Part B T835 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.

Section	Title
1	General Information
2	Circuit Operation
3	Initial Tuning & Adjustment
4	Functional Testing
5	Fault Finding
6	PCB Information

1 T835 General Information

This section provides a brief description of the T835 receiver, along with detailed specifications and a list of types available.

The following topics are covered in this section.

Section	Title	Page
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replace A4 pages B1.3/B1.4 with A3 pages B1.3/B1.4

1.1 Introduction

The T835 is a high performance microprocessor controlled FM base station receiver designed for single or multichannel operation in the 136 to 174MHz frequency range[1].

The receiver is a dual conversion superhet with a synthesised local oscillator. The first IF is 21.4MHz, allowing exceptionally high spurious signal rejection to be achieved in the receiver front end. The second IF section (455kHz) combines amplitude limiting, detection and RSSI within a single integrated circuit. This IC also drives a noise level detector for gating the audio output. RSSI can also be used to drive a carrier mute for audio output gating (link selectable).

The audio section output can be adjusted to deliver >+10dBm to a 600 ohm 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 optional 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.

The T835 has a width of 60mm and occupies a single space in a Tait rack frame, which has the ability to accommodate up to seven standard modules.

1. Although capable of operating over the 136-174MHz frequency range, the T835 has a 3MHz 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	Link PL220
De-emphasised Audio	1-2	2-3
Flat Audio	2-3	1-2

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	.. -30°C to +60°C
Dimensions:	
Height	.. 183mm
Width	.. 60mm
Length	.. 322mm
Weight	.. 2.13kg

1.2.3 RF Section

Frequency Range	.. 136-174MHz
Type	.. dual conversion superheterodyne
Frequency Increment	.. 5 or 6.25kHz 2.5 or 3.125kHz (T835-26-0000 only)[2]
Switching Range	.. 3MHz (i.e. ±1.5MHz from the centre frequency)
Input Impedance	.. 50 ohms
Frequency Stability (see also Section 1.4)	.. ±2.5ppm, -30°C to +60°C (±1ppm available for special applications)
Signal Strength Indicator (RSSI)	.. -115dBm to -70dBm, 3.5 to 6.5V at approx. 15dB/V

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

IF Amplifiers:

Frequencies	..	21.4MHz 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 (CEPT)	..	30dB (WB) 25dB (NB)	25dB (WB) 20dB (NB)
RF Level -83dBm (CEPT)	..	54dB (MB) 50dB (NB)	49dB (MB) 45dB (NB)
RF Level -57dBm (EIA)	...	55dB (WB)	52dB (WB)

Selectivity:

Narrow Bandwidth (±12.5kHz)	..	86dB minimum, 89dB typical (CEPT)
Mid Bandwidth (±20kHz)	..	87dB minimum, 90dB typical (CEPT)
Wide Bandwidth (±25kHz)	..	92dB minimum, 95dB typical (EIA)

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

Intermodulation Response Attenuation:

Narrow Bandwidth	..	80dB CEPT (typical)
Mid Bandwidth	..	80dB 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 .. 600 ohms
Distortion (@ -70dBm signal level):

		De-emphasised	Flat
Wide Bandwidth	..	≤2%	≤2%
Mid & Narrow Bandwidth	..	≤2%	≤4%

Monitor Output:

Power .. 1W
Speaker Impedance .. 4 ohms
Distortion .. ≤3%
(@ -70dBm signal level, links set to de-emphasis)

1.2.4.2 CTCSS

Linkable High Pass Filter:

Bandwidth .. 350 to 3400Hz
Response .. within +1, -3dB of level at 1kHz
Hum And Noise .. 30dB min. at 250.3Hz
(1kHz at 60% system deviation 35dB typical (67 to 240Hz)
CTCSS at 10% system deviation)

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	.. 6-20dB sinad
Hysteresis	.. 1.5 to 6dB
Threshold	.. adjustable to -105dBm
Opening Time	.. 20ms
Closing Time	.. 50ms

Carrier Mute:

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 set-up (SL210 linked and SL220 not linked - refer to Section 3.8).

1.2.5 Microcontroller

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.

1.3 Product Codes

The three groups of digits in the T830 Series II product code provide information about the model, type and options fitted, according to the conventions described below.

The following explanation of T830 Series II product codes is not intended to suggest that any combination of features is necessarily available in any one product. Consult your nearest Tait Dealer or Customer Service Organisation for more information regarding the availability of specific models, types and options.

Model

The Model group indicates the basic function of the product, as follows:

T83X-XX-XXXX
- T835 receiver
- T836 25W transmitter
- T837 exciter
- T838 50W power amplifier
- T839 100W power amplifier

Type

The Type group uses two digits to indicate the basic RF configuration of the product.

The first digit in the Type group designates the frequency range:

T83X-**X**X-XXXX
- '1' for 136-156MHz
- '2' for 148-174MHz

The second digit in the Type group indicates the channel spacing:

T83X-X**X**-XXXX
- '0' for wide bandwidth (25kHz)
- '3' for mid bandwidth (20kHz)
- '5' for narrow bandwidth (12.5kHz)
- '6' for narrow bandwidth (12.5kHz), United States market only

Options

T83X-XX-**XXXX**

The Options group uses four digits and/or letters to indicate any options that may be fitted to the product. This includes standard options and special options for specific customers. '0000' indicates a standard Tait product with no options fitted. The large number of options precludes listing them here.

1.4 Standard Product Range

The following table lists the range of standard T835 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.

Frequency Range (MHz)[a]		136-156		
IF Bandwidth (kHz)		7.5	12	15
TCXO[b]	±2.5ppm -30°C to +60°C	•	•	•
Receiver Type: T835-		15-0000	13-0000	10-0000

Frequency Range (MHz)[a]		148-174			
IF Bandwidth (kHz)		7.5	7.5	12	15
TCXO[b]	±2.5ppm -30°C to +60°C	•	•	•	•
Receiver Type: T835-		26-0000[c]	25-0000	23-0000	20-0000

a. Selectable by solder links and the appropriate VCO - refer to Section 3.7.

b. A TCXO with a stability of ±1ppm (0°C to +60°C) is available to suit specific requirements. Contact your nearest authorised Tait Dealer or Customer Service Organisation for further details.

c. US market only.

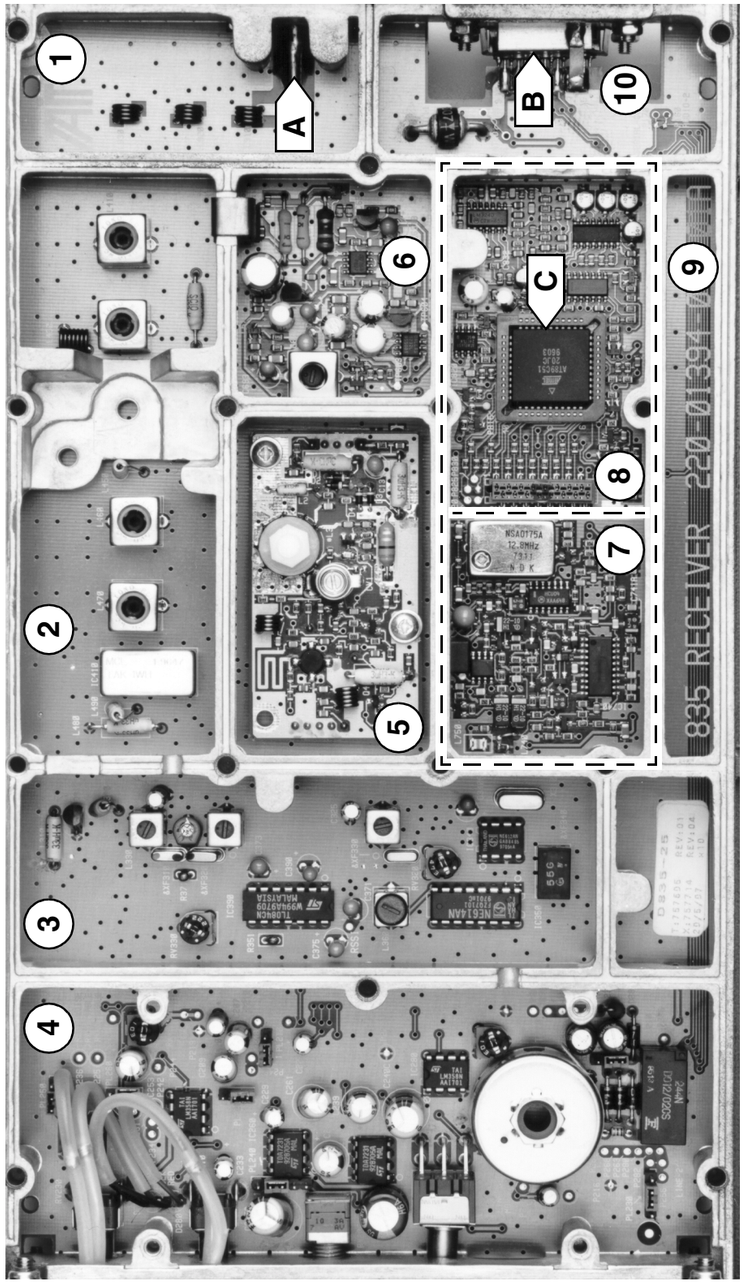
You can identify the receiver type by checking the product code printed on a label on the rear of the chassis (Figure 1.1 in Part A shows typical labels). You can further verify the receiver type by checking the placement of an SMD resistor in the table that is screen printed onto the PCB (refer to Section 6.1 for more details).

The photograph in Figure 1.1 on the next page will help you to identify the main circuit blocks in the T835.

There is a similar photograph in Figure 4.3 which shows the main tuning and adjustment controls.

Extending both these fold-outs will allow you to refer to both photographs while using the manual.

The photograph in Figure 1.2 on the next page shows the T835 front panel controls.



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 & DC in (refer to Section 1.2 in Part F)
C microcontroller

Figure 1.1 T835 Main Circuit Block Identification

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.

Supply LED

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

Line Level

Sets the audio output line level.

Monitor Volume

Adjusts the speaker volume if a speaker is connected.

Monitor Mute

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

On - audio muted
Off - audio unmuted.

Figure 1.2 T835 Front Panel Controls

2 T835 Circuit Operation

This section provides a basic description of the circuit operation of the T835 receiver.

Note: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 3.00 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.

Section	Title	Page
2.1	**Introduction**	**2.3**
2.2	**Receiver Front End**	**2.4**
2.3	**Mixer**	**2.5**
2.4	**IF Circuitry**	**2.5**
2.5	**Noise Mute (Squelch)**	**2.6**
2.6	**Carrier Mute**	**2.6**
2.7	**Audio Processor**	**2.7**
2.8	**Power Supply And Regulators**	**2.8**
2.9	**Microcontroller**	**2.9**
2.10	**Synthesised Local Oscillator**	**2.10**
2.11	**VCO**	**2.11**
2.12	**Received Signal Strength Indicator (RSSI)**	**2.11**

Figure	Title	Page
2.1	T835 High Level Block Diagram	2.3
2.2	T835 Front End, IF and Mute Block Diagram	2.4
2.3	T835 Audio Processor Block Diagram	2.7
2.4	T835 Power Supply And Regulator Block Diagram	2.8
2.5	T835 Microcontroller Block Diagram	2.9
2.6	T835 Synthesiser Block Diagram	2.10

2.1 Introduction

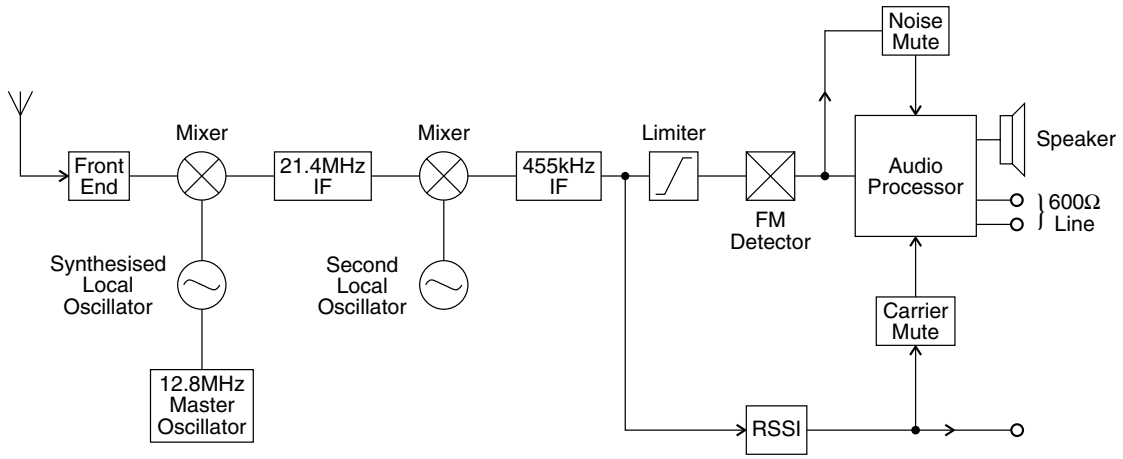


Figure 2.1 T835 High Level Block Diagram

The T835 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.)

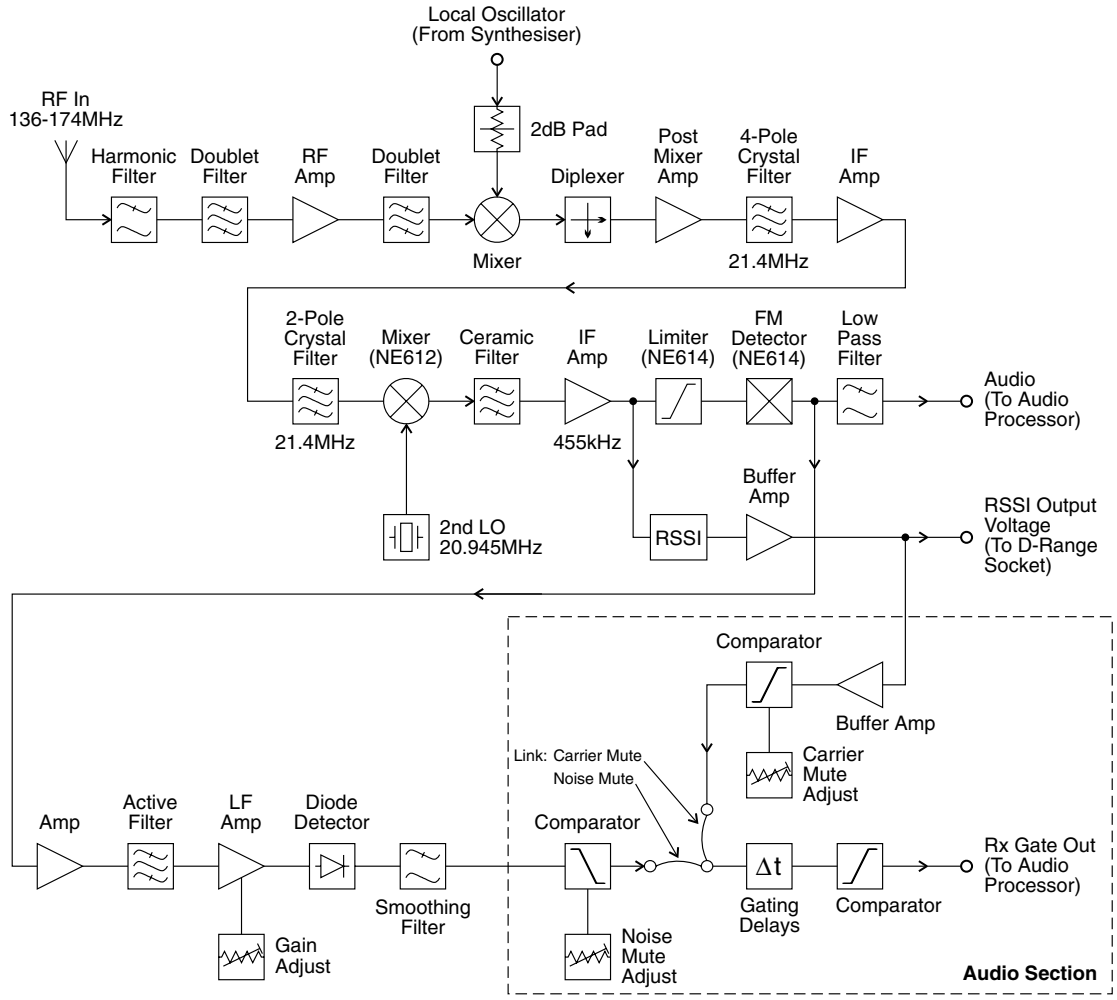


Figure 2.2 T835 Front End, IF and Mute Block Diagram

The incoming signal from the N-type antenna socket is fed through a 7-pole, low pass filter with a cut off frequency of approximately 200MHz. This low loss filter (typically less than 0.5dB insertion loss over 136-174MHz) provides excellent immunity to interference from high frequency signals.

The signal is then further filtered, using a notched doublet (L410, L420) which provides exceptional image rejection, before being amplified by approximately 12dB (Q420). The signal is then passed through a further doublet (L460, L470) before being presented to the mixer.

Each sub-block within the front end has been designed with 50 ohm terminations for ease of testing and fault finding.

2.3 Mixer

(Refer to the front end circuit diagram (sheet 4) in Section 6 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 +22dBm (typical) and this is fed to the mixer via a 2dB attenuator pad. A diplexer terminates the IF port of the mixer in a good 50 ohms, thus preventing unnecessary intermodulation distortion.

2.4 IF Circuitry

(Refer to the IF section circuit diagram (sheet 3) in Section 6 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 (&XF310 and &XF320) which is matched into 50 ohms on both its input and output ports. This stage is followed by a two-stage amplifier (designed as a 50 ohm block) and second crystal filter (2 pole, &XF330), after which the signal is mixed down to 455kHz with the second local oscillator (20.945MHz) by IC340.

The 455kHz signal is filtered using a six-pole ceramic filter (&XF340) before being limited and detected.

The second IF mixer, limiter, detector and RSSI is in a 16-pin IC (IC350). Quadrature detection is employed, using L360, and the recovered audio on pin 7 of IC350 is typically 0.3V p-p 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 and Figure 2.2.)

The noise mute operates on the detected noise outside the audio bandwidth. An operational amplifier in IC390 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 (Q340 & Q350) 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 introduced 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 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.)

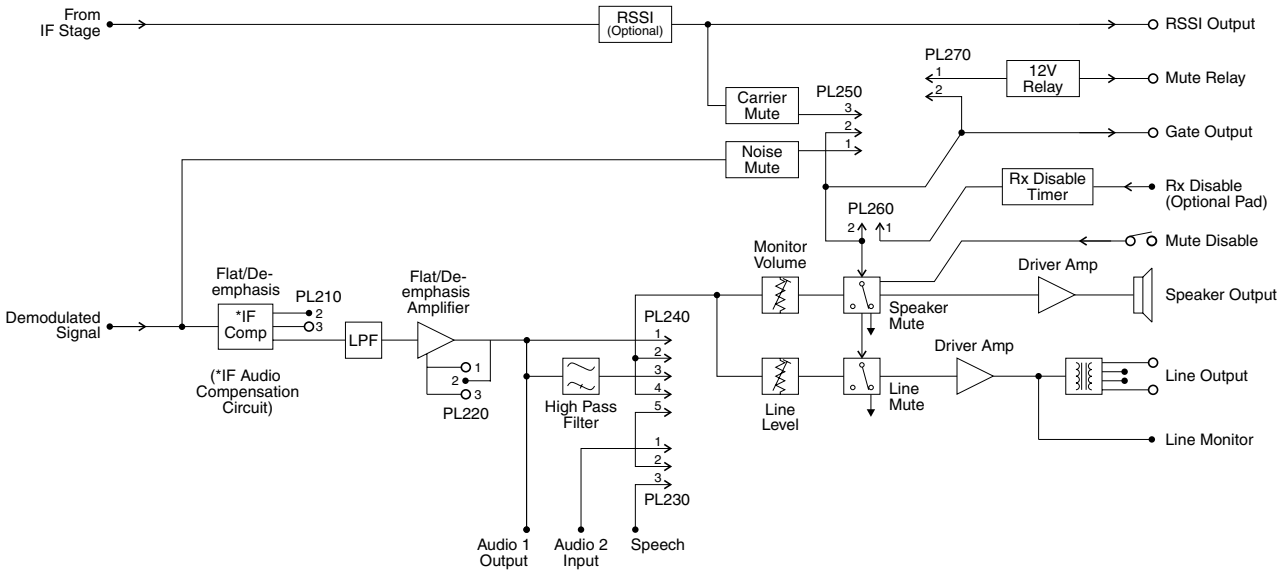


Figure 2.3 T835 Audio Processor Block Diagram

The recovered audio on pin 7 of IC350 is processed by IC390 and passed through a frequency compensation network and a third order elliptic active filter (IC210) to give the required response. Linking (PL220 & 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, 600 ohm 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 Mute" switch (SW201) on the front panel opens the mute, allowing continuous monitoring of the audio signal (on = audio muted; off = audio unmuted).

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 & 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 (refer to Section 1.4 in Part G).

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.)

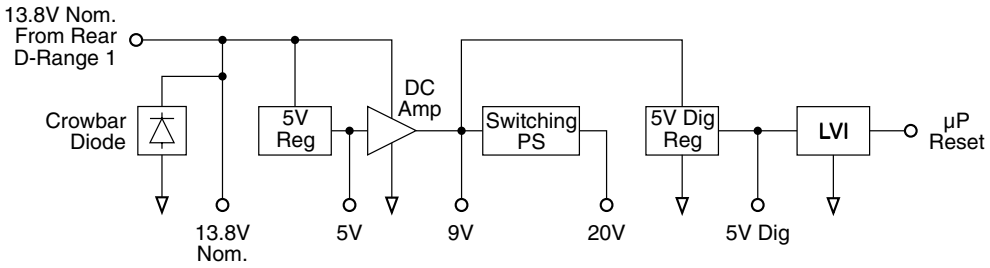


Figure 2.4 T835 Power Supply And Regulators Block Diagram

The T835 is designed to operate off a 10.8-16V 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.

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 (IC750), 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.)

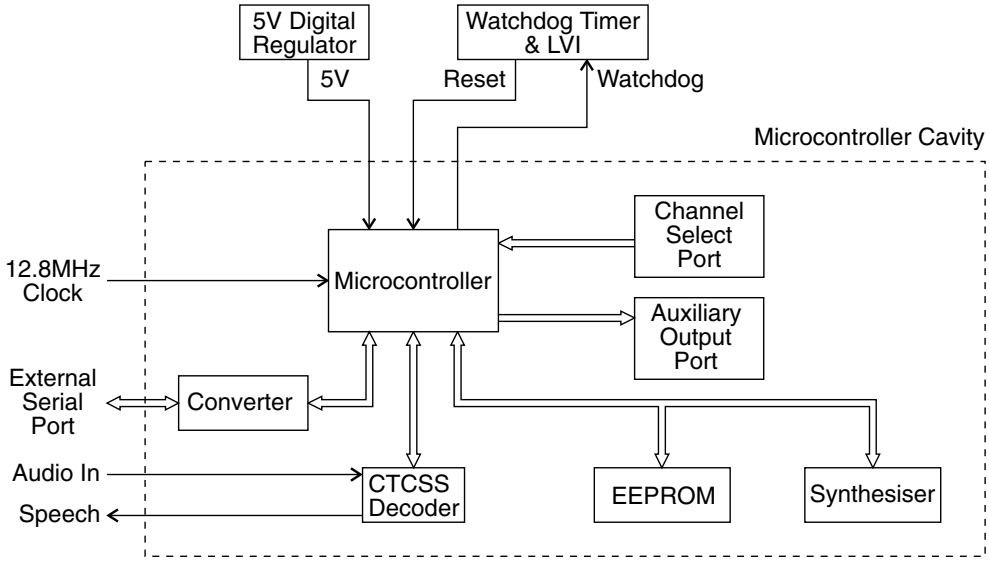


Figure 2.5 T835 Microcontroller Block Diagram

Overall system control of the T835 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) & 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 and the VCO circuit diagram in Part E.)

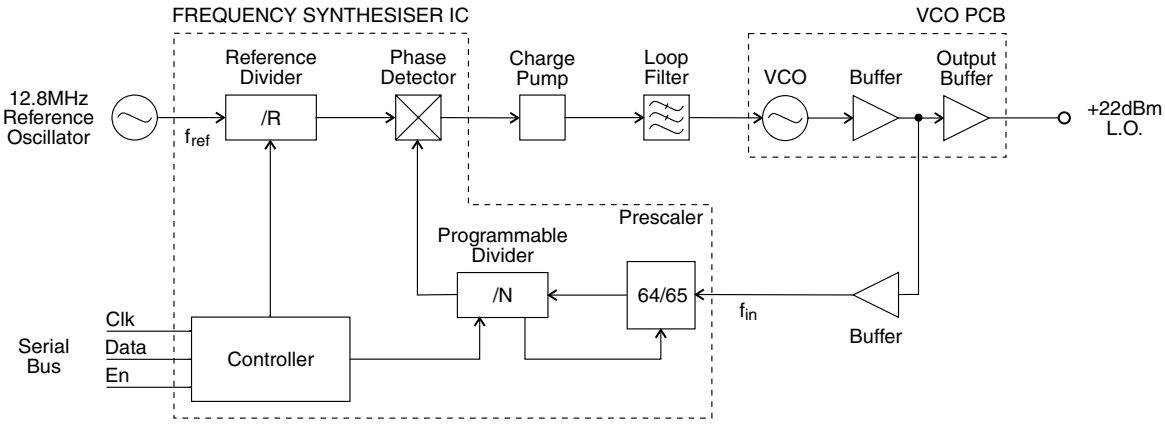


Figure 2.6 T835 Synthesiser Block Diagram

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[1] 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 (R510, C505) to attenuate noise and other spurious signals. Note that the VCO frequency increases with increasing control voltage.

Editor's Note:	The last paragraph in Section 2.10 has been deleted as it applied only to an exciter/transmitter.

1. 2.5kHz or 3.125kHz for T835-26-0000

2.11 VCO

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

The VCO transistor (Q1) operates in a common source 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-D4) to facilitate tuning within a 3MHz band of frequencies. A trimcap (CV1) 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 +22dBm (typically) to the receiver mixer input pad.

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 frequency required by the first mixer, i.e. there are no multiplier stages.

The VCO frequency spans from either 157-177MHz or 169-196MHz according to product type (refer to Section 1.4). The VCO is tuned to 21.4MHz above the desired receive frequency (high side injection) to produce a 21.4MHz IF signal at the output of the mixer.

2.12 Received Signal Strength Indicator (RSSI)

(Refer to the IF section circuit diagram (sheet 3) in Section 6.)

The RSSI provides a DC voltage proportional to the signal level at the receiver input and is an on-chip function of IC350. Buffering is provided by IC390 and the 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 at RV235.

3 T835 Initial Tuning & 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 3.00 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.

Section	Title	Page
3.1	**Introduction**	**3.3**
3.2	**Channel Programming**	**3.3**
3.3	**Test Equipment Required**	**3.4**
3.4	**Short Tuning Procedure**	**3.5**
3.4.1	Introduction	3.5
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3.4.7	RSSI (If Used)	3.8

Section	Title	Page
3.5	**Audio Processor Links**	**3.8**
3.5.1	General	3.8
3.5.2	Audio Processor Linking Details For CTCSS	3.9
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3.11	**Audio Processor**	**3.13**
3.11.1	Line Amplifier Output	3.13
3.11.2	Monitor Amplifier Output (Speaker Output)	3.13
3.12	**CTCSS**	**3.13**
3.12.1	Decoder Operation	3.13
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3.13	**RSSI**	**3.14**

Figure	Title	Page
3.1	T835 Test Equipment Set-up For Short Tuning Procedure	3.4
3.2	T835 Test Equipment Set-up For Full Tuning & Adjustment Procedure	3.4

3.1 Introduction

When you receive your T835 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 3MHz switching range (i.e. ±1.5MHz 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 3MHz 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 an IBM™ PC. You can also use PGM800Win to select the receiver's current operating frequency (or "default channel").

If the receiver is installed in a rack frame, you can program it via the programming port in the speaker 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 the rack frame backplane PCB. Refer to Part C in the T800 Series Ancillary Equipment Service Manual (M800-00-101 or later issue) or 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).

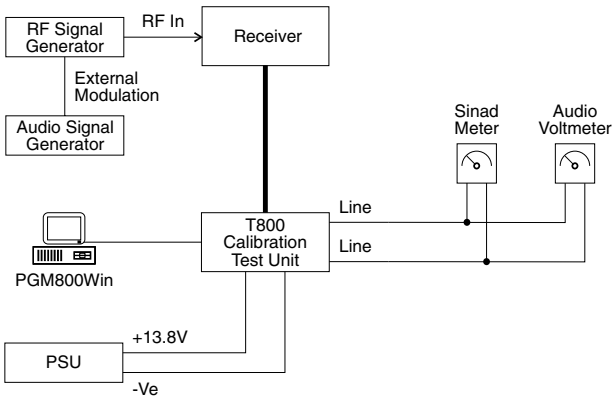


Figure 3.1 T835 Test Equipment Set-up For Short Tuning Procedure

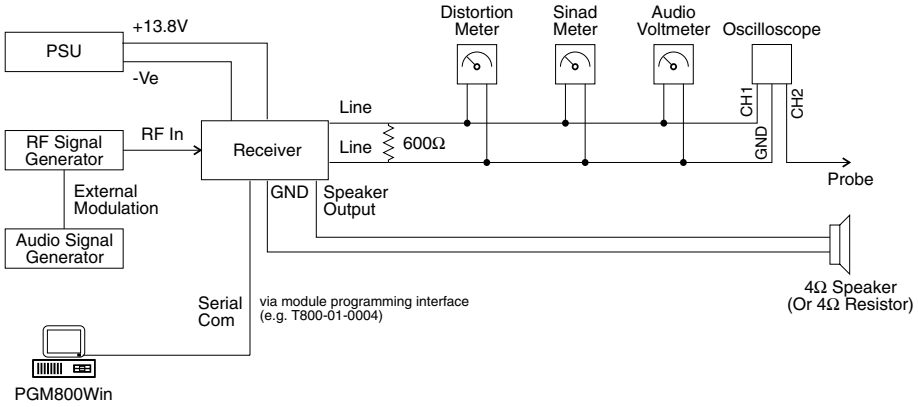


Figure 3.2 T835 Test Equipment Set-up For Full Tuning & Adjustment Procedure

3.4 Short Tuning Procedure

Use this procedure only if you want to reprogram the receiver to a frequency outside the 3MHz 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 (nearest the handle).

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 PL4-1 or the junction of L1 & R1 in the VCO (this measures the synthesiser loop voltage).

- **Single Channel** Tune VCO trimmer CV1 for a synthesiser loop voltage of 9V.

  Multichannel Tune VCO trimmer CV1 for a synthesiser loop voltage of 9V on the middle channel.

  If there is no middle channel, tune CV1 so that the channels are symmetrically placed around a loop voltage of 9V.

  All channels should lie within the upper and lower limits of 13V and 5V respectively.

  Do not attempt to program channels with a greater frequency separation than the specified switching range of 3MHz.

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 front end doublets L410, L420, L460 & L470 to give best sinad.

Continually decrease the RF level to maintain 12dB sinad.

Readjust L410, L420, L460 & L470 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

Carry out the one of the following sets of instructions according to the mute option you have selected.

3.4.4.1 Noise Mute

Connect pins 1 & 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 RV330 (noise mute gain) fully clockwise to close the mute (if necessary turn off the RF signal and then turn it on again).

Rotate RV330 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 & 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 & 2 linked (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	de-emphasised response
PL230	2 - 3	audio from internal CTCSS speech filter
PL240	4 - 5	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 Used)

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 -100dBm with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Adjust RV320 (RSSI level) to give 4.5V 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	Function
PL210	[1 - 2] 2 - 3	de-emphasised response flat response
PL220	1 - 2 [2 - 3]	flat response de-emphasised response
PL230[a]	1 - 2 [2 - 3] 3 - 4	audio input via AUDIO-2 pad audio from internal CTCSS speech filter audio input via I/O pad P250
PL240[a]	1 - 2 [2 - 3] or 3 - 4 4 - 5	bypass high pass filter 300Hz high pass filter in circuit audio input via PL230 or I/O pad
PL250	[1 - 2] 2 - 3	noise mute carrier mute
PL260[b]	1 - 2 [2 - 3]	RX-DISABLE link not connected
PL270	[1 - 2] 2 - 3	relay link not connected

a. Refer to Section 3.5.2 for further details.

b. Refer to Section 1.4 in Part G 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	2 - 3
received CTCSS + speech passed to line output	3 - 4	1 - 2
high pass filtered speech, internal CTCSS detection	2 - 3	4 - 5
external CTCSS detection	1 - 2	4 - 5

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 & noise 55dB
- received CTCSS tone + speech to line output
  - tone and speech transmitted down 600 ohm line
  - audio bandwidth 10Hz to 3kHz
  - hum & noise 45dB
- high pass filtered speech + internal CTCSS detection
  - 400Hz to 3kHz
  - hum & 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 600 ohm 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 PGM800Win software.

- Connect a high impedance voltmeter to PL4-1 or the junction of L1 & R1 in the VCO (this measures the synthesiser loop voltage).

- **Single Channel** Tune VCO trimmer CV1 for a synthesiser loop voltage of 9V.

  Multichannel Tune VCO trimmer CV1 for a synthesiser loop voltage of 9V on the middle channel.

  If there is no middle channel, tune CV1 so that the channels are symmetrically placed around a loop voltage of 9V.

  All channels should lie within the upper and lower limits of 13V and 5V respectively.

  Do not attempt to program channels with a greater frequency separation than the specified switching range of 3MHz.

- 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 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: **Frequency Range**

136-156MHz: **Check that links SL405 to SL440 and link B in the front end are bridged with solder.**

148-174MHz: **Check that link A is bridged with solder and links SL405 to SL440 and link B are not connected.**

VCO: **The correct VCO is fitted at the factory. If you change the operating frequency range of the receiver, make sure you also fit the correct VCO for that frequency range.**

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 front end doublets L410, L420, L460 & L470 to give best sinad.

Continually decrease the RF level to maintain 12dB sinad.

Roughly tune IF coils L330/L340/L350, CV318 and quad coil L360 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 21.4MHz - you will hear a beat note.

Trim the synthesiser TCXO (IC700) 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 5V p-p.

Readjust L410, L420, L460 & L470 to give 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 the RSSI test point (TP310) and connect plugs PL210 and PL220 to give a flat audio response (refer to Section 3.5).

Readjust IF coils L330/L340/L350, CV318 and quad coil L360 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 L360, 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 bandwidth	≤4%
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 & 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 & 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 RV330 (noise mute gain) fully clockwise to close the mute (if necessary turn off the RF signal and then turn it on again).

Rotate RV330 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 & 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 600 ohm 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 4 ohm resistive load.

Check for any clipping or distortion on the oscilloscope.

Switch to a 4 ohm 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 & 2 linked (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	de-emphasised response
PL230	2 - 3	audio from internal CTCSS speech filter
PL240	4 - 5	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

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 -100dBm with ±3kHz deviation (±2.4kHz) [±1.5kHz] at 1kHz.

Adjust RV320 (RSSI level) to give 4.5V RSSI output on pin 5 of D-range 1 (PL100) when measured with a high impedance DMM.

4 T835 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 T835 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 3.00 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.

Section	Title	Page
4.1	Current Consumption	4.3
4.2	Sensitivity	4.3
4.3	Switching Range	4.3
4.4	Audio Distortion	4.4
4.5	Ultimate Signal-To-Noise Ratio	4.4
4.6	De-emphasised Audio Frequency Response	4.5
4.7	Noise Mute (If Linked In)	4.6
4.8	RSSI	4.6
4.9	Carrier Level Mute (Carrier Mute Linked In)	4.7

Editor's Note: The CTCSS adjustment procedures described in Section 4.10 have been moved to a more appropriate location in Section 3 as part of the Initial Tuning & Adjustment procedure (refer to Section 3.4.6 and Section 3.12).

Figure	Title	Page
4.1	T835 De-emphasised Audio Frequency Response	4.5
4.2	T835 RSSI Voltage vs Signal Strength	4.6
4.3	T835 Main Tuning & Adjustment Controls	4.9

4.1 Current Consumption

Connect the T835 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 T835 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 3MHz 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 F) 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 600 ohms.

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 4 ohm 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 & 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).

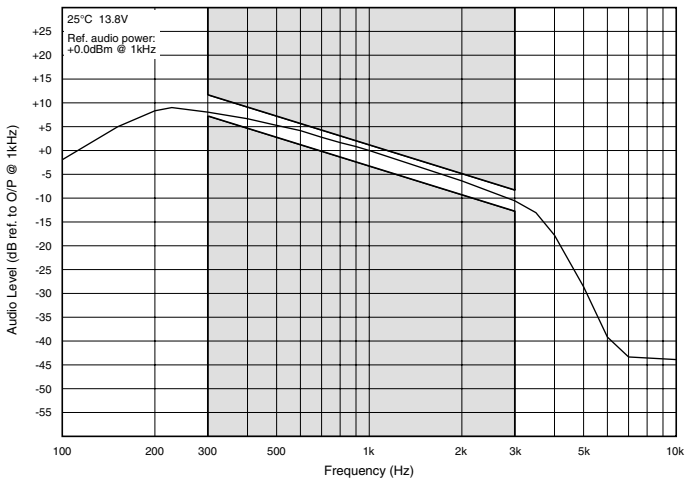
Note: You can make the measurement without the 300Hz high pass filter, but the result will be 10dB worse.

4.6 De-emphasised Audio Frequency Response

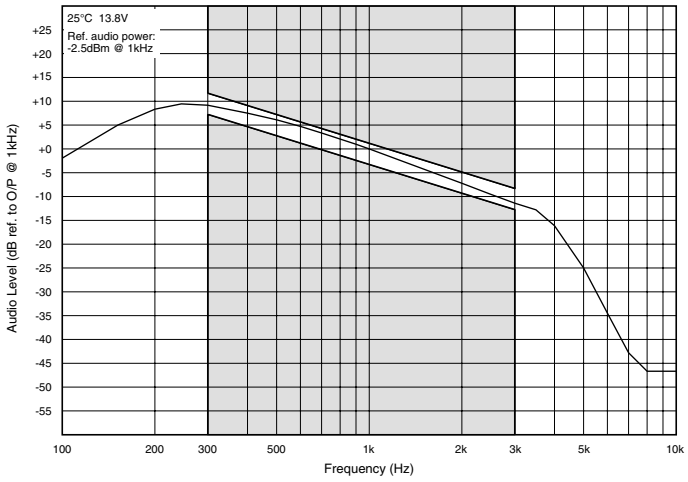
Set RV210 (front panel line level) to provide 0dBm output at 1kHz modulating frequency.

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

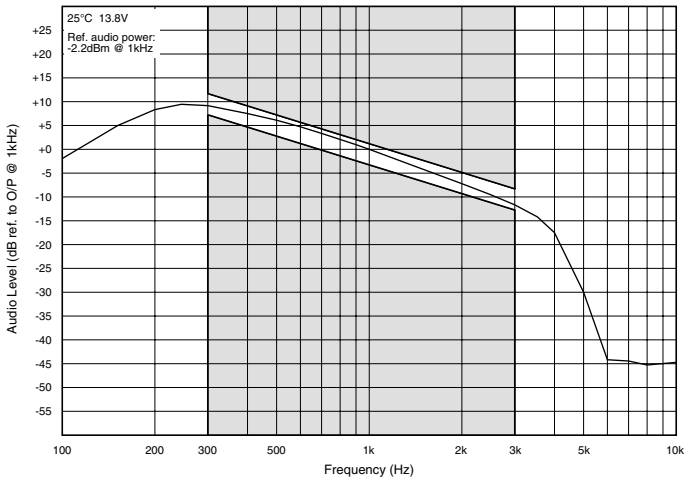


Figure 4.1 T835 De-emphasised Audio Frequency Response

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.

Note: False opening of the mute can occur if the RF generator's attenuator is noisy when the level is being changed.

4.8 RSSI

Apply an on-channel signal from the RF generator at a level of -100dBm 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 4.5V (nominal).

Vary the RF level in 5dB steps and check that the RSSI output voltage changes at a rate of approximately 15dB/V over the range of -115dBm to -70dBm (refer to Figure 4.2 for RSSI voltage vs signal strength).

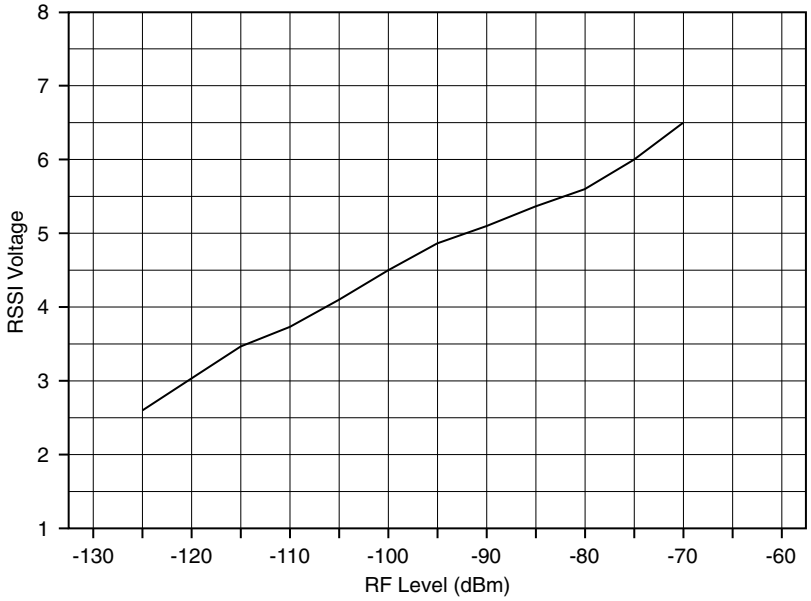


Figure 4.2 T835 RSSI Voltage vs Signal Strength

4.9 Carrier Level Mute (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.

Editor's Note:	The CTCSS adjustment procedures described in Section 4.10 have been moved to a more appropriate location in Section 3 as part of the Initial Tuning & Adjustment procedure (refer to Section 3.4.6 and Section 3.12).

The photograph printed at right will help you to identify the main controls used in tuning and adjusting the T835.

There is a similar photograph in Figure 1.1 which shows the main circuit blocks.

Extending both these fold-outs will allow you to refer to both photographs while using the manual.

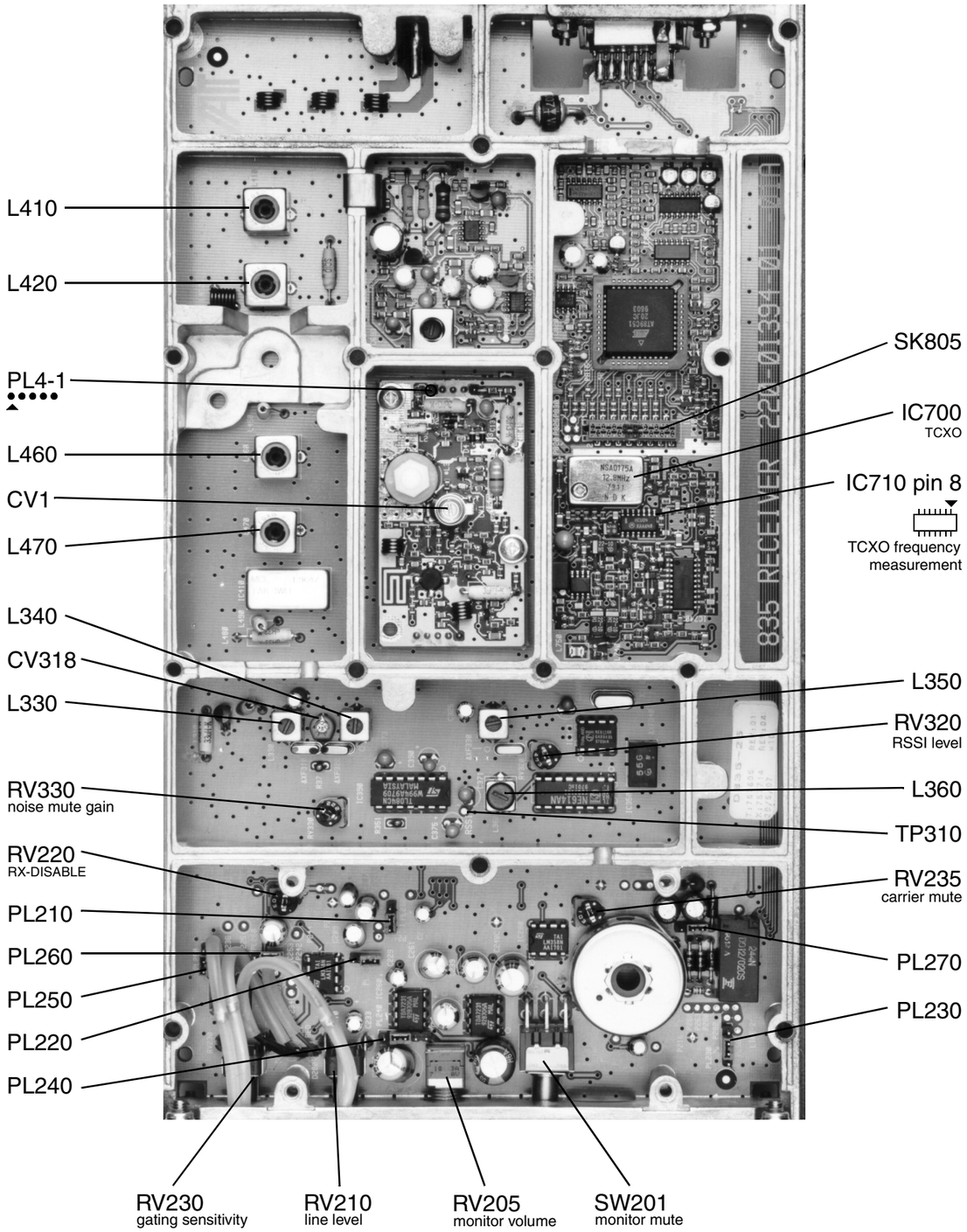


Figure 4.3 T835 Main Tuning & Adjustment Controls

5 T835 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 Customer 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 3.00 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.

Section	Title	Page
5.1	**Visual Checks**	**5.3**
5.2	**Component Checks**	**5.3**
5.3	**Front Panel LED Indicator**	**5.3**
5.4	**DC Checks**	**5.4**
5.4.1	Power Rails	5.4
5.4.2	VCO Locking	5.4
5.4.3	Mute Operation	5.4
5.5	**RF Checks**	**5.5**
5.5.1	VCO Frequency	5.5
5.5.2	RF Sensitivity	5.5
5.5.3	Oscillator Stability	5.6
5.5.3.1	TCXO	5.6
5.5.3.2	Second IF	5.6
5.5.4	Demodulator Output	5.6
5.5.5	IF Distortion	5.7

Section	Title	Page
5.6	**PGM800Win Generated Errors**	**5.8**
5.7	**Fault Finding Charts**	**5.9**
5.7.1	Microcontroller	5.9
5.7.1.1	Basic Checks	5.9
5.7.1.2	Serial Communication	5.10
5.7.1.3	CTCSS Decode	5.11
5.7.2	Regulator	5.12
5.7.3	Synthesiser	5.13
5.7.4	Noise Mute	5.16
5.7.5	Carrier Mute	5.17
5.7.6	Receiver	5.18
5.7.7	Audio	5.19

Figure	Title	Page
5.1	RF Test Cable	5.5
5.2	IF Swept Response	5.7
5.3	Ceramic Filter Swept Response	5.7

5.1 Visual Checks

Remove the covers from the T835 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 20k ohm/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 receiver front panel will flash according to the conditions described in the following table:

Flash Rate		Condition
fast	(⅓ sec. on/⅓ sec. off approx.)	receiver is linked with PGM800Win
slow	(1 sec. on/1 sec. off approx.)	VCO is out of lock - refer to Section 5.4.2
unequal	(⅓ sec. on/1 sec. 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 & 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 IC350 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 at PL4-1 or the junction of L1 & R1 on the VCO PCB.

If the synthesiser is locked and the VCO aligned, the voltage at this point should be between 5 and 13V.

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 +19dBm) to the VCO input to the mixer (IC410).

Monitor the local oscillator frequency and check that it is 21.4MHz ***above*** 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 links SL405 to SL440 and link B in the front end are set correctly for the operating frequency (refer to Section 3.7).

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.

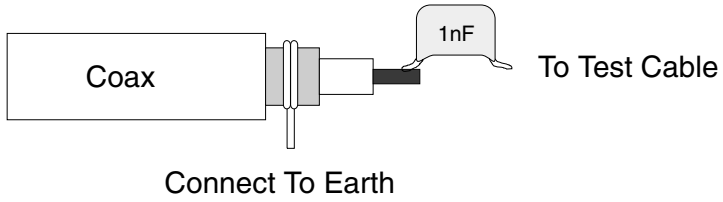


Figure 5.1 RF Test Cable

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 21.4MHz 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 21.4MHz - 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 the frequency of the 455kHz signal for zero beat.

If the second IF is more than 300Hz off frequency, check IC340, X310, C345 and C347 and replace if necessary.

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 IC350 pin 7 (audio output).

Check that an audio signal of approximately 380mV peak to peak is present.

With the audio response set to flat, optimum tuning of the quad coil (L360) for minimum audio distortion should coincide with maximum audio amplitude and a DC level of approximately 1.3V.

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 approximately ±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 IC350 pin 16 via a suitable RF probe on the "Y" input. Alternatively, use an oscilloscope probe for the "Y" input to monitor the RSSI output voltage at TP310 (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 (&XF340).

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).

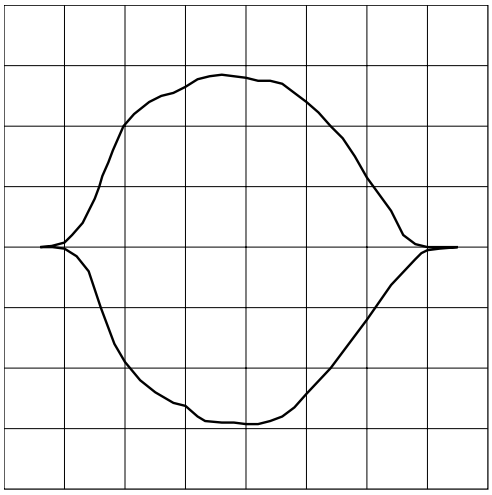


Figure 5.2 IF Swept Response

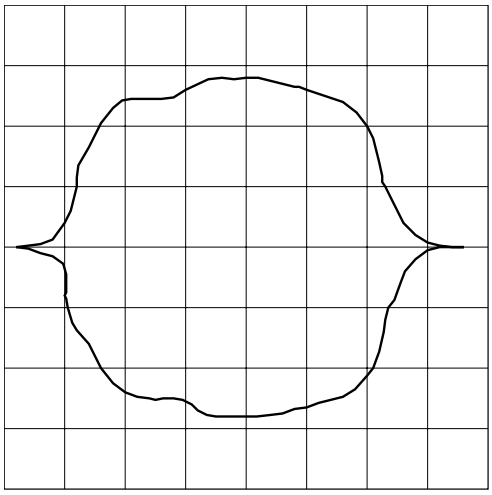


Figure 5.3 Ceramic Filter Swept Response

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 was not accepted by the base station because a channel is selected externally. Try turning the external channel switch off before changing the default channel in PGM800Win.

Synth Out Of Lock

The synthesiser received incorrect data, the data was corrupted, or a frequency outside the VCO switching range was entered. 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. The link to the module has somehow been broken, possibly due to a temporary loss of the power supply to the module. Try relinking the module in PGM800Win (F9 key or the 'Link Module' option on the 'Communication' menu).

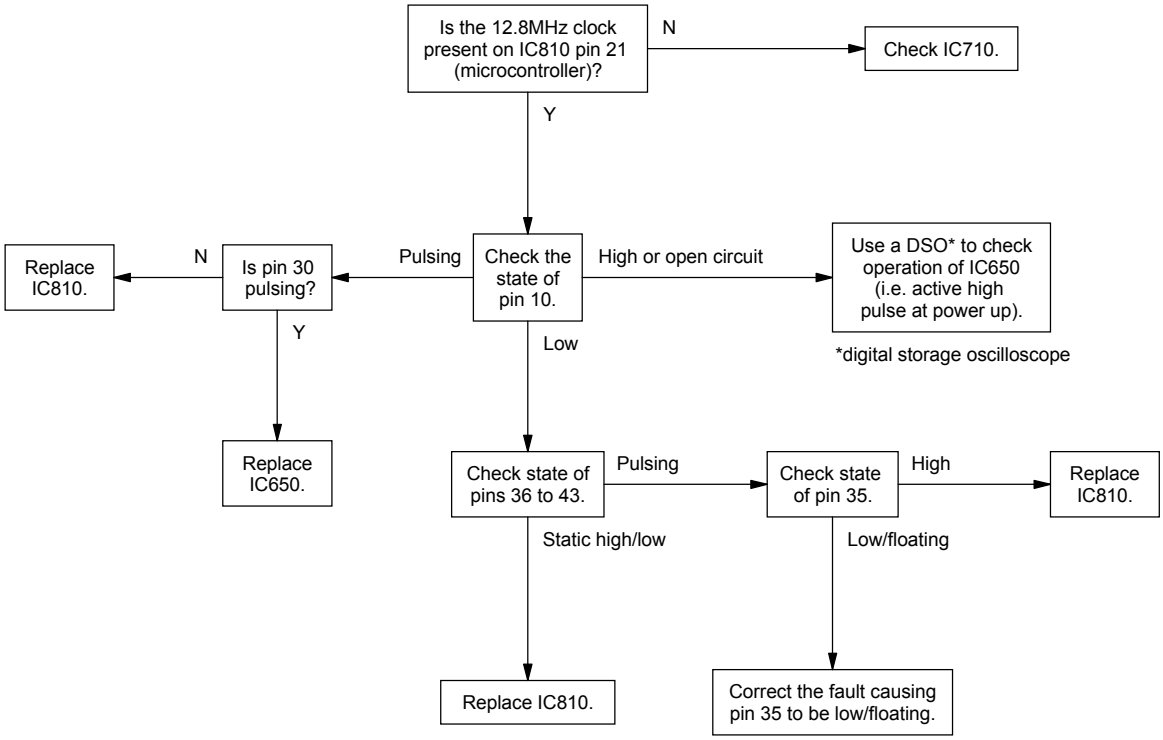
5.7 Fault Finding Charts

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

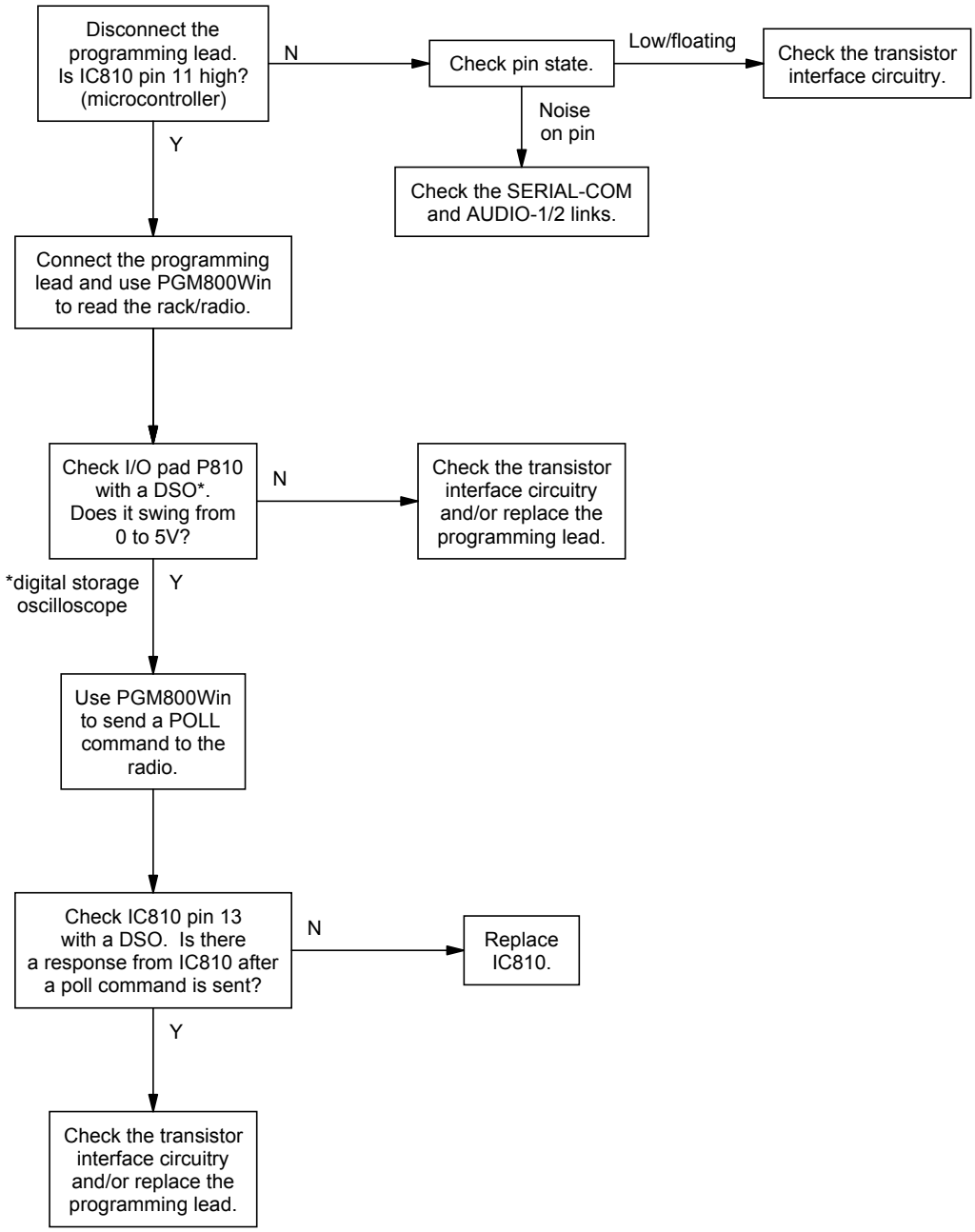
TP601	13.8V
TP602	9V
TP603	20V
TP604	5V

5.7.1 Microcontroller (IC810)

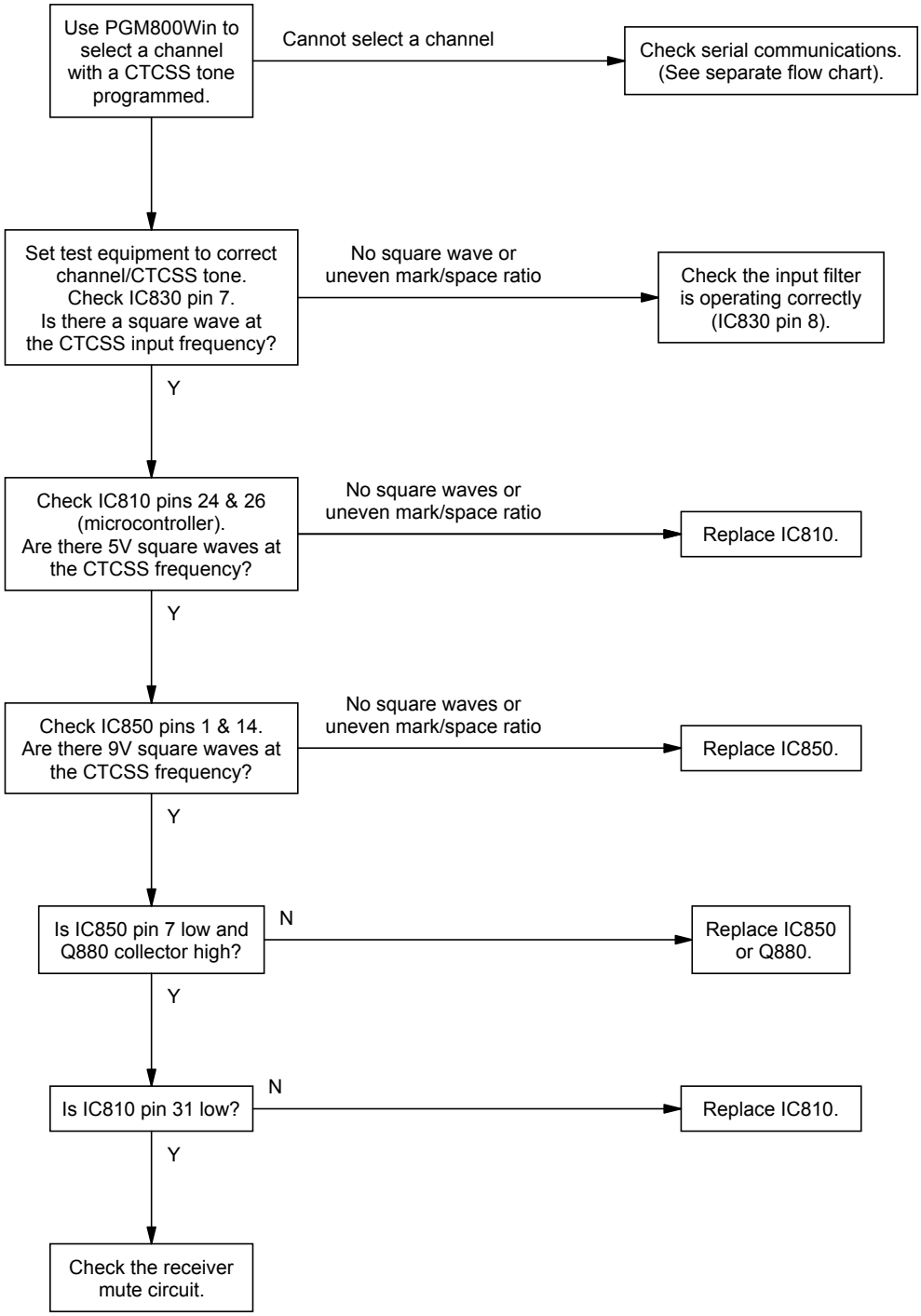
5.7.1.1 Basic Checks



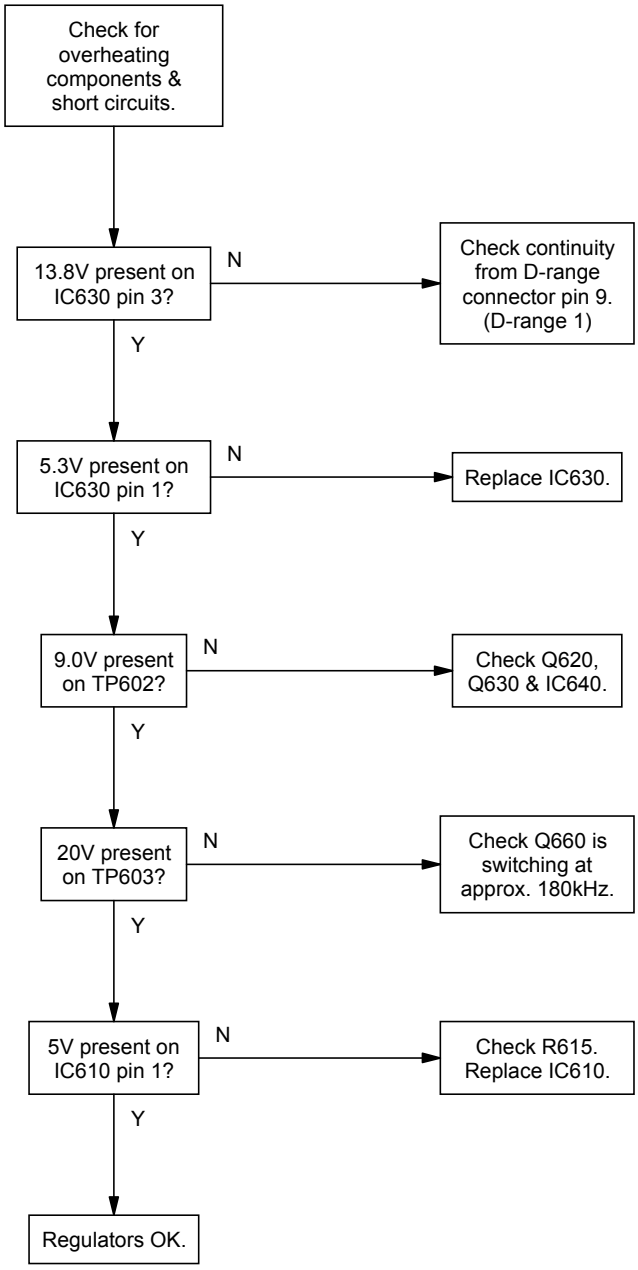
5.7.1.2 Serial Communication



5.7.1.3 CTCSS Decode

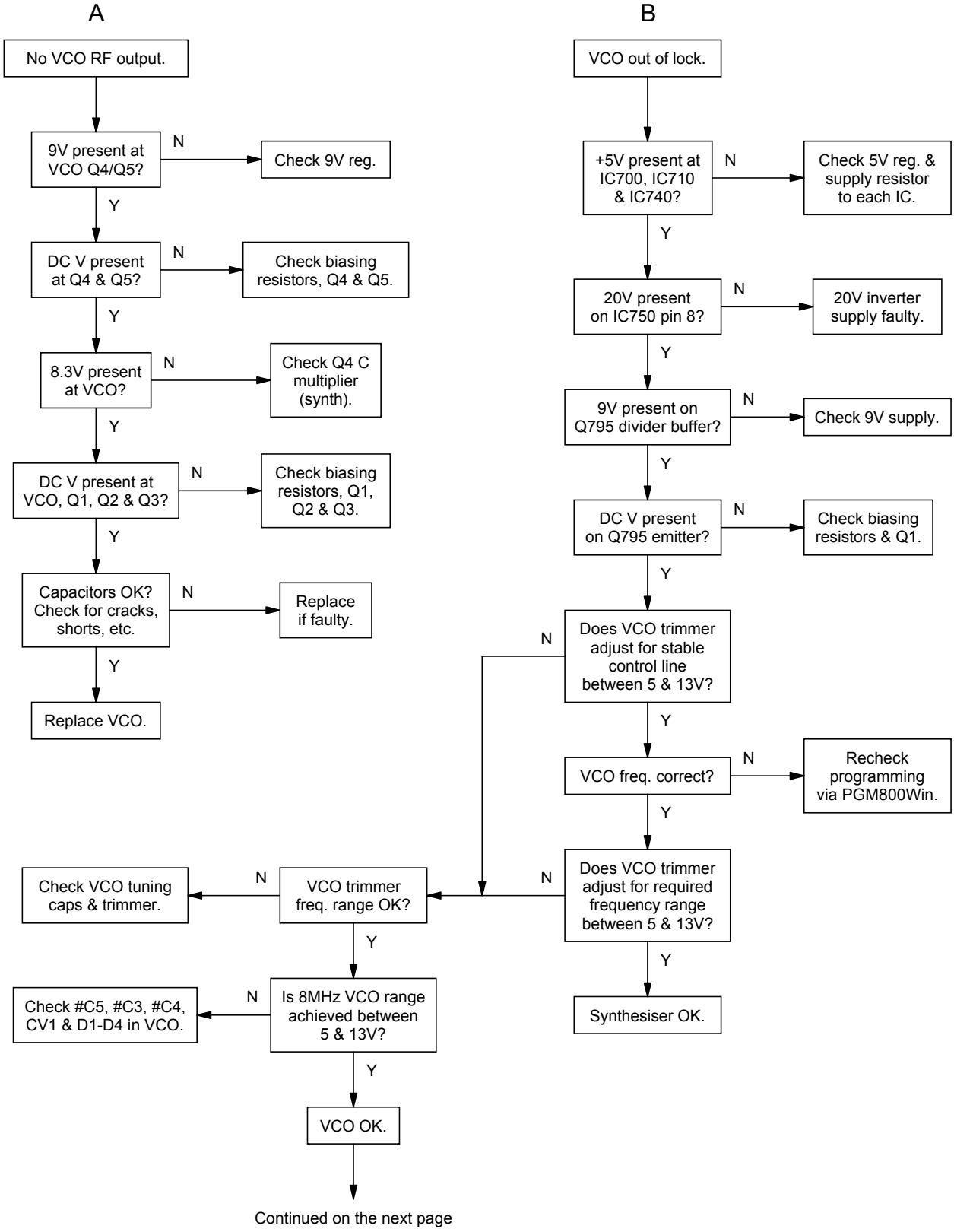


5.7.2 Regulator



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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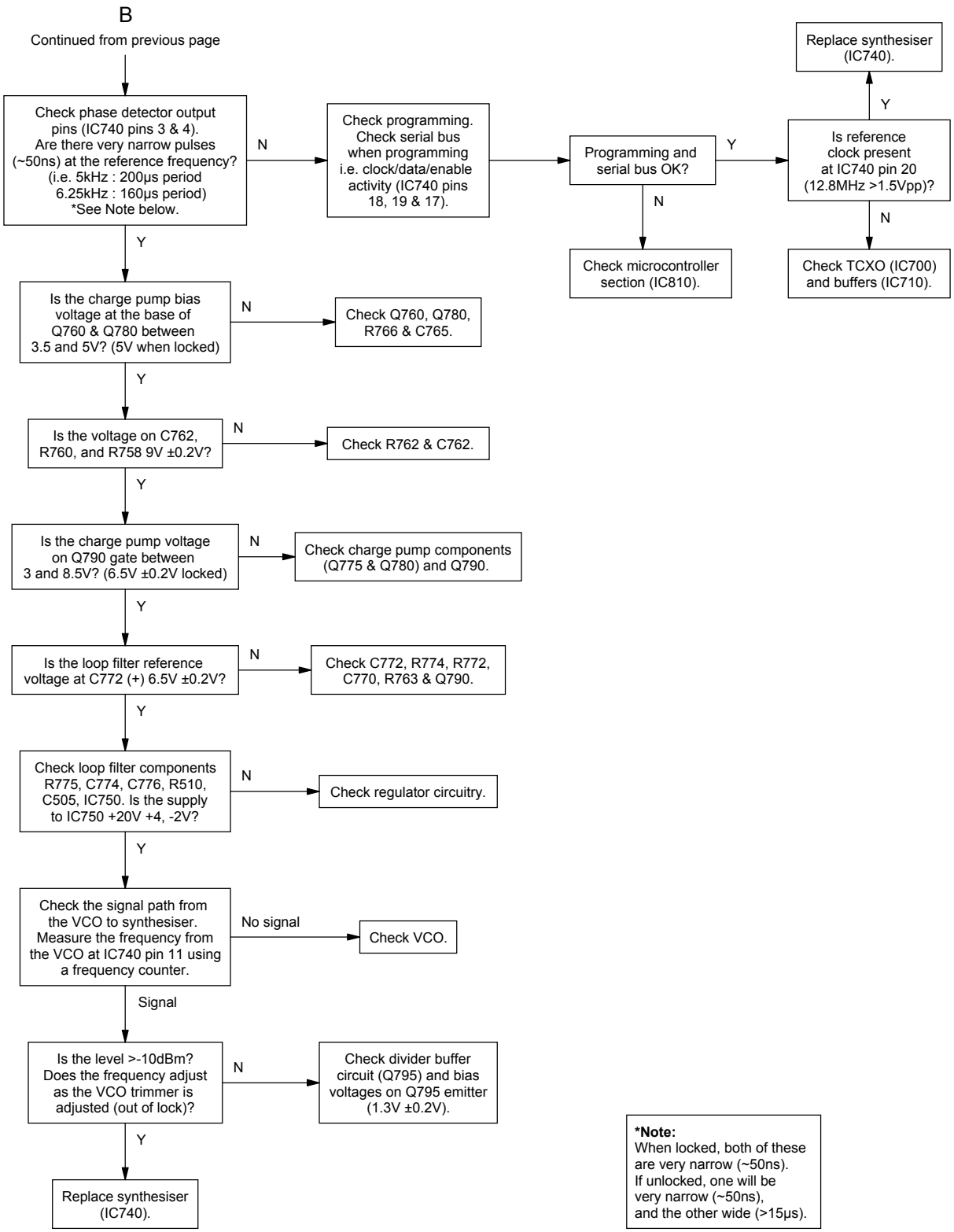
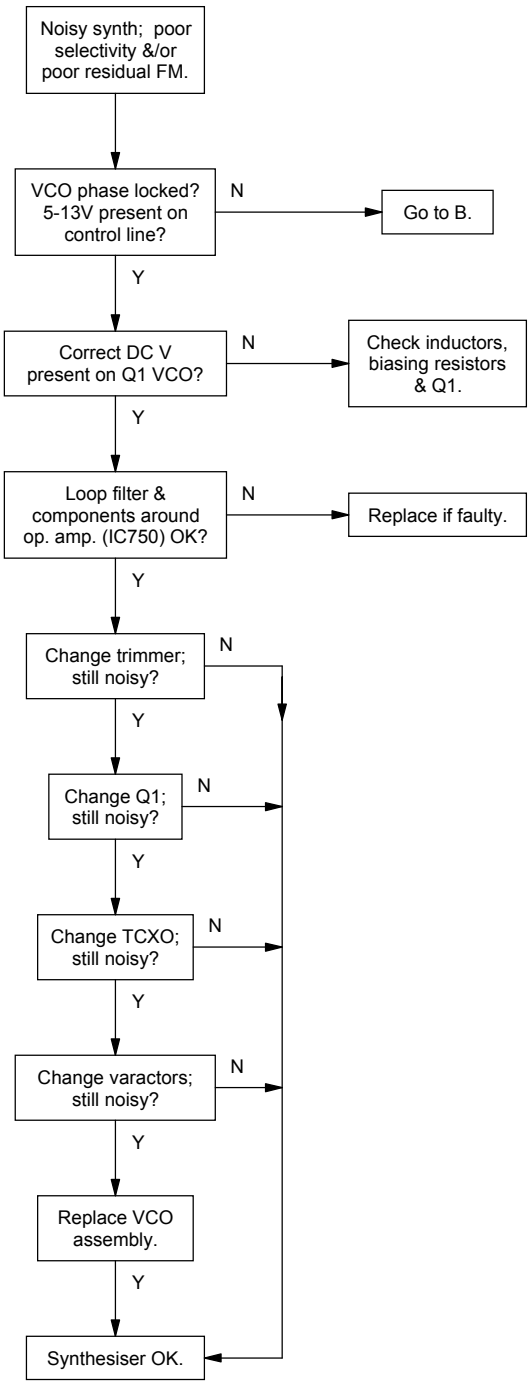
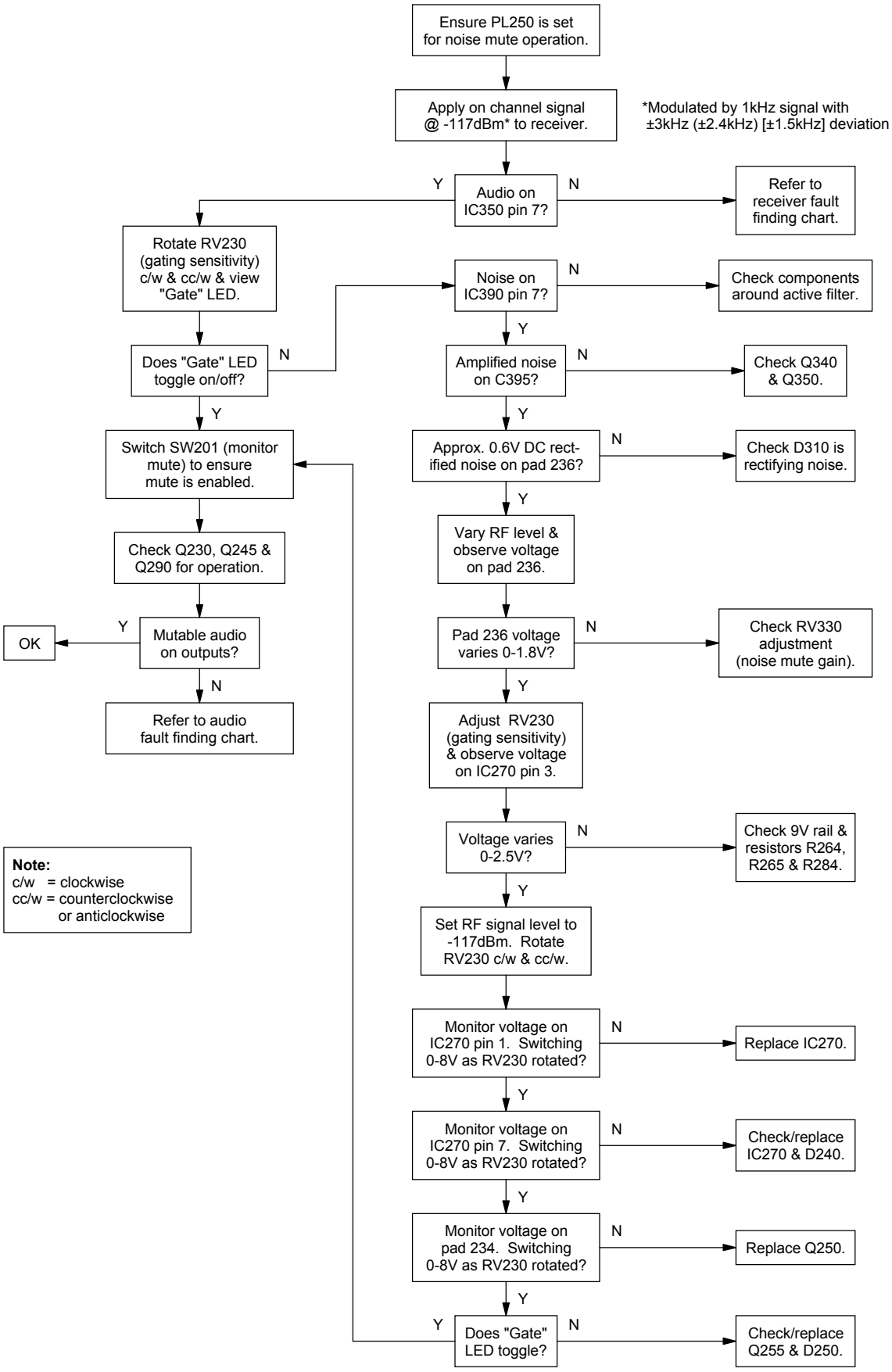


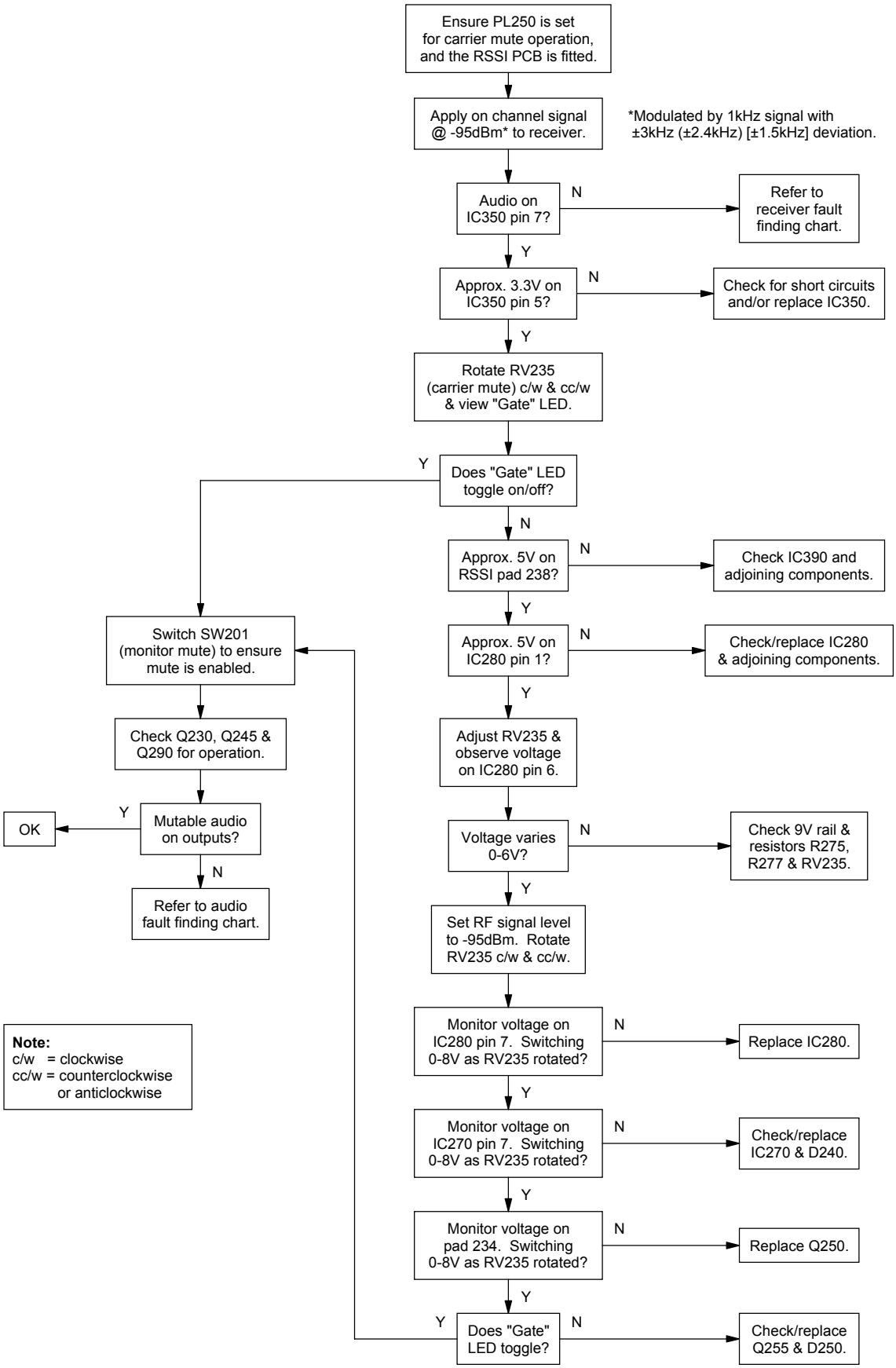
C


Noisy synth; poor selectivity &/or poor residual FM.
VCO phase locked? 5-13V 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

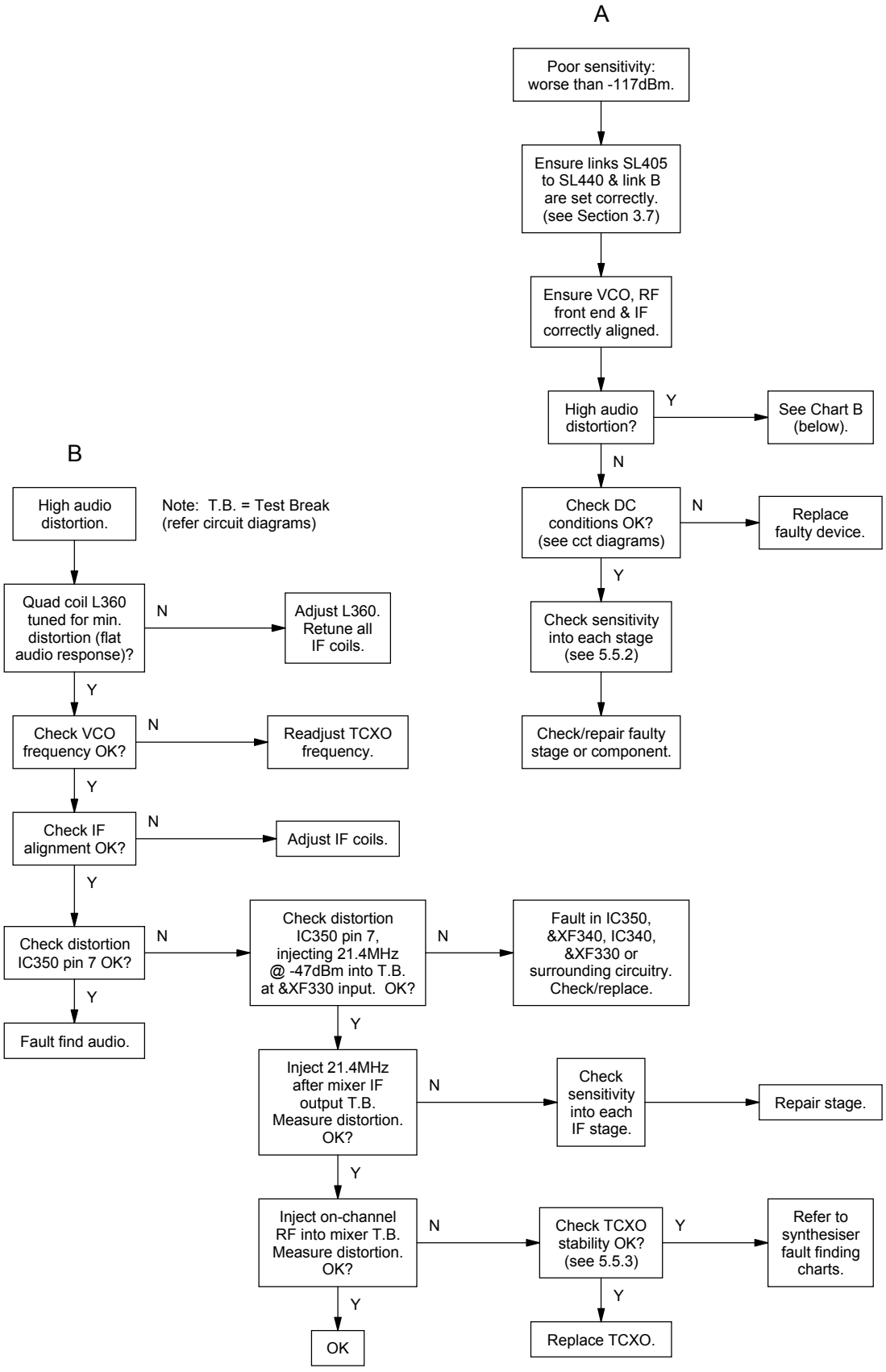


5.7.5 Carrier Mute

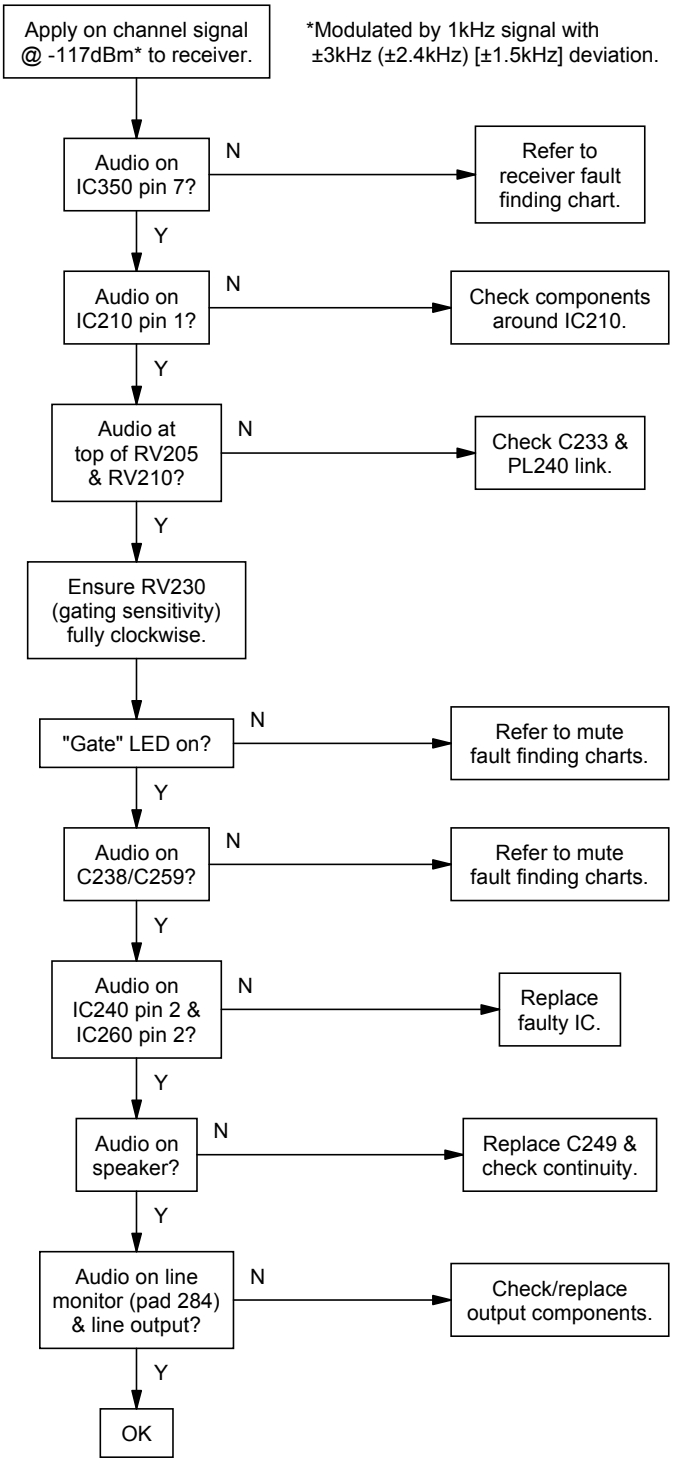


5.7.6 Receiver

Refer to the receiver IF and front end circuit diagrams (sheets 3 & 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 IC350 pin 7?
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 & PL240 link.
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 T835 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 T835 receiver:

- parts lists
- grid reference index
- mechanical assembly drawing
- PCB layouts
- test points & options connections drawings
- circuit diagrams.

Section	Title	IPN	Page
6.1	**Introduction**		**6.1.3**
6.2	**T835 Receiver PCB**	**220-01394-02**	**6.2.1**

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 1.3 in this Part of the manual, and Figure 1.1 in Part A shows typical labels). You can further verify the receiver 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 (this table also appears in the resist layer on the bottom side of the PCB). In this example, the resistor indicates that the product was built as a T835-10-XXXX.

835-	
835-	
835-	
PRODUCT TYPE	

PRODUCT TYPE	
835-10	835-20
835-13	835-23
835-15	835-25

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. 220-12345-00, 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.

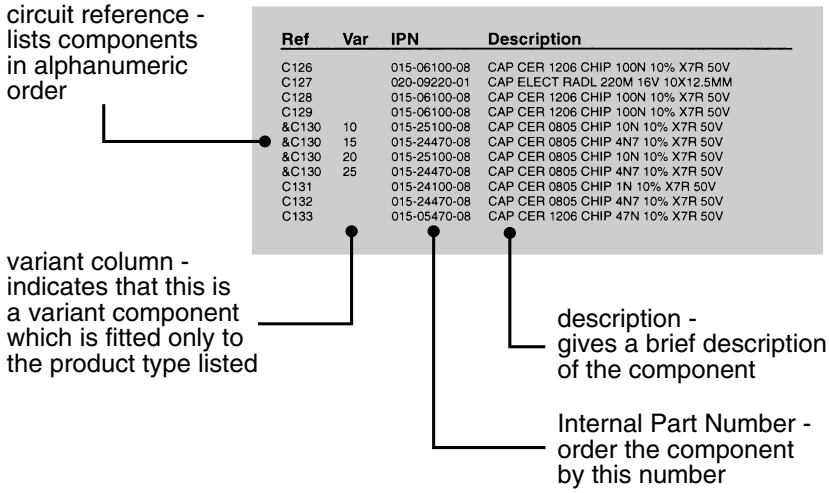
Note: It is important that you identify which issue PCB you are working on so that you can refer to the appropriate set of PCB information.

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).

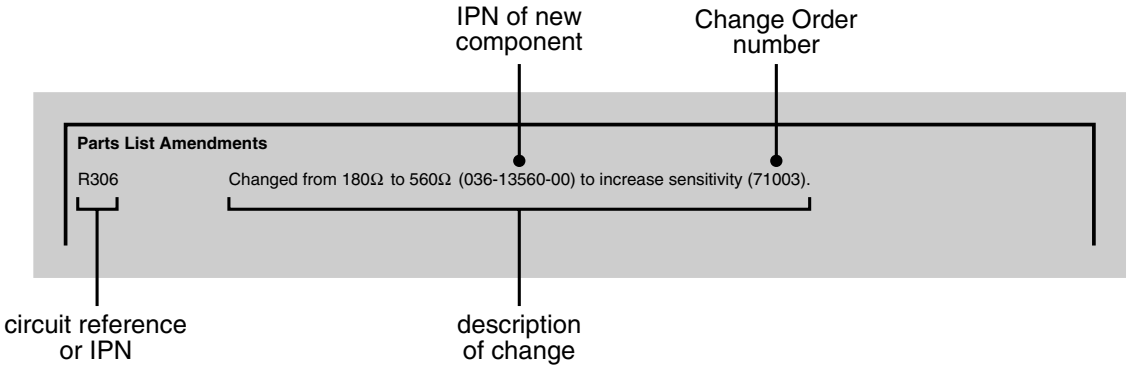
Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns, as shown below:



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

Parts List Amendments

At the front of the parts list is the Parts List Amendments box (an example of which is shown below). This box contains a list of component changes which took place after the parts list and diagrams in this section were compiled. These changes (e.g. value changes, added/deleted components, etc.) are listed by circuit reference in alphanumeric order and supersede the information given in the parts list or diagrams. Components without circuit references are listed in IPN order. The number in brackets at the end of each entry refers to the Tait internal Change Order document.



Variant Components

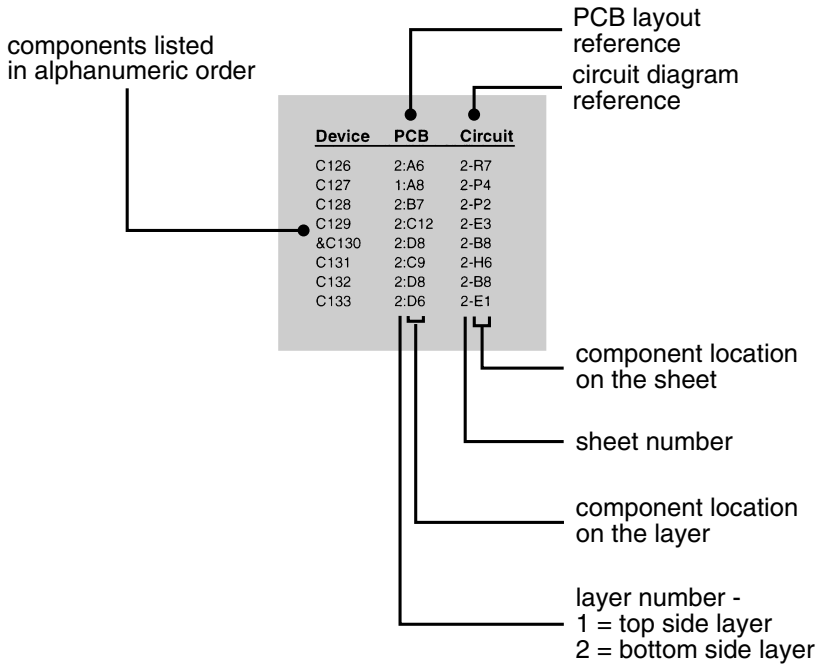
A variant component is one that has the same circuit reference but different value or specification in different product types. Where two products share the same PCB, the term "variant" is also used to describe components unplaced in one product. Variant components have a character prefix, such as "&",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

The table below explains the variant prefixes used in T800 Series II 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 placed/unplaced for special applications
*	be unplaced in one product (where two products share the same PCB)

Grid Reference Index

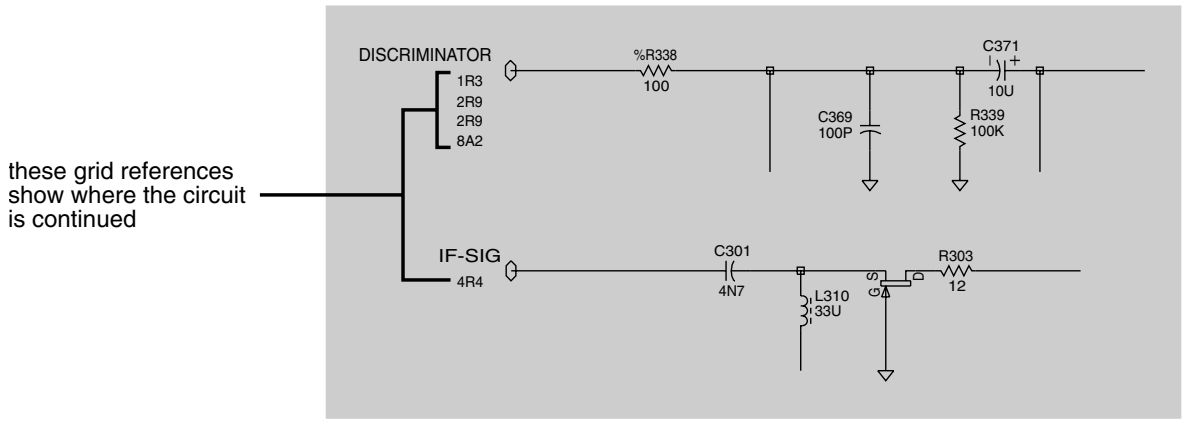
This section contains a component grid reference index to help you find components and labelled pads on the PCB layouts and circuit diagrams. This index lists the components and pads in alpha-numeric order, along with the appropriate alphanumeric grid references, as shown below:



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 T835 Receiver PCB

This section contains the following information.

IPN	Section	Page
220-01394-02	Parts List	6.2.3
	Mechanical & Miscellaneous Parts	6.2.10
	Mechanical Assembly	6.2.11
	Grid Reference Index	6.2.13
	PCB Layout - Top Side	6.2.17
	PCB Layout - Bottom Side	6.2.18
	Test Points & Options Connections - Top Side	6.2.19
	Test Points & Options Connections - Bottom Side	6.2.20
	Receiver Overview Diagram	6.2.21
	Audio Processor Circuit Diagram	6.2.22
	IF Section Circuit Diagram	6.2.23
	Front End Circuit Diagram	6.2.24
	VCO Section Circuit Diagram	6.2.25
	Regulators Circuit Diagram	6.2.26
	Synthesiser Circuit Diagram	6.2.27
	Microcontroller Circuit Diagram	6.2.28
	Harmonic Filter Circuit Diagram	6.2.29

T835 Parts List (IPN 220-01394-02)

How To Use This Parts List

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: 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. Static sensitive devices are indicated by an (S) at the start of the description column.

The miscellaneous and mechanical section lists the variant and common parts in IPN order. Where possible, a number in the legend column indicates their position in the mechanical assembly drawing.

The Parts List Amendments box below lists component changes that took place after the parts list and diagrams in this section were compiled. These changes (e.g. value changes, added/deleted components, etc.) are listed by circuit reference in alphanumeric order and supersede the information given in the parts list or diagrams. Components without circuit references are listed in IPN order.

Parts List Amendments

Capacitor IPN Change	4U7 16V capacitors (IPN 014-07470-00) changed to 4U7 24V capacitors (IPN 014-07470-01) to standardise components (750334)
&C203	T835-26-0000, New product type for US market: 4n7 (IPN 015-24470-08).
C309	Changed from 33p to 18p (IPN 015-22180-01).
C311	Changed from 39p to 47p (IPN 015-22470-01).
	To improve sensitivity, selectivity, distortion and mute ratio (710056).
&C313	T835-26-0000, New product type for US market: 39p (IPN 015-22390-01).
&C315	T835-26-0000, New product type for US market: 82p (IPN 015-22820-01).
&C317	T835-26-0000, New product type for US market: 10p (IPN 015-22100-01).
&C319	T835-26-0000, New product type for US market: 82p (IPN 015-22820-01).
&C321, &C333	T835-26-0000, New product type for US market: 39p (IPN 015-22390-01).
&C335	T835-26-0000, New product type for US market: 82p (IPN 015-22820-01).
&C337	T835-26-0000, New product type for US market: 1p8 (IPN 015-21180-01).
C406, C420 C448, C464	148-174MHz (-20, -23 & -25): changed from 15p (IPN 015-22150-01) to 18p (IPN 015-22180-01) to improve the front end tuning (710386).
C705	Changed 8p2 5% (IPN 015-21820-01) to 8p2 1% (IPN 015-21820-02) due to standardisation (780047/48/49/50).
C774	Changed from 330n polyester to 330n polyphenylene-sulphide (IPN 022-06330-05) to improve ultimate signal-to-noise performance by reducing PLL phase noise (710352). T835-26-0000, New product type for US market: 100n (IPN 022-06100-16). Component designator changed to &C774
C776	T835-26-0000, New product type for US market: 6n8 (IPN 015-24680-08). Component designator changed to &C776
D111	Changed from MR750 (IPN 001-00011-60) to MR2520L (IPN 001-00012-90) to provide overvoltage transient suppression (750087/88/89/90/91/92).
D250	Red LED (IPN 008-00013-32) changed to Red LED subassembly (IPN 070-02001-00). Red subassembly replaced with Red LED (IPN 008-00014-79).
D280	Green LED (IPN 008-00013-32) changed to Green LED subassembly (IPN 070-02001-00). Green subassembly replaced with Green LED (IPN 008-00014-79).
IC710	Changed from 74HCU04 to 74HC04 (IPN 002-74900-04) to improve ultimate signal-to-noise performance by reducing PLL phase noise (710352).

IC740	Changed obsolete MC145191F (IPN 002-14519-10) to MC145193F (IPN 002-14519-30) (711438,1439,1440,1441,1442,1443)
Q310	Changed from BF477A (IPN 000-50020-18) to BF247A (IPN 000-00020-18) as BF477A unavailable (710896). Changed to J310 (IPN 000-00033-10) as BF247A obsolete (711087).
Q540	Changed from BCW60 (IPN 000-10008-48) to BC817-25 (IPN 000-10008-17) because BCW60 is underrated. (711093)
&R202	T835-26-0000, New product type for US market: 3k3 (IPN 036-14330-10).
&R209	T835-26-0000, New product type for US market: 18k (IPN 036-15180-00).
&R219	T835-26-0000, New product type for US market: 3k9 (IPN 036-14390-10).
R256	Changed from 4k7 to 2k7 (IPN 036-14270-00) to improve sensitivity, selectivity, distortion and mute ratio (710056).
R301	Changed from 100Ω to 22Ω (IPN 036-12220-00) as obsolete BF247A (Q310) replaced (711087).
&R333	T835-26-0000, New product type for US market: 3k3 (IPN 036-14330-10).
&R347	T835-26-0000, New product type for US market: 8k2 (IPN 036-14820-10).
R419	Changed from 470Ω to 560Ω (IPN 036-13560-00) to improve sensitivity, selectivity, distortion and mute ratio (710056).
R422	Moved R422 (see T835 PCB Layout - Bottom Side) as in its old position, it may cause desensing of the receiver when the top cover is fitted (711256)
R425	Changed from 180Ω to 560Ω (IPN 036-13560-00) to improve sensitivity, selectivity, distortion and mute ratio (710056).
R510	Changed from 680Ω to 2k2 (IPN 036-14220-00) due to Loop filter revisions to improve narrow band selectivity and lock time (710317).
R775	Changed from 5k6 to 6k8 (IPN 036-14680-00) due to Loop filter revisions to improve narrow band selectivity and lock time (710317). T835-26-0000, New product type for US market: 18k (IPN 036-15180-00). Component designator changed to &R775
RV320	Changed to IPN 042-05470-07 (47k preset) because IPN 042-05470-06 no longer available (710793/96/97/98).
&XF310, &XF320	T835-26-0000, New product type for US market: FLTR XTL 21.4M 7.5K 1PR 4POLE (IPN 276-00010-46).
&XF330	T835-26-0000, New product type for US market: FLTR XTAL 21.4MHZ 7.5KHZ 2POLE (IPN 276-00010-44).
&XF340	T835-26-0000, New product type for US market: FLTR CER 455KHZ G 9KHZ B/W (IPN 276-00010-13).
303-11169-03	T800 chassis: replaced by 303-11169-04
312-01052-01	T800 top lid: replaced by 312-01052-02
312-01053-01	T800 bottom lid: replaced by 312-01053-02
	New chassis and lid tooling introduced, incorporating mechanical improvements and better RF shielding (750027, 750028 & 750029). Note that the new lids should be used only with the new chassis.
349-00020-36	The two M3x8 Torx screws which secure the module into the rack frame have been replaced by M3x8 Pozidriv screws (IPN 349-00020-55) (750101/2/3/5/6).
349-00020-43	Top lid M4x12 Pozidriv screws (IPN 349-00020-43) replaced with M4x12 Torx screws (IPN 349-20430-00) to ease assembly (711240, 750333)
349-00020-45	Top lid M4x20 Pozidriv screws (IPN 349-00020-45) replaced with M4x20 Torx screws (IPN 349-20580-00) to ease assembly (711240, 750333)

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
C205		015-24470-08	CAP CER 0805 4N7 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
C301		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C303		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C305		020-08100-04	CAP ELE RA 10M 16V 4X7MM
C307		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C309		015-22330-01	CAP CER 0805 33P 5% NPO 50V
C311		015-22390-01	CAP CER 0805 39P 5% NPO 50V
&C313	10	015-22270-01	CAP CER 0805 27P 5% NPO 50V
&C313	13	015-22270-01	CAP CER 0805 27P 5% NPO 50V
&C313	15	015-22390-01	CAP CER 0805 39P 5% NPO 50V
&C313	20	015-22270-01	CAP CER 0805 27P 5% NPO 50V
&C313	23	015-22270-01	CAP CER 0805 27P 5% NPO 50V
&C313	25	015-22390-01	CAP CER 0805 39P 5% NPO 50V
&C315	10	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C315	13	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C315	15	015-22820-01	CAP CER 0805 82P 5% NPO 50V
&C315	20	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C315	23	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C315	25	015-22820-01	CAP CER 0805 82P 5% NPO 50V
&C317	10	015-20050-01	CAP CER 0805 0P5+-1/4P NPO 50V
&C317	13	015-20050-01	CAP CER 0805 0P5+-1/4P NPO 50V
&C317	15	015-22100-01	CAP CER 0805 10P+-1/2P NPO 50V
&C317	20	015-20050-01	CAP CER 0805 0P5+-1/4P NPO 50V
&C317	23	015-20050-01	CAP CER 0805 0P5+-1/4P NPO 50V
&C317	25	015-22100-01	CAP CER 0805 10P+-1/2P NPO 50V
&C319	10	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C319	13	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C319	15	015-22820-01	CAP CER 0805 82P 5% NPO 50V
&C319	20	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C319	23	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C319	25	015-22820-01	CAP CER 0805 82P 5% NPO 50V
&C321	10	015-22270-01	CAP CER 0805 27P 5% NPO 50V
&C321	13	015-22270-01	CAP CER 0805 27P 5% NPO 50V
&C321	15	015-22390-01	CAP CER 0805 39P 5% NPO 50V
&C321	20	015-22270-01	CAP CER 0805 27P 5% NPO 50V
&C321	23	015-22270-01	CAP CER 0805 27P 5% NPO 50V
&C321	25	015-22390-01	CAP CER 0805 39P 5% NPO 50V
C323		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C325		020-08100-04	CAP ELE RA 10M 16V 4X7MM
C327		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C329		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C331		015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C333	10	015-22270-01	CAP CER 0805 27P 5% NPO 50V
&C333	13	015-22270-01	CAP CER 0805 27P 5% NPO 50V
&C333	15	015-22390-01	CAP CER 0805 39P 5% NPO 50V
&C333	20	015-22270-01	CAP CER 0805 27P 5% NPO 50V
&C333	23	015-22270-01	CAP CER 0805 27P 5% NPO 50V

Ref	Var	IPN	Description
&C333	25	015-22390-01	CAP CER 0805 39P 5% NPO 50V
&C335	10	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C335	13	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C335	15	015-22820-01	CAP CER 0805 82P 5% NPO 50V
&C335	20	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C335	23	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C335	25	015-22820-01	CAP CER 0805 82P 5% NPO 50V
&C337	10	015-20050-01	CAP CER 0805 0P5+-1/4P NPO 50V
&C337	13	015-20050-01	CAP CER 0805 0P5+-1/4P NPO 50V
&C337	15	015-21180-01	CAP CER 0805 1P8+-1/4P NPO 50V
&C337	20	015-20050-01	CAP CER 0805 0P5+-1/4P NPO 50V
&C337	23	015-20050-01	CAP CER 0805 0P5+-1/4P NPO 50V
&C337	25	015-21180-01	CAP CER 0805 1P8+-1/4P NPO 50V
C339		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C340A		025-08100-03	CAP 10M 35V 20% TANT 5MM L/S
C340B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C344		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C345		015-22330-01	CAP CER 0805 33P 5% NPO 50V
C347		015-22330-01	CAP CER 0805 33P 5% NPO 50V
C348		025-08100-03	CAP 10M 35V 20% TANT 5MM L/S
C349		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C351		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C353		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C355		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C357		015-23150-01	CAP CER 0805 150P 5% NPO 50V
C359		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C361		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C363		015-22150-01	CAP CER 0805 15P 5% NPO 50V
C365		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C367		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C369		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C371		025-08100-02	CAP TANT BEAD 10M 10% 16V
C373		025-08100-02	CAP TANT BEAD 10M 10% 16V
C375		025-08100-02	CAP TANT BEAD 10M 10% 16V
C376		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C377		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C381		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C383		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C385		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C390		025-08100-02	CAP TANT BEAD 10M 10% 16V
C391		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C392		015-23120-01	CAP CER 0805 120P 5% NPO 50V
C393		015-23120-01	CAP CER 0805 120P 5% NPO 50V
C394		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C395		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C397		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C399		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C402		015-22390-01	CAP CER 0805 39P 5% NPO 50V
C404		015-21560-01	CAP CER 0805 5P6+-1/4P NPO 50V
C406		015-22150-01	CAP CER 0805 15P 5% NPO 50V
C408		015-22150-01	CAP CER 0805 15P 5% NPO 50V
C410		015-22390-01	CAP CER 0805 39P 5% NPO 50V
C412		015-22120-01	CAP CER 0805 12P 5% NPO 50V
C414		015-22330-01	CAP CER 0805 33P 5% NPO 50V
C416		015-22390-01	CAP CER 0805 39P 5% NPO 50V
C418		015-21560-01	CAP CER 0805 5P6+-1/4P NPO 50V
C420		015-22150-01	CAP CER 0805 15P 5% NPO 50V
C422		015-22150-01	CAP CER 0805 15P 5% NPO 50V
C424		015-22390-01	CAP CER 0805 39P 5% NPO 50V
C428		015-22220-01	CAP CER 0805 22P 5% NPO 50V
C430		015-23680-08	CAP CER 0805 680P 10% X7R 50V
C432		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C436		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C438		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C440		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C442		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C446		015-21680-01	CAP CER 0805 6P8+-1/4P NPO 50V
C448		015-22150-01	CAP CER 0805 15P 5% NPO 50V
C450		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C452		015-22150-01	CAP CER 0805 15P 5% NPO 50V
C454		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C456		015-22100-01	CAP CER 0805 10P+-1/2P NPO 50V
C458		015-22390-01	CAP CER 0805 39P 5% NPO 50V
C462		015-21680-01	CAP CER 0805 6P8+-1/4P NPO 50V
C464		015-22150-01	CAP CER 0805 15P 5% NPO 50V
C468		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C470		015-22150-01	CAP CER 0805 15P 5% NPO 50V
C472		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C478		015-23180-01	CAP CER 0805 180P 5% NPO 50V
C480		015-23180-01	CAP CER 0805 180P 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		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
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		015-24100-08	CAP CER 0805 1N 10% X7R 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		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C640		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C651		015-06100-08	CAP CER 1206 100N 10% X7R 50V

Ref	Var	IPN	Description
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 Al 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		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C712		015-23100-01	CAP CER 0805 100P 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		015-24100-08	CAP CER 0805 1N 10% X7R 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		022-06330-03	CAP METPOLY330N 10% 50V 5 L/S
C776		015-25150-08	CAP CER 0805 15N 10% X7R 50V
C782		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C784		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C786		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C788		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C790		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C792		015-24100-08	CAP CER 0805 1N 10% X7R 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		015-22150-01	CAP CER 0805 15P 5% NPO 50V
C920		015-22330-01	CAP CER 0805 33P 5% NPO 50V
C930		015-22330-01	CAP CER 0805 33P 5% NPO 50V
C940		015-22150-01	CAP CER 0805 15P 5% NPO 50V
CV318		028-02100-06	CAP TRM 3/10P NPO TOP ADJ
D111		001-00011-60	(S) DIODE SR2607 -- USE MR750
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		008-00013-32	(S) LED 3 RED LO CURRENT NO MTG
D260		001-10084-33	(S) DIODE ZEN SMD 0.3W 3V3SOT23
D270		001-10000-70	(S) DIODE SMD BAV70 D-SW SOT23
D280		008-00013-35	(S) LED 3 GRN LO CURRENT NO MTG
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
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 BAT65 SCHOTTKEY SOD123
D740		001-10065-00	DIODE BAT65 SCHOTTKEY SOD123
D820		001-10065-00	DIODE BAT65 SCHOTTKEY SOD123
D860		001-10000-70	(S) DIODE SMD BAV70 D-SW SOT23
D880		001-10000-70	(S) DIODE SMD BAV70 D-SW SOT23
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
IC340		002-00061-20	(S) IC NE612AN DBM & OSCILLATOR
IC350		002-00061-40	(S) IC NE614AN LO PWR IF 16DIL
IC390		002-00012-25	(S) IC TL084 4X O-AMP JFET IP
IC410		002-00022-01	(S) MIXER DOUBLE BLNCD 2-750MHZ
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		539-00010-41	TCXO 12.8MHZ +-2.5PPM -30 +70C
IC710		002-74910-04	(S) IC SMD 74HCU04 6X INV
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) IC 4053 SMD 3X 2CH M-PLEXR
IC850		002-10003-24	(S) IC SMD 324 4X O-AMP SO14
L230		056-00021-02	IND FXD 100UH AX
L310		056-00021-07	IND FXD 33UH AX
L320		056-00021-09	IND FXD 820NH AX 4X9
L330		050-00016-58	COIL TAIT 658 2MH IF 7.5*7.5
L340		050-00016-58	COIL TAIT 658 2MH IF 7.5*7.5
L350		050-00016-58	COIL TAIT 658 2MH IF 7.5*7.5
L360		050-00016-31	COIL TAIT NO 631 455KHZ
L410		050-00016-59	COIL 659 RF 3.5T SLUG/CAN
L420		050-00016-59	COIL 659 RF 3.5T SLUG/CAN
L430		052-08135-65	COIL A/W 6.5T/3.5MM HOR 0.8MM
L440		056-00021-04	IND FXD 330NH AX
L450		056-00021-04	IND FXD 330NH AX
L460		050-00016-59	COIL 659 RF 3.5T SLUG/CAN
L470		050-00016-59	COIL 659 RF 3.5T SLUG/CAN
L480		056-00021-04	IND FXD 330NH AX
L490		056-00021-04	IND FXD 330NH AX
L750		056-10068-00	IND FXD SMD 68NH 3.2*2.5*1.6
L910		052-08140-35	COIL A/W 3.5T/4.0MM HOR 0.8MM
L920		052-08140-35	COIL A/W 3.5T/4.0MM HOR 0.8MM
L930		052-08140-35	COIL A/W 3.5T/4.0MM HOR 0.8MM
PL100		240-00010-55	PLUG 15 W D RANGE W/W PNL MT
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 Al BF247A JFETTO92 VHF
Q320		000-10095-10	(S) XSTR SMD BR951 NPN UHF
Q330		000-10095-10	(S) XSTR SMD BR951 NPN UHF
Q340		000-10008-48	(S) XSTR SMD BCW60 NPN SOT23 SS
Q350		000-10008-48	(S) XSTR SMD BCW60 NPN SOT23 SS
Q410		000-10008-57	(S) XSTR SMD BCW70 PNP SOT23 SS
Q420		000-10095-10	(S) XSTR SMD BR951 NPN UHF
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 Al 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

Ref	Var	IPN	Description
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%
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%
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	036-14390-00	RES M/F 0805 3K9 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	036-14390-00	RES M/F 0805 3K9 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%
R301		036-13100-00	RES M/F 0805 100E 5%
R302		036-17100-00	RES M/F 0805 1M 5%
R303		036-12120-00	RES M/F 0805 12E 5%
R305		036-12100-00	RES M/F 0805 10E 5%
R307		036-13680-00	RES M/F 0805 680E 5%
R309		036-17100-00	RES M/F 0805 1M 5%
R311		036-10000-00	RES M/F 0805 ZERO OHM
R313		036-17100-00	RES M/F 0805 1M 5%
R315		036-14100-00	RES M/F 0805 1K 5%
R317		036-11470-00	RES M/F 0805 4E7 10%
R319		036-14330-00	RES M/F 0805 3K3 5%
R321		036-14100-00	RES M/F 0805 1K 5%
R323		036-12680-00	RES M/F 0805 68E 5%
R325		036-13100-00	RES M/F 0805 100E 5%
R327		036-12560-00	RES M/F 0805 56E 5%
R329		036-12390-00	RES M/F 0805 39E 5%
R331		036-13470-00	RES M/F 0805 470E 5%
R332		036-13680-00	RES M/F 0805 680E 5%
R333		036-12100-00	RES M/F 0805 10E 5%
&R333	10	036-17100-00	RES M/F 0805 1M 5%
&R333	13	036-17100-00	RES M/F 0805 1M 5%
&R333	15	036-14330-00	RES M/F 0805 3K3 5%
&R333	20	036-17100-00	RES M/F 0805 1M 5%
&R333	23	036-17100-00	RES M/F 0805 1M 5%
&R333	25	036-14330-00	RES M/F 0805 3K3 5%
R334		036-10000-00	RES M/F 0805 ZERO OHM
R335		036-10000-00	RES M/F 0805 ZERO OHM
R337		036-14120-00	RES M/F 0805 1K2 5%
R339		036-16100-00	RES M/F 0805 100K 5%
R341		036-17100-00	RES M/F 0805 1M 5%
R343		036-15470-00	RES M/F 0805 47K 5%
R345		036-15470-00	RES M/F 0805 47K 5%
&R347	10	036-15100-00	RES M/F 0805 10K 5%
&R347	13	036-15100-00	RES M/F 0805 10K 5%
&R347	15	036-14820-00	RES M/F 0805 8K2 5%
&R347	20	036-15100-00	RES M/F 0805 10K 5%
&R347	23	036-15100-00	RES M/F 0805 10K 5%
&R347	25	036-14820-00	RES M/F 0805 8K2 5%
R349		036-15100-00	RES M/F 0805 10K 5%
R351		045-03500-01	RES NTC 500E 5MM DISC UNCOATED
R353		036-13220-00	RES M/F 0805 220E 5%
R355		036-15100-00	RES M/F 0805 10K 5%
R357		036-14150-00	RES M/F 0805 1K5 5%
R359		036-16330-00	RES M/F 0805 330K 5%
R361		036-17100-00	RES M/F 0805 1M 5%
R363		036-12100-00	RES M/F 0805 10E 5%
R365		036-14330-00	RES M/F 0805 3K3 5%
R367		036-14100-00	RES M/F 0805 1K 5%
R369		036-15150-00	RES M/F 0805 15K 5%
R371		045-06100-01	RES NTC 100K 5% 5MM DISC
R372		036-14100-00	RES M/F 0805 1K 5%
R374		036-14330-00	RES M/F 0805 3K3 5%
R376		036-15220-00	RES M/F 0805 22K 5%
R378		036-16100-00	RES M/F 0805 100K 5%
R380		036-13100-00	RES M/F 0805 100E 5%
R381		036-14270-00	RES M/F 0805 2K7 5%
R383		036-14100-00	RES M/F 0805 1K 5%
R385		036-15100-00	RES M/F 0805 10K 5%
R387		036-15470-00	RES M/F 0805 47K 5%
R389		036-15470-00	RES M/F 0805 47K 5%
R391		036-15820-00	RES M/F 0805 82K 5%
R393		036-15470-00	RES M/F 0805 47K 5%
R395		036-13470-00	RES M/F 0805 470E 5%
R397		036-15220-00	RES M/F 0805 22K 5%
R398		036-15100-00	RES M/F 0805 10K 5%
R399		036-14100-00	RES M/F 0805 1K 5%
R410		036-14100-00	RES M/F 0805 1K 5%
R413		036-14390-00	RES M/F 0805 3K9 5%
R416		036-14220-00	RES M/F 0805 2K2 5%
R418		036-17100-00	RES M/F 0805 1M 5%
R419		036-13470-00	RES M/F 0805 470E 5%
R422		036-12100-00	RES M/F 0805 10E 5%
R425		036-13180-00	RES M/F 0805 180E 5%
R427		036-17100-00	RES M/F 0805 1M 5%
R428		036-12330-00	RES M/F 0805 33E 5%
R432		036-13470-00	RES M/F 0805 470E 5%
R435		036-12120-00	RES M/F 0805 12E 5%
R438		036-13470-00	RES M/F 0805 470E 5%
R441		036-17100-00	RES M/F 0805 1M 5%
R444		036-10000-00	RES M/F 0805 ZERO OHM
R447		036-17100-00	RES M/F 0805 1M 5%
R453		036-13470-00	RES M/F 0805 470E 5%
R456		036-12120-00	RES M/F 0805 12E 5%
R459		036-13470-00	RES M/F 0805 470E 5%
R464		036-12470-00	RES M/F 0805 47E 5%
R510		036-13680-00	RES M/F 0805 680E 5%
R515		036-12560-00	RES M/F 0805 56E 5%
R555		036-14100-00	RES M/F 0805 1K 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%

Ref	Var	IPN	Description
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		036-16100-00	RES M/F 0805 100K 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		036-14560-00	RES M/F 0805 5K6 5%
R784		036-12680-00	RES M/F 0805 68E 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		036-13220-00	RES M/F 0805 220E 5%
R791		036-13100-00	RES M/F 0805 100E 5%
R792		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%
R910		036-15100-00	RES M/F 0805 10K 5%
RL210		237-00010-22	RELAY 12V DPDT 8PIN DIL PCB MT
RV205		040-05100-22	POT 10K LOG DUAL PCB 6 OD SFT
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
RV320		042-05470-06	RES PRE 47K CAR 6MM FLAT T/ADJ
RV330		042-04220-06	RES PRE 2K2 CAR 6MM FLAT
SHLD610		062-00010-13	CAN 10MM SQ X 11MM CAN A4M1017
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
X310		274-00010-02	XTAL 20.945MHZ SPEC TE/15
&XF310	10	276-00010-43	FLTR XTAL 21.4M 15KHZ PR 4POLE
&XF310	13	276-00010-43	FLTR XTAL 21.4M 15KHZ PR 4POLE
&XF310	15	276-00010-44	FLTR XTL 21.4M 7.5KHZ PR 4POLE
&XF310	20	276-00010-43	FLTR XTAL 21.4M 15KHZ PR 4POLE
&XF310	23	276-00010-43	FLTR XTAL 21.4M 15KHZ PR 4POLE
&XF310	25	276-00010-44	FLTR XTL 21.4M 7.5KHZ PR 4POLE
&XF320	10	276-00010-43	FLTR XTAL 21.4M 15KHZ PR 4POLE
&XF320	13	276-00010-43	FLTR XTAL 21.4M 15KHZ PR 4POLE
&XF320	15	276-00010-44	FLTR XTL 21.4M 7.5KHZ PR 4POLE
&XF320	20	276-00010-43	FLTR XTAL 21.4M 15KHZ PR 4POLE
&XF320	23	276-00010-43	FLTR XTAL 21.4M 15KHZ PR 4POLE
&XF320	25	276-00010-44	FLTR XTL 21.4M 7.5KHZ PR 4POLE
&XF330	10	276-00010-47	FLTR XTAL 21.4MHZ 15KHZ 2POLE
&XF330	13	276-00010-47	FLTR XTAL 21.4MHZ 15KHZ 2POLE
&XF330	15	276-00010-46	FLTR XTAL 21.4MHZ 7.5KHZ 2POLE
&XF330	20	276-00010-47	FLTR XTAL 21.4MHZ 15KHZ 2POLE
&XF330	23	276-00010-47	FLTR XTAL 21.4MHZ 15KHZ 2POLE
&XF330	25	276-00010-46	FLTR XTAL 21.4MHZ 7.5KHZ 2POLE
&XF340	10	276-00010-14	FLTR CER 455KHZ 15KHZ B/W
&XF340	13	276-00010-76	FLTR CER 455KHZ 12KHZ B/W
&XF340	15	276-00010-13	FLTR CER 455KHZ 9KHZ B/W
&XF340	20	276-00010-14	FLTR CER 455KHZ 15KHZ B/W
&XF340	23	276-00010-76	FLTR CER 455KHZ 12KHZ B/W
&XF340	25	276-00010-13	FLTR CER 455KHZ 9KHZ B/W

T835 Mechanical & Miscellaneous Parts (220-01394-02)

IPN	Legend	Description
012-04150-01		CAP CER F/THRU 1N5 NO LEAD Fitted to D-range pins.
051-00006-02		SOLDER SPRING 1.3MM A4M1877 Support for front panel LED solder joints.
065-00010-13		BEAD FER 7D 1.9X0.9X3.8 Fitted to D-range pins.
201-00030-02		WIRE T/C 7/0.2 PVC RED Front panel LEDs.
201-00030-10		WIRE T/C 7/0.2 PVC BLACK Front panel LEDs.
220-01176-03	1	PCB T83X VCO
220-01394-02	2	PCB T835 SERIES II
230-00010-31	3	SWITCH COVER FOR 230-00010-30
240-00010-55	25	PLUG 15 W D-RANGE W/W PNL MT PL100
240-02100-06	4	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	5	CHASSIS PAINTED T800 SERIES
303-23118-00	6	COVER A3M2247 D RANGE
303-50074-00	7	CLIP A3M2246 SPRING CLAMP
308-01007-01	8	HANDLE BASE STATION SERIES II
311-01015-00	9	KNOB 15MM & SKIRT 6MM SFT
312-01052-01	10	LID TOP PNTD A1M2364 T800
312-01053-01	11	LID BOTTOM PNTD A1M2364 T800
316-06622-00	12	PNL FRT RX T800 SERIES II
319-01152-00	13	SHIELD A3M2250 F/THRU MTG T857
345-00040-10	14	SCRW M3X6MM P/POZ ST BZ
349-00020-36	15	LIM)SCREW TT M3X8m PANTORX BLK
349-00020-43	16	SCRW T/T M4X12MM P/POZ BZ
349-00020-45	17	SCRW T/T M4X20MM P/POZ BZ
350-00016-42	18	SPACER 5MM HI 8MM ST 2.5MM HO
352-00010-08	19	NUT M3 COLD FORM HEX ST BZ
352-00010-29	20	NUT M4 NYLOC HEX
353-00010-10	21	WSHR M3 FLAT 7MMX0.6MM ST BZ
353-00010-13	22	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	23	GASKET SIL TO-220 CLIP MTG.
362-00010-33	24	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
400-00020-07		SLEEVING 2MM SIL RUBBER
410-01081-01		CRT T800 SERIES II

replace A4 pages B6.2.11/B6.2.12 with A3 pages B6.2.11/B6.2.12

replace A4 pages B6.2.11/B6.2.12 with A3 pages B6.2.11/B6.2.12

T835 Grid Reference Index (IPN 220-01394-02)

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	Device	PCB	Circuit	Device	PCB	Circuit	Device	PCB	Circuit
C201	1:D7	2-B9	C325	1:F5	3-K8	C442	2:K7	4-H5	C740A	1:H2	7-B4
&C203	2:C6	2-B8	C327	2:F5	3-L8	C446	2:K8	4-J5	C740B	1:H2	7-B3
C205	2:C6	2-B8	C329	2:F5	3-M6	C448	2:J8	4-J4	C741A	1:H2	7-C4
C207	1:D6	2-C8	C331	2:F5	3-M7	C450	2:J8	4-J4	C741B	1:G2	7-C3
C209	1:C7	2-E8	&C333	2:F5	3-N7	C452	2:J8	4-K4	C742A	1:H2	7-D4
C210	2:C7	2-C7	&C335	2:F5	3-P6	C454	2:J8	4-K4	C742B	1:H3	7-D3
C211	2:C7	2-D7	&C337	2:F4	3-Q6	C456	2:J8	4-L4	C743	1:H2	7-B1
C213	2:C7	2-E7	C339	2:F4	3-R7	C458	2:J8	4-K4	C745	1:G3	7-D1
C215	2:C7	2-E7	C340A	1:F4	3-A2	C462	2:J8	4-L5	C750	1:H4	7-H7
C217	2:C7	2-E7	C340B	2:F4	3-B2	C464	2:J8	4-L4	C757	1:G4	7-G5
C219	2:C6	2-H6	C344	2:F4	3-B1	C468	2:J8	4-L4	C759	1:G4	7-G4
C221	2:C6	2-H6	C345	2:F4	3-B2	C470	2:H8	4-L4	C761	1:H3	7-J4
C222	1:C6	2-J9	C347	2:F4	3-C2	C472	2:H8	4-M4	C762	1:G3	7-K4
C223	2:C6	2-H8	C348	1:F4	3-C2	C478	2:G7	4-Q4	C764	1:H3	7-J2
C225	2:C6	2-J8	C349	2:E4	3-D2	C480	2:G8	4-Q4	C765	1:G3	7-J2
C227	2:C6	2-J8	C351	2:E4	3-D0	C505	1:K6	5-L8	C767	1:H3	7-K3
C229	1:C6	2-K8	C353	2:E3	3-D0	C515	1:H5	5-F3	C769	1:H4	7-M4
C231	1:B3	2-K8	C355	2:E4	3-D1	C530	1:K5	5-K1	C770	1:H3	7-N4
C233	1:B7	2-J7	C357	2:E4	3-E2	C535	1:K5	5-L1	C772	1:G4	7-M2
C235	2:C5	2-M6	C359	2:E4	3-E2	C610A	1:M5	6-C8	C774	1:H4	7-P2
C237	2:C6	2-M5	C361	2:E4	3-E1	C610B	1:M5	6-D8	C776	1:H4	7-N1
C238	2:C5	2-N7	C363	2:E4	3-E1	C611A	1:L5	6-E8	C782	1:G3	7-N0
C239	1:C5	2-P6	C365	2:E4	3-F2	C611B	1:M5	6-F8	C784	1:G2	7-Q1
C240A	2:B5	2-Q8	C367	2:E4	3-F0	C623	1:M6	6-N8	C786	1:G2	7-R1
C240B	2:B5	2-R8	C369	2:E5	3-G3	C625	1:M6	6-Q8	C788	1:G3	7-N0
C240C	1:C5	2-R8	C371	1:E5	3-G3	C626	1:M6	6-R8	C790	1:G3	7-Q0
C249	1:B5	2-Q7	C373	1:E6	3-G1	C628	1:M6	6-R8	C792	1:G4	7-R0
C251	2:A5	2-R7	C375	1:E5	3-H2	C630	1:M5	6-K4	C810	1:L4	8-K8
C253	1:C8	2-G5	C376	2:E7	3-J3	C631A	1:M5	6-M6	C812	1:K2	8-E5
C255	2:B7	2-L2	C377	2:E7	3-K3	C631B	1:N5	6-M6	C813	1:J3	8-H5
C257	2:B6	2-M2	C381	2:E6	3-K3	C637	1:M6	6-P5	C814	1:L2	8-Q4
C259	2:B6	2-M3	C383	2:E6	3-J4	C640	1:M5	6-R5	C815	1:N3	8-B2
C260A	2:B6	2-P4	C385	2:E7	3-L2	C651	1:M5	6-M4	C816	1:N3	8-B2
C260B	2:B6	2-P4	C390	1:E6	3-L3	C658	1:M5	6-J1	C818	1:N3	8-C1
C260C	1:B6	2-P4	C391	2:E7	3-N1	C660	1:L5	6-K1	C819	1:N3	8-D1
C261	1:C6	2-N2	C392	2:E7	3-N3	C665	1:L5	6-K1	C820	1:N4	8-E1
C262	1:B5	2-P3	C393	2:E7	3-N2	C670	1:L6	6-L1	C822	1:N3	8-D2
C264	2:B5	2-P2	C394	2:E7	3-N3	C673	1:L5	6-P2	C824	1:N3	8-D2
C266	1:D2	2-R3	C395	2:E8	3-P3	C677	1:M6	6-P1	C826	1:N3	8-D0
C268	1:D3	2-R3	C397	2:E8	3-Q2	C681	1:M5	6-R3	C828	1:N3	8-D0
C270	2:B8	2-E3	C399	2:E8	3-R2	C684	1:M6	6-R3	C830	1:M4	8-F1
C272	2:B8	2-D1	C402	2:N8	4-B4	C687	1:L6	6-Q1	C832	1:M3	8-G2
C274	2:B8	2-E1	C404	2:N8	4-B5	C690	1:L6	6-R1	C833	1:M4	8-G1
C276	2:C4	2-B0	C406	2:N8	4-B5	C693	1:L6	6-R1	C834	1:M3	8-H2
C278	2:C4	2-C0	C408	2:M8	4-B4	C700	1:J4	7-A8	C836	1:M3	8-G0
C280	2:C4	2-F1	C410	2:M8	4-C4	C702	1:J4	7-B8	C837	1:M3	8-G0
C286	2:B8	2-F1	C412	2:M8	4-C5	C703	1:J3	7-B7	C838	1:N4	8-H0
C301	2:F8	3-B7	C414	2:M8	4-C4	C705	1:J3	7-B7	C840	1:M2	8-K1
C303	2:F8	3-B6	C416	2:M8	4-D4	C707	1:J3	7-B5	C842	1:N2	8-L0
C305	1:F7	3-B7	C418	2:M8	4-D5	C708	1:J3	7-B5	C844	1:N3	8-L0
C307	2:F8	3-C7	C420	2:M8	4-D5	C709	1:H3	7-C5	C846	1:M2	8-M0
C309	2:F8	3-D7	C422	2:L8	4-D4	C710A	1:H3	7-D8	C848	1:N2	8-M0
C311	2:F8	3-E7	C424	2:L8	4-E4	C710B	1:H4	7-D8	C850	1:M2	8-N0
&C313	2:F7	3-F7	C428	2:L8	4-E4	C710C	1:J3	7-F8	C873	1:M4	8-N2
&C315	2:F7	3-G6	C430	2:L8	4-F4	C711	1:J2	7-E7	C876	1:M4	8-P2
&C317	2:F7	3-H6	C432	2:L8	4-F5	C712	1:H2	7-E7	C879	1:M3	8-Q0
&C319	2:F7	3-J6	C436	2:K8	4-G5	C713	1:H2	7-F7	C910	2:P6	9-E6
&C321	2:F6	3-J7	C438	2:K8	4-G4	C735	1:J2	7-A1	C920	2:P7	9-F6
C323	2:F6	3-K7	C440	2:K7	4-H6	C736	1:J2	7-B1	C930	2:P7	9-G6

Device	PCB	Circuit
C940	2:P8	9-H6
CTP310	2:F8	3-E7
CTP320	2:F6	3-K7
CTP330	2:F5	3-N7
CTP410	2:L8	4-E4
CTP420	2:K8	4-H4
CTP430	2:H8	4-N4
CTP440	2:G8	4-R4
CTP910	2:N8	9-J6
CV318	1:F7	3-H6
D111	1:P4	1-R1
D220	2:D8	2-E4
D220	2:D8	2-E4
D230	2:C6	2-J5
D230	2:C6	2-J4
D240	2:C8	2-D3
D240	2:C8	2-D2
D250	1:B7	2-H1
D260	2:A7	2-H1
D270	2:B7	2-J1
D270	2:B7	2-H1
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:E8	3-P2
D310	2:E8	3-P2
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
D740	1:H3	7-K2
D820	1:J3	8-B7
D860	1:M2	8-N0
D860	1:M2	8-N0
D880	1:M2	8-R2
D880	1:M2	8-R2
IC210	1:C7	2-G7
IC210	1:C7	2-C7
IC210	1:C7	2-F7
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-B0
IC280	1:C4	2-D0
IC280	1:C4	2-E1
IC340	1:F4	3-B1
IC350	1:E4	3-D1
IC390	1:E6	3-H3
IC390	1:E6	3-L3
IC390	1:E6	3-L0
IC390	1:E6	3-H0
IC390	1:E6	3-K3
IC410	1:H7	4-P4
IC610	1:M5	6-D8
IC630	1:N5	6-K5
IC640	1:M5	6-N5
IC640	1:M5	6-J0
IC640	1:M5	6-R5
IC650	1:L5	6-E5
IC700	1:J3	7-A8
IC710	1:H3	7-E8
IC710	1:H3	7-J0
IC710	1:H3	7-C6
IC710	1:H3	7-D6
IC710	1:H3	7-D7
IC740	1:H2	7-D1
IC750	1:H4	7-M3

Device	PCB	Circuit
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-B7
L320	1:F8	3-C7
L330	1:F7	3-G7
L340	1:F7	3-J7
L350	1:F5	3-P7
L360	1:E5	3-F2
L410	1:M8	4-C5
L420	1:L8	4-D5
L430	1:L8	4-F4
L440	1:M7	4-G6
L450	1:K8	4-G5
L460	1:J8	4-K4
L470	1:H8	4-M4
L480	1:G8	4-P4
L490	1:G8	4-Q4
L750	1:G4	7-R0
L910	1:P6	9-F7
L920	1:P7	9-G7
L930	1:P8	9-H7
P100	1:P6	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-K9
P252	1:B2	2-K9
P254	1:B2	2-K9
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
P380	1:D3	3-R0
P810	1:K2	8-A5
P815	1:L4	8-C4
P820	1:K4	8-M8

Device	PCB	Circuit
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
PL210	1:C6	2-B8
PL220	1:C6	2-H7
PL230	1:B2	2-K8
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
Q310	1:F8	3-C7
Q320	2:F6	3-L7
Q330	2:F6	3-M7
Q340	2:E7	3-M2
Q350	2:E7	3-P2
Q410	2:L8	4-F5
Q420	2:K8	4-G4
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-J3
Q770	1:H3	7-J1
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

Device	PCB	Circuit
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-R6
R241	2:D8	2-G5
R242	2:C8	2-G4
R244	2:C8	2-G4
R245	2:C8	2-H5
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:B7	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
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-H3
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
R301	2:F8	3-B6
R302	2:F8	3-B6
R303	2:F8	3-C7
R305	2:F7	3-C8
R307	2:F8	3-D7
R309	2:E8	3-F6
R311	2:F8	3-F7
R313	2:E8	3-F6
R315	2:F6	3-L6
R317	2:F6	3-L6
R319	2:F6	3-L7
R321	2:F6	3-L8
R323	2:F6	3-L7
R325	2:F6	3-L8
R327	2:F5	3-M8
R329	2:F6	3-M7
R331	2:F5	3-M6
R332	2:F4	3-B3
&R333	2:F4	3-Q6
R333	2:E4	3-C2
R334	2:F3	3-C1
R335	2:E3	3-D1
R337	2:E4	3-D2
%R338	2:E5	3-F3
R339	2:E5	3-G3
R341	2:E6	3-H3
R343	2:E6	3-G2

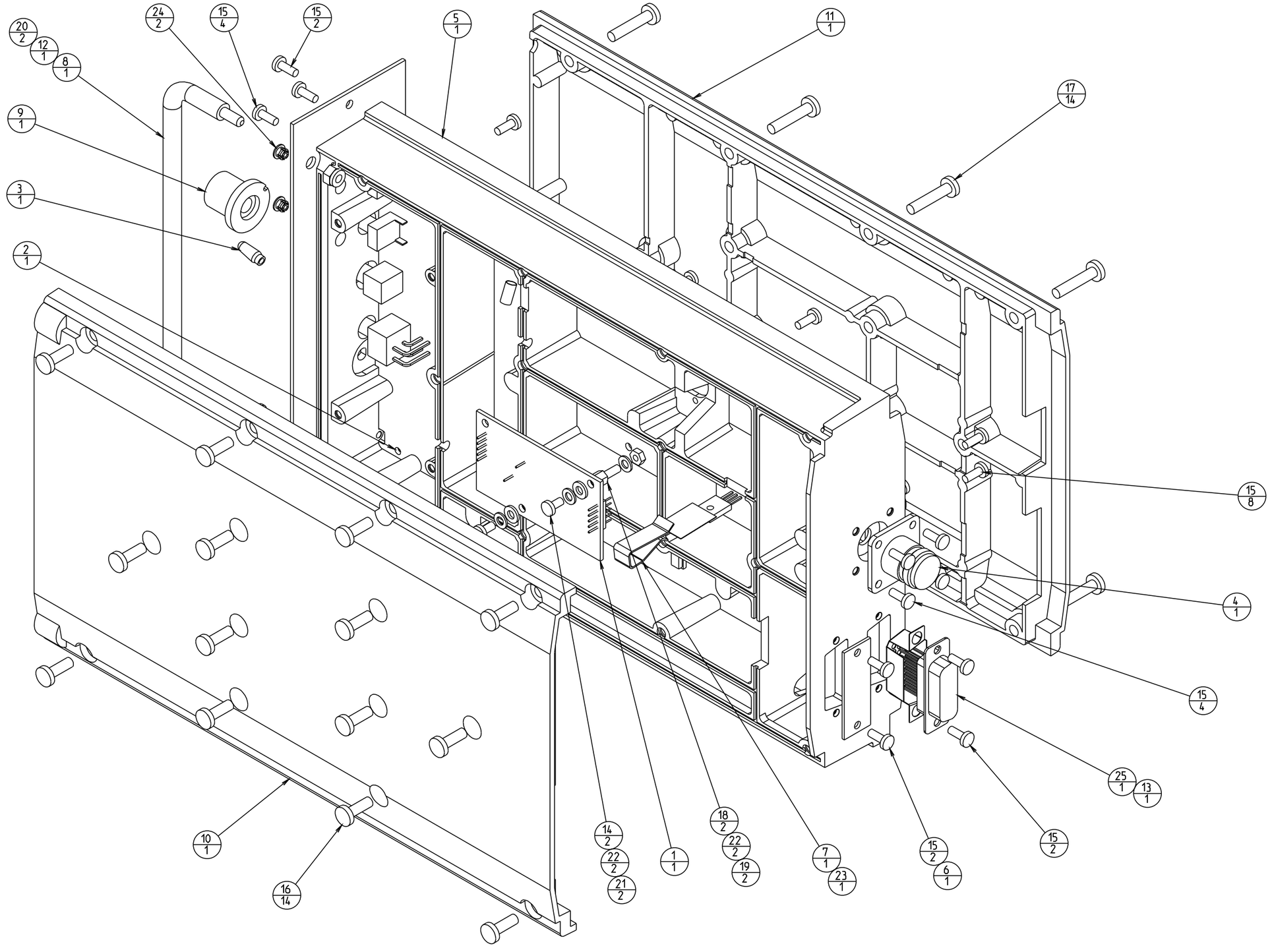
Device	PCB	Circuit
R345	2:E6	3-G1
&R347	2:E6	3-H2
R349	2:E6	3-H2
R351	1:E6	3-J2
R353	2:E6	3-J4
R355	2:E7	3-J3
R357	2:E7	3-K3
R359	2:E6	3-K3
R361	2:E6	3-K2
R363	2:E7	3-L2
R365	2:E7	3-M1
R367	2:E7	3-M1
R369	2:E7	3-M3
R371	1:E7	3-M3
R372	2:E7	3-M3
R374	2:E7	3-N3
R376	2:E7	3-N2
R378	2:E7	3-N3
R380	2:E6	3-P4
R381	2:E7	3-P3
R383	2:E8	3-P3
R385	2:E8	3-Q2
R387	2:E8	3-Q3
R389	2:E8	3-Q3
R391	2:E4	3-G0
R393	2:F4	3-G0
R395	2:E5	3-G0
R397	2:E5	3-G0
R398	2:E6	3-H0
R399	2:E5	3-J0
R410	2:K7	4-E6
R413	2:L7	4-E5
R416	2:L8	4-F5
R418	2:K8	4-F4
R419	2:K8	4-G4
R422	2:L8	4-G4
R425	2:K8	4-G5
R427	2:K7	4-G6
R428	2:K7	4-G6
R432	2:K8	4-H4
R435	2:K8	4-H4
R438	2:K8	4-J4
R441	2:H8	4-M4
R444	2:H8	4-N4
R447	2:H8	4-N4
R453	2:H7	4-P5
R456	2:H7	4-Q5
R459	2:H7	4-Q5
R464	2:G7	4-Q4
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-J4
R759	1:H3	7-J4
R760	1:H3	7-K4
R762	1:H3	7-K4
R763	1:H4	7-L4
R765	1:H3	7-J2
R766	1:G3	7-J3
R767	1:H3	7-K2
R769	1:H3	7-L3
R771	1:H4	7-L3
R772	1:G4	7-M2
R774	1:H4	7-M2
R775	1:H4	7-N2
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
R792	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
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
R910	2:P6	9-D6
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-G5
RV230	1:B8	2-A2
RV235	1:C4	2-C0
RV320	1:E4	3-G0
RV330	1:E7	3-N2
SHLD610	1:L6	6-J3
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-Q5
SK805	1:K3	8-Q6
SK805	1:K3	8-Q7
SK805	1:K3	8-Q8
SK805	1:K3	8-Q9
SK810	1:L3	8-H5
SL210	2:B8	2-E2
SL220	2:B8	2-D2
SL405	2:N7	4-B5
SL410	2:M8	4-C5
SL415	2:M7	4-D5
SL420	2:K8	4-J5
SL425	2:K8	4-H4
SL430	2:K7	4-J5
SL435	2:J8	4-K4
SL440	2:J7	4-L5
SW201	1:B4	2-A6
T210	1:C3	2-Q2
T610	1:L6	6-N2
TP202	1:D7	2-D9
TP211	1:D3	2-P8
TP310	1:E5	3-K0
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:F3	3-C2
&XF310	1:F7	3-G7
&XF320	1:F7	3-J7
&XF330	1:F5	3-P7
&XF340	1:E3	3-C1

Key

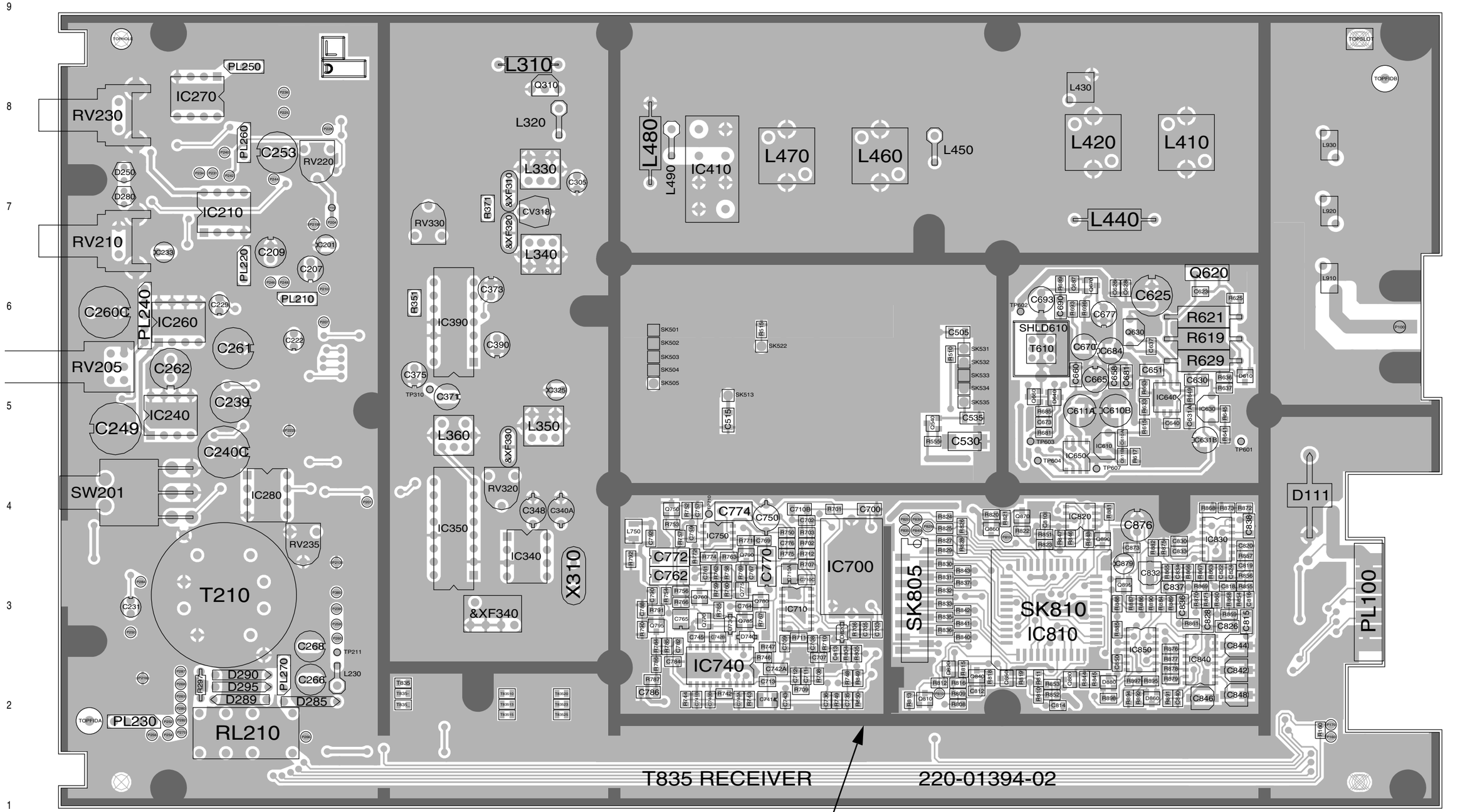
33/2

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

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



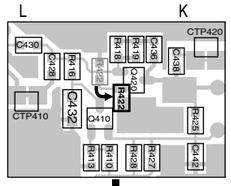
T835 Mechanical Assembly
220-01394-02

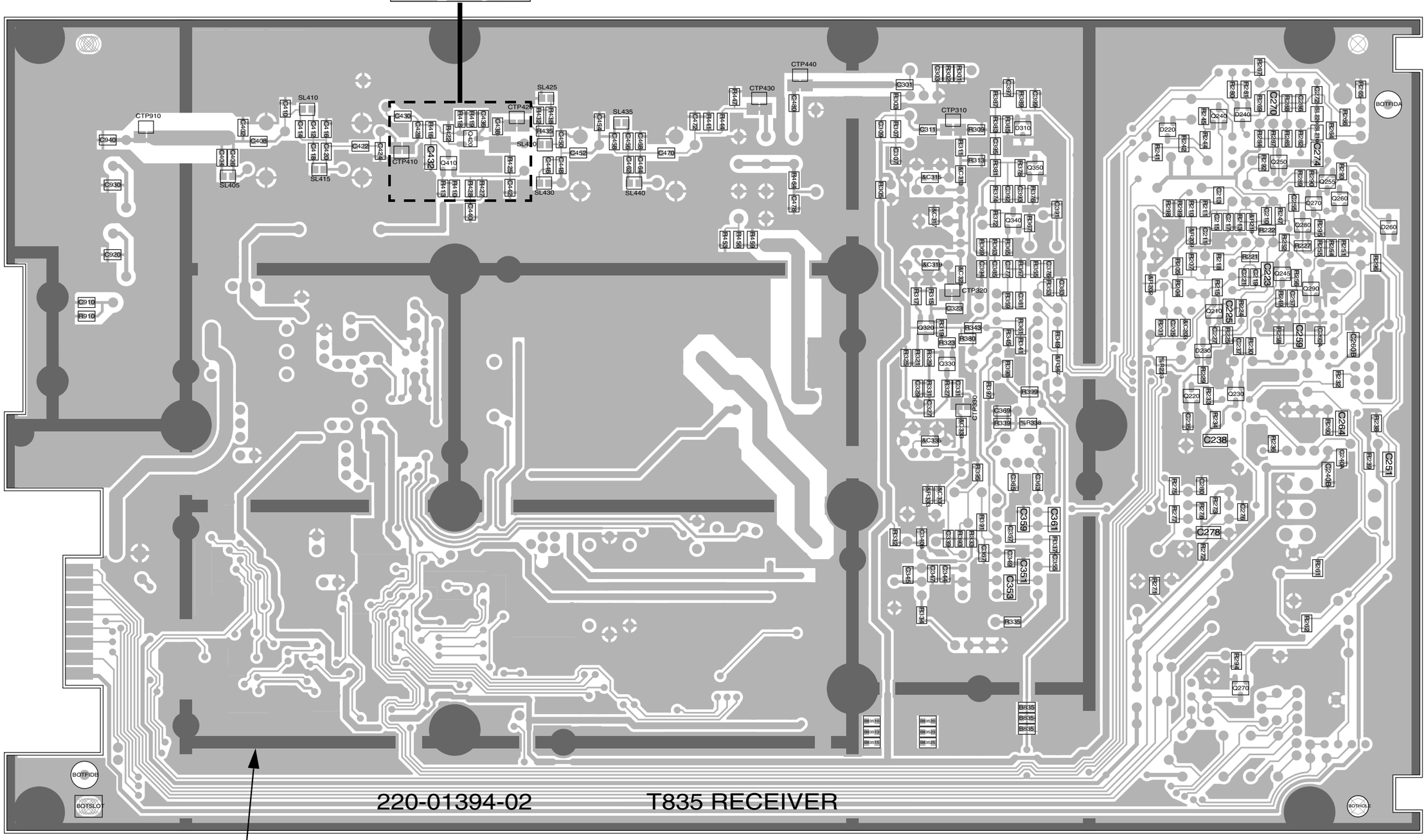


T835 PCB Layout - Top Side
220-01394-02

31/03/01

R422 has been moved, and is now placed as shown

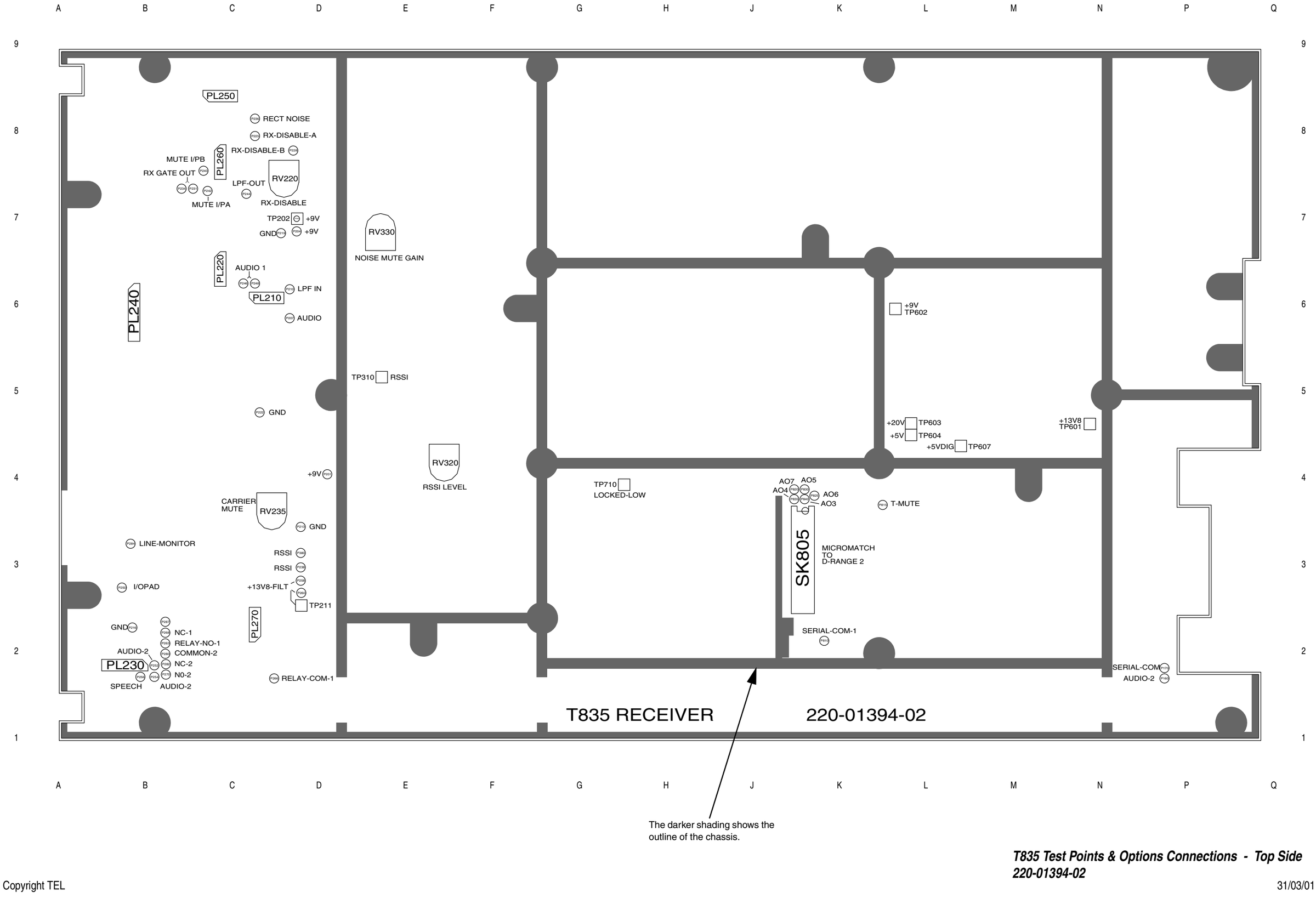




The darker shading shows the footprint of the bottom cover.

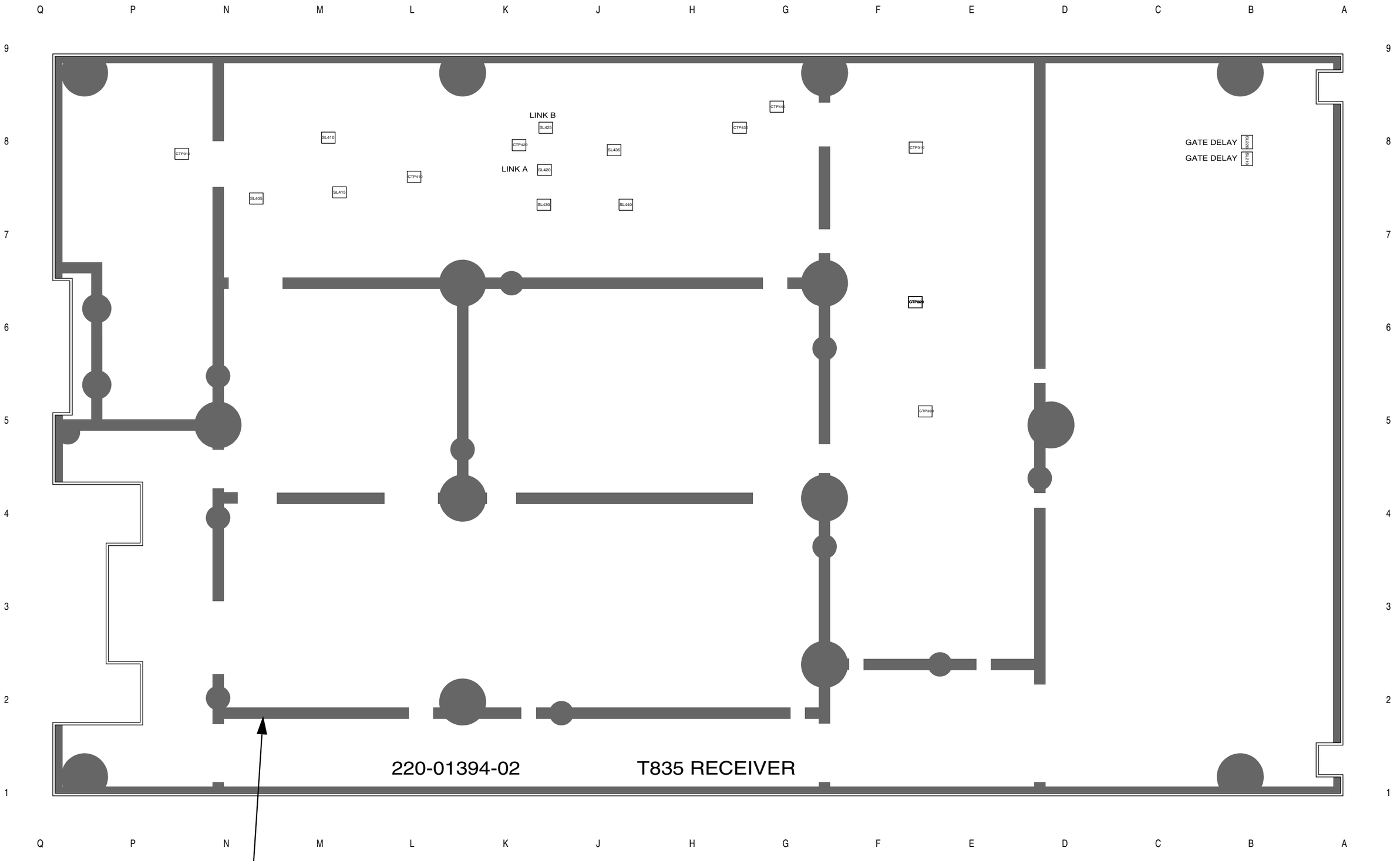
T835 PCB Layout - Bottom Side
220-01394-02

31/03/01



The darker shading shows the outline of the chassis.

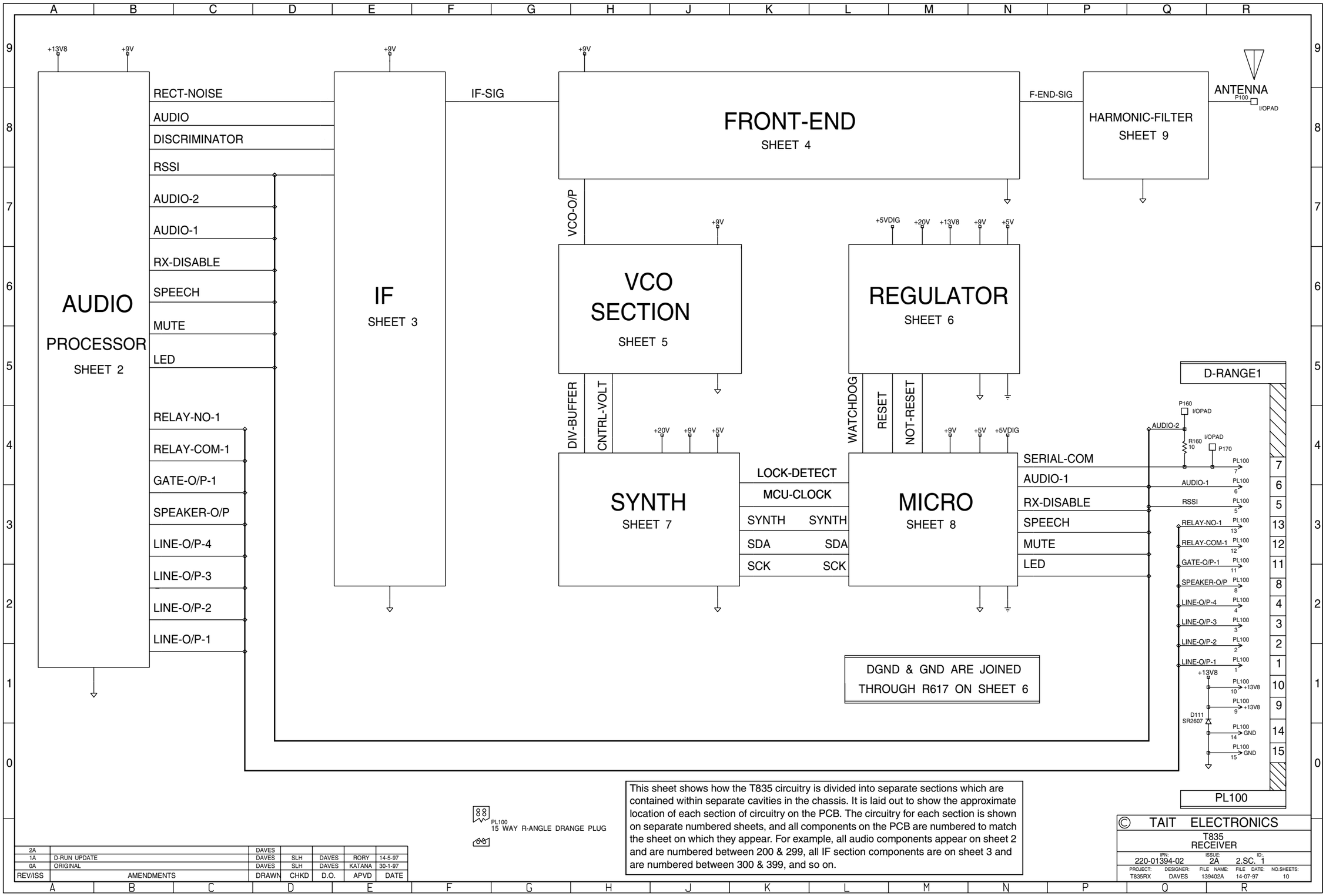
T835 Test Points & Options Connections - Top Side
220-01394-02



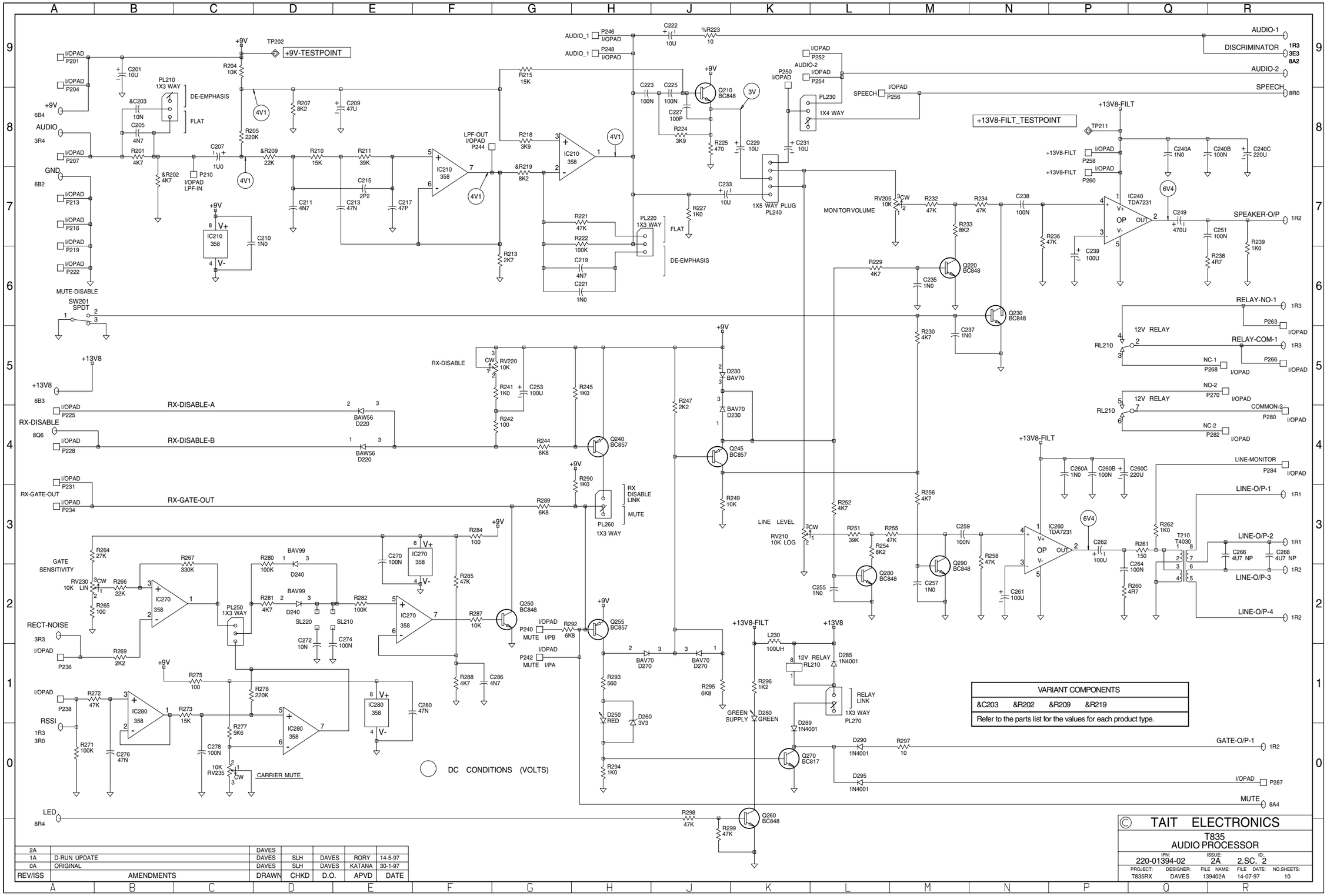
The darker shading shows the footprint of the bottom cover.

T835 Test Points & Options Connections - Bottom Side
220-01394-02

31/03/01



Sheet 1 - T835 Receiver Overview
220-01394-02



REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE
2A		DAVES				
1A	D-RUN UPDATE	DAVES	SLH	DAVES	RORY	14-5-97
0A	ORIGINAL	DAVES	SLH	DAVES	KATANA	30-1-97

Sheet 2 - T835 Audio Processor
220-01394-02

VARIANT COMPONENTS					
&C313	&C319	&C335	&R333	&XF310	&XF330
&C315	&C321	&C337	&R347	&XF320	&XF340
&C317	&C333				

Refer to the parts list for the values for each product type.

SPARE GATE

REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE
2A		DAVES				
1A	D-RUN UPDATE	DAVES	SLH	DAVES	RORY	14-5-97
0A	ORIGINAL	DAVES	SLH	DAVES	KATANA	30-1-97

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T835-RECEIVER IF

IPN:	ISSUE:	ID:		
220-01394-02	2A	2.SC. 3		
PROJECT:	DESIGNER:	FILE NAME:	FILE DATE:	NO.SHEETS:
T835RX	DAVES	139402A	14-07-97	10

Sheet 3 - T835 IF Section
220-01394-02

REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE
2A		DAVES				
1A	D-RUN UPDATE	DAVES	SLH	DAVES	RORY	14-5-97
0A	ORIGINAL	DAVES	SLH	DAVES	KATANA	30-1-97

T835-RECEIVER
FRONT-END

IPN:	ISSUE:		ID:
220-01394-02	2A	2.SC. 4	

PROJECT:	DESIGNER:	FILE NAME:	FILE DATE:	NO.SHEETS:
T835RX	DAVES	139402A	14-07-97	10

Sheet 4 - T835 Front End
220-01394-02

CNTRL-VOLT
7R3

R510
680

C505
100N

+9V
6B4

GND
6B2

1 SK501 GND
1 WAY SOCKET

2 SK502 GND
1 WAY SOCKET

3 SK503 GND
1 WAY SOCKET

4 SK504 GND
1 WAY SOCKET

5 SK505 RF-OUT
1 WAY SOCKET

VCO-O/P
4R5

+9V

C515
100N

SK513
1 WAY SOCKET
VCO-BUFFER

DIV-BUFFER
7R0

R515
56

SK522
1 WAY SOCKET
DIV-BUFFER

CV-OUT SK531
1 WAY SOCKET

1 SK531

GND SK532
1 WAY SOCKET

2 SK532

GND SK533
1 WAY SOCKET

3 SK533

GND SK534
1 WAY SOCKET

4 SK534

+9V-VCO SK535
1 WAY SOCKET

5 SK535

+9V

Q540
BC848

R555
1K0

C530
10U
TANT

C535
100N

The circuit diagram for the VCO PCB is in Part E.

REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE
2A		DAVES				
1A	D-RUN UPDATE	DAVES	SLH	DAVES	RORY	14-5-97
0A	ORIGINAL	DAVES	SLH	DAVES	KATANA	30-1-97

T835
VCO SECTION

IPN:	ISSUE:	ID:
220-01394-02	2A	2.SC. 5

PROJECT:	DESIGNER:	FILE NAME:	FILE DATE:	NO.SHEETS:
T835RX	DAVES	139402A	14-07-97	10

Sheet 5 - T835 VCO Section
220-01394-02

+5VDIG-SUPPLY

+5VDIG TESTPOINT

DGND CONNECTS GND THROUGH R617

+13V8-TESTPOINT

+9V-TESTPOINT

+5V REGULATOR

+5V TESTPOINT

+9V REGULATOR

CAN TO SHIELD T610

10MM SQ * 11MM SHLD610

240KHz

24vpp

+20V SUPPLY

+20V TESTPOINT

IC640 SPARE GATE

REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE
2A		DAVES				
1A	D-RUN UPDATE	DAVES	SLH	DAVES	RORY	14-5-97
0A	ORIGINAL	DAVES	SLH	DAVES	KATANA	30-1-97

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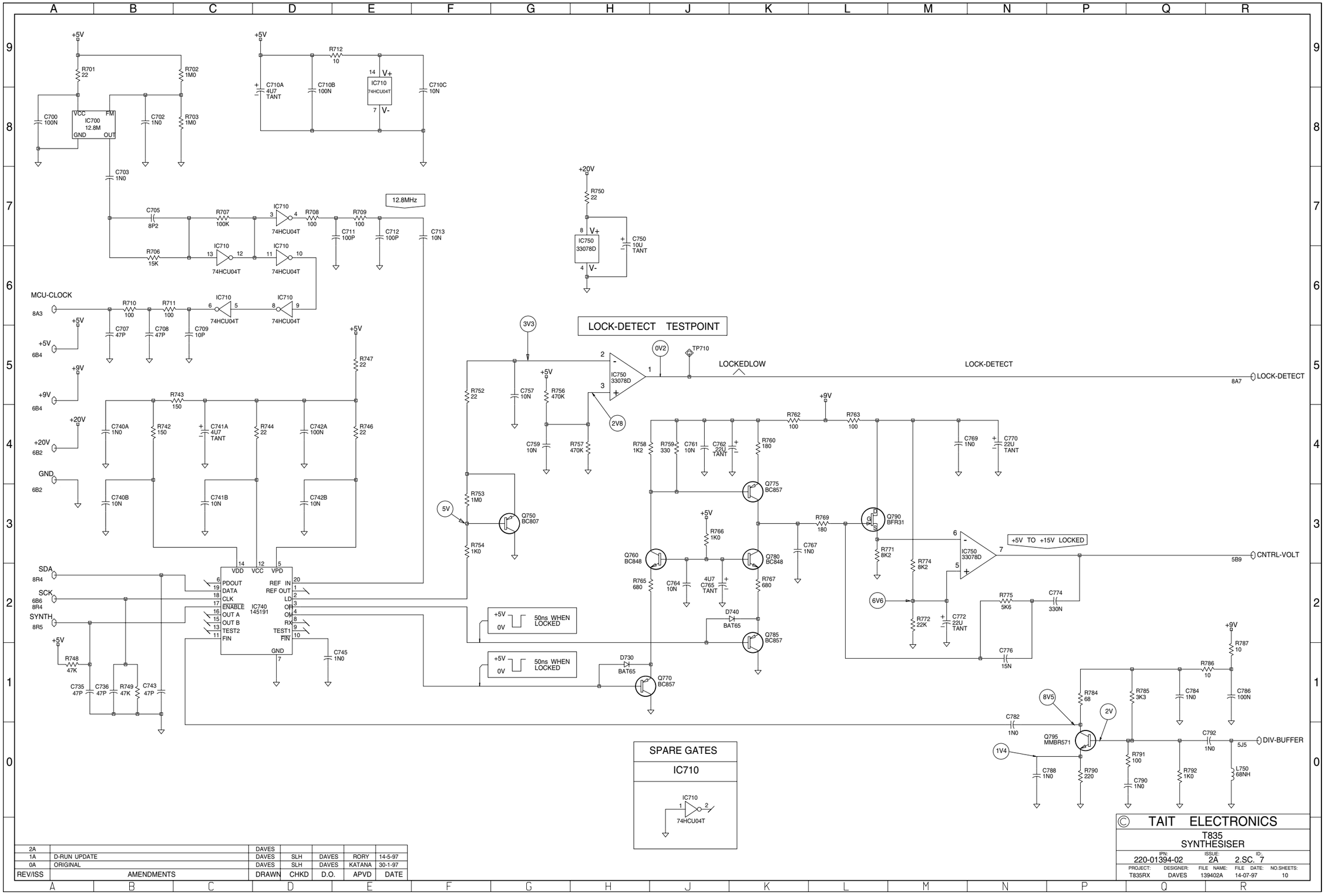
T835
REGULATORS

IPN:	ISSUE:	ID:
220-01394-02	2A	2.SC. 6

PROJECT:	DESIGNER:	FILE NAME:	FILE DATE:	NO.SHEETS:
T835RX	DAVES	139402A	14-07-97	10

Sheet 6 - T835 Regulators
220-01394-02



REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE
2A		DAVES				
1A	D-RUN UPDATE	DAVES	SLH	DAVES	RORY	14-5-97
0A	ORIGINAL	DAVES	SLH	DAVES	KATANA	30-1-97

Sheet 7 - T835 Synthesiser
220-01394-02

Circuit Diagram Amendments

SK805 pin 16 was incorrectly labelled “AUX-OUT-3”. The label at grid reference Q7 has been corrected to read “+5VDIG”. The line from IC810 pin 19 to SK805 pin 4 was incorrectly labelled “CTCSS_ENABLE”. The label at grid reference H4 has been corrected to read “CTCSS_DISABLE”.

CHANNEL SELECT TO MICRO BUS

MICROMATCH TO D-RANGE2 CONNECTIONS

MICROMATCH PIN	D-RANGE2 PIN
1	1
3	2
5	3
7	4
9	5
11	6
13	7
6	11
16	NC
14	15
12	14
10	13
4	10
8	12
2	9
15	8

REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE
2A		DAVES				
1A	D-RUN UPDATE	DAVES	SLH	DAVES	RORY	14-5-97
0A	ORIGINAL	DAVES	SLH	DAVES	KATANA	30-1-97

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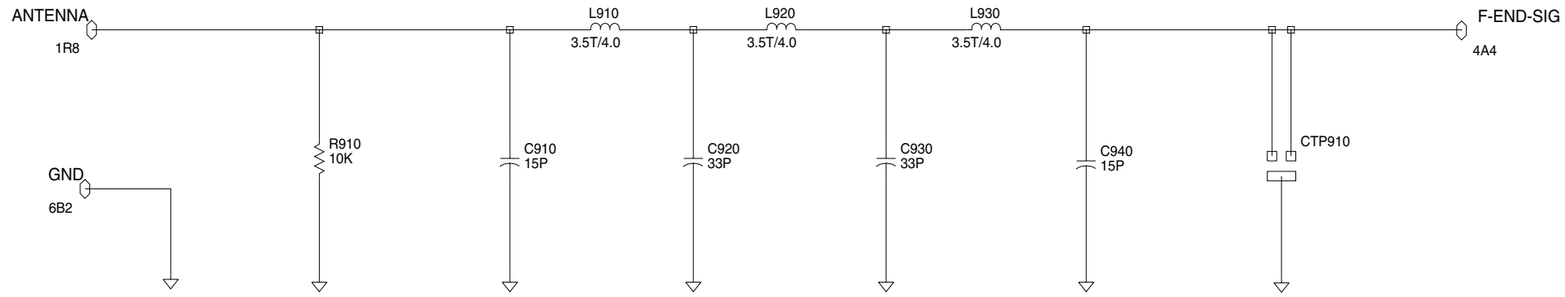
T835
MICROCONTROLLER

IPN:	ISSUE:	ID:
220-01394-02	2A	2.SC. 8

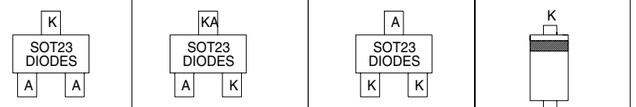
PROJECT:	DESIGNER:	FILE NAME:	FILE DATE:	NO.SHEETS:
T835RX	DAVES	139402A	14-07-97	10

Sheet 8 - T835 Microcontroller
220-01394-02

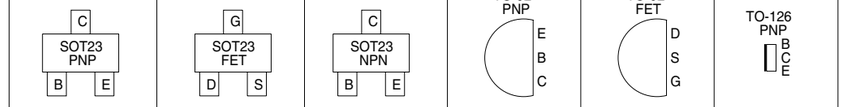


HARMONIC-FILTER

DIODE PHYSICAL PIN-OUTS



TRANSISTOR PHYSICAL PIN-OUTS



TANTALUMS

REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE
2A		DAVES				
1A	D-RUN UPDATE	DAVES	SLH	DAVES	RORY	14-5-97
0A	ORIGINAL	DAVES	SLH	DAVES	KATANA	30-1-97

T835
HARMONIC-FILTER

IPN:	ISSUE:	ID:
220-01394-02	2A	2.SC. 9

PROJECT:	DESIGNER:	FILE NAME:	FILE DATE:	NO.SHEETS:
T835RX	DAVES	139402A	14-07-97	10

Sheet 9 - T835 Harmonic Filter
220-01394-02