T800, TB7100, TB8100 base stations

TA703 Change Over Module Service Manual

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Preface

Scope of Manual

This document contains information about the operation and functions of the TA703-xx-xxxx Change Over Module. This is a T800-based product but can be used with TB7100 and TB8100 equipment. Differences are described within the manual.

Document Conventions

"File > Open" means "click File on the menu bar, then click Open on the list of commands that pops up". "Monitor > Module Details > Reciter" means "click the Monitor icon on the toolbar, then in the navigation pane find the Module Details group, and select Reciter from it".

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

Warning **This alert is used when there is a hazardous situation which, if not avoided, could result in death or serious injury.**

Caution This alert is used when there is a hazardous situation which, if not avoided, could result in minor or moderate injury.

Notice This alert is used to highlight information that is required to ensure procedures are performed correctly. Incorrectly performed procedures could result in equipment damage or malfunction.

This icon is used to draw your attention to information that may improve your understanding of the equipment or procedure.

Associated Documentation

This manual should be read in conjunction with the following documents. Updates are made available on the Tait support web. Print copies of the documentation are available on request.

- TB8100 base station Service Manual (MBA-00016-xx)
- TB7100 base station Service Manual (MBB-00005-xx)
- T800 series II Service Manual (M800-00-xxx)

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Publication Record

Issue	Publication Date	Description
00	January 2001	First release
01	July 2003	Update
02	June 2005	Update
03	September 2005	Update
04	June 2014	Generalise to T800, TB7100 and TB8100 base stations.

Abbreviations

Abbreviation	Description
RR	Remote Reset. In earlier versions this signal was named Remote Alarm Clear
RS	Remote Select. This signal was known as Remote Tx or Tx Select
RAC	Remote Alarm Clear: superseded by RR
RTS	Remote Transmit Select: superseded by RS
FWD PWR	Forward Power meters signal from external monitor module or from the base station transmitter. Typical T858 delivers 5V for output power of 50Watt
REV PWR	Reverse Power meter signal from external monitor module or from the base station transmitter
RSSI	Receiver Signal Strength Indicator, an analog signal from receiver that indicates how strong the incoming RF signal is at the receiver antenna port. In a UHF receiver this is about 10dB per Volt, relative to 2V at -110dBm.

Contents

1 Introduction

This part introduces the TA703-xx-xxxx Change Over Module and contains the following sections:

1.1 Overview

The TA703-xx-xxxx Change Over Module system provides automated failure protection for a Tait conventional base station which has a standby transmitter, receiver and power supply. If a fault is detected in the operating base station, the unit can automatically switch operation to the standby base station and indicate the fault on the front panel.

The module either identifies a fault condition in the active repeater, or compares a measure on the active repeater and a measure on the standby repeater. It gives flexibility in alarm monitoring and switching and can be operated locally or remotely.

The TA703-xx-xxxx Change Over Module replaces the TA703-01 and has many added features, including:

- Simultaneous monitoring active and standby base stations
- Intelligent switchover on failure.
- Enhanced alarm connection options
- Removal of internal RF plumbing
- Optional +5v regulator for use by other modules.
- A DB25 connector for flexible connection configurations.
- RSSI switching
- Future modem option allows technicians in the field to easily detect the error condition after change over.
- Mode B provides continuous alarm monitoring and switching, and independent TX and RX switching

The TA703-xx-xxxx Change Over Module system has a wide range of options and functions. For more information on power monitoring options and the installation kits, see Variants on page 12.

Notice Throughout this manual, the upper base station is called Base A, the lower base station is Base B. Base A is the normally active base station and Base B is the standby, unless stated otherwise.

1.2 Minimum system requirements

1.2.1 Receiver with RSSI fitted

The receivers inputs need to be derived from a single antenna to ensure that they receive the same signal strength. Systems with a split receiver antenna setup will give invalid readings in the RSSI comparator module.

The RSSI of each receiver is connected to the Change Over Module for comparison. The RSSI characteristics are different for different receivers. The RSSI of a TB7100 mobile-based base station maxes out at 3.3V, while the RSSI of the TB8100 can be as high as 8V. Careful tuning is required for the setup of the 6dB difference allowed between two receivers before the RSSI alarm is triggered.

1.2.2 Transmitter

To establish proper operation of the transmitter, at least one power monitor signal must be provided to the TA703. This signal may be derived from an external power monitor module or from the PA itself. Refer to the system variants in section 1.4.2, System Variants.

The power monitor signal level is based on the typical level a 50 W PA produces. Under certain circumstances like when an external monitor is used or when operating with low power settings, you may have to adjust the gain of the input amplifiers for the forward and reverse voltage levels. Refer to IC201 in the circuit diagrams and PCB layout in section 6, PCB information.

The Transmitter antenna and receiver antenna may or may not be in different locations, based on design decisions.

1.2.3 Limitations

Due to the variations in proximity of the terminals, the incoming RF signals to the base station tends to vary dramatically. This feature of voice systems was instrumental in the implementation of the mute alarm algorithms.

For Modes A and C, the receive gate opening difference between Base A and Base B must be greater than one second, on three consecutive occasions before the Mute alarm is raised. Consequently, short data messages of less than one second duration will not activate the mute alarm. Similarly a system with continuous carrier can not generate a mute alarm.

For Mode D, the receive gate opening difference between Base A and Base B must be greater than three seconds, on five consecutive occasions before the Mute alarm is raised. Consequently, short data messages of less than three seconds duration will not activate the mute alarm. Similarly a system with continuous carrier can not generate a mute alarm.

Refer to section 4.4.5, Rx-Gate Monitor (MUTE) - Modes A and C only. If these limitations affect your system, please contact TCI for a customised solution.

1.3 System Configuration

A TA703-xx-xxxx Change Over Module system can be configured in a number of ways, according to customer requirements.

The system can be setup with either a single, dual or no power monitors. Where no power monitor is fitted, power is monitored by the transmitter power monitor signals. The system may have a duplexer, RX/TX Coaxial Relay or dual antennae.

The three block diagrams that follow show some typical configuration options:

Figure 1.1 Typical Two Power Monitor System Configuration

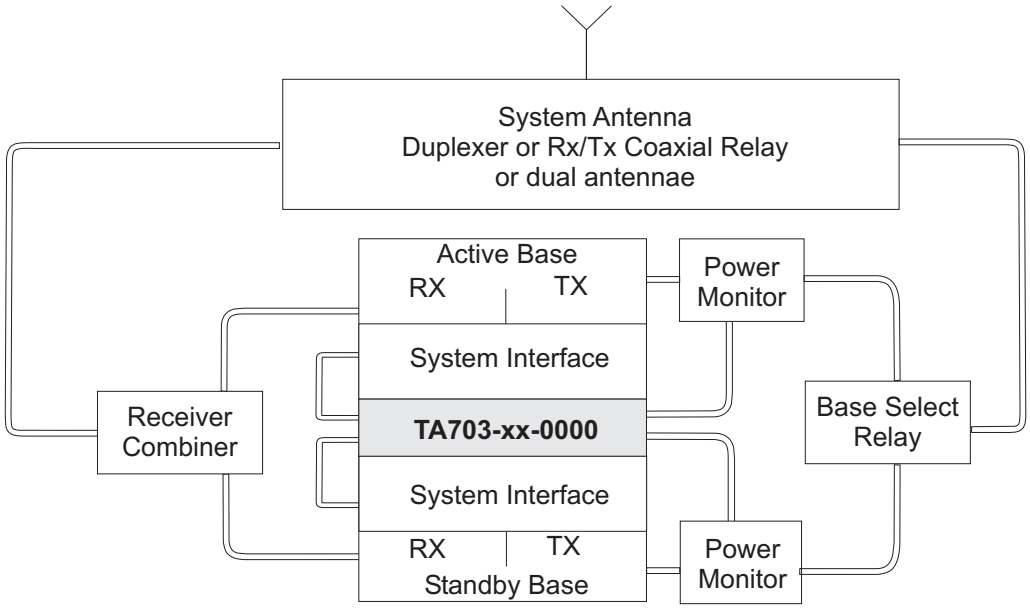


Figure 1.2 Typical One Power Monitor System Configuration

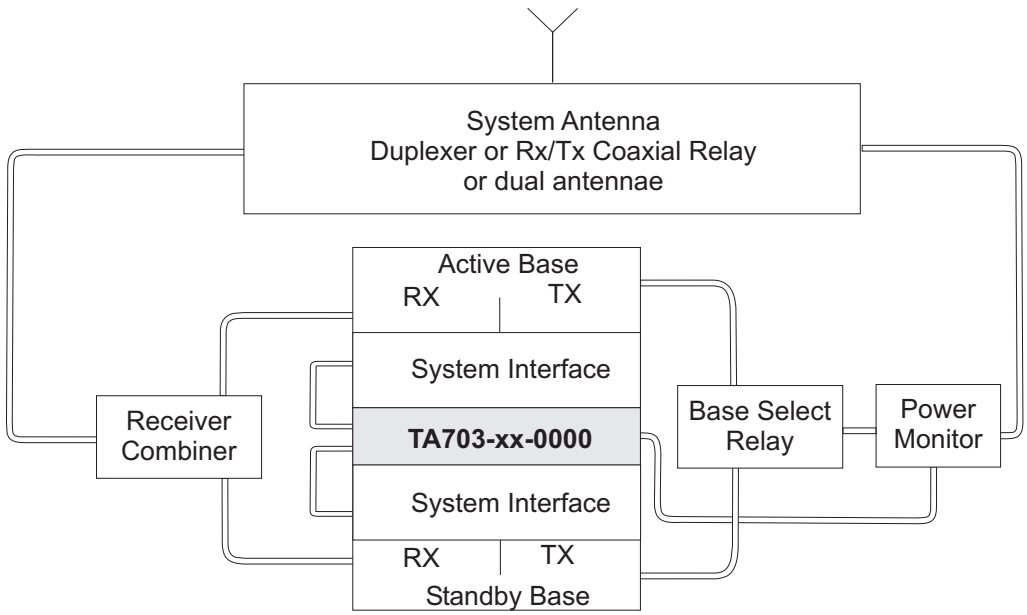
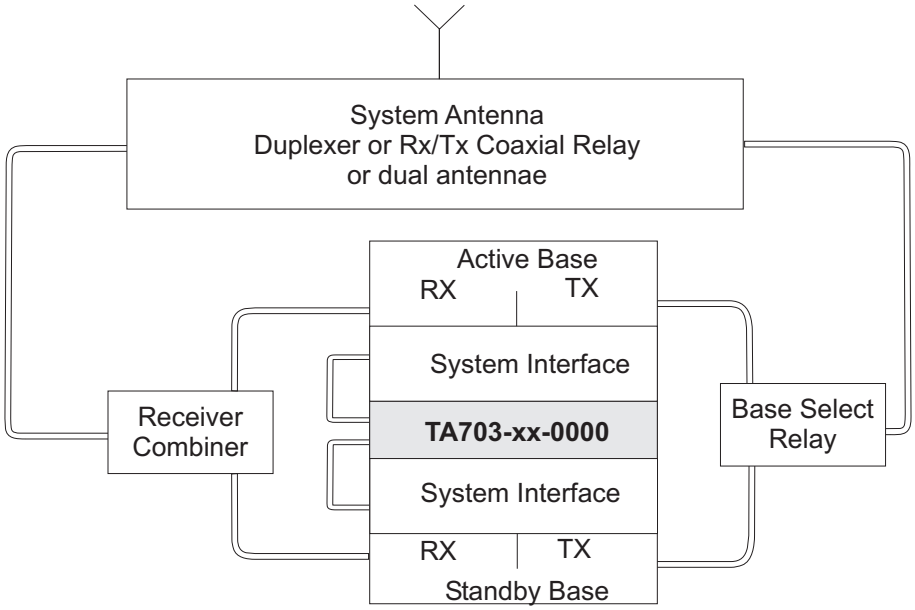


Figure 1.3 Internal Power Monitoring Configuration



1.4 Variants

1.4.1 Change Over Module Variants

The TA703-xx-xxxx Change Over Module is available in six frequency variants, with further options provided for each frequency.

Module variant			**Frequency**
T800	**TB8100**	**TB7100**	
TA703-xx-0000	TA703-51-8000	TA703-51-7000	Standard change over module
TA703-xx-0001	Not available	TA703-51-7001	072-088MHz
TA703-xx-0002	TA703-51-8002	TA703-51-7002	132-174MHz
TA703-xx-0003	Not available	TA703-51-7003	320-390 MHz
TA703-xx-0004	TA703-51-8004	TA703-51-7004	400-512 MHz

The difference between the variants is the receiver combiner and transmitter power monitor modules, which are specific for a particular frequency range. Models TA703-xx-0001 to -0004 require a single power monitor to monitor power from both base stations.

The Change Over Module is also able to monitor each base station separately. In this case, the module requires a receiver splitter and an additional power monitor module which require installation with the Change Over Module.

Models -0001 to -0004 include a coaxial relay for transmitter output chantage over.

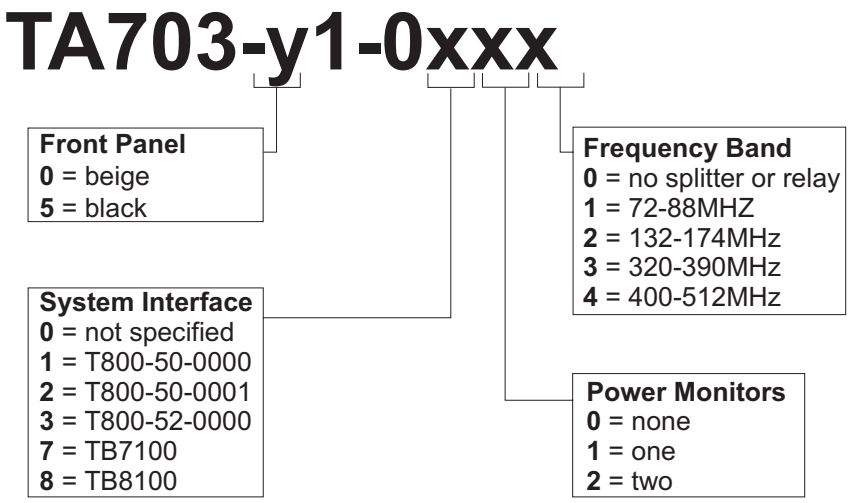
TA703-5x-xxxx indicates that the front panel is black.

1.4.2 System Variants

The Change-Over Module is part of a TA703-xx-xxxx system. Each system contains:

- TA703-xx-xxxx Change-Over Unit with a coaxial Relay and a Receiver Splitter in the ordered frequency band
- installation kit (see section2.2, Installation for details to interface with the specified backplane or System Interface)
- power monitor kit/s (see section2.2, Installation for details) according to the required power monitoring options.

The diagram below shows how the system variant numbering system operates:



For example, TA703-51-0824 system monitors T8100 base stations which:

- require two separate power monitors
- operate in the 400-512MHz band.

1.5 Specifications

Supply Voltage	10.8 - 16V DC
Current Consumption	100mA
Change Over	by transparent latching relays
	2 wire Rx Audio
	2 wire Tx Audio
	Rx-Gate + RSSI
	Tx-Key
	Coaxial Relay for Transmitter Output
	Switch time 3ms after fault detection

Notice Receiver signals are derived from a single antenna and split to the respective receivers by a low insertion loss power splitter.

Change Over Criteria	Supply
	Forward Power
	Reverse Power
	RSSI
	Rx-Gate
External Alarms	All Alarm - Base A
	Supply - Base A
	Forward Power - Base A
	Reverse Power - Base A
	RSSI - Base A
	Rx-Gate - Base A
	All Alarm - Base B
	Supply - Base B
	Forward Power - Base B
	Reverse Power - Base B
	RSSI - Base B
	Rx-Gate - Base B
	Low Battery Alarm combined with All Alarm A and B
Alarm Polling	Mode A 20mSec
	Mode B 10mSec
	Mode C 20mSec
	Mode D 20mSec
Additional Features	Output for Rx/Tx Relay for operation in simplex mode
	Optional DC-DC converter to power third-party equipment

1.6 Operating Modes

The TA703-01-0000 Change Over Module currently operates in four standard modes.

- Mode A is the standard operating mode, enhanced but backward-compatible with the TA703-01
- Mode B is an additional mode with specific customised features
- Mode C is identical to Mode A except that in Mode C Remote Select automatically resets all alarms
- Mode D is a mode specifically designed for marine and rural environments because the Rx gate mute alarm algorithm is modified. Otherwise all other features are like mode C.

This table highlights the differences and similarities between Mode A, B, C and D.

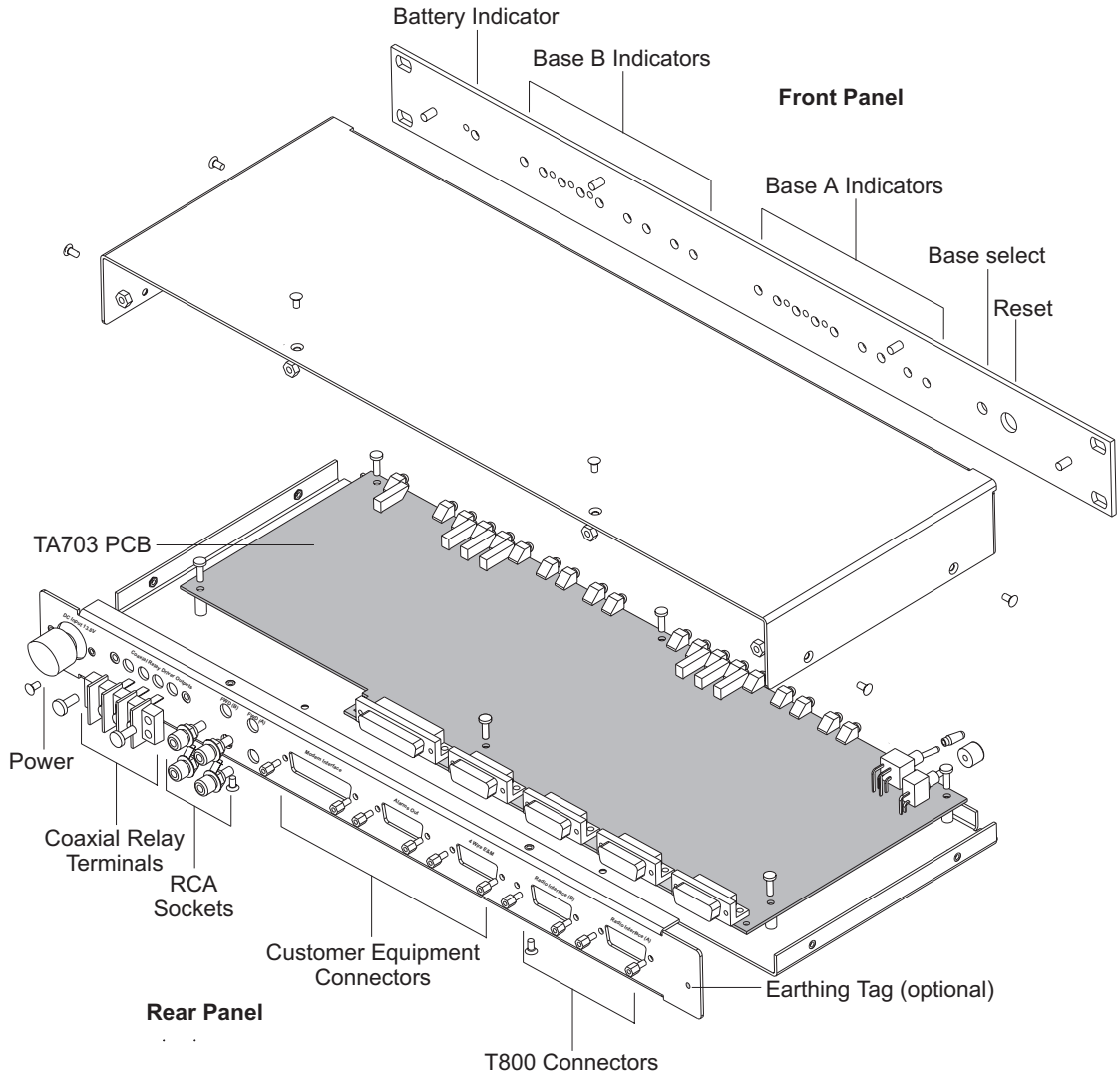
Feature	Mode A	Mode B	Mode C	Mode D
Power reset sequence	✔	✔	✔	✔
Remote Select	✔	✔	✔	✔
Remote Reset	✔	✔	✔	✔
Front panel base station selection	✔	✖	✔	✔
Front panel reset	✔	✔	✔	✔
PSU monitor	✔	✔	✔	✔
FWD monitor	✔	✔	✔	✔
REV monitor	✔	✔	✔	✔
RSSI monitor	✔	✔	✔	✔
Mute monitor	✔	✔	✔	✔
Independent TX and Rx switching	✖	✔	✖	✖
Operation following error condition	One shot	Continuous	One shot	One shot
Combined Rx gate	✖	✔	✖	✖
Combined RSSI and mute alarm	✖	✔	✖	✖
Alarm polling interval	20mSec	10mSec	20mSec	20mSec
Consecutive error samples before alarm activates (except Rx Gate mute alarm)	✘	✔	✘	✘
Tx-Key change over	✔	✖	✔	✔
Tx change over	Automatic or Manual (local or remote)	Manual (remote only)	Automatic or Manual (local or remote)	Automatic or Manual (local or remote)

Feature	Mode A	Mode B	Mode C	Mode D
Rx change over	Automatic or Manual (local or remote)	Automatic	Automatic or Manual (local or remote)	Automatic or Manual (local or remote)
Default Base	Selected	Base A (Rx) Selected (Tx)	Selected	Selected
Remote Select automatically resets all alarms	✖	Tx only switches without reset	✔	✔
No of Rx gate opening before change over	3x in 1 sec		3x in 1 sec	5x in 3 sec
Gates combined		✔		
Remote forced change-over	Remote change over (Tx select) level change + Pulse low on rem Alm Clear	Remote change over (Tx select) level change only	As A	
Combined RSSI and Rx Gate alarm		✔		

1.7 Hardware Description

1.7.1 General

The TA703-xx-xxxx Change Over Module consists of a 1U 19” rack mount unit with switches and LED indicators on the front panel, and connectors on the rear. Inside the unit a single Control PCB, flush-mounted against the front panel, interfaces to the base stations and customer’s equipment via D-range connectors on the back panel. Power monitor cables connect via RCA sockets on the back panel. A 4-way terminal block connects to two coaxial relays, one for base selection and one for RX/TX change over.



1.7.2 Front Panel

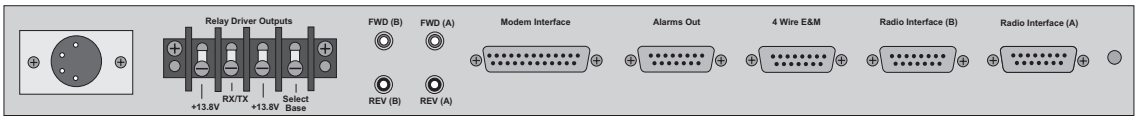
The Change Over Module front panel has a series of LED indicators, switches, and preset resistors.

- 1 x momentary push button switch to clear and reset after an error condition
- 1 x double throw, double pole toggle switch for local, manual base station selection
- 2 x yellow LEDs indicating active or standby status for Base A
- 2 x green LEDs indicating TX and RX activity for Base A
- 5 x red LEDs indicating error conditions on Base A
- 3 x preset resistors for adjusting fault condition trigger levels for Base A faults
- 2 x yellow LEDs indicating active or standby status for Base B
- 2 x green LEDs indicating TX and RX activity for Base B
- 5 x red LEDs indicating error conditions on Base B
- 3 x preset resistors for adjusting fault condition trigger levels for Base B faults
- 1 x red LED indicating battery power status
- 1 x preset resistor for adjusting battery fault trigger level

Notice A more detailed description of these components is included in section 4, Operation.

1.7.3 Rear Panel

The Change Over Module rear panel has a series connectors as shown below.



- Connection to the Change Over Module is as follows:
- 4 pin XLR plug Power Input (+13.8v, 1.2A max)
- Tag-strip for Co-axial relay control output.
- 4 x RCA sockets for Forward and Reverse power on Base A and Base B
- A separate 25 pin D-range plug provides customer-specific interface (modem, not normally fitted).
- 1 x 15 pin D-range plug to provide the switched receiver and transmitter signals to the customers remote control site
- 1 x 15 pin D-range plug to provide the alarm signals to the remote control site
- 2 x 15 pin D-range connectors plug for connection to Base A and Base B.
- Earthing tag (optional)

Notice Pin out information for these connectors is included in section 5, Circuit Description.

1.7.4 Mechanical Parts List

The table below lists all mechanical parts which are not covered elsewhere in this manual. When ordering parts, please use the IPN and description.

IPN	Qty	Description	Where used
240-02100-53	2	SKT PHONO PNL MTG NICKEL RED	Rear panel - FWD PWR Base A and Base B
240-02100-54	2	SKT PHONO PNL MTG NICKEL BLK	Rear panel - REV PWR Base A and Base B
303-11208-00	1	CHASSIS TA703 CHANGEOVER UNIT	Module Tray
303-23158-00	1	COVER TA703 CHANGEOVER UNIT	Module top cover
316-06739-02	1	PNL FRT TA703 CHANGEOVER UNIT	Module Front panel beige
316-06739-50	1	PNL FRT TA703 CHANGEOVER UNIT	Module Front panel black
345-00040-09	10	SCRW M3*6MM CSK POZI TRUNCATE	
345-00040-11	6	SCRW M3*10MM P/POZI ST BZ	
345-00040-12	2	SCRW M3*10MM CSK POZI ST BZ	
349-00020-46	2	SCRW M4X16MM P/POZ T/T BLK	Rear panel - Relay Driver terminal block
352-00010-10	4	NUT M4 COLD FORM HEX ST BZ	
354-01043-00	10	FASTENER 4-40 SCREW LOCK	
369-00010-14	3	TIE CABLE NYLON 100*2.6MM	Internal - PCB wiring
316-21260-01	1	PNL REAR TA703 CHANGEOVER UNIT	Module rear panel
240-04030-29		BARRIER SCREW TO TAG T/B 4WAY	Rear panel - relay driver t/b
W703-00-0000	1	WIRING KIT TA703-XX-XXXX	Wires PCB to power input, relay driver output and FWD and REV PWR connectors.*
* Position and colours for these wires is included in section 7, Wiring			

2 Setup and Installation

This part contains information for installing the TA703-xx-xxxx Change Over Module with two base stations. It contains:

2.1 Internal Setup

The Change Over Module requires the following selections to be made for correct setup. Refer to section 2.1.6, Internal Link Setting and section 2.1.7, Dip Switch and Test Point Location for further details.

2.1.1 Mode Select

Refer to section 1.6, Operating Modes.

- Mode A SW201-1 off, SW201-2 on
- Mode B SW201-1 on, SW201-2 off
- Mode C SW201-1 off, SW201-2 off
- Mode D SW201-1 on, SW201-2 on

2.1.2 Repeater Mode Versus Base Station Mode

- Close SW100-1 and SW100-2 to link Rx Audio to Tx Audio
- Close SW100-6 to link Rx Gate to Tx-Key

2.1.3 Forward and Reverse Power Measurements

There are two options for alarm detection in the TA703:

- You can opt to use analog forward and reverse metering signals taken either from the PA or from one or two external power monitors. In this case you need to open SW201-6 and SW201-7. This shuts out the digital alarm outputs from the PA.
  Always use external monitors for TB8100 and TB7100.
- For T800 PAs, you can select the digital alarm signals generated in the PA. These signals are active high in the T800.
  The T800 forward power alarm goes high impedance when the forward power does not reach its required level.

Set SW201-6 and SW201-7 to close.
In this case you may also need to adjust the alarm trigger level in the PA to the desired level. You must set the front panel trimmers on the Change Over Module for forward and reverse power alarm to 0.

- For TB8100 PAs a task manager script needs to be written:
  - If forward power low then activate Dig Output 1,
  - If reverse power high then activate Dig Output 2.
- The TB7100 does not provide digital outputs reflecting the forward and reverse power status. External power monitor(s) have to be used instead.

2.1.4 Single External Power Monitor

When you have only one single external power monitor, close SW201-5 and SW201-8.

This links the inputs of Base A and Base B for both the forward and reverse power measurements

2.1.5 Alarm Outputs

There is one more selection to be considered with regard to the alarm outputs

SW400 and SW401 allows for a small variety in output settings. SW400 deals with the outputs of Base A, while SW401 does the same for Base B

When a switch on SW400 or SW401 is closed a 1k pull up resistor is connected to 13.8V. Refer to table SW400 in. Defaults is: no pull up.

2.1.6 Internal Link Setting

All internal link settings are by dip switch. Four dip switches SW100, SW201, SW400 and SW401 provide separate, adjustable internal links on the TA703-01-0000 PCB to allow the Change Over Module to perform as described in the table below. See the diagram on page on page 25 for dip switch locations.

Notice Some switches are unused.

SW100 (Shaded fields indicate default settings)

Switch	on	off	comment
1-16	Repeater mode	Base Station mode	Repeater Audio +
2-15	Repeater mode	Base Station mode	Repeater Audio -
3-14	disable remote batt sense	enable remote batt sense	remote battery sense option
4-13			not connected
5-12			not connected
6-11	Repeater mode	Base Station mode	RxTx key
7-10	enable	disable for testing	Tx-key B Enable
8-9	enable	disable for testing	Tx-key A Enable

SW 201 (Shaded fields indicate default settings)

Switch	on	off	comments
1-16	Modes B and D	Modes A and C	Operating mode
2-15	Modes A and D	Modes B and C	Operating mode
3-14			not used
4-13			not used
5-12	Rev Pwr inputs linked	Rev Pwr inputs separate	Reverse power input
6-11	enable Fwd Alm B I/P	disable Fwd Alm B I/P	Disable for Fwd and Rev power metering inputs
7-10	enable Fwd Alm A I/P	disable Fwd Alm A I/P	Disable for Fwd and Rev power metering inputs
8-9	Fwd Pwr inputs linked	Fwd Pwr inputs separate	Forward power input

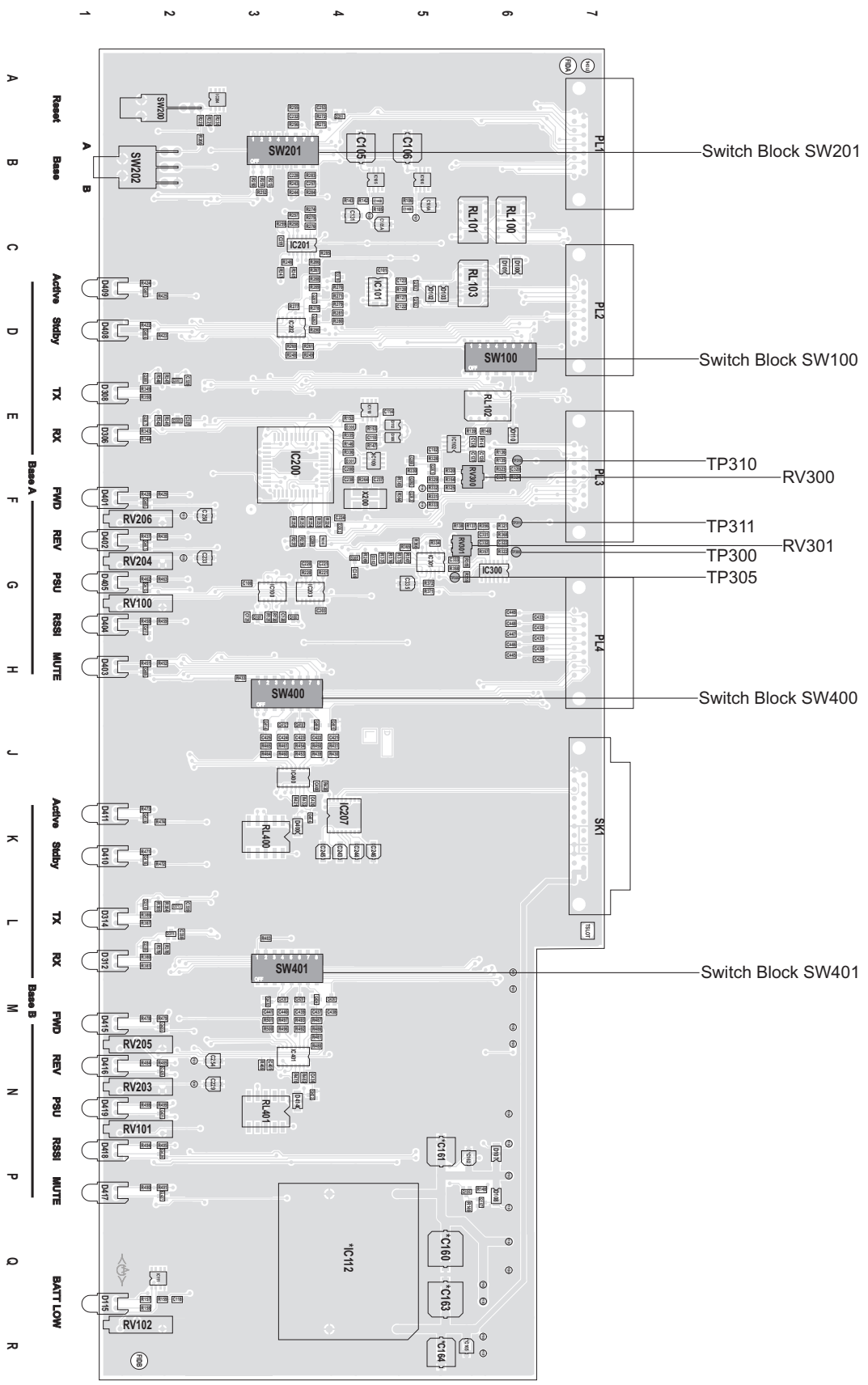
SW 400 (Shaded fields indicate default settings)

Switch	on	off	comments
1-16	Fwd Pwr A 1k to V+ pull up	Fwd Pwr A open collector	Fwd Pwr A pull up select
2-15	Rev Pwr A 1k to V+ pull up	Rev Pwr A open collector	Rev Pwr A pull up select
3-14	Mute A 1k to V+ pull up	Mute A open collector	Mute A pull up select
4-13	RSSI A 1k to V+ pull up	RSSI A open collector	RSSI A pull up select
5-12	PSU A 1k to V+ pull up	PSU A open collector	PSU A pull up select
6-11			not used
7-10	All Alm-A common Gnd	All Alm A common float	All Alm-A common select
8-9	All Alm A N/O 1k to V+	All Alm A N/O float	All Alm-A pull up select

SW 401 (Shaded fields indicate default settings)

Switch	on	off	comments
1-16	Rev Pwr B 1k to V+	Rev Pwr B open collector	Rev Pwr B pull up select
2-15	Fwd Pwr B 1k to V+	Fwd Pwr B open collector	Fwd Pwr B pull up select
3-14	Mute B 1k to V+	Mute B open collector	Mute B pull up select
4-13	RSSI B 1k to V+	RSSI B open collector	RSSI B pull up select
5-12	PSU B 1k to V+	PSU B open collector	PSU B pull up select
6-11			not used
7-10	All Alm-B common to Gnd	All Alm-B common float	All Alm-B common select
8-9	All Alm-B N/O 1k to V+	All Alm-B N/O float	All Alm-B pull up select

2.1.7 Dip Switch and Test Point Location



2.2 Installation

The TA703-xx-xxxx Change Over Module is a 1U rack unit designed to be mounted in a standard 19” base station rack. It should be positioned between the two base stations it monitors, with Base A above and Base B below.

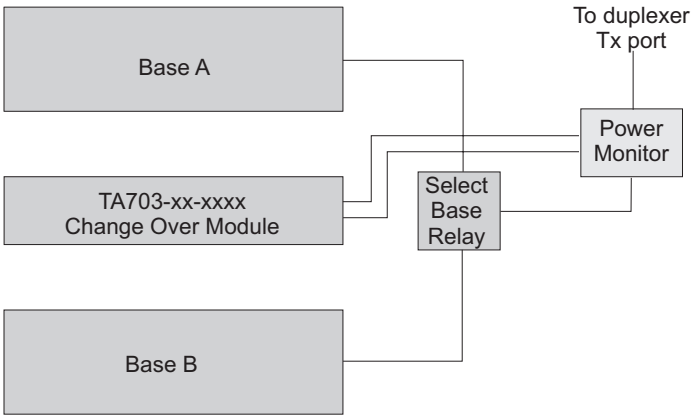
2.2.1 Power Monitor Options

The Change Over Module variants have several power monitor options.

- The Change Over Module can function with a single, or dual power monitors, depending upon its application.
- Instead of a power monitor, the module may be configured to use the folloiwnign inputs:
  - The T800 50/100W Power Amplifier internal forward and reverse power detectors.
  - The TB8100/9100 digital outputs under control of Task Manager.

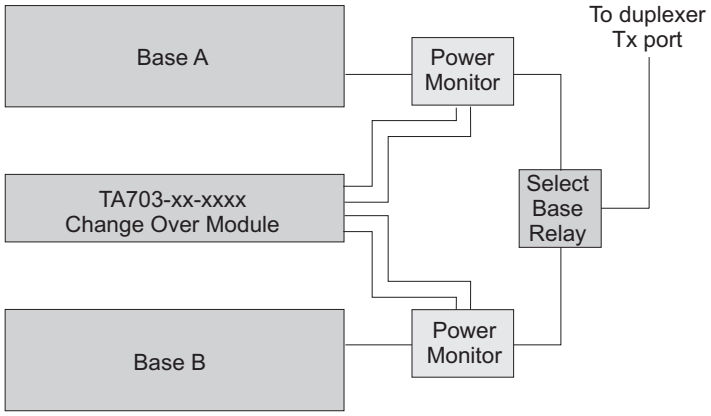
Single Power Monitor

A single power monitor installed between the relay and the duplexer monitors power to the active base as designated by the relay.



Dual Power Monitors

Where two power monitors are installed, they are fitted between each base and the relay.



2.3 Rack Installation

The TA703-01-0000 Change Over Module slides between the two base station racks from the front, and is secured in place by screws (not supplied) appropriate to the rack, through the slots at either end of the module front panel. Fibre washers are recommended to prevent damage to the front panel finish.

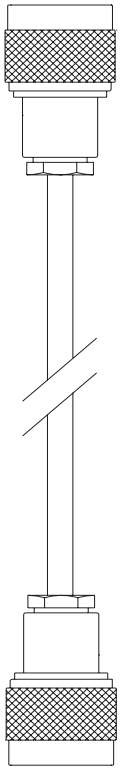
All connections between the Change Over Module and the two bases are made from the rear of the rack.

Like the two base stations, the module requires earthing, by connecting the earth tag on the module rear panel to the base station rack.

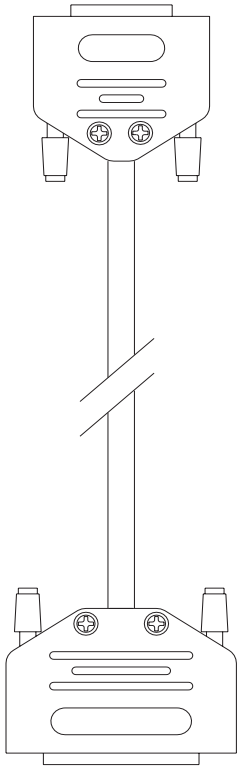
2.4 Connection to Typical Base

2.4.1 Installation Kits

Each Kit contains eight cables. Note that the IPN of the base station to Change Over Module cable is different for each kit variant.



6 x N-type male to N-type male cable
IPN 219-02701-00

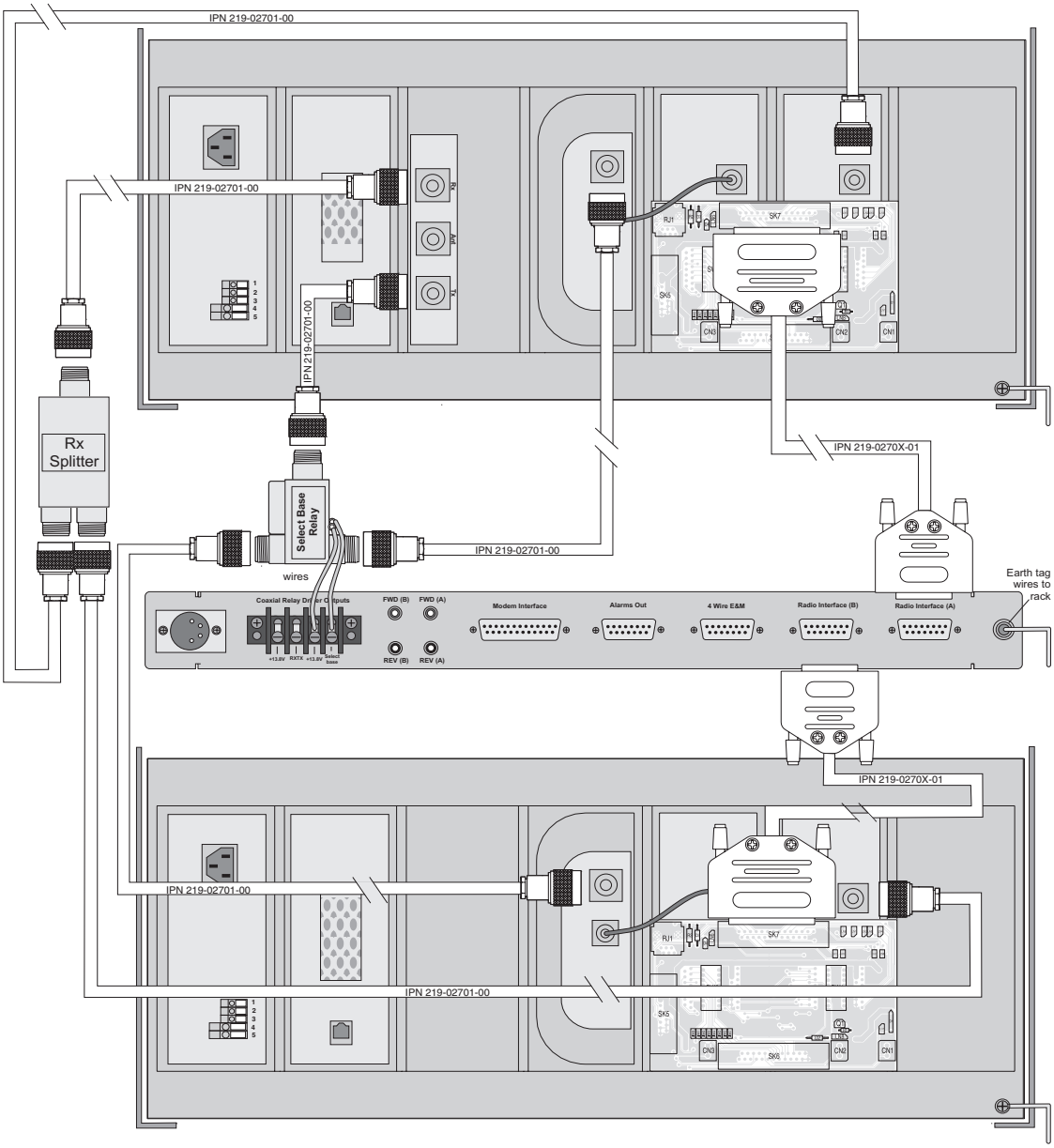


2 x 15 way to 25 way D Range cable
IPN 219-02702-01 (kit TA703-11-0010)
IPN 219-02703-01 (kit TA703-11-0011)
IPN 219-02700-01 (kit TA703-11-0012)
IPN 219-03115-00 (kit TA703-11-7010)
IPN 219-03460-00 (kit TA703-11-8010)

2.4.2 Installation

This diagram shows the rear of a typical T800-50-0000 Backplane Base Station rack and the correct position of the wires and installation kit cables. Please note:

- the module has an earth tag which requires a wire connection to the rack frame
- the diagram shows connection details only (cable lengths are not to scale)
- the duplexer is shown fitted into Base A, but may be mounted on a separate tray above the Change Over Module
- the splitter and relay can be mounted separately in one of the base station racks or on a separate tray above the Change Over Module
- the duplexer-to-antenna cable is not supplied
- the wires connecting the relay to the relay driver outputs on the rear of the Change Over Module are not supplied (details are on the following page)
- power monitor connections are documented later in this section.



The table below describes placement of the connectors.

Cable IPN	Cable Description	TA703	Base Station
219-02701-00	N-Type to N-Type Cable	RX(A)	Receiver (A) rear socket
		RX(B)	Receiver (B) rear socket
		TX (ANT)	Duplexer Tx socket
		Rx (ANT)	Duplexer Rx socket
		Tx (A)	PA (A) rear socket
		Tx (B)	PA (B) rear socket
219-0270X-01*	15-way to 25-way D Range Cable	Base (A)	Backplane PCB SK7
		Base (B)	Backplane PCB SK7

* This IPN refers to 219-02700-01, 219-02702-01 or 219-02703-01.

Installation with TB7100 and TB8100

The set up for TB7100 and TB8100 is identical, except for the position of the 25-way connector. There is only one 25-way connector on each base station

Relay Installation - Select Base Station Function

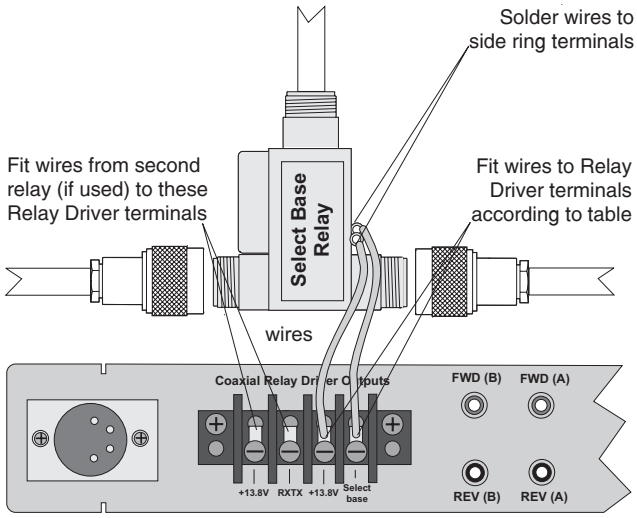
The Relay requires hard-wiring to the rear panel terminal block (labelled Relay Driver Outputs). The table below shows which terminals to use.

Notice Applications without a duplexer require a second coaxial relay to perform the RxTx change over in simplex base station systems. This second relay connects to the remaining two relay terminals (labelled +13.8V and RxTx) in the same way as the first.

Relay Driver Outputs Terminal	Relay
+13.8V	Relay side terminal
Select Base	Relay side terminal

The following instructions and diagram describe the correct installation procedure.

1. Cut two 7/0.2 PVC wires to required length.
2. Strip both ends of each 10mm and tin.
3. Solder one wire to each of the relay side ring terminals.
4. Remove screw from Relay Driver Outputs terminal labelled +13.8V.
5. Fit one wire into terminal and replace screw.
6. Remove screw from Relay Driver Outputs terminal labelled Select Base.



7. Fit remaining wire into terminal and replace screw.

Notice Reverse Voltage Transient Protection diode is built into the TA703-01-0000 circuitry.

2.5 Power Monitor Installation

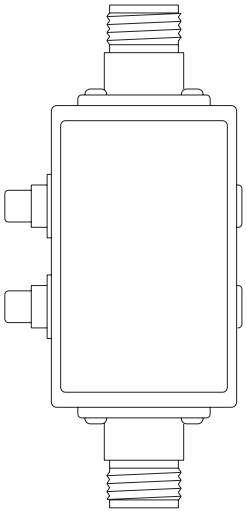
A single, or pair of Power Monitors monitor transmitter forward and reverse power. The unit is placed in series with the Transmitter Antenna Cable, preferably after the duplexer. The kits provide for a choice of installation options:

- installed directly in series with the antenna port of the duplexer via the barrel adapter provided
- connected to the duplexer via the coaxial cable provided.

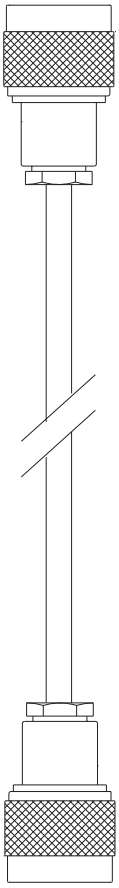
A second Power Monitor kit is required if Base A and Base B are monitored separately.

2.5.1 Power Monitor Kits - all variants

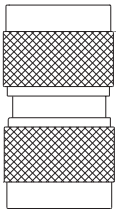
Each kit contains the following items:



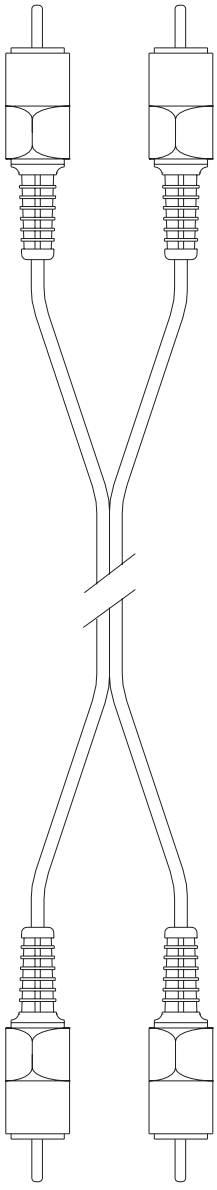
1x Dual Power Monitor
IPN 009-00000-01 (30-88MHz)
IPN 009-00000-02 (118-512MHz)
IPN 009-00000-03 (806-960MHz)



1 x N-type male/N-type male cable
IPN 219-02701-00



1 x N-type male /N-type male adapter
IPN 240-06020-04



2x Twin Phono/Phono Cable
IPN 219-00025-82

More details of the cables follow in section 7, Wiring.

2.5.2 Cable Installation

The power monitor connects via the twin phono/phono cable to the rear of the Change Over Module via either the A or B pair of RCA (phono) cable sockets at the rear of the module.

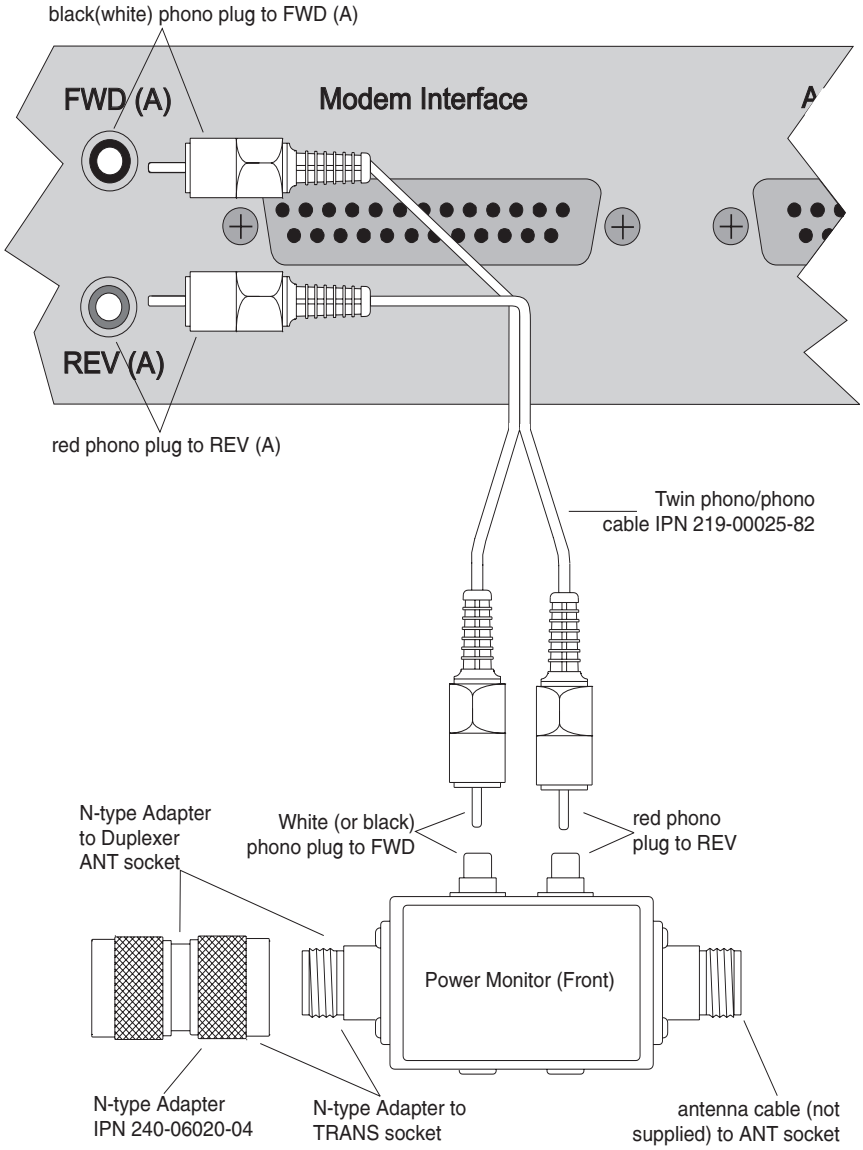
Notice The black RCA connector is for forward power measurement. The red RCA connector is used for reverse power measurement

The Power Monitor also connects to the duplexer, and each kit provides two options to do this, either via an N-type to N-type adaptor, or using an N-type to N-type coaxial cable.

Two internal links on the Change Over Module PCB may require setting after installation. See Link Setting instructions that follow.

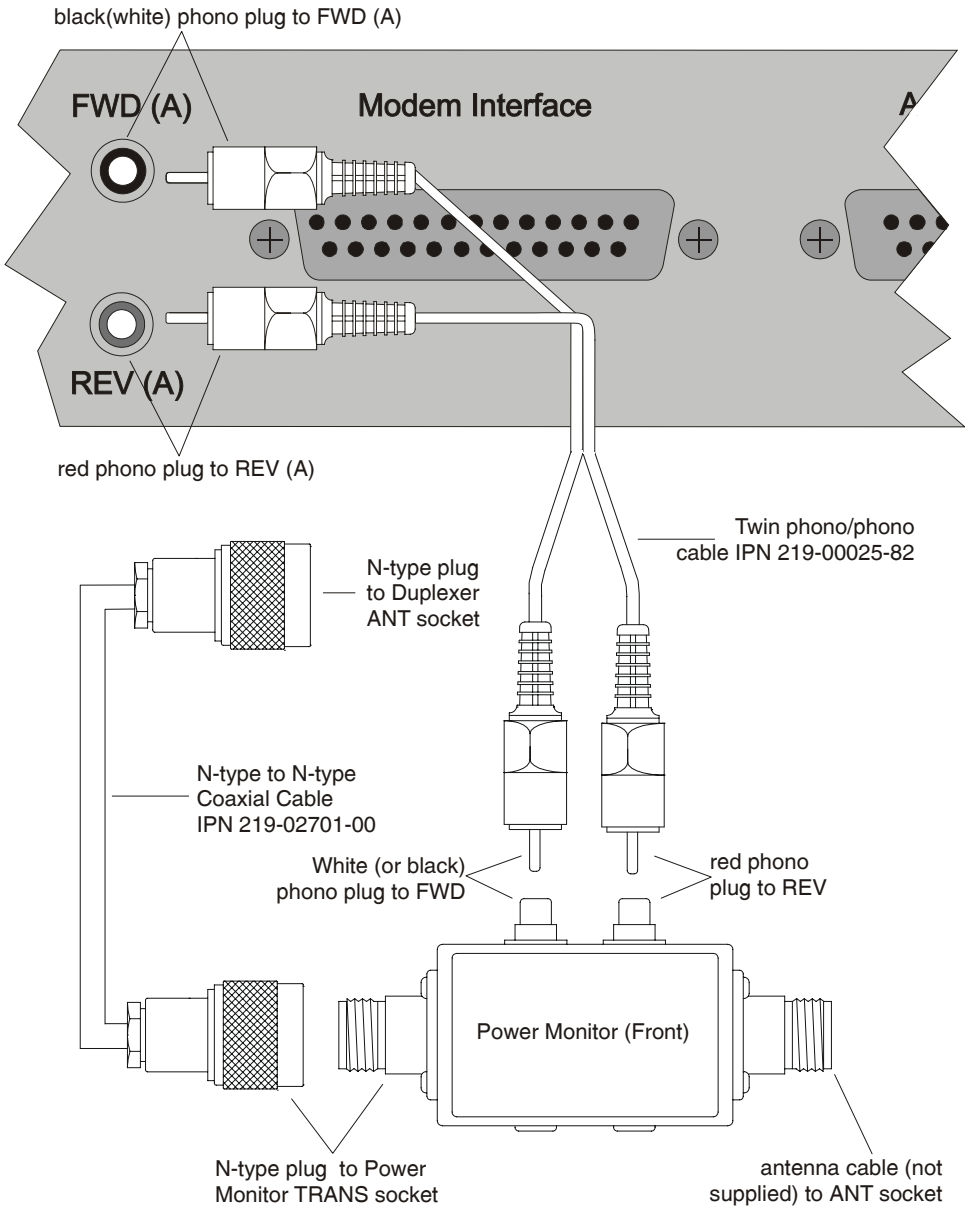
N-type Adapter Installation Option

The diagram below shows typical installation of a single Power Monitor using the N-type to N-type adapter.



Cable Installation Option

The diagram below shows typical installation of a single Power Monitor using the N-type to N-type adapter.



Link Setting - Single Power Monitor

Where a single power monitor is used, the inputs of Base A and Base B must be linked together on the PCB. The correct position for the adjustable dip switches are:

- SW201-5 ON
- SW201-8 ON

2.5.3 Installation - Two Power Monitors

A second Power Monitor is required if Base A and Base B are monitored separately. Where two power monitors are required, each Power Monitor connects via its twin RCA cable to the A and B pairs of RCA (phono) sockets on the rear of the Change Over Module.

Notice The black RCA connectors are for forward power measurement. The red RCA connectors are used for reverse power measurement.

From this point, installation will vary according to the individual base setup. For example, there may be either a single, or two duplexer, and a single, or two antennae. Follow the instructions for a single power monitor, noting that extra adaptation may be required.

Notice Link setting for two power monitors is different from the single power monitor setting. See below.

Link Setting - Two Power Monitors

Where two power monitors are used, the inputs of Base A and Base B must not be linked together on the PCB. The correct position for the adjustable dip switches are:

- SW201-5 OFF
- SW201-8 OFF

3 Calibration and Testing

This part contains information for setting, calibrating and testing the TA703-xx-xxxx Change Over Module after initial installation or servicing. It contains:

- Calibration
- External Adjustments
- Test Procedure

3.1 Calibration

Notice All internal adjustments have been preset during manufacturing. If re-adjustment is required proceed as follows:

3.1.1 RSSI

Receiver RSSI output levels need to be set as per the instructions in the relevant base station service manual. The procedure that follows uses the UHF receiver as an example

- Apply a carrier to produce 2V DC at the RSSI input of the TA703-01-0000. For a correctly setup UHF TB8100 and T800 receiver, that should occur at a RF input level of -110dBm, the RSSI level can be measured at TP310 for Base A and at TP311 for Base B. Otherwise disconnect the receiver and apply 2V to PL1-14 for Base A and 2V to PL2-14 for Base B. The levels in the TB7100 are lower than in the TB8100 and may require resistor changes on the TAQ703 PCB. If the voltages are too low, gain adjustments have to be made in the Change Over Module. Refer to IC201 in page two of the circuit diagram.
- Put a DC voltmeter probe on TP300 or pin 1 of IC300 and adjust RV300 to read 2.6V
- Put a probe on TP305 or pin 7 of IC300 and adjust RV301 for a reading of 2.6V.

3.1.2 Verifying RSSI operation

1. Select Base A
2. Ensure that both Bases provide the same 2V RSSI voltage
3. Increase the RSSI voltage of Base B slowly, either by increasing the RF input or by increasing the simulated DC input. Stop when LED D300 on the PCB lights up and the TA703-xx-xxxx changes over.
4. This should take place around the 6dB increase in RF power or after a 0.4V increase in DC input.
5. Return the level to normal and reset system
6. Repeat steps 1 to 4 with Base A and B swapped. In this case LED D301 on the PCB lights up

7. With Base A active, increase the RF level to both receivers until D302 turns off. Further increase the RF level to Base B by another 10dB. No change over should take place.

8. With Base B active, increase the RF level to both receivers until D302 turns off. Further increase the RF level to Base A by another 10dB. No change over should take place.

RSSI level	D300	D301	D302	comment
below -75dB				
A=B	off	off	on	
A>B by 6dB	off	on	on	
B>A by 6dB	on	off	on	
above -75dB	*	*	off	* = undefined

3.1.3 Mute

The mute operation does not require any calibration in the TA703. It is important to set the mute opening levels as close together as possible. Due to the nature of the noise mute the receivers will probably never open at the same level. Setting the mute of the stand-by receiver slightly less sensitive than the active one by about 0.5dB will avoid unnecessary fault alarms on the active base under conditions with frequent low signal conditions. See "Rx-Gate Monitor (MUTE) - Modes A and C only" on page 51 and "Rx-Gate Monitor (MUTE) - Modes D only" on page 51 for further details of the mute.

3.1.4 Mute Operation

1. Ensure the Change Over Module is operating in Mode A or Mode C (SW200 1-16 OFF, SW200 1-15 ON), if the base station is used for maritime applications or very low density rural situations use Mode D.

2. Activate the Rx Gate by pulling either PL1 pin5 or PL2 pin 5 to ground for Base A or Base B respectively or, when the Change Over Module is connected to a base station you can apply a carrier to the receiver.

3. To check the mute alarm behaviour:

- Select Base A.
- Apply carrier (-100dBm or stronger) to Receiver A for at least 3 seconds.
- Remove the carrier.
- Wait a few seconds then apply the carrier again for at least three seconds. Repeat this process two more times (four times for Mode D). The mute alarm should activate.
- Now apply a carrier to both receivers simultaneously. The alarm should reset.

4. To test the mute of Base B repeat step 3 selecting Base B and applying carrier to Receiver B.

3.1.5 Reverse Power

1. Activate the relevant transmitter by pulling either PL1 pin7 or PL2 pin 7 to ground for Base A or Base B respectively and check that it produces its nominal power into a 50 Ohm load. Alternately the relevant transmitter may be activated by placing the Change Over Module in repeater mode by closing SW100-6/11 and then apply a carrier to the relevant receiver that will activate the Rx Gate, this will pull down the Tx Key line and activate the transmitter.

Notice The carrier switch on the front panel of the base station Exciter/Transmitter does not activate the Tx Key lines in the Change Over Module and cannot be used for power calibration purposes.

2. Reduce the power to 25% of its nominal value. The forward power failure indictor will probably trigger and cause change over when power is reduced to such a low level.
3. Adjust front panel preset on the Change Over Module for the forward power failure trigger to avoid triggering.
4. Remove the termination/50 Ohm load.
5. Adjust front panel preset for the reverse power till the associated LED turns on.

3.1.6 Forward Power

1. Refit the 50 ohm load/termination to the PA.
2. Reduce the power to 50% of its nominal value.
3. Adjust front panel preset on the Change Over Module for the forward power till the associated LED turns on.
4. Reset PA power to nominal power.

3.1.7 Power Supply and Battery

1. Reduce power supply level to 10.8V
2. Adjust the front panel preset until the associated LED turns on

3.1.8 Repeater Audio: Receiver to Transmitter

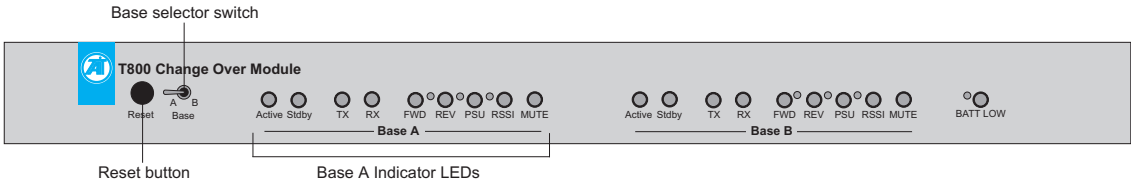
For repeater setup, adjust receiver line output for -10dBm.

3.2 External Adjustments

Once installed, The TA703-01-0000 Change Over Module requires a series of adjustments. These adjustments must be carried out on a live system by introducing defined good conditions and defined error conditions.

3.2.1 Front Panel Adjustments - Base A

The adjustment trim pots are located just above the red LEDs on the left half of the Change Over Module front panel as shown.



- On front panel, select Base A.

Forward and Reverse Power Alarm Calibration

The calibration should take place in the fully setup system. When calibration starts it is assumed that the forward and reverse metering voltages are of reasonable level. That is, they should be similar to the nominal output levels of the PA operating at its nominal level even if the voltages are derived from external monitors. The Change Over Module has been designed for amplifiers with output levels in the range of 25 to 100 Watts.

If the voltages are too low, gain adjustments have to be made in the TA703. Refer to IC201 in the circuit diagram in section 6, PCB information and section 6.7, Circuit Diagram (227-70301-07) - page 2 of 2.

Reverse Power with 3dB 50 Ohm Attenuation

- Terminate the transmitter aerial output with a 3dB 50 Ohm attenuator. Do not terminate with 50 Ohm load. The termination represents a SWR of 3:1. Approximately 25% of the transmit power is reflected back into the transmitter.
- Activate the transmitter by pressing the Tx Key button at the front of the exciter/transmitter.
- Adjust the reverse power change over level so that the Change Over Module just changes over.
- Change the termination of the transmitter back to 50 Ohm and press reset on the Change Over Module.

Reverse Power without 3dB 50 Ohm Attenuation

- If no 3dB attenuator is available, adjust as in section 3.1.6, Forward Power.

Forward Power

- Activate the transmitter by pressing the Tx Key button at the front of the exciter/transmitter.
- Ensure that the power is set to the nominally required output power into a 50 Ohm load at the aerial output.
- Turn the power level down to 60% of nominal output power.

- Adjust the forward power change over level so that the Change Over Module just changes over.
- Re-adjust transmitter power to nominal power.

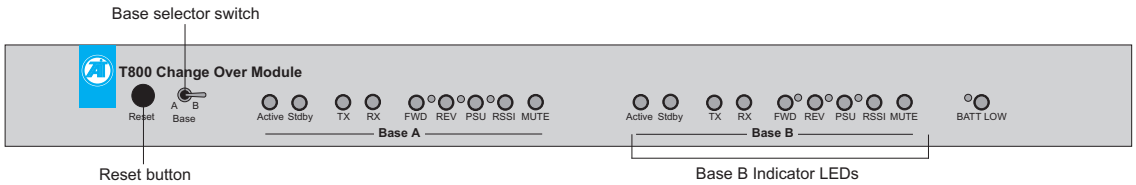
PSU

The PSU has been preset during manufacturing. If adjustment is required proceed as follows:

- Reduce the Supply voltage of Base A slowly to +10.5V.
- If the Change Over Module has not changed over adjust the PSU preset resistor. Note this preset operates counter clockwise. To increase the PSU fault trigger level turn the preset counter clockwise.
- Return supply level to nominal +13.8V

3.2.2 Front Panel Adjustments - Base B

The adjustment trim pots are located just above the red LEDs on the right half of the front panel of the Change Over Module.



- To test Base B, switch the base switch to position B and press the reset button.
- Repeat instructions for Base A (previous page).

3.3 Test Procedure

The procedure below describes the tests carried out prior to shipping the product. Note that they specify the use of a Change Over Module Test Jig.

Initial test setup
Set dip switches as in section 2, Setup and Installation, section 2.1.6, Internal Link Setting Set RSSI pots on test jig to mid level Set Fwd Pwr pots to max Set Rev Pwr pots to min Set all switches on test jig to off (white dot) Connect everything together as required Use independent power supplies for Base A and Base B. (Red banana socket on test jig is for second supply)

Test	Conditions	Result
Audio path and C/O	■ Radio in Base mode	
Base A and Base B	■ Turn supply on ■ Select TA703 Base A Active ■ On TA703 Active A LED ON ■ On TA703 Standby B LED ON ■ Jig TX-A and RX-A LEDs ON ■ Jig TX and RX Remote LEDs ON ■ Measure impedance to gnd at TA703 Base Sel terminal High	
	■ Activate Jig Rx-B Gate sw ■ Change over: ■ Jig Active B LED on ■ Jig TX-B and RX-B LEDs ON ■ Jig TX and RX Remote LEDs ON ■ Measure impedance to gnd at TA703 Base Sel terminal Low ■ Switch TA703 to Base B and Reset	
	■ TA703 Active B LED ON ■ TA703 Standby A LED ON	
TX test Base A	■ Select Base A active ■ Set Jig Fwd Pwr pot to max ■ Activate Jig Tx RMT Key ■ TA703 Green Tx LED Base A ON ■ Turn Jig fwd pwr pot down to minimum ■ Change over: ■ TA703 Green Tx LED Base B ON ■ TA703 Fwd-A Alarm LED ON ■ Turn Jig Tx RMT Key off ■ Reset system and set TA703 to Base B	

Tx test Base B	Base B active: ■ Set Jig Fwd Pwr pot to max ■ Activate Jig Tx RMT key ■ TA703 Green Tx LED Base B ON ■ Turn Jig fwd pwr pot down to minimum ■ Change over: ■ TA703 Green Tx LED Base A ON ■ TA703 Fwd-B Alarm LED ON ■ Turn Jig Tx RMT B off ■ Reset system and select TA703 Base A	
Remote Tx test	Base A active: ■ Activate Jig Remote Tx switch: SK1 ■ TA703 Tx Key Base A ON ■ Activate Jig Remote Tx switch: PL3 ■ TA703 Tx Key Base A ON	
Reverse Pwr Base A	■ Set Jig Rev Pwr pot A to max ■ Activate Jig Tx Key Base A ■ Change Over: ■ Turn Jig Tx Key off ■ Reset system – Base A active ■ Turn Jig Rev A switch on ■ Activate Jig Tx Key Base A ■ No Change Over: ■ Set Jig Rev Pwr pot A to min ■ Reset system and set to Base B	
Reverse Pwr Base B	■ Set Jig Rev Pwr pot B to max ■ Activate Jig Tx Key Base B ■ Change Over: ■ Jig Turn Tx Key off ■ Reset TA703 system ■ Turn Jig Rev B pwr sw on ■ Activate Jig Tx Key Base B ■ No Change over: ■ Set Jig Rev Pwr pot B to min	
Receiver test	■ On TA703, select Base A: ■ Activate Jig Rx-B Gate sw ■ Change Over: ■ Jig Mute A Alarm ON ■ Reset TA703 system and select B	
	■ Activate Jig Rx-A Gate sw ■ Change Over: ■ TA703 Mute B Alarm ON ■ Reset TA703 system and select A	

Front panel setup		
Fwd Pwr Base A setup	■ Setup 1V DC at I/O PAD213	
Fwd Pwr Base B setup	■ Setup 1V DC at I/O PAD210	
Rev Pwr Base A setup	■ Setup 1V DC at I/O PAD205	
Rev Pwr Base B setup	■ Setup 1V DC at I/O PAD202	
PSU Base A setup	■ Set Base A supply to 10.5V ■ Adjust until PSU-A alarm first appears ■ Reset voltage to 13.8V after test	
PSU Base B setup	■ Set Base B supply to 10.5V ■ Adjust until PSU-B alarm first appears ■ Reset voltage to 13.8V after test	
Battery test	■ Adjust Battery pot on test jig to min ■ All Alarm relays start clicking ■ Restore Jig battery voltage ■ TA703 Relays stop clicking	
Internal controls: RSSI setup		
RSSI A setup T855 (-110dBm) T835/T825 -110dBm	■ Set 2.0V DC at RSSI A - R323/C320 ■ Set 3.8V DC at RSSI A - R323/C320 ■ Adjust RV300 to read 2.60V +/-.1V at IC300-1 TP300	
RSSI B setup T855 (-110dBm) T835/T825 -110dBm	■ Set 2.0V DC at RSSI B - R356/C331 ■ Set 3.8V DC at RSSI B - R356/C331 ■ Adjust RV301 to read 2.6V +/-.1V at IC300-7/TP305	
RSSI C/O	■ TA703, select Base A ■ Set Jig RSSI A to minimum ■ Set Jig RSSI B to max ■ Activate Jig RX-A plus RX-B Gate ■ Changeover: ■ TA703 RSSI A Alarm LED ON	
	■ Select Base B Reset ■ Set Jig RSSI B to minimum ■ Set Jig RSSI A to max ■ Activate Jig RX-A plus RX-B Gate ■ Changeover: ■ TA703 RSSI B Alarm LED ON	

4 Operation

This part contains operating information for the TA703-xx-xxxx Change Over Module. It includes the following information:

- Front Panel Functions
- Standard Operation
- Change Over
- Fault Monitoring
- Base Station Selection

4.1 Front Panel Functions

The Change Over Module front panel has a series of LED indicators, switches, and preset resistors.

Notice The upper base station is called Base A, the lower base station is Base B.

4.1.1 Switches

Reset
A single poll, momentary push button switch which clears all alarms, returns the unit to its normal operating state, and resumes alarm sensing.
On pressing the reset button, all LEDs (except the green TX and RX LEDs and the red Battery Alarm LED) illuminate for one second. After this, all LEDs resume normal operation.

Base Select
Base Select switch selects and indicates the active base station. Selection depends on the selected mode and operation. In Mode A, the front panel Base Select switch, (or remote select) can be used to select the active base station.

Notice Mode B functions override this switch.

Notice In Mode B this applies to the Receiver only.

4.1.2 LED Indicators

Two identical sets of LED indicators provide the following signals for Base A and Base B.

LED	Function
Active	Indicates the active transmitter
Stdby	Indicates the standby transmitter
TX	Indicates this transmitter has been keyed
RX	Indicates the gate condition of this receiver
FWD	Indicates a Forward Power error has occurred
REV	Indicates a Reverse Power error has occurred
Mute	Indicates a Rx mute error has occurred
	Indicates an error has occurred
PSU	Indicates a PSU error has occurred

A single red LED labelled Batt Low indicates battery power status for the system.

4.1.3 Preset Resistors

FWD, REV, PSU and Batt Low indicators each has front panel access to a preset resistor. While default levels are factory set, these resistors can be adjusted to suit individual system requirements.

4.2 Standard Operation

Notice Base A is the normally active and Base B is the standby, unless stated otherwise.

4.2.1 Power Up

On power up, all LEDs (except green Tx and Rx LEDs and red Batt Low LED) light for one second.

After one second, only one Active and one Stdby (Standby) LED remains on, depending upon the Base switch setting. For example, when the Base switch is set to A, Base A will show its Active LED and Base B will show Stdby.

4.2.2 Transmitting

When a Tx-key is received via the 4 wire E&M connector, the green Tx LED for the active base will turn on.

4.2.3 Receiving

When either receiver receives a carrier, the Rx Gate signal turns on the green Rx LEDs on the Active and Standby bases. This is because the receivers operate in parallel.

Notice In repeater mode, both Rx LEDs are on, but only Tx LED of the active base.

4.2.4 Change Over

At change over, one red LED (FWD, REV, PSU, , MUTE) of Base A lights to indicate the failure, and the unit changes over to Base B. Base B Active LED lights and its Stdby LED turns off. Base A Active and Standby LEDs are off.

4.2.5 Reset

Base B will remain active until Reset input is received, locally or remotely. Once reset, the module's internal microprocessor returns operation to Base A and recommences its scan protocol for error conditions.

Notice This does not reset Batt Low indicator

4.2.6 Base Selection - Mode A, C and D Only

The Base switch on the front of the module allows a technician to select which base acts as the active one, by pointing the switch toward A or B, then pressing the reset button. The Active and Stdby LEDs swap when the Base switch is toggled.

4.3 Change Over

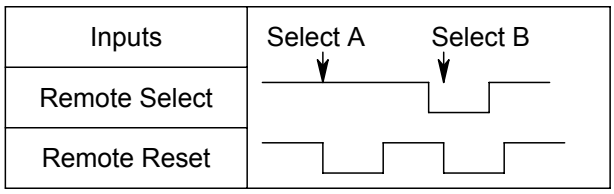
4.3.1 Manual Change Over - Mode A,C and D

On power up, the active base is determined by the position of the Base Select switch on the front panel of the module. Remote base selection is ignored until the first negative transient on the remote reset input.

Change over is either:

- via the front panel with the base select switch, followed by a press of the reset button
- via the remote select and the remote reset input. Note that in Mode C and Mode D, remote select automatically resets all alarms.

Both inputs have pull up resistors. The Remote Reset is active low.



4.3.2 Mode A Test Function

When the carrier button on the standby receiver or transmitter is pressed, the Change Over Module changes over for the duration of the press, provided the active transmitter is not busy. Alarm indicators and outputs are not latched.

When the standby base station Tx-Key is pressed, the module changes over and remains changed over until it is reset by the reset button on the front panel.

Notice If the test function detects a fault on the standby base station, the fault is indicated, but the base is no longer available as a standby until the fault is repaired and the module reset.

4.3.3 Manual Change Over - Mode B

Notice In this mode the front panel Base Select switch has no effect.

On power up the Change Over Module always defaults to Base A receiver. On presence of a signal, the module selects the receiver that unmutes first. No dedicated change-over input or key is available.

When the Change Over Module raises a Tx alarm, the operator must change over to the standby transmitter manually, via the Remote Select input.

Remote Select selects the transmitter

- RTS high: Active transmitter is in Base A
- RTS low: Active transmitter is in Base B

4.3.4 Automatic Change Over - Mode A, C and D

If the active base develops an error resulting in an alarm, the Change Over Module changes over to the standby base. This change over is final. If the new active base develops an alarm condition, the module will indicate the fault but will not switch back to the original base. A local or remote reset is required. If the standby base develops an error, it indicates a fault, but no change over occurs.

In Mode A, C and D, the Change Over Module automatically changes over under any one of the following conditions:

- PSU monitor indicates a failure

- FWD PWR monitor indicates a failure
- RVS PWR monitor indicates a failure
- error detection indicates a failure
- RX-Gate monitor indicates a failure
- provided there is no PSU error on the standby base.

Conditions for each of these failure mechanisms is described in section 4.4, Fault Monitoring.

4.3.5 Automatic Change Over - Mode B

Notice In Mode B there is no automatic change over of the transmitters.

If the active receiver develops an error resulting in an alarm, the Change Over Module changes over to the standby receiver. This change over is final. If the newly active receiver develops an alarm condition, the module will indicate the fault, but will not switch back to the original active base until the system receives a local or remote reset. If the standby base developed an error, it indicates a fault, but no change over occurs.

In Mode B, the Change Over Module automatically changes the active receiver under either one of these conditions:

- error (A) detection indicates a failure
- RX-Gate (A) monitor indicates a failure

Conditions for each of these failure mechanisms is described in section 4.4, Fault Monitoring.

4.4 Fault Monitoring

The TA703-xx-xxxx Change Over Module monitors fault conditions in the base stations by polling the equipment at predetermined intervals. A predetermined number of consecutive faulty samples is required to activate an alarm and change over. The operating mode determines both polling intervals and consecutive samples as follows:

Mode	Polling	Alarms Activate
Mode A, Mode C and Mode D	Once every 20mS	After eight consecutive fault samples (except Rx Gate mute, see Rx-Gate Monitor (MUTE) - Modes A and C only and Rx-Gate Monitor (MUTE) - Modes D only)
Mode B	Once every 10mS	After four consecutive fault samples

4.4.1 PSU Monitor (PSU)

Errors on either active or standby supply lines are indicated by the front panel indicators and signalled on the rear panel alarm connector. The alarm remains active until the front panel reset switch or remote reset signal is manually activated.

Both sides are monitored simultaneously. [Previous versions of the Change Over Module only monitored PSU levels for the Base station that was currently active].

The PSU alarm on the Change Over Module activates after the mode-specified consecutive samples indicate PSU voltage has fallen below the preset threshold.

The preset level is set on the front panel. Factory setting is 10.8V.

4.4.2 Forward Power Monitor (FWD)

Forward power is monitored for the active transmitter only, and only while the transmitter is keyed. FWD-PWR signals are polled at the mode-specific alarm polling interval. The FWD alarm on the Change Over Module activates after mode-specific consecutive samples indicate that forward power voltage has fallen below the preset threshold, or that a forward power alarm has been received from the active base. The alarm remains active until the front panel reset switch or remote alarm clear signal is manually activated.

The preset level is set on the front panel.

4.4.3 Reverse Power Monitor (REV)

Reverse power is monitored for active transmitter only, and only while the transmitter is keyed. The REV-PWR signals are polled at the mode-specific alarm polling interval. The REV alarm on the Change Over Module activates after mode-specific consecutive samples indicate that reverse power voltage has exceeded the preset threshold, or that a reverse power alarm has been received from the active base. The alarm remains active until the front panel reset switch or remote reset signal is manually activated.

The preset level is set on the front panel.

4.4.4 Error Detection ()

The output alarm on the Change Over Module activates after mode-specific consecutive samples (see table above) indicate an absolute difference of greater than 6dB. The alarm on the Change Over Module is activated for the base with the low .

 signals are polled at mode-specific intervals only when the Rx gates are open and levels are below a preset level of -75 to -70dB.

The circuit goes into saturation above levels of around -70dB. When both signal are in saturation, the Change Over Module will not activate an alarm even when the difference between the signals is more than 6dB.

4.4.5 Rx-Gate Monitor (MUTE) - Modes A and C only

The Rx-Gate mute signals are polled at mode-specific alarm polling intervals. The mute alarm activates when discrepancies between the mutes of the two receivers are detected with the following criteria fulfilled:

- if the Rx-Gate of one base opens before the other base by more than 160ms (8 x 20ms), and
- if this open Rx-Gate remains open for at least one second, and
- the above two conditions occur in three consecutive activations of Rx-Gate.

If any of these conditions fail to occur, then the mute error count will be reset. This scheme was introduced with version 0703a532 Change Over Module software to reduce false alarms caused by low signal conditions or interference.

The mute alarm on the Change Over Module is indicated for the base with the Rx-Gate that has not opened or has opened too late.

An active base Rx-Gate mute fault will cause change over, but an Rx-Gate fault in a standby base will not. See “Mute Operation” on page 38 to check the Mute.

Notice The gate opening level of the active receiver is typically set 0.5 to 1dB more sensitive than the gate opening level of the standby receiver.

4.4.6 Rx-Gate Monitor (MUTE) - Modes D only

The Rx-Gate mute signals are polled at mode-specific alarm polling intervals. The mute alarm activates when discrepancies between the mutes of the two receivers are detected with the following criteria fulfilled:

- if the Rx-Gate of one base opens before the other base by more than 160ms (8 x 20ms), and
- if this open Rx-Gate remains open for at least three seconds, and
- the above two conditions occur in five consecutive activations of Rx-Gate, irrespective of time.

If any of these conditions fail to occur, then the mute error count will be reset.

Following the change over, if both mutes become active again within the three second window, the mute alarm is reset and the change over is cancelled.

If the change over was effected by a failure other than a mute alarm, the change over state will remain and the mute fault LED on the front panel will not be reset.

This scheme was introduced with version 0703a535 Change Over Module software to reduce false alarms caused by low signal conditions in rural or marine environments.

The mute alarm on the Change Over Module is indicated for the base with the Rx-Gate that has not opened or has opened too late.

An active base Rx-Gate mute fault will cause change over, but an Rx-Gate fault in a standby base will not. See “Mute Operation” on page 38 to check the Mute.

Notice The gate opening level of the active receiver is typically set 0.5 to 1dB more sensitive than the gate opening level of the standby receiver.

4.4.7 Combined Rx-Gate - Mode B only

This is a hardware function. Rx-Gate signals from both base stations are combined so that activity on either generates an interrupt to the microprocessor to determine if receiver change over is required.

4.4.8 Combined and Mute Alarm - Mode B only

An or RX-Gate alarm on either the active or standby receiver will cause the combined and Mute alarm (PL3 pin 13) to be activated.

An RX-Gate error on the active receiver will cause an alarm condition on both (active and RX-Gate (active) alarms.

An RX-Gate error occurring on the standby receiver will cause an alarm condition on both (standby) and RX-Gate (standby) alarms.

4.5 Base Station Selection

Notice Throughout this manual, the upper base is called Base A, the lower base is Base B. Base A is the normally active base and Base B the standby, unless stated otherwise.

Base station selection depends on the selected mode and operation. In Mode A the front panel Base Select switch (or remote select) selects the active base station. In Mode B this must be done remotely and the front panel Base Select is overridden.

4.5.1 Selection Following Error Condition - Mode A, C and D

When an error condition is detected on the active base, the transmitter and receiver pair will automatically switch the standby pair. When the system changes over, the source of the fault is indicated on the Change Over Module front panel indicators via the rear panel alarm connector.

Notice The faulty base station equipment will not be available as standby but alarm monitoring continues on both base stations.

4.5.2 Selection Following Error Condition - Mode B

When an or mute error condition has been detected, the system will automatically switch to the fault-free receiver. This condition will remain until the front panel reset switch or a remote reset signal is manually activated.

Notice or mute errors will not affect transmitter selection.

Notice There is no automatic switching resulting from a PSU, FWD or RVS fault condition.

5 Circuit Description

This part describes the Change Over Module circuit operation. It contains the following information:

5.1 Introduction

Inside the Change Over Module a single Control PCB, flush-mounted against the front panel, interfaces to the base stations and other equipment via D-range connectors on the back panel. Power monitor cables connect via RCA sockets on the back panel. A 4-way terminal block connects to two coaxial relays, one for base selection and one for the standard RX/TX change over function in base station applications.

The unit either identifies a fault condition in the active repeater, or compares a measure on the active repeater and a measure on the standby repeater.

Fault condition trigger levels can be set on preset resistors on the front panel of the unit. After change over, the unit displays the error on the LEDs. A reset button on the front panel allows the module to return to the situation before change over. A selector switch allows the technician to define which base is active and which is on standby.

A change over relay internal to the Change Over Module provides the means to switch the antenna as required. The receiver signals are derived from a low loss power splitter. An external directional coupler provides the DC signals for forward and reverse powers.

Internal dip switches provide setup to select repeater function and provide alarm outputs. See section3, Calibration and Testing for information.

The control board contains a 68HC705C8A microprocessor that controls the functions of the Change Over Module. Inputs and outputs to the microprocessor are as follows:

- Input comparators (PSU, FWD, RVS,)
- Direct logic inputs (Rx-Gate, TX -Key, Reset, Base Select, Remote Reset, Remote Select, Mode Select)
- Rx gate selection input - IRQ
- Switches (Rx, TX, , Tx Audio, Rx Audio, Tx Key, Rx Gate, and Coaxial Relay)
- Direct logic outputs (Alarm)
- Alarm outputs

The remaining circuitry consists of power regulators and an optional DC-DC converter.

5.2 Monitor Circuits

The monitor circuits are:

- PSU and Battery
- Forward Power
- Reverse Power
-
- RX-Gate
- Tx-Key

5.2.1 PSU and Battery Input Comparators

Relevant circuitry: IC109, IC110 & IC111

The MC34064 is an under voltage sensing device. It features a comparator with precise thresholds and built-in hysteresis to prevent erratic reset operation.

RV100, RV101 and RV102 are set to activate their alarms when the input to the circuit drops below 10.8V

When the input to IC109-2 drops below 4.59v the output will indicate an alarm (logic ‘0’). The output will not deactivate until the voltage rises above 4.61v.

When a battery is connected to PL3-8 and the switch SW100-3-14 is selected open, IC111 will monitor the battery voltage. When the T703 is connected to the common rack supply and the SW100-3-14 is selected closed to monitor the common supply.

5.2.2 Forward Power Input Comparators

Relevant ICs: IC202 for FWD-PWR-A and FWD-PWR-B

IC 202 is a comparator IC with open collector output stages.

Adjustments: RV206 for Base A, RV205 for Base B

Base A component designators have been taken to describe the circuit in more detail.

Forward power alarms can be taken from an external power meter, or direct from the base station power amplifier stage.

With power meter signals, the FWD-PWR signal is high when the transmitter and antenna are operating efficiently and reduces when a fault condition occurs. When the FWD-PWR falls below the threshold voltage set by RV206 the comparator output is forced to 0v, indicating a FWD-PWR error.

The trigger level to generate an alarm is typically set at nominal power level -3dB

The power alarm can also be selected by the power transmitters alarm outputs. These outputs are normally shorted to Gnd and go high impedance to respond to digital outputs from the base stations when activated. In this configuration for instance, the generated alarm output is connected via PL2-6 and pulls low the alarm input to the microprocessor.

Notice RV206 should be tuned to 0V to ensure the IC202-1 output impedance is high.

Notice When power meter alarms are used, SW201 6-11 and SW201 7-12 are closed.

The controller reads the alarm input only when the associated Tx-Key is active.

5.2.3 Reverse Power Input Comparators

Relevant ICs: IC201 & IC202 for REV-PWR-A and REV-PWR-B. IC 202 is a comparator with open collector output stages.

Adjustments: RV204 for Base A, RV203 for Base B

Notice Base A components have been used to illustrate the circuit operation in more detail.

Notice Reverse power alarms can be taken from an external power meter, or direct from the base station power amplifier stage.

Notice These signals are not available in the TB7100 and TB8100 base stations.

The REV-PWR signal is low when transmitter and antenna are operating efficiently, and increases when a fault occurs. When REV-PWR raises above the threshold voltage set by RV204, comparator output is forced to +5V, indicating a REV-PWR error.

The alarm trigger level is typically set for 50% of power reflected back by terminating the transmitter antenna port with a 3dB open ended attenuator.

An alternative way for power alarm to be selected by using the base station power transmitters' alarm outputs. These outputs are normally low and go high impedance when activated. In this configuration the digital alarm output should be connected to PL1 pins 6 and 8 and PL2 pins 6 and 8.

Notice When this type of alarm is selected, RV204 needs to be tuned to +5V to ensure that the output impedance of IC202-13 is high.

Notice When power meter alarms are used, ensure that REV-ALMA (PL1 pin 8) and REV-ALMB (PL2 pin 8) are not connected via the cable to transmitter alarm outputs.

The controller only reads the alarm input when the associated Tx-Key is active.

5.2.4 Input Comparators

Relevant ICs: IC300 & IC301

Adjustments: RV300 for Base A and RV301 for Base B

Receiver performance is measured in two ways:

- both Rx-Gates must be unmuted.
- the RF level of the stand-by receiver must be within + or - 6dB of the active receiver.

The RF level is translated into the voltage (Receiver Signal Strength Indicator). For an UHF receiver the output is set to 2.0V for a RF input level of -110dBm. For a VHF receiver, the output is 3.8V.

Mute monitoring is detailed later in this document.

Four comparators determine whether an error has occurred. These produce output signals PA3, PA7 and PB7.

- PA3 is active low when -A is lower than a predetermined offset voltage below -B. LED D300 illuminates.
- PA7 is active low when -A is higher than a predetermined offset voltage above -B. LED D301 illuminates.
- PB7 is active low when either -A or -B is below a predetermined threshold.
- decoders are outside their linear operating range when both A and B are above the threshold. In this case no comparison is made and the system assumes operation of both receivers. LED D302 illuminates when of either A or B is below the threshold level.

signals are fed from a resistor divider network to non-inverting differential amplifier IC300 with a variable DC input offset provided by RV300 (RV13). The input stage gain is set by combining the resistor divider (approximately 0.68) and the non-inverting amplifier (approximately 2), giving a total input gain of approximately 1.3.

-A is fed into a temperature-compensated current mirror network that provides a constant current through R331 and R332 and hence a constant voltage drop across R331 and R332. R331 and R332 have about 0.48V across them. (6dB difference in RF level creates about 0.48V.)

When the non-inverting input (-A + offset) is greater than -B, the PA3 comparator goes into positive saturation. When -A + offset is less than -B, the comparator goes into negative saturation and LED1 illuminates.

The same principles apply to the PA7 comparator. When -A + offset is greater than -B, the comparator goes into negative saturation and LED2 illuminates.

Two comparators, whose outputs are open collector, drive PB7. Therefore if either -A or -B are below the threshold voltage set by R177 and R178 then PB7 will be effectively connected to ground.

5.2.5 RX-Gate Selection

Relevant components: Q307, Q309, IC100 and IC203

Adjustments: none

Both RX-Gate signals are via inverting level translators connected directly to the processor inputs. A transient detector circuit ensures each gate change triggers the interrupt input of the processor for fast detection.

The RX-Gate Select circuit indicates which receiver should be selected based on which RX Gate opens first. If neither gate is open, the switch defaults to the last selected receiver.

The output of the RX Gate Select circuit can control the RX Audio and RX switches directly, or, in the event of a fault for example, allow the microprocessor to override RX selection.

The logic for this circuit is derived from the following.

Rx Mute A	Rx Mute B	
0	0	no change
0	1	1 (A opened first)
1	0	0 (B opened first)
1	1	Always defaults to Base A

5.2.6 TX-Key Inputs

Relevant circuitry: Q308, Q310, and Q106.

Tx-Key inputs are, like the Rx-Gate signals, connected to the microprocessor via level translating inverters. For simplicity, the Tx-Key signals are shorted to the Tx-Enable inputs of the Control PCB.

Remote Tx-Key input connects to the Tx-key of either Base A or Base B via the change over relay contacts. Remote Tx-Key signal directly drives the Rx/Tx change over relay in the base station applications.

The circuitry is designed for the Remote Tx-Key input to be connected to an open collector or relay contact to Gnd.

5.2.7 Direct Logic Inputs

RX-Gate, TX-Key, Reset, Base Select, Mode Select, Alarm clear, Remote select

Q307, Q308, Q309 and Q310 invert Rx-Gate and TX-Key signals before being fed to the microprocessor. Diodes protect the input stages against excessive input levels. Rx-Gate and TX-Key lines also drive the front panel LEDs. Both signals are active low.

Switches in series with Tx-Key are for test purposes only.

Reset, Base Select and Mode Select input are driven from switches with pull-up resistors.

Remote Reset and Remote Select feed straight into the microprocessor by a diode protection and resistor pull-up arrangement.

Mode selection is controlled by SW6 8-way DIL switch as follows:

SW201-1	SW201-2	Mode
OFF	ON	Mode A
ON	OFF	Mode B
OFF	OFF	Mode C
ON	ON	Mode D

Notice If the mode setting is changed, the Change Over Module must be reset before it can assume its new configuration.

Notice Microprocessor pin 15 (PB2) is connected to SW201-3 but has a second function described in the section below.

5.2.8 Direct Logic Outputs (Alarm)

Relevant circuitry: Q200

Adjustments: none

There are two direct logic outputs

- Alarm
- Alarm Tone Burst

In Mode A and B Alarm is active low and triggers when the difference between the level of Base A and Base B is more than 6dB. In Mode B only, this alarm also triggers with the Mute alarm or on either Base.

The Alarm Tone Burst is generated by the microprocessor at PB2 (pin 15) when an alarm condition occurs. This output produces a tone burst at 3 second intervals when an alarm condition exists. The outputs need to be connected to either RX or TX Audio lines if necessary.

SW201-3 is always OFF. During power up, the microprocessor reads PB2 as an input. As SW201-3 is OFF it will not cause a conflict after power up when PB2 is setup as an output.

5.2.9 Alarm Outputs

Relevant circuitry: IC400, IC401, Q400 to Q414 and Q418 to Q432

Adjustments: none

Alarm outputs can be configured as either open collector or active low with a source resistor to +13.8V.

The All Alarm for Base A and Base B has closed contacts in the non-alarm state and can be configured as:

- Dry relay contact to Gnd - All2A switched to Gnd
- Closure of two dry relay contacts - All1A shorts to All2A
- With source resistor to +13.8V, hard wired to All1A

Alarm outputs available:

- All Alarm, activates when any of the standard alarm conditions are met
- Fwd Pwr, activates when the level stays below to minimum set.
- Rev. Pwr, activates when the level exceeds a maximum set
- Mute, activates when the other mute gets active and this one not
- , activates when this is more than 6dB below the other one
- PSU, activates when the level stays below minimum set, typically 10.8V

These alarms are open collector to Gnd with an optional 1k resistor to +13.8V

5.2.10 Battery Alarm

When the battery drops below its preset alarm trigger level both ALL relays - RL400 and RL 401 - start a continuous on-off cycle of 600/600mS. If a power supply then drops below the trigger level the cycle changes to continuous alarm on the relay of the base with the faulty supply (contacts open when alarm raised).

Notice In the non-alarm state the ALL Alarm relays are normally powered up

Notice When no battery is connected, to prevent the Change Over Module from triggering the “low battery” alarm, SW100-3 should be closed connecting the V+ Batt input to the 13.8V supply.

5.2.11 Signal Polarity

Function	I/O	Comment
Rx Gate	Input	Active low
TX Key	Output	Active low
Rx Mute	Input	Active low
Fwd Pwr Alarm	Input	Active high
Rev Pwr Alarm	Input	Active high
Remote Select	Input	'1' – Base A; '0' – Base B
Remote Reset	Input	Active low
alarm	Output	Active low
CO relay	Output	Active low
SR_ALL	Output	select: contact closure, short to Gnd, pull up to +
SR_individual	Output	active low, select: pull up to +

5.3 Change Over

5.3.1 Change-Over Switches

Relevant circuitry: IC100, IC101, RL100, RL101, RL 102, RL 103, IC102 and Q106

Adjustments: none

The following signals are changed over:

- 2 wire Rx Audio
- 2 wire Tx Audio
- Rx Gate (= Rx Mute)
- Tx-Key (= Tx-Enable)
- Select Base Coaxial Relay

Latching relays are used for all switching. If power disappears from the Change Over Module, the latched relay contacts ensure that all 4 wire plus E&M signalling remains connected to the selected base.

5.3.2 Change Over Control

Latching relays are driven by the microprocessor with two lines for direction (DIR_PC0 and DIR_PC2) and one line to control (CNTRL_PC1). To change over, the control line must be pulsed

high for one polling cycle.

PC1 Direction	PC0 ⇑	PC2 ⇑
low	sel Base A: Rx Aud, Rx-Gate,	sel Base A Tx Aud, Tx-Key, Coax Relay
high	sel Base B: Rx Aud, Rx-Gate,	sel Base B Tx Aud, Tx-Key, Coax Relay

Rx/Tx Change-over Relay switches from the remote Tx-Key input

5.4 External Connections

5.4.1 PL1 and PL2 15-way D-ranges (Base A and Base B

Pin	Function	I/O	Comment
1	RX Audio +	Input	transparent
2	RX Audio -	Input	transparent
3	TX Audio +	Input	transparent
4	TX Audio -	Input	transparent
5	RX-Gate	Input	RX Gate
6	Fwd Pwr Alarm	Input	Active High
7	TX Key	Output	Open collector 10mA sink impedance
8	Rev Pwr Alarm	Input	Active high
9			
10	Tx Enable	Input	Shorted to TX Key
11	Fwd Pwr level	Input	Output
12	Rev Pwr level	Input	Output
13	PSU	Input	PSU monitoring. Optionally to supply power to TA703-xx-xxxx module.
14		Input	
15	GND	Gnd	

5.4.2 PL3 15-way D-range (4 Wire E&M)

This connector is the interface point between the base station system and the remote console. It is wired as follows:

Pin	Function	Description
1	Rx-Audio +	Transparent
2	Rx Audio -	Transparent
3	Tx Audio +	Transparent
4	Tx-Audio -	Transparent
5	Rx-Gate O/P	Active low upon receive of valid carrier
6	Rx-Gate (spare)	not used
7	Remote Tx-Key	Active low input to transmit
8	V+ Battery	Input to Battery Alarm Circuit
9	Combined Audio +	Balanced output to voice logger - future development
10	Combined Audio -	Balanced output to voice logger - future development
11	Active	Displays level of active base
12	Remote Reset (RAC)	Driven by open collector 10mA sink capability
13	Alarm	Open collector 10mA sink
14	Remote Select	High = TX of Base A, Low = TX of Base B.
15	Gnd	

5.4.3 PL4 15-way D-range (Alarm Outputs)

Pin	Alarm	Comments
1	contact between pin 1 and pin 2 opens on any alarm activated in Base A	refer to internal links for options on all alarm outputs
2		
3	open collector. Active low when Fwd Pwr of Base A fails	
4	open collector. Active low when Rev Pwr of Base A fails	
5	open collector. Active low when Mute of Base A fails	
6	open collector. Active low when of Base A fails	
7	open collector. Active low when PSU of Base A fails	
8	Gnd	
9	contact between pin 9and pin 10 opens on any alarm activated in Base B	
10		
11	open collector. Active low when Fwd Pwr of Base B fails	
12	open collector. Active low when Rev Pwr of Base B fails	
13	open collector. Active low when Mute of Base B fails	
14	open collector. Active low when of Base B fails	
15	open collector. Active low when PSU of Base B fails	

5.4.4 SK1 25-way D-range (Modem Interface)

This socket interfaces to external equipment and RS-232 for Data Terminal Equipment.

Pin	Signal	Function
1	FRAME GND	Earth to Chassis
2	TD	Transmitted data - RS-232
3	RD	Received data - RS-232
4	N/C	
5	N/C	
6	N/C	
7	SG-GND	RS-232 - Ground
8	N/C	
9	GND	
10	GND	
11	N/C	
12	V+ OUT	From optional DC-DC converter
13	V+ OUT	
14	REMOTE RX LINE +	600 Ohm balanced audio from receiver
15	REMOTE RX LINE -	
16	REMOTE TX LINE +	600 Ohm balanced audio to transmitter
17	REMOTE TX LINE -	
18	RX GATE OUT	Copy from active receiver gate O/P
19	REMOTE TX KEY	Active low input to key active transmitter
20	N/C	

21	O/P	Analog level from receiver
22	N/C	
23	RMT_ SELECT	Forces change over to standby transmitter
24	V+ OUT	From optional DC-DC converter
25	V+ OUT	

5.4.5 XLR Plug

This connector provides the power input (13.8V, 1.2A maximum).

Pin	Function
1	+ve
2	+ve
3	Ground
4	Ground

6 PCB information

This part contains information for the Change Over Module Control PCB (IPN 227-70301-07). It contains the following information:

6.1 Introduction

6.1.1 Parts Lists

The 10 digit numbers (000-00000-00) in the parts lists are ‘internal part numbers’ (IPNs). Your spare parts orders can be handled more efficiently if you quote: equipment type, circuit reference and IPN, along with a brief description of the part. The components listed in the parts lists are divided into two main types: those with a circuit reference (e.g. C201, D106, R121, etc.) and those without (mechanical and miscellaneous). Those with a circuit reference are grouped firstly by PCB, then by circuit designation in numerical order.

Each component entry comprises three or four columns: the circuit reference, variant number (if applicable), IPN and description. A number in the variant column indicates that this particular component is fitted only to that variant. The miscellaneous and mechanical section lists the variant and common parts in IPN order.

6.1.2 Grid Reference Indexes

To assist in locating components and labelled pads on the PCB layouts and circuit diagrams, a component grid reference index has been provided. This index lists the components and pads in alphabetical order, along with the appropriate alphanumeric grid references.

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. 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.

6.1.3 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. The first digit refers to the sheet number (printed on the bottom right hand corner of the CAD diagram) and the last two characters refer to the location on that sheet of the continuation of the circuit (e.g. 1-D4). If more than one line is represented (indicated by a double thickness line), a dot with a reference label will follow the route each individual line represents.

6.2 SMD Parts List (227-70301-07)

Ref	IPN	Description	PCB	Schematic
C100	015-26100-08	CAP 100N 10% 50V X7R	1:G3	1-J0
C101	015-26100-08	CAP 100N 10% 50V X7R	1:C5	1-K0
C102	015-26100-08	CAP 100N 10% 50V X7R	1:E5	1-G0
C105	016-09100-05	CAP 100U ELEC 25V 20% SIZE 8.5*9.2MM	1:B4	1-P8
C105A	016-08100-01	CAP 10U ELEC 16V 4*5.7MM	1:C5	1-Q8
C105B	015-26100-08	CAP 100N 10% 50V X7R	1:C5	1-Q8
C106	016-09100-05	CAP 100U ELEC 25V 20% SIZE 8.5*9.2MM	1:B5	1-P6
C106A	016-08100-01	CAP 10U ELEC 16V 4*5.7MM	1:C5	1-Q6
C106B	015-26100-08	CAP 100N 10% 50V X7R	1:C5	1-Q6
C110	015-24100-08	CAP 1N0 5% 50V X7R	1:E4	1-Q5
C114	015-24100-08	CAP 1N0 5% 50V X7R	1:E5	1-Q4
C118	015-24100-08	CAP 1N0 5% 50V X7R	1:R2	1-Q2
C120	015-25100-08	CAP 10N 10% 50V X7R	1:G3	1-D6
C121	015-25100-08	CAP 10N 10% 50V X7R	1:G3	1-D5
C122	015-25100-08	CAP 10N 10% 50V X7R	1:D5	1-D4
C123	015-25100-08	CAP 10N 10% 50V X7R	1:C5	1-D4
C126	015-23100-01	CAP 100P 5% NPO 50V	1:E6	1-K6
C127	015-24100-08	CAP 1N0 5% 50V X7R	1:F6	1-L7
C128	015-24100-08	CAP 1N0 5% 50V X7R	1:F6	1-L6
C131	016-08100-01	CAP 10U ELEC 16V 4*5.7MM	1:C4	1-R8
*C160	016-09220-01	CAP 220U ELEC 35V 10.5MM SQ SMD	1:Q5	1-M1
*C161	016-09100-05	CAP 100U ELEC 25V 20% SIZE 8.5*9.2MM	1:P5	1-N1
*C162	016-07100-01	CAP 1U0 ELEC 16V 4*5.7MM	1:P6	1-N1
*C163	016-09470-01	CAP 470U ELEC 16V 10.5MM SQ SMD	1:R5	1-Q1
*C164	016-09100-05	CAP 100U ELEC 25V 20% SIZE 8.5*9.2MM	1:R5	1-Q1
*C165	016-07100-01	CAP 1U0 ELEC 16V 4*5.7MM	1:R6	1-Q1
C200	015-26100-08	CAP 100N 10% 50V X7R	1:F4	2-K7
C201	015-26100-08	CAP 100N 10% 50V X7R	1:C3	2-K0
C203	015-26100-08	CAP 100N 10% 50V X7R	1:G4	2-L0
C220	015-26100-08	CAP 100N 10% 50V X7R	1:G4	2-G7
C221	015-26100-08	CAP 100N 10% 50V X7R	1:G4	2-G6
C224	015-24100-08	CAP 1N0 5% 50V X7R	1:F4	2-L7
C228	015-24470-08	CAP 4N7 10% 50V X7R	1:B4	2-B6
C229	016-08100-01	CAP 10U ELEC 16V 4*5.7MM	1:N3	2-E5
C232	015-24470-08	CAP 4N7 10% 50V X7R	1:B4	2-B4
C233	016-08100-01	CAP 10U ELEC 16V 4*5.7MM	1:G2	2-E3
C237	015-22220-01	CAP 22P 5% NPO 50V	1:F5	2-J3
C238	015-22220-01	CAP 22P 5% NPO 50V	1:F4	2-J3
C243	016-08100-01	CAP 10U ELEC 16V 4*5.7MM	1:K4	2-P6
C244	016-08100-01	CAP 10U ELEC 16V 4*5.7MM	1:K4	2-P6
C245	016-08100-01	CAP 10U ELEC 16V 4*5.7MM	1:K4	2-Q6
C246	016-08100-01	CAP 10U ELEC 16V 4*5.7MM	1:K4	2-Q6
C249	015-24100-08	CAP 1N0 5% 50V X7R	1:G4	2-N4
C253	015-24470-08	CAP 4N7 10% 50V X7R	1:A4	2-B2
C254	016-08100-01	CAP 10U ELEC 16V 4*5.7MM	1:N3	2-E2
C257	015-24470-08	CAP 4N7 10% 50V X7R	1:B4	2-B1
C258	016-08100-01	CAP 10U ELEC 16V 4*5.7MM	1:F2	2-E0

Ref	IPN	Description	PCB	Schematic
C320	015-24100-08	CAP 1N0 5% 50V X7R	1:F6	3-A6
C321	015-25470-08	CAP 47N 10% 50V X7R	1:F6	3-B6
C322	015-23100-01	CAP 100P 5% NPO 50V	1:G6	3-C8
C327	015-24100-08	CAP 1N0 5% 50V X7R	1:E2	3-J8
C328	015-24100-08	CAP 1N0 5% 50V X7R	1:E2	3-J6
C331	015-24100-08	CAP 1N0 5% 50V X7R	1:F6	3-A4
C332	015-25470-08	CAP 47N 10% 50V X7R	1:G6	3-B4
C333	015-23100-01	CAP 100P 5% NPO 50V	1:G5	3-C5
C335	016-07100-01	CAP 1U0 ELEC 16V 4*5.7MM	1:G5	3-E3
C338	015-24100-08	CAP 1N0 5% 50V X7R	1:L2	3-J5
C339	015-24100-08	CAP 1N0 5% 50V X7R	1:L2	3-J3
C400	015-26100-08	CAP 100N 10% 50V X7R	1:J4	4-D9
C401	015-26100-08	CAP 100N 10% 50V X7R	1:N3	4-D4
C420	015-24100-08	CAP 1N0 5% 50V X7R	1:K4	4-H8
C421	015-24100-08	CAP 1N0 5% 50V X7R	1:J4	4-G7
C422	015-24100-08	CAP 1N0 5% 50V X7R	1:J4	4-J6
C423	015-24100-08	CAP 1N0 5% 50V X7R	1:J4	4-L6
C424	015-24100-08	CAP 1N0 5% 50V X7R	1:J3	4-M5
C425	015-24100-08	CAP 1N0 5% 50V X7R	1:J3	4-P5
C429	015-24100-08	CAP 1N0 5% 50V X7R	1:H6	4-Q7
C430	015-24100-08	CAP 1N0 5% 50V X7R	1:H6	4-Q7
C431	015-24100-08	CAP 1N0 5% 50V X7R	1:H6	4-Q6
C432	015-24100-08	CAP 1N0 5% 50V X7R	1:H6	4-Q6
C433	015-24100-08	CAP 1N0 5% 50V X7R	1:G6	4-Q5
C436	015-24100-08	CAP 1N0 5% 50V X7R	1:N4	4-H3
C437	015-24100-08	CAP 1N0 5% 50V X7R	1:M4	4-G2
C438	015-24100-08	CAP 1N0 5% 50V X7R	1:M4	4-J2
C439	015-24100-08	CAP 1N0 5% 50V X7R	1:M4	4-L1
C440	015-24100-08	CAP 1N0 5% 50V X7R	1:M3	4-M1
C441	015-24100-08	CAP 1N0 5% 50V X7R	1:M3	4-P0
C445	015-24100-08	CAP 1N0 5% 50V X7R	1:H6	4-Q3
C446	015-24100-08	CAP 1N0 5% 50V X7R	1:H6	4-Q2
C447	015-24100-08	CAP 1N0 5% 50V X7R	1:H6	4-Q1
C448	015-24100-08	CAP 1N0 5% 50V X7R	1:H6	4-Q1
C449	015-24100-08	CAP 1N0 5% 50V X7R	1:G6	4-Q0
D100	001-10011-74	DIODE MRA4004T3 PWR RECTIFIER 400V 1A CASE 403B-01	1:C6	1-D7
D101	001-10011-74	DIODE MRA4004T3 PWR RECTIFIER 400V 1A CASE 403B-01	1:C6	1-D6
D102	001-10011-74	DIODE MRA4004T3 PWR RECTIFIER 400V 1A CASE 403B-01	1:D5	1-D5
D103	001-10011-74	DIODE MRA4004T3 PWR RECTIFIER 400V 1A CASE 403B-01	1:D5	1-D4
D107	001-10011-74	DIODE MRA4004T3 PWR RECTIFIER 400V 1A CASE 403B-01	1:P6	1-J3
D108	001-10011-74	DIODE MRA4004T3 PWR RECTIFIER 400V 1A CASE 403B-01	1:P6	1-L4
D109	001-10011-74	DIODE MRA4004T3 PWR RECTIFIER 400V 1A CASE 403B-01	1:E5	1-Q5
D110	001-10011-74	Diode SMD MRA4004T3 1A/400v	1:E5	1-Q4
D112	001-10011-74	DIODE MRA4004T3 PWR RECTIFIER 400V 1A CASE 403B-01	1:E5	1-Q4
D202	001-10000-99	DIODE BAV99 DUAL SW (PIN 3 IS ANODE/CATH)	1:F4	2-L7
D205	001-10000-99	DIODE BAV99 DUAL SW (PIN 3 IS ANODE/CATH)	1:G4	2-M4
D210	001-10000-99	DIODE BAV99 DUAL SW (PIN 3 IS ANODE/CATH)	1:C4	2-G2
D211	001-10000-99	DIODE BAV99 DUAL SW (PIN 3 IS ANODE/CATH)	1:B4	2-G0
D300	008-10065-00	LED HSMG-C650 GREEN SMD	1:E4	3-F8
D301	008-10065-00	LED HSMG-C650 GREEN SMD	1:F4	3-G8

Ref	IPN	Description	PCB	Schematic
D302	008-10065-00	LED HSMG-C650 GREEN SMD	1:G4	3-G8
D305	001-10000-99	DIODE BAV99 DUAL SW (PIN 3 IS ANODE/CATH)	1:E2	3-K8
D307	001-10000-99	DIODE BAV99 DUAL SW (PIN 3 IS ANODE/CATH)	1:E2	3-K7
D311	001-10000-99	DIODE BAV99 DUAL SW (PIN 3 IS ANODE/CATH)	1:L2	3-K5
D313	001-10000-99	DIODE BAV99 DUAL SW (PIN 3 IS ANODE/CATH)	1:L2	3-K3
D400	001-10011-74	DIODE MRA4004T3 PWR RECTIFIER 400V 1A CASE 403B-01	1:L1	3-L3
D414	001-10011-74	DIODE MRA4004T3 PWR RECTIFIER 400V 1A CASE 403B-01	1:N4	4-H4
IC100	002-10040-01	IC 4001BT QUAD 2 I/P NOR	1:G3	1-C6
IC101	002-10040-01	IC 4001BT QUAD 2 I/P NOR	1:D5	1-C5
IC102	002-10227-20	IC TLC2272CD DUAL CMOS OP AMP	1:E5	1-H0
IC105	002-10078-08	IC 78L08CD +VE VOLTAGE REG 8V 100MA	1:B4	1-P8
IC106	002-10078-05	IC 78L05CD REG 5V 100MA	1:B5	1-P6
IC109	002-10340-64	IC MC34064D-5 LOW VOLTAGE INDICATOR	1:F4	1-P5
IC110	002-10340-64	IC MC34064D-5 LOW VOLTAGE INDICATOR	1:E4	1-P4
IC111	002-10340-64	IC MC34064D-5 LOW VOLTAGE INDICATOR	1:Q2	1-P2
IC200	240-04020-42	SKT SMD FOR A PLCC44 CHIP CARRIER	1:F4	2-J4
IC201	002-10003-24	IC LM324D QUAD OP AMP	1:C4	2-C6
IC202	002-10339-00	IC SMD LM339D QUAD COMPARATOR	1:D3	2-E5
IC203	002-74900-86	IC 74HC86T QUAD 2I/P EXCLUSIVE-OR GATE	1:G4	2-F6
IC204	002-10340-64	IC MC34064D-5 LOW VOLTAGE INDICATOR	1:A3	2-K8
IC207	002-10002-32	IC MAX232 / RS-232 RECEIVER/TRANSMITTER	1:K4	2-P5
IC300	002-10003-24	IC LM324D QUAD OP AMP	1:G6	3-D1
IC301	002-10339-00	IC SMD LM339D QUAD COMPARATOR	1:G5	3-F6
IC400	002-74905-95	IC 74HC595S 8-BIT SHIFT REG	1:J4	4-C7
IC401	002-74905-95	IC 74HC595S 8-BIT SHIFT REG	1:N4	4-C2
Q100	000-10330-60	TRANSISTOR ZVN3306F LOW PWR N-CHAN MOSFET	1:G4	1-D6
Q101	000-10330-60	TRANSISTOR ZVN3306F LOW PWR N-CHAN MOSFET	1:G3	1-D5
Q102	000-10330-60	TRANSISTOR ZVN3306F LOW PWR N-CHAN MOSFET	1:D5	1-D5
Q103	000-10330-60	TRANSISTOR ZVN3306F LOW PWR N-CHAN MOSFET	1:D5	1-D4
Q106	000-10008-57	TRANSISTOR BCW70/BC857 PNP AF SMALL SIG	1:P6	1-L4
Q107	000-10330-60	TRANSISTOR ZVN3306F LOW PWR N-CHAN MOSFET	1:P6	1-L3
Q200	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:G4	2-N6
Q201	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:D4	2-E2
Q202	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:D4	2-E0
Q300	000-10008-57	TRANSISTOR BCW70/BC857 PNP AF SMALL	1:F5	3-D8
Q301	000-10008-57	TRANSISTOR BCW70/BC857 PNP AF SMALL	1:F5	3-D8
Q302	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:F5	3-D6
Q303	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:F5	3-D6
Q307	000-10008-57	TRANSISTOR BCW70/BC857 PNP AF SMALL	1:E2	3-L9
Q308	000-10008-57	TRANSISTOR BCW70/BC857 PNP AF SMALL	1:E2	3-L7
Q309	000-10008-57	TRANSISTOR BCW70/BC857 PNP AF SMALL	1:L2	3-L5
Q310	000-10008-57	TRANSISTOR BCW70/BC857 PNP AF SMALL	1:L2	3-L3
Q400	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:D2	4-E7
Q401	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:D2	4-E5
Q404	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:K4	4-H8
Q405	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:F2	4-G7
Q406	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:J4	4-H7
Q407	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:G2	4-H7
Q408	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:J4	4-J7
Q409	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:H2	4-K6

Ref	IPN	Description	PCB	Schematic
Q410	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:J4	4-L6
Q411	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:H2	4-M6
Q412	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:J3	4-N6
Q413	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:G2	4-P5
Q414	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:J3	4-Q5
Q418	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:K2	4-E2
Q419	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:K2	4-E0
Q422	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:N4	4-H3
Q423	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:M2	4-G2
Q424	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:M4	4-H2
Q425	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:N2	4-H2
Q426	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:M4	4-J2
Q427	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:P2	4-K1
Q428	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:M4	4-L1
Q429	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:P2	4-M1
Q430	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:M3	4-N1
Q431	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:N2	4-P0
Q432	000-10008-17	TRANSISTOR BCX19/BC817 NPN AF LOW POWER	1:M3	4-Q0
R105	036-14470-10	RES 4K7 1%	1:C5	1-Q8
R106	036-14220-00	RES 2K2 5%	1:C5	1-Q6
R120	036-16100-10	RES 100K 1%	1:G3	1-C6
R121	036-16100-10	RES 100K 1%	1:G3	1-C6
R127	036-16100-10	RES 100K 1%	1:D5	1-C5
R128	036-16100-10	RES 100K 1%	1:D5	1-C4
R135	036-15470-10	RES 47K 1%	1:F6	1-H7
R136	036-15470-10	RES 47K 1%	1:E6	1-J7
R137	036-15470-10	RES 47K 1%	1:F6	1-H6
R138	036-15470-10	RES 47K 1%	1:F5	1-J6
R139	036-16100-10	RES 100K 1%	1:E6	1-J7
R140	036-15470-10	RES 47K 1%	1:E6	1-K6
R141	036-15470-10	RES 47K 1%	1:E6	1-K6
R142	036-15100-10	RES 10K 1%	1:C4	1-R8
R143	036-15100-10	RES 10K 1%	1:C4	1-R8
R146	036-15100-10	RES 10K 1%	1:E4	1-P5
R147	036-14390-10	RES 3K9 1%	1:E4	1-Q5
R148	036-16100-10	RES 100K 1%	1:P6	1-K4
R149	036-15470-10	RES 47K 1%	1:P6	1-L3
R152	036-15100-10	RES 10K 1%	1:E4	1-P4
R153	036-14390-10	RES 3K9 1%	1:E4	1-Q4
R157	036-15100-10	RES 10K 1%	1:R2	1-N3
R158	036-13470-00	RES 470 5%	1:R2	1-P3
R159	036-14390-10	RES 3K9 1%	1:R2	1-Q2
R213	036-14100-10	RES 1K0 1%	1:B3	2-G4
R220	036-16100-10	RES 100K 1%	1:G4	2-G7
R221	036-16100-10	RES 100K 1%	1:G4	2-G6
R224	036-15100-10	RES 10K 1%	1:F4	2-H6
R228	036-15100-10	RES 10K 1%	1:B2	2-J8
R229	036-14100-10	RES 1K0 1%	1:B3	2-K8
R230	036-14150-10	RES 1K5 1%	1:B3	2-K8
R233	036-15100-10	RES 10K 1%	1:F4	2-L7

Ref	IPN	Description	PCB	Schematic
R234	036-15100-10	RES 10K 1%	1:F4	2-L6
R235	036-15100-10	RES 10K 1%	1:F4	2-L6
R236	036-15100-10	RES 10K 1%	1:F4	2-L6
R237	036-15100-10	RES 10K 1%	1:G4	2-M6
*R238	036-15220-00	RES 22K 5%	1:G4	2-N7
R239	036-15220-00	RES 22K 5%	1:G4	2-M6
R243	036-15470-10	RES 47K 1%	1:B4	2-C6
R244	036-15470-10	RES 47K 1%	1:B4	2-C6
R245	036-15220-00	RES 22K 5%	1:C3	2-C5
R246	036-16100-10	RES 100K 1%	1:C3	2-D5
R247	036-16100-10	RES 100K 1%	1:C3	2-D6
R248	036-16220-00	RES 220K 5%	1:D3	2-E6
R249	036-15100-10	RES 10K 1%	1:D4	2-E6
R250	036-15100-10	RES 10K 1%	1:B3	2-F5
R251	036-15100-10	RES 10K 1%	1:B3	2-G5
R252	036-15100-10	RES 10K 1%	1:B3	2-G5
R255	036-15470-10	RES 47K 1%	1:A4	2-C4
R256	036-15470-10	RES 47K 1%	1:B4	2-C4
R257	036-15220-00	RES 22K 5%	1:C4	2-C4
R258	036-16100-10	RES 100K 1%	1:C4	2-D4
R259	036-16100-10	RES 100K 1%	1:C3	2-D4
R260	036-16220-00	RES 220K 5%	1:D3	2-E4
R261	036-15100-10	RES 10K 1%	1:D4	2-E4
R264	036-17220-00	RES 2M2 5%	1:F4	2-J4
R266	036-15100-10	RES 10K 1%	1:B2	2-N5
R269	036-15220-00	RES 22K 5%	1:G4	2-M4
R270	036-15100-10	RES 10K 1%	1:D4	2-F2
R271	036-15270-10	RES 27K 1%	1:D4	2-F2
R272	036-15470-10	RES 47K 1%	1:B4	2-C2
R273	036-15470-10	RES 47K 1%	1:B4	2-C3
R274	036-16100-10	RES 100K 1%	1:C4	2-C2
R275	036-16100-10	RES 100K 1%	1:C4	2-D2
R276	036-16100-10	RES 100K 1%	1:C4	2-D3
R277	036-16220-00	RES 220K 5%	1:D4	2-E3
R278	036-15100-10	RES 10K 1%	1:D4	2-F3
R279	036-15100-10	RES 10K 1%	1:D4	2-F3
R280	036-15100-10	RES 10K 1%	1:D4	2-F0
R281	036-15270-10	RES 27K 1%	1:D4	2-F0
R283	036-15470-10	RES 47K 1%	1:B4	2-C1
R284	036-15470-10	RES 47K 1%	1:B4	2-C1
R285	036-16100-10	RES 100K 1%	1:C4	2-C0
R286	036-16100-10	RES 100K 1%	1:C4	2-D0
R287	036-16100-10	RES 100K 1%	1:C4	2-D1
R288	036-16220-00	RES 220K 5%	1:C4	2-E1
R289	036-15100-10	RES 10K 1%	1:D4	2-F1
R290	036-15100-10	RES 10K 1%	1:D4	2-F1
R320	036-14470-10	RES 4K7 1%	1:F5	3-B7
R321	036-16220-00	RES 220K 5%	1:F6	3-B7
R322	036-16220-00	RES 220K 5%	1:G6	3-C7
R323	036-15470-10	RES 47K 1%	1:F6	3-B7

Ref	IPN	Description	PCB	Schematic
R324	036-16100-10	RES 100K 1%	1:F6	3-B6
R325	036-14470-10	RES 4K7 1%	1:F5	3-C6
R328	036-14100-10	RES 1K0 1%	1:F5	3-D8
R329	036-14100-10	RES 1K0 1%	1:F5	3-D8
R330	036-15120-00	RES 12K 5%	1:F5	3-D7
R331	036-14100-10	RES 1K0 1%	1:F5	3-D7
R332	036-14100-10	RES 1K0 1%	1:F5	3-D6
R333	036-14100-10	RES 1K0 1%	1:F5	3-E7
R334	036-16180-00	RES 180K 5%	1:G5	3-F8
R335	036-14330-10	RES 3K3 1%	1:E4	3-F8
R336	036-14330-10	RES 3K3 1%	1:E4	3-G8
R337	036-14330-10	RES 3K3 1%	1:G5	3-G8
R341	036-15220-00	RES 22K 5%	1:E2	3-K9
R342	036-15100-10	RES 10K 1%	1:E2	3-K9
R343	036-14470-10	RES 4K7 1%	1:E2	3-L8
R344	036-14150-10	RES 1K5 1%	1:E2	3-L8
R347	036-15470-10	RES 47K 1%	1:E2	3-K7
R348	036-15470-10	RES 47K 1%	1:E2	3-K7
R349	036-14470-10	RES 4K7 1%	1:E2	3-L6
R350	036-14150-10	RES 1K5 1%	1:E2	3-L6
R354	036-14470-10	RES 4K7 1%	1:F5	3-B5
R355	036-16220-00	RES 220K 5%	1:G6	3-B5
R356	036-15470-10	RES 47K 1%	1:F6	3-B4
R357	036-16100-10	RES 100K 1%	1:G6	3-B4
R358	036-16220-00	RES 220K 5%	1:G5	3-C5
R359	036-14470-10	RES 4K7 1%	1:G6	3-C4
R363	036-14100-10	RES 1K0 1%	1:F5	3-D5
R364	036-14100-10	RES 1K0 1%	1:F5	3-D5
R365	036-14100-10	RES 1K0 1%	1:G5	3-E6
R366	036-16180-00	RES 180K 5%	1:G5	3-F5
R367	036-16180-00	RES 180K 5%	1:G5	3-F5
R368	036-14100-10	RES 1K0 1%	1:F6	3-E4
R371	036-14150-10	RES 1K5 1%	1:G5	3-D4
R372	036-14560-00	RES 5K6 5%	1:G5	3-D3
R373	036-14100-10	RES 1K0 1%	1:G5	3-E3
R374	036-16180-00	RES 180K 5%	1:G5	3-F3
R378	036-15220-00	RES 22K 5%	1:L2	3-K5
R379	036-15100-10	RES 10K 1%	1:L2	3-K5
R380	036-14470-10	RES 4K7 1%	1:L2	3-L5
R381	036-14150-10	RES 1K5 1%	1:M2	3-L5
R384	036-15470-10	RES 47K 1%	1:L2	3-K3
R385	036-15470-10	RES 47K 1%	1:L2	3-K4
R386	036-14470-10	RES 4K7 1%	1:L2	3-L3
R387	036-14150-10	RES 1K5 1%	1:L2	3-L3
R420	036-14100-10	RES 1K0 1%	1:J4	4-B7
R421	036-14100-10	RES 1K0 1%	1:K4	4-C7
R422	036-14150-10	RES 1K5 1%	1:D2	4-E7
R423	036-15100-10	RES 10K 1%	1:D2	4-D7
R424	036-14150-10	RES 1K5 1%	1:C2	4-E6
R425	036-15100-10	RES 10K 1%	1:D2	4-D5

Ref	IPN	Description	PCB	Schematic
R428	036-14150-10	RES 1K5 1%	1:F2	4-G8
R429	036-14100-10	RES 1K0 1%	1:F2	4-G8
R430	036-15100-10	RES 10K 1%	1:J4	4-F7
R431	036-14470-10	RES 4K7 1%	1:J4	4-G7
R432	036-14470-10	RES 4K7 1%	1:K4	4-H8
R433	036-14100-10	RES 1K0 1%	1:H3	4-J9
R437	036-14150-10	RES 1K5 1%	1:F2	4-H7
R438	036-14100-10	RES 1K0 1%	1:F2	4-J7
R439	036-15100-10	RES 10K 1%	1:J4	4-H6
R450	036-14470-10	RES 4K7 1%	1:J4	4-J6
R451	036-14150-10	RES 1K5 1%	1:H2	4-K7
R452	036-14100-10	RES 1K0 1%	1:H2	4-L7
R453	036-15100-10	RES 10K 1%	1:J4	4-K6
R454	036-14470-10	RES 4K7 1%	1:J4	4-K6
R458	036-14150-10	RES 1K5 1%	1:G2	4-M6
R459	036-14100-10	RES 1K0 1%	1:G2	4-M6
R460	036-15100-10	RES 10K 1%	1:J3	4-L5
R461	036-14470-10	RES 4K7 1%	1:J3	4-M5
R462	036-14150-10	RES 1K5 1%	1:G2	4-P5
R463	036-14100-10	RES 1K0 1%	1:G2	4-P5
R464	036-15100-10	RES 10K 1%	1:J3	4-N5
R465	036-14470-10	RES 4K7 1%	1:J3	4-P5
R469	036-14100-10	RES 1K0 1%	1:N3	4-B2
R470	036-14100-10	RES 1K0 1%	1:N4	4-C2
R471	036-14150-10	RES 1K5 1%	1:K2	4-E2
R472	036-15100-10	RES 10K 1%	1:K2	4-D2
R473	036-14150-10	RES 1K5 1%	1:K2	4-E1
R474	036-15100-10	RES 10K 1%	1:K2	4-D0
R478	036-14150-10	RES 1K5 1%	1:M2	4-G3
R479	036-14100-10	RES 1K0 1%	1:M2	4-G3
R480	036-15100-10	RES 10K 1%	1:N4	4-F2
R481	036-14470-10	RES 4K7 1%	1:M4	4-G2
R482	036-14470-10	RES 4K7 1%	1:N4	4-H3
R483	036-14100-10	RES 1K0 1%	1:L3	4-J4
R484	036-14150-10	RES 1K5 1%	1:N2	4-H2
R485	036-14100-10	RES 1K0 1%	1:N2	4-J2
R486	036-15100-10	RES 10K 1%	1:M4	4-H2
R487	036-14470-10	RES 4K7 1%	1:M4	4-J2
R490	036-14150-10	RES 1K5 1%	1:P2	4-K2
R491	036-14100-10	RES 1K0 1%	1:P2	4-L2
R492	036-15100-10	RES 10K 1%	1:M4	4-K1
R493	036-14470-10	RES 4K7 1%	1:M4	4-K1
R494	036-14150-10	RES 1K5 1%	1:P2	4-M1
R495	036-14100-10	RES 1K0 1%	1:P2	4-M1
R496	036-15100-10	RES 10K 1%	1:M3	4-L1
R497	036-14470-10	RES 4K7 1%	1:M3	4-M1
R498	036-14150-10	RES 1K5 1%	1:N2	4-P1
R499	036-14100-10	RES 1K0 1%	1:N2	4-P1
R500	036-15100-10	RES 10K 1%	1:M3	4-N0

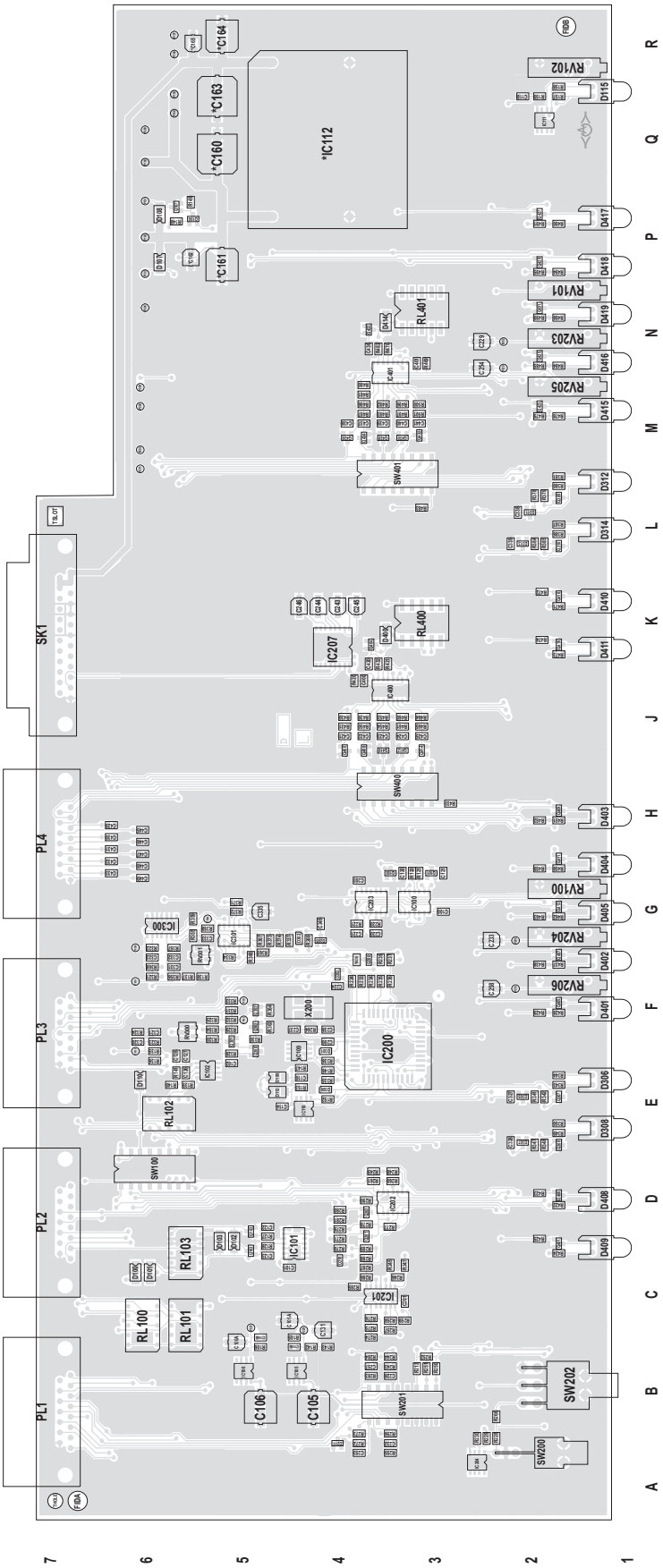
Ref	IPN	Description	PCB	Schematic
R501	036-14470-10	RES 4K7 1%	1:M3	4-P0
RL400	237-10010-00	RLY DPDT 1-2A/12V DIL 10PIN SMD AS-12W-K-B05	1:K3	4-K0
RL401	237-10010-00	RLY DPDT 1-2A/12V DIL 10PIN SMD AS-12W-K-B05	1:N3	4-K4
RV300	042-04500-05	TRIM POT 5K +/-25% 5MM SQUARE SMD CERMET	1:F6	3-B7
RV301	042-04500-05	TRIM POT 5K +/-25% 5MM SQUARE SMD CERMET	1:G5	3-B5
SW100	230-10010-44	SW X 8 SPST	1:D6	1-F0
SW201	230-10010-44	SW X 8 SPST	1:B3	2-F0
SW400	230-10010-44	SW X 8 SPST	1:H3	4-M6
SW401	230-10010-44	SW X 8 SPST	1:M3	4-J2
X200	274-10004-00	CRYSTAL 4.032MHZ +-10PPM	1:F4	2-J4

6.3 Non-SMD Parts List (227-70301-07)

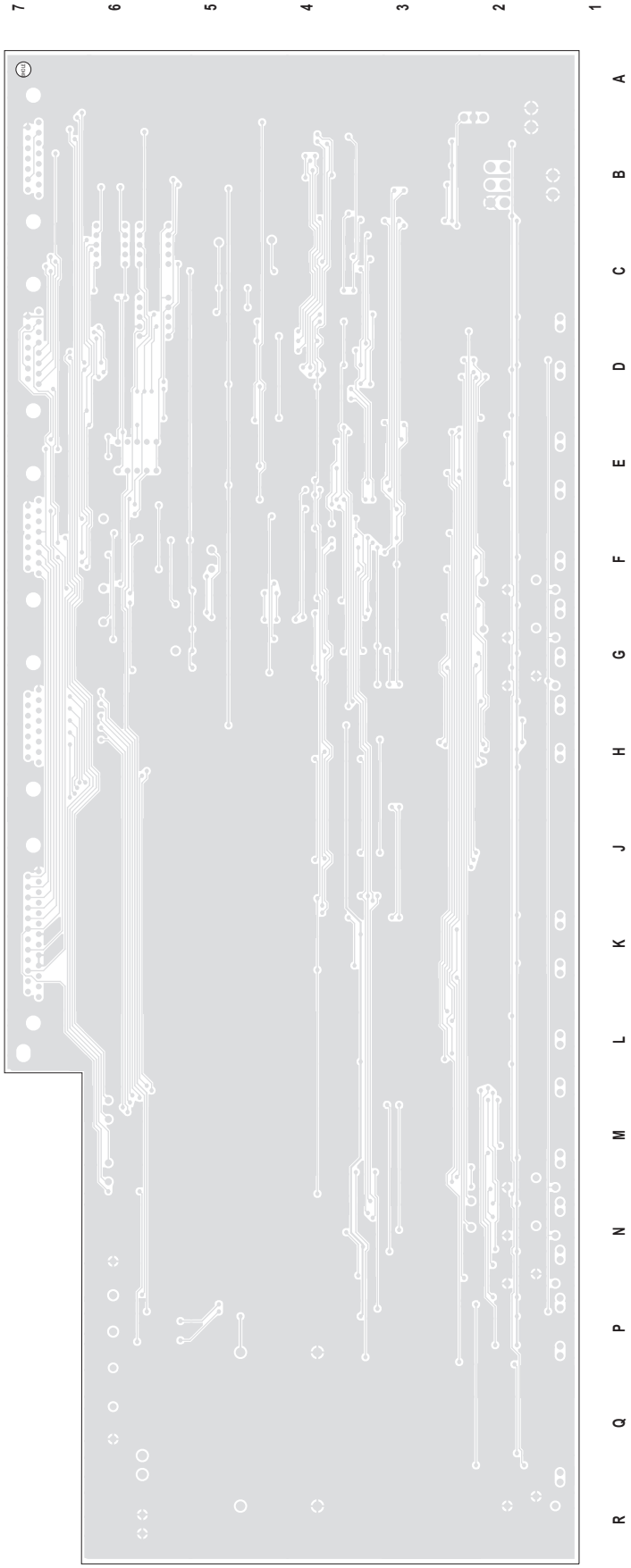
Ref	IPN	Description
D115	008-00014-74	LED HLMP5030 RED MTG IN A RIGHT ANGLE HOLDER 5MM
D306	008-00014-73	LED HLMP5050 GREEN MTG IN A RT ANGLE HOLDER 5MM
D308	008-00014-73	LED HLMP5050 GREEN MTG IN A RT ANGLE HOLDER 5MM
D312	008-00014-73	LED HLMP5050 GREEN MTG IN A RT ANGLE HOLDER 5MM
D314	008-00014-73	LED HLMP5050 GREEN MTG IN A RT ANGLE HOLDER 5MM
D401	008-00014-74	LED HLMP5030 RED MTG IN A RIGHT ANGLE HOLDER 5MM
D402	008-00014-74	LED HLMP5030 RED MTG IN A RIGHT ANGLE HOLDER 5MM
D403	008-00014-74	LED HLMP5030 RED MTG IN A RIGHT ANGLE HOLDER 5MM
D404	008-00014-74	LED HLMP5030 RED MTG IN A RIGHT ANGLE HOLDER 5MM
D405	008-00014-74	LED HLMP5030 RED MTG IN A RIGHT ANGLE HOLDER 5MM
D408	008-00014-75	LED HLMP5040 YELLOW 5mm RT ANGLE PCB MTG
D409	008-00014-75	LED HLMP5040 YELLOW 5mm RT ANGLE PCB MTG
D410	008-00014-75	LED HLMP5040 YELLOW 5mm RT ANGLE PCB MTG
D411	008-00014-75	LED HLMP5040 YELLOW 5mm RT ANGLE PCB MTG
D415	008-00014-74	LED HLMP5030 RED MTG IN A RIGHT ANGLE HOLDER 5MM
D416	008-00014-74	LED HLMP5030 RED MTG IN A RIGHT ANGLE HOLDER 5MM
D417	008-00014-74	LED HLMP5030 RED MTG IN A RIGHT ANGLE HOLDER 5MM
D418	008-00014-74	LED HLMP5030 RED MTG IN A RIGHT ANGLE HOLDER 5MM
D419	008-00014-74	LED HLMP5030 RED MTG IN A RIGHT ANGLE HOLDER 5MM
IC1	002-20068-07	IC MC68HC705C8FN 1-TIME PROG MICRO (MECH PART)
*IC112	005-01205-00	MODULE PP101205 DC-DC CONVERTER 12-5V 2A 10W
P100	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P101	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P102	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P103	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P105	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P106	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P107	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P108	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P200	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P202	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P203	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P204	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P205	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P208	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P209	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P210	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P211	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P213	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P220	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
P221	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
PL1	240-00010-53	PLUG 15WAY RIGHT ANGLE SIDE ENTRY DRANGE
PL2	240-00010-53	PLUG 15WAY RIGHT ANGLE SIDE ENTRY DRANGE
PL3	240-00010-53	PLUG 15WAY RIGHT ANGLE SIDE ENTRY DRANGE
PL4	240-00010-53	PLUG 15WAY RIGHT ANGLE SIDE ENTRY DRANGE
RL100	237-00010-37	RELAY TQ2L2 4V5 SPDT 2 COIL LATCHING 200MW PTH
RL101	237-00010-37	RELAY TQ2L2 4V5 SPDT 2 COIL LATCHING 200MW PTH

Ref	IPN	Description
RL102	237-00010-37	RELAY TQ2L2 4V5 SPDT 2 COIL LATCHING 200MW PTH
RL103	237-00010-37	RELAY TQ2L2 4V5 SPDT 2 COIL LATCHING 200MW PTH
RV100	044-05100-01	POT 10K LIN 15 TURNS COPAL CT-20P SIDE ADJUST
RV101	044-05100-01	POT 10K LIN 15 TURNS COPAL CT-20P SIDE ADJUST
RV102	044-05100-01	POT 10K LIN 15 TURNS COPAL CT-20P SIDE ADJUST
RV203	044-05100-01	POT 10K LIN 15 TURNS COPAL CT-20P SIDE ADJUST
RV204	044-05100-01	POT 10K LIN 15 TURNS COPAL CT-20P SIDE ADJUST
RV205	044-05100-01	POT 10K LIN 15 TURNS COPAL CT-20P SIDE ADJUST
RV206	044-05100-01	POT 10K LIN 15 TURNS COPAL CT-20P SIDE ADJUST
SK1	240-02010-59	SOCKET 25WAY RIGHT ANGLE SIDE ENTRY DRANGE
SW200	232-00010-26	SWITCH SPDT PUSH MOMENTARY RIGHT ANGLE
SW202	230-00010-30	SWITCH SPDT TOGGLE RT ANGLE PCB MTG
TP300	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
TP301	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
TP302	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
TP305	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
TP310	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION
TP311	I/O-PAD	PAD HOLE FOR OFF BOARD WIRE CONNECTION

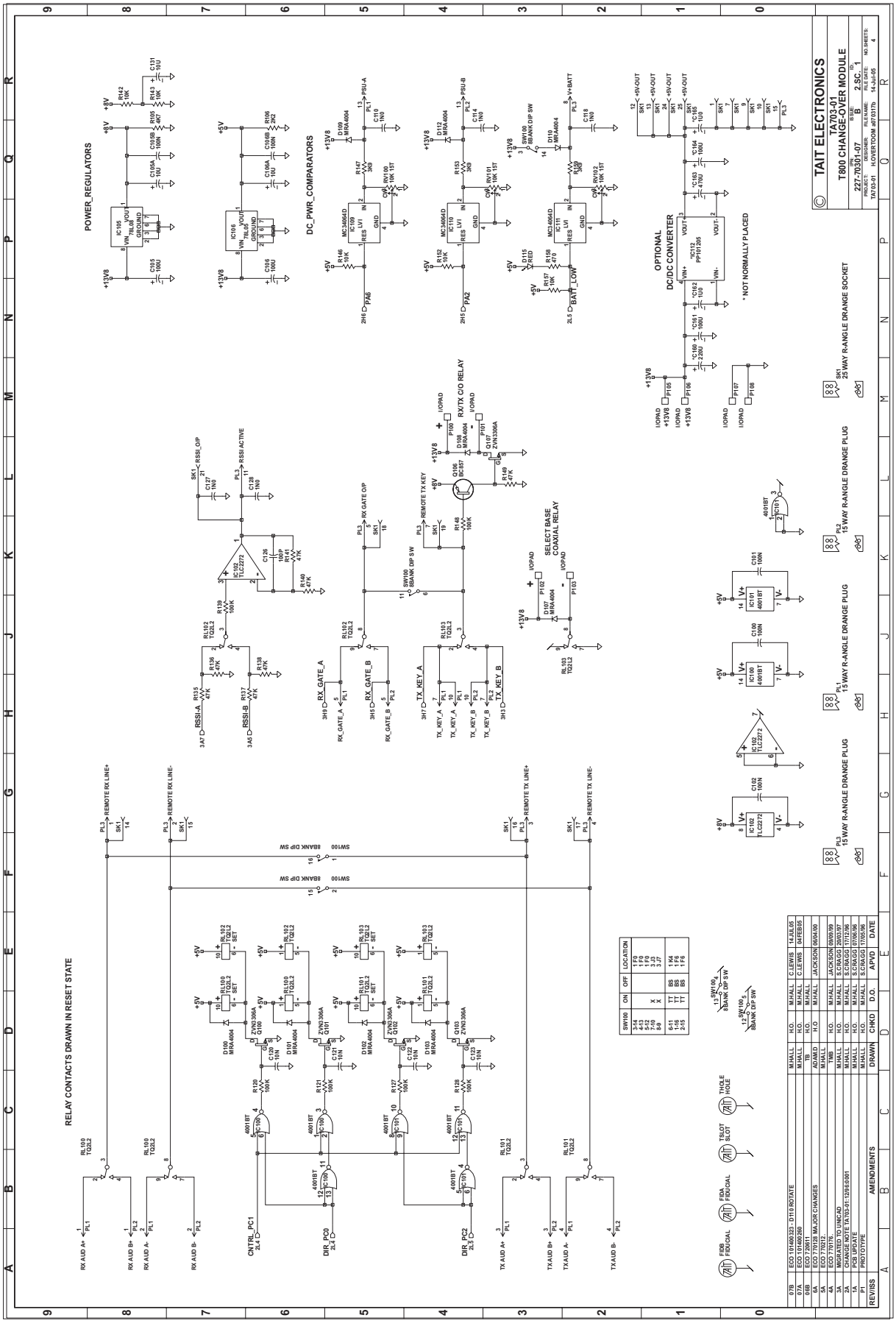
6.4 PCB Layout (227-70301-07) - top side



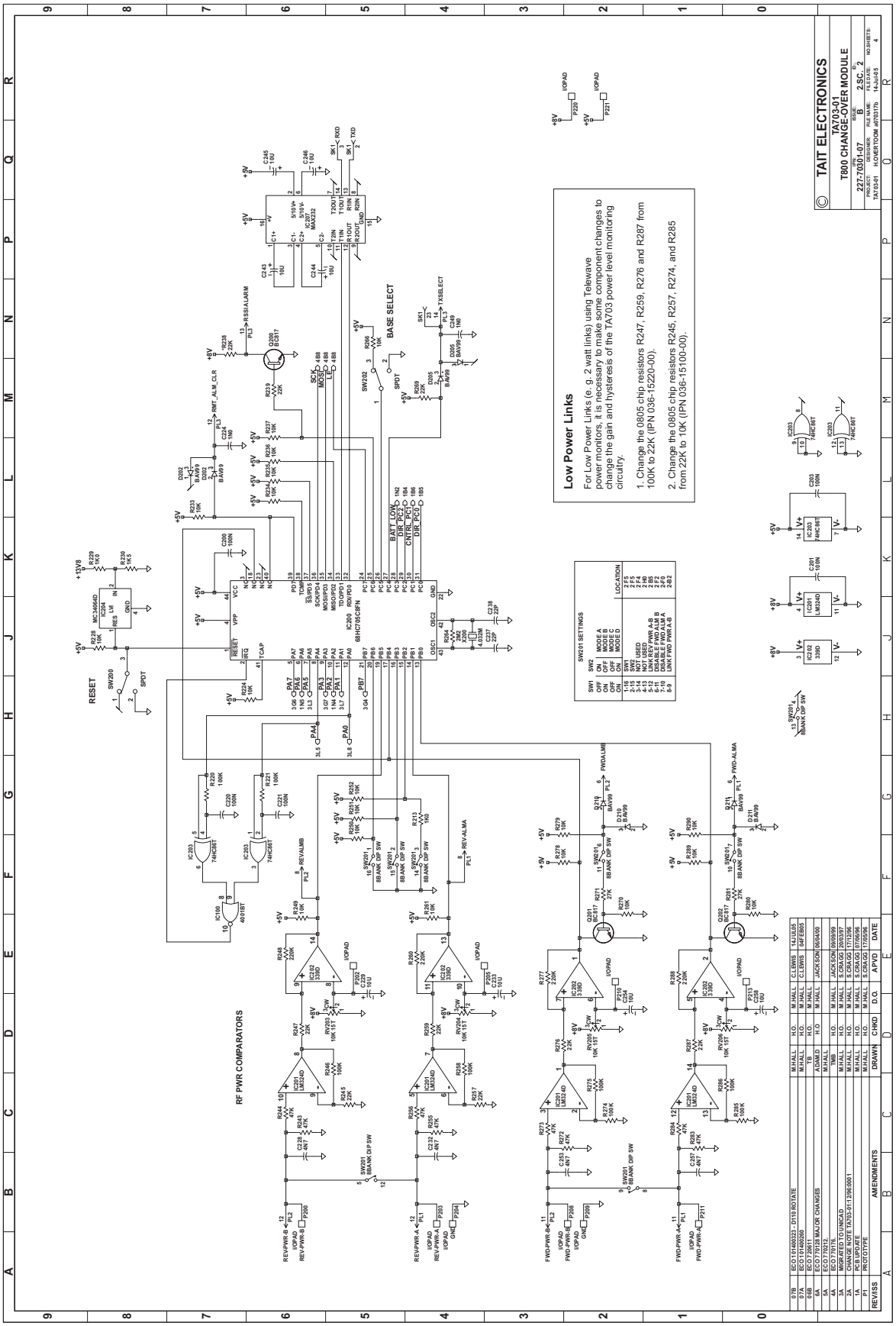
6.5 PCB Layout (227-70301-07) - bottom side



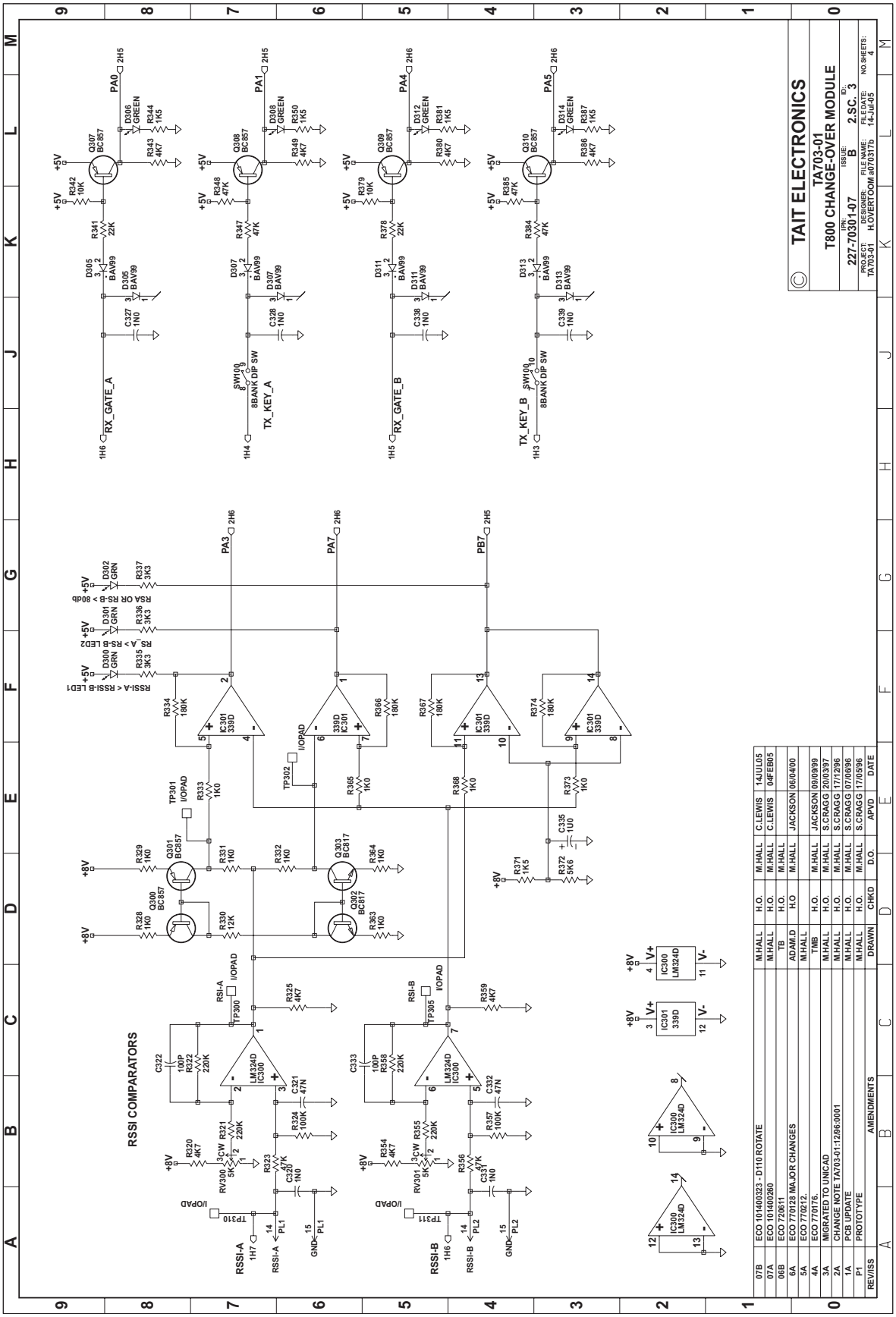
6.6 Circuit Diagram (227-70301-07) - page 1 of 2



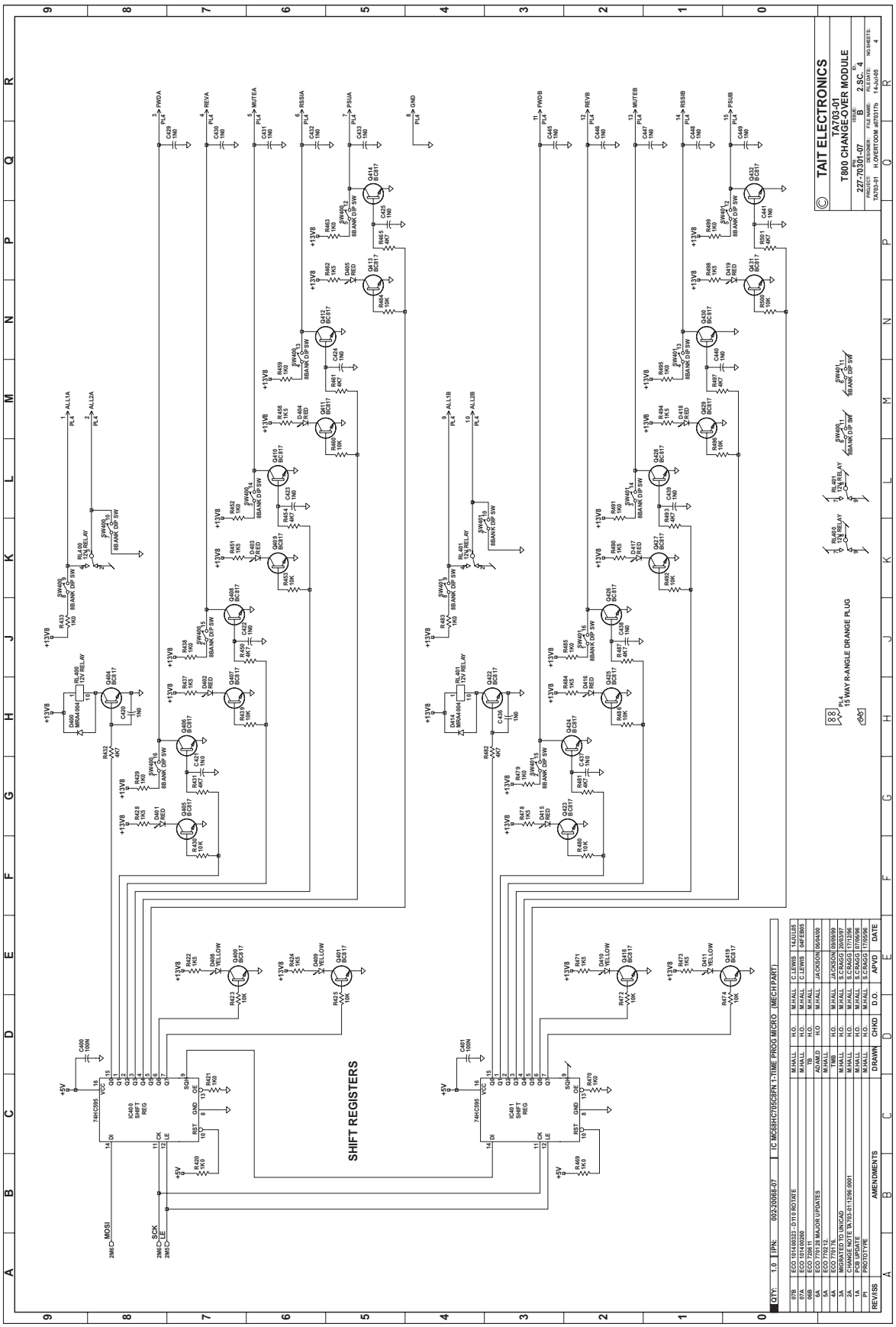
6.7 Circuit Diagram (227-70301-07) - page 2 of 2



6.8 Circuit Diagram (227-70301-07) - page 3 of 4



6.9 Circuit Diagram (227-70301-07) - page 4 of 4



7 Wiring

This part contains internal wiring details for the TA703-xx-xxxx Change Over Module. It contains the following information:

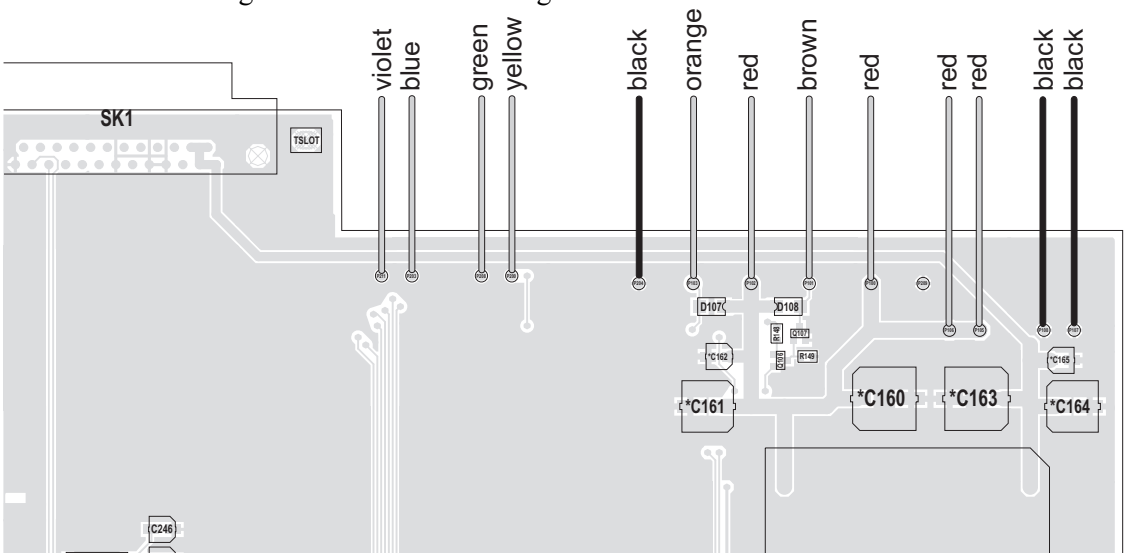
- Internal Wiring Connections
- External Cable Specifications

7.1 Internal Wiring Connections

The TA703-xx-xxxx Change Over Module rear panel connectors are wired to the Change Over Module Control PCB according to the table and diagram that follow:

Pad	Wire	Rear Panel Connector	Function	Pin/Terminal
P107	Black	4 pin XLR Plug	Power Out - GND	pin 3
P108	Black	4 pin XLR Plug	Power Out - GND	pin 4
P105	Red	4 pin XLR Plug	Power Out - 13.8V	pin 1
P106	Red	4 pin XLR Plug	Power Out - 13.8V	pin 2
P209	not connected			
P100	Red	Tag Strip for Coaxial Relay Control	Relay Driver O/P	+13.8V
P101	Brown	Tag Strip for Coaxial Relay Control	Relay Driver O/P	RX/TX
P102	Red	Tag Strip for Coaxial Relay Control	Relay Driver O/P	+13.8V
P103	Orange	Tag Strip for Coaxial Relay Control	Relay Driver O/P	Base Select
P204	Black	RCA Socket/s		Solder tags*
P200	Yellow	Black RCA Socket	Reverse Power Base B	Rev (B)
P208	Green	Red RCA Socket	Forward Power Base B	Fwd (B)
P203	Blue	Black RCA Socket	Reverse Power Base B	Rev (A)
P211	Violet	Red RCA Socket	Forward Power Base B	Fwd (A)
* RCA socket solder tags are soldered together in pairs - Rev/Fwd (A) and Rev/Fwd (B)				

Notice The diagram below reads from right to left.



7.2 External Cable Specifications

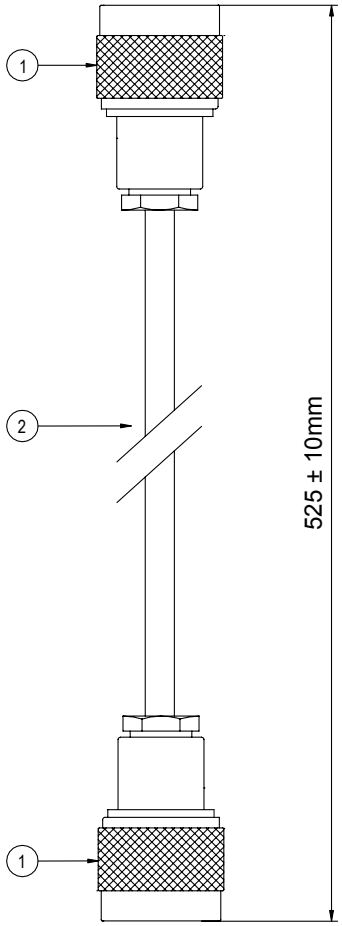
This section provides details of the external cables required to instal the TA703-01-000X Change Over Module and the Power Monitor. The cables are supplied as follows:

- Installation Kit/Power Monitor Kit Cable IPN 219-02701-00
  - N-type to N-type cable
  - 6 provided - all installation kits
  - 1 provided - all power monitor kits
- Installation Kit Cable (TA703-11-0010) IPN 219-02702-01
  - 15-way D-range to 25-way D-range cable
- Installation Kit Cable (TA703-11-0011) IPN 219-02703-01
  - 15-way D-range to 25-way D-range cable
  - 2 provided - installation kit TA703-12-0011 only
- Installation Kit Cable (TA703-11-0012) IPN 219-02700-01
  - 15-way D-range to 25-way D-range cable
  - 2 provided - installation kit TA703-12-0012 only
- Installation Kit Cable (TA703-11-7010) IPN 219-03115-00
  - 15-way D-range to 25-way D-range cable
- Installation Kit Cable (TA703-11-8010) IPN 219-03460-00
  - 15-way D-range to 25-way D-range cable
- Power Monitor Kit Cable IPN 219-00025-82
  - Phono to phono red/black (or white) twin cable
  - 2 provided - all power monitor kits

7.2.1 Installation Kit/Power Monitor Cable IPN 219-02701-00

Six of these cables are supplied in each TA703-01-XXXX Change Over Module Installation Kit.

One cable is also provided in each Power Monitor kit for connecting the Power Monitor to the Duplexer.



Parts List

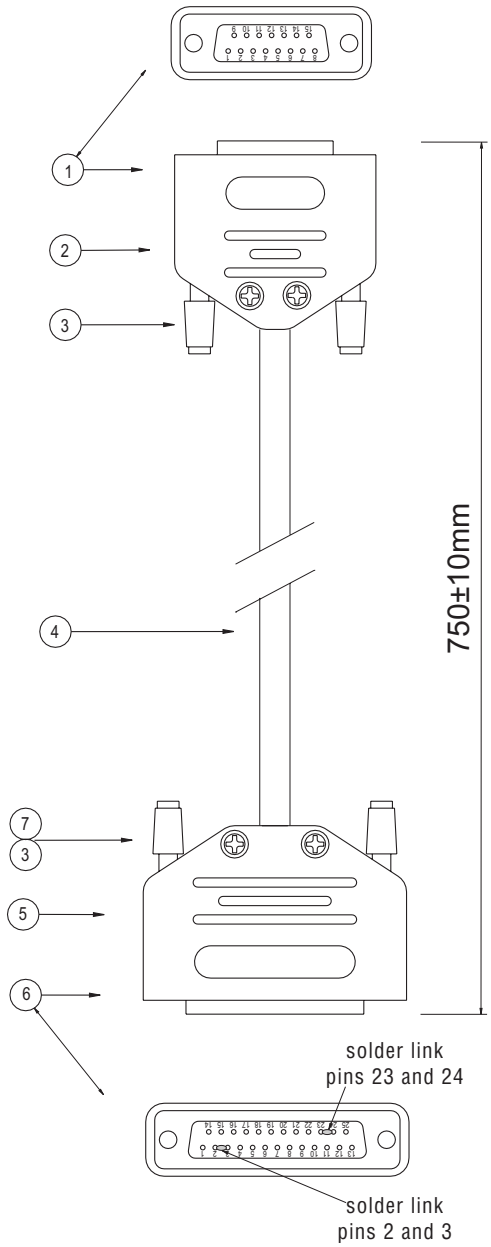
Item	Description	Quantity	Supplier	Supplier Part
1	Plug Coax N-type Cord Captive	2	Tait	206-00010-15
2	Cable Coax 50E RG223/U2 Scrn	525mm	Tait	240-00010-06

7.2.2 Installation Kit Cable (TA703-11-0010) IPN 219-02702-01

Two of these cables connect the Change Over Module to the Base A and Base B T800-50-0000 Backplane. The 15-way D-ranges connect to the Change Over Module at PL1 and PL2, and the 25-way D-ranges connects to the T800 backplane at SK7.

Notice This cable is ground shielded.

Notice This cable differs according to the installation kit variant.



A list of parts and D-Range connector wiring details are on the following page.

Parts List

Item	Description	Quantity	Supplier	Supplier Part
1	15-way D-Range Skt S/B	1	Tait	240-02010-54
2	15-way D-Range Cover and Hood	1	Tait	240-06010-18
3	Heatshrink 10mm	60mm	Tait	400-00020-70
4	Cable 20 Core Screened	750mm	Tait	205-00010-58
5	25-way D-Range Plug S/B	1	Tait	240-06010-63
6	25-way D-Range Cover and Hood	1	Tait	240-00010-17
7	Wire 7/0.2 PVC Grey	80mm	Tait	201-00030-08

D-range Wiring - 219-02702-01

The following table describes the wiring of the 15-way and 25-way D-Range connectors on this cable.

15-way pin	function	wire colour	25-way pin
1	Rx Line 1	Brown	1
2	Rx Line 4	White	4
3	Tx Line 1	Red	25
4	Tx Line 4	Black	22
5	Rx Gate	Orange	14
6	Forward Power Alarm	Green/red	10
7	Tx Key	Yellow	17
8	Reverse Power Alarm	Red/blue	11
9	Rx Mute	Pink	14
10	Tx Enable	Blue	17
11	not connected	-	-
12	not connected	-	-
13	13.8V+	Violet	2, 3
14		Green	5
15	0V-	Grey	23, 24
All remaining 25-way D-Range pins are not connected.			

Notice On the 25-way D-range, pins 2 and 3, and pins 23 and 24 are solder linked. This is done to provide power and Ground from SK7 on the back plane to the TA703. 13.8V is linked in via pin 2 and pin 3 of SK7. This set up requires removal of +13.8V from the receiver line transformer.

In similar fashion Gnd is provided via linking into the Tx audio centre lines normally present at pins 23 and 24 of SK.

Links on the T800-50-0000 need to be set as follows:

- Lnk9 2-3
- Lnk10 2-3

- Lnk11 2-3
- Lnk12 2-3

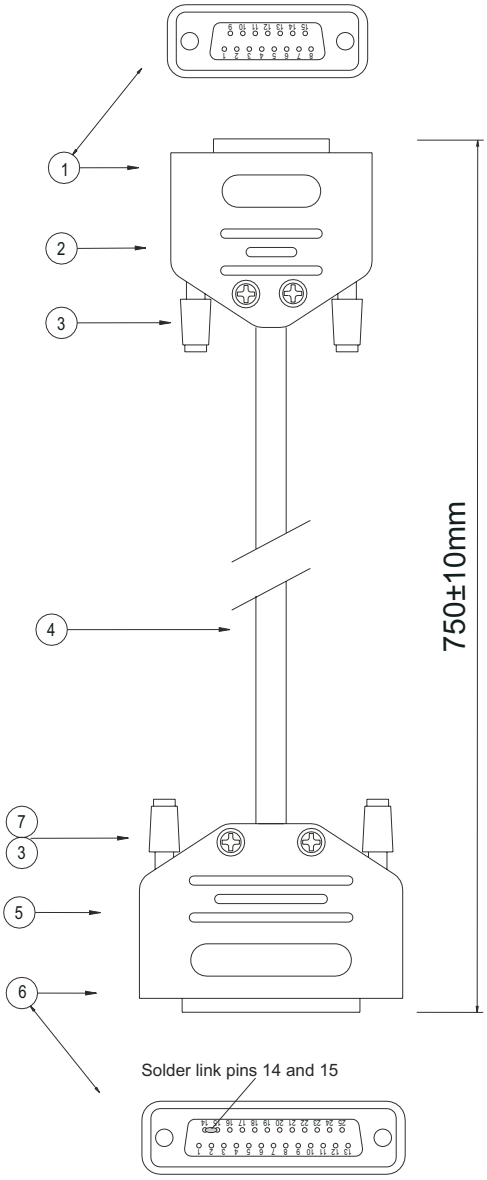
Links 1, 2, 3, 4 and 5 on the T800-50-0000 are to be set as preferred by the customer, but are typically left open as they are used for talk-through mode and DC keying. Refer to the T800-50-0000 Service Manual for detailed setup.

7.2.3 Installation Kit Cable (TA703-11-0011) IPN 219-02703-01

Two of these cables connect the Change Over Module to the T800-50-0001 Backplane. The 15-way D-Range connects to the Change Over Module and the 25-way D-range connects to the backplane at SK7.

Notice This cable is ground shielded.

Notice This cable differs according to the installation kit variant.



A list of parts and D-Range connector wiring details are on the following page.

Cable Parts List

Item	Description	Quantity	Supplier	Supplier Part
1	15-way D-Range Skt S/B	1	Tait	240-02010-54
2	15-way D-Range Cover and Hood	1	Tait	240-06010-18
3	Heatshrink 10mm	60mm	Tait	400-00020-70
4	Cable 20 Core Screened	750mm	Tait	205-00010-58
5	25-way D-Range Skt S/B	1	Tait	240-06010-67
6	25-way D-Range Cover and Hood	1	Tait	240-06010-17
7	Wire 7/0.2 PVC Black	80mm	Tait	201-00030-10

D-range Wiring - 219-02703-01

The following table describes the wiring of the 15-way and 25-way D-Range connectors on this cable.

15-way pin	function	wire colour	25-way pin
1	Rx Line 1	Brown	1
2	Rx Line 4	Yellow	4
3	Tx Line 1	Green	5
4	Tx Line 4	Blue	8
5	Rx Gate	Violet	14
6	Forward Power Alarm	Green/red	22
7	Tx Key	Orange	15
8	Reverse Power Alarm	Red/blue	12
9	Rx Mute	Pink	14
10	Tx Enable	Grey	15
11	not connected	-	-
12	not connected	-	-
13	13.8V+	Red	25
14		White	9
15	0V-	Black	13
All remaining 25-way D-Range pins are not connected.			

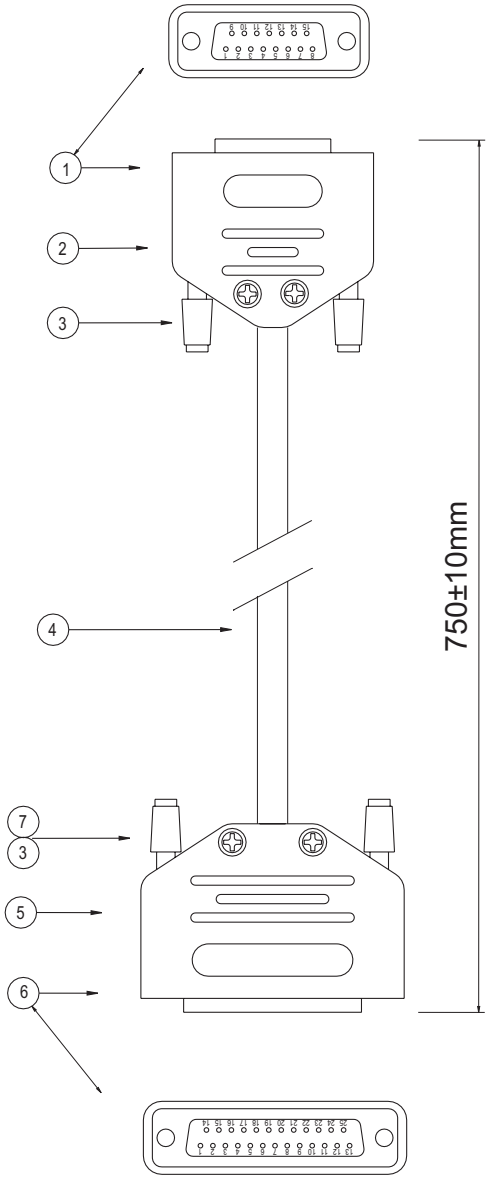
Notice On the 25-way D-range, pins 14 and 15 each have two wires connected.

7.2.4 Installation Kit Cable (TA703-11-0012) IPN 219-02700-01

This cable connects the Change Over Module to the T800-52-0000 Quasi-Sync Backplane. The 15-way D-range connects to the Change Over Module and the 25-way D-range connects to the T800 backplane at SK7.

Notice This cable is ground shielded.

Notice This cable differs according to the installation kit variant.



A list of parts and D-Range connector wiring details are on the following page.

Parts List

Item	Description	Quantity	Supplier	Supplier Part
1	15-way D Range Skt S/B	1	Tait	240-02010-54
2	15-way D Range Cover and Hood	1	Tait	240-06010-18
3	Heatshrink 10mm	60mm	Tait	400-00020-70
4	Cable 20 Core Screened	750mm	Tait	205-00010-58
5	25-way D Range Skt S/B	1	Tait	240-06010-67
6	25-way D Range Cover and Hood	1	Tait	240-00010-17
7	Wire 7/0.2 PVC Black	80mm	Tait	201-00030-10

D-range Wiring - 219-02700-01

The following table describes the wiring of the 15-way and 25-way D-Range connectors on this cable.

15-way pin	function	wire colour	25-way pin
1	Rx Line 1	Brown	1
2	Rx Line 4	Yellow	2
3	Tx Line 1	Green	15
4	Tx Line 4	Blue	16
5	Rx Gate	Violet	14
6	Forward Power Alarm	Green/red	19
7	Tx Key	Orange	3
8	Reverse Power Alarm	Red/blue	20
9	Rx Mute	Pink	14
10	Tx Enable	Grey	3
11	not connected	-	-
12	not connected	-	-
13	13.8V+	Red	25
14		White	11
15	0V-	Black	13
All remaining 25-way D-Range pins are not connected.			

On the 25-way D-range, pins 3 and 14 each have two wires connected.

7.2.5 Installation Kit Cable (TA703-11-7010) IPN 219-03115-00

This cable connects the Change Over Module to a TB7100 base station. The 15-way D-range connects to the Change Over Module and the 25-way D-range connects to back of the TB7100

The cable length is 900mm.

Parts List

Item	Description	Quantity	Supplier	Supplier part
1	SKT 15wy drng 125° pnl mtg	1	Tait	240-02010-54
2	CONN 15wy hood cvr drng MDJ15	1	Tait	240-06010-18
3	SLVG Si rbr 1.5mm	0.05m	Tait	400-00020-05
4	CBL 6 Pair mult shld Data	0.9m	Tait	206-00010-25
5	PLG 25wy drng sldr cup RoHS	1	Tait	240-00053-00
6	CONN 25wy hood cvr drng	1	Tait	240-06010-17

D-range Wiring - 219-03115-00

The following table describes the wiring of the 15-way and 25-way D-range connectors on this cable

15-way pin	function	Wire colour	25-way pin
1	Rx Audio +	Brown	1
2	Rx Audio -	Red	4
3	Tx Audio +	Orange	5
4	Tx Audio -	Yellow	8
5	Rx Gate	Green	14
6	--		
7	Tx Key	Violet	15
8	--		
9	--		
10	--		
11	--		
12	--		
13	+13.8V	Blue	25
14		Grey	9
15	Ground	Black/braid	13
			pin 2 (linked to pin 10)
All remaining 25-way D-range pins are not connected			

7.2.6 Installation Kit Cable (TA703-11-8010) IPN 219-03460-00

This cable connects the Change Over Module to a TB8100 base station. The 15-way D-range connects to the Change Over Module and the 25-way D-range connects to back of the TB8100

Note that the cable length is 900mm.

Parts List

Item	Description	Quantity	Supplier	Supplier part
1	SKT 15wy drng 125° pnl mtg	1	Tait	240-02010-54
2	CONN 15wy hood cvr drng MDJ15	1	Tait	240-06010-18
3	SLVG Si rbr 1.5mm	0.05m	Tait	400-00020-05
4	CBL 6 Pair mult shld Data	0.9m	Tait	206-00010-25
5	PLG 25wy drng sldr cup RoHS	1	Tait	240-00053-00
6	CONN 25wy hood cvr drng	1	Tait	240-06010-17

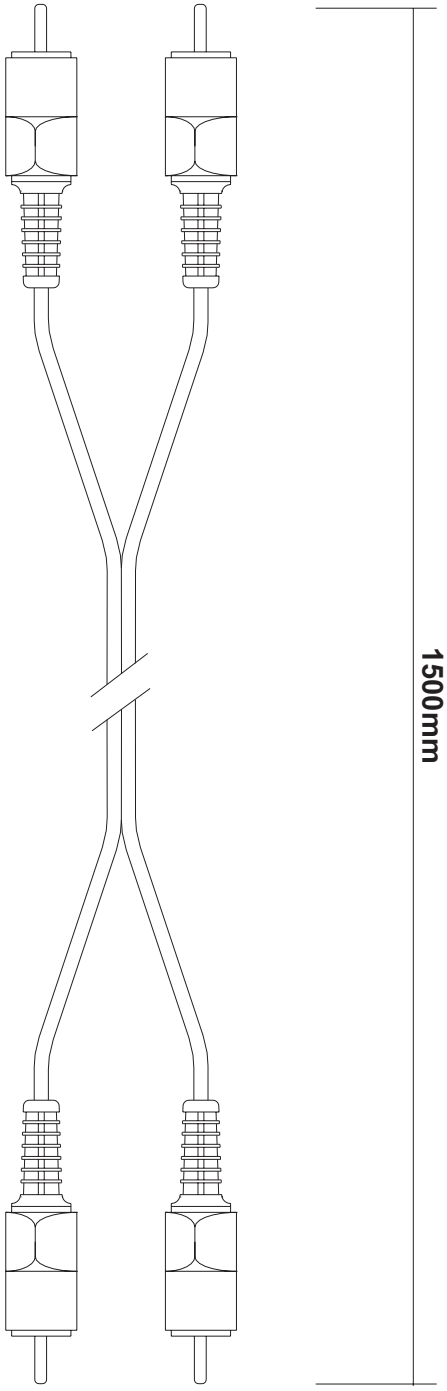
D-range Wiring - 219-03460-00

The following table describes the wiring of the 15-way and 25-way D-range connectors on this cable

15-way pin	function	Wire colour	25-way pin
1	Rx Audio +	Black	1
2	Rx Audio -	Brown	2
3	Tx Audio +	Red	6
4	Tx Audio -	Orange	7
5	Rx Gate	Green	9
6	Low Forward Power	Violet	11
7	Tx Key	Dark Blue	pin 10 (linked to pin 23)
8	High Reverse Power	White	12
9	--		
10	--		
11	--		
12	--		
13	+13.8V	Grey	13
14		Yellow	8
15	Ground	Pink/braid	4
All remaining 25-way D-range pins are not connected			

7.2.7 Power Monitor Kit Cable IPN 219-00025-82

This cable connects the power monitor to the forward and reverse power outlets of the Change Over Module. One cable connects the power monitor to Base A, the other to Base B. The black (or white) connectors indicate forward power, the red connectors indicate reverse power.



Parts List

Item	Description	Qty	Supplier	Supplier Part
1	Cable twin phono/phono red/black (or white)	1	SI Components	CA1042