
TA2444-01 Change-over Module Operation and Service Manual



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Tait Contact Information

Tait Radio Communications Corporate Head Office

Tait Electronics Ltd
P.O. Box 1645
Christchurch
New Zealand

For the address and telephone number of regional offices, refer to the TaitWorld website:

Website: <http://www.taitworld.com>

Technical Support

For assistance with specific technical issues, contact Technical Support:

E-mail: support@taitworld.com

Website: <http://support.taitworld.com>

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Preface

Scope of Manual

The TA2444-01 Change-over Module Operation and Service Manual provides information on installing, operating and servicing the TA2444-01 hardware.

Enquiries and Comments

If you have any enquiries regarding this manual, or any comments, suggestions and notifications of errors, please contact Technical Support (refer to [“Tait Contact Information”](#) on page 2).

Updates of Manual and Equipment

In the interests of improving the performance, reliability or servicing of the equipment, Tait Electronics Ltd reserves the right to update the equipment or this manual or both without prior notice.

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Associated Documentation

TB8100 Installation and Operation Manual (IPN MBA-00005-05).

TB8100 Specifications Manual (IPN MBA-00001-06).

TB8100 Service Kit and Alarm Center User's Manuals and online Help (IPN MBA-00010-03)

TB8100 Calibration Kit User's Manual and online Help.

Technical notes are published from time to time to describe applications for Tait products, to provide technical details not included in manuals, and to offer solutions for any problems that arise.

All available TA2444-01 product documentation is provided on the CD supplied with the TA2444-01¹. Updates may also be published on the Tait support website.

Document Conventions

Within this manual, four types of alerts may be given to the reader. The following illustrate each type of alert and its associated symbol.



Warning!! This alert is used when there is a potential risk of death or serious injury.



Caution This alert is used when there is a risk of minor or moderate injury to people.



Important This alert is used to warn about the risk of equipment damage or malfunction.

Note This alert is used to highlight information that is required to ensure procedures are performed correctly.

Publication Record

Issue	Publication Date	Description
1	July 2005	first release

1. Technical notes are only available in PDF format from the Tait support website. Consult your nearest Tait Dealer or Customer Service Organisation for more information.

Safety and Servicing Information

This chapter contains general information on safety and servicing procedures for the TA2444-01 Change-over Module.

Personal Safety

Explosive Environments



Warning!! Do not operate TA2444-01 fitted BSS equipment near electrical blasting caps or in an explosive atmosphere. Operating the equipment in these environments is a definite safety hazard.

Proximity to RF Transmissions

Do not operate the transmitter when someone is standing within 90 cm (3ft) of the antenna. Do not operate the transmitter unless you have checked that all RF connectors are secure.

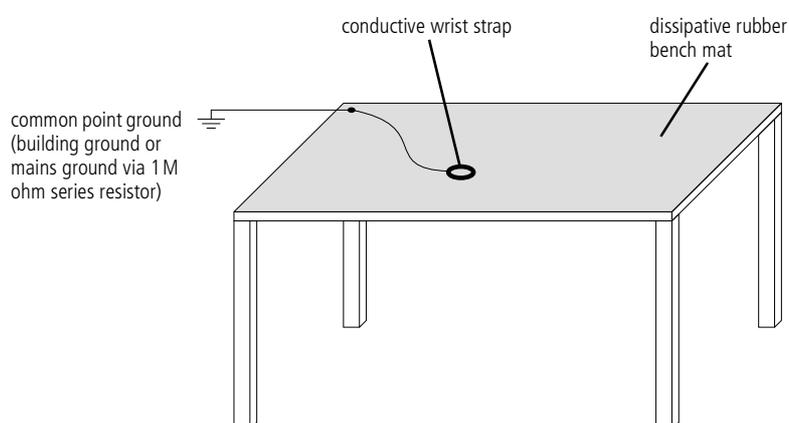
Equipment Safety

ESD Precautions



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

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



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

Aerial Load

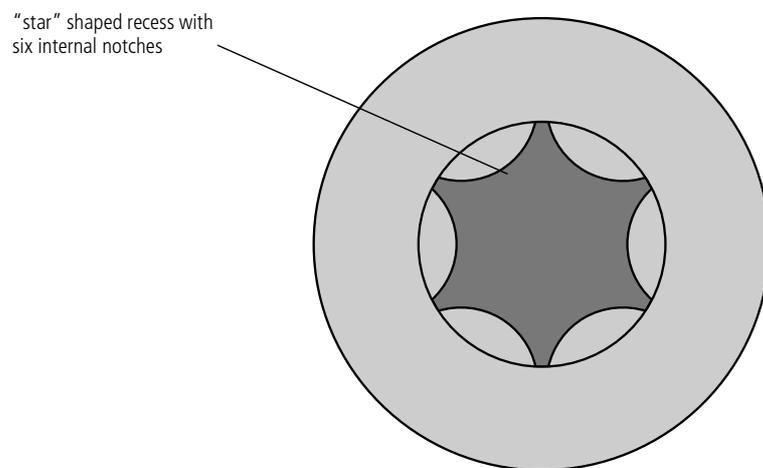
The TA2444-01 equipped BSS equipment has been designed to operate safely under a wide range of aerial loading conditions. However, we strongly recommend that the transmitter should always be operated with a suitable load to prevent damage to the transmitter output power stage.

Identifying Screw Types

Torx Recess Head Screws

Torx recess head screws are the standard type of screw used in all TA2444-01 equipped BSS equipment, although Pozidriv and Allen recess head screws are also used in a few special applications.

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



Allen Recess Head UNC Screws

Allen recess head 4-40 UNC thread screws are used to secure the RF power transistors in the TA2444-01 power amplifier and cannot be interchanged with M3 screws.

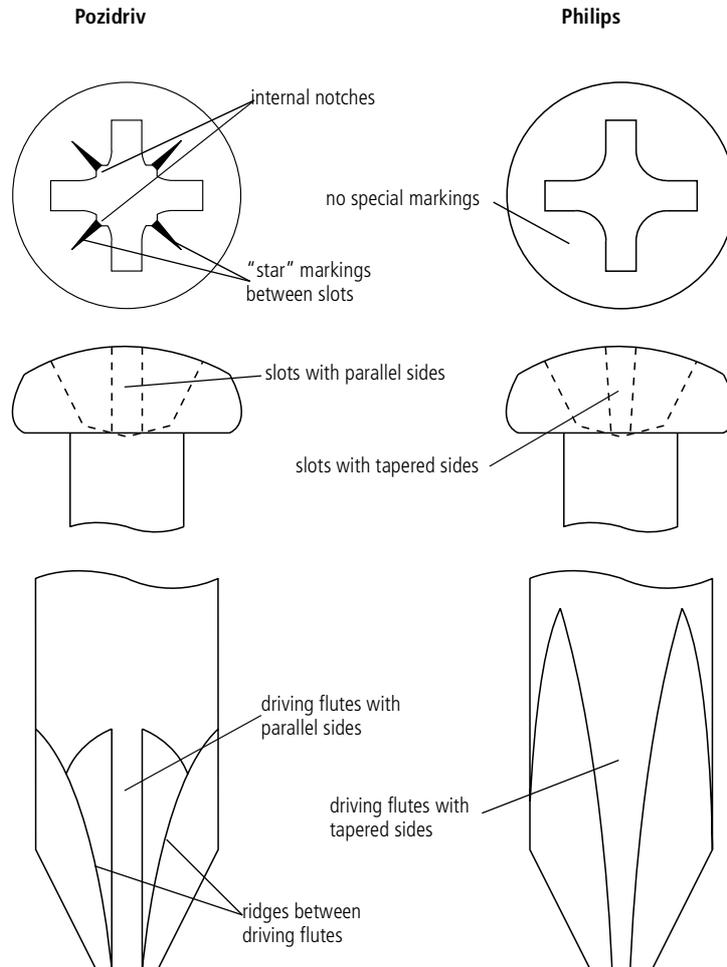
Pozidriv Recess Head Screws

Pozidriv recess head screws are used in TA2444-01 equipment in a few special applications. It is important that you use the correct type and size screwdriver to avoid damaging the screw head.

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

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

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



Recommended Tools

It is beyond the scope of this manual to list every tool that a service technician should carry. However, the tools specifically required for servicing TA2444-01 fitted BSS equipment are listed in the table below. You can also obtain the TBA0ST2 tool kit from your nearest Tait Dealer or Customer Service Organisation. It contains the basic tools needed to install, tune and service TA2444-01 BSS equipment.

Driver/ Spanner	Size	Location / Function
Torx T8C*	M2.5	securing the SMA connector to the reciter and PA front panel
Torx T10*	M3	all M3 screws
Torx T20*	M4	all M4 screws
Pozidriv PZ3	M6	DC input terminals on the PMU
3/32 in Allen key	4-40 UNC	securing the RF power transistors to the PA heatsink
5.5mm AF*	M3	securing the speaker to the control panel chassis
11 mm AF		securing the BNC/TNC connectors to the reciter rear panel

* included in the TBA0ST2 kit

Replacing Components

Ensure that any replacement components are of the same type and specifications as the originals. This will prevent the performance and safety of the TA2444-01 equipment from being degraded.

Surface Mount Devices



Important

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

Leaded Components

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

Desoldering Iron Method

This method requires the use of a desoldering station.

1. Place the tip over the lead and, as the solder starts to melt, move the tip in a circular motion.
2. Start the suction and continue the movement until three or four circles have been completed.
3. Remove the tip while continuing suction to ensure that all solder is removed from the joint, then stop the suction.
4. **Before** pulling the lead out, ensure it is not stuck to the plating.
5. If the lead is still not free, resolder the joint and try again.

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

Component Cutting Method

6. Cut the leads on the component side of the PCB.
7. Heat the solder joint **sufficiently** to allow **easy** removal of the lead by drawing it out from the component side: do **not** use undue force.
8. Fill the hole with solder and then clear with solderwick.

Cased Mica Capacitors

Cased mica capacitors can be removed by heating the top with a heavy-duty soldering iron and gently lifting the capacitor off the PCB with a solder-resistant spike or equivalent. Make sure that the solder at the tab solder joint is melted or removed before attempting to lift the capacitor.

Regulatory Information

Any modifications you make to this equipment which are not authorised by Tait Electronics Ltd may invalidate your compliance authority's approval to operate the equipment.

PCB Information

All PCBs are identified by a unique 10 digit IPN (internal part number) which is printed onto the PCB (usually on the top side), as shown in the example below.

220-02008-04

The last two digits of this number define the issue status, which starts at 01 and increments through 02, 03, 04 etc. as the PCB is updated.

1 General Information

To ensure continuous operation of a TB8000 system, an additional base station on standby can take over in the event of the active base station developing a fault condition.

The TA2444-01 Change-over Switch provides automated failure protection for the Tait TB8000 series of base station equipment. In the event of failure, the standby base station is brought into service and takes over operations from the active unit. The TA2444-01 provides the physical change-over mechanics, interfaces to external alarm components and termination points for remote audio connections.

The TA2444-01 Change-over Module consists of two circuit boards, connected to each other via their 25 way connectors, and mounted to the rear of the active TB8000 Reciter fitted with a SIF (System Interface) board. The switch plugs directly into the SIF. A cable loom connects the Switch to the other base station Reciter's SIF, and to a coaxial relay if required. Interface from the TB8100 to the TA2444-01 is through the "Standard 25" series of system interface boards.

External connections to the TA2444-01 can be made through the auxiliary connector for external forward and reverse power monitoring, selected RSSI and unbalanced audio in/out. Selected base station output is also available.

1.1 Operation

The active and standby TB8000 base stations in the system each has a dedicated script for the Enhanced Task Manager software, to monitor its own status and transmit a specific heartbeat signal to the task manager of the other base station. When the standby base station detects a change in the heartbeat of the active one, it issues a change-over command to the TA2444-01, which effects the change over of the Tx and Rx audio, and the E&M signalling lines. The system's transmit antenna is redirected to the standby transmitter via coaxial relay, on transmission from standby base.

The TA2444-01 also provides facility for exercising the standby base station, to ensure it is functioning correctly, before an active base station failure occurs.

1.2 Task Manager

The TA2444-01 change-over solution uses the TB8000 Enhanced Task Manager software to monitor and report the status of the TB8100 pair and to make the decision to change over. Both TB8100 base stations in the change-over solution are equipped with advanced profiles and Task Manager (TBAS020).

There are a number of methods for remote notification of a base station failure or fault. A single alarm point is available on the TA2444-01, with more sophisticated alarm facilities available from the TB8000.

1.3 Alarms

The TB8000 has a series of internal alarms which can be configured in the Task Manager to generate change overs. The alarms are given high or low priority. Low priority alarms (for example fan failure) are typically caused by failures that don't present an immediate threat to the base station operation. High priority alarms are caused by failures which impede operation, such as receiver failure.

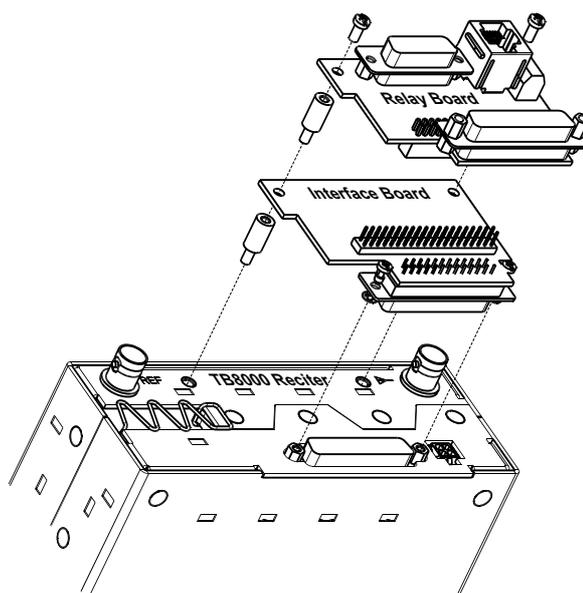
Base station alarms can be added or removed from the alarm custom input lists to suit the application, but would typically include the following:

- failures of receiver, transmitter and power supply
- internal forward and reverse transmitter power
- synthesiser out of lock
- receiver gate failure
- fan failure
- overheating

1.4 Mechanical

The drawing illustrates the PCB pair which comprises the TA2444-01 change-over Module, and its position when fitted to the rear of the TB8000 Reciter.

For more information on mechanical detail of this product, see [“Fitting the TA2444-01 PCB Assembly”](#) on page 25 of this manual.



1.5 Specifications

12 volt operation: via aux volts from SIF.

Timing

Failure type	Typical change-over time from detection
receiver failure (receiver fail counter set to 1)	~5 seconds
transmitter/other alarm failure	~3 seconds
complete base station failure	~4 seconds

Software Enhanced Task Manager version TBAS020 (or later)

1.6 System Configuration

Different base station setups, variable change-over requirements and minimum system requirements all influence the system configuration. In systems that employ RF combining equipment, the attenuation introduced may prevent the PA's internal forward and reverse power failure detectors from sensing an antenna failure.

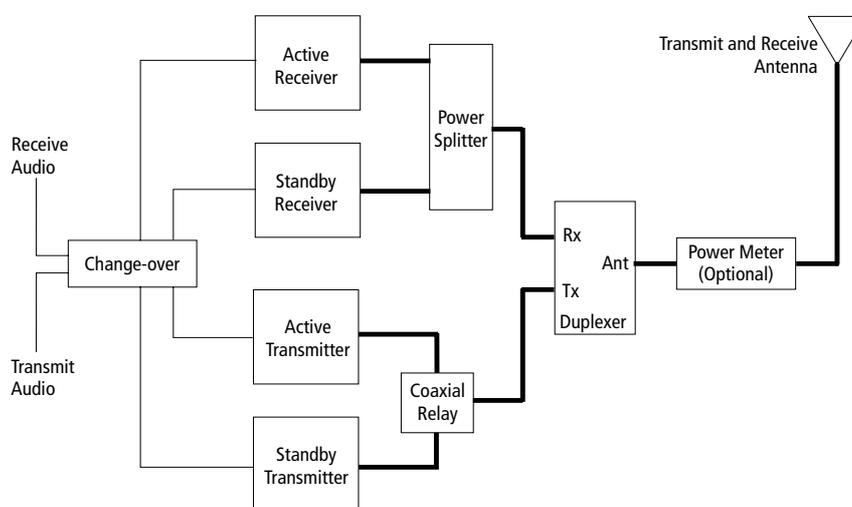
To accommodate this situation, an external forward and reverse power monitor needs to be added to the system. The Change-over Module is capable of accommodating separate monitors for both base stations.

The four most common TB8000 base station change-over system configurations are:

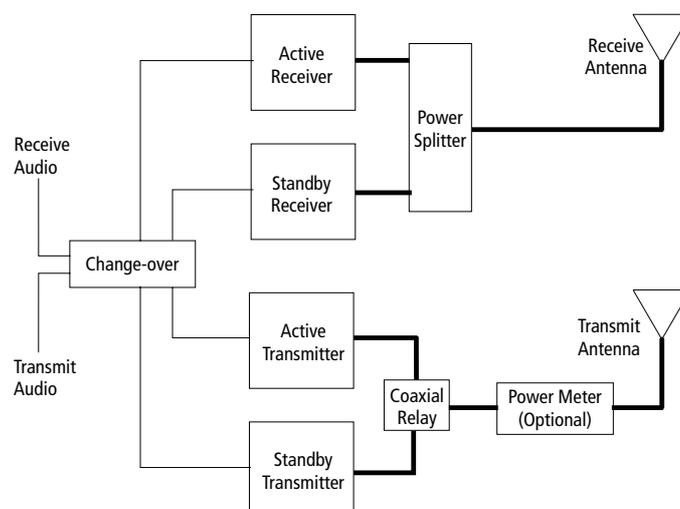
- Shared Single Antenna System
- Shared Dual Antenna System
- Redundant Antenna System
- Dual Transmit, Single Receive Antenna System

These are illustrated in the diagrams that follow.

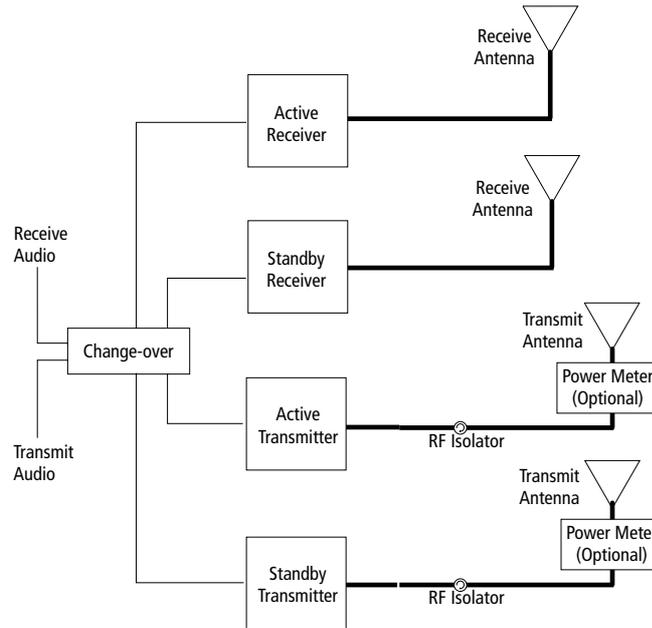
Shared Single-Antenna System



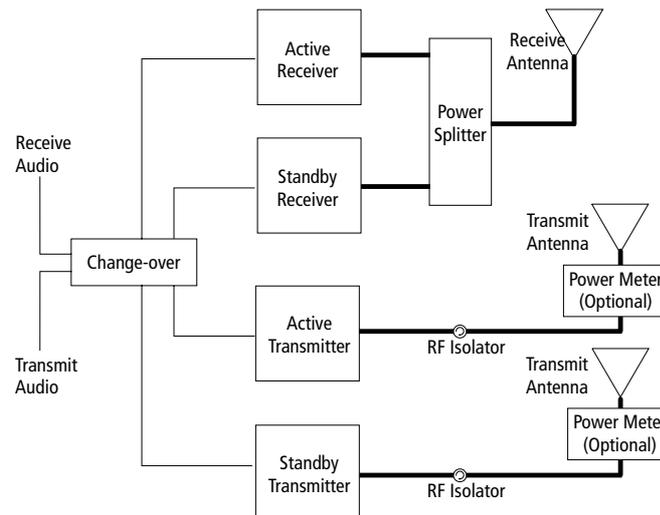
Shared Dual-Antenna System



Redundant Antenna System



Dual-Transmit, Single-Receive Antenna System



1.7 Ancillary Equipment

The configurations described above all require ancillary equipment, some of which is frequency-specific. This equipment may include:

- Power Monitors
- Power Splitters
- Coaxial Relays

For more information on system requirements and details of ancillary equipment, see [“Ancillary Equipment”](#) section on page 65 of this manual.

2 Installation

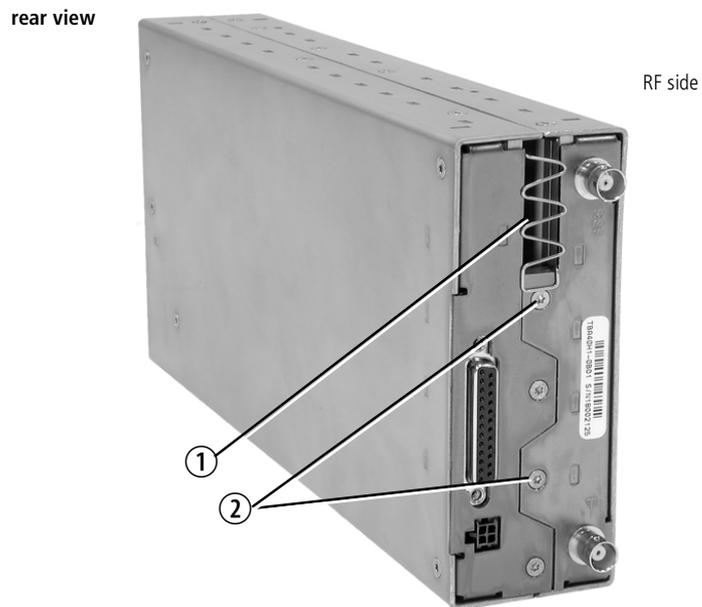
2.1 Disassembling the TB8000

Removing the Covers

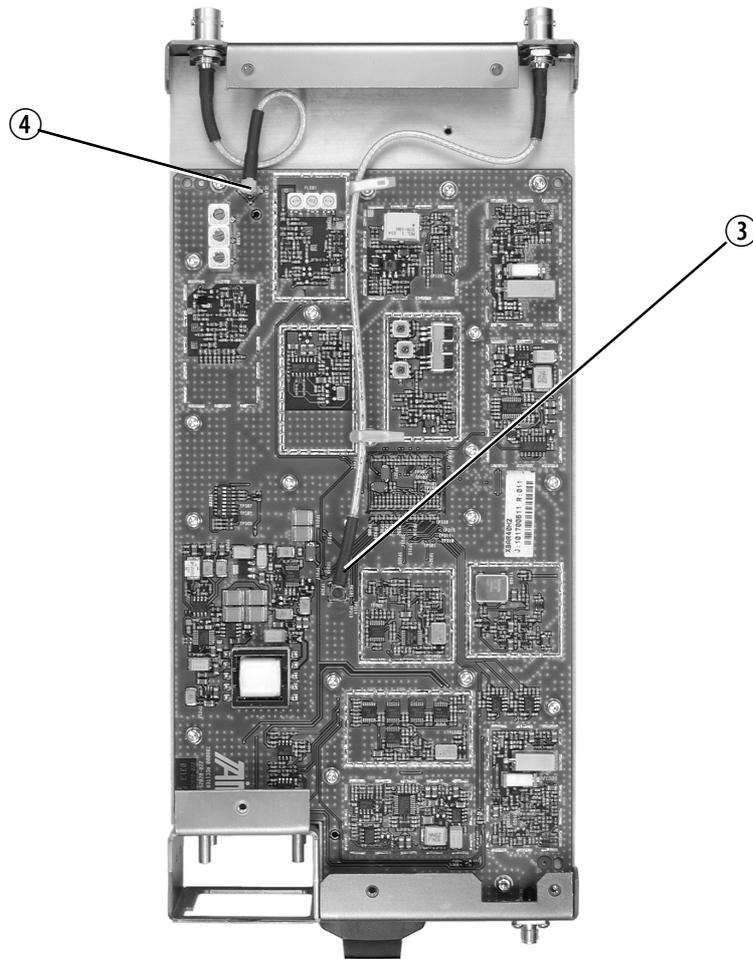
1. Remove the M3 Torx screws securing the covers to the heatsink, and to the front and rear panels. Lift off the covers.

Removing the Front and Rear Panels

2. Remove the vent guard clip ① from the rear panel



3. Remove the two M3 Torx screws ② securing each rear panel to the heatsink.
4. To remove the rear panel on the RF side, unplug the coaxial cables ③ and ④ from the RF PCB.



5. Noting which side the RF cables fit, remove the retaining nuts on the BNC connectors and draw the cables out through the holes.
6. Take the new rear panel from the TA2444-01 Change-over Switch kit and fit in the reverse order of the disassembly

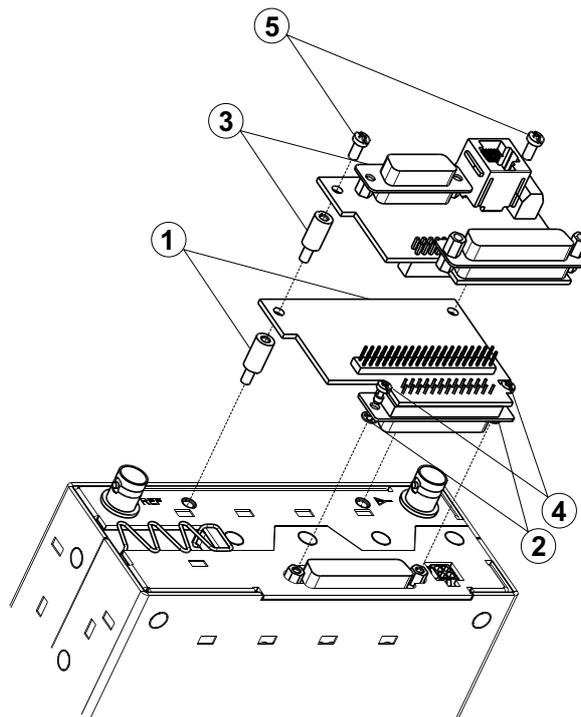
Note The covers are not interchangeable. Each cover must be fitted to the correct side and in the correct orientation.

2.2 Fitting the TA2444-01 PCB Assembly

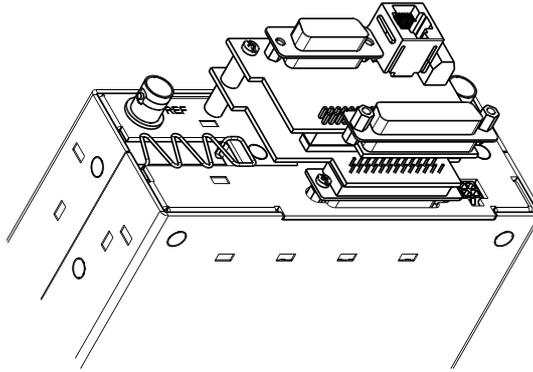
The TA2444-01 assembly consists of two boards that are mounted to each other and secured to the Reciter. These boards must first be fitted together, using the parts and instructions that follow:

Qty	IPN	Description
	303-20077-00	Cir Clip 5.0mm OD
	316-06847-00	Pnl Rear RF App Pcb T8K Rctr
	347-00011-01	Scrw 4-40*5.7mm
	349-00020-32	Scrw M3*8mm T/T P/P Bz
	319-30003-00	Sprc 11mm M3

1. Fit the two standoffs ① and finger-tighten.
2. Install the Relay Board onto the Reciter D range and fix in place with washers ② and screws ④.
3. Fit the two standoffs ③ through the Relay Board into the standoffs ① and finger tighten.
4. Fit the Interface Board onto the Relay Board and standoffs ③.
5. Screw into place with two M3 screws ⑤.



The correctly-installed TA2444-01 Board assembly will look like the diagram that follows.



2.3 Fitting the TA2444-02 Coax Relay/Power Splitter Mounting Kit

Note The power splitter is **not** included in the kit.

The TA2444-02 Coax Relay/Power Splitter Mounting Kit is a 1u panel with power splitter mounting kit, coaxial relay, and all mounting hardware.

The following hardware is included in the kit:

Qty	IPN	Description	Purpose
1	318-01057-00	Rail TB8K Chng ovr relay Mnt	Panel
1	237-00010-35	Relay 12v Coax Spdt N Type	Relay
1	302-05207-00	Brkt A4M2388 Coax Rly T0o4-72	Relay panel support bracket
2	345-00040-06	Scrw M3*8mm P/P S/T Bz	
2	345-00040-11	Scrw M3*10mm P/P S/T Bz	
2	352-00010-08	Nut M3 Cold Form Hex S/T Bz	
2	353-00010-11	Wshr M3 Flat 9.5od*0.9 S/T Bz	
4	353-00010-12	Wshr M3 Spring Bz Or Z/C	
2	219-02639-00	Cbl Assy RG223/Un-BNC	
2	219-02701-00	Cbl Assy Rg223 525mm N To N	
2	302-05267-01	Brkt Transit T8K Rack	
6	349-00020-53	Scrw M6*16mm Ss Post	
43	352-00010-56	Nut M6 Cage	
4	352-00010-31	Nut M6 Nyloc Hex	
8	353-00010-39	Wshr M6 Flat S/T Bz 6x12.5x1.2	
4	349-00020-15	Scrw M2.5*6mm T/T P/P Bz	

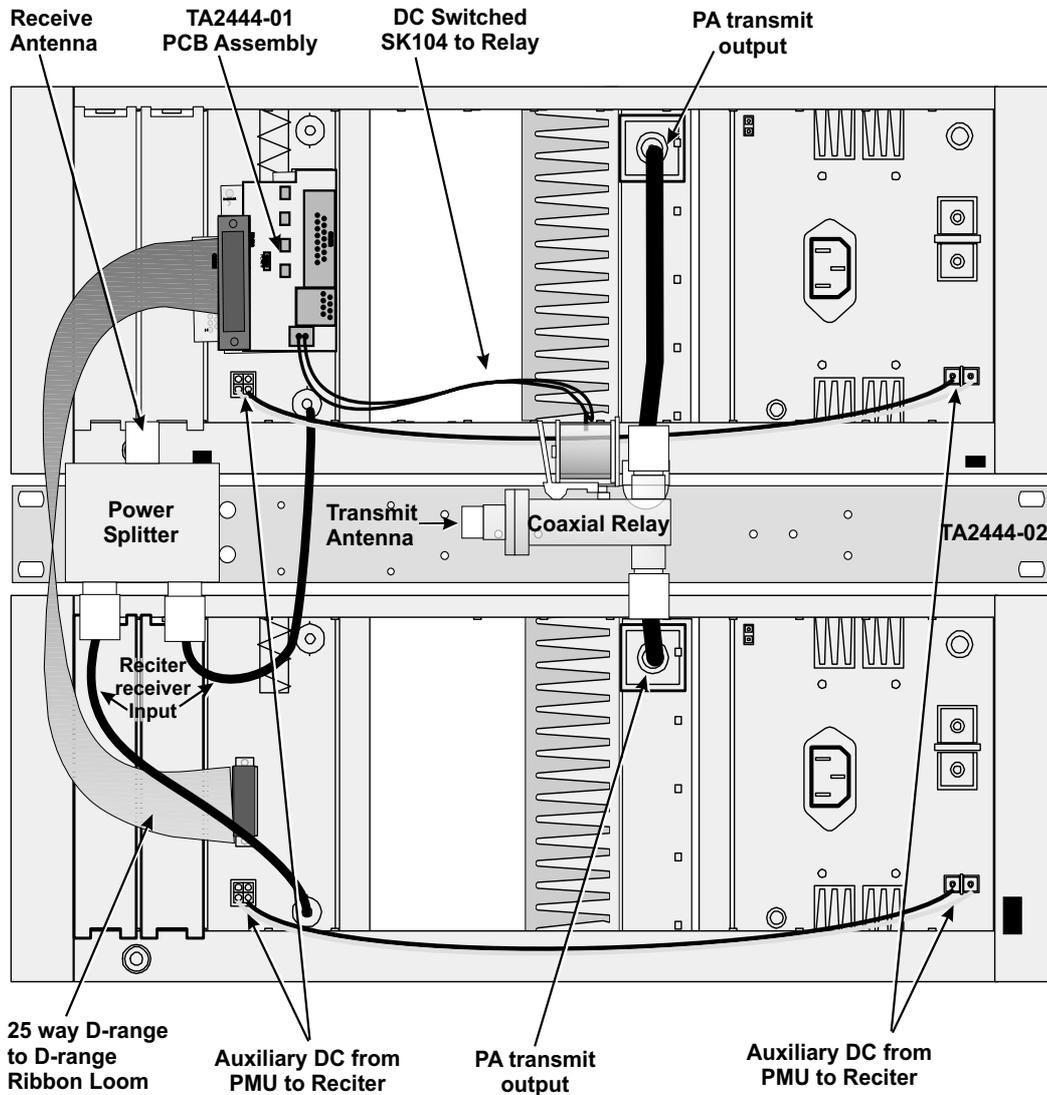
Coaxial Relay 237-00010-35

Specifications

Pull in	.9Vdc-16.5Vdc(12.0Vdc Nominal)
Drop out	.1.5Vdc Min
Current	160mA @12Vdc 20 degrees C
Coil resistance	75 Ohms 10% @ 20 degrees C
Contact arrangement	SPDT
Operational temperature	-55 degrees C to +70 degrees C



Install the Coaxial Relay Panel to the rear of the TB8100 using an Auxiliary support bracket shown at right. The diagram that follows illustrates correct installation.



2.4 Installing the Task Manager

The instructions that follow are the steps required to install the Task Manager.

1. Load TB8100 template QA2444A8X to PC running TB8100 Service Kit (supplied with the TA2444-01 Task Manager) into both TB8100 Base Stations.
2. Open template using the TB8100 service kit
3. Make any customer-specific changes (eg frequencies) to the template. See the TB8100 Installation and Operation Manual for details.
4. Configure the Change-over Task Manager script as required, according to “[Basic Configuration](#)” on [page 33](#) of this manual.
5. Connect to TB8100 Base Stations and download the updated templates to the Base Station.

2.5 Basic Configuration

External RSSI Fail Comparison Setup

This compares the RSSI of the main and standby base stations. When the standby base RSSI exceeds that of the main by more than the amount set by RV101, and the time of the failure exceeds the time defined in “*LRX fail*”, then the counter “*receiver fail*” is incremented. If the counter “*receiver fail*” reaches its maximum then a high priority alarm is set and the standby base takes control.

Set up the RSSI hysteresis between the bases as follows:

1. Load QA2444A8 Task Manager script.
2. Set relevant frequencies and any other customer-specific parameters.
3. Switch both bases to standby mode.
4. Insert an on-frequency -107dBm signal via a splitter into both receiver RF inputs. Into the active base station RF signal path, insert a pad of the required dB level of receiver signal strength difference before failure is detected.
5. On the Change-over Module, adjust RV101 until LED DS252 just switches on.

RSSI hysteresis is now set.

External RF Power Fail Setup

The Change-over Module is capable of detecting forward and reverse power failures when external power couplers are fit.

If isolators or high loss combining equipment is used, then it may be desirable to have external power couplers inserted into the antenna feeder after this equipment, to detect antenna failures.

Set up the forward power failure on the local base (the base with the Change-over board attached) and remote base (the base with the cable) as follows:

1. Load Task Manager configuration and set relevant frequencies and other customer-specific parameters.
2. Switch both bases to standby mode
3. Reduce base output power to the desired forward power failure point (typically 3dB below the nominal at the power coupler).
4. Transmit on the local base station.
5. On the Change-over Module, adjust RV105 until DS101 is just illuminated.
6. Transmit on the remote base station.
7. On the Change-over Module, adjust RV104 until DS103 is just illuminated.
8. Return the base to nominal power.
9. Disconnect the power couplers from the antenna feeder and attach a 3dB Pad, to give 3:1 VSWR at the coupler.
10. Transmit on the local base station.
11. On the Change-over Module, adjust RV102 until DS102 is just illuminated.
12. Transmit on the remote base station.
13. On the Change-over Module, adjust RV103 until DS104 is just illuminated.

External RF power failure alarms are now set.

Note The Forward Power Fail LEDs will briefly flicker at key-up and key-down of the PA to indicate that power is being transmitted up the antenna feeder.

Setting the Active and Standby Base Station

The link fitted to the change over module defines which base station will be active and which will be standby.

- To make the base station that the Change-over Module is fitted to become the active base, set the link to local.
- To make the base station that the Change-over Module is attached to via cable become the standby base, set the link to remote.

3 Change-over Task Manager

This section describes the TB8100 Enhanced Task Manager in relation to the TA2444-01 Change-over Module operation. For more details of the Task Manager operation, see “[Task Manager Operation](#)” on page 35 of this manual.

3.1 Task Manager Configuration

Load configuration file QA2444A8 into both Base Stations. (See the TA2444-01 Service Kit and Alarm Center User’s Manuals and online Help for more information.)

Task Manager Alarm Configuration

The TB8000 has a number of internal alarms which can be configured in the Change-over Task Manager to generate change-overs. The alarms can be low or high priority as well as a complete failure detection which causes the standby base to take control in the event of a loss of communication from the active base.

A high priority alarm takes precedence over a low priority alarm. For instance if a change over occurred due to a fan failure and then the base that seized control suffered a PA failure then the base that had the fan failure would take control back. The base stations will always hunt for the base that has the lowest alarm priority. If the bases have the same alarm priority then no change over will occur.

It is important to note that alarms enabled in the change over module will still be acted on even in the event that they are not enabled in the alarm control section of the service kit. As such it is strongly recommended that alarms be enabled in both the alarm control section and task manager as change over due to an alarm not enabled in the alarm control will not appear in the alarm centre software.

Low Priority Alarms These alarms are typically associated with events that are not compromising the function of the base station immediately but if left may eventually cause a functional failure.

Note By default, high temperature and fan failure are added to the low priority alarm custom input LLPA (Local Low Priority Alarm).

To add a low priority alarm it should be added to the LLPA custom input. To remove a low priority alarm it must be deleted from the LLPA custom input.

High Priority Alarms These alarms are associated with events that stop the base station from functioning correctly. These are typically PA, receiver or PMU failures and are listed in the custom input LHPA (Local High Priority Alarm) or in LHPA b (this is the over flow from LHPA).

In addition to the internally generated alarms, external alarms for forward and reverse power and RSSI failure also generate a high priority alarm. These are tested in sections “*Receive fail detect*” and “*External power alarm detect*” of the Task Manager script.

Standby Base Exercise

Because it is possible that the standby base could sit idle for many years, an automatic base cycle function has been added. This allows the base station to swap over after a period of up to seven days, ensuring that the standby base is still operative whilst the main base remains fault free.

The cycle time is set by the timer “*Base cycle*”. It is recommended that this be set to:

- seven days for the main base
- several hours for the standby base, or as long as necessary for it to be exercised in the system.

This feature can be disabled by disabling “*Base cycle check*” in the Task Manager script.

Alarm Notifications

There are various methods of remote notification of a base station failure. By default, the over-the-air pips are enabled. These are transmitted by the standby base when it has taken control. Other notification methods can be selected in the “*Change-over evaluation*” section of the Task Manager script or in the “*Base house keeping*” section.

For remote alarm notification setup instructions, see the “TB8000 Alarm Centre User Manual”. Remote alarm notification is then enabled in the Task Manager script.

3.2 Task Manager Processes

The TB8000 Task Manager carries out the processing tasks necessary to determine the correct state of the TA2444-01 Change-over Switch and whether the TB8000 base station should be the active or standby channel.

On reset, both base stations check the status of digital input 3 and determine whether their initial base state is Active or Standby. If only one base is reset, that base will signal the other base to reset.

Active channels perform the following tasks.

Initialisation	<p>When the base station transitions into run mode, a reset signal is sent to the other base. The reset signal is a 50mS space on the heartbeat line. The local base station then checks digital input 3 to determine its initial state.</p> <ul style="list-style-type: none">■ 0 = active channel (enables its transmitter)■ 1 = standby channel (disables its transmitter)
Heartbeat Output	<p>Dependent on the current alarm state of the base an appropriate heartbeat will be generated at output 1.</p> <ul style="list-style-type: none">■ No alarm = 200mS space : 200mS mark.■ Low priority alarm = 400mS space : 200mS mark.■ High priority alarm = 600mS space : 200mS mark.
Heartbeat Input	<p>The Task manager monitors the heartbeat input on digital input 4 from the remote base and determine that bases current alarm state.</p>
RSSI Alarm Status	<p>Checks to see if an alarm has been raised on digital input 2 to determine if there is an RSSI failure on the active channel. If there is an alarm then set the receiver failed flag.</p> <ul style="list-style-type: none">■ 0 = RSSI failure■ 1 = RSSI ok
External Forward and Reverse Power Alarms	<p>Monitor digital input 1 to determine the alarm status of the external forward and reverse power monitoring. This must be done in conjunction with the status of the TX key of the channel, if the TX key is not asserted then the external forward and reverse power alarm input will be ignored.</p> <ul style="list-style-type: none">■ 0 = forward or reverse power failure.■ 1 = forward and reverse power ok.
Determine the Local Channels Alarm Level	<p>Checks the local channel's alarms to determine what level of alarm state is appropriate.</p> <p>Note Note: Alarms should be separated into two levels of priority</p> <ul style="list-style-type: none">■ Low priority alarms where the function of the base station is not immediately compromised eg Fan failures.■ High priority alarms where the function of the base is immediately compromised eg PA failures
Determine if a Change Over is Required	<p>A comparison is made between the active and standby base station alarm status. If the alarm status of the active channel is higher than that of the standby channel then control is swapped to the standby base.</p> <ul style="list-style-type: none">■ If the active base has a low priority alarm then a change-over will occur only if there are no alarms on the standby base.

- If the active base has a high priority alarm then a change over will occur as long as the standby base does not have a high priority alarm.

Active Channel Change-over

The base sets its status to standby and inhibits its transmissions.

Alarm notification is user-selectable all available task manger alarm notification methods will be available .

Standby Channel Change-over

A 100ms pulse is sent from digital output 2 to the latched relays to change their state. The channel sets its status to active, so transmission is also active.

Note By default, the newly active base will transmit pip tones over the air if the change-over occurs on a high priority alarm. Other Task Manager notification methods are programmable.

Base Station Cycle

The Task Manager can generate an automated change-over after a period of up to seven days. This allows the standby base station to be exercised, ensuring the standby PA is still in working order.

4 Task Manager Operation

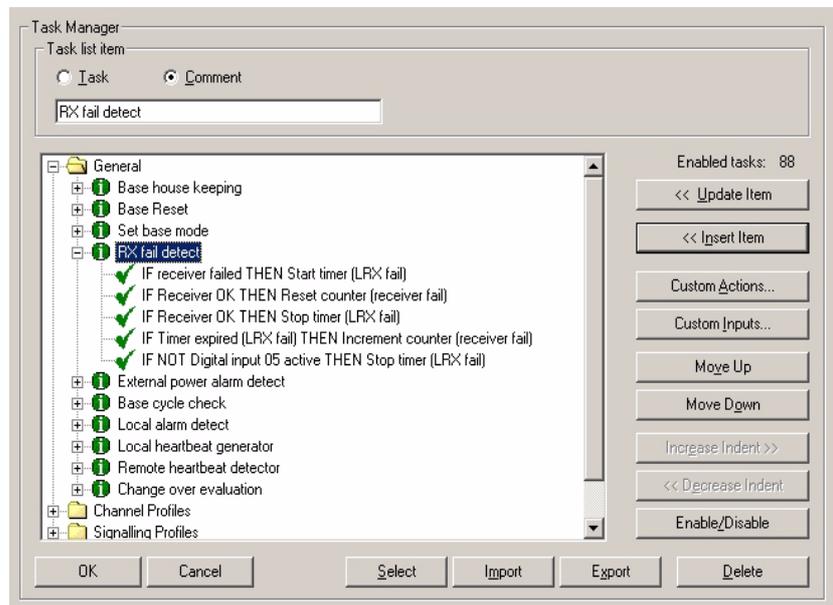
The operation and configuration of the most common change-over functions are described in this section. These are:

- Receiver Failure Detection
- External RF Power Failure Detection
- Base Station Cycle
- Local Base Station Alarm Detection
- Change-over Evaluation

4.1 Receiver failure detection

The “*RX fail detect*” section of the TB8100 task manager script provides the decision-making process for detection of receiver failures in the active base station. A single default mechanism detects receiver failures on the active base station.

- The RSSI failure line (digital input 2) is asserted, indicating the standby base has a significantly stronger receiver sensitivity.



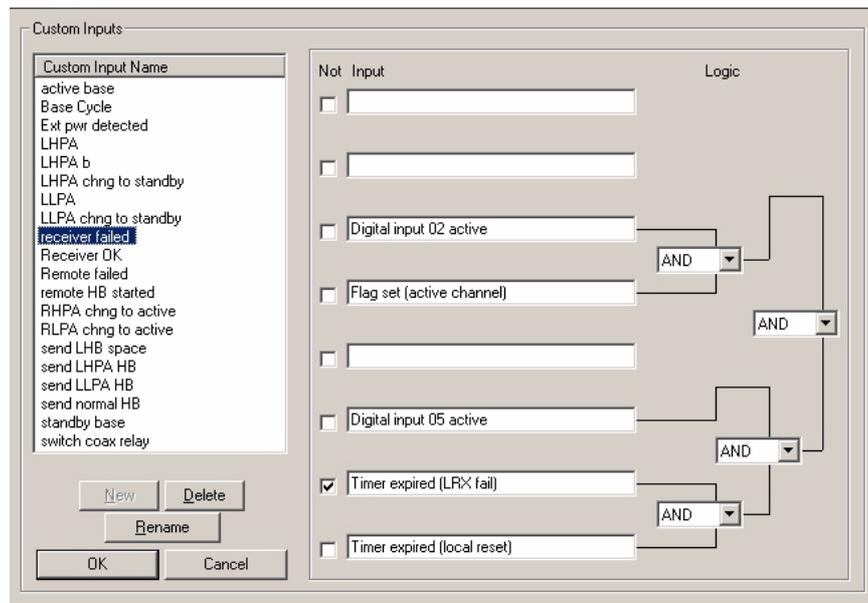
Once a failure has been detected, “*LRX fail*” timer is started. This timer provides the first form of hysteresis to the receiver failure decision-making process. It enforces a set period of time which must pass before the receiver is deemed to have experienced a failure. During this period, the receiver is able to recover from the detected fault condition, in which case the timer is stopped. This allows for differences in base station gating time and weak received signals opening one base receiver gate instead of the other due to antenna positional differences.

If the “*LRX fail*” timer expires, the “*receiver fail*” counter is incremented. The “*LRX fail*” timer is only reset – allowing another receiver failure detection to occur – when the remote base station receiver gate has closed.

By default, the counter is set to allow a maximum of three receiver failures before an alarm is raised. This provides an extra level hysteresis to the receiver failure mechanism, to allow for weak and fluctuating received signals opening the receiver gate of one base station but not the other. Once this counter reaches its maximum value, a receiver failure is deemed to have occurred and a high priority alarm flag is set.

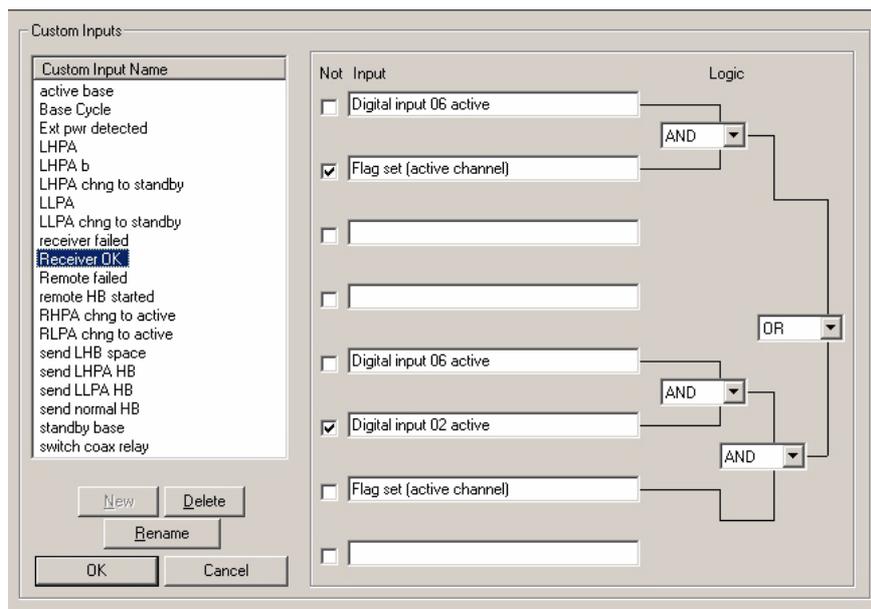
The basic receiver failure decision-making element in the task manager script is the “receiver failed” custom input.

- *Digital input 5* = remote base RX gate.
- *Digital input 2* = RSSI failure of active base station.
- *Active channel* = if set, indicates the active channel
- *LRX fail* = timer that sets the period in which the receiver may recover
- *Local reset* = timer that once expired, denotes that base station reset is complete.



The basic receiver success decision-making element in the task manager script is the “receiver OK” custom input.

- *Digital input 6* = local base RX gate.
- *Digital input 2* = RSSI failure of active base station.
- *Active channel* = if set, indicates the active channel



Configuration of parameters

Two receiver failure detection parameters can be modified to provide more or less hysteresis in receiver failure detection.

"LRX Fail" timer (on "Timers" page)

Increasing the length of the "*LRX Fail*" timer increases the change over's resistance to receiver failures. However, in the event of a receiver failure, it will result in longer failure detection times.

Decreasing the length of the "*LRX Fail*" timer will result in faster receiver failure detection times. This may be useful when using the change-over base stations in a linking situation, where the received signal strength is of a constant level. However in traditional talk-through and base station operation where calls of variable signal quality are received, this time should be long enough to prevent false receiver change over failures.

"receive fail" counter (on counters page)

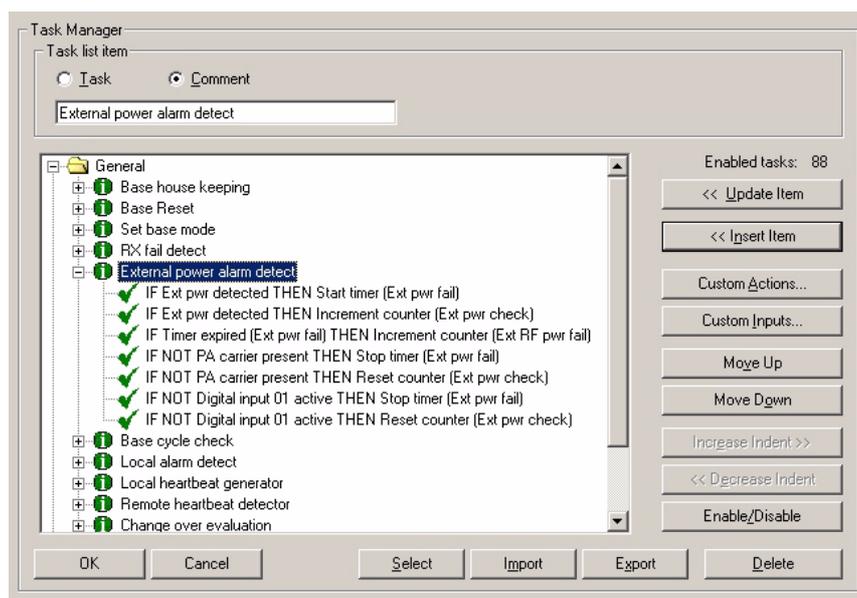
Increasing the maximum count of the "*LRX Fail*" timer will increase the change overs resistance to receiver failures. However in the event of an actual receiver failure counts will be required to force a change over.

Decreasing the Maximum count is only worth while if the count is set to "1", this will cause an immediate change over upon a the "*LRX fail*" timer timing out. This can be useful in linking situations where there is a know consistent signal level.

4.2 External RF Power Failure Detection

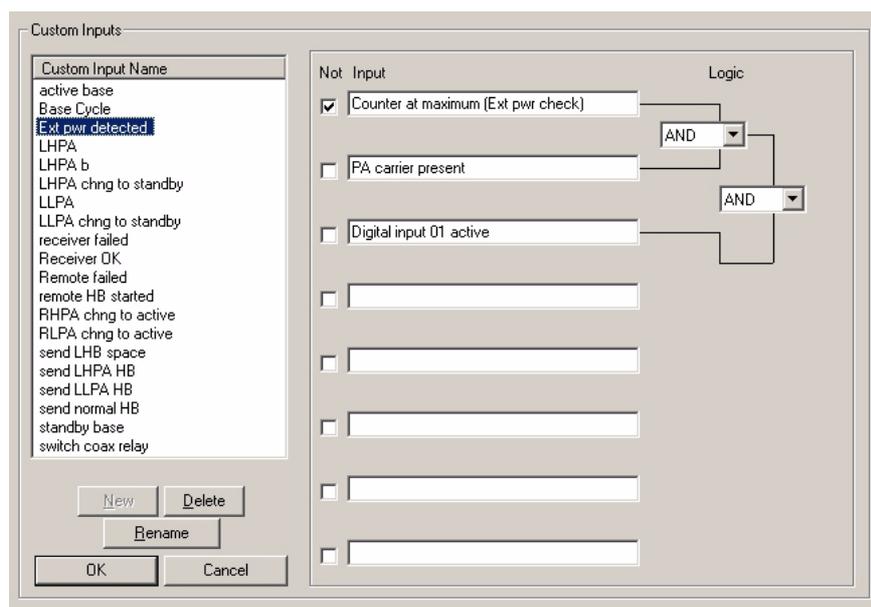
The “*External Power Alarm Detect*” section of the TB8100 task manager script provides the decision making process for the detection of external forward and reverse RF power failures. This power failure detection process operates independently of the internal forward and reverse power alarms of the base station. It is intended for use in antenna systems that employ circulators, combiners or duplexers, where antenna failures may not be detected by the internal base station RF power monitors due to the high loss through external antenna system components.

External RF power feedback is supplied by either a single antenna power coupler in the case of one transmit antenna, or two antenna power couplers where independent transmit antennas are provided. Outputs from the power couplers are fed into the Change-over Module where user-selectable comparators monitor forward and reverse power voltages. If either the forward transmitted power falls below the selected threshold, or the reverse power from the antenna rises above the selected threshold, then digital input one is set to the base station. Each base station has its own independent power monitoring comparators which feed only that base station digital input one input.



In the event of an external RF power failure, the timer “*Ext Pwr Fail*” starts, giving some hysteresis to the external power failure mechanism. The timer default is set to two seconds. If the timer is allowed to time out, indicating an external RF power failure, the “*External RF pwr fail*” counter is incremented. Typically set to a maximum value of one, this causes a high priority alarm to be generated at the next “*Local Alarm Detect*” evaluation.

Note The “*Ext Pwr Fail*” timer is stopped if either the PA has stopped transmitting, or Digital Input 1 has stopped being asserted, indicating the external power RF alarm has cleared.



The "Ext pwr detected" custom input is responsible for detecting external RF power failures. A power failure is deemed to have occurred if Digital Input 1 is active, the base station is transmitting, and this is the first time this custom input has detected a failure after a previous failure was cleared.

Configuration of parameters

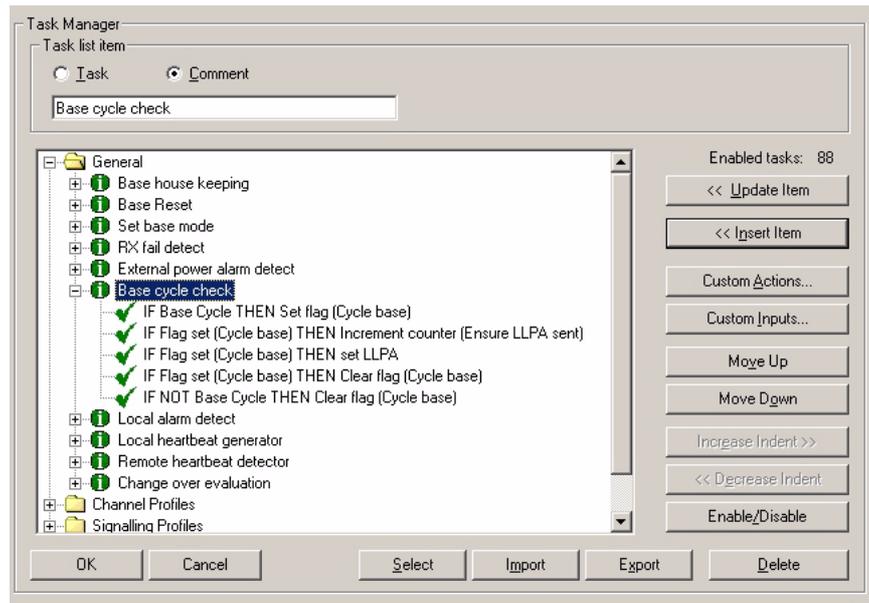
One external RF power failure detection parameter can be modified to provide more or less hysteresis in the detection of external RF power failure.

- "Ext Pwr Fail" timer sets the time period required for an external RF power failure to be present before generating an alarm, typically set to two seconds. Reducing the time to will speed up the detection of external RF power failures, but care should be taken to ensure that the time is not reduced to a point where false RF power failures are detected. Increasing the time results in improved protection from false alarm situations, but detection of failures correspondingly takes longer.

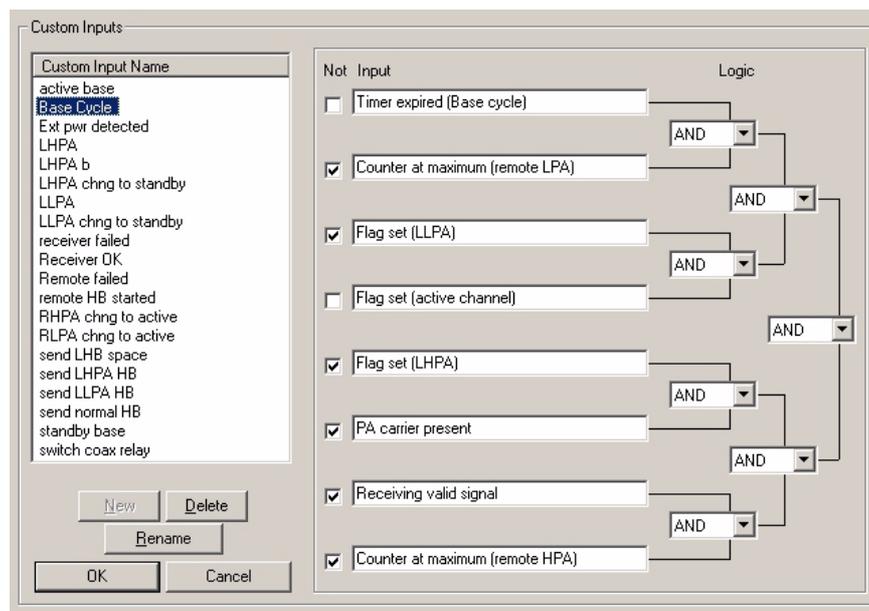
4.3 Base Station Cycle

Base station cycling allows the base stations to periodically swap between standby or active modes of operation. This allows the standby base to be used in operation mode before the failure of the active base station. If the standby base proves to have developed a fault condition, an alarm is raised and the initial active base station takes back control. This mitigates situations where an active base station fails and a change-over occurs to find the standby base station had developed an undetected failure.

When a base cycle is initiated, a local low priority alarm is generated to force the base station to change over.



The custom input "Base Cycle" determines if the base station is ready to generate a local low priority alarm causing a change-over. (Only active base stations are allowed to initiate a change-over.) This input checks to see if the "Base Cycle" timer has expired, which sets the duration for which the base station is active. If this timer has expired, the remote base alarm status is evaluated; if a base cycle change over is to occur, there should be no alarms raised on the remote base station. The custom input also ensures the base station is not actively processing calls by checking the status of the receiver and PA. If all of these prerequisites are met, the "Base Cycle" custom input is true and a change-over can occur.



Configuration of Parameters

There is one base station parameter that can be configured, or alternately the base cycle tasks can be switched off if not required.

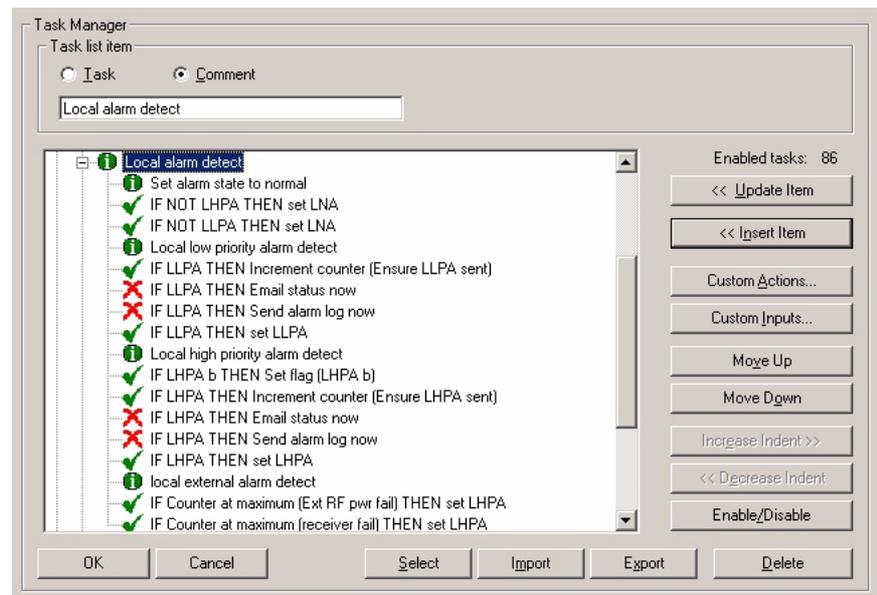
- “Base Cycle” timer can be set to give varying base cycle times; by default this is set to seven days (the maximum setting). It is recommended that this be reduced to around 12 hours on what is normally the standby base station. This ensures that while the standby base is still being periodically exercised, it is operational significantly less than the normally active base, ensuring they are less likely to develop faults at the same time.
- Short base cycle times of a few seconds are helpful for testing purposes, with a minimum cycle time of 15 seconds.
- Base cycle can be disabled in the task manger script by highlighting “Base Cycle Check” and selecting the “Enable/Disable” button.

4.4 Local Base Station Alarm Detection

Note The following Acronyms are used in this section:

- LHPA Local High Priority Alarm
- LLPA Local Low Priority Alarm
- LNA Local No Alarm

Local base station alarm detection sets the local base station alarm level, based on inputs from “receiver fail”, “Ext RF pwr fail”, “LLPA” and “LHPA”. In addition to setting the alarm level, alarm reporting from the local base station is enabled for both low priority and high priority alarms.



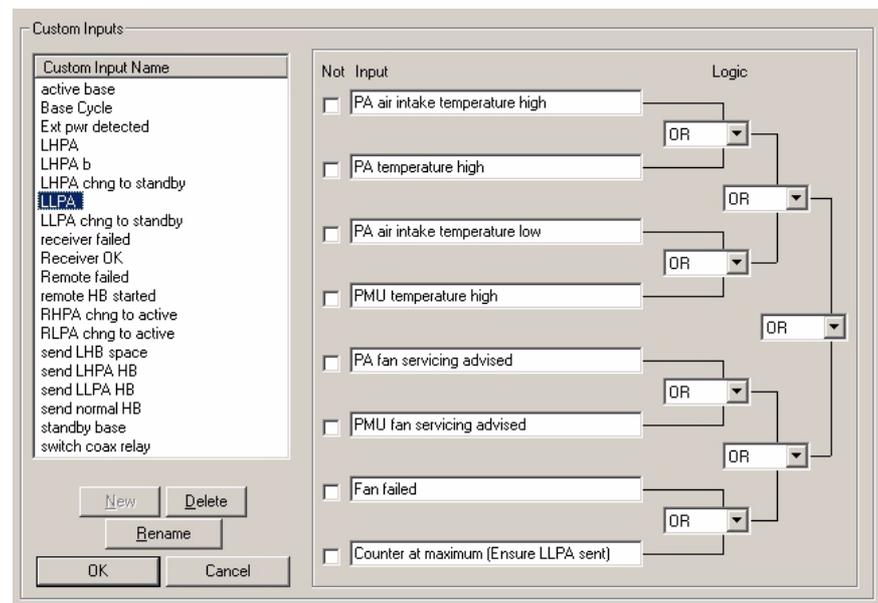
Configuration of Local Alarm Detection

Remote alarm reporting is enabled in the local alarm detect field, by selecting "IF LxPA THEN Email Status now" or "IF LxPA THEN Send alarm log now" and clicking the "Enable/Disable" button. Note that if base station cycle and LLPA alarm reporting are enabled, each time the base station cycles, an alarm report will be sent.

When enabling alarm log and email reporting, the communications alarm centre and email settings must be configured. Refer to Application Note TN-742 (Remotely monitoring and configuring the TB8100 base station).

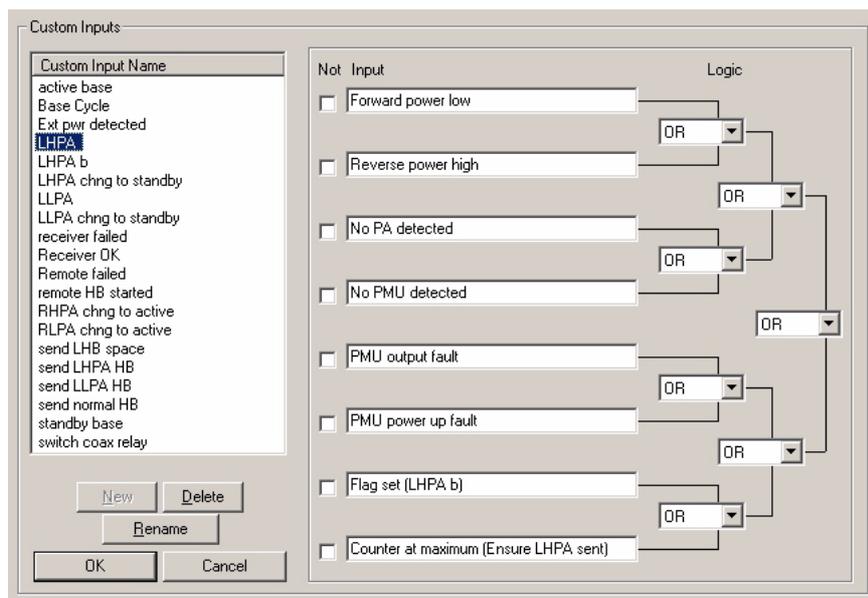
Alternative methods of alarm reporting are enabled by default in the standby base station. If the standby base station takes control due to a high priority failure of the active base station, over-line and over-air warning pips are enabled.

Two main custom inputs determine the presence of either a low-priority alarm or a high-priority alarm. Low-priority alarms are determined by the LLPA custom input.



Alarms in the low-priority alarm list are typically those that do not cause immediate base station failure but left unattended, could result in eventual base station failure. To add alarms from the LLPA custom input, highlight the chosen input using the mouse, then select an alarm input from the list presented. To remove an alarm, highlight the chosen input and select the blank field at the top of the presented options list.

Low-priority alarms can also reset, allowing the alarm level of a base station to return to normal. This allows, for example, an overheated local base station to cool and be able to take over from the remote base station should it overheat as well.

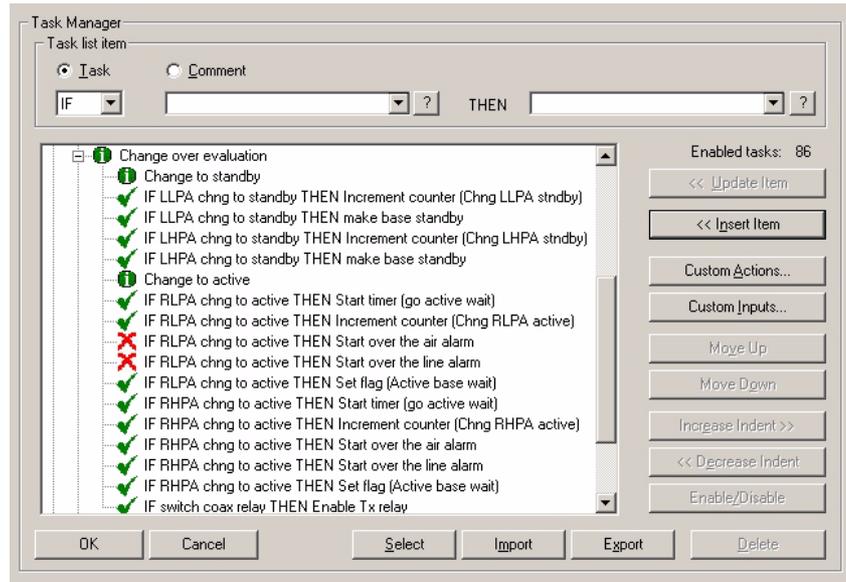


There are two custom inputs for high-priority alarms, LHPA and LHPA B. LHPA B is required to give sufficient alarm inputs to cover most of the available base station alarms. The LHPA custom input has an additional input at the bottom of the input list that is used to deal with the state of the LHPA B custom input, this should be left operational.

High-priority alarms have immediate impact on the operation of the base station and require a change-over regardless of whether the remote base station has a low-priority alarm. A high-priority alarm will typically not clear until the base station is reset, as these alarms will require technician intervention to correct.

4.5 Change-Over Evaluation

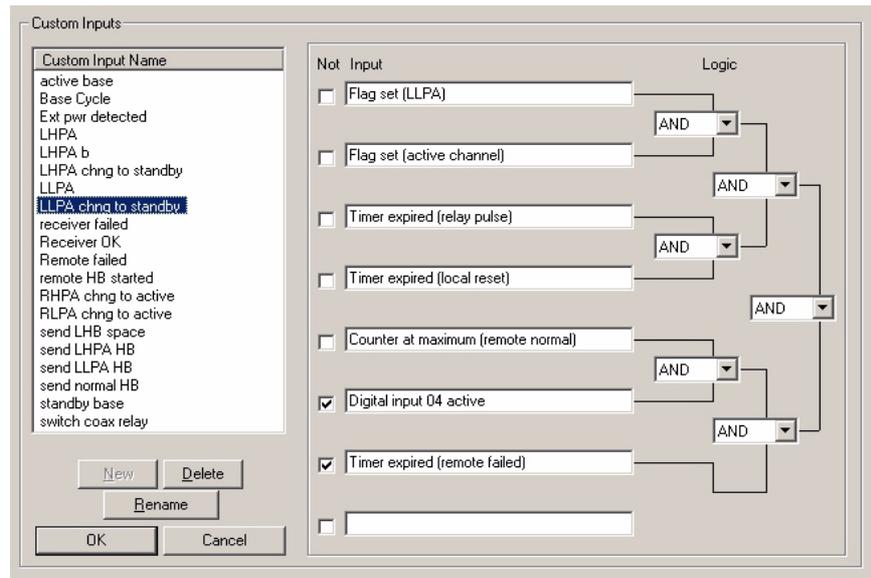
Change-over evaluation refers to the task manager script tasks that provide the decision-making component of the change-over script. It is also where over-air and over-line pip alarms are enabled when a base becomes active due to a remote base failure.



A base station change to standby occurs immediately after detecting a local base station alarm that exceeds the alarm state of the remote base station alarm. On changing to standby, a diagnostic counter is incremented “*Chng LLPA stndby*” or “*Chng LHPA stndby*”, dependent on whether the change-over occurred due to a low-priority alarm/base cycle event, or a high-priority alarm. The counters reset on base station reset.

When base stations become active, a change to active delay timer is started “*go active wait*”. The base station then waits the timer period before it becomes active and seizes control. This period ensures the remote base station has changed to standby mode before the local base station goes active. Failure to allow this to happen could result in damage to the remote base station PA, if the local base transmitted and drove a coax relay disconnecting the remote base from the antenna while it was still transmitting. The drive to the coax relay is only enabled once the base station becomes active, and if the base station is normally the standby base station.

Once the decision to become active is made, the “*Chng LLPA active*” and “*Chng LHPA active*” counters are incremented, to count the number of times since reset that the base station has become active. Over-air and over-line pip tones are also activated at this point to indicate a base station failure. Low-priority alarm change-overs do not normally generate pips, as these change-overs can be created by a base cycle, and not necessarily an alarm.

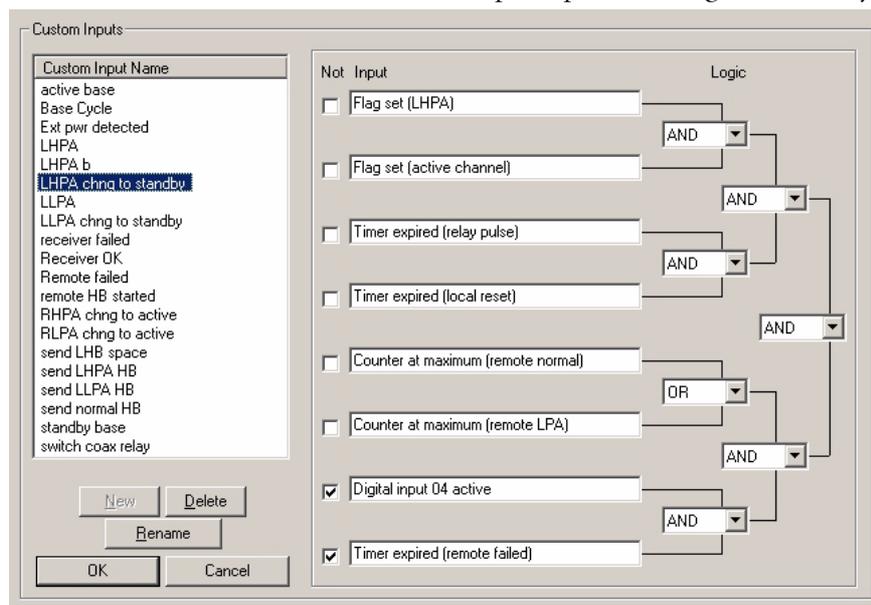


Decisions to change from standby to active mode due to low-priority local alarms are based on the “*LLPA chng to standby*” custom input. This input ensures that the base station change-over processes are not in a transition mode: the task manager script has completed its reset process (Timer expired “*local reset*”), and it is not in the process of seizing control from the remote base (Timer expired “*relay pulse*”). It also checks that it is currently the active base station, and that the latest status of the remote base station has been received ((not)Digital input 04 active).

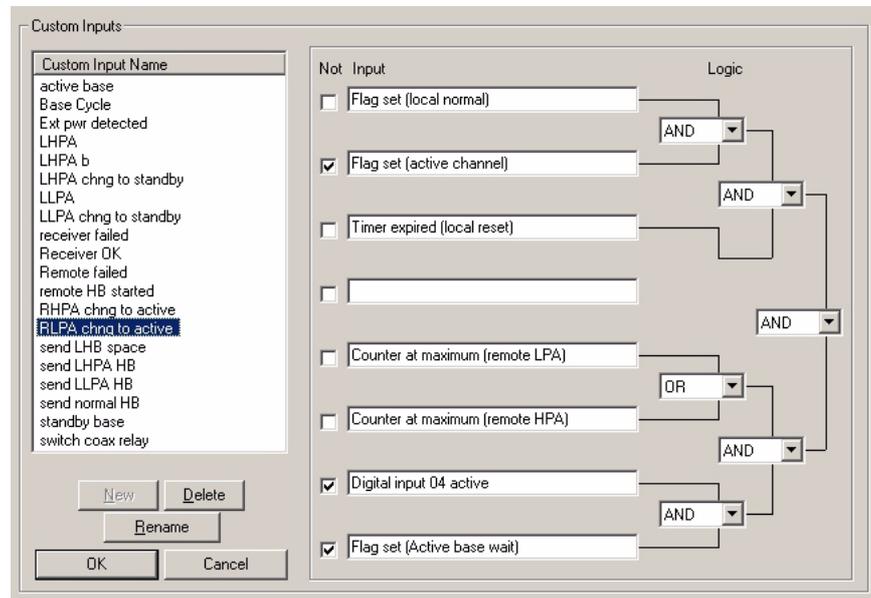
Whether or not to change to standby is evaluated against the following:

- if a local low-priority alarm,
- remote base station has no alarm set
- remote base station is sending a heartbeat (Timer expired “*remote failed*”).

If all of these cases are true, the custom input reports a change is necessary.



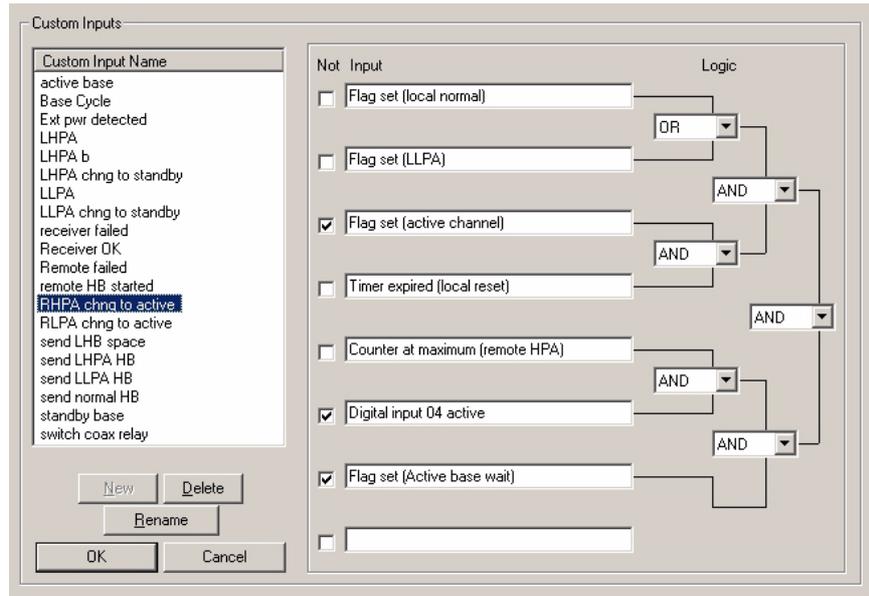
A local high-priority alarm reports a change to standby is required if the same cases are true as in the local low-priority change to standby, with the exception that the remote base station can have a low-priority alarm active and the custom input will still return a requirement to change to standby.



Decisions to change into active mode due to remote low-priority alarms are based on the “*RLPA chng to active*” custom input. The custom input ensures that base station change-over processes are not in transition, ie the task manager script has completed its reset processes (Timer expired “*local reset*”), and it is not in the process of seizing control from the remote base (Timer expired “*relay pulse*”). It also checks that it is currently the standby, and that the latest status of the remote base station has been received ((not)Digital input 04 active).

Whether or not a change to active mode is made is evaluated against the following:

- presence of a remote low-priority alarm or a remote high-priority alarm
- the alarm state of the local base station being normal.



Note A remote high-priority alarm causes a change to active mode if it has the same criteria as a remote low-priority alarm, except that the local base station can have a low-priority alarm present.

Configuration of Change-Over Evaluation

The only parts of the change-over evaluation script that should be altered are turning pip tones on and off. All other parts of the script are critical to the operation of the change-over.

By default, pip tones are enabled for changes to active mode if the change-over is due to a high-priority remote base station alarm. Pip tones are then broadcast according to the setup in the “*Alarm Notifications*” section of the base station service kit.

To switch pip tones on or off, highlight “*IF RxPA chng to active THEN Start over the air alarm*” or “*IF RxPA chng to active THEN Start over the line alarm*” and select the “*Enable / Disable*” button.

Note Switching on pip tones for a low-priority base station change-over with base cycle enabled results in pip tones being heard after the change-over has occurred.

4.6 TA2444-01 Change-over Alignment

External RSSI Fail Comparison Setup

This compares the RSSI of the main and standby base stations, when the standby base RSSI exceeds that of the main by more than the amount set by RV101, and the time of the failure exceeds the time defined in “*LRX fail*” then the counter “*receiver fail*” is incremented. If the counter “*receiver fail*” reaches its maximum, a high-priority alarm is set and the standby base takes control.

To set up the RSSI hysteresis between the bases:

1. Load QA2444A8 task manager script and set frequencies of interest and other customer-related parameters.
2. Switch the standby base to standby mode.
3. Switch the main base to standby mode.
4. Insert an on-frequency signal via a splitter into both receiver RF inputs.

Note The active base receiver should have a pad of the receiver signal strength difference desired before failure is detected, inserted into the RF signal path.

5. Adjust the RF signal level so the level is the number of dB of the attenuator above the gating threshold of the base stations. Ensure both base station gates are open.
6. Adjust RV101 on the change-over module until LED DS252 just switches on.

RSSI hysteresis is now set.

External RF Power Fail Setup

Note If isolators or high loss combining equipment is used, it may be desirable to have external power couplers inserted into the antenna feeder after this equipment to detect antenna failures.

The change-over module is capable of detecting forward and reverse power failures when external power couplers are fit. To set up the forward power failure on the local base (the base with the change-over module attached) and remote base (the base with the cable):

1. Load task manager configuration and set frequencies of interest and other customer related parameters.
2. Switch both bases into standby mode
3. Reduce base output power to the desired forward power failure point (typically 3dB down on what is nominal at the power coupler).
4. Transmit on the local base station.

5. Adjust RV105 until DS101 is just illuminated.
6. Transmit on the remote base station.
7. Adjust RV104 until DS103 is just illuminated.
8. Return the base to nominal power.
9. Disconnect the power couplers from the antenna feeder and attach a 3dB Pad, to give a 3:1 VSWR at the coupler.
10. Transmit on the local base station.
11. Adjust RV102 until DS102 is just illuminated.
12. Transmit on the remote base station.
13. Adjust RV103 until DS104 is just illuminated.
14. External RF power failure alarms are now set.

Note The forward power fail LEDs give a brief flicker at key-up and key-down of the PA to indicate that power is being transmitted up the antenna feeder.

Setting the Active and Standby Base Station

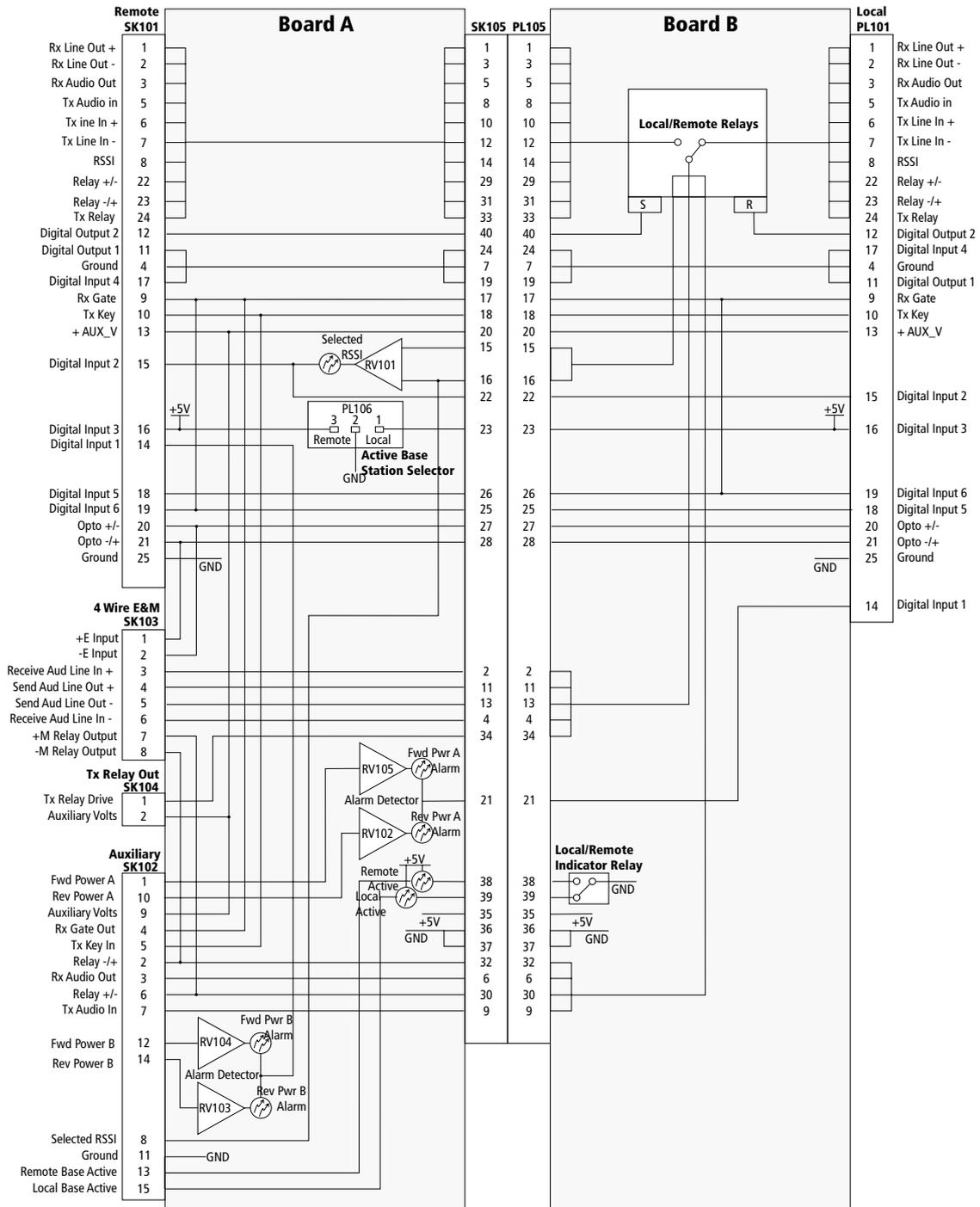
The link fitted to the change-over module defines which base station is active and which is standby.

- Setting the link to “local” will make the base station that the change-over module is attached directly to become the active base.
- Setting the link to “remote” will make the base station that the change-over module is attached to via cable become the standby base.

5 Circuit Description

The TB8100 Change-over Module boards provides mechanics, audio connections and external alarm monitoring for a TB8100 change-over solution.

The diagram below illustrates the functional relationship between the two Change-over Module boards, and their external interfaces.



5.1 4 Wire E&M Interface

An RJ45 (SK103) connector provides the interface to the active base station's 4 wire E&M input. Relays RL105 and RL103 provide switching to the current active base station's isolated 600 Ohm balanced audio inputs and outputs. RL105 switches the outgoing relay +/- signals of the active base to the M outputs on the RJ45. The E input lines are paralleled across both base stations' opto inputs and the standby base station has its transmitter suppressed by the task manager.

5.2 Unbalanced Audio and Control Interface

Auxiliary connector (SK105) provides the interface to unbalanced audio, transmitter key and receiver gate lines for the active base. RL102 switches both the transmit and receive audio whilst the transmitter key is paralleled across both base stations with the standby bases task manger suppressing transmitter operation. The receiver gate output is also paralleled across both bases via D108 and D101.

5.3 Power Supply

The Change-over Module is powered from both connected bases stations' SIFs. Supply is via diodes D109 and D102 allowing continued operation if one base station fails. Most parts of the Change-over Module use 5 volts derived from the 5 V regulator (U111).

5.4 RSSI Monitoring

Receiver signal strength of both bases stations is monitored by the base station Task Managers. If the standby bases station's RSSI level exceeds that of the active base station by a predetermined amount then the Task Managers are signalled via digital input 2.

Relay RL104 switches the RSSI input from both bases so the active base's RSSI signal feeds the non-inverting input of comparator U102 and the standby base feeds the inverting input. The standby base's RSSI potential is divided across resistors R102, RV101 and R254, with RV101 setting the potential applied to the inverting input, effectively degrading the apparent RSSI signal from the standby base. Typically RV101 is adjusted by placing an on-frequency RF carrier on both base station receivers. The receiver signal strength of both bases stations. The active base is attenuated by a desired alarm trigger amount (ie 6dB) then RV101 is adjusted until the output of the comparator goes low, illuminating LED DS252.

Capacitors C250 and C251 remove any transient responses in the RSSI signals from the base stations.

5.5 External Forward and Reverse Power Monitoring

Forward and reverse voltages from the remote monitors are terminated on to the Change-over Module via auxiliary connector SK105. These are then fed to two separate comparator circuits to monitor the forward and reverse voltages. The inputs to the comparator are buffed by U107, U108, U109 and U110. Resistors on the non-inverting input of the forward power buffer divide the signal down to a useable level for the change-over board to monitor.

U103 and U105 compare incoming forward power voltage from the buffers to the reference set by RV105 and RV104. Typically these reference values are set by passing the desired minimum forward power through the external power monitor and then adjusting RV105 or RV106 until the output of the comparator goes low and LED DS101 or DS103 illuminates).

Because there is no forward power whilst the base station is transmitting DS101 and DS103 will be illuminated. To prevent this from happening comparators U116 and U115 are used to look for forward power and enable the LEDs operation when forward power is present. Component values have been set to ensure the LEDs give a brief indicative flash when forward power is removed.

U104 and U106 monitor the reverse power voltage from the external RF power monitors. RV102 and RV103 set the alarm trigger voltages for the comparators. These are typically set by transmitting through the remote power monitors into an unterminated attenuator to achieve the desired level of reverse power. RV102 and RV103 are then adjusted until the comparator outputs go low and LED DS104 or DS102 illuminates).

Both external forward and reverse power alarms are tied together through diodes D103 and D104 or diodes D106 and D107. These outputs are then fed to digital input 1 of their respective base stations.

5.6 Change-over Drive

The change-over relays have two coils (set and reset).

- The local base station drives the reset coils
- The remote base drives the set coils.

When a base station Task Manager determines that a change-over is required, the current standby base asserts digital output 2 for 100ms. This energises the relay coils resulting in the relay contacts changing state.

A possible cause of base station failure is that digital output 2 may become shorted to ground and the change-over relays on one side will be permanently energised, preventing the other base from seizing control. To prevent this from happening, a timing circuit is added to the relay drive to cut power to the relays if digital output 2 is held low for more than approximately 500ms.

On the application of power to the Change-over Module, C4 and C6 are charged up. The charge is monitored by comparators U114 and U113. Under normal operation the voltage across C4 and C6 does not fall below the comparison set up on the inverting input of the comparators, and transistors Q1 and Q2 remain switched on via R21 and R23. When digital input 2 goes low and energises the relay coils through Q1 or Q2, capacitors C4 or C6 start to discharge. If their charged voltage falls below the threshold set on the comparator, Q1 or Q2 is switched off disabling the relay coils.

5.7 Receiver Gate Monitoring

Each base station monitors its own receiver gate, and the receiver gate of the remote base. This is achieved by looping the local base's receiver gate line into digital input 6 and monitoring the remote bases receiver gate on digital input 5.

5.8 Heartbeat Cross-over

The base stations communicate their current alarm state by means of a heartbeat signal transmitted from digital output 1 and received on the remote base station on digital input 4. These inputs and outputs are crossed over on the change-over board.

6 Functional Testing

6.1 Test Transmissions

Once the TA2444-01 Change-over Module fitting and installation procedures are completed, the following test transmissions will verify that your TA2444-01 BSS is operating correctly.

1. Run the Service Kit software during these tests so that you can monitor the performance of the BSS.
2. Ensure that the BSS is correctly connected to an appropriate antenna and that all RF connectors are secure.
3. Plug the microphone into the RJ45 socket on the standard control panel (refer to TB8100 Installation and Operation Manual “Control Panel” section).
4. Select the channel you wish to transmit on with the microphone channel button.
5. Turn on the speaker audio for the selected channel with the speaker button.
6. Press the PTT switch on the microphone and make your transmission. Check that:
 - the red transmit LED turns on
 - there are no alarms generated
 - the audio quality on the receiving radio is good.
7. When the other radio answers your transmission, check that:
 - the green receive LED turns on
 - the audio quality from the speaker in the control panel is good (adjust the speaker volume as required).

6.2 TA2444-01 Function Tests

The following test procedures are designed to ensure the basic failure detection and change-over mechanics of the TB8100 change over unit are functioning correctly.

Change-over due to receiver failure

1. Ensure base stations are configured according to the instructions in [“Task Manager Configuration” on page 31](#) of this manual.
2. Check that either the local or remote LEDs are illuminated according to the setting of the local/remote link.

3. Inject an on-channel signal into both receiver inputs of the base station reciters.
4. Ensure the received signal LEDs on both TB8100 control panels have been illuminated.
5. Remove the on-channel signal from the active base station reciter.
6. If the receiver fail counter is set to “1” then the local/remote LEDs will have swapped illumination, and the changeover has been completed.
7. If the receiver fail counter has been set a value greater than “1” (default is “3”), then remove the standby base station’s on-channel signal and wait the LRX fail period (default is 2 seconds) and replace the standby base station’s signal.
8. Repeat this procedure until the signal has been removed and replaced on the standby base station “receiver fail counter” times.
9. Ensure the local/remote LEDs have swapped illumination.

Change-over due to transmitter failure

1. Ensure base stations are configured according to the instructions in [“Task Manager Configuration” on page 31](#) of this manual.
2. Check that either the local or remote LEDs are illuminated according to the setting of the local/remote link.
3. Remove the antenna feed from either
 - the active base station PA, if not using power monitors.
 - the power monitor output, if using power monitors.
4. Key the active base station.
5. Ensure RF power alarms have become active.
6. Check the local/remote LEDs have swapped illumination.
7. Key the standby base station and test its ability to transmit.

Change-over due to complete base station failure

1. Ensure the base stations are configured according to the instructions in [“Task Manager Configuration” on page 31](#) of this manual.
2. Check that either the local or remote LEDs are illuminated according to the setting of the local/remote link.
3. Remove power from the active base station.
4. Ensure the local/remote LEDs have swapped illumination.

7 Wiring Specification

Once the TA2444-01 Change-over Module and Coaxial Relay Panel are installed, you need to connect up the change-over switch solution to include the TB8100 BSS. This chapter also provides information on the inputs and outputs used.

Note All cables to and from the TA2444-01 BSS should be routed along the side of the cabinet or relay panel to avoid restricting the cooling airflow.

7.1 Change-over Switch Solution

- The TA2444-01 Interface Board SK101 is connected to the other reciter in the solution by a 25 way plug-plug D-range ribbon loom.
- The Receive antenna coax goes to the power splitter and is divided to each Reciter.
- The PA coax cables from each Reciter go to the switched ports on the Coaxial Relay. The relay then connects to the Transmit antenna.
- The Coaxial relay is controlled by TA2444-01 Relay Board. This is achieved by soldering two wires to the relay and the fitting the other end to TA2444-01 PCB assembly SK104.
- An auxiliary DC connection is required for each Reciter from their respective PMUs.
- TA2444-01 Interface Board SK103 provides 4 wire E & M signalling.
- TA2444-01 Interface Board SK102 provides auxiliary output.

7.2 TA2444-01 Connections

The TA2444-01 Change-over Switch consists of a pair of boards, with the following connections:

Relay Board

- PL101 25-way D Range Plug - Channel A Interface (Local)
- PL105 40-way Micromatch Plug - Interface Board Interface

Interface Board

- SK105 40-way Micromatch Socket - Relay Board Interface
- SK102 15-way D Range Socket - Auxillary equipment
- SK103 8-way RJ Socket - 4 wire E&M Interface

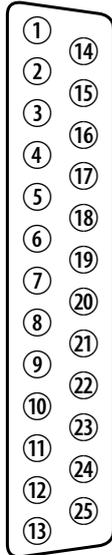
- SK104 2-way Screw Terminal - Coax Relay Drive
- SK101 25-way D Range Socket - Remote Change-over Interface
- PL106 3-way Header Plug - Local/Remote Selector

The functional relationship between the connections is illustrated in the table below:

Function	Remote SK101 Pins	Board Interconnect SK105/PL105 Pins	4 Wire E&M SK103 Pins	Local PL101 Pins	Auxiliary SK102 Pins	Tx Relay Out SK104 Pins	Local/Remote PL106 Pins
RX Line Out +	1	1/1, 2/2	3	1			
RX Line Out -	2	3/3, 4/4	6	2			
Rx Audio Out	3	5/5, 6/6		3	3		
TX Audio In	5	8/8, 9/9		5	7		
Tx Line In +	6	10/10, 11/11	4	6			
Tx Line In -	7	12/12, 13/13	5	7			
RSSI	8	14/14, 15/15, 16/16		8			
Relay +/-	22	29/29, 30/30	7	22	6		
Relay -/+	23	31/31, 32/32	8	23	2		
Tx Relay	24	33/33, 34/34		24		1	
Digital Out 2 (RL10S)	12	40/40		12			
Digital Out 1 (RL10S)	11	24/24/		17			
Ground	4,25	7/7		4,25	11,13,15		2
Digital In 4 (Remote)	17	19/19		11 (Digital O/P 1)			
Rx Gate	9,19	25/25		18			
Digital In 6 (Remote)	19,9	25/25		18 (Digital I/P 5)			
RX Gate Out		17/17			4		
Tx Key	10	18/18		10	5		
+ Auxiliary Volts	13	20/20		13	9	2	
Digital In 2	15	22/22		15			
Digital In 3 (Remote)	16						3
Digital In 1 (Remote)	14						
Digital In 5	18	26/26		19,9			
Opto +/-	20	27/27	2	20			
Opto -/+	21	28/28	1	21			
Digital In 1 (Local)		21/21		14			
Digital In 3 (Local)		23/23		16			1
Fwd Power A					1		
Selected RSSI					8		
Rev Power A					10		
Fwd Power B					12		
Rev Power B					14		

PL101 25-way D Range plug Channel A Interface (Local)

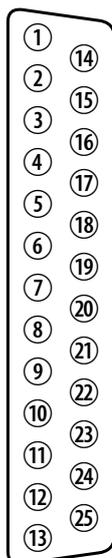
Pin	Signal Name	Signal Type	Notes
1	Rx line out +	audio output	non-isolated AC coupled line
2	Rx line out –		
3	Rx audio out	audio output	AC coupled
4	ground	ground	
5	Tx audio in	audio input	AC coupled
6	Tx line in +	audio input	AC coupled line
7	Tx line in –		
8	RSSI	DC signal	
9	Rx gate	output	open collector
10	Tx key	input	
11	digital out 1	output	open collector
12	digital out 2		
13	+AUX_V	power output	
14	digital in 1	input	5V logic
15	digital in 2		
16	digital in 3		
17	digital in 4		
18	digital in 5		
19	digital in 6		
20	Opto +/-		
21	Opto +/-		
22	Relay +/-		
23	Relay +/-		
24	Tx relay	output	open collector
25	ground	ground	



rear view

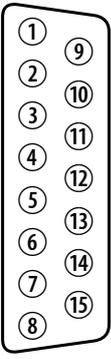
SK101 25-way D Range Socket Channel B Interface (Remote)

Pin	Signal Name	Notes
1	Rx line out +	non-isolated
2	Rx line out -	AC coupled line
3	Rx audio out	AC coupled
4	Ground	
5	Tx audio in	AC coupled
6	Tx line in +	AC coupled line
7	Tx line in -	
8	RSSI	
9	Rx gate	open collector
10	Tx key	
11	Digital output 1 (heartbeat out)	open collector
12	Digital output 2 (set active channel)	
13	Auxiliary volts	
14	Digital in 1 (external fwd/rev pwr alarm A)	5V logic
15	Digital in 2 (RSSI alarm)	
16	Digital in 3 (active channel select)	
17	Digital in 4 (heartbeat in)	
18	Digital in 5 (remote channel Rx gate)	
19	Digital in 6 (local channel Rx gate)	
20	Opto +/- (E+) or digital in 7	
21	Opto +/- (E-) or digital in 8	
22	Relay +/- (M+) or digital in 9	
23	Relay +/- (M-) or digital in 10	
24	Tx Relay	open collector
25	Ground	

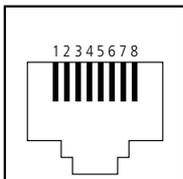


rear view

SK102 - 15-way D-range connector plug Auxiliary In

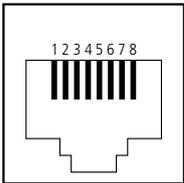
	Pin	Description	Notes
 <p>rear view</p>	1	External Forward Power Monitor A	
	2	Relay +/- (digital in 10)	
	3	Rx Audio Out	
	4	Rx Gate Out	
	5	Tx Key In	
	6	Relay +/-	
	7	Tx Audio In	
	8	RSSI Active Channel	
	9	Auxiliary Volts	
	10	External Reverse Power Monitor A	
	11	ground	
	12	External Forward Power Monitor B	
	13	Remote base active	
	14	External Reverse Power Monitor A	
	15	Local base active	

SK103 - RJ45 Socket 4 Wire + Digital Input Interface (requires isolated 4-wire SIF)

	Pin	Description	Notes
 <p>Top view</p>	1	Digital in 7	
	2	Digital in 8	
	3	Receive Line In +	
	4	Send Line Out +	
	5	Send Line Out -	
	6	Receive Line In -	
	7	Digital in 9	
	8	Digital in 10	

SK103 - RJ45 Socket 4 Wire E&M (requires 4-wire E&M SIF)

Pin	Description
1	+E Input
2	-E Input
3	Receive Line In +
4	Send Line Out +
5	Send Line Out -
6	Receive Line In -
7	+M Relay Output
8	-M Relay Output



Top view

SK104 - 2 way Screw Terminal Tx Relay Out

Pin	Description
1	Tx relay drive (open collector)
2	Auxiliary volts

7.3 TB8000 BSS Connections

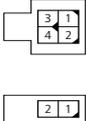
Reciter Auxiliary DC Input

The Reciter System Interface Board (SIF) has an auxiliary DC input connector. DC from the auxiliary DC output on the PMU can be supplied to the +AUX_V pin on the system interface connector via this input.

DC output from the PMU is 12VDC. Although this power output is isolated, the negative supply is grounded on the SIF Board to give a +V output.

The pin allocations for the auxiliary DC input on the System Interface Board are given in the following table.

Pin	Description	Links
1	+V input	● ●
2	ground	
3	+V input	● ●
4	ground	



rear view

Note Pins 1 and 3 and pins 2 and 4 on this connector are linked.

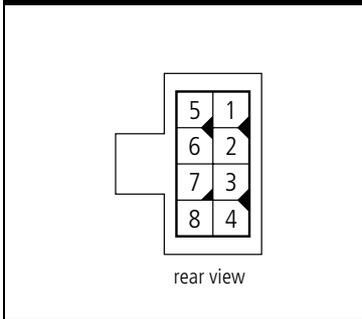
PMU Auxiliary DC Output

The PMU provides an auxiliary DC output when it is fitted with the optional 40 W auxiliary power supply PCB. This power supply is current limited to 3 A and is available on the auxiliary DC output connector on the rear panel.

DC from this output can be supplied to the +AUX_V pin on the Reciter SIF connector via the SIF Board Auxiliary DC input connector.

The pin allocations for the auxiliary DC output on the PMU are given in the following table.

Pin	Description	Links
1	+V output	●
2	+V output	●
3	+V output	●
4	+V output	●
5	ground	●
6	ground	●
7	ground	●
8	ground	●



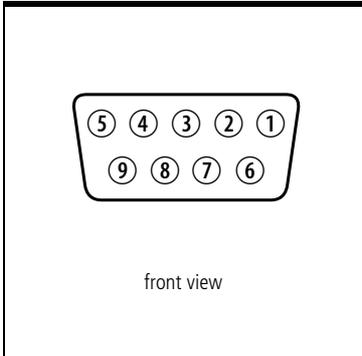
Note Pins 1 to 4 and pins 5 to 8 on this connector are linked.

7.4 Service Kit Connection

The TA2444-01 service kit connects to the BSS via the RS-232 serial port on the control panel. This port is a 9-way female D-range connector. It is also used for remote connection to the Service Kit or Alarm Center software via a modem or radio modem. To connect the programming computer to the BSS, use a straight through cable, as supplied with the service kit.

The pin allocations for the serial port are given in the following table.

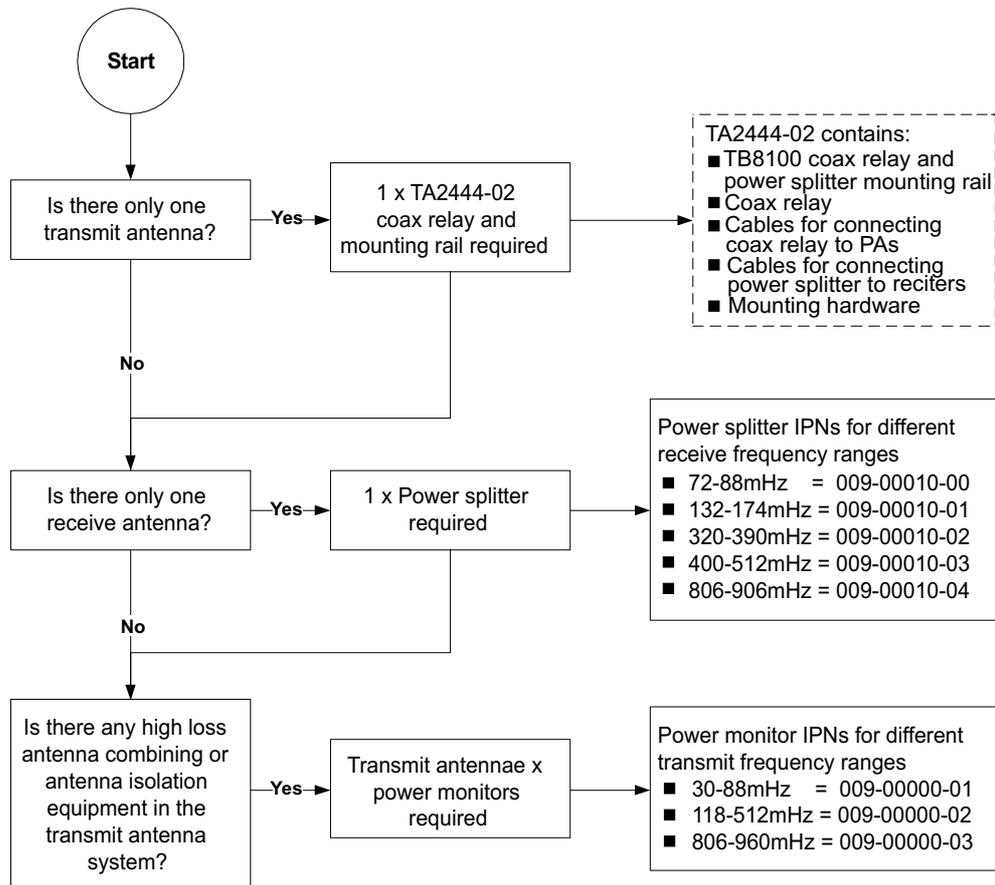
Pin	Description	Links
1	not connected	●
2	receive data	
3	transmit data	
4	not connected	●
5	ground	
6	not connected	●
7	not connected	●
8	not connected	●
9	not connected	



Note Pins 1, 4 and 6 and pins 7 and 8 are linked.

8 Ancillary Equipment

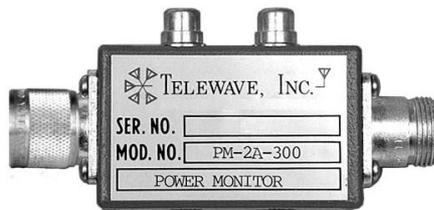
The following flow chart describes the selection process for ancillary equipment, dependant upon the system configuration. More information on typical configuration options is available [on page 21](#) of this manual.



8.1 Power Monitor PM-2A-XXX (IPN:009-00000-0X)

Model	Frequency	DC	IPN
PM-2A-50	30-88 MHz	Dual direction 1000 Watts	009-00000-01
PM-2A-300	118-512 MHz	Dual direction (50 MHz BW) 1000 Watts	009-00000-02
PM-2A-900	806-960 MHz	Dual direction (50 MHz BW) 1000 Watts	009-00000-03

The Telewave PM-2A-XXX series are dual-direction, forward/reverse RF power monitors which produce a DC voltage proportional to an RF signal. An internal trimmer allows each monitor to be recalibrated after installation. Two RCA connectors provide access to the proportional DC output.



Specifications

Frequency ranges	PMA-2A-50 30 - 88 mHz PMA-2A-300 118 - 512 mHz PMA-2A-900 806 - 960 mHz
Bandwidth	50 MHz
Power input (max.)	1000 watts
VSWR (max.)	1.1:1
Insertion loss (typ.)	0.1 dB
Dimensions (HWD)	1.375" x 2.25" x 1.25"
Weight	0.5 lb.
RF input/ouput connectors	N-Male / Female
DC output connectors	RCA

Note Bandwidth is the approximate maximum range over which accurate power readings may be obtained without readjustment.

8.2 Power Splitter PS-1502 and PS-4502 IPN 009-00010-01 (VHF),009-00010-03 (UHF)

Telewave Receiver Power Splitters provide two balanced 50 ohm receiver outputs from one input. The antenna port is tuned with a matching network to ensure a balanced input. These rugged, compact splitters are most commonly used in RX multicouplers, and are not intended for use with transmitters.

Since the input signal is split evenly between two or four ports, the available signal at each output port will be at least 3.dB or 6 dB down from the input. For this reason, preamplification is usually required before the receivers.



Telewave Receiver Distribution Panels include a power supply, inline low noise preamplifier, and one or two 8-way splitters all on a single 19" panel. The preamplifier provides up to +18 dB gain to overcome splitting losses.

Specifications

	PS-1502	PS-4502
Frequency (MHz)	132-174	400-512
Bandwidth (MHz)	26	25
Impedance (ohms)	50	50
VSWR (max)	1.3:1	1.3:1
Matched Pwr. (max)	1 W	1 W
Isolation (typ/min)	25/20 dB	25/20 dB
Coupling loss	3 dB	3 dB
Insertion loss	0.2 dB	0.2 dB
Connectors	N-F	N-F
Dimensions in. (HWD)	1.25 x 2.25 x 1.5	1.25 x 2.25 x 1.5
Dimensions cm. (HWD)	3.2 x 5.7 x 3.8	3.2 x 5.7 x 3.8
Weight lb (kg)	1 (0.45)	1 (0.45)

Note PS-4502 splitters are normally tuned to 450-470 MHz.

9 PCB Information

Note The information in this section treats the TA2444-01 Board pair as a single item.

The following information is included for the XA2444-01 Board pair:

- The parts list contains all information for each part and designator. The “IPN” column refers to the Tait internal part number, and “Description” is how the part is described on the Tait Database. The “PCB” column provides a grid reference to the PCB layouts. The “Circuit” column provides a grid reference to the circuit diagram. Note that the initial number indicates the circuit diagram page.
- PCB layout drawings for both sides of the board
- Circuit diagram (multiple A4 pages)

9.1 XA2444-01 Boards (PBA2444-01-003)

Parts List

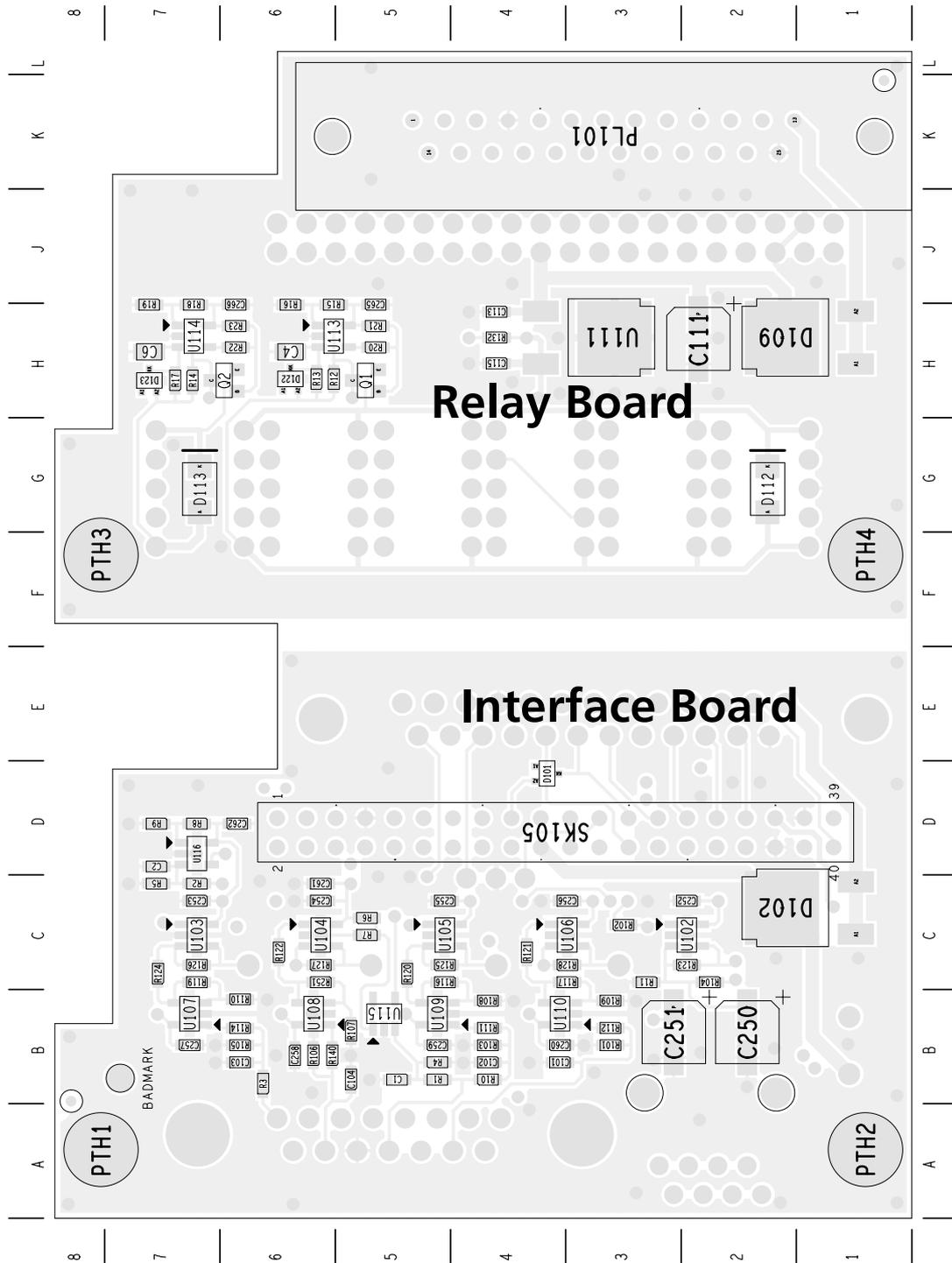
Part	IPN	Description	PCB	Circuit
C1	018-16100-00	Cap 0603 100n 16v x7r + - 10%	B5	2F7
C2	018-16100-00	Cap 0603 100n 16v x7r + - 10%	D7	2F2
C4	015-27100-08	Cap Cer 0805 X7R 1uF 16V 10%	H6	3D8
C6	015-27100-08	Cap Cer 0805 X7R 1uF 16V 10%	H7	3C9
C101	018-14470-00	Cap 0603 4n7 50v X7r±10%	B4	2D7
C102	018-14470-00	Cap 0603 4n7 50v X7r±10%	B4	2F7
C103	018-14470-00	Cap 0603 4n7 50v X7r±10%	B6	2F2
C104	018-14470-00	Cap 0603 4n7 50v X7r±10%	B5	2D2
C111	016-07470-04	Cap Elec SMD 4u7 50v 20%	H2	3F7
C113	018-13330-00	Cap 0603 330p 50v X7r±10%	H4	3F8
C115	018-13330-00	Cap 0603 330p 50v X7r±10%	H4	3F9
C250	016-08100-02	Cap Elec SMD 10M 5.5*5 35v 20%	B2	2C7
C251	016-08100-02	Cap Elec SMD 10M 5.5*5 35v 20%	B3	2C7
C252	018-16100-00	Cap 0603 100n 16v x7r + - 10%	C2	2B1
C253	018-16100-00	Cap 0603 100n 16v x7r + - 10%	C7	2B2
C254	018-16100-00	Cap 0603 100n 16v x7r + - 10%	C6	2B3
C255	018-16100-00	Cap 0603 100n 16v x7r + - 10%	C5	2B4
C256	018-16100-00	Cap 0603 100n 16v x7r + - 10%	C3	2B5
C257	018-16100-00	Cap 0603 100n 16v x7r + - 10%	B7	2B6
C258	018-16100-00	Cap 0603 100n 16v x7r + - 10%	B6	2B7
C259	018-16100-00	Cap 0603 100n 16v x7r + - 10%	B5	2B7
C260	018-16100-00	Cap 0603 100n 16v x7r + - 10%	B4	2B8
C261	018-16100-00	Cap 0603 100n 16v x7r + - 10%	C6	2B9
C262	018-16100-00	Cap 0603 100n 16v x7r + - 10%	D6	2B10
C265	018-16100-00	Cap 0603 100n 16v x7r + - 10%	H5	3A7
C266	018-16100-00	Cap 0603 100n 16v x7r + - 10%	H6	3A8
D101	001-10070-01	Diode BAV70W Dual Ss SOT323	D4	1E2
D102	001-10051-00	Diode SMD SCH 5a/100v Dpak	C1	1D2
D103	001-10070-01	Diode BAV70W Dual Ss SOT323	C6	2E5

Part	IPN	Description	PCB	Circuit
D104	001-10070-01	Diode BAV70W Dual Ss SOT323	C5	2D5
D106	001-10070-01	Diode BAV70W Dual Ss SOT323	C4	2E10
D107	001-10070-01	Diode BAV70W Dual Ss SOT323	C3	2D10
D108	001-10070-01	Diode BAV70W Dual Ss SOT323	K3	3G6
D109	001-10051-00	Diode SMD SCH 5a/100v Dpak	H1	3F6
D112	001-10011-74	Diode SMD MRA4004T3 1a/400v	G2	3B7
D113	001-10011-74	Diode SMD MRA4004T3 1a/400v	G7	3B8
D122	001-10070-01	Diode BAV70W Dual Ss SOT323	H6	3D7
D123	001-10070-01	Diode BAV70W Dual Ss SOT323	H7	3C8
DS101	008-10111-20	LED SMD 0603 Red	C6	2F5
DS102	008-10111-20	LED SMD 0603 Red	C5	2D5
DS103	008-10111-20	LED SMD 0603 Red	C4	2F9
DS104	008-10111-20	LED SMD 0603 Red	C3	2D9
DS252	008-10004-00	LED SMD 0603 Green Ultrabright	C2	2C9
J250	No component fitted		C6	2F4
J251	No component fitted		C5	2E4
J252	No component fitted		C4	2F9
J253	No component fitted		C3	2E9
LOCAL	008-10004-00	LED SMD 0603 Green Ultrabright	C1	3E8
PL101	240-00010-87	Plg 25w Drng Pcb Mtg	K5	3F5 3D5 3C5 3G5 3G2 3F2 3E2 3B5 3E5 3C2 3B2 3D2
PL105	240-00020-44	Hdr 10w 2row Pcb Mtg 5*2	J6	3F7 3G7 3E7 3B10 3E8 3E10 3F10 3E4 3D7 3C7 3G10 3B4 3D4 3F4 3G4 3C4
PL106	240-00020-59	Hdr 3w 1row Pcb Mtg	C4	1C3
PTH1	No component fitted		A8	1B7
PTH2	No component fitted		A1	1B8
PTH3	No component fitted		F8	3A5
PTH4	No component fitted		F1	3A6
Q1	000-10008-17	Xstr SMD BC817-25 NPN SOT23	H5	3D9
Q2	000-10008-17	Xstr SMD BC817-25 NPN SOT23	H6	3C10
R1	038-16100-00	Res 0603 100k 1/10w 5%	B5	2G6
R2	038-16100-00	Res 0603 100k 1/10w 5%	C7	2G2
R3	038-16100-00	Res 0603 100k 1/10w 5%	B6	2F2
R4	038-17100-00	Res 0603 1M 1/10w 5%	B5	2F7
R5	038-17100-00	Res 0603 1M 1/10w 5%	C7	2F2
R6	038-16100-00	Res 0603 100k 1/10w 5%	C5	2G7
R7	038-15220-00	Res 0603 22k 1/10w 5%	C5	2F7
R8	038-16100-00	Res 0603 100k 1/10w 5%	D7	2G2
R9	038-15220-00	Res 0603 22k 1/10w 5%	D7	2F2
R10	038-16100-00	Res 0603 100k 1/10w 5%	B4	2F6
R11	038-17100-00	Res 0603 1M 1/10w 5%	C3	2C7
R12	038-15100-00	Res 0603 10k 1/10w 5%	H6	3D7
R13	038-16330-00	Res 0603 330k 1/10w 5%	H6	3D7
R14	038-15100-00	Res 0603 10k 1/10w 5%	H7	3C8
R15	038-15100-00	Res 0603 10k 1/10w 5%	H6	3D8
R16	038-14220-00	Res 0603 2k2 1/10w 5%	H6	3D8
R17	038-16330-00	Res 0603 330k 1/10w 5%	H7	3C8
R18	038-15100-00	Res 0603 10k 1/10w 5%	H7	3C9
R19	038-14220-00	Res 0603 2k2 1/10w 5%	H7	3C9
R20	038-12560-00	Res 0603 56R 1/10w 5%	H5	3D9
R21	038-13470-00	Res 0603 470R 1/10w 5%	H5	3D9

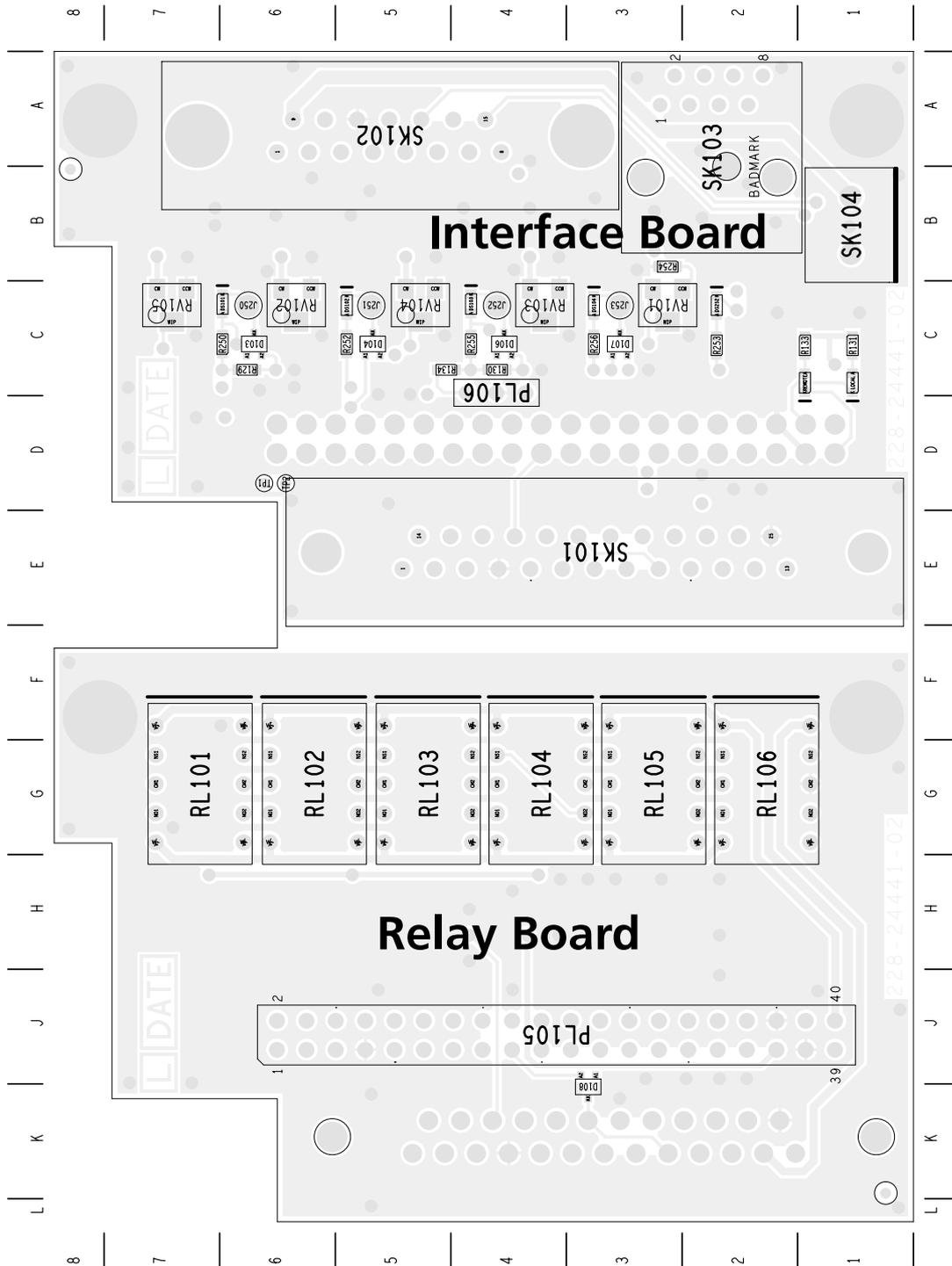
Part	IPN	Description	PCB	Circuit
R22	038-12560-00	Res 0603 56R 1/10w 5%	H6	3C10
R23	038-13470-00	Res 0603 470R 1/10w 5%	H6	3C10
R101	038-15470-10	Res 0603 47k 1/10w 1%	B3	2D7
R102	038-15100-00	Res 0603 10k 1/10w 5%	C3	2C7
R103	038-15330-00	Res 0603 33k 1/10w 5%	B4	2F7
R104	038-15100-00	Res 0603 10k 1/10w 5%	C2	2C7
R105	038-15330-00	Res 0603 33k 1/10w 5%	B6	2F2
R106	038-15470-10	Res 0603 47k 1/10w 1%	B6	2D2
R107	No component fitted		B5	2D2
R108	No component fitted		B4	2E7
R109	No component fitted		B3	2D7
R110	No component fitted		B6	2E2
R111	038-15470-10	Res 0603 47k 1/10w 1%	B4	2F7
R112	038-15470-10	Res 0603 47k 1/10w 1%	B3	2E7
R114	038-15470-10	Res 0603 47k 1/10w 1%	B6	2F2
R116	038-10000-00	Res 0603 Zero 0hm 1/16w ± 5%	C5	2E8
R117	038-10000-00	Res 0603 Zero 0hm 1/16w ± 5%	C3	2D8
R119	038-10000-00	Res 0603 Zero 0hm 1/16w ± 5%	C7	2E3
R120	038-15100-00	Res 0603 10k 1/10w 5%	C5	2F8
R121	038-16100-00	Res 0603 100k 1/10w 5%	C4	2D8
R122	038-16100-00	Res 0603 100k 1/10w 5%	C6	2D3
R123	038-17100-00	Res 0603 1M 1/10w 5%	C2	2D8
R124	038-15100-00	Res 0603 10k 1/10w 5%	C7	2F3
R125	038-17100-00	Res 0603 1M 1/10w 5%	C5	2F9
R126	038-17100-00	Res 0603 1M 1/10w 5%	C7	2F4
R127	038-17100-00	Res 0603 1M 1/10w 5%	C6	2E4
R128	038-17100-00	Res 0603 1M 1/10w 5%	C3	2E9
R129	038-15100-00	Res 0603 10k 1/10w 5%	C6	2F5
R130	038-15100-00	Res 0603 10k 1/10w 5%	C4	2F10
R131	038-13470-00	Res 0603 470R 1/10w 5%	C1	3F8
R132	038-15100-00	Res 0603 10k 1/10w 5%	H4	3F6
R133	038-13470-00	Res 0603 470R 1/10w 5%	C1	3F9
R134	038-15100-00	Res 0603 10k 1/10w 5%	C5	1C2
R140	038-15470-10	Res 0603 47k 1/10w 1%	B6	2E2
R250	038-13470-00	Res 0603 470R 1/10w 5%	C6	2G5
R251	038-10000-00	Res 0603 Zero 0hm 1/16w ± 5%	C6	2D3
R252	038-13470-00	Res 0603 470R 1/10w 5%	C5	2E5
R253	038-13470-00	Res 0603 470R 1/10w 5%	C2	2C9
R254	038-15330-00	Res 0603 33k 1/10w 5%	B3	2C7
R255	038-13470-00	Res 0603 470R 1/10w 5%	C4	2G9
R256	038-13470-00	Res 0603 470R 1/10w 5%	C3	2E9
REMOTE	008-10004-00	LED SMD 0603 Green Ultrabright	C1	3E9
RL101	237-00010-37	Relay 2coil Latching Dpdt Pth	F7	3B5 3F3 3G3 3B8
RL102	237-00010-37	Relay 2coil Latching Dpdt Pth	F6	3B9 3B6 3E3 3F3
RL103	237-00010-37	Relay 2coil Latching Dpdt Pth	F5	3B6 3C3 3B9 3D3
RL104	237-00010-37	Relay 2coil Latching Dpdt Pth	F4	3B9 3B6 3C3 3B3
RL105	237-00010-37	Relay 2coil Latching Dpdt Pth	F3	3B9 3B7 3D6
RL106	237-00010-37	Relay 2coil Latching Dpdt Pth	F2	3C6 3B7 3B10 3E9
RV101	042-16100-10	Res Pre 100k 5t TOP 10%	C3	2C7
RV102	042-16100-10	Res Pre 100k 5t TOP 10%	C6	2E3
RV103	042-16100-10	Res Pre 100k 5t TOP 10%	C4	2E8
RV104	042-16100-10	Res Pre 100k 5t TOP 10%	C5	2E8
RV105	042-16100-10	Res Pre 100k 5t TOP 10%	C7	2E3
SK101	240-02020-20	Skt 25w Drng Pcb + Full H/W	E5	1G5 1F1 1G1 1F5 1C1 1E1 1B1 1D1

Part	IPN	Description	PCB	Circuit
SK102	240-02020-15	Skt 15 Drng Pcb + Pcb H/W	A6	3F8 3F10 2E6 2C6 2F1 2E1 2F6 1C5 1D3 1E5 1E3 1D5
SK103	240-04021-75	Skt 8w Ph Jack Vrt PCB Mtg	A3	1G8 1F8 1E7 1D7 1G7
SK104	240-04030-09	Term Block 2w Pcb Mtg 5mm	B1	1F8 1E8
SK105	240-02011-39	Conn 40w Fem Vrt	D6	3F10 3E10 3G10 3E8 2C10 2C6 2D5 1F10 1G10 1G3 1F3 1D3 1E3 1C3 1G6 1F6 1D6 1B3
TP1	No component fitted		D6	1E2
TP2	No component fitted		D6	1B2
U102	002-10397-00	IC SMD LM397 CMptr SOT23-5	C2	2B1 2C8
U103	002-10397-00	IC SMD LM397 CMptr SOT23-5	C7	2E4 2B2
U104	002-10397-00	IC SMD LM397 CMptr SOT23-5	C6	2B3 2D4
U105	002-10397-00	IC SMD LM397 CMptr SOT23-5	C5	2B4 2E9
U106	002-10397-00	IC SMD LM397 CMptr SOT23-5	C3	2D9 2B5
U107	002-10032-10	IC LM321 1x0pamp L/Pwr SOT23-5	B7	2B5 2F3
U108	002-10032-10	IC LM321 1x0pamp L/Pwr SOT23-5	B6	2B6 2D3
U109	002-10032-10	IC LM321 1x0pamp L/Pwr SOT23-5	B5	2F8 2B7
U110	002-10032-10	IC LM321 1x0pamp L/Pwr SOT23-5	B4	2D8 2B8
U111	002-10078-00	IC SMD MC78M05CDT5v Reg0.5a	H3	3G8
U113	002-10397-00	IC SMD LM397 CMptr SOT23-5	H6	3A7 3D9
U114	002-10397-00	IC SMD LM397 CMptr SOT23-5	H7	3C9 3A8
U115	002-10397-00	IC SMD LM397 CMptr SOT23-5	B5	2B9 2G8
U116	002-10397-00	IC SMD LM397 CMptr SOT23-5	D7	2G3 2B10

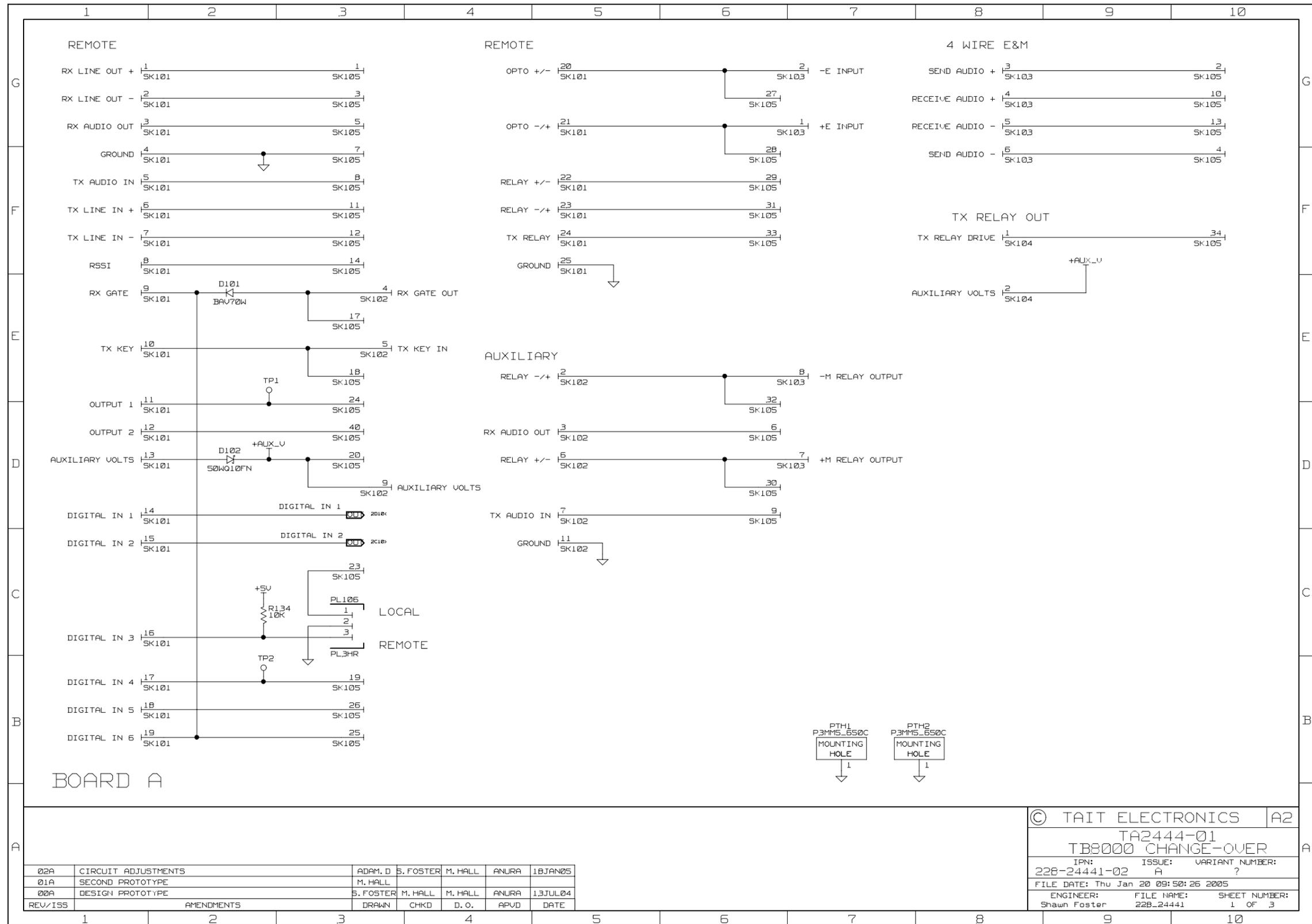
PCB Layout (top side)



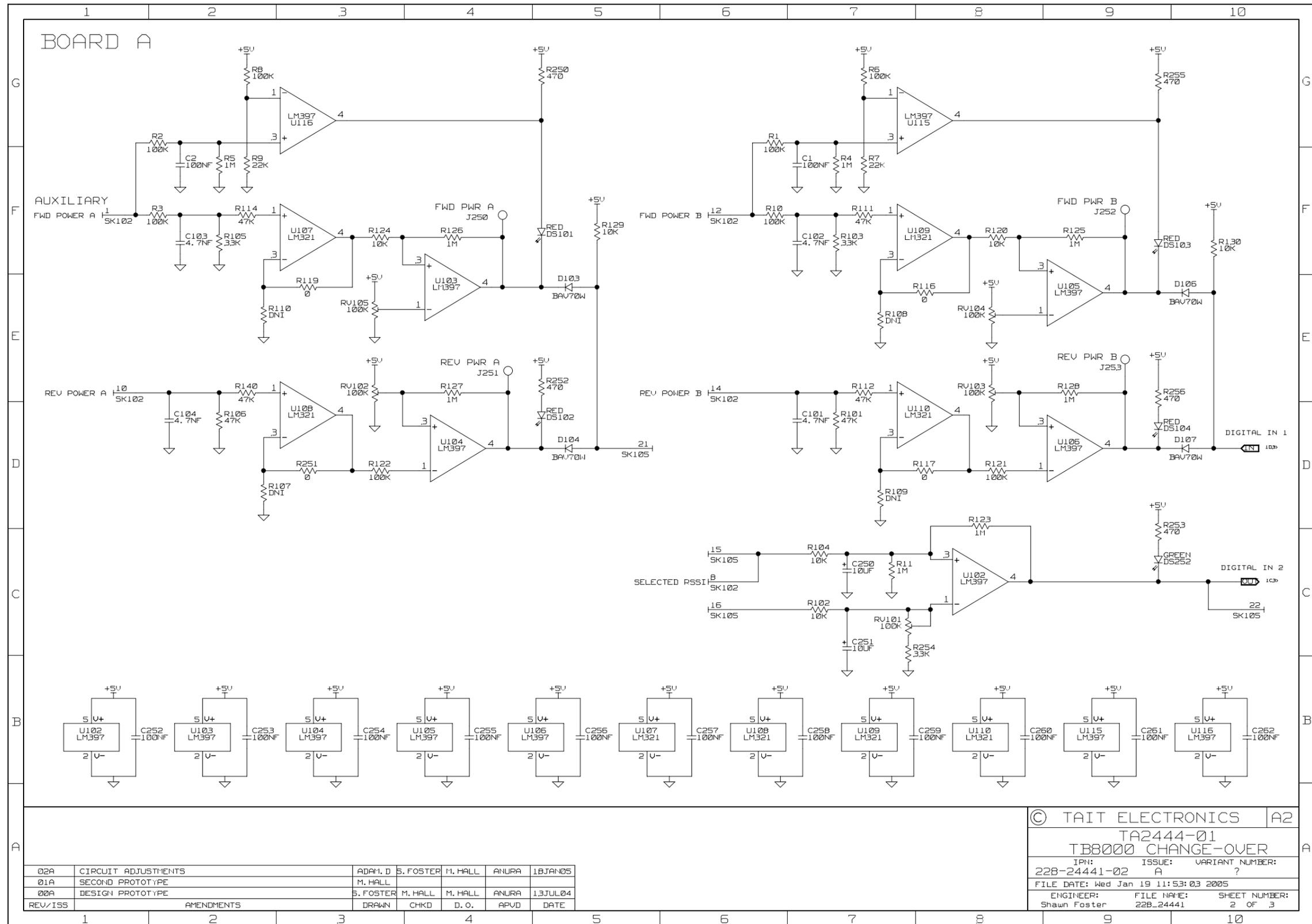
PCB Layout (bottom side)



Circuit Diagram (page 1 of 3)



Circuit Diagram (page 2 of 3)



02A	CIRCUIT ADJUSTMENTS	ADAM D	S. FOSTER	M. HALL	ANURA	18JAN05
01A	SECOND PROTOTYPE	M. HALL				
00A	DESIGN PROTOTYPE	S. FOSTER	M. HALL	M. HALL	ANURA	13JUL04
REV/ISS	AMENDMENTS	DRAWN	CHKD	D. O.	APVD	DATE

© TAIT ELECTRONICS		A2
TA2444-01		
TB8000 CHANGE-OVER		
IPN:	ISSUE:	VARIANT NUMBER:
228-24441-02	A	?
FILE DATE: Wed Jan 19 11:53:03 2005		
ENGINEER:	FILE NAME:	SHEET NUMBER:
Shawn Foster	228_24441	2 OF 3

Circuit Diagram (page 3 of 3)

