum keying rate.

3. PGM800Win: "Warning: the Firmware version is not compatible. Data read maybe incorrect"

This warning occurs when reading the T803 with an old version of PGM800Win.

This can be ignored as the T803 unit is backwards compatible. However, it is recommended to use the latest PGM800Win with full T803 support.

4. Loop-Line functionality (also known as Loopback)

Loopback can be enabled in PGM800Win. It is then activated by sending the T803 the programmed function tones.

5. While in Line-In Level Configuration Mode, the LEDs flash green only briefly when the dispatch console PTT is pressed

The Line-In level is too low. The T803 is only detecting the high-level guard tone (HLGT).

While still in Line-In Level Configuration Mode, activate the console PTT and adjust the Line-In level by pressing the Monitor button (increases the Line-In level) until the LEDs remain constant green. The top alarm LED will toggle on and off, indicating a level increase until the top of the range is reached (may be as many as 65 presses). If this still fails, open up the unit and add JP200, and try again.

6. When the PTT is pressed, a pulsing sound can be heard from the speaker

The Line-In level is too high. The function tones can not be decoded properly hence it keys off.

While still in Line-In Level Configuration Mode, activate the console PTT and adjust the Line-In level by pressing the Mode button. The bottom alarm LED will toggle on and off, indicating a level decrease until the bottom of the range is reached. Using an oscilloscope measure the signal on TP204 – the function tone level should be about half the level of the high level guard tone.

7. The console keys the transmitter correctly except when speech is present

This is known as 'Talkoff' and occurs when the difference between the keytone level and speech peak level exceeds specification (32dB in 2-wire mode and 35dB in 4-wire mode), causing the keytone detection to fail.

For reliable operation, the keytone level should be no more than 35dB lower than ***peak*** speech level.

If it is not possible to adjust the levels at the console, decrease the programmed Line-In level of the T803 until talkoff is eliminated. This requires that the audio level from T803 to transmitter will also need to be re-adjusted (using the transmitter's Line Sensitivity control) to maintain 60% full system deviation for the test tone sent from the console.

Adjust the relative audio levels (keytone and speech) sent from the dispatch console.

8. Keytone Falsing in 2-wire mode

When operating in 2-wire mode with lossy lines (i.e. significant separation required between T803 Line-In and Line-Out levels) the keytone detector can become de-sensitised by noise.

- Check to ensure that the input level from the receiver is correctly set up at $230mV_{rms}$ (See Section 3.2.4.3).

- Check the receiver mute open level (squelch). If necessary adjust the receiver Gating Sensitivity control on the front panel of the receiver, so that the receiver mute opens at a higher SINAD level (12dB or preferably greater). This has the effect of reducing the noise on the line input of the T803 in 2-wire mode.

- If there is still a problem after the squelch gating level has been adjusted as much as practicable, it becomes necessary to reduce the separation between the T803 Line-In and Line-Out levels. This separation may need to be reduced to less than 8dB for 12dB receiver audio SINAD (or less then 12dB for 14dB receiver audio SINAD). To achieve this, adjust the relative input and output levels of the dispatch console. Again, this has the effect of reducing the noise on the line input of the T803.

If the above solutions do not help resolve the problem, the 2-wire line loss may be too severe and unacceptable for normal 2-wire T803 operation. In this case an external hardware solution involving a notch filter fitted to the receiver audio path (TA1086-01) and a 2-wire/4-wire hybrid fitted across the line may be required. This solution has been verified and documentation is available detailing how to install the TA1086-01. Contact your your nearest Tait Dealer or Customer Service Organisation for more information.

4 T803 PCB Information

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 3.1 for more information on anti-static procedures when handling these devices.**

This section provides the following information on the T803.

- parts list
- grid reference index
- PCB layouts
- circuit diagrams.

4.1 Introduction

PCB Identification

All PCBs are identified by a unique 10 digit “internal part number” (IPN), e.g. 220-12345-00, which is screen printed onto the PCB (usually on the top side), as shown in the example below:

The last 2 digits of this number define the issue status, which starts at 00 and increments through 01, 02, 03, etc. as the PCB is updated. Some issue PCBs never reach full production status and are therefore not included in this manual. A letter following the 10 digit IPN has no relevance in identifying the PCB for service purposes.

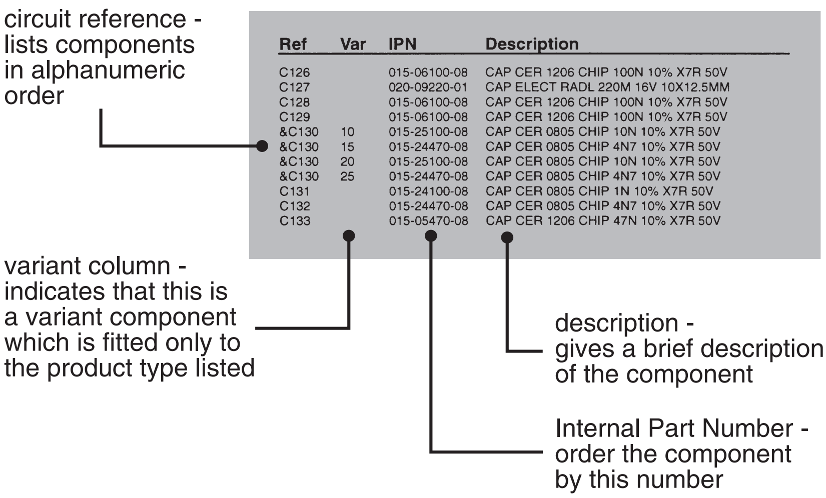
Note: It is important that you identify which issue PCB you are working on so that you can refer to the appropriate set of PCB information.

Parts Lists

The 10 digit numbers (000-00000-00) in this Parts List are “internal part numbers” (IPNs). We can process your spare parts orders more efficiently and accurately if you quote the IPN and provide a brief description of the part.

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns, as shown below:

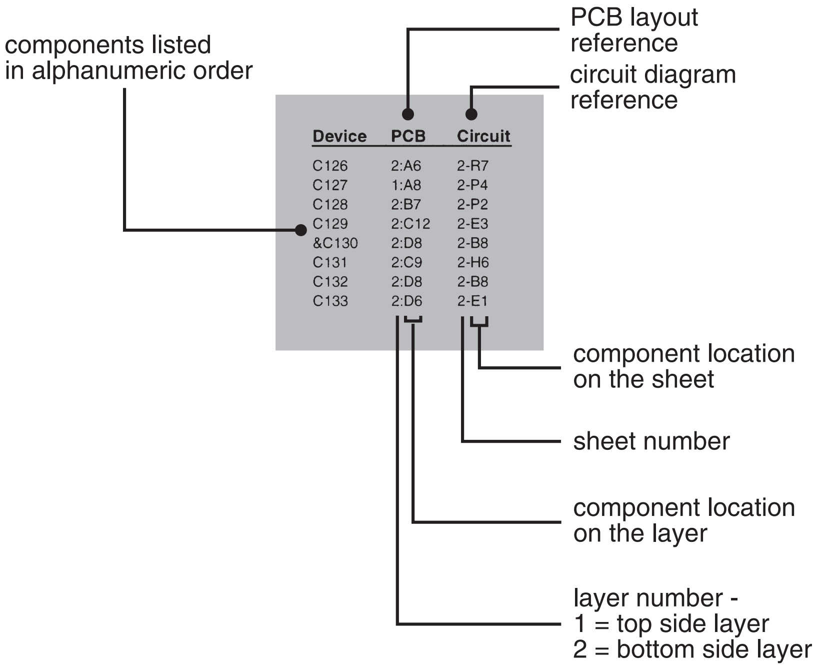


Ref	Var	IPN	Description
C126		015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V
C127		020-09220-01	CAP ELECT RADL 220M 16V 10X12.5MM
C128		015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V
C129		015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V
&C130	10	015-25100-08	CAP CER 0805 CHIP 10N 10% X7R 50V
&C130	15	015-24470-08	CAP CER 0805 CHIP 4N7 10% X7R 50V
&C130	20	015-25100-08	CAP CER 0805 CHIP 10N 10% X7R 50V
&C130	25	015-24470-08	CAP CER 0805 CHIP 4N7 10% X7R 50V
C131		015-24100-08	CAP CER 0805 CHIP 1N 10% X7R 50V
C132		015-24470-08	CAP CER 0805 CHIP 4N7 10% X7R 50V
C133		015-05470-08	CAP CER 1206 CHIP 47N 10% X7R 50V

The mechanical and miscellaneous section lists the variant and common parts in IPN order.

Grid Reference Index

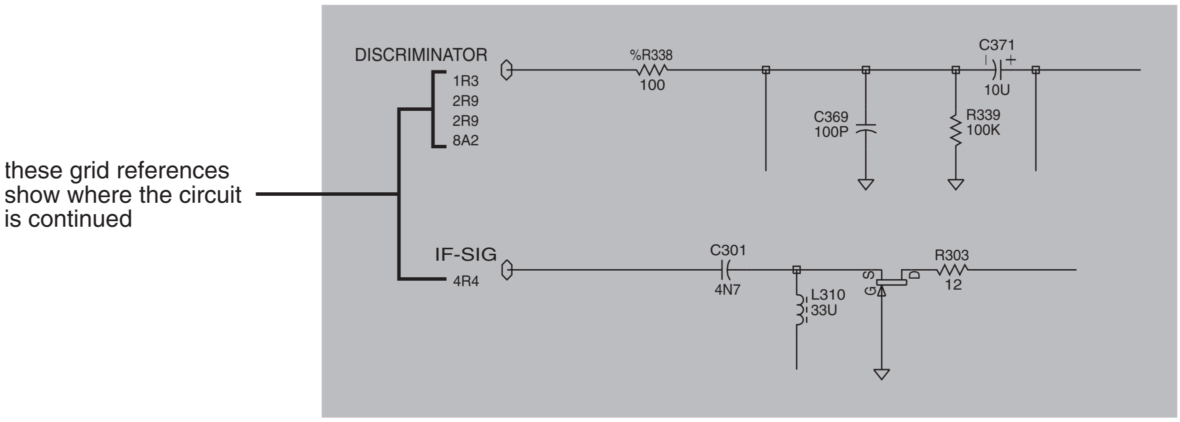
This section contains a component grid reference index to help you find components and labelled pads on the PCB layouts and circuit diagrams. This index lists the components and pads in alphanumeric order, along with the appropriate alphanumeric grid references, as shown below:



Using CAD Circuit Diagrams

Reading a CAD circuit diagram is similar to reading a road map, in that both have an alphanumeric border. The circuit diagrams in this manual use letters to represent the horizontal axis, and numbers for the vertical axis. These circuit diagram "grid references" are useful in following a circuit that is spread over two or more sheets.

When a line representing part of the circuitry is discontinued, a reference will be given at the end of the line to indicate where the rest of the circuitry is located, as shown below. The first digit refers to the sheet number and the last two characters refer to the location on that sheet of the continuation of the circuit (e.g. 1R3).



4.2 T803 Main and Front Panel PCBs

This section contains the following information.

T803 Parts List (IPN 220-01581-04)

How To Use This Parts List

The components listed in this parts list are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns: the circuit reference, variant (if applicable), IPN and description. A number in the variant column indicates that this is a variant component which is fitted only to the product type listed.

This parts list is correct at the time of publishing, but is subject to change without notification. An up to date parts list can be obtained from your local Customer Service Organisation

Ref	Var	IPN	Description
C1		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C128		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C145		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C162		016-08470-01	CAP ELEC SMD 47UF 6*4 16V
C163		016-08100-01	CAP ELEC SMD 10M 4*5.2 16V 20%
C164		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C165		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C166		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C167		016-08470-01	CAP ELEC SMD 47UF 6*4 16V
C168		016-08100-01	CAP ELEC SMD 10M 4*5.2 16V 20%
C170		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C172		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C173		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C174		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C2		016-08100-01	CAP ELEC SMD 10M 4*5.2 16V 20%
C202		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C203		016-07470-06	CAP ELEC SMD BI-P 4U7 50V 20%
C204		016-07470-06	CAP ELEC SMD BI-P 4U7 50V 20%
C205		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C206		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C207		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C208		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C210		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C211		015-23470-08	CAP CER 0805 470P 10% X7R 50V
C212		015-05330-08	CAP CER 1206 33N 10% X7R 50V
C213		015-05330-08	CAP CER 1206 33N 10% X7R 50V
C214		015-23470-08	CAP CER 0805 470P 10% X7R 50V
C215		015-23470-08	CAP CER 0805 470P 10% X7R 50V
C216		015-23470-08	CAP CER 0805 470P 10% X7R 50V
C217		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C218		015-27100-10	CAP CER 0805 1M+80-20% Y5V 16V
C219		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C220		015-27100-10	CAP CER 0805 1M+80-20% Y5V 16V
C222		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C224		015-27100-10	CAP CER 0805 1M+80-20% Y5V 16V
C225		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C226		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C227		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C232		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C233		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C235		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C236		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C238		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C239		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C240		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C242		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C3		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C300		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C301		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C302		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C303		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C304		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C305		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C306		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C307		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C308		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C310		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C311		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C312		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C313		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C314		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C315		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C316		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C317		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C318		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C319		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C320		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C4		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C400		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C401		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C402		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C403		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C404		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C405		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C406		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C407		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C408		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C409		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C410		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C411		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C412		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C413		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C414		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C415		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C416		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C417		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C418		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C419		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C420		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C421		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C422		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C423		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C424		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C425		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C426		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C427		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C428		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C429		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C430		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C431		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C432		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C433		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C434		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C435		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C436		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C437		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C438		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C439		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C440		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C441		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C442		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C443		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C444		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C445		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C446		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C447		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C448		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C449		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C450		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C451		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C452		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C453		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C454		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C455		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C5		016-08470-01	CAP ELEC SMD 47UF 6*4 16V
C500		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C501		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C502		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C503		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C504		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C505		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C506		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C507		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C508		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C509		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C510		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C511		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C512		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C513		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C514		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C515		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C516		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C517		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C518		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C519		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C520		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C521		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C522		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C523		015-24100-08	CAP PCB 0805 1N 10% X7R 50V
C524		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C525		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C526		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C527		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C6		016-08470-01	CAP ELEC SMD 47UF 6*4 16V
C600		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C601		015-22270-01	CAP CER 0805 27P 5% NPO 50V

Ref	Var	IPN	Description
C602		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C603		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C604		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C605		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C606		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C607		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C608		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C609		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C610		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C611		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C612		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C613		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C7		015-27100-10	CAP CER 0805 1M+80-20% Y5V 16V
D1		008-00014-81	LED 5MM RED/GRN BICOLOR
D2		008-00014-81	LED 5MM RED/GRN BICOLOR
D207		001-18410-00	DIODE SMD BZX84C10V ZEN SOT23
D3		008-00014-81	LED 5MM RED/GRN BICOLOR
D4		008-00014-81	LED 5MM RED/GRN BICOLOR
D5		008-00014-81	LED 5MM RED/GRN BICOLOR
D6		001-10084-62	DIODE SMD BZX84C6V2 ZEN SOT23
IC1		002-10078-00	IC SMD MC78M05CDT5V REG0.5A
IC100		002-10078-00	IC SMD MC78M05CDT5V REG0.5A
IC101		002-10078-00	IC SMD MC78M05CDT5V REG0.5A
IC2		002-74905-95	IC SMD 74HC595 SHIFT REG
IC200		002-74905-95	IC SMD 74HC595 SHIFT REG
IC201		002-12003-00	IC SMD ULN2003AD 7-DARL 16P S0
IC202		002-10140-21	IC MC14021BDR2 8B SREG S016
IC203		002-74905-95	IC SMD 74HC595 SHIFT REG
IC204		002-74940-53	IC SMD 74HC4053 S016
IC205		002-11454-80	IC SMD MC145480DW PCM
%IC206		002-11454-80	IC SMD MC145480DW PCM
IC208		002-10832-00	IC TLC0832 8BIT A/D 8PIN S0
IC209		002-74940-53	IC SMD 74HC4053 S016
IC210		002-10126-71	IC SMD DS1868 DGTL POT TSOP20
IC3		002-10854-10	IC TDA8541T 1W AUDIO AMP
IC300		002-10203-00	IC TMS320C203 80MHZ PQFP100
IC301		002-74940-53	IC SMD 74HC4053 S016
IC303		002-74900-00	IC SMD 74HC00 4X 2 I/P NAND
IC307		002-00090-00	IC SRAM 64KX16 15*5 44SOJ
IC310		002-74905-73	IC SMD 74HC573D 8X 3STATE
%IC311		240-04020-42	SKT 44 PIN SMD PLCC
IC312		002-12416-00	IC SMD AT24C16N-10SC EEPROM
IC313		002-10012-32	IC DS1232LPS-2 LO-P RESET&WDOG
JP302		036-10000-00	RES M/F SMD 0805 0E 0.125W
JP303		036-10000-00	RES M/F SMD 0805 0E 0.125W
JP307		036-10000-00	RES M/F SMD 0805 0E 0.125W
L1		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L114		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L131		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L132		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L200		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L201		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L202		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L203		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L400		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L401		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L402		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L403		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L404		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L405		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L406		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L407		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L408		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L409		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L410		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L411		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L412		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L413		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L414		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L415		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L416		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L417		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L418		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L419		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L420		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L421		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L422		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L423		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L424		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L425		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L426		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L427		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L500		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L501		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L502		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L503		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L504		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L505		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L506		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L507		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L508		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L509		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L510		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L511		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L512		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L513		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L600		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L601		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L602		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L603		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L604		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L605		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
L606		057-10120-03	IND 0805 120E@100M .2 EMI SUPR
P1		240-04020-72	SKT HSNG 2W CORD MTG ULTREX
P100		240-00026-34	PLG 15W DRNG DUAL PORT
Q203		000-10008-47	XSTR SMD BC847B NPN SOT23
R1		036-12100-10	RES M/F SMD 0805 10E 1%
R10		036-13220-10	RES M/F SMD 0805 220E 1%
R100		036-10000-00	RES M/F SMD 0805 0E 0.125W
R12		036-13330-00	RES M/F SMD 0805 330E 5%
R13		036-13220-10	RES M/F SMD 0805 220E 1%
R14		036-13330-00	RES M/F SMD 0805 330E 5%
R15		036-13220-10	RES M/F SMD 0805 220E 1%
R2		036-14470-10	RES M/F SMD 0805 4K7 1%
R201		036-14100-10	RES M/F SMD 0805 1K 1%
R202		036-14100-10	RES M/F SMD 0805 1K 1%
R203		036-14100-10	RES M/F SMD 0805 1K 1%
R204		036-14100-10	RES M/F SMD 0805 1K 1%
R205		036-14100-10	RES M/F SMD 0805 1K 1%
R206		036-14100-10	RES M/F SMD 0805 1K 1%
R207		036-14100-10	RES M/F SMD 0805 1K 1%
R208		036-14100-10	RES M/F SMD 0805 1K 1%
R209		036-14470-10	RES M/F SMD 0805 4K7 1%
R210		036-14100-10	RES M/F SMD 0805 1K 1%
R211		036-14100-10	RES M/F SMD 0805 1K 1%
R212		036-14100-10	RES M/F SMD 0805 1K 1%
R213		036-14100-10	RES M/F SMD 0805 1K 1%
R214		036-14100-10	RES M/F SMD 0805 1K 1%
R215		036-14100-10	RES M/F SMD 0805 1K 1%
R216		036-15100-10	RES M/F SMD 0805 10K 1%
R217		036-14120-00	RES M/F SMD 0805 1K2 5%
R218		036-15100-10	RES M/F SMD 0805 10K 1%
R219		036-14560-00	RES M/F SMD 0805 5K6 5%
R220		036-15100-10	RES M/F SMD 0805 10K 1%
R221		036-15100-10	RES M/F SMD 0805 10K 1%
R223		036-15100-10	RES M/F SMD 0805 10K 1%
R224		036-15100-10	RES M/F SMD 0805 10K 1%
R225		036-15100-10	RES M/F SMD 0805 10K 1%
R226		036-15100-10	RES M/F SMD 0805 10K 1%
R227		036-14220-00	RES M/F SMD 0805 2K2 5%
R228		036-12100-10	RES M/F SMD 0805 10E 1%
R229		036-12390-00	RES M/F SMD 0805 39E 5%
R230		036-13470-00	RES M/F SMD 0805 470E 5%
R231		036-15470-10	RES M/F SMD 0805 47K 1%
R232		036-13470-00	RES M/F SMD 0805 470E 5%
R234		036-15100-10	RES M/F SMD 0805 10K 1%
R235		036-13470-00	RES M/F SMD 0805 470E 5%
R236		036-15100-10	RES M/F SMD 0805 10K 1%
R237		036-15100-10	RES M/F SMD 0805 10K 1%
R239		036-13220-10	RES M/F SMD 0805 220E 1%
R240		036-14150-10	RES M/F SMD 0805 1K5 1%
R243		036-14100-10	RES M/F SMD 0805 1K 1%
R244		036-14560-00	RES M/F SMD 0805 5K6 5%
R246		036-15100-10	RES M/F SMD 0805 10K 1%
R247		036-15470-10	RES M/F SMD 0805 47K 1%
R250		036-14560-00	RES M/F SMD 0805 5K6 5%
R251		036-14470-10	RES M/F SMD 0805 4K7 1%
R254		036-15100-10	RES M/F SMD 0805 10K 1%
R257		036-14680-10	RES M/F SMD 0805 6K8 1%
R258		036-15100-10	RES M/F SMD 0805 10K 1%
R259		036-16100-10	RES M/F SMD 0805 100K 1%
R261		036-15470-10	RES M/F SMD 0805 47K 1%
R262		036-15100-10	RES M/F SMD 0805 10K 1%
R264		036-12220-00	RES M/F SMD 0805 22E 5%
R266		036-15330-10	RES M/F SMD 0805 33K 1%
R267		036-12100-10	RES M/F SMD 0805 10E 1%
R268		036-12100-10	RES M/F SMD 0805 10E 1%
R269		036-15100-10	RES M/F SMD 0805 10K 1%
R271		036-15100-10	RES M/F SMD 0805 10K 1%
R272		036-14220-00	RES M/F SMD 0805 2K2 5%
R273		036-14470-10	RES M/F SMD 0805 4K7 1%
R274		036-14470-10	RES M/F SMD 0805 4K7 1%
R275		036-14470-10	RES M/F SMD 0805 4K7 1%
R276		036-14470-10	RES M/F SMD 0805 4K7 1%
R277		036-14470-10	RES M/F SMD 0805 4K7 1%
R280		036-15100-10	RES M/F SMD 0805 10K 1%
R3		036-13470-00	RES M/F SMD 0805 470E 5%
R301		036-14220-00	RES M/F SMD 0805 2K2 5%
R302		036-14220-00	RES M/F SMD 0805 2K2 5%
R303		036-14470-10	RES M/F SMD 0805 4K7 1%
R310		036-15100-10	RES M/F SMD 0805 10K 1%
R311		036-15100-10	RES M/F SMD 0805 10K 1%
R312		036-15100-10	RES M/F SMD 0805 10K 1%
R313		036-15100-10	RES M/F SMD 0805 10K 1%
R314		036-15100-10	RES M/F SMD 0805 10K 1%
R317		036-15100-10	RES M/F SMD 0805 10K 1%
R318		036-15100-10	RES M/F SMD 0805 10K 1%
R320		036-15100-10	RES M/F SMD 0805 10K 1%
R321		036-14470-10	RES M/F SMD 0805 4K7 1%

Ref	Var	IPN	Description
R322		036-14180-00	RES M/F SMD 0805 1K8 5%
R323		036-14180-00	RES M/F SMD 0805 1K8 5%
R324		036-14180-00	RES M/F SMD 0805 1K8 5%
R325		036-14180-00	RES M/F SMD 0805 1K8 5%
R326		036-14180-00	RES M/F SMD 0805 1K8 5%
R327		036-14180-00	RES M/F SMD 0805 1K8 5%
R328		036-14180-00	RES M/F SMD 0805 1K8 5%
R330		036-14180-00	RES M/F SMD 0805 1K8 5%
R331		036-14180-00	RES M/F SMD 0805 1K8 5%
R332		036-14180-00	RES M/F SMD 0805 1K8 5%
R333		036-14180-00	RES M/F SMD 0805 1K8 5%
R334		036-14180-00	RES M/F SMD 0805 1K8 5%
R335		036-14180-00	RES M/F SMD 0805 1K8 5%
R336		036-15100-10	RES M/F SMD 0805 10K 1%
R341		036-15100-10	RES M/F SMD 0805 10K 1%
R342		036-15100-10	RES M/F SMD 0805 10K 1%
R343		036-15100-10	RES M/F SMD 0805 10K 1%
R344		036-15100-10	RES M/F SMD 0805 10K 1%
R345		036-15100-10	RES M/F SMD 0805 10K 1%
R346		036-15100-10	RES M/F SMD 0805 10K 1%
R347		036-15100-10	RES M/F SMD 0805 10K 1%
R348		036-15100-10	RES M/F SMD 0805 10K 1%
R351		036-15100-10	RES M/F SMD 0805 10K 1%
R352		036-14150-10	RES M/F SMD 0805 1K5 1%
R353		036-15100-10	RES M/F SMD 0805 10K 1%
R4		036-13330-00	RES M/F SMD 0805 330E 5%
R5		036-13220-10	RES M/F SMD 0805 220E 1%
R7		036-13330-00	RES M/F SMD 0805 330E 5%
R8		036-13220-10	RES M/F SMD 0805 220E 1%
R9		036-13330-00	RES M/F SMD 0805 330E 5%
RV1		042-05100-10	RES PRE 10K CER 9.5MM SQ FLAT
S1		230-00010-38	SW EXTENDER CAP 19MM
S2		230-00010-38	SW EXTENDER CAP 19MM
SK1		240-10000-07	CONN SMD 16W 2R SKT M/MATCH
SK100		240-04021-80	SKT 8W RJ45 HOR MTG
SK101		240-10000-07	CONN SMD 16W 2R SKT M/MATCH
SK2		240-04021-60	SKT 6W MODR PH VRT T-ENT
T200		054-00010-16	XFMR LINE 600 OHM 1:1 P1200
T201		054-00010-16	XFMR LINE 600 OHM 1:1 P1200
XL300		274-00010-59	XTAL 18.432MHZ HC49/U

Ref	Var	IPN	Description

T803 Mechanical and Miscellaneous Parts (220-01581-04)

IPN	Legend	Description
002-00021-03		IC W78LE54 PLCC44 MICRO 24MHZ
069-00010-31		CLAMP FER FOR 13MM CBL DIA
201-00030-08		WIRE T/C 7/0.2MM PVC GREY
201-00030-10		WIRE T/C 7/0.2MM PVC BLK
219-02685-00		T0NE RMT RBBN CBL LOOM
220-01581-04		PCB T803 T0NE RMT/T805-08 QS
230-00020-38		SW SPNO THRU HOLE PCB MTG
240-00020-72		HDR 2W PCB MTG ULTREX
240-04020-76		SKT HSNG 4W RECEP CRIMP ULTREX
252-00010-55		MIC SPKR 40MM 0.5W 16E FOSTER
303-23149-00		CVR SIDE T1511-20-0000
308-01007-02		HANDLE BS SII INT THREAD
316-06706-00		PNL FRT SUB CHASS 14MM
316-06707-01		PNL FRT T803-00-0000
316-21252-00		PNL REAR T803-00-0000 RJ45
318-01037-00		RAIL CHASS T1511-20 EXTRA AL
345-00040-08		SCRW M3*12MM P/P S/T BZ
345-00040-09		SCRW M3*6MM CSK POZI TRUNCATE
345-00050-04		SCRW M4*10MM CSK POZI S/T BZ
349-00020-09		SCRW 4-40*3/8" T/T P/P BLK
349-00020-08		SCRW 4-40*3/8" T/T CSK POZI BZ
349-00020-55		SCRW M3*8MM T/T P/P BZ
369-01039-00		ADH RING 40MM T/ORCA SPKR

T803 Grid Reference Index (IPN 220-01581-04)

How To Use This Grid Reference Index

The first digit in the PCB layout reference is a “1” or “2”, indicating the top or bottom side layout respectively, and the last two characters give the location of the component on that diagram.

The first digit in the circuit diagram reference is the sheet number, and the last two characters give the location of the component on that sheet.

Device	PCB	Circuit
C1	1:Q10	1-N3
C2	1:Q11	1-O3
C3	1:Q11	1-O3
C4	1:S11	1-P3
C5	1:S11	1-Q3
C6	1:S7	1-Q4
C7	1:S7	1-R3
C128	1:H5	1-A0
C145	1:H5	1-B0
C162	1:H5	1-B0
C163	1:H8	1-C0
C164	1:H8	1-D0
C165	1:H3	1-E0
C166	1:H3	1-F0
C167	1:H4	1-F0
C168	1:H4	1-G0
C170	1:G4	1-G0
C172	1:G5	1-H0
C173	1:G5	1-H0
C174	1:G5	1-I0
C202	1:F5	2-E2
C203	1:C12	2-E9
C204	1:C9	2-E8
C205	1:C12	2-F9
C206	1:C9	2-F8
C207	1:C12	2-F9
C208	1:C9	2-F8
C210	1:F4	2-G4
C211	1:F10	2-G9
C212	1:F11	2-G9
C213	1:F9	2-G8
C214	1:F9	2-G7
C215	1:F10	2-H9
C216	1:F9	2-H7
C217	1:F7	2-H5
C218	1:C15	2-K5
C219	1:F10	2-J9
C220	1:D15	2-L5
@C221	1:D15	2-L4
C222	1:F8	2-N2
C224	1:C14	2-M4
C225	1:D15	2-M4
C226	1:E15	2-M5
C227	1:D14	2-N4
@C228	1:E13	2-N8
#C230	1:D14	2-N5
@C231	1:G13	2-N4
C232	1:E15	2-N7
C233	1:F7	2-O1
#C234	1:G15	2-N2
C235	1:F13	2-P8
C236	1:E13	2-P5
#C237	1:H13	2-O4
C238	1:F11	2-R9
C239	1:F8	2-O2
C240	1:E15	2-K5
C242	1:F13	2-M7
C300	1:L15	3-A9
C301	1:M15	3-B9

Device	PCB	Circuit
C302	1:K13	3-D9
C303	1:M14	3-D9
C304	1:K14	3-D9
C305	1:K14	3-G4
C306	1:K14	3-G4
C307	1:K11	3-I4
C308	1:L11	3-J4
C310	1:H9	3-L8
C311	1:K10	3-M6
C312	1:K15	3-H7
C313	1:L10	3-M6
C314	1:H9	3-P3
C315	1:L6	3-P6
C316	1:L8	3-P7
C317	1:K9	3-Q7
C318	1:M8	3-Q7
C319	1:H12	3-F3
C320	1:J5	3-Q2
C400	1:D7	4-H8
C401	1:E8	4-H8
C402	1:D6	4-H7
C403	1:D6	4-H6
C404	1:D7	4-H6
C405	1:D4	4-H5
C406	1:D3	4-H4
C407	1:D5	4-H3
C408	1:D6	4-H3
C409	1:D5	4-H2
C410	1:D4	4-H1
C411	1:D4	4-H1
C412	1:D6	4-H0
C413	1:D8	4-H8
C414	1:E8	4-H8
C415	1:D6	4-H7
C416	1:D6	4-H6
C417	1:D7	4-H6
C418	1:D4	4-H5
C419	1:D3	4-H4
C420	1:D5	4-H3
C421	1:D5	4-H3
C422	1:D5	4-H2
C423	1:D4	4-H1
C424	1:D3	4-H1
C425	1:D6	4-H0
C426	1:D7	4-J9
C427	1:D8	4-J8
C428	1:D7	4-J7
C429	1:D7	4-J7
C430	1:D6	4-J6
C431	1:D7	4-J5
C432	1:D4	4-J4
C433	1:D3	4-J4
C434	1:C3	4-J3
C435	1:D6	4-J2
C436	1:D5	4-J2
C437	1:D4	4-J1
C438	1:D5	4-J0
C439	1:D4	4-J0
C440	1:D8	4-J9

Device	PCB	Circuit
C441	1:D8	4-J8
C442	1:D7	4-J7
C443	1:D7	4-J7
C444	1:D6	4-J6
C445	1:D7	4-J5
C446	1:D3	4-J4
C447	1:D3	4-J4
C448	1:C3	4-J3
C449	1:D5	4-J2
C450	1:D5	4-J2
C451	1:D4	4-J1
C452	1:D5	4-J0
C453	1:D4	4-J0
C454	1:B3	4-J0
C455	1:B3	4-J0
C500	1:M6	5-E8
C501	1:M5	5-E7
C502	1:M5	5-E6
C503	1:M4	5-E5
C504	1:M4	5-E3
C505	1:M3	5-E2
C506	1:M3	5-E1
C507	1:M5	5-F8
C508	1:M5	5-F7
C509	1:M4	5-F6
C510	1:M4	5-F5
C511	1:M4	5-F3
C512	1:M3	5-F2
C513	1:M3	5-F1
C514	1:M6	5-G8
C515	1:M5	5-G7
C516	1:M5	5-G6
C517	1:M4	5-G5
C518	1:M4	5-G4
C519	1:M3	5-G3
C520	1:M3	5-G2
C521	1:M5	5-G8
C522	1:M5	5-G7
C523	1:M4	5-G6
C524	1:M4	5-G5
C525	1:M4	5-G4
C526	1:M3	5-G3
C527	1:M3	5-G2
C600	1:J4	6-E6
C601	1:K4	6-E5
C602	1:L4	6-E4
C603	1:J4	6-F6
C604	1:K4	6-F5
C605	1:L4	6-F4
C606	1:J4	6-F6
C607	1:J4	6-F5
C608	1:K4	6-F4
C609	1:L4	6-F3
C610	1:J4	6-G6
C611	1:K4	6-G5
C612	1:K4	6-G4
C613	1:L4	6-G3
D1	2:T9	1-T2

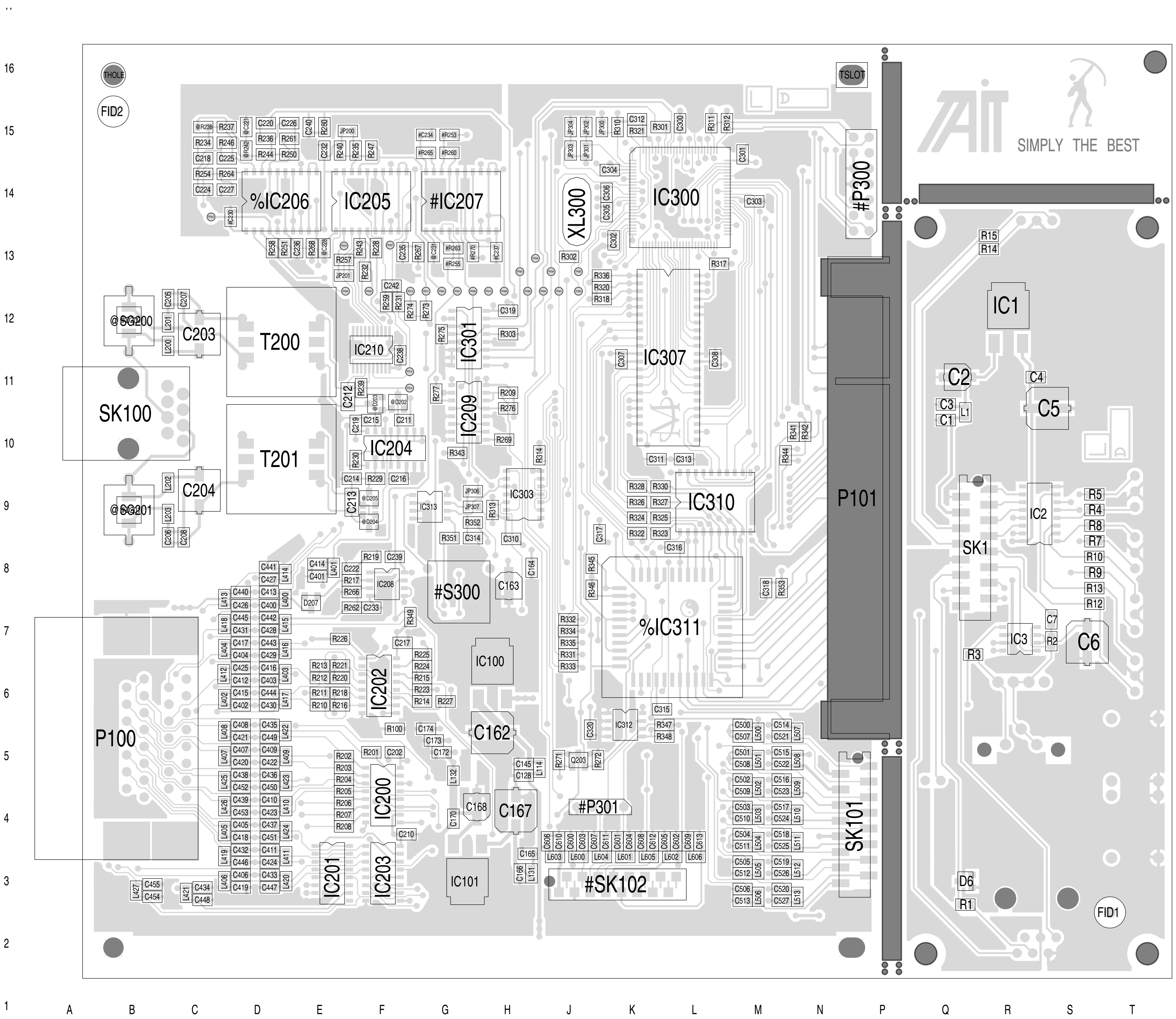
Device	PCB	Circuit
D1	2:T9	1-S2
D2	2:T8	1-T2
D2	2:T8	1-S2
D3	2:T7	1-S2
D3	2:T7	1-T2
D4	2:T6	1-S1
D4	2:T6	1-T1
D5	2:S14	1-S0
D5	2:S14	1-T0
D6	1:Q3	1-O0
@D200	1:B12	2-E9
@D201	1:B9	2-E8
@D202	1:F11	2-H9
@D203	1:F11	2-H9
@D204	1:F9	2-H8
@D205	1:F9	2-H8
D207	1:E8	2-M2
FID1	1:T3	1-I0
FID2	1:B15	1-I0
IC1	1:R12	1-O3
IC2	1:S9	1-P1
IC3	1:R7	1-R3
IC100	1:H6	1-C0
IC101	1:G3	1-F0
IC200	1:F4	2-F1
IC201	1:E3	2-F3
IC202	1:F6	2-G4
IC203	1:F3	2-H3
IC204	1:F10	2-J8
IC205	1:F14	2-O7
%IC206	1:D14	2-O4
#IC207	1:G14	2-O2
IC208	1:F8	2-P1
IC209	1:G11	2-S0
IC210	1:F12	2-R8
IC210	1:F12	2-K8
IC210	1:F12	2-M8
IC300	1:L14	3-B9
IC300	1:L14	3-F5
IC301	1:G12	3-F2
IC303	1:H9	3-I8
IC303	1:H9	3-K8
IC303	1:H9	3-I9
IC303	1:H9	3-I8
IC303	1:H9	3-J8
IC307	1:L11	3-J1
IC310	1:L9	3-M5
%IC311	1:L7	3-P5
IC312	1:K6	3-Q1
IC313	1:G9	3-R3
JP200	1:F15	2-L8
JP201	1:E13	2-M8
JP300	1:K15	3-F7
JP301	1:J15	3-E5
JP302	1:J15	3-F5
JP303	1:J15	3-E4

Device	PCB	Circuit
JP304	1:J15	3-F4
JP306	1:H9	3-P3
JP307	1:H9	3-P3
L1	1:Q11	1-O3
L114	1:J5	1-B0
L131	1:H3	1-E0
L132	1:G5	1-H0
L200	1:C12	2-E9
L201	1:C12	2-E8
L202	1:C9	2-E8
L203	1:C9	2-E8
L400	1:E8	4-H8
L401	1:E8	4-H8
L402	1:D6	4-H7
L403	1:E6	4-H6
L404	1:D7	4-H6
L405	1:D4	4-H5
L406	1:D3	4-H4
L407	1:D5	4-H4
L408	1:D5	4-H3
L409	1:E5	4-H2
L410	1:E4	4-H1
L411	1:E3	4-H1
L412	1:D6	4-H0
L413	1:D8	4-J9
L414	1:E8	4-J8
L415	1:E7	4-J7
L416	1:E7	4-J7
L417	1:E6	4-J6
L418	1:D7	4-J5
L419	1:D3	4-J5
L420	1:E3	4-J4
L421	1:C3	4-J3
L422	1:E5	4-J2
L423	1:E5	4-J2
L424	1:E4	4-J1
L425	1:D5	4-J0
L426	1:D4	4-J0
L427	1:B3	4-J0
L500	1:M5	5-F8
L501	1:M5	5-F7
L502	1:M5	5-F6
L503	1:M4	5-F5
L504	1:M4	5-F4
L505	1:M3	5-F3
L506	1:M3	5-F2
L507	1:N5	5-G8
L508	1:N5	5-G7
L509	1:N5	5-G6
L510	1:N4	5-G5
L511	1:N4	5-G4
L512	1:N3	5-G3
L513	1:N3	5-G2
L600	1:J3	6-E6
L601	1:K3	6-E5
L602	1:L3	6-E4
L603	1:J3	6-G6
L604	1:K3	6-G5
L605	1:K3	6-G4
L606	1:L3	6-G3
P1	2:Q5	1-T3
P100	1:B5	1-B3
P101	1:P9	1-U8
P101	1:P9	1-U6
#P300	1:P14	3-H3
#P301	1:K4	3-R0
Q203	1:J5	2-G0
R1	1:Q3	1-O0
R2	1:S7	1-S3
R3	1:R7	1-T3
R4	1:S9	1-S2
R5	1:S9	1-T2

Device	PCB	Circuit
R7	1:S8	1-S2
R8	1:S9	1-T2
R9	1:S8	1-S2
R10	1:S8	1-T2
R12	1:S7	1-S1
R13	1:S8	1-T1
R14	1:R13	1-S0
R15	1:R13	1-T0
R100	1:F5	1-H0
R201	1:F5	2-E2
R202	1:E5	2-E2
R203	1:E5	2-E2
R204	1:E5	2-E1
R205	1:E4	2-E1
R206	1:E4	2-E1
R207	1:E4	2-E1
R208	1:E4	2-E1
R209	1:H11	2-E1
R210	1:E6	2-E5
R211	1:E6	2-E5
R212	1:E6	2-E5
R213	1:E7	2-E5
R214	1:G6	2-E5
R215	1:G6	2-E5
R216	1:E6	2-E5
R217	1:F8	2-M2
R218	1:E6	2-F5
R219	1:F8	2-N2
R220	1:E6	2-F5
R221	1:E7	2-F5
R223	1:G6	2-F5
R224	1:G6	2-F5
R225	1:G7	2-G5
R226	1:E7	2-G5
R227	1:G6	2-H5
R228	1:F13	2-L8
R229	1:F9	2-H8
R230	1:F10	2-I8
R231	1:F12	2-J8
R232	1:F13	2-L8
R234	1:C15	2-L5
R235	1:F15	2-L8
R236	1:D15	2-L5
R237	1:D15	2-L5
@R238	1:C15	2-L5
R239	1:F11	2-K8
R240	1:E15	2-L8
@R242	1:D15	2-L4
R243	1:F13	2-L8
R244	1:D15	2-M5
R246	1:D15	2-M4
R247	1:F15	2-M8
R250	1:E15	2-M5
R251	1:D13	2-M5
#R253	1:G15	2-M3
R254	1:C14	2-M4
#R255	1:G13	2-M3
R257	1:E13	2-N8
R258	1:D13	2-N5
R259	1:F12	2-N7
#R260	1:G15	2-M3
R261	1:E15	2-N5
R262	1:F7	2-N1
#R263	1:G13	2-M3
R264	1:D14	2-N4
#R265	1:G15	2-N3
R266	1:F8	2-O1
R267	1:G13	2-O9
R268	1:E13	2-O6
R269	1:H10	2-R0
#R270	1:H13	2-O4
R271	1:J5	2-G0
R272	1:K5	2-G0
R273	1:G12	2-S7
R274	1:G12	2-S5
R275	1:G12	2-S3

Device	PCB	Circuit
R276	1:H11	2-S1
R277	1:G11	2-T1
R280	1:E15	2-L5
R301	1:L15	3-E6
R302	1:J13	3-E5
R303	1:H12	3-E3
R310	1:K15	3-F7
R311	1:L15	3-G3
R312	1:M15	3-G4
R313	1:H9	3-H9
R314	1:J10	3-H8
R317	1:L13	3-I2
R318	1:K12	3-K4
R320	1:K13	3-K3
R321	1:K15	3-H7
R322	1:K9	3-M4
R323	1:L9	3-M4
R324	1:K9	3-M4
R325	1:L9	3-M4
R326	1:K9	3-M4
R327	1:L9	3-M4
R328	1:K9	3-M4
R330	1:L9	3-M4
R331	1:J7	3-M4
R332	1:J7	3-M4
R333	1:J6	3-M4
R334	1:J7	3-M4
R335	1:J7	3-M4
R336	1:K13	3-L3
R341	1:N10	3-P4
R342	1:N10	3-P4
R343	1:G10	3-P4
R344	1:N10	3-P4
R345	1:J8	3-P4
R346	1:J8	3-P4
R347	1:L6	3-O2
R348	1:L5	3-P2
R349	1:G7	3-P4
R351	1:G9	3-Q3
R352	1:H9	3-Q3
R353	1:M8	3-R6
RV1	2:R6	1-S3
S1	2:T5	1-T1
S2	2:T4	1-S1
#S300	1:G8	3-R3
@SG200	1:B12	2-D9
@SG201	1:B9	2-D8
SK1	1:R8	1-M2
SK2	2:S2	1-T0
SK100	1:B11	1-B9
SK101	1:P4	1-K2
#SK102	1:K3	1-L3
T200	1:D12	2-G9
T201	1:D10	2-G8
TP200	1:F12	2-L8
TP201	1:G12	2-L3
TP203	1:C14	2-M5
TP204	1:G12	2-M8
TP205	1:E12	2-Q4
TP206	1:H12	2-Q2
TP207	1:F13	2-T9
TP208	1:H12	2-P3
TP209	1:J13	2-L3
TP211	1:G12	2-R8
TP212	1:G12	2-R5
TP213	1:H12	2-R3
TP214	1:F11	2-K9
TP215	1:F11	2-K9
TP216	1:E13	2-N9
TP300	1:J12	3-C5
TP301	1:J12	3-C5
TP302	1:H13	3-C4

Device	PCB	Circuit
TP303	1:J13	3-G5
TP304	1:J13	3-G4
TP305	1:J12	3-E3
TP306	1:H12	3-G3
XL300	1:J14	3-G4
XXX1000	nil	1-E4



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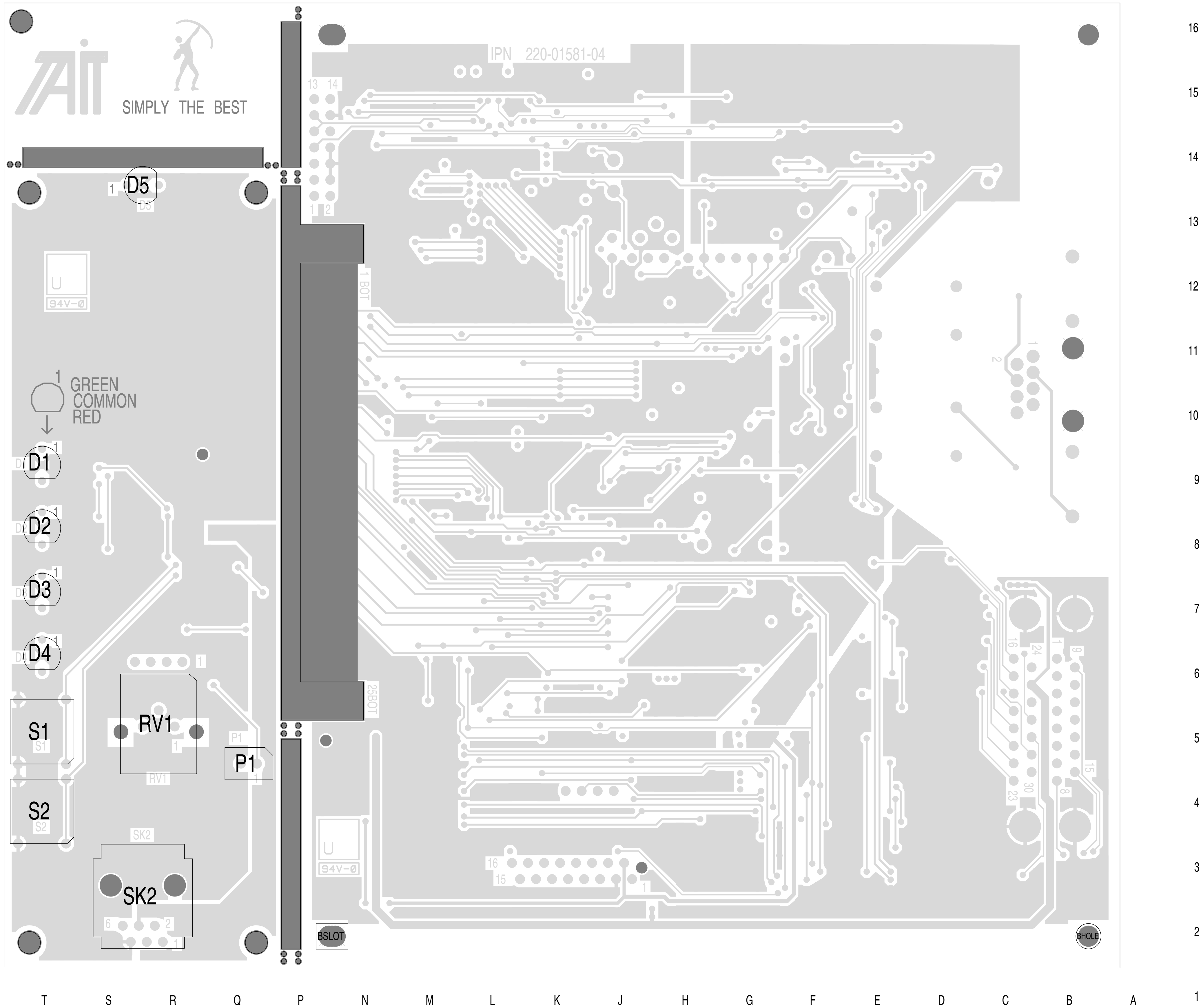
T803 / T805 PCB LAYOUT - TOP SIDE				

Scale:1.5:1 ; Rotation: 0 degrees

T803 PCB Layout – Top Side
220-01581-04



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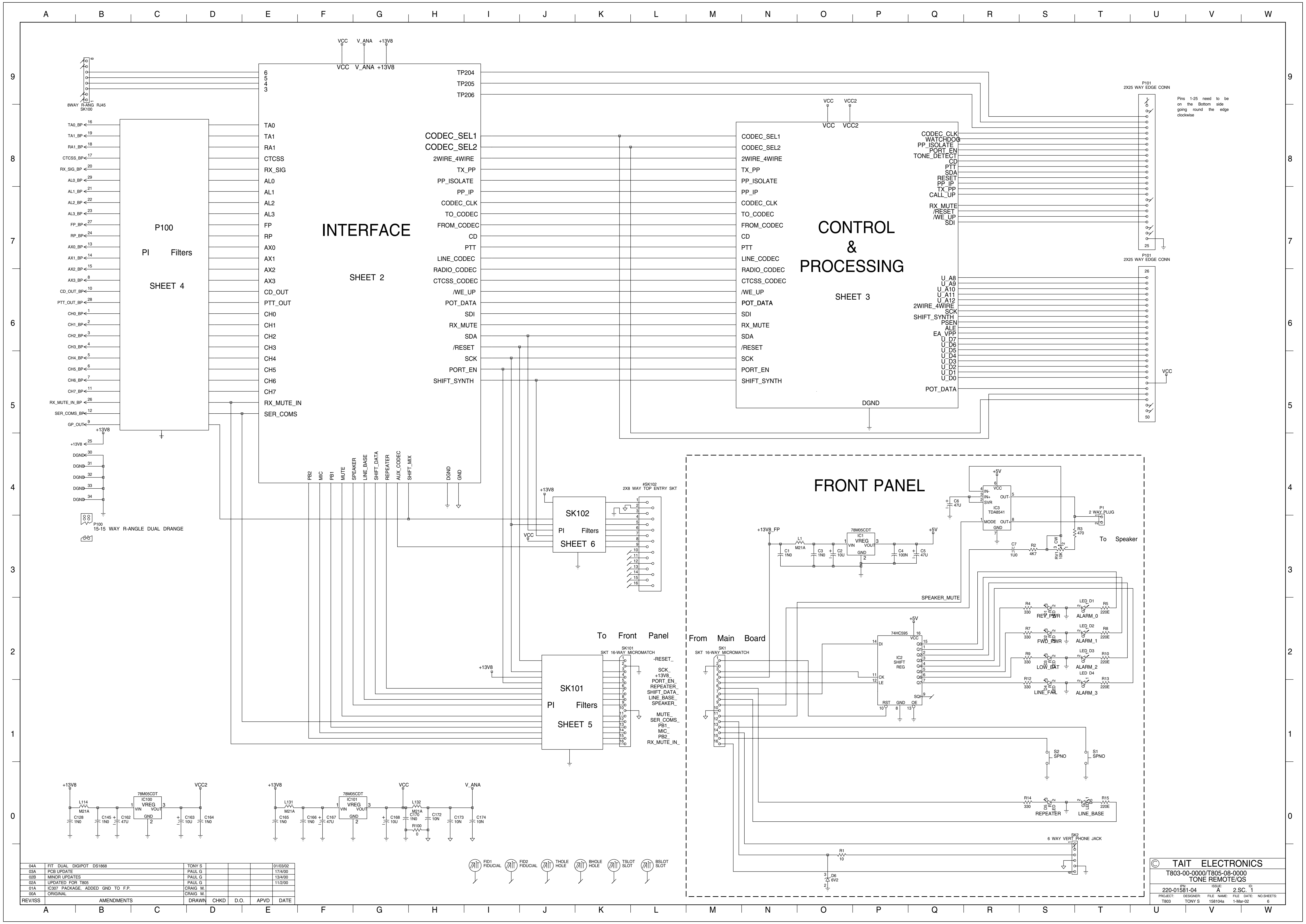
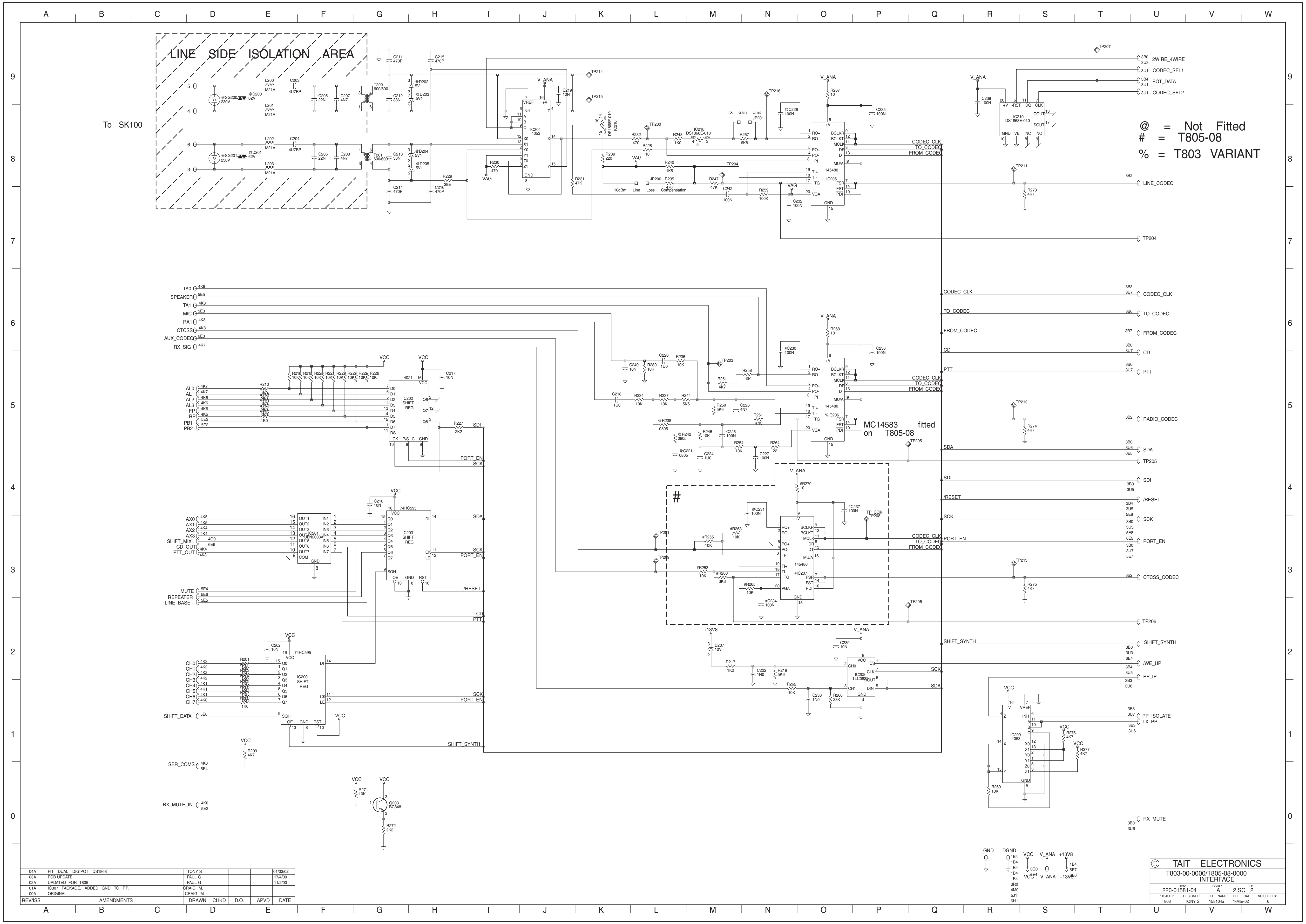
Scale:1.5:1 ; Rotation: 0 degrees

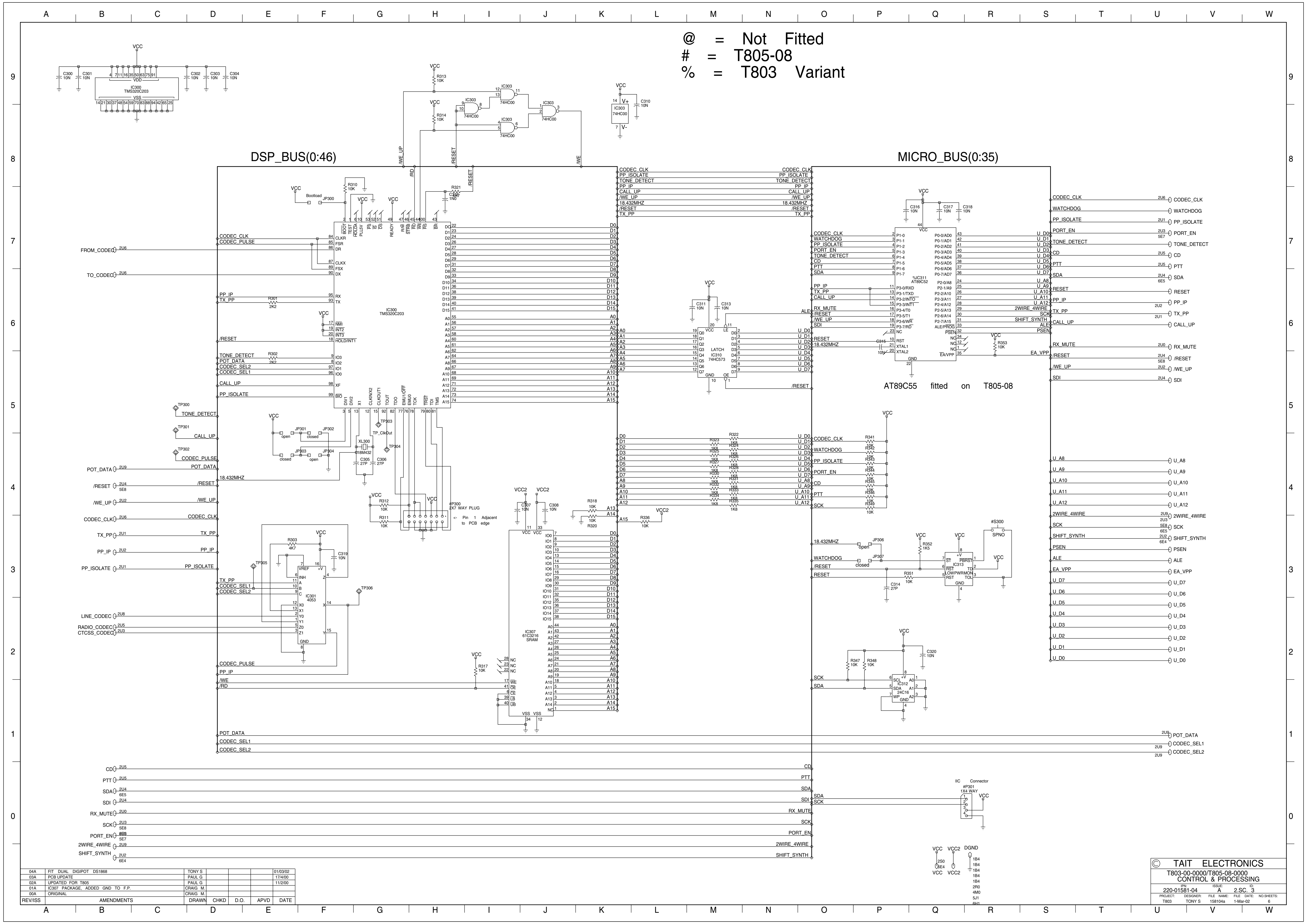
T803 PCB Layout – Bottom Side
220-01581-04



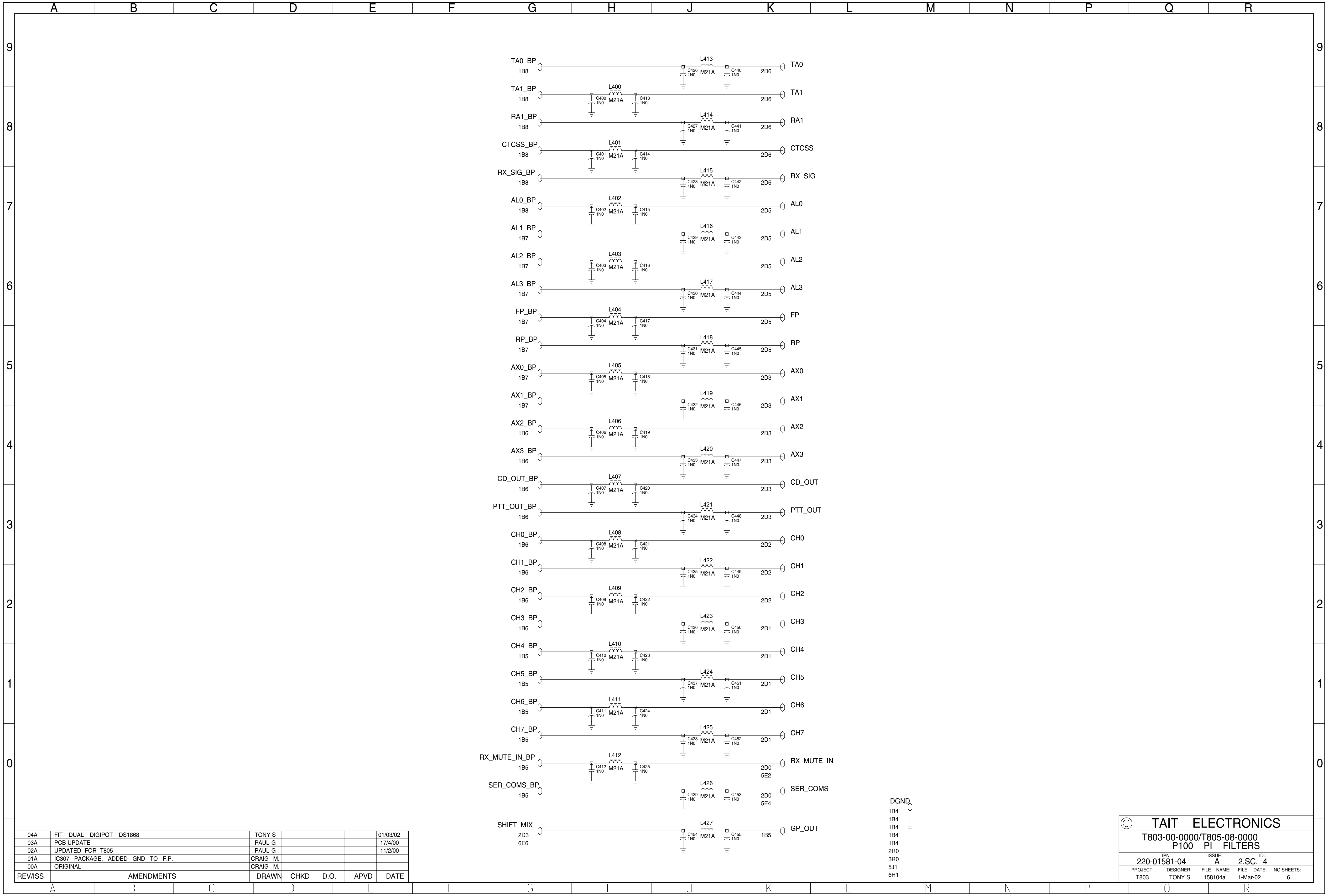
Sheet 1 – T803 Overview and Front Panel
220-01581-04



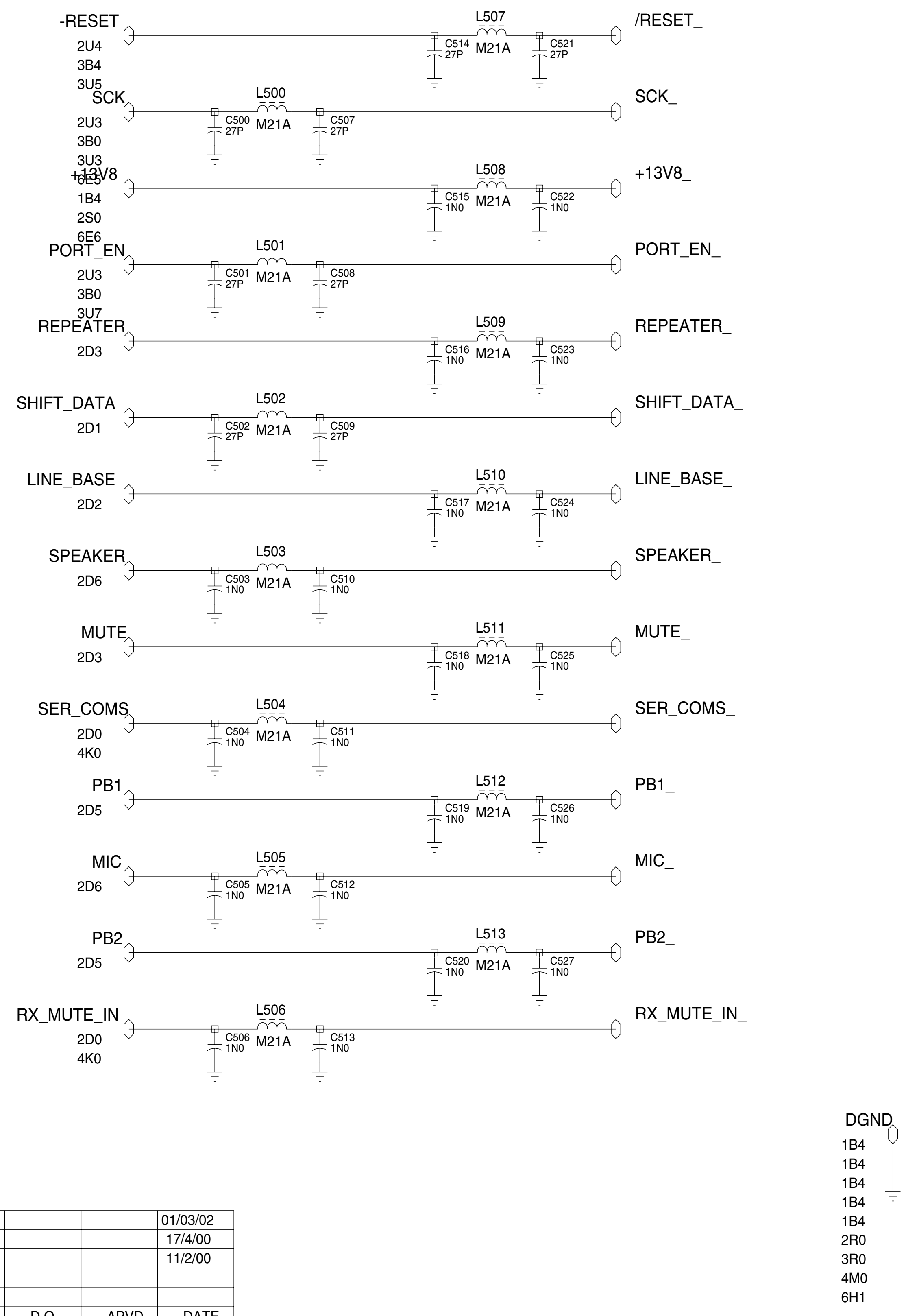
Sheet 2 – T803 Interface
220-01581-04



Sheet 3 – T803 Control and Processing
220-01581-04



Sheet 4 – T803 P100 PI filters
220-01581-04



REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE
04A	FIT DUAL DIGIPOT DS1868	TONY S				01/03/02
03A	PCB UPDATE	PAUL G				17/4/00
02A	UPDATED FOR T805	PAUL G				11/2/00
01A	IC307 PACKAGE, ADDED GND TO F.P.	CRAIG M.				
00A	ORIGINAL	CRAIG M.				

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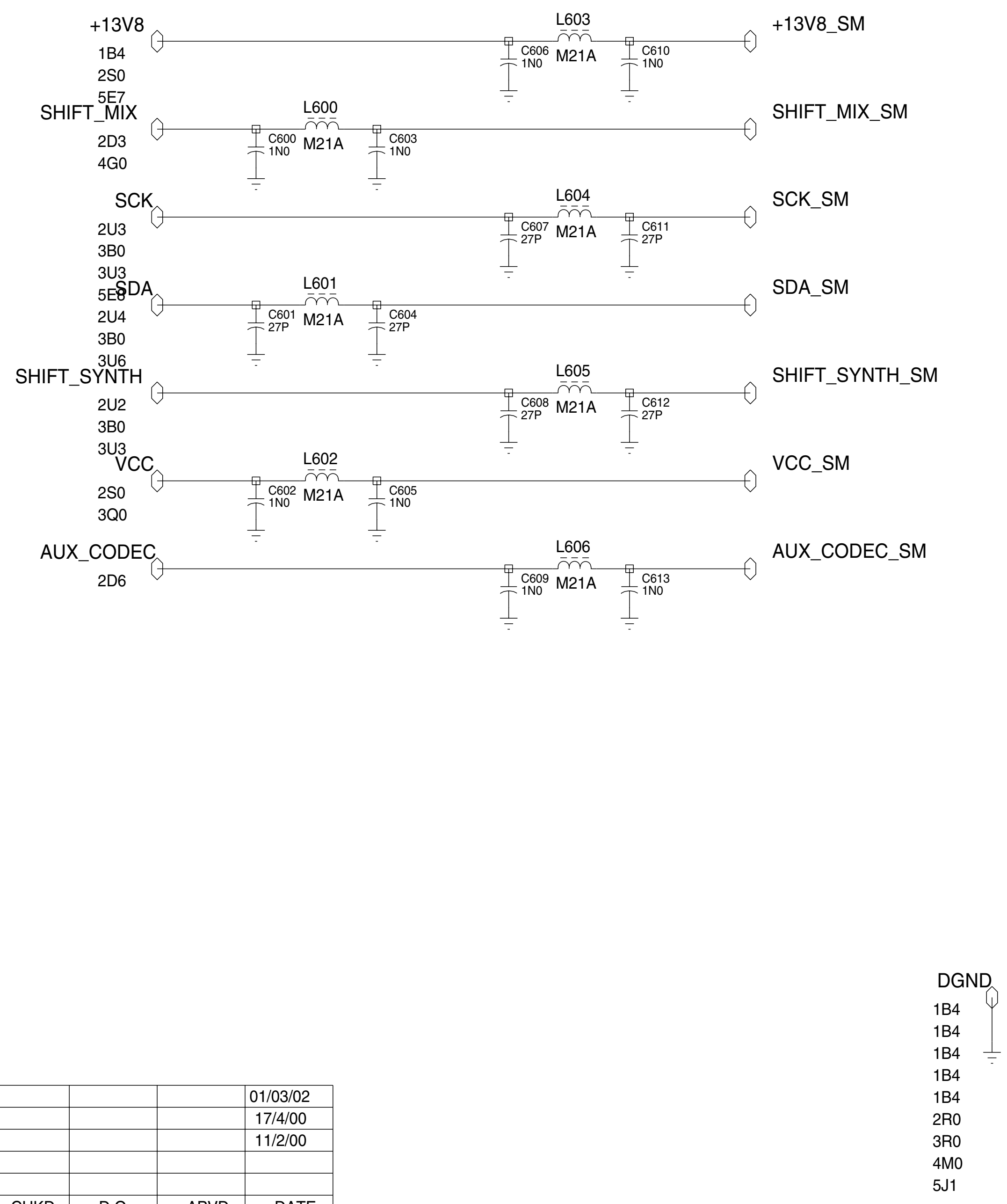
T803-00-0000/T805-08-0000
SK101 PI FILTERS

IPN:	ISSUE:	ID.:
220-01581-04	A	2.SC. 5

PROJECT:	DESIGNER:	FILE NAME:	FILE DATE:	NO.SHEETS:
T803	TONY S	158104a	1-Mar-02	6

Sheet 5 – T803 SK101 PI Filters
220-01581-04



REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE
04A	FIT DUAL DIGIPOT DS1868	TONY S				01/03/02
03A	PCB UPDATE	PAUL G				17/4/00
02A	UPDATED FOR T805	PAUL G				11/2/00
01A	IC307 PACKAGE, ADDED GND TO F.P.	CRAIG M.				
00A	ORIGINAL	CRAIG M.				

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T803-00-0000/T805-08-0000
SK102 PI FILTERS

IPN:	ISSUE:	ID:
220-01581-04	A	2.SC. 6

PROJECT:	DESIGNER:	FILE NAME:	FILE DATE:	NO.SHEETS:
T803	TONY S	158104a	1-Mar-02	6

Sheet 6 – T803 SK102 PI Filters
220-01581-04

Part E T850 VCO PCB Information

This part of the manual provides the parts list, PCB layouts and circuit diagram for the T850 VCO PCB. There is a detailed table of contents at the start of Section 2.

1 Introduction

PCB Identification

All PCBs are identified by a unique 10 digit “internal part number” (IPN), e.g. 220-12345-00, which is screen printed onto the PCB (usually on the top side), as shown in the example below:

The last 2 digits of this number define the issue status, which starts at 00 and increments through 01, 02, 03, etc. as the PCB is updated. Some issue PCBs never reach full production status and are therefore not included in this manual. A letter following the 10 digit IPN has no relevance in identifying the PCB for service purposes.

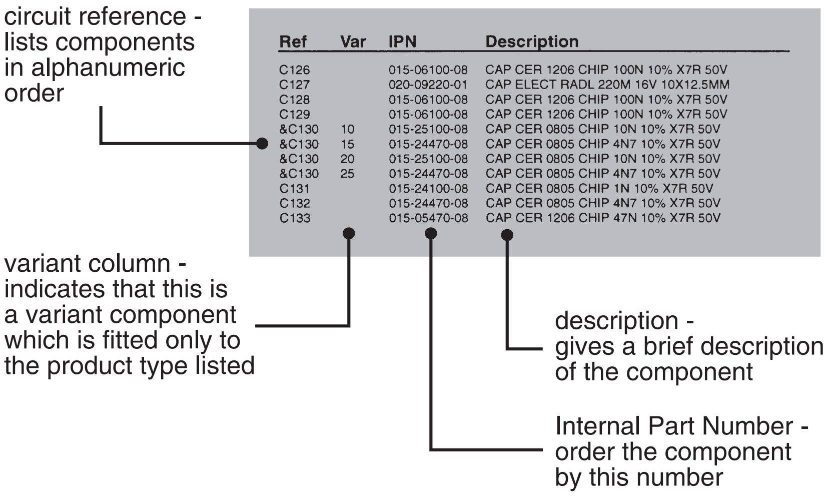
Note: It is important that you identify which issue PCB you are working on so that you can refer to the appropriate set of PCB information.

Parts Lists

The 10 digit numbers (000-00000-00) in this Parts List are “internal part numbers” (IPNs). We can process your spare parts orders more efficiently and accurately if you quote the IPN and provide a brief description of the part.

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns, as shown below:



Ref	Var	IPN	Description
C126		015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V
C127		020-09220-01	CAP ELECT RADL 220M 16V 10X12.5MM
C128		015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V
C129		015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V
&C130	10	015-25100-08	CAP CER 0805 CHIP 10N 10% X7R 50V
&C130	15	015-24470-08	CAP CER 0805 CHIP 4N7 10% X7R 50V
&C130	20	015-25100-08	CAP CER 0805 CHIP 10N 10% X7R 50V
&C130	25	015-24470-08	CAP CER 0805 CHIP 4N7 10% X7R 50V
C131		015-24100-08	CAP CER 0805 CHIP 1N 10% X7R 50V
C132		015-24470-08	CAP CER 0805 CHIP 4N7 10% X7R 50V
C133		015-05470-08	CAP CER 1206 CHIP 47N 10% X7R 50V

The mechanical and miscellaneous section lists the variant and common parts in IPN order.

Variant Components

A variant component is one that has the same circuit reference but different value or specification in different product types. Variant components have a character prefix, such as "&", "=" or "#", before the circuit reference (e.g. &R100).

2 T850 VCO PCB

This section contains the following information.

IPN	Section	Page
220-01145-07	Parts List	2.3
	PCB Layout – Bottom Side	2.5
	PCB Layout – Top Side	2.6
	Circuit Diagram	2.7

T850 VCO Parts List (IPN 220-01145-07)

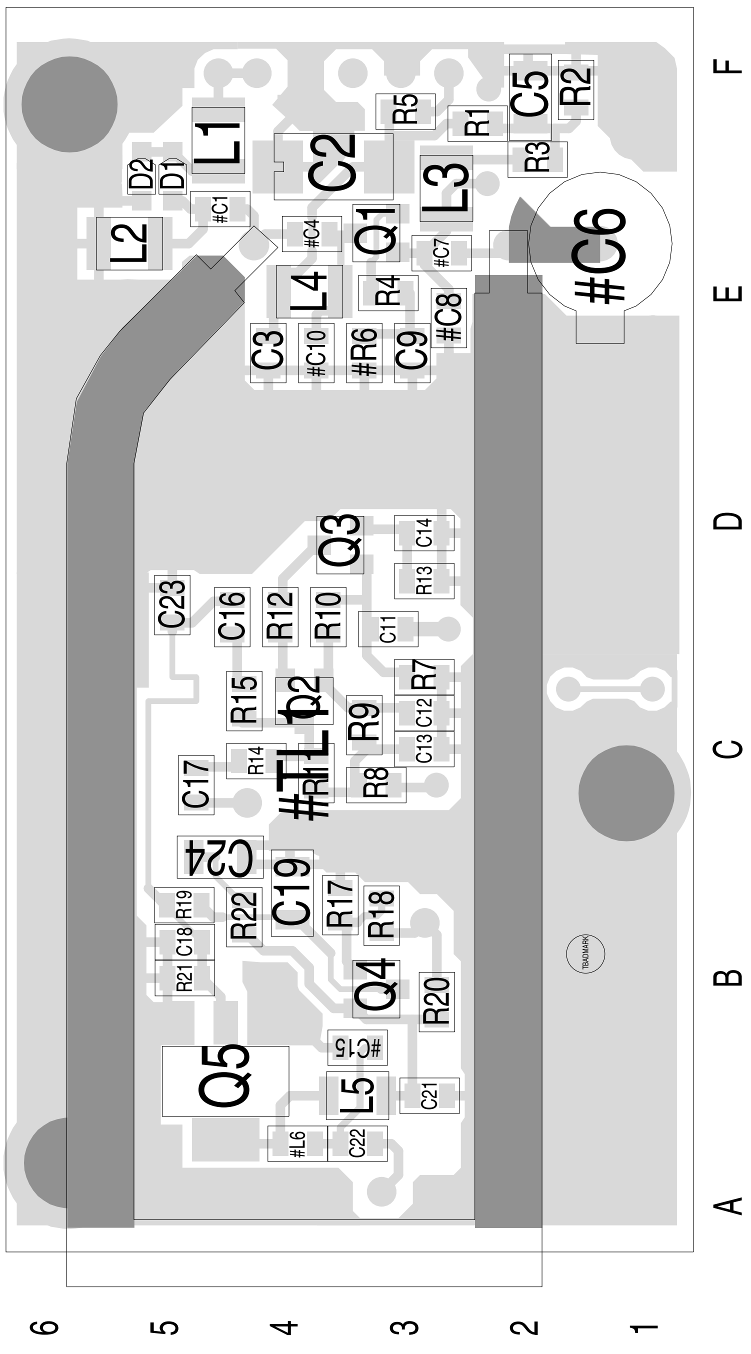
How To Use This Parts List

The components listed in this parts list are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns: the circuit reference, variant (if applicable), IPN and description. A number in the variant column indicates that this is a variant component which is fitted only to the product type listed.

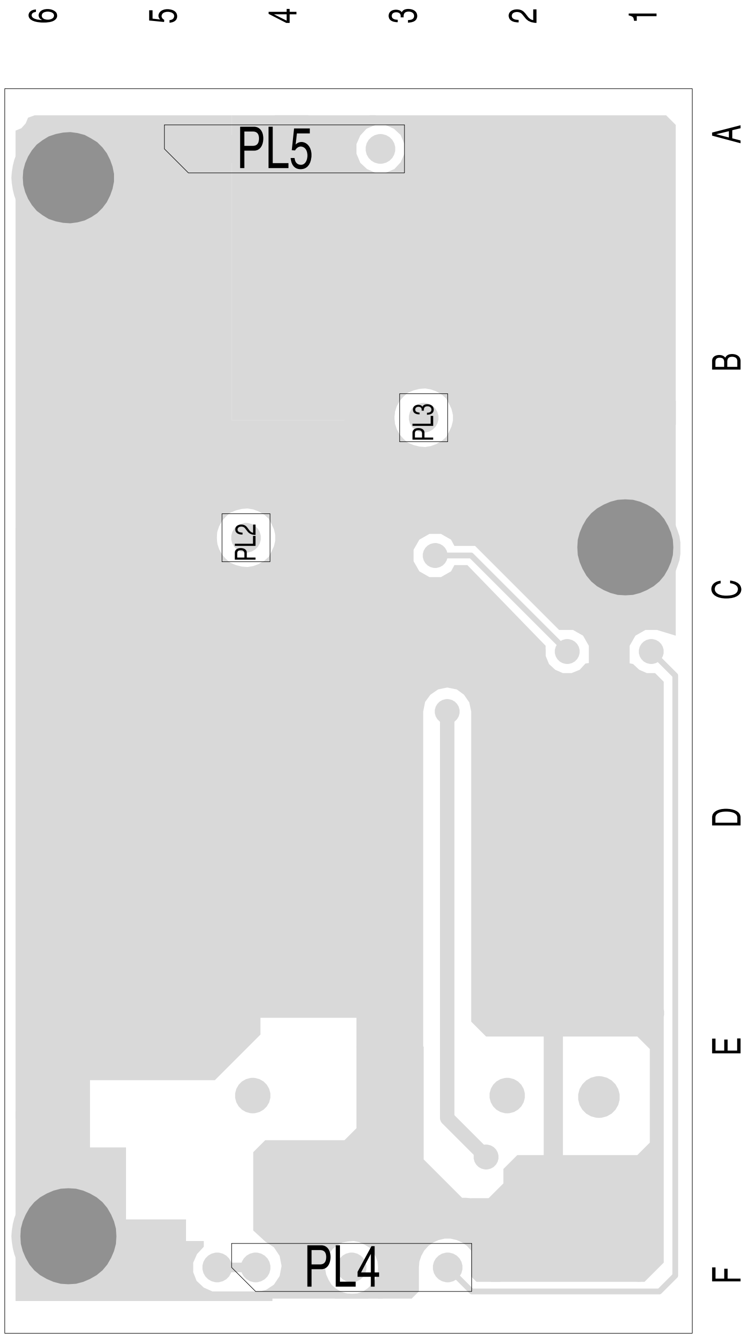
This parts list is correct at the time of publishing, but is subject to change without notification. An up to date parts list can be obtained from your local Customer Service Organisation

Variant Code	Description	T855 (MHz)	T854 (MHz)
A	Tx High	—	480 to 500
B	Tx Mid/Rx High	480 to 520	440 to 480
C	Tx Low/Rx Mid	440 to 480	400 to 440
D	Rx Low	400 to 440	—

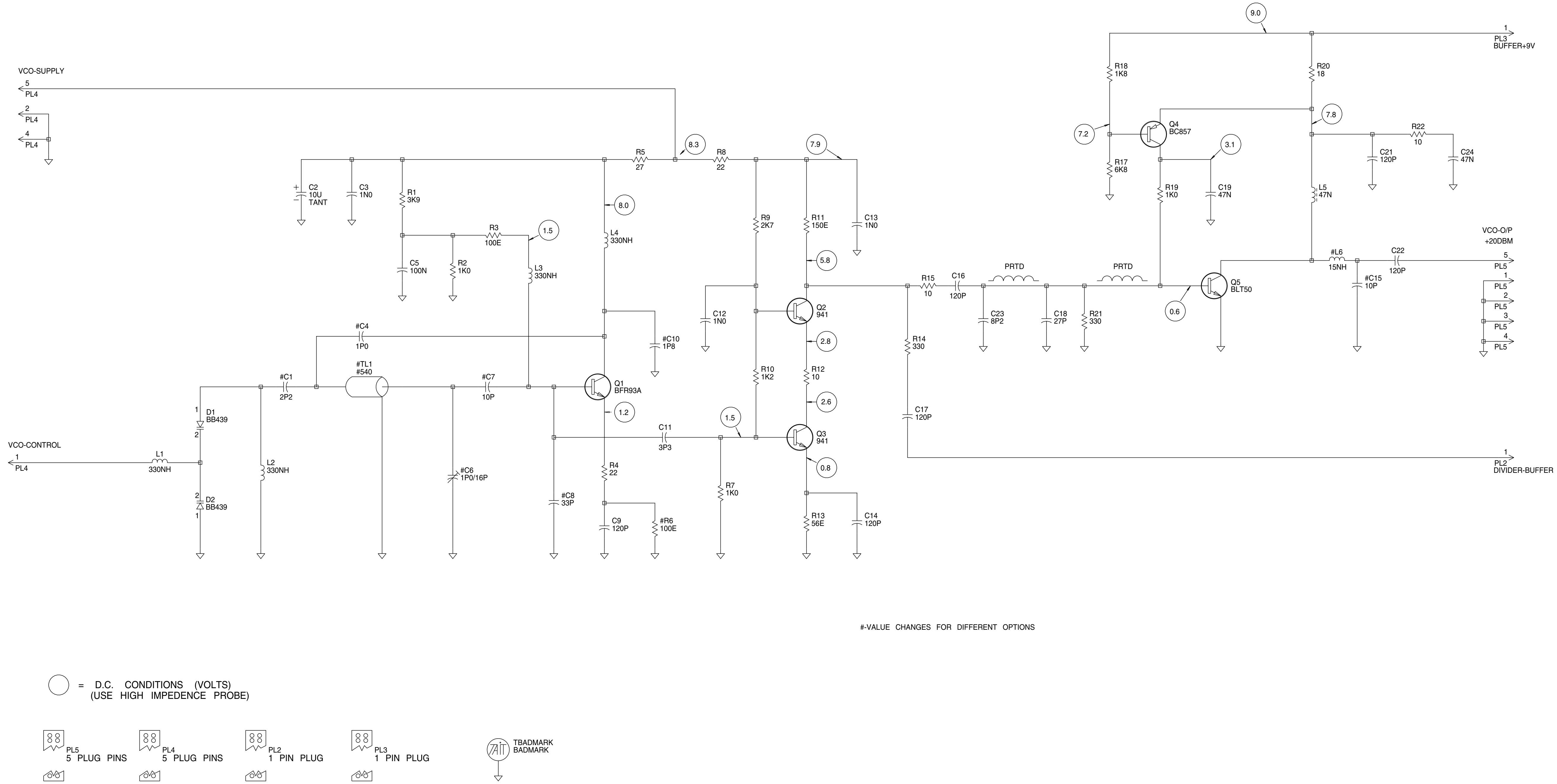
Ref	Var	IPN	Description
#C1	A	015-21120-02	Cap Cer 0805 1p2 1% NPO 50v
#C1	B	015-21120-02	Cap Cer 0805 1p2 1% NPO 50v
#C1	C	015-21150-01	Cap Cer 0805 1p5+-0.25 NPO 50v
#C1	D	015-21150-05	Cap Cer 0805 1p5 +0.1pf 200v
C2		014-08100-00	Cap Tant SMD 10u 16v 20% 267c
C3		015-24100-08	Cap Cer 0805 1n 10% X7r 50v
#C4	A	015-21100-02	Cap Cer 0805 1po 1% NPO 50v
#C4	B	015-21100-02	Cap Cer 0805 1po 1% NPO 50v
#C4	C	015-21100-02	Cap Cer 0805 1po 1% NPO 50v
#C4	D	015-21100-02	Cap Cer 0805 1po 1% NPO 50v
C5		015-06100-08	Cap Cer 1206 100n 10% X7r 50v
#C6	A	028-02111-00	Cap Trim 16pf Piston Prec
#C6	B	028-02111-00	Cap Trim 16pf Piston Prec
#C6	C	028-02111-00	Cap Trim 16pf Piston Prec
#C6	D	028-02111-00	Cap Trim 16pf Piston Prec
#C7	A	015-21330-02	Cap 0805 3p3 +/-0.1p NPO 50v
#C7	B	015-21470-02	Cap 0805 4p7 1% NPO 50v
#C7	C	015-21680-02	Cap 0805 6p8 +/-0.1p NPO 50v
#C7	D	015-21820-02	Cap 0805 8p2 0.1 NPO 50v
#C8	A	015-22220-01	Cap Cer 0805 22p 5% NPO 50v
#C8	B	015-22220-01	Cap Cer 0805 22p 5% NPO 50v
#C8	C	015-22270-01	Cap Cer 0805 27p 5% NPO 50v
#C8	D	015-22330-01	Cap Cer 0805 33p 5% NPO 50v
C9		015-23120-01	Cap Cer 0805 120p 5% NPO 50v
#C10	A	015-21180-02	Cap 0805 1p8 1% NPO 50v
#C10	B	015-21180-02	Cap 0805 1p8 1% NPO 50v
#C10	C	015-21180-02	Cap 0805 1p8 1% NPO 50v
#C10	D	015-21180-02	Cap 0805 1p8 1% NPO 50v
C11		015-21330-02	Cap 0805 3p3 +/-0.1p NPO 50v
C12		015-24100-08	Cap Cer 0805 1n 10% X7r 50v
C13		015-24100-08	Cap Cer 0805 1n 10% X7r 50v
C14		015-23120-01	Cap Cer 0805 120p 5% NPO 50v
C16		015-23120-01	Cap Cer 0805 120p 5% NPO 50v
C17		015-23120-01	Cap Cer 0805 120p 5% NPO 50v
C18		015-22270-01	Cap Cer 0805 27p 5% NPO 50v
C19		015-05470-08	Cap Cer 1206 47n 10% X7r 50v
C21		015-23120-01	Cap Cer 0805 120p 5% NPO 50v
C22	A	015-22100-02	Cap 0805 10p +/-0.1p NPO 50v
C22	B	015-22150-01	Cap Cer 0805 15p 5% NPO 50v
C22	C	015-22150-01	Cap Cer 0805 15p 5% NPO 50v
C22	D	015-23120-01	Cap Cer 0805 120p 5% NPO 50v
C23		015-21820-02	Cap 0805 8p2 0.1 NPO 50v
C24		015-05470-08	Cap Cer 1206 47n 10% X7r 50v
D1	A	001-10015-30	Diode SMD Vcap BB153 SOD323
D1	B	001-10043-90	Diode SMD BB439 Vcap SOD323
D1	C	001-10043-90	Diode SMD BB439 Vcap SOD323
D1	D	001-10043-90	Diode SMD BB439 Vcap SOD323
D2	A	001-10015-30	Diode SMD Vcap BB153 SOD323
D2	B	001-10043-90	Diode SMD BB439 Vcap SOD323
D2	C	001-10043-90	Diode SMD BB439 Vcap SOD323
D2	D	001-10043-90	Diode SMD BB439 Vcap SOD323
L1		056-10330-02	Ind SMD 1210 330nh 10% Simid02
L2		056-10330-02	Ind SMD 1210 330nh 10% Simid02
L3		056-10330-02	Ind SMD 1210 330nh 10% Simid02
L4		056-10330-02	Ind SMD 1210 330nh 10% Simid02
L5		057-00047-10	Ind Fxd 47nh +-5% 1206
#L6	A	056-10015-03	Ind SMD 0805cs 15nh 20%
#L6	B	056-10015-03	Ind SMD 0805cs 15nh 20%
#L6	C	056-10015-03	Ind SMD 0805cs 15nh 20%
#L6	D	056-10015-03	Ind SMD 0805cs 15nh 20%
Q1		000-10009-30	Xstr SMD BFR93A NPN SOT23
Q2		000-10009-30	Xstr SMD BFR93A NPN SOT23
Q3		000-10009-30	Xstr SMD BFR93A NPN SOT23
Q4		000-10008-57	Xstr SMD BC857 PNP SOT23 SS
Q5		000-10050-00	Xstr SMD BLT50 UHF SOT22
R1		036-14390-10	Res M/F SMD 0805 3k9 1%
R2		036-14100-10	Res M/F SMD 0805 1k 1%
R3		036-13100-10	Res M/F SMD 0805 100e 1%
R4		036-12220-00	Res M/F SMD 0805 22e 5%
R5		036-12270-00	Res M/F SMD 0805 27e 5%
#R6	A	036-13100-10	Res M/F SMD 0805 100e 1%
#R6	B	036-13100-10	Res M/F SMD 0805 100e 1%
#R6	C	036-13100-10	Res M/F SMD 0805 100e 1%
#R6	D	036-13100-10	Res M/F SMD 0805 100e 1%
R7		036-14100-10	Res M/F SMD 0805 1k 1%
R8		036-12220-00	Res M/F SMD 0805 22e 5%
R9		036-14270-10	Res M/F SMD 0805 2k7 1%
R10		036-14120-00	Res M/F SMD 0805 1k2 5%
R11		036-13150-10	Res M/F SMD 0805 150e 1%
R12		036-12100-10	Res M/F SMD 0805 10e 1%
R13	A	036-12270-00	Res M/F SMD 0805 27e 5%
R13	B	036-12390-00	Res M/F SMD 0805 39e 5%
R13	C	036-12390-00	Res M/F SMD 0805 39e 5%
R13	D	036-12560-00	Res M/F SMD 0805 56e 5%
R14		036-13330-00	Res M/F SMD 0805 330e 5%
R15		036-12100-10	Res M/F SMD 0805 10e 1%
R17	A	036-14680-10	Res M/F SMD 0805 6k8 1%
R17	B	036-14680-10	Res M/F SMD 0805 6k8 1%
R17	C	036-14680-10	Res M/F SMD 0805 6k8 1%
R17	D	036-14820-10	Res M/F SMD 0805 8k2 1%
R18		036-14180-00	Res M/F SMD 0805 1k8 5%
R19		036-14100-10	Res M/F SMD 0805 1k 1%
R20		036-12180-00	Res M/F SMD 0805 18e 5%
R21		036-13330-00	Res M/F SMD 0805 330e 5%
R22		036-12100-10	Res M/F SMD 0805 10e 1%
#TL1	A	051-00005-43	Reso Tait #543 480-520
#TL1	B	051-00005-42	Reso Tait #542 435-480
#TL1	C	051-00005-41	Reso Tait #541 395-440
#TL1	D	051-00005-40	Reso Tait #540 355-395
		240-00026-32	Plg 32w 1row Pcb Mtg
		220-01145-07	PCB T855/856/857/870 VCO
		345-00040-10	Scrw M3*6mm P/P S/T Bz
		350-00016-42	Spcr 5mm Hi 8*M3 Stud 2.5*M3ho
		353-00010-13	Wshr M3 S/Proof Int Bz



T850 VCO PCB (IPN 220-01145-07) – Top Side



T850 VCO PCB (IPN 220-01145-07) – Bottom Side



REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE
07B	REGENERATED NEW PASTE	BRD				10-06-03
07A	MINOR UPDATE TO THE LAYOUT	SSAHI				06-09-00
06A	MINOR UPDATE	SSAHI				06-07-00
05A	UPDATE	SSAHI				05-05-00
04A	SMD PARTS ADDED	BENC				07-10-99
03A	CYCLIC KEYING MODIFICATION	BENC				

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T850/T870 VCO

IPN:	ISSUE:	ID:		
220-01145-07	B	2.SC. 1		
PROJECT:	DESIGNER:	FILE NAME:	FILE DATE:	NO.SHEETS:
T850	SSAHI	1145_07b	10-Jun-03	1

T850 VCO
220-01145-07

Part F T800-23-0011 Power Supply

This part of the manual provides information on the power supply, and is divided into six sections as listed below..

1 General Information

This section provides a brief description of the T800-23-0011 Switch Mode Power Supply, as well as detailed specifications.

1.1 Introduction

The T800-23-0011 is a switching power supply designed to meet the requirements of the T800 SL2 25W Continuous Basestation. It is capable of suppling 13.8V_{DC} at up to 14.5A (see derating information in Section 1.2.4). The unit provides power to the T800 SL2 Basestation modules via a cable assembly (with a 12A fuse) which connects between the DC output connector on the back of the unit, and the backplane PCB (X800-56-PCB3).

The T800-23-0011 is protected against damage caused by faults in the line or load, or by temperature variations. (refer to Section 1.2 for specifications). The protection features include:

- Short circuit protection.
- Overload protection
- Over voltage protection
- Over Temperature protection

Electromagnetic compatibility (EMC) and operator safety are important and critical requirements for a switching power supply. Refer to Section 1.3.1 and Section 1.3.2 for specifications.

Caution: To prevent the T800-23-0011 equipment from overheating, do not exceed the rated current.

1.2 Specifications

1.2.1 Introduction

The performance figures given are minimum figures, unless otherwise indicated, for equipment operating at standard room temperature (+22°C to +28°C).

Details of test methods and the conditions which apply for Type Approval testing in all countries can be obtained from Tait Electronics Ltd.

1.2.2 General

Basic Power Supply Concept	… switched mode technology pulse width modulation
Overtemperature Protection	… shuts down when PC Board temperature rises above 95°C ±5°C Reset: auto recovery
Cooling	… convection and forced air (fan)
Efficiency	… 80%, full load
Temperature Range:	
$230V_{AC}$ supply	… –10 to +60°C
$115V_{AC}$ supply	… –10 to +50°C
Isolation:	
Input to Output	… $3000V_{AC}$, 1 minute
Input to Ground/Chassis	… $1500V_{AC}$, 1 minute
Output to Ground/Chassis	… $500V_{AC}$, 1 minute

1.2.3 AC Mains Input

Voltage:	… 100 to $130V_{AC}$ 47–63Hz 200 to $240V_{AC}$ 47–63Hz
AC Input Current	… 2.8A maximum ($115V_{AC}$ at full load)
Maximum Inrush Current	… 40A maximum ($230V_{AC}$ at full load)
Connection to mains supply	… IEC plug on rear panel

Power Factor at full load:

$230V_{AC}$ supply	… >0.96
$115V_{AC}$ supply	… >0.98

Note: Exact power factor depends on impedance of mains supply.

Input Fuse (Internal)	… 5A 250V fast acting (Littlefuse 217 series)

1.2.4 Output

Output Voltage	… $13.8V_{DC}$

Note: A drop of up to 0.5V may be expected across the wiring from the power supply to the load.

Voltage Regulation	… ±0.5%

Current

Operation from 200–240V_{AC} supply:

Continuous, –10°C to +50°C	… 0 to $14.5A_{DC}$
Continuous, up to +60°C	… 0 to $8.5A_{DC}$

Operation from 100–130V_{AC} supply:

Continuous, –10°C to +20°C	… 0 to $14.5A_{DC}$
Continuous, +20°C to +50°C	… 0 to $8.5A_{DC}$

Note: Continuous operation from $115V_{AC}$ supplies in ambient temperatures exceeding +50°C is not recommended, as this will cause the equipment to overheat.

Output Overvoltage Protection	… 14.8 to $19.1V_{DC}$ Type: Shutdown Reset: Power off and on
Output Hum and Noise	… <$100mV_{pp}$ (At full load, with mains supply voltage = 230V)
Current Overload Limit	… 15.2 to 21.8A Type: Constant current limiting Reset: Auto recovery
Output Connector	… Molex 6-way receptacle

Note: Refer to Figure 3.1 in Section 3.2 for the output connector pinouts.

1.3 Regulatory Information

1.3.1 EMC Conformity

This equipment complies with:

ETSI EN301 349-1 V1.3.1 (2001-09) "Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part1: Common technical requirements".

Tested in accordance to:

- BS EN55022: 1998
- BS EN61000-3-2: 2001
- BS EN61000-3-3: 1995
- IEC 61000-4-2: 1995
- IEC 61000-4-3: 2002
- IEC 61000-4-4: 1995
- IEC 61000-4-5: 1995
- IEC 61000-4-6: 1996
- IEC 61000-4-11: 1994

BS EN55022: 1998 for class B Radiated and conducted emissions, and electromagnetic susceptibility specifications.

AS/NZS CISPR22: 2002 for class B Radiated and conducted emissions, and electromagnetic susceptibility specifications.

FCC 47 Part 15: 2001 for class B (Radiated and conducted emissions, and electromagnetic susceptibility specifications) of the FCC rules for the United States. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must not accept any interference received, including interference that may cause undesired operation.

Warning: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

  Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.

1.3.2 Safety Approvals

This equipment complies with:

IEC 60950 : 1999 “Safety of information technology equipment”. All the relevant provisions including AS/NZS and EN deviations.

CAN/CSA-C22.2 No 950-95 “Safety of information technology equipment”.

ANSI/UL Std N0 1950 Third Edition “Safety of information technology equipment”.

Warning: Safety approval will become void if T800-23-0011 components are replaced with non-equivalent rated or non-certified/approved components. Contact Tait Electronics Technical Support before replacing components of the T800-23-0011. See Section 6 for important servicing information.

2 Power Supply Description

2.1 Introduction

The T800-23-0011 power supply consists of a Power Supply Unit (PSU) Module, connectors, and ferrite filters. These components are shown in Figure 2.1 below.

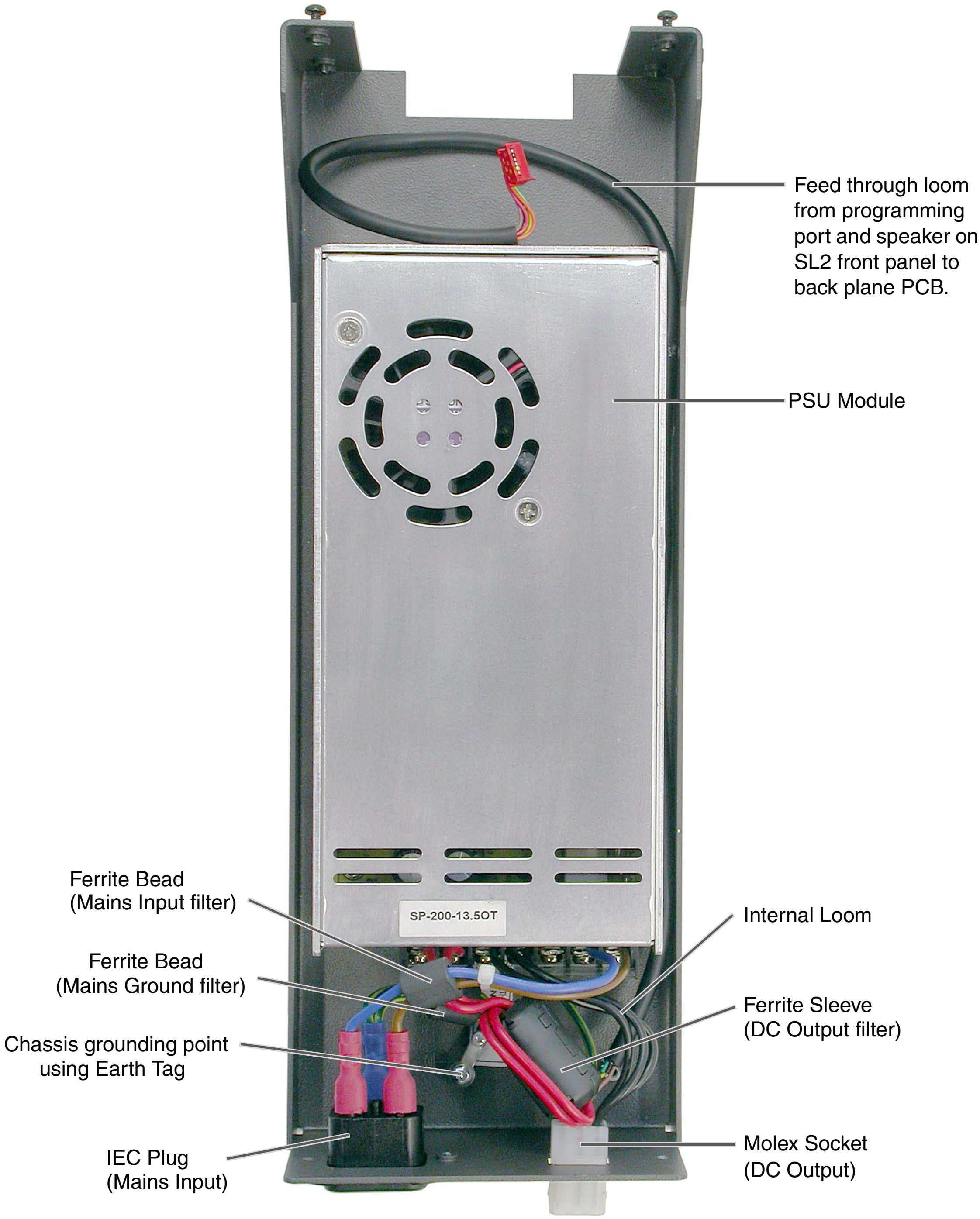


Figure 2.1 T800-23-0011 internal view. See the Parts List in Section 6.2.2 for more detail.

2.1.1 PSU Module

The PSU module used in the T800-23-0011 power supply has over temperature, current overload and overvoltage protection. Refer to Section 1.2 for specification details.

Overvoltage applied on the module's output will cause the module to shutdown. To reset the module, remove the mains supply to the T800-23-0011, allow 30 seconds for charges to leak away, and then reconnect the T800-23-0011.

The module is protected from current overload by a voltage foldback method. If the load on the output starts drawing more current than the specified maximum, the voltage will start dropping away. This condition will recover automatically when the load is removed or returns to normal.

Over temperature will cause the module to shutdown. It will recover automatically when it has cooled down to an acceptable operational temperature.

Caution: Correct mounting of the T800-23-0011 power supply is important: Refer to Section 3.3 for ventilation guidelines. Ignoring these conditions may cause the module to overheat, and consequently, to shut down.

2.1.2 Internal Loom

Mains power to the PSU module is supplied via an IEC plug on the rear panel and then filtered by a ferrite bead (shown in Figure 2.1). The mains ground line is filtered by a ferrite bead and then connected to the T800-23-0011 chassis and to the PSU module's floating ground contact.

The PSU module's output is filtered by a ferrite sleeve on the positive line, and then interfaces to the SL2 backplane via a Molex connector on the T800-23-0011 rear panel.

Additionally a 'feed-through' loom is connected to the Molex connector. This loom forms part of the path for the programming and speaker connection between the SL2 backplane and the SL2 front panel. The external cable connection between the T800-23-0011 and the SL2 backplane completes this path.

For the wiring diagram, refer to Section 6.2.1.

3 Installation Guidelines

The following section gives a brief description of the basic rack mounting and wiring procedures.

3.1 General

The T800-23-0011 is supplied mounted to the SL2 front panel by four M3x10 button hex screws.

A small cable extending out of the front of the T800-23-0011 plugs onto to the SL2 front panel. This cable forms part of the programming and speaker connection between the SL2 front panel and the backplane. The external cable connection between the T800-23-0011 and the SL2 backplane provides the DC power supply to the basestation and also incorporates 3 wires completing the programming and speaker connection.

Warning: **FUSE**
The cable connecting the T800-23-0011 DC power output to the backplane also includes a fuse. This fuse is critical to the IEC 60950 safety compliance of the T800 SL2 Base Station and must be replaced with the same component or compliance will be voided.
The Fuse is a Bussmann TDC10 Series fast blow fuse rated at 12A (60V_{AC})

For the AC mains input connection of the T800-23-0011 use only an IEC type detachable power supply cord (with a moulded IEC connector). Ensure that it has a current rating of at least 5A.

3.2 Connector Pinouts

The pinouts for the AC mains input connector and the DC output connector on the rear of the T800-23-0011 are shown in Figure 3.1 below.

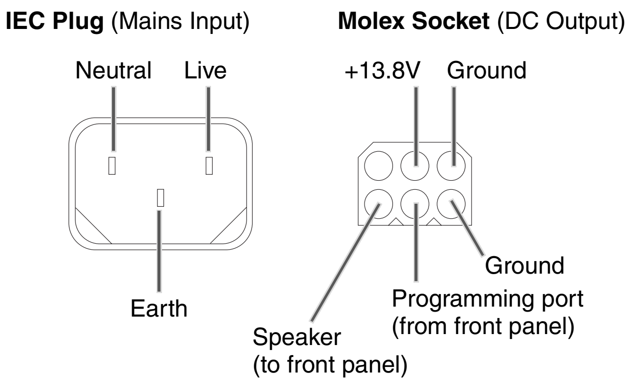


Figure 3.1 Connector Pinouts on the T800-23-0011 rear panel.

3.3 Equipment Cooling

Although the T800-23-0011 is a high efficiency switching power supply, a considerable amount of heat is generated during normal operation. An adequate flow of cooling air is therefore essential for reliable operation.

Caution: Do not operate this unit in a completely enclosed cabinet.

It is estimated that the average life expectancy of this unit will double with every 10°C drop in ambient temperature. It is therefore recommended to:

- Keep the ambient temperature low.
- Ensure that airflow is not restricted.

4 Functional Testing

The following test procedures will confirm that the T800-23-0011 has been set up and adjusted correctly and is fully operational. Refer to Figure 4.1 for test equipment details.

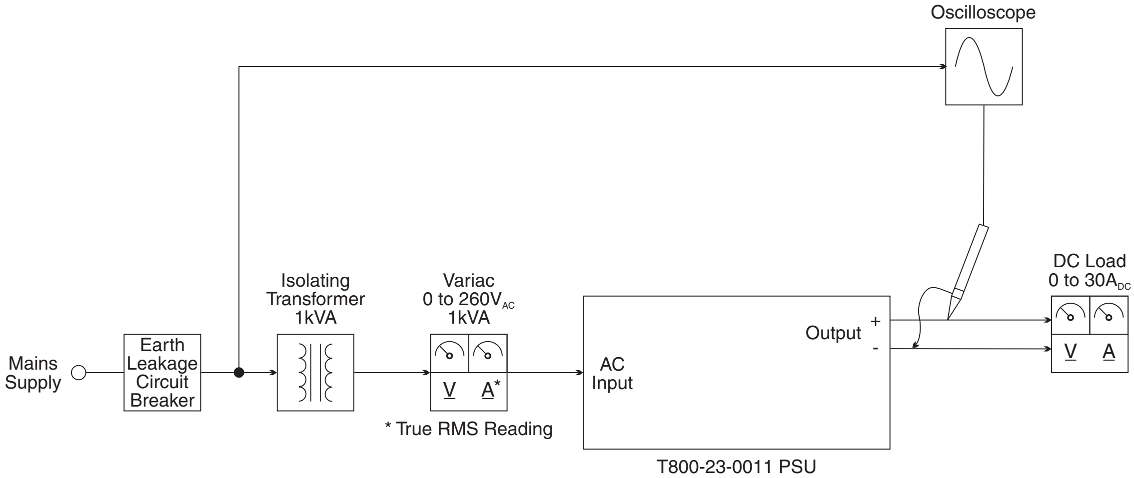


Figure 4.1 Test equipment setup

4.1 Basic Operation

To confirm the basic operation of the power supply, proceed as follows.

- Ensure that the main supply to the T800-23-0011 is switched off. Set up the test equipment as shown in Figure 4.1.
- Set the output DC load to maximum resistance/minimum current.
- Connect the T800-23-0011 to the mains supply and switch it on.
- Vary the DC load and check that the output voltage and current are within the specifications (refer to Section 1.2.4).

4.2 Output Current Overload

To confirm the operation of the current overload protection circuitry, proceed as follows.

- Ensure that the main supply to the T800-23-0011 is switched off. Set up the test equipment as shown in Figure 4.1.
- Set the output DC load to draw approximately 11A.
- Switch on the mains supply and slowly decrease the load resistance, thereby increasing the current until voltage foldback occurs. The current should not rise above the Current Overload Limit (refer to Section 1.2.4), but voltage should drop away.

4.3 Output Noise

To check that output noise is within specification, proceed as follows.

- Ensure that the main supply to the T800-23-0011 is switched off. Set up the test equipment as shown in Figure 4.1. Connect the T800-23-0011 to the mains supply and switch it on.
- Connect a digital voltmeter (e.g. Fluke 77) across the load terminals and set the meter to its lowest AC volts range.
- Check that the reading is less than $100mV_{pp}$ under all load and line conditions.

Note: A ***real*** reading of the level of noise present on the output of a switching power supply is very difficult to obtain, as low noise levels, common mode noise paths and ground loops all lead to inaccurate measurement results. The procedure outlined above will, however, give a good indication of the output noise.

4.4 Overall Power Supply Stability

To check for overall PSU stability, proceed as follows.

- Ensure that the main supply to the T800-23-0011 is switched off. Set up the test equipment as shown in Figure 4.1. Connect the T800-23-0011 to the mains supply and switch it on.
- Connect the oscilloscope across the output.
- Vary the mains voltage and DC load over the full specified range (refer to Section 1.2).
- Check on the oscilloscope that no oscillations occur.

5 Troubleshooting

The following is a list of possible power supply fault symptoms and possible causes.

Symptoms		Possible Causes and their Solutions	
1.	No output voltage	Mains supply not present or too low	Check and rectify mains supply
		Equipment has over-heated and thermal cut-out has operated	See Symptom 3 below
		Defective switching cir-cuitry	Replace module and return faulty module for servicing
2.	Output voltage below specification	Mains supply is to low	Check and correct mains supply problem
		Current overload protec-tion is active	Check for possible causes, e.g. short-circuits
		Defective switching cir-cuitry	Replace module or return faulty module for servic-ing
3.	Power Supply over-heats	Mains supply is to low	Check and correct mains supply problem
		Equipment cooling is inef-ficient due to incorrect installation of the T800-23-0011	Refer to Section 3.3 for installation guidelines
		The T800-23-0011 internal fan has failed	Replace module or return faulty module for servic-ing

6 Service Information

This section provides specific information on servicing procedures for the T800-23-0011.

6.1 Warnings

6.1.1 Warning: Lethal Voltages

The T800-23-0011 power supply contains voltages that may be lethal.

Disconnect the mains IEC connector and wait for 5 minutes for the internal voltages to drain away before dismantling.

Servicing should be carried out only by qualified technicians and should be attempted only when powered through a mains isolating transformer of sufficient rating. It is ***strongly recommended*** that the mains supply to the whole of the repair and test area is supplied via an ***earth leakage circuit breaker***.

6.1.2 Warning: Fuse

The cable connecting the T800-23-0011 DC power output to the backplane also includes a fuse. This fuse is critical to the IEC 60950 safety compliance of the T800 SL2 Base Station and must be replaced with the same component or compliance will be voided.

The Fuse is a Bussmann TDC10 Series fast blow fuse rated at 12A ($60V_{AC}$)

6.1.3 Caution: Handle With Care

Although this is a lightweight unit, it contains a number of quite heavy and fragile individual components which are mounted directly on the PCB. Severe mechanical shock may damage the PCB (e.g. solder joints, copper tracks) and/or components (e.g. fragile ferrite magnetic materials).

6.2 Mechanical

This section provides information necessary for replacement of various parts and modules of the T800-23-0011 power supply.

Warning: **Safety approval will become void if T800-23-0011 components are replaced with non-equivalent rated or non-certified/approved components. Contact Tait Electronics Technical Support before replacing components of the T800-23-0011.**

The power supply module is not a user serviceable item. This module contains components that operate at voltages that may be lethal. Do not open this module.

Caution: Disconnect the mains IEC connector and wait for 5 minutes for the internal voltages to drain away before dismantling the T800-23-0011.

6.2.1 Wiring Diagram

Refer to the diagram below for connection information between the T800-23-0011's connectors and powers supply module.

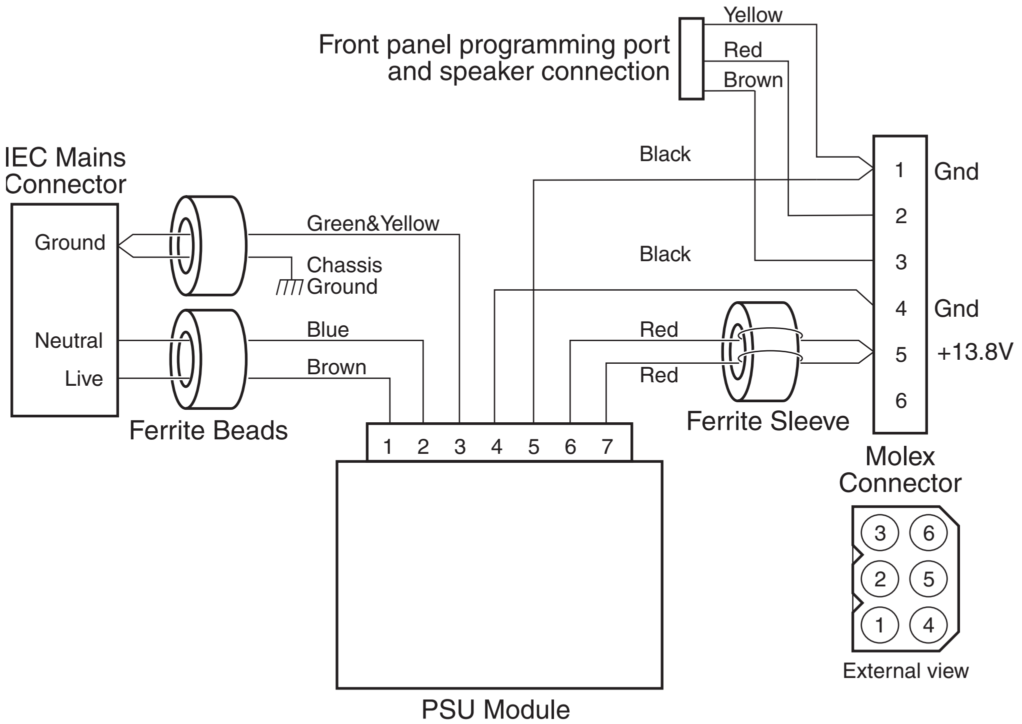
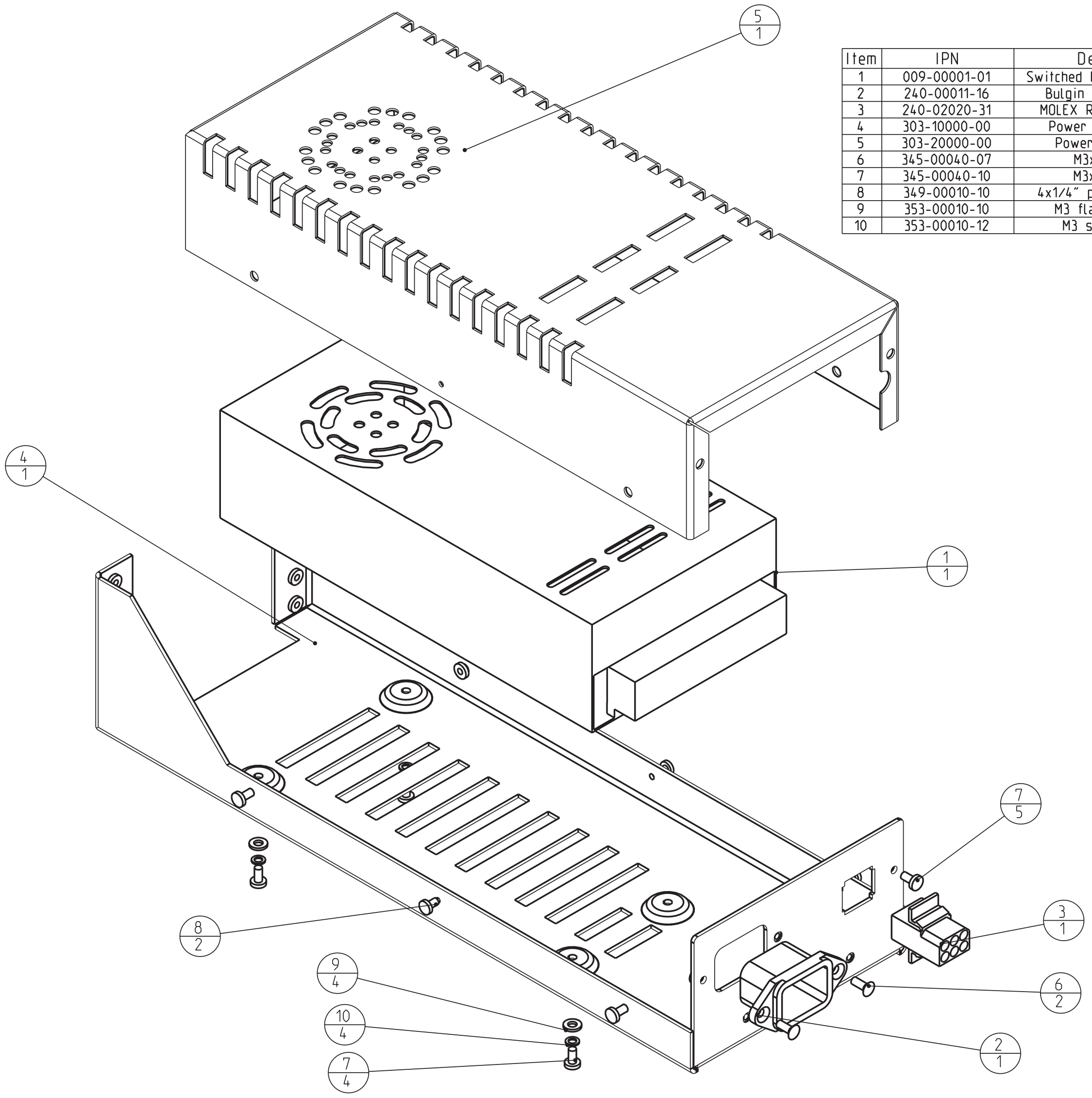


Figure 6.1 T800-23-0011 Wiring Diagram

6.2.2 Assembly Drawing

Figure 6.2 below shows an exploded view of the T800-23-0011.



Item	IPN	Description	Qty
1	009-00001-01	Switched Mode Power Supply	1
2	240-00011-16	Bulgin 230V Panel mtg	1
3	240-02020-31	MOLEX Receptacle 6 CKT	1
4	303-10000-00	Power Supply Chassis	1
5	303-20000-00	Power Supply Cover	1
6	345-00040-07	M3x8 csk pozi	2
7	345-00040-10	M3x6 pan pozi	9
8	349-00010-10	4x1/4" pan pozi self tap	2
9	353-00010-10	M3 flat washer OD7	4
10	353-00010-12	M3 spring washer	4

Figure 6.2 Mechanical assembly of the T800-23-0011.

Part G Installation and Configuration

This part of the manual is divided into the sections listed below. These sections give a brief description of the mounting and wiring procedures as well as some brief information on basic system types and how to configure T800 SL2 equipment for use in them.

1 T800 SL2 Installation

1.1 Specifications

Overall Dimensions:

Height	… 132mm
Width	… 480mm
Depth	… 335mm

Weight with Tone Remote	… 16kg
Weight without Tone Remote	… 13kg

1.2 Mounting

The T800SL2 unit is shipped ready assembled for fitting into racks. All that is required is for the connection of suitable cables.

1.3 Power Supply

The power rating information for the T800SL2 with the Tait supplied power supply module (T800-23-0011), is provided on the label located on the top cover as visible in Figures 1.6.

The power rating information for the T800SL2 for use with a customer supplied DC power source, is provided on the label located on the top rear of the Transmitter module.

In order to comply with the safety requirements of EN60950, the power supply module used with the T800SL2 must be provided with an easily accessible mains disconnect device compliant with IEC61058, such as a switch or circuit breaker. This provides the means to rapidly disconnect the mains power in an emergency.

All Tait supplied racks incorporate a power distribution board with a circuit breaker easily accessible in the back of the rack, on the lower right hand side (viewed from the rear). The circuit breaker will disconnect the mains to the entire rack. If only one channel needs to be mains-isolated and the Tait power supply module is T800-23-0011, then it is acceptable practice to pull the IEC connector directly out of the power supply module.

If a customer supplied power source is used, it must have the following features:

- An easily accessible and safety compliant mains disconnect device.
- The capability to provide enough current to drive the T800 system.
- Free from excessive ripple or noise.
- Meets all EMC and safety regulations for the intended market.

The entire system should be protected by the use of appropriately rated fuses in the power supply.

Note: It is particularly important when the prime power source is a battery that fuses be employed in all the supply lines.

Warning: **Fuse – DC powered Base Stations**
The cable supplied for connecting a DC power source such as a battery to the backplane of the SL2 Base Station, includes a fuse. This fuse is critical to the IEC 60950 safety compliance of the T800 SL2 Base Station and must be used or compliance will be voided. If the fuse has blown it must be replaced with the same component
The Fuse is a Bussmann TDC10 Series fast blow fuse rated at 12A (60V_{AC})

1.4 Reverse Polarity and Overvoltage Protection

A crowbar diode is fitted to all T854 transmitters for protection against connection to a power supply of incorrect polarity. It also provides overvoltage protection from voltage transients caused by lightning strikes.

Note: A fuse must be fitted in the power supply line for the diode to provide effective protection.

1.5 D-range wiring

The T855 and T854 D-range input and output connections are shown in Figure 1.1 to Figure 1.4..

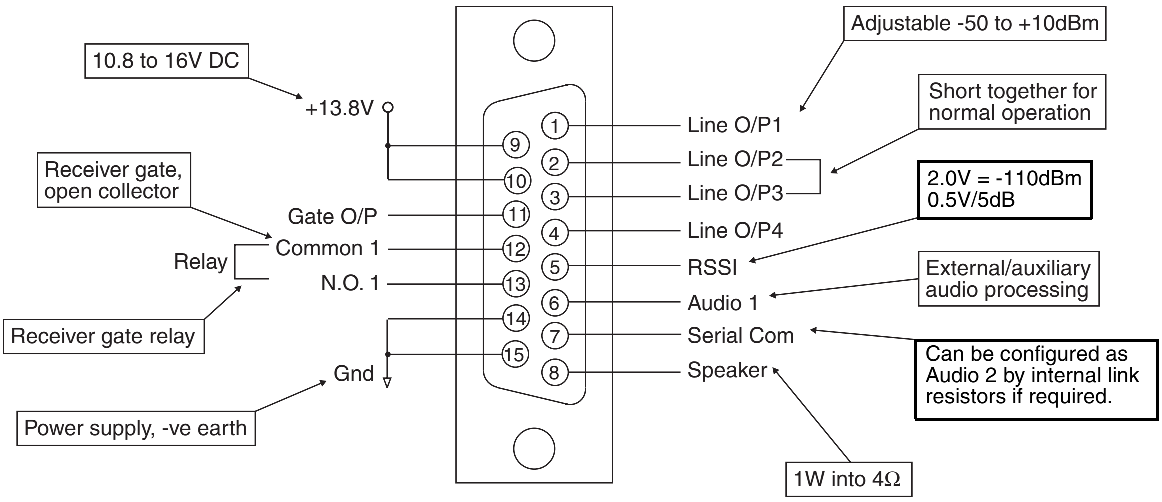


Figure 1.1 T855 D-Range 1 Wiring – Rear View

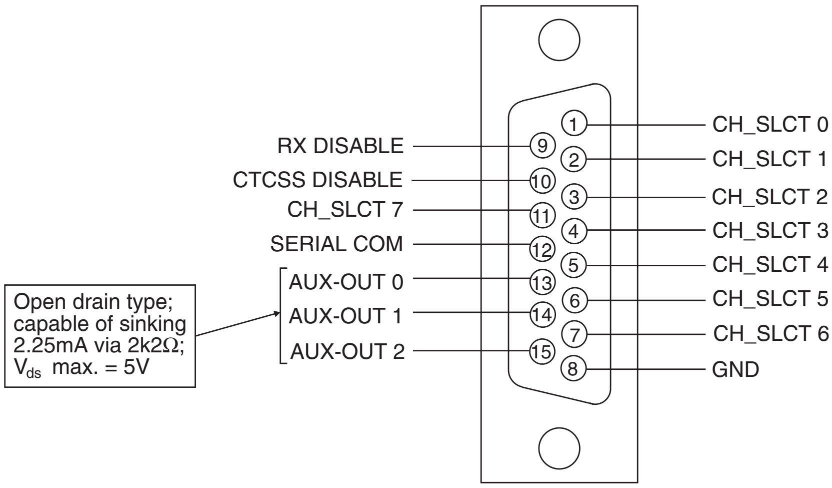


Figure 1.2 T855 D-Range 2 Wiring – Rear View (standard T800-03-0000 kit)

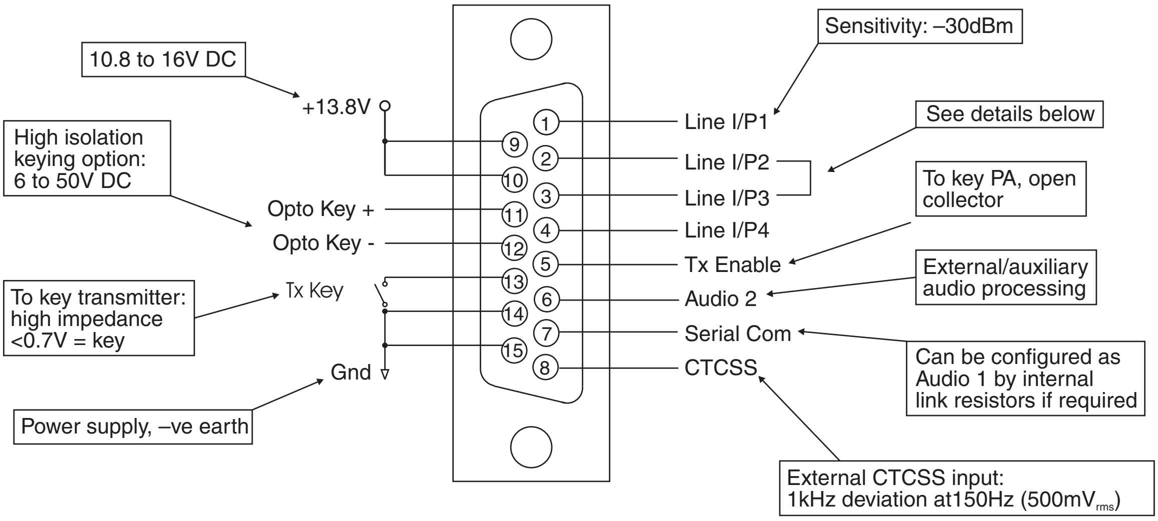


Figure 1.3 T854 D-Range 1 Wiring – Rear View

Line I/P2 and Line I/P3

If %T210A or %T210B is fitted without a centre tapped transformer (usual configuration), these lines can be shorted together or left open to be used as inputs to the audio cavity.

If %T210A or %T210B is fitted with a centre tapped transformer, these lines must be left open. Line I/P3 becomes the centre tap on the transformer.

If %T210 is fitted (Pot core type), short these lines together for normal operation.

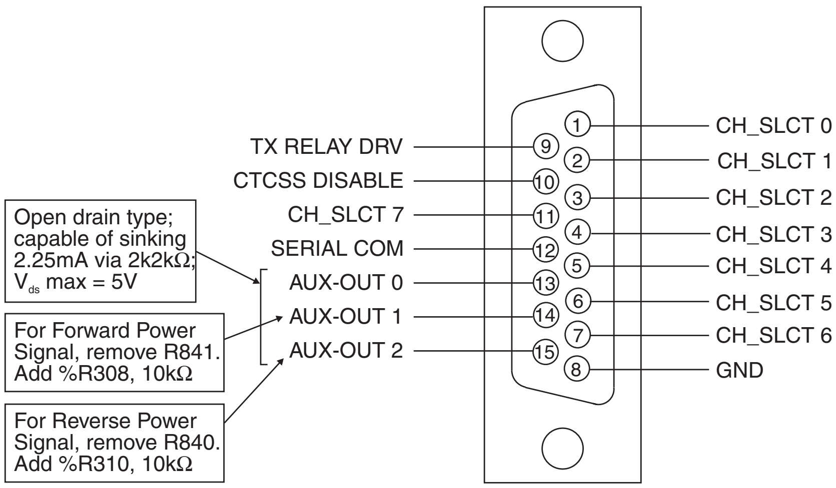


Figure 1.4 T854 D-Range 2 Wiring – Rear View (standard T800-03-0000 kit)

Note: Figure 1.4 above shows the standard pin allocations for the T800-03-0000 auxiliary D-range kit. A T800-03 auxiliary D-range kit is also available for special applications requiring custom internal wiring.

1.6 RF Coax Cable and N-Type Connector

Make sure the RF coax cable to the N-type connector is free from sharp bends or twists. If access to the rear of the rack frame is restricted, the cable should be long enough to allow the slimline assembly to be fully withdrawn from the cabinet.

Make sure that any N-type plugs connected to Tait equipment are assembled according to the manufacturer's instructions. It is particularly important that the centre pin in the plug is positioned correctly:

- if the pin is positioned too far back in the plug, it may not make good contact with the socket;
- if the pin protrudes too far (as shown in Figure 1.5), or is not straight, it may damage the socket when the plug is screwed in.

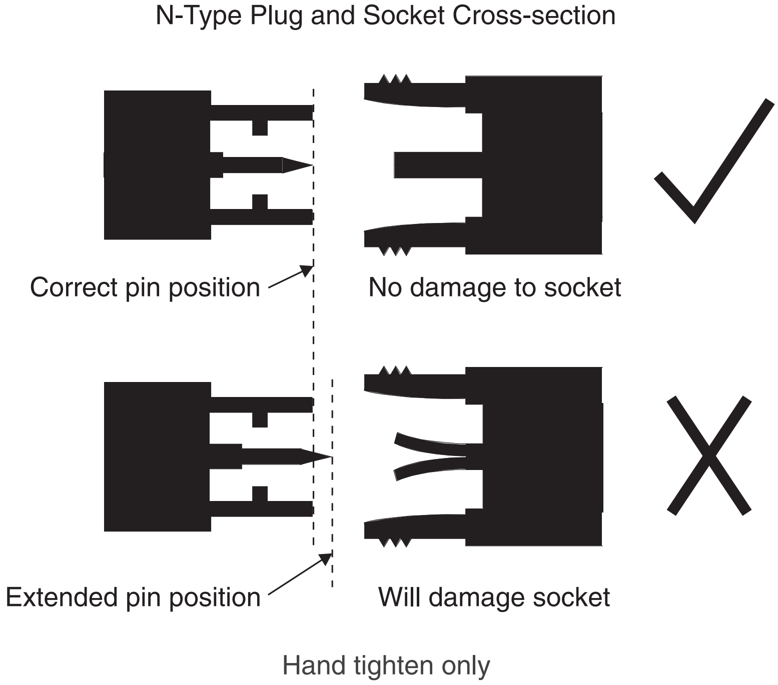
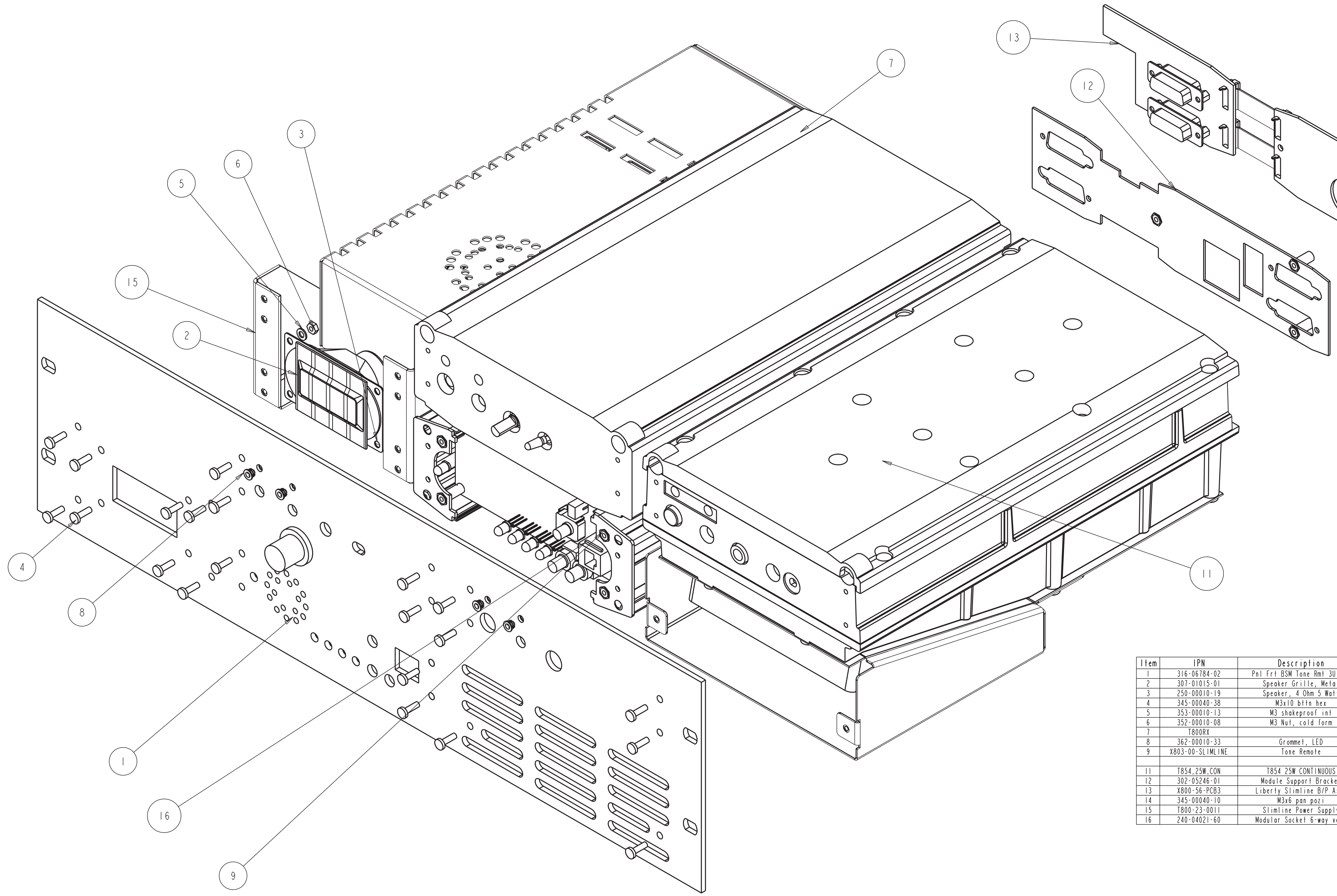
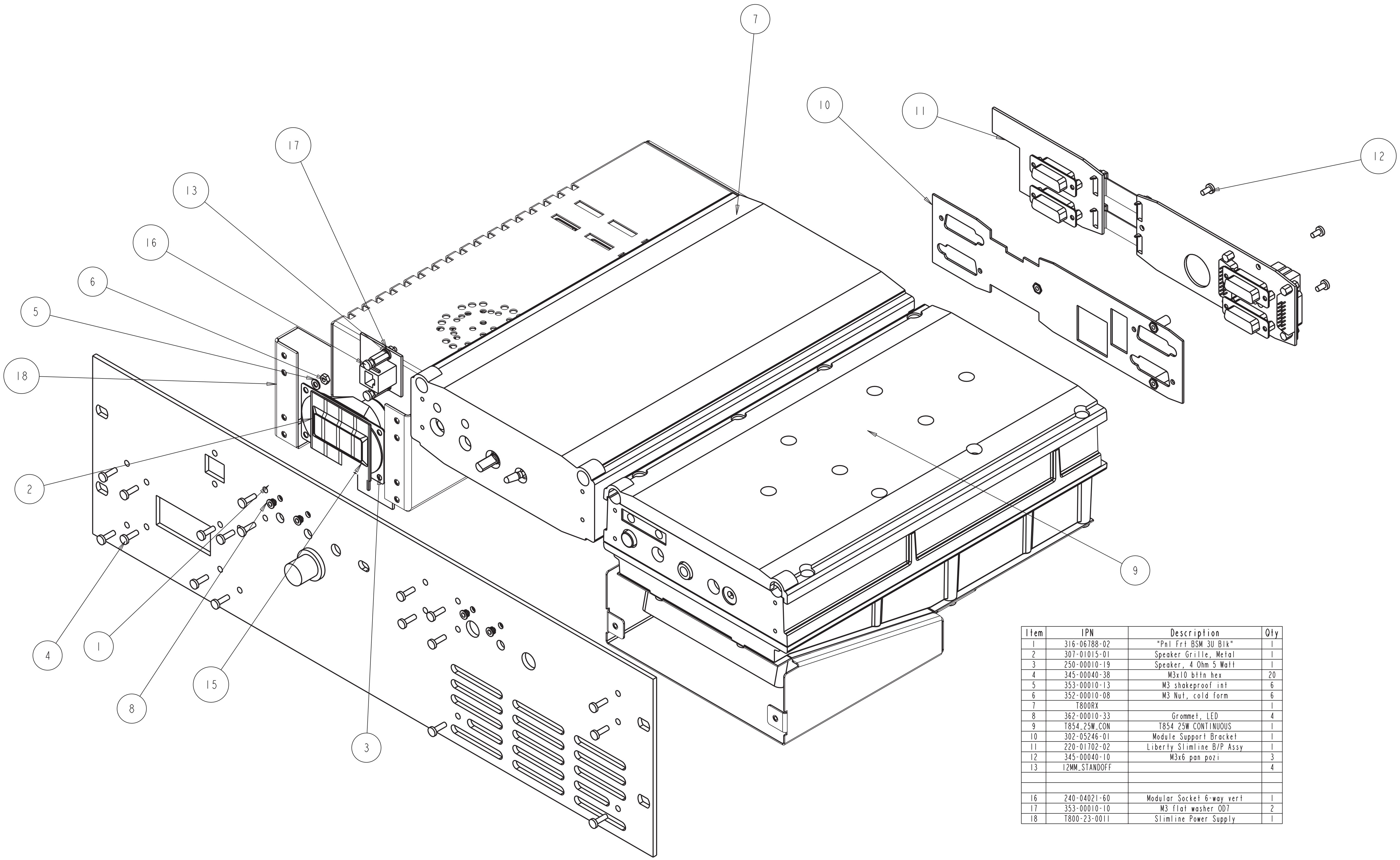


Figure 1.5 N-Type Plug Assembly Details



Item	IPN	Description	Qty
1	316-06784-02	Pnl Frt BSM Tone Rmt 3U Blk	1
2	307-01015-01	Speaker Grille, Metal	1
3	250-00010-19	Speaker, 4 Ohm 5 Watt	1
4	345-00040-38	M3x10 bttn hex	18
5	353-00010-13	M3 shakeproof int	4
6	352-00010-08	M3 Nut, cold form	4
7	T800RX		1
8	362-00010-33	Grommet, LED	4
9	X803-00-SLIMLINE	Tone Remote	1
11	T854_25W_CON	T854 25W CONTINUOUS	1
12	302-05246-01	Module Support Bracket	1
13	X800-56-PCB3	Liberty Slimline B/P Assy	1
14	345-00040-10	M3x6 pan pozi	3
15	T800-23-0011	Slimline Power Supply	1
16	240-04021-60	Modular Socket 6-way vert	1

Figure 1.6 T800 SL2 Assembly – with T803 fitted



Item	IPN	Description	Qty
1	316-06788-02	"Pnl Frt BSM 3U Blk"	1
2	307-01015-01	Speaker Grille, Metal	1
3	250-00010-19	Speaker, 4 Ohm 5 Watt	1
4	345-00040-38	M3x10 bttn hex	20
5	353-00010-13	M3 shakeproof int	6
6	352-00010-08	M3 Nut, cold form	6
7	T800RX		1
8	362-00010-33	Grommet, LED	4
9	T854_25W_CON	T854 25W CONTINUOUS	1
10	302-05246-01	Module Support Bracket	1
11	220-01702-02	Liberty Slimline B/P Assy	1
12	345-00040-10	M3x6 pan pozi	3
13	12MM_STANDOFF		4
16	240-04021-60	Modular Socket 6-way vert	1
17	353-00010-10	M3 flat washer OD7	2
18	T800-23-0011	Slimline Power Supply	1

Figure 1.7 T800 SL2 Assembly – without T803 fitted

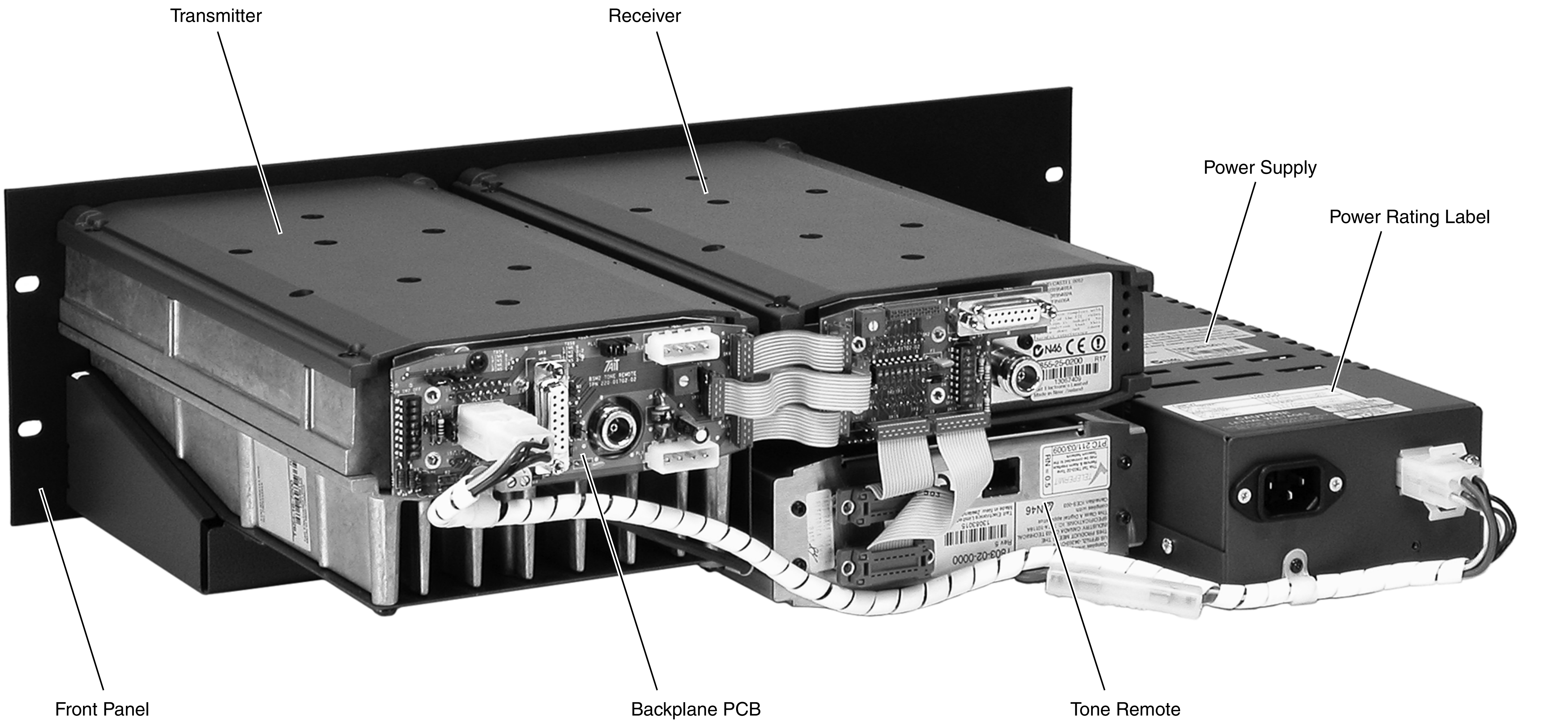


Figure 1.8 T800 SL2 Assembly – with T803 fitted (rear view)

2 T854 Optional Features

2.1 Audio Processor

The T854 come with a number of link selectable features which give added system flexibility.

Note: The tables in this section are the same as those in Section 3.5 in Part C. They have been repeated here for ease of reference.

2.1.1 Link Details

Use the following table to set up the audio processor to the configuration you require. You should set the audio processor links before carrying out any of the tuning and adjustment procedures.

Plug	Link[a]		Function
PL201	1–2	A	not connected
	3–4[b]	B	microphone pre-amp output to compressor input
	5–6	C	microphone pre-amp output to multiplexer input
	7–8	D	pre-emphasis output to multiplexer input
	9–10[b]	E	pre-emphasis output to limiter input
	11–12	F	not connected
	13–14	G	not connected
PL202	1–2[b]	H	compressor output to multiplexer input
	3–4	I	compressor output to limiter input
	5–6	J	compressor output to pre-emphasis input
	7–8	K	not connected
	9–10[b]	L	multiplexer output to pre-emphasis input
	11–12	M	multiplexer output to limiter input
	13–14	N	multiplexer output to compressor input

a. The letters in this column refer to the letters printed on the PCB beside each pair of pins. Note that the link names and pin numbers are different to earlier products. The lettering A to N is however the same.

b. Factory Setting

2.1.2 Typical Options

	PL205	PL210	PL215	PL220
microphone pre-amp. compressed and pre-emphasised; line input pre-emphasised (standard set-up)	3–4[a] B	1–2[a] L	3–4[a] H	3–4[a] E
microphone pre-amp. compressed and pre-emphasised; line input unprocessed	3–4 B	3–4 M	7–8 J	1–2 D
line and microphone compressed and pre-emphasised	5–6 C	5–6 N	7–8 J	3–4 E
microphone pre-amp. compressed; line and microphone flat response	3–4 B	3–4 M	3–4 H	5–6 F

a. Factory Setting

2.2 Line Transformer Configuration and Options

There are four Line Transformer options.

%T210 original T800 Line transformer T4030, 300/300:300/300

%T210A ETAL P1200 or similar 600:600 non centre-tapped leaded encapsulated Line transformer

or ETAL P2602 or similar 300/300:600 centre-tapped leaded encapsulated Line transformer

%T210B ETAL P2781 or similar 600:600 non centre-tapped SMD encapsulated Line transformer

or ETAL P2782 or similar 300/300:600 centre-tapped SMD encapsulated Line transformer

No transformer leaded (%R200 and %R203) or SMD (%R200A and %R203A) by-pass resistors fitted, and an attenuator pad if necessary.

The default option is %T210B, SMD P2781 or similar 600:600 non centre-tapped SMD encapsulated Line transformer.

%T210A and %T210B use a standard footprint which allows the use of other similar transformers with special characteristics, such as the ETAL P3181 ultra-low distortion V.90 SMD.

The line transformer is designed to provide a balanced interface to 600Ω lines, connected between LINE I/P 1 and LINE I/P 4. When %T210 is fitted, the two centre connections (LINE I/P 2 and LINE I/P 3) are shorted together for normal operation. With the other options these two centre connections are available to the user via P204 and P208, unless a centre-tapped %T210A or %T210B is used, wired to LINE I/P 3.

The secondary winding of the transformer is connected via 1kΩ (R202) and 10Ω (R160) resistors to pin 6 (AUDIO-2) of D-range 1 and may be used to monitor audio on the line. Pin 7 of D-range 1 can be reconfigured as AUDIO-1 by removing R808 and R160, and placing %R150. Note that this configuration does not allow external programming of the module

Transformer	T4030	P1200	P2781	No Transformer
IPN	053-00010-17	054-00010-16	054-00010-18	
Designator	%T210	%T210A	%T210B	
%R200	Not Fitted	Not Fitted	Not Fitted	Not Fitted
%R200A	Not Fitted	Not Fitted	Not Fitted	0Ω
%R203	Not Fitted	Not Fitted	Not Fitted	Not Fitted
%R203A	Not Fitted	Not Fitted	Not Fitted	0Ω
%R203B	Not Fitted	0Ω	0Ω	Not Fitted
%R203C	0Ω	Not Fitted	Not Fitted	Not Fitted
%R203D	0Ω	Not Fitted	Not Fitted	Not Fitted
%R203E	Not Fitted	560Ω	560Ω	560Ω
%R201	560Ω	Not Fitted	Not Fitted	Not Fitted
C201	4U7 BP	4U7 BP	4U7 BP	Not Fitted
C202	4U7 BP	4U7 BP	4U7 BP	Not Fitted
%C204	4U7 BP	Not Fitted	Not Fitted	Not Fitted
%C205	4U7 BP	Not Fitted	Not Fitted	Not Fitted
%C203A	Not Fitted	15nF	15nF	Not Fitted
%C203B	Not Fitted	15nF	15nF	Not Fitted

%R203C and %R203D have replaced SL201 and SL202.

To retain the DC loop keying keying facility, there is a centre-tapped version of the ETAL leaded and SMD transformers, the P2602 and P2782 respectively. This will only work for Common Earth systems. If full isolated DC loop keying is required, then the T4030 must still be used. The T4030 must also be used if the Transmitter is to be used as half of a 2-wire to 4-wire hybrid.

2.2.1 Line Limiter Option

This option should be fitted if no line transformer is installed.

	Enabled	**Disabled**
%D205	1N4531	Not Fitted
%D210	1N4531	Not Fitted

2.2.2 Line Attenuator Option

When enabled this attenuates the line input by approximately 20dB

	Enabled	**Disabled**
Link 1	Open	Closed
%R211	470Ω	Not Fitted
%R220	470Ω	Not Fitted
%R228	120Ω	Not Fitted

2.3 Opto Key

The keying circuitry may be completely isolated from the rest of the system by means of the optocoupler (IC250). A constant current source (Q270) allows keying voltages between 6 and 50 V.

	Opto+ to PL100/11	**PL100/11 Free**
R240	0Ω	Not Fitted
	Opto- to PL100/12	PL100/12 Free
R243	0Ω	Not Fitted

R240 and R243 have replaced SL203 and SL204, originally on the T856 underside. These connect the opto key to D-range 1 pins 11 and 12, and when removed free the D-range pins for alternative use.

2.4 Relay Driver

A dedicated transistor (Q250) is provided for the purpose of switching an external (e.g. coaxial) relay. The output is open collector and is activated by the Tx-Reg rail. This output is available on pin 9 of the T800-03-0000 auxiliary D-range connector (D-range 2).

2.5 Local Microphone

Use of the local microphone (via the front panel stereo socket) will disable the audio input from the line. The audio switching occurs when the PTT switch is closed.

2.6 Keying With Option PCBs

If an option PCB is fitted, the exciter may be keyed via the TX-ENB-OPT pad in the audio processor. The line must be pulled low to key.

2.7 Transmit Key Time

(Refer to the appropriate test points and options connections drawing in Section 6 in Part C.)

A solder link (SL501) is provided on the bottom of the PCB to allow two transmit key time options, as shown in the table below.

Transmit Key Time		SL501
standard	30ms (approx.)	not linked
short*	<5ms	linked

*In this configuration the standby spurious emissions should be <–65dBm.

2.8 Local PTT Indication for A800 SIM

This option allows the use of D-range 1 pin 3 for an external PTT indication when the mic PTT or carrier switch is activated. Used for A-800 SIM or any other external control or CTCSS unit.

	Enabled	Disabled
D245	BAW56	BAW57
R276	0Ω	0Ω
%R276A	0Ω	Not fitted
%R203C	Not fitted	See transformer option table

2.9 Direct input to Buffer option

A direct input for data use. Note that this input will have 4.5V half-rail, and needs isolation unless R289 is also removed. Leaving R291 as 0Ω and removing &R290 may improve data shape (less overshoot), as &C289 is still in circuit.

	Enabled	Disabled
%R246	0Ω	Not fitted
%R291	Not fitted	0Ω
%C265	Not fitted	4U7 BP
%R259	Not fitted	22K

2.10 Line Input Control Replacement

The Line Input control can be replaced with fixed resistors if required.

	Enabled	Disabled
%R222	4K7	Not fitted
%R234	4K7	Not fitted
%RV210	Not fitted	10K Log

3 Talk Through Repeater

In this configuration the receiver directly keys the transmitter when the signal is received. The demodulated audio is fed via 600Ω lines to the transmitter to modulate the carrier. The receiver and transmitter operate simultaneously and must therefore be on different frequencies. The minimum frequency separation depends on the duplexer used.

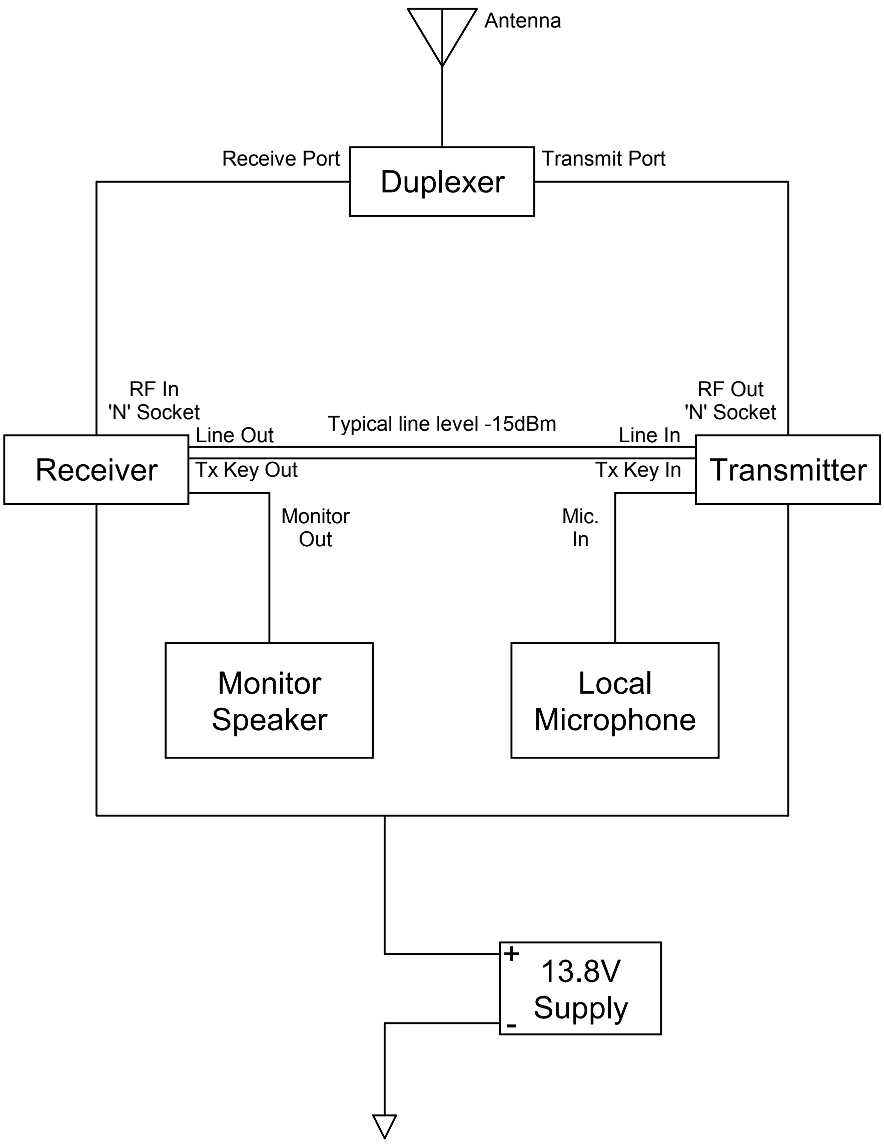


Figure 3.1 Talk Through Repeater

4 Line Controlled Base without Talk Through

4.11 General

This installation contains a transmitter and receiver which may or may not be on the same frequency, thus simultaneous transmission and reception is not possible. When the transmitter is keyed, the coaxial relay is also energised. When the relay is in its rest position, signals from the antenna are passed to the receiver and the demodulated output is fed via 600Ω lines to the RCU.

The receiver is disabled when the transmitter is energised to prevent the receiver mute opening from RF due to lack of isolation in the relay, direct radiation or the noise skirt of the dual frequency link.

Since the base station may be controlled via a 2-wire line and a 4-wire to 2-wire hybrid, there is a possibility of system oscillation if the receiver is not disabled during transmit. This occurs when the transmit energy enters the receiver and produces an audio response which can pass from the receive to the transmit audio part of the hybrid (impedance imbalance, etc).

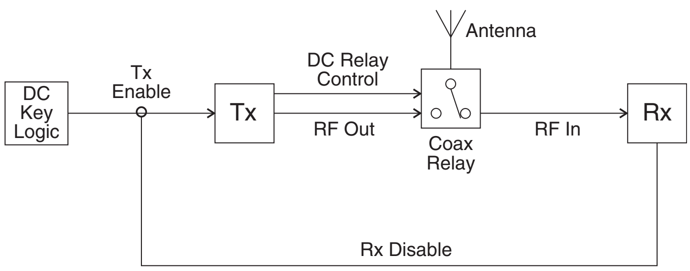


Figure 4.2 Basic Configuration

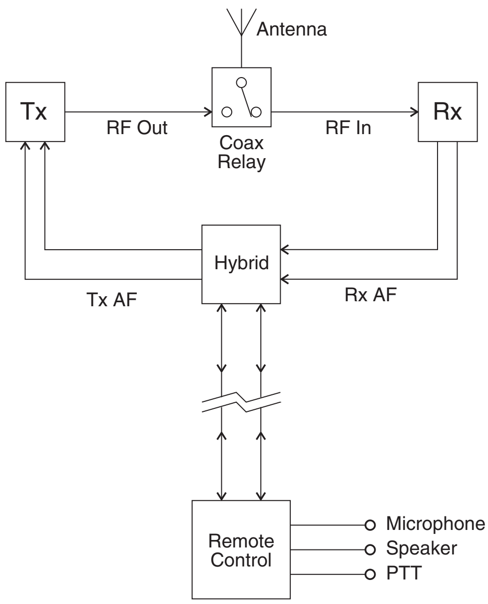


Figure 4.3 Remote Line Controlled Base Station

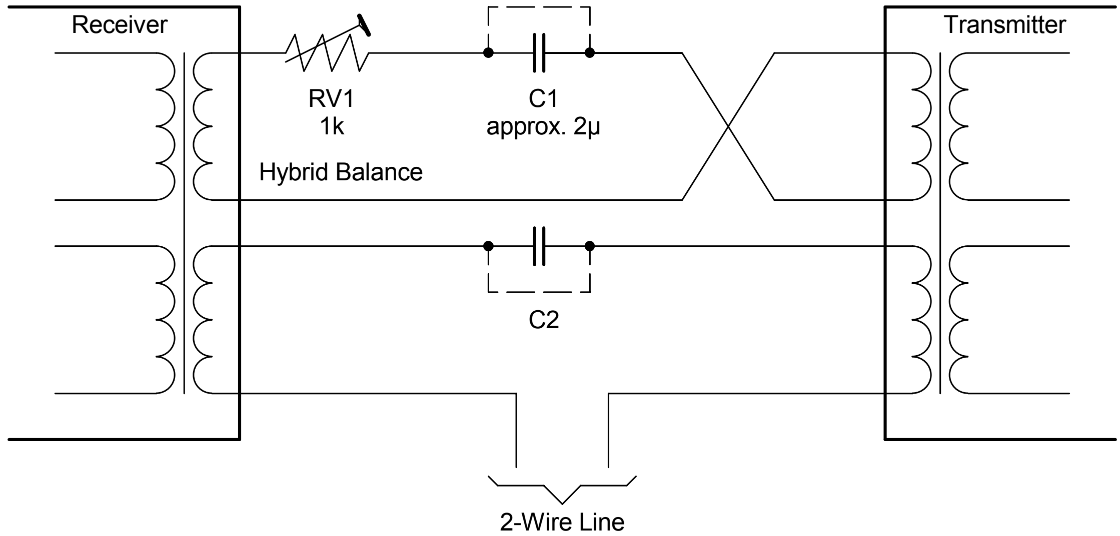


Figure 4.4 4-Wire to 2-Wire Converter

Note: This configuration is only possible when transformer %T210 and T4030 are fitted. Refer to Section 2.2.

4.12 Transmitter Tail Timer

If the transmitter has the tail timer enabled:

- the receiver disable timer must be set so that ^{t}Rx/Dis > ^{t}Tx/Tail;

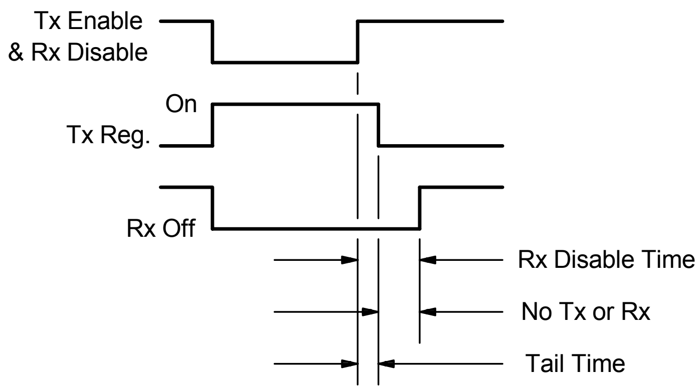


Figure 4.5 Receiver Disable Time vs Tail Time

- if the system configuration also uses an aerial changeover relay as well as the tail timer, the changeover relay must be driven from the relay driver (Q250) in the audio processor, rather than by Tx-Key or Tx-Enable; this output is available on pin 9 of the T800-03-000 auxiliary D-range (D-range 2);

- depending on tail time requirements, it is possible for the transmitter tail time to exceed the receiver disable time capability; in this situation the receiver disable line should also be driven from relay driver Q250 (D-range 2 pin 9).

5 DC Line Keying

Where the transmitter and receiver are separated by only a short distance and DC isolation is not required, DC loop keying may be employed.

Note: This feature is not available with standard line transformer ETAL P2781 (%T201B). Refer to Section 2.2.

A small DC current (usually less than 10mA) can be fed via the balanced 2-wire line to provide remote control of various functions.

In a duplex system the receiver mute is used to key a transmitter, provided there is a common earth between the two units (refer to Figure 5.6).

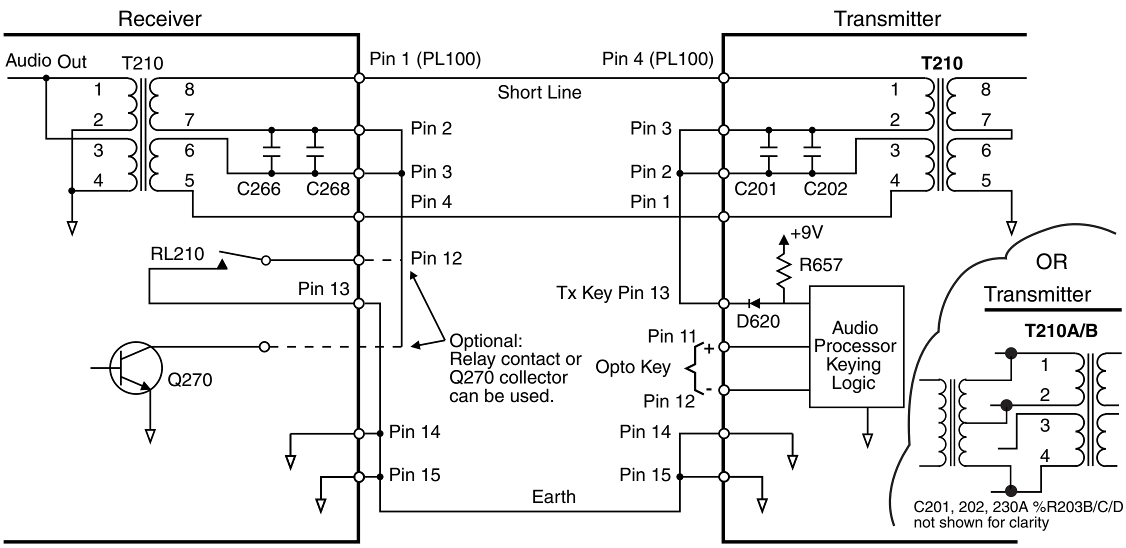


Figure 5.6 DC Loop Keying With Common Earth

Where the receiver and transmitter (or remote control) are distant, DC loop keying is provided by an isolated supply, driver and detector because an earth cannot be relied on (refer to Figure 5.7, Figure 5.8 and Figure 5.9).

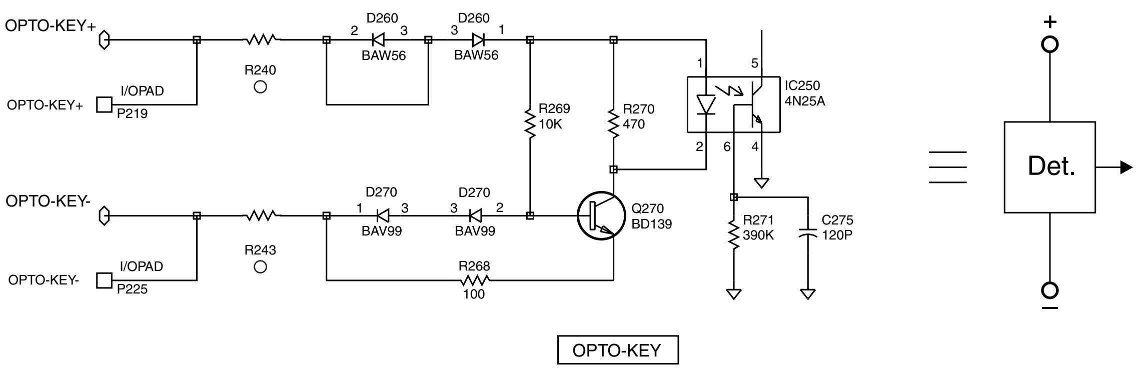


Figure 5.7 Isolated Constant Current Loop Current Detector (Opto-key input on T854)

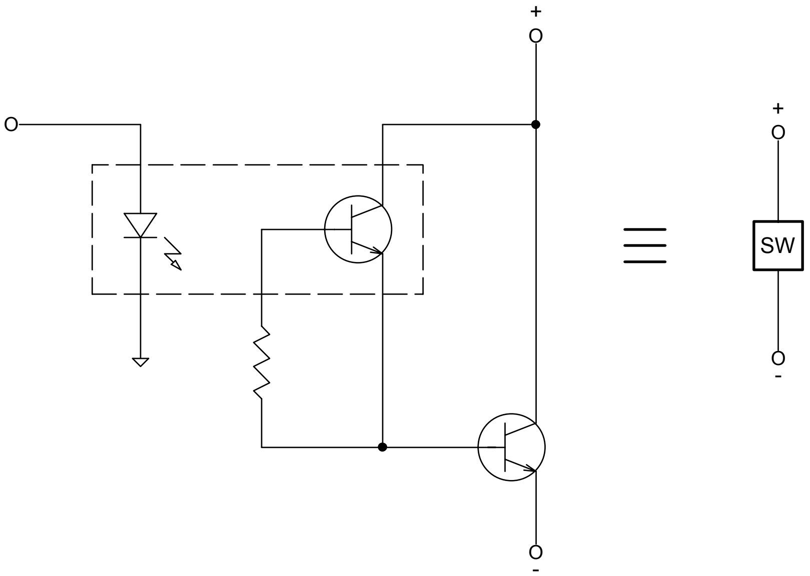


Figure 5.8 Isolated Loop Current Switch

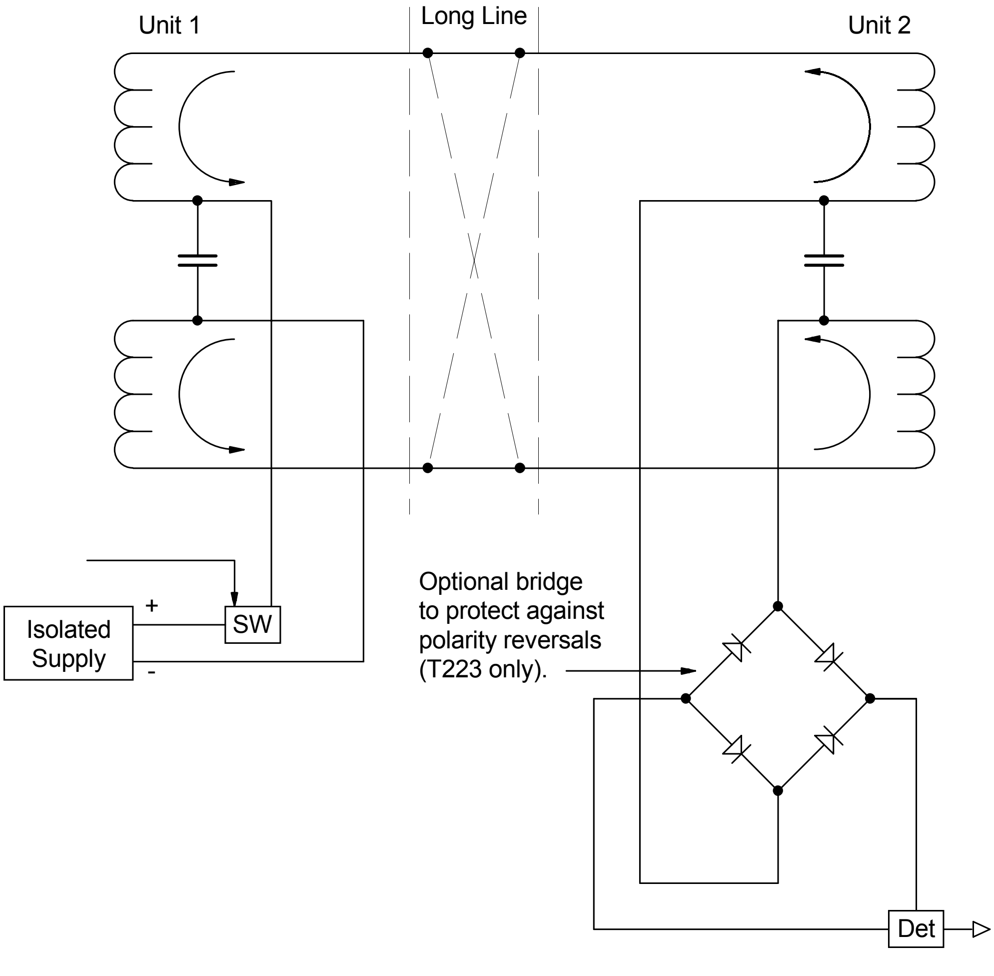


Figure 5.9 Typical System

6.2 X800-56-PCB3 Backplane PCB

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges.**

This section contains the following information.

IPN	Section	Page
220-01702-02	Backplane Links and Switches	6.2.3
	Parts List	6.2.5
	PCB Layout – Top Side	6.2.7
	PCB Layout – Bottom Side	6.2.8
	Circuit Diagram	6.2.9

6 X800-56-PCB3 PCB Information

This part of the manual provides the parts list, PCB layouts and circuit diagram for the X800-56-PCB3 backplane PCB. There is a detailed table of contents at the start of Section 2.

6.1 Introduction

PCB Identification

All PCBs are identified by a unique 10 digit “internal part number” (IPN), e.g. 220-12345-00, which is screen printed onto the PCB (usually on the top side), as shown in the example below:

The last 2 digits of this number define the issue status, which starts at 00 and increments through 01, 02, 03, etc. as the PCB is updated. Some issue PCBs never reach full production status and are therefore not included in this manual. A letter following the 10 digit IPN has no relevance in identifying the PCB for service purposes.

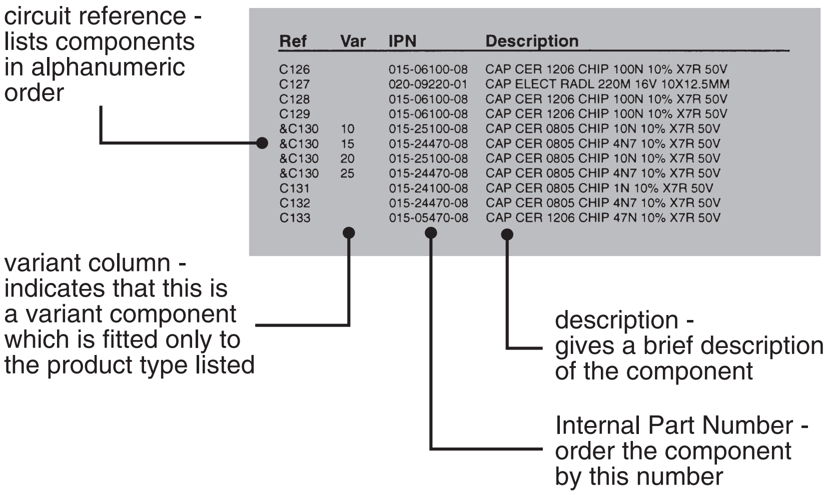
Note: It is important that you identify which issue PCB you are working on so that you can refer to the appropriate set of PCB information.

Parts Lists

The 10 digit numbers (000-00000-00) in this Parts List are “internal part numbers” (IPNs). We can process your spare parts orders more efficiently and accurately if you quote the IPN and provide a brief description of the part.

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns, as shown below:

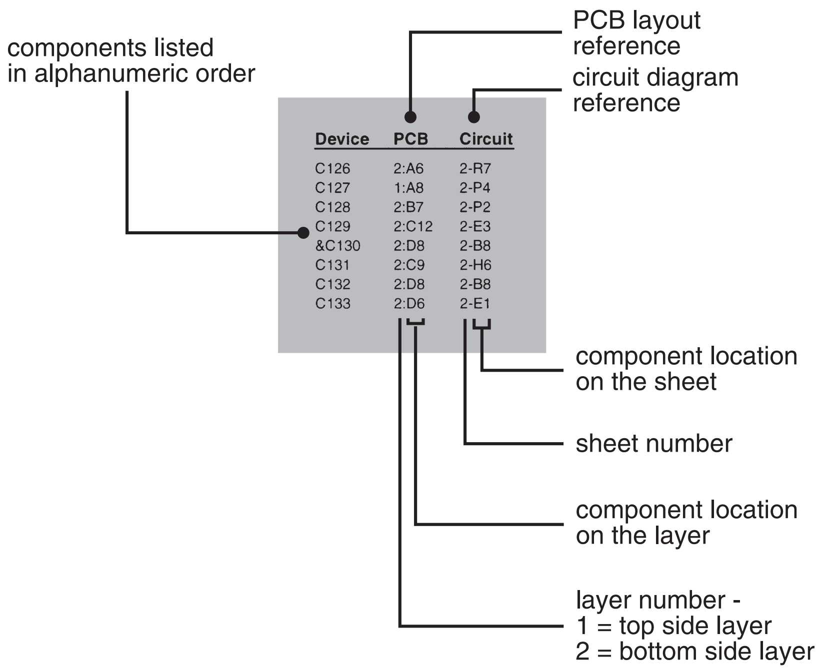


Ref	Var	IPN	Description
C126		015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V
C127		020-09220-01	CAP ELECT RADL 220M 16V 10X12.5MM
C128		015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V
C129		015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V
&C130	10	015-25100-08	CAP CER 0805 CHIP 10N 10% X7R 50V
&C130	15	015-24470-08	CAP CER 0805 CHIP 4N7 10% X7R 50V
&C130	20	015-25100-08	CAP CER 0805 CHIP 10N 10% X7R 50V
&C130	25	015-24470-08	CAP CER 0805 CHIP 4N7 10% X7R 50V
C131		015-24100-08	CAP CER 0805 CHIP 1N 10% X7R 50V
C132		015-24470-08	CAP CER 0805 CHIP 4N7 10% X7R 50V
C133		015-05470-08	CAP CER 1206 CHIP 47N 10% X7R 50V

The mechanical and miscellaneous section lists the variant and common parts in IPN order.

Grid Reference Index

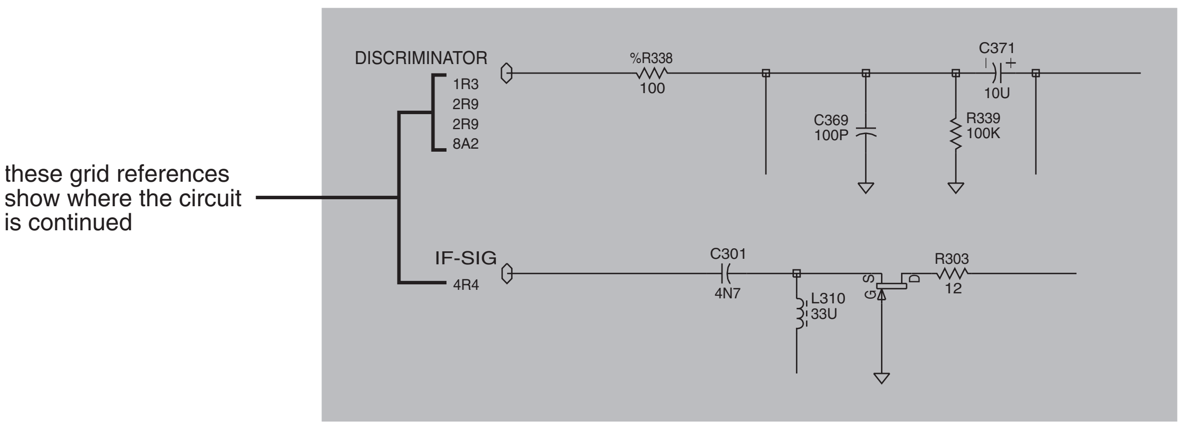
This section contains a component grid reference index to help you find components and labelled pads on the PCB layouts and circuit diagrams. This index lists the components and pads in alpha-numeric order, along with the appropriate alphanumeric grid references, as shown below:



Using CAD Circuit Diagrams

Reading a CAD circuit diagram is similar to reading a road map, in that both have an alphanumeric border. The circuit diagrams in this manual use letters to represent the horizontal axis, and numbers for the vertical axis. These circuit diagram “grid references” are useful in following a circuit that is spread over two or more sheets.

When a line representing part of the circuitry is discontinued, a reference will be given at the end of the line to indicate where the rest of the circuitry is located, as shown below. The first digit refers to the sheet number and the last two characters refer to the location on that sheet of the continuation of the circuit (e.g. 1R3).



Backplane Links and Switches

The tables below explain the functions of each of the links and switches on the X800-56-PCB3 backplane.

Link	Function	Notes
LN1, LN2	Connects balanced audio from the receiver to the transmitter.	For talk-through operation.
LN3	Connects Rx-Gate to Tx-Key.	
LN4	Select between primary serial comms (link pins 2–3) or secondary (link pins 1–2).	Secondary serial comms is via the receiver and transmitter Aux connectors (second D-ranges).
LN5	Connects Tx-Relay-Driver output from transmitter to the coax relay.	
LN6	Select between serial comms (link pins 1–2) or RSSI (link pins 2–3) on pin 11 of SK6 (Auxiliary connector).	
LN7	Links external (or T803) CTCSS audio to transmitter.	T803 CTCSS audio not available at time of publication.
LN8	Link pins 1–2. Connects unbalanced Rx audio (‘Audio1’) to T803. Not to be used when CTCSS is present on RX audio as internal CTCSS filtering cannot be applied to this path. For CTCSS use the option below.	Adjust level using RV2. Level to T803 independent of Rx Line Level control.
	Link Pins 2–3 and Pins 4–5. Changes the balanced Rx Line audio output to unbalanced for the T803. This option should be used when CTCSS is present on RX audio so that the internal CTCSS filter can be applied.	Level to T803 controlled by RX Line Level control.
LN9	**T854 transmitters (after S/N 13098764):** Select between Transmitter Aux-Out-0 (link pins 2–3) or direct FWD power sense voltage (link pins1–2). The latter could be used for an externally fitted RF power indicator or alarm.	If an internal alarm board is fitted Aux-Out-0 (link pins 2–3) becomes FWD power alarm output.
	Older T854 transmitters (s/n 13098764 or earlier): Select between Transmitter Aux-Out-0 (link pins 2–3) or Aux-Out-1 (link pins 1–2).	
LN10	**T854 transmitters (after S/N 13098764):** Select between direct FWD power sense voltage (link pins 2–3) or direct REV power sense voltage (link pins1–2). Could be used for an externally fitted RF power indicator or alarm.	If an internal alarm board is fitted direct FWD power sense voltage (link pins 2–3) becomes REV power alarm output.
	Older T854 transmitters (s/n 13098764 or earlier): Selection between transmitter Aux-Out-1 (link pins 2–3) or Aux-Out-2 (link pins1–2).	
LN11	Connects RX CTCSS disable from the T803 to the receiver.	
LN12	Connects Tx-Relay-Driver output from the transmitter to RX-Inhibit on the receiver.	Recommended setting to prevent the receiver mute from inadvertently opening.

Table 6.1 X800-56-PCB3 links

Switch	Function	Notes
SW1-1	Hardware selection of channel select 1	Leave OFF for Channel select via T803 and or PGM800Win
SW1-2	Hardware selection of channel select 2	
SW1-3	Hardware selection of channel select 3	
SW1-4	Hardware selection of channel select 4	
SW1-5	Hardware selection of channel select 5	
SW1-6	Hardware selection of channel select 6	
SW1-7	Hardware selection of channel select 7	
SW1-8	Hardware selection of channel select 8	
SW2-1	**T854 transmitters (after S/N 13098764):** When ON connects transmitter Aux-Out-0 or direct FWD power sense voltage to ground, depending on the links on LN9. See description of LN9 in the previous table	Not recommended that direct FWD power sense voltage is grounded.
	For older T854 transmitters (s/n 13098764 or earlier): When ON connects transmitter Aux-Out-0 or Aux-Out-1 to ground, depending on the links on LN9. See description of LN9 in the previous table.	
SW2-2	**T854 transmitters (after S/N 13098764):** When ON connects direct FWD power sense voltage or direct REV power sense voltage to ground depending on the links on LN10. See description of LN10 in the previous table.	Not recommended
	For older T854 transmitters (s/n 13098764 or earlier): When ON connects transmitter Aux-Out-1 or Aux-Out-2 to ground, depending on the links on LN10. See description of LN10 in the previous table.	
SW2-3	When ON connects Serial Comms to Pin 6 of transmitter D-Range1	
SW2-4	When ON connects Serial Comms to the transmitter (Tx D-Range1 pin 7)	Default = ON
SW2-5	When ON connects Serial Comms to the receiver (Rx D-range1 pin 7) and the T803	Default = ON
SW2-6	Not used	
SW2-7	When ON connects Tx-Key to ground	
SW2-8	Not used	
SW3-1	When ON connects Rx-Audio through to the T803 and the external Auxiliary connector (SK13 pin2)	
SW3-2, SW3-3	When ON connects balanced audio from the T803 or the external Auxiliary connector (SK13 pins 3 and 4) to the Transmitter.	
SW3-4	When ON connects Receiver RSSI through to the T803	
SW3-5	When ON connects Tx-Key from the T803 to the Transmitter	
SW3-6	When ON connects Rx-Gate to the T803 and the external Auxiliary connector (SK13 pin9)	
SW3-7	When ON connects T803 CTCSS audio to the transmitter.	T803 CTCSS audio not available at time of publication.
SW3-8	Not used.	

Figure 6.10 X800-56-PCB3 switches

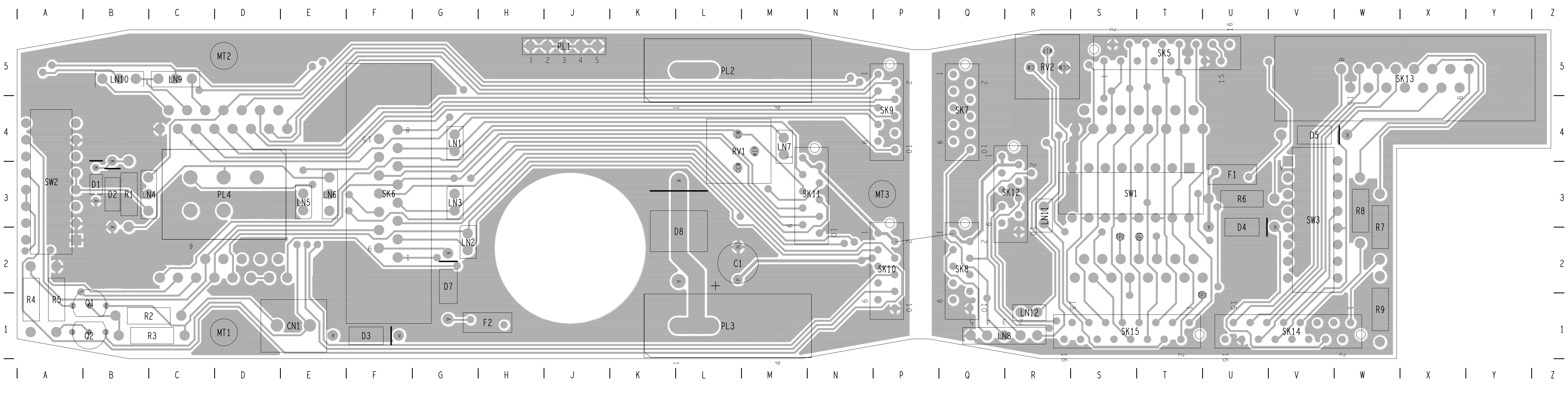
X800-56-PCB3 Parts List/Grid Reference Index (IPN 220-01702-02)

How To Use This Parts List

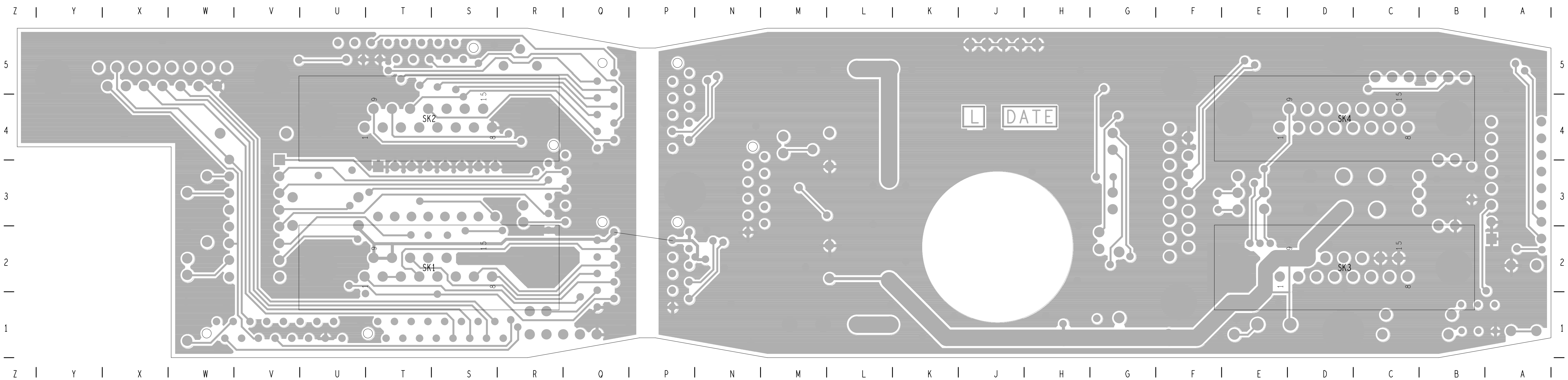
The components listed in this parts list are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns: the circuit reference, variant (if applicable), IPN and description. A number in the variant column indicates that this is a variant component which is fitted only to the product type listed.

This parts list is correct at the time of publishing, but is subject to change without notification. An up to date parts list can be obtained from your local Customer Service Organisation

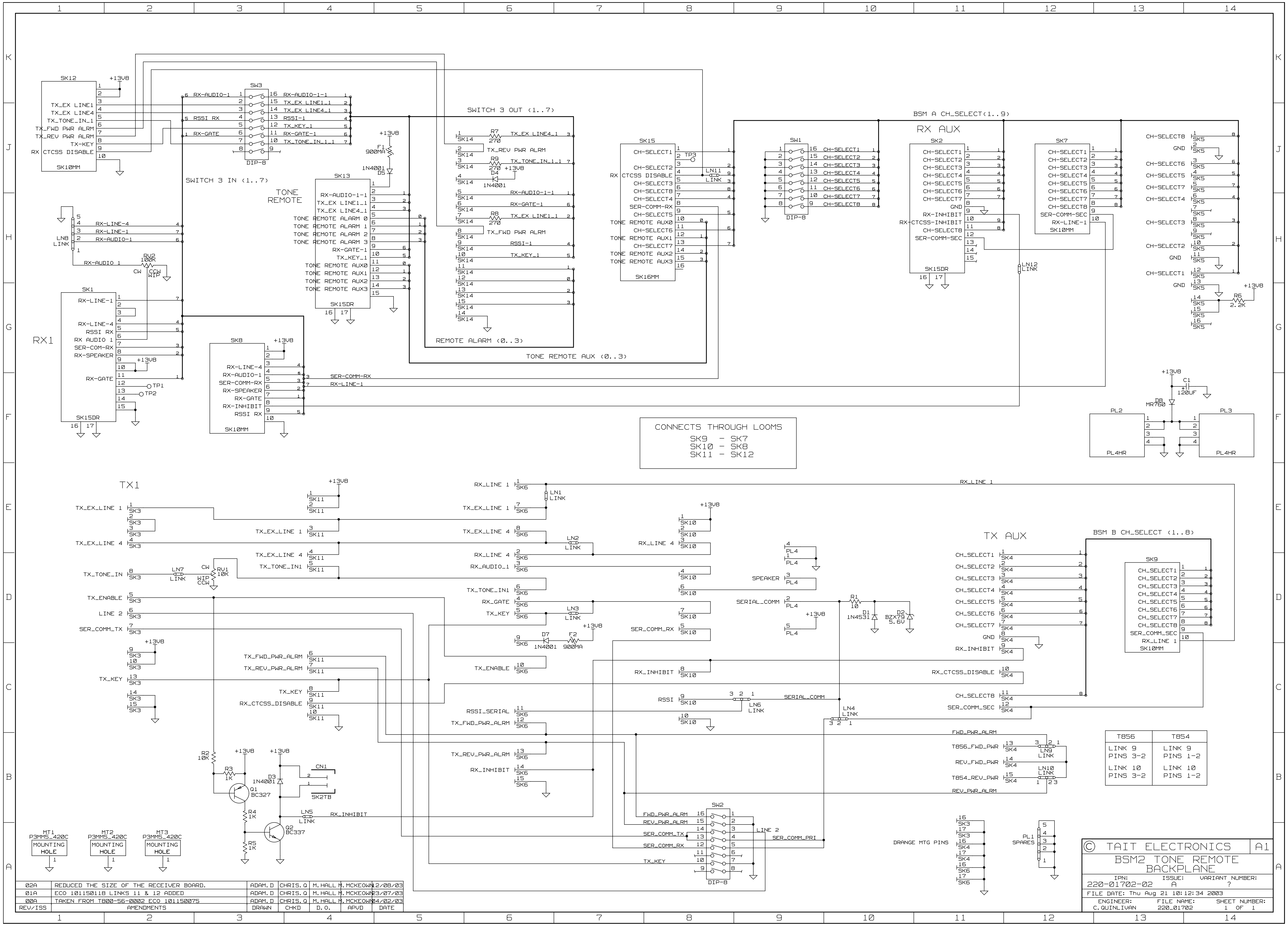
Ref	IPN	Description
C1	020-09120-01	120UF 6.3Dx15H mm
CN1	240-04030-09	SK2TB TERMINAL BLOCK 2WAY SIDE ENTRY
D1	001-50012-05	1N4531 AI SMALL SIGNAL
D2	001-00015-12	BZX79 VOLTAGE REGULATOR
D3	001-00011-70	1N4001 GENERAL PURPOSE
D4	001-00011-70	1N4001 GENERAL PURPOSE
D5	001-00011-70	1N4001 GENERAL PURPOSE
D7	001-00011-70	1N4001 GENERAL PURPOSE
D8	001-00011-60	MR760 HIGH CURRENT CASE 194-04
F1	265-00010-69	900MA RESETABLE 30V 40A
F2	265-00010-69	900MA RESETABLE 30V 40A
LN1	240-00020-68	HEADER PLUG 2WAY WITH SHORTING LINK
LN10	240-00020-59	HEADER PLUG 3WAY WITH SHORTING LINK
LN11	240-00020-68	HEADER PLUG 2WAY WITH SHORTING LINK
LN12	240-00020-68	HEADER PLUG 2WAY WITH SHORTING LINK
LN2	240-00020-68	HEADER PLUG 2WAY WITH SHORTING LINK
LN3	240-00020-68	HEADER PLUG 2WAY WITH SHORTING LINK
LN4	240-00020-59	HEADER PLUG 3WAY WITH SHORTING LINK
LN5	240-00020-68	HEADER PLUG 2WAY WITH SHORTING LINK
LN6	240-00020-59	HEADER PLUG 3WAY WITH SHORTING LINK
LN7	240-00020-68	HEADER PLUG 2WAY WITH SHORTING LINK
LN8	240-00020-58	HEADER PLUG 5WAY WITH SHORTING LINK
LN9	240-00020-59	HEADER PLUG 3WAY WITH SHORTING LINK
MT1	MTG-C420P-35	P3MM5_420C MOUNTING HOLE 3.5MM HOLE 4.2MM PAD
MT2	MTG-C420P-35	P3MM5_420C MOUNTING HOLE 3.5MM HOLE 4.2MM PAD
MT3	MTG-C420P-35	P3MM5_420C MOUNTING HOLE 3.5MM HOLE 4.2MM PAD
PL1	240-00020-58	HEADER PLUG 5WAY WITH SHORTING LINK
PL2	240-02011-20	"HEADER 4WAY 1ROW 200"" PITCH TOP ENT WITH SHROUD"
PL3	240-02011-20	"HEADER 4WAY 1ROW 200"" PITCH TOP ENT WITH SHROUD"
PL4	240-00010-64	HEADER PLUG 6WAY 2X3 TOP ENTRY WITH SHROUD
Q1	000-50010-60	BC327 AI AF POWER
Q2	000-00010-66	BC337 AF POWER
R1	030-02100-00	10 FILM 7X2.5MM
R2	032-05100-00	10K M/F 7X2.5MM
R3	032-04100-00	1K M/F 7X2.5MM
R4	032-04100-00	1K M/F 7X2.5MM
R5	032-04100-00	1K M/F 7X2.5MM
R6	032-04220-00	2.2K M/F 7X2.5MM
R7	030-03270-00	270 FILM 7X2.5MM
R8	030-03270-00	270 FILM 7X2.5MM
R9	030-03270-00	270 FILM 7X2.5MM
RV1	042-05100-10	10K CERMET 9.5mm SQ Top Adjust 3386P
RV2	042-06100-09	100K CERMET 9.5mm SQ Top Adjust 3386P
SK1	240-02020-15	SKT 15WAY DRANGE ASTRON AT-DB500-15-F-A55
SK10	240-00010-79	SKT 10WAY 2X5 AMP MICRO MATCH TOP ENTRY
SK11	240-00010-79	SKT 10WAY 2X5 AMP MICRO MATCH TOP ENTRY
SK12	240-00010-79	SKT 10WAY 2X5 AMP MICRO MATCH TOP ENTRY
SK13	240-02020-15	SKT 15WAY DRANGE ASTRON AT-DB500-15-F-A55
SK14	240-04020-54	SKT 16WAY AMP MICRO MATCH TOP ENTRY
SK15	240-04020-54	SKT 16WAY AMP MICRO MATCH TOP ENTRY
SK2	240-02020-15	SKT 15WAY DRANGE ASTRON AT-DB500-15-F-A55
SK3	240-02020-15	SKT 15WAY DRANGE ASTRON AT-DB500-15-F-A55
SK4	240-02020-15	SKT 15WAY DRANGE ASTRON AT-DB500-15-F-A55
SK5	240-04020-54	SKT 16WAY AMP MICRO MATCH TOP ENTRY
SK6	240-02020-15	SKT 15WAY DRANGE ASTRON AT-DB500-15-F-A55
SK7	240-00010-79	SKT 10WAY 2X5 AMP MICRO MATCH TOP ENTRY
SK8	240-00010-79	SKT 10WAY 2X5 AMP MICRO MATCH TOP ENTRY
SK9	240-00010-79	SKT 10WAY 2X5 AMP MICRO MATCH TOP ENTRY
SW1	230-00010-19	DIP-8 SW X 8 SPST DIP
SW2	230-00010-19	DIP-8 SW X 8 SPST DIP
SW3	230-00010-19	DIP-8 SW X 8 SPST DIP
TP1	UNI-009TP-XX	PROBE TESTPOINT WITH A 0.8MM HOLE AND A 1.25MM COPPER PAD
TP2	UNI-009TP-XX	PROBE TESTPOINT WITH A 0.8MM HOLE AND A 1.25MM COPPER PAD
TP3	UNI-009TP-XX	PROBE TESTPOINT WITH A 0.8MM HOLE AND A 1.25MM COPPER PAD



X800-56-PCB3 PCB (IPN 220-01702-02) – Top Side
220-01702-02



X800-56-PCB3 PCB (IPN 220-01702-02) – Bottom Side
220-01702-02



X800-56-PCB3 circuit diagram
220-01702-02

Part H T800 Ancillary Equipment

This part of the manual features a brief description of the major ancillaries that may be used with T800 SL2 equipment. For a comprehensive list of available ancillary equipment, please contact your nearest Tait Dealer or Customer Service Organisation.

1 T800 Ancillary Equipment

1.1 Programming Kits

T800-01-0000

The T800-01-0000 kit is used for programming T800 SL2 base station equipment using a standard IBM™ (or compatible) PC.

The kit comprises the following items:

PGM800Win programming software user's manual
PGM800Win Windows™ based programming software on CD
T800-01-0002 programming cable.

T800-01-0001

The T800-01-0001 kit is the same as the T800-01-0000 kit described above, but with the addition of the T800-01-0004 module programming interface.

T800-01-0002

The T800-01-0002 programming cable connects the PC directly to the programming socket on the T800 SL2 rack frame speaker panel or backplane PCB, thus enabling T800 SL2 modules to be read or programmed while in the rack frame. It can also connect to the programming socket on the T800-01-0004 programming module interface if the module is to be read or programmed while out of the rack frame.

T800-01-0003

The T800-01-0003 programming kit contains a T800-01-0002 programming cable and a T800-01-0004 programming module interface.

T800-01-0004

The T800-01-0004 programming module interface is designed to allow a PC to connect directly to a T800 SL2 module. It comprises a small PCB on which is mounted a D-range socket, a programming socket, a Micromatch socket and a DC input connector.

The T800-01-0004 plugs directly into D-range 1 or D-range 2 (selected by a switch on the PCB), or into SK805 in the microcontroller compartment via the supplied ribbon cable loom, and is then connected to the PC with a T800-01-0002 programming cable.

Refer to the T800 Ancillary Equipment Service Manual for more information.

1.2 General Ancillaries

T800-09-0001 RF Coaxial Relay

The T800-09-0001 is an RF coaxial relay assembly fitted with three female N-type connectors, and comes complete with a mounting bracket and two coaxial cables terminated in male N-type connectors. It can be used, for example, in base station applications where the receiver and transmitter share the same antenna, in which case it can be driven by the T800 SL2 transmitter relay driver (refer to Section 2.4 in Part G for more information).

T800-01-0010 Calibration Test Unit

The T800-01-0010 provides all inputs and outputs necessary to carry out the full tuning and adjustment procedure for T800 Series I and II receivers, exciters and transmitters. It provides a convenient method of connecting test equipment, including a PC and power supply, to a T800 Series I or II module (via D-range 1) without the need to construct custom wiring looms.

The T800-01-0010 also has a built-in speaker, a switch for selecting Series I or II modules, and uses standard BNC and "banana plug" sockets.

T800-03 Auxiliary D-Range

The T800-03 is an additional D-range kit comprising one D-range plug assembly and two locating pins, nuts and washers. Although originally a T800 Series I ancillary, it can be used in T800 SL2 products for special applications requiring custom internal wiring.

T800-03-0000 Auxiliary D-Range

The T800-03-0000 is an additional D-range kit (normally fitted as D-range 2) comprising one D-range plug assembly complete with connecting loom and mounting screws. The ribbon cable loom connects the D-range PCB to the Micromatch socket (SK805) in the microcontroller compartment. Typical uses of the T800-03-0000 are in paging applications and where external channel control is required. Refer to Figure 1.4 in Part G for the T800-03-0000 pin connections.

T800-04-0000 RSSI

The T800-04 RSSI option PCB plugs directly into the main PCB (support circuitry being fitted as standard). It is fitted to the T855, T875 and T885 whenever receiver signal strength monitoring is required, e.g. trunking or voting. Its function is to provide a DC voltage proportional to the signal level at the receiver input.

T800-10-0000 Channel Select PCB

The T800-10-0000 is a small PCB that plugs into the Micromatch connector (SK805) in the microcontroller compartment of a T800 SL2 receiver, exciter or transmitter. It is fitted with an eight-switch DIP switch which allows the manual selection of any one of the channels already programmed into the module by PGM800Win. The T800-10-0000 is also fitted with a Micromatch socket to provide access to SK805 for programming purposes.

T800-80-0000 Local Microphone

A 600Ω microphone complete with 300mm cord terminated in a ¼″ stereo plug for use with the T854.

T800-80-0001 T803 Microphone

A 600Ω microphone complete with 300mm cord terminated with a RJ11connector for use with the T803.

1.3 Paging

T800-30-0000 and T800-30-0002 DFSK Modulators

The T800-30-0000 (formerly T800-30) and T800-30-0002 (formerly T800-35) are DFSK modulators for T800 SL2 transmitters, suitable for POCSAG or similar paging data formats. Analogue transmissions (e.g. tone or speech) are still possible by disabling the data path via a control line. 512 or 1200 baud data rates are link selectable. The T800-30-0002 is adapted for use with an external reference oscillator for simulcast transmission. The T800-30-0000 and T800-30-0002 are not designed for use with 66 to 88MHz equipment.

T800-32-0000 and T800-32-0010 DFSK Modulators

The T800-32-0000 and T800-32-0010 are DFSK modulator PCBs which can be fitted to T800 SL2 transmitters to enable them to function as low-speed paging transmitters. These new PCBs have been specifically designed for Series II transmitters and are much easier to fit into the latest design transmitters.

Both PCBs are suitable for POCSAG or similar paging data formats, but are not designed for analogue transmissions (e.g. tone or speech). The T800-32-0010 is adapted for use with an external reference oscillator for simulcast transmission. The T800-32-0000 and T800-32-0010 are not designed for use with 66 to 88MHz equipment.

1.4 External Frequency Reference

T800-06-0000 External Frequency Reference Kit

The T800-06-0000 kit provides an additional D-range plug/PCB assembly which incorporates a miniature RF connector to carry an externally generated 12.8MHz reference signal into a T800 SL2 module. This enables the use of very high stability external reference oscillators for special applications.

The D-range PCB is also fitted with a Micromatch socket which can be connected to SK805 in the microcontroller section via the supplied loom to provide access to the channel change lines.

The kit comes complete with fitting instructions and all installation hardware.

T800-06-0001 External Frequency Reference Kit

The T800-06-0001 is the same as the T800-06-0000 kit with the addition of a special coax cable for external frequency reference input. One end of this coax is terminated with a miniature RF connector which fits into the D-range socket in an appropriate backplane PCB to connect to a T800 SL2 module fitted with a T800-06-0000 kit. The other end is terminated with a BNC connector which can be mounted on the rack frame.

T801-00 Frequency Reference Module

The T801-00 frequency reference module provides a high stability frequency source to which the synthesiser within a T800 SL2 base station can be locked. The master standard within the T801-00 is primarily intended to be rubidium, although high quality ovenised crystal oscillators can also be used in applications where more frequent readjustment of frequency is acceptable. The T801-00 converts the output frequency from its master standard to the 12.8MHz required by the T800 SL2 base station.

Refer to M801-00.

T801-10 OCXO Module

The T801-10 OCXO module provides a high stability frequency source to which the synthesiser within a T800 SL2 base station can be locked. This will provide T800 SL2 transmitters with the frequency stability required for simulcast transmission. The master standard within the T801-10 is a high quality ovenised crystal oscillator (OCXO). Three outputs are provided on the rear panel, which allows up to three T800 SL2 transmitters to be referenced to the source oscillator.

Refer to M801-10.