

TA2922 TM8000/TM9000 Universal Line Interface Board Installation Instructions

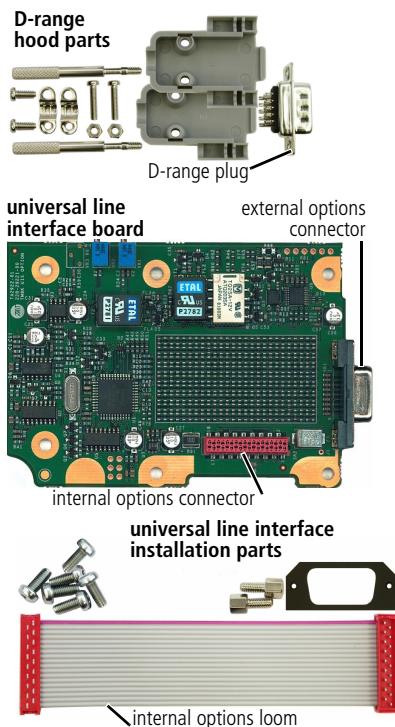


Introduction

The TA2922 universal line interface board is fitted into the TM8000 and TM9000 radios and is functionally equivalent to the AM8000-UIS manufactured by Tait Australia. It features hardware and software-configurable options for features such as phantom DC keying options, tail and anti-kerchunker timers and a flexible supply voltage monitoring alarm.

Available variants are:

- 8-wire isolated line interface (TA2922-01)
- 2-wire line interface (TA2922-02)
- 6-wire line interface (TA2922-03)
- 6-wire balanced line interface with unbalanced speaker output (TA2922-04)
- 6-wire marine line interface (TA2922-05)
- 6-wire -10dBm line interface (TA2922-06)



The TA2922 kits provide the following items:

- TA2922-xx PCB assembly
- 18-way micromatch loom
- D-range foam seal
- D-range hood parts
- D-range screw locks (x2)
- M3x8 taptrite screws (x6)

The interface board fits inside the radio in the options cavity and is connected to the main PCB by the internal options loom. The 9-way D-range connector mounted on the interface board fits through the external options connector hole provided in the radio chassis.

A configurable matrix allows the integrator to allocate any of 26 different I/O signals to any of the nine pins on the external 9-way D-range socket.

Important: The radio does not meet the IP54 protection standard once a TA2922 board has been installed.

Installation Precautions

This equipment contains devices that are susceptible to static charges. The procedures outlined in this installation guide should therefore be carried out in a static-safe environment. You can obtain information on antistatic precautions and the dangers of electrostatic discharge (ESD) from standards such as ESD S4.1-1997 (revised) or BS EN 100015-4 1994. The Electrostatic Discharge Association website is <http://www.esda.org/>.

Installation

- 1 Program the radio. We recommend you do this prior to board installation to isolate any hardware problems introduced during board fitting.

Ensure the TM8000/TM9000 radio is programmed with the following settings:

Programmable I/O form, Digital tab

Pin	Direction	Label	Action	Active	Debounce	Signal State	Mirrored
IOP_GPIO1	Input	PTT	External PTT 1	Low	10	None	None
IOP_GPIO2	Output	BUSY	Signalling Audio Mute Status	Low	None	None	None

If line interface enable/disable control is needed, set the following:

Pin	Direction	Label	Action	Active	Debounce	Signal State	Mirrored
IOP_GPIO4	Output	DISABLE	F1 Key Status	Low	None	Latching	None

Programmable I/O form, Audio tab

Rx/PTT Type	Tap In	Tap In Type	Tap In Unmute	Tap Out	Tap Out Type	Tap Out Unmute
Rx	None	A-Bypass In	On PTT	R7	D - Split	Busy Detect
EPTT1	T5	A-Bypass In	On PTT	None	C-Bypass Out	On PTT

PTT form, External PTT (1) tab

Field	Setting
Advanced EPTT1	PPT Transmission Type
	Audio Source

- 2 Configure the external D-range SK1 signals if required.

The available TA2922 variants have different signals available on the external D-range connector SK1, determined by the factory fitting of the top-side zero ohm resistors to a 26x9 matrix.

The external options connector SK1 pin out details for the available variants are:

Pin	TA2922-01 8-wire -10dBm in, -10dBm out	TA2922-02 2-wire -10dBm in, -10dBm out	TA2922-03 6-wire -14dBm in, -2dBm out	TA2922-04 6-wire -14dBm in	TA2922-05 6-wire -0dBm in, -0dBm out	TA2922-06 6-wire -10dBm in, -10dBm out
1	LINE OUT 1	LINE IN/OUT 1	LINE OUT 1	Speaker out	LINE OUT 1	LINE OUT 1
2	GATE OUT 1	LINE IN/OUT 2	GND	GND	GND	GND
3	GND	—	GND	GND	GND	GND
4	PTT IN +	—	+13V8_SW	+13V8_SW	+13V8_SW	+13V8_SW
5	LINE IN 1	GND	LINE IN 1	LINE IN 1	LINE IN 1	LINE IN 1
6	LINE IN 2	—	LINE IN 2	LINE IN 2	LINE IN 2	LINE IN 2
7	PTT IN -	—	PTT IN	PTT IN	PTT IN	PTT IN
8	GATE OUT 2	RADIO DATA IN	GATE OUT	GATE OUT	GATE OUT	GATE OUT
9	LINE OUT 2	RADIO DATA OUT	LINE OUT 2	GND	LINE OUT 2	LINE OUT 2

The D-range signals can also be field-configured by applying solder links to the 26x9 matrix on the bottom of the board. The matrix has a printed table with columns labelled with the associated SK1 D-Range pin number, and rows labelled with the signal letter, as shown below. Fit a solder link at the intersection of the required pin number and signal.

For example, to configure SK1 pin 5 as ground, fit a solder link to the bottom-side matrix at the intersection of row C and column 5.

Important: Before fitting solder links to the bottom side of the matrix, remove existing components from the top side of the matrix or check carefully that existing links do not conflict with newly populated solder links on the bottom side. Failure to do so may result in unexpected operation or permanent damage to the TA2922 interface.

Signal	Signal Name	Description	Direction (relative to TA2922)	Level
A	LINE OUT 1	Balanced line output (6/8-way) /balanced line in/out (2-way)	Output	-30 to +10dBm into 600 ohms
B	/GATE OUT 1	RX gate output via relay contacts, configurable	Output	0-50VDC @1A
C	GROUND	Analogue/DC ground	Bidirectional	0V
D	/PTT IN 1	PTT input to opto-coupler	Input	10-50VDC
E	LINE IN 1	Balanced line input (6/8-way)	Input	-30 to +5dBm
F	LINE IN 2	Balanced line input (6/8-way)	Input	-30 to +5dBm
G	/PTT IN2	PTT input to opto-coupler	Input	10-50VDC
H	/GATE OUT 2	RX gate output via relay contacts, configurable	Output	0-50VDC @1A
I	LINE OUT 2	Balanced line output (6/8-way) /balanced line in/out (2-way)	Output	-30 to +10dBm into 600 ohms
J	+13V8_SW	Switched DC supply output	Output	10.8-16VDC @150mA
K	AUX MIC AUD	Mic audio directly to the radio aux microphone input	Input	2.3VDC 15mV RMS
L	RSSI	Analogue RSSI output from the radio	Output	0-3VDC
M	LINE IN UNBAL	Unbalanced transmitter audio input	Input	8mV to 1V RMS
N	LINE OUT UNBAL	Unbalanced receiver audio output	Output	25mV to 1V RMS
O	GATE OUT DIRECT	Open collector RX gate output	Output	45VDC max
P	PTT DIRECT	Un-isolated PTT input	Input	5VDC max
Q	EXT GPIO3	Bidirectional I/O to/from radio	Bidirectional	0-3.3VDC
R	EXT GPIO4	Bidirectional I/O to/from radio and line interface disable	Bidirectional	0-3.3VDC
S	EXT GPIO5	Bidirectional I/O to/from radio	Bidirectional	0-3.3VDC
T	EXT GPIO6	Bidirectional I/O to/from radio	Bidirectional	0-3.3VDC
U	EXT GPIO7	Bidirectional I/O to/from radio	Bidirectional	0-3.3VDC
V	RADIO DATA IN	Data to microcontroller (RS-232 level)	Input	-10 to +10V
W	RADIO DATA OUT	Data from microcontroller (RS-232 level)	Output	-10 to +10V
X	RTS IN	RTS input to microcontroller (RS-232 level) [not yet implemented]	Input	-10 to +10V
Y	CTS OUT	CTS output from microcontroller (RS-232 level) [not yet implemented]	Output	-10 to +10V
Z	AUX I/O	AC coupled line to J1, can connect to radio speaker output via internal wire	Bidirectional	N/A

- Fit other additional solder links if required.

Other available configuration solder links are:

- 2/6/8-wire operation
- keying options
- gate out relay operation
- software profile configurations.

These bottom-side solder link pads can alternatively be fitted with top side machine-populated 0603 resistors. The table below indicates the hardware variants and the relationship between bottom side solder link pads and top side resistor locations. Note that some solder link pads are 2-way while others are 3-way links.

Solder link	SMD resistor	Description
LK1 1-2	R46	Connect normally open relay contact to /GATE OUT 1
LK1 2-3	R78	Connect normally closed relay contact to /GATE OUT 1
LK4	R62	Enable RX line audio from line TX pair (2-wire line operation)
LK5 1-2	R82	Connect 2-wire line transformer centre tap to RX gate relay output
LK5 2-3	R80	Connect 2-wire line transformer centre tap to optocoupler input
LK6 1-2	R77	Connect normally open relay contact to /PTT IN 1
LK6 2-3	R76	Connect normally closed relay contact to /PTT IN 1
LK7	R65	Connect +13.8V to relay common and /GATE OUT 2
LK8	R81	Connect half of optocoupler input and /PTT IN 2 to DC ground
LK9	R42	Select configuration profile 2 (if enabled in programming)

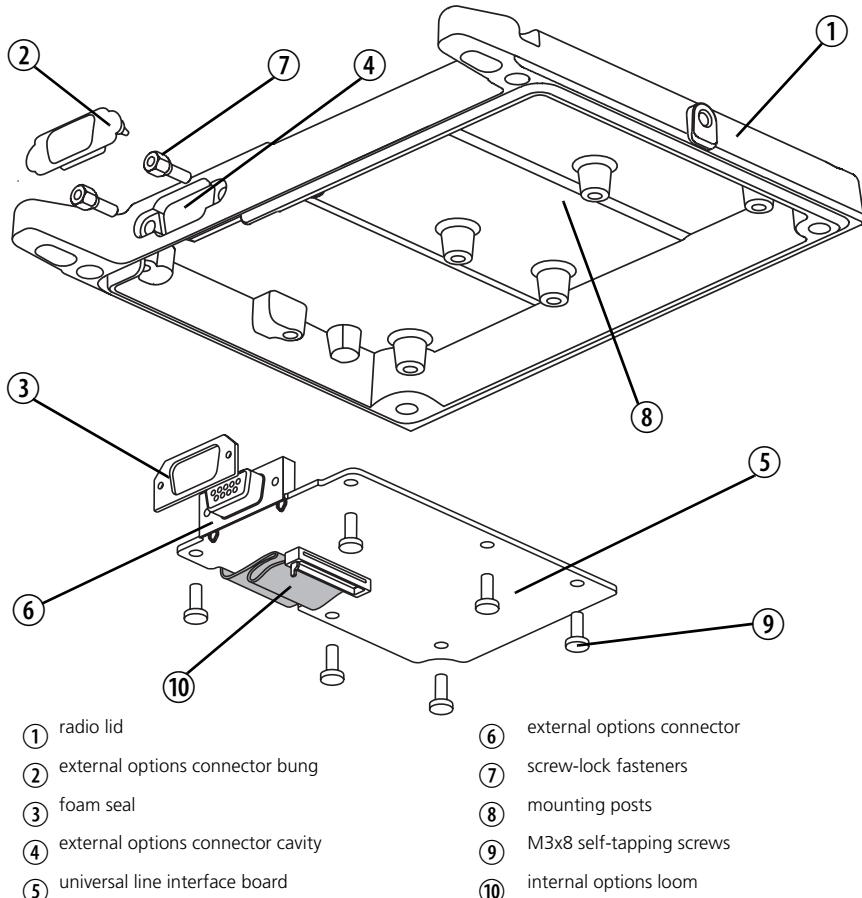
- To fit the board, refer to the following diagram for item numbering. Remove the top cover and lid ① from the radio to access the options cavity.
- Remove the external options connector bung ②, if it is fitted.
- On the inside of the radio lid place the foam seal ③ over the external options connector cavity ④.
- With the top side of the universal line interface board ⑤ facing the radio lid, guide the external options connector ⑥ into the external options connector cavity.
- Screw the external options connector to the radio lid using the two screw-lock fasteners ⑦.
- Tighten the fasteners to a torque of 0.9N·m (8lbf·in).

Important: The external options connector screw-lock fasteners must be tightened correctly before screwing the universal line interface board onto the mounting posts ⑧.

- 10 Screw the universal line interface board to the mounting posts on the radio lid using six M3x8 self-tapping screws ⑨. Tighten the M3x8 screws to a torque of 1.9N·m (17lbf·in)

Important: For the universal line interface board to be installed correctly in the radio's options cavity, the internal options connector loom ⑩ must be looped in the way shown in the diagram.

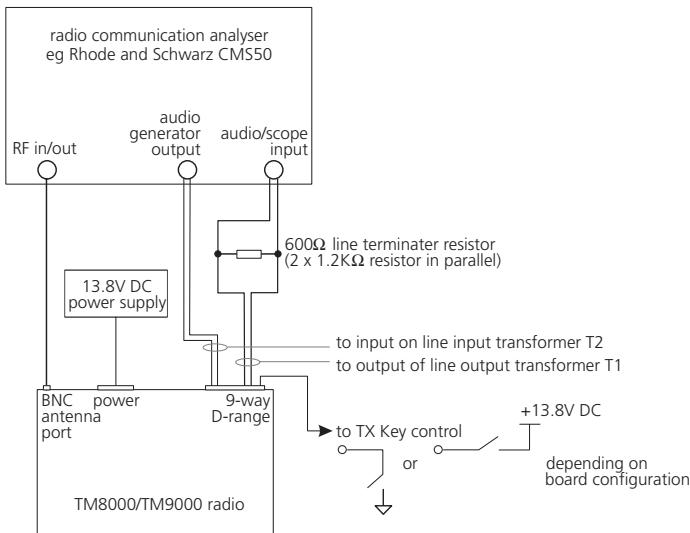
- 11 Plug the unattached end of internal options connector loom ⑩ into the internal options connector on the radio main PCB.



- 12 Configure the line input and output audio level adjustments VR1 and VR2.
 Audio levels are factory preset depending on the variant and do not need adjusting unless you want to change from the factory default.

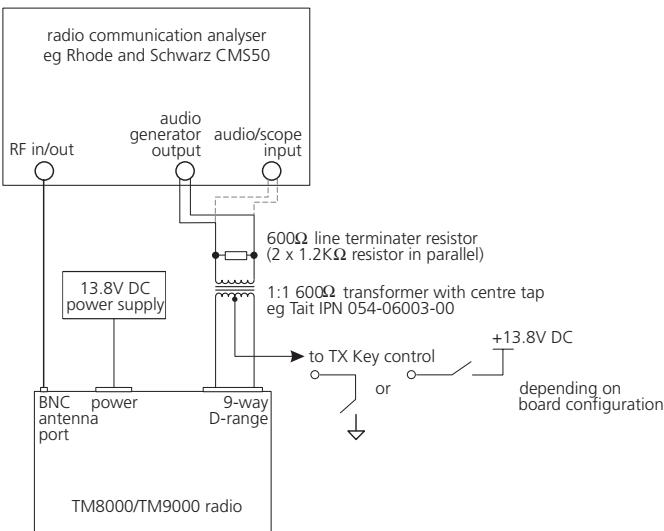
6/8-wire equipment setup

Test equipment set up as described below is required to measure and adjust line audio levels in a 6-wire or 8-wire configuration with separate E&M keying.



2-wire equipment setup

Similar equipment set up is required to measure and adjust line audio levels in a 2-wire configuration with centre tap or ‘phantom’ DC keying, though a 1:1 600 ohm line transformer with a centre tap is required.



Setting line output level (VR1)

- 13 Connect the radio to the instruments as shown in the diagram.
- 14 Set the radio communications analyser to generate an on-signal frequency at a level of -70dBm. Modulate with a 1kHz tone at a level of 60% system deviation (1.5kHz for narrow band, 3kHz for wide band).
- 15 Ensure there is a 600 ohm termination resistor fitted across the two balanced line out audio wires.
- 16 Monitor the audio level using the communications analyser and adjust RV1 on the TA2922 interface to achieve the desired output level.

Setting line input level (VR2)

- 17 Connect the radio to the instruments as shown in the diagram.
- 18 Set the radio communications analyser to monitor the radios RF transmission.
- 19 Set the audio generator to produce a 1kHz audio tone at the desired level.
- 20 Activate the TX key input to the TA2922 interface to set the radio to transmit.
- 21 Monitor the transmitter deviation using the communications analyser and adjust RV2 on the TA2922 interface to achieve 60% system deviation (1.5kHz for narrow band, 3kHz for wide band).

Setting talk-through level (VR3)

Important: This feature cannot be used when the TA2922 is operating in 2-wire mode as it may cause audio oscillations or instability.

- 22 Fit VR3 (IPN 040-06000-00) to the TA2922 interface by soldering in the three component leads.
- 23 Align both the line in and line out audio levels as described in the previous section.
- 24 Disable the RF output of the communications analyser so that the radio is in an idle state (not transmitting and not receiving a RF signal).
- 25 On the communications analyser, generate a 1kHz tone at the nominal audio level, connect this to the TA2922 line input.
- 26 Ensure there is a 600 ohm termination resistor fitted across the two balanced line out audio wires.
- 27 While continuing to generate the 1kHz tone, monitor the TA2922 line output on the communications analyser.
- 28 Adjust VR3 on the TA2922 line interface to set the desired talk through audio level.
- 29 Refit the radio lid and top cover to the radio.

Additional programming

Additional line interface parameters can be programmed using the TA2922 PGM-UIS programming software.

The TA2922 universal interface board will not generally require programming with the PGM-UIS application, as factory default settings will suit a majority of applications.

To change the factory defaults, download the PGM-UIS programming application from the support area of the TaitWorld website <http://www.taitworld.com/technical/>.

The download is available from Custom Solutions > Programming Applications after logging in.

To operate the PGM-UIS, refer to the TA2922 Service Manual (MAS-02922-01-xx). The service manual is available from TaitWorld technical support website

<http://www.taitworld.com/technical/> under Custom Solutions > Documentation - Service.