

RT 9080 Manual Supplement

For additional information dealing with the radio section please consult the RT 9000 manual .

Nov. 28, 2001

RF-Tel Communications Ltd

RT 9080 Radio Telephone

General:

The RT9080 Unit was designed to provide continued support for the popular RT8150 RadioTelephone. It consists basically of an RT9000 VHF / UHF radio with an interface board that allows the radio to be connected either 4W E&M or onto which a regular RT8150 Sub or CO controller board can be mounted in piggyback fashion. Depending on the controller board mounted, the RT9080 operates as an RT8150 Subscriber unit or an RT8150Central Office unit. The RT9080 can also be connected 4W E&M to a carrier system. In this case the C.O. is split into two units, the RT9080 E&M Radio which connets from the remote carrier site to the Subscribers and the RT9080 E&M controller which connects at the local carrier site to the two wire line. Because of the inband signaling used, 4 line partyline operation is maintained. The radio parameters of the RT9080 are programmable via a personal computer using RF-Tel's setup program. The RT9080 also has the signal strength indication feature of the RT9000. All audio connections such as Tip and Ring and 4W E&M are accessible on the DB-15 connector at the rear of the unit; the two-wire telephone line is also connected to a modular phone plug at the front panel. Programming the radio is via the DB-15 connector.

The RT9080 interface boards supports the following configurations selectable via four links.

- RT8150 Subscriber New designation RT9080 Subscriber
- RT 8150 Central Office New designation RT9080 C.O.
- RT8150 E&M Radio New designation RT9080 E&M Radio
- RT 8150 E&M Controller New designation RT9080 E&M controller

Link positions for Rev. 0 Interface boards

E&M Controller				E&M Radio				Sub / C.O.			
J1	J2	J3	J4	J1	J2	J3	J4	J1	J2	J3	J4
■	■	□	■	□	□	■	□	□	□	□	□
■	■	□	■	□	□	■	□	■	■	■	■
□	□	■	□	■	■	□	■	■	■	■	■
□	□	■	□	■	■	□	■	□	□	□	□

Link positions for Rev. 1 Interface boards

E&M Controller				E&M Radio				Sub / C.O.			
J1	J2	J3	J4	J1	J2	J3	J4	J1	J2	J3	J4
■	■	■	■	□	□	□	□	□	□	□	□
■	■	■	■	□	□	□	□	■	■	■	■
□	□	□	□	■	■	■	■	■	■	■	■
□	□	□	□	■	■	■	■	□	□	□	□

Programming:

When programming new parameters from a computer via the setup software, make sure to first upload the existing data from the unit's EEPROM into the computer, otherwise all preset parameter such as power output, deviation, reference oscillator and fronted tuning are lost.

Setup Program:

The sections of the setup program that are applicable to the RT9080 are:

Page 1 (F8): Transmit frequency, Receive frequency

Page 2 (F9): Frontend tuning, Transmit Deviation, Output Power , Ref Oscillator Rx and Tx

(Download the latest setup software from the RF-Tel web-site <rftel.com>)

Uploading: To upload existing radio parameters from the EEPROM to the computer proceed as follows: With the radio turned off, on the computer press F3 and then F7. Now turn on the radio. The uploading progress can be monitored on the computer screen and is completed when the display returns to the setup page .

Programming frequencies on the RT9080 is done via the setup software from a personal computer in a similar way as programming frequencies on the RT9000, the main difference is that, for programming, the radio does not need to be turned off, simply use function keys F4 and F7 to download the changed frequencies.

Programming power output, TCXO fine tuning and Frontend tuning can be done from the computer by repeatedly downloading new parameters while observing the resulting power, frequency and sensitivity changes. Use function keys F4 and F7. Do not switch off the unit between these downloads. A delay of approximately 3 seconds exists between downloading and the new parameters taking effect.

An alternate method of programming parameters that require interactive feedback is to connect the radio to an RT9000 controller board and use the handset programming. When using this method it is necessary to temporarily install the EEPROM on the RT9000 controller board and re-install it on the RT9080 interface board after programming is completed.

RT9080 E&M Radio

General: The RT9080 E&M Radio has a 4W E&M interface which is accessible on a DB-15 connector at the rear of the unit. The RT9080 E&M Radio in conjunction with the RT9080 E&M Controller fully supports the RT8000 C.O. partyline functions such as Tip or Ring ringing over a carrier system. For repeater operation, two RT9080 E&M Radios are connected back to back via a repeater cable. When connecting the radio 4W E&M to a carrier, the audio levels are adjusted to +7dBm and -16dBm. For back to back repeater operation, the Rx / Tx audio levels are adjusted to 1VPP.

Functionality:

- A ground on the E' lead (pin 2 of the DB 15 connector) keys the transmitter.
- Transmit 4W audio is on pins 4 and 12; level is preset for 3.5kHz deviation with +7dBm input.
- Receive 4W audio is on pins 3 and 10; level is preset to -16dBm output at 3.5kHz deviation.
- Receive COR activates the 'M' relay which places a short between pins 1 and 9 ('M' lead).

Test procedure

- Connect the RT9080 E&M radio using the test setup of fig.1
- Set the Marconi test set to the receive frequency modulated with 3.5 kHz deviation at 1kHz. The 'M' relay on the interface board should energize; this can be verified by pins 1 and 9 on the DB 15 connector being shorted or, if using the test setup below, by the 'M' relay indication LED turning on.
- The audio level at pins 3 and 10 of the DB15 connector should be -16dBm (125mV RMS). Adjust VR 1 on the interface board if necessary.
- Inject a +7dBm (2.2VRMS 1kHz audio signal on pins 4 and 12 of the DB 15 connector and place a ground on the 'E' lead or, if using the test setup below, short pins 2 and 11 via a switch. Verify that the unit transmits at 3.5kHz deviation. Adjust VR 2 on the interface board if necessary.

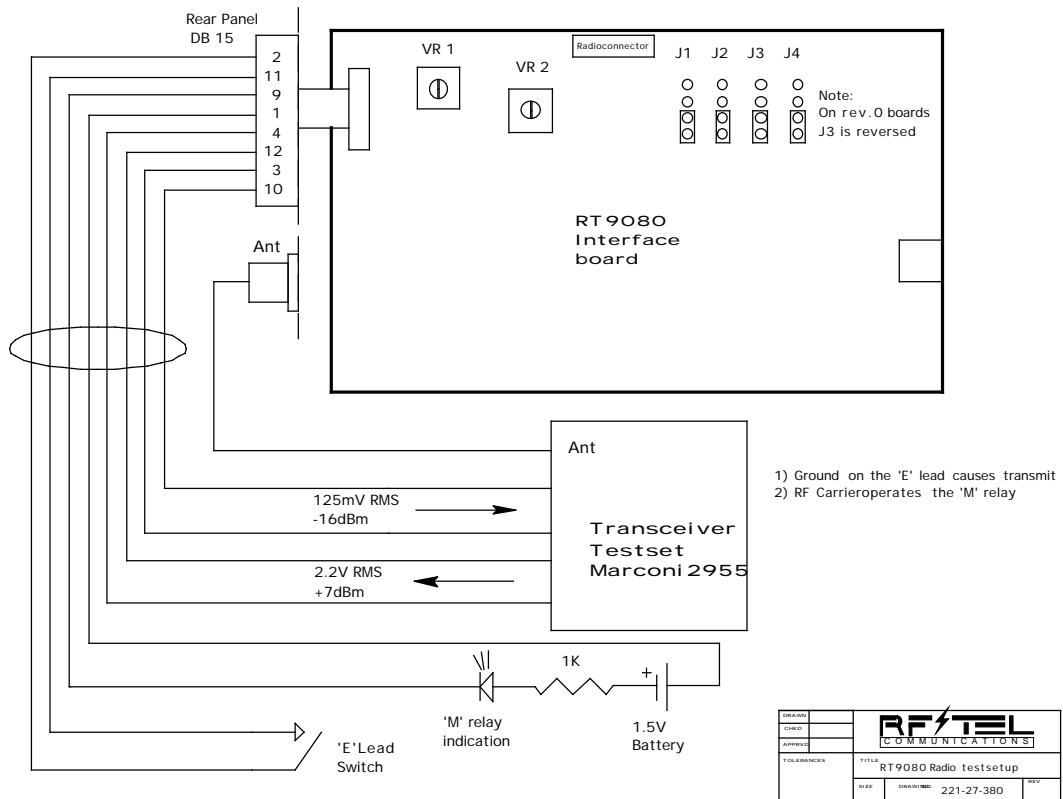
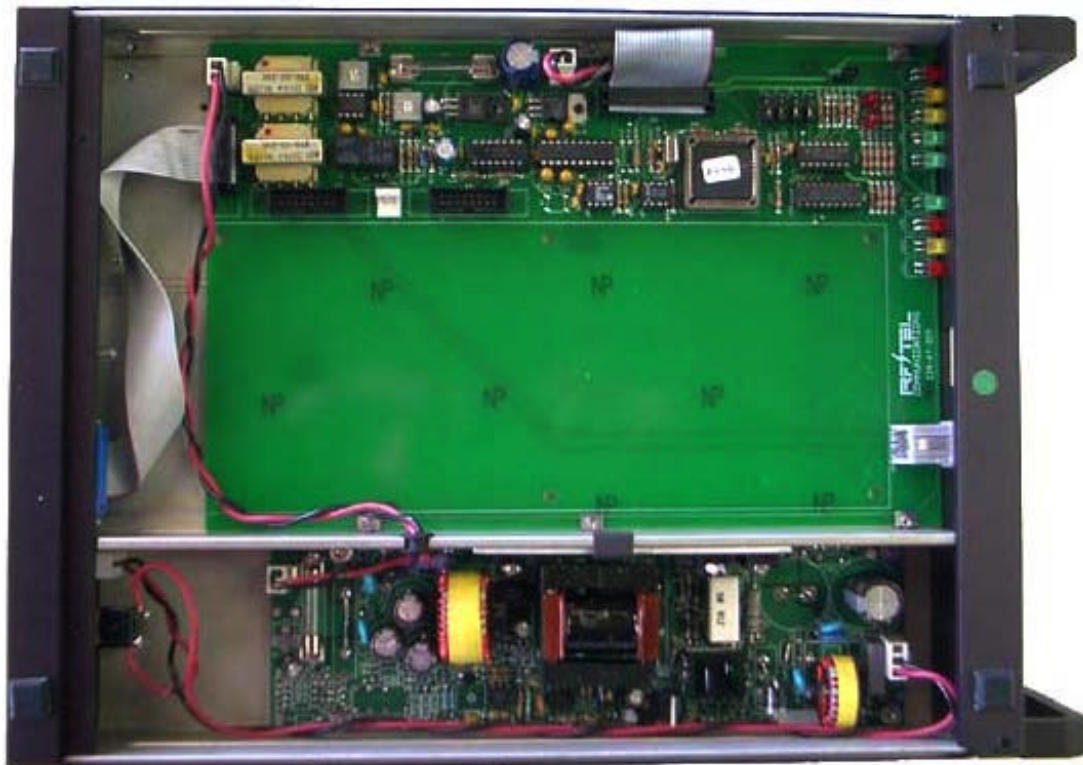


Fig. 1



RT9080 E&M Controller

General: The RT9080 E&M Controller consists of an RT8000 C.O. controller board mounted piggyback onto the 9080 interface board. The C.O controller board provides the regular RT8000 C.O. functions and the interface board provides the interface between the C.O. controller card and a 4 W E&M circuit. The 4 W E&M leads are accessible on a DB-15 connector at the rear of the unit.

Functionality:

- A ground on the 'E' lead (pin 2 of the DB 15 connector) causes the C.O. controller to go off hook
- 4W Transmit audio is on pins 4 and 12, level is preset at +7dBm to give 0dBm into the phone line
- 4W Receive audio is on pins 3 and 10; level is preset to -16dBm with 0dBm on the phone line.
- Ringing on the 2-wire phone line places a short between pins 1 and 9 of the DB-15 ('M' lead).

Test procedure

2W line to 4W Tx

- Connect the RT 9080 E&M controller using the test setup of fig.2
- Install the 'Tip test' link on the controller board and adjust VR1 for 1037Hz at TP-1, adjust VR3 for 1632Hz at TP-3. Remove the link.
- Install the 'Ring test' link, and adjust VR2 for 1289Hz at TP-2.
- Adjust VR1 on the 9080 interface board for 150mV RMS on the Level Meter.
- Verify that the 'M' LED is on. Remove the link.
- From the Audio Oscillator inject a 1kHz 0dBm (.7VRMS or 2.2VPP) audio signal into the telephone line
- Install SW 3 (Off hook/TX key) on the controller board and adjust the Tx level potentiometer for -16dBm (125mV RMS) on the Level Meter.

4W Rx to 2W line

- Set the Audio Oscillator level to +7dBm (2.2V RMS) and connect it to pins 4 and 12 of the DB-15 connector
- Activate the 'E' lead switch and verify that the 'M' relay indication LED turns on.
- On the 9080 interface board adjust the Tx audio level VR2 to 1VPP at TP2.
- On the controller board adjust the RX level potentiometer for 0dBm on the telephone line.

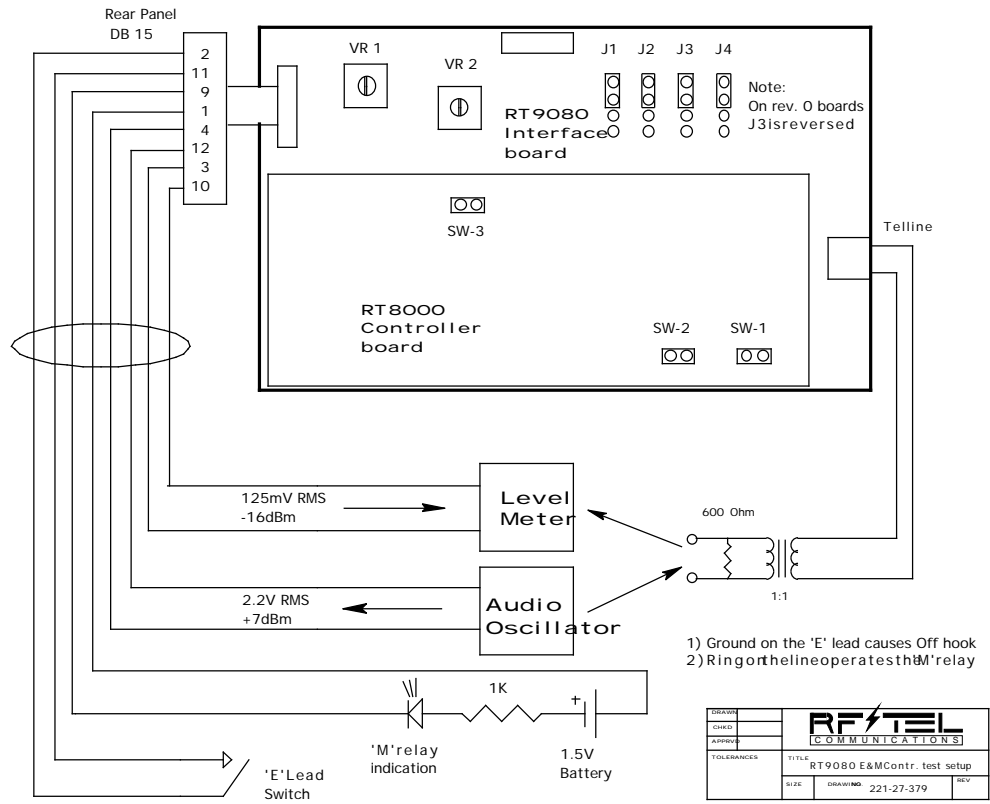
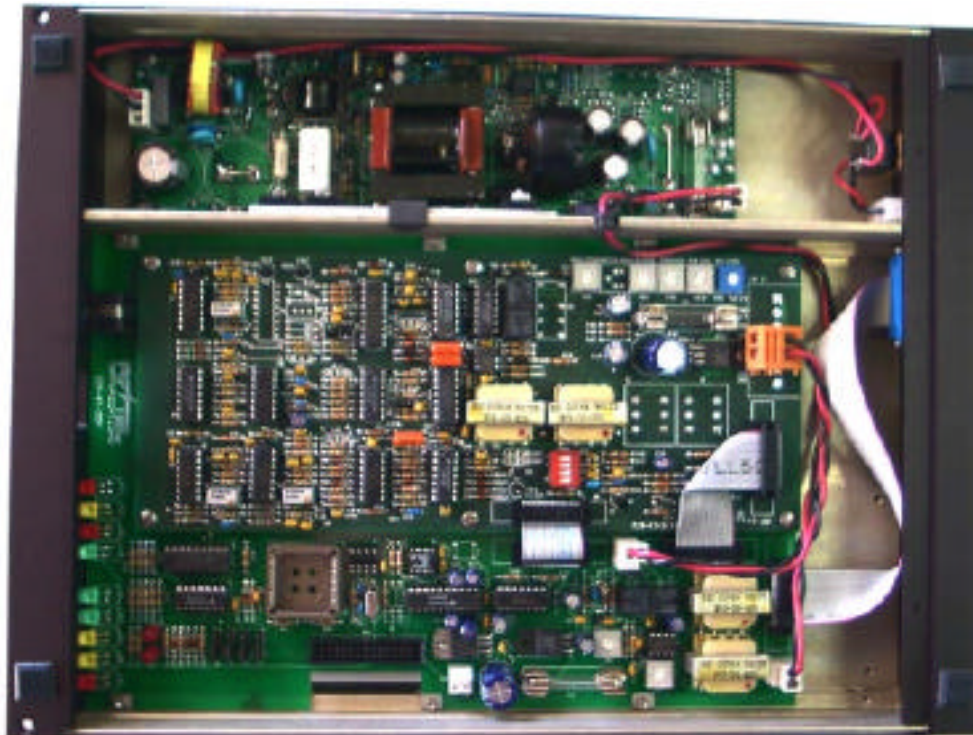


Fig. 2



RT9080 Central Office Radio

General: The RT9080 Central Office unit consists of an RT8000 C.O. controller board mounted piggyback onto the 9080 interface board. The C.O controller board provides the regular RT8000 C.O. functions and is connected to the radio via the interface board. Radio parameters are programmable from a PC.

Functionality:

- Functionally the unit operates like an RT8000 C.O.
- Ring detected between Tip and ground causes tones A&C to be transmitted
- Ring detected between Ring and ground causes tones A&B to be transmitted
- Receipt of a carrier causes the unit to go off hook and transmit
- Transparency is maintained for line reversals but not for CLID data

Test procedure

Tone level / Tx line level

- Install the 'Tip test' link on the controller board and adjust VR1 for 1037Hz at TP-1, adjust VR3 for 1632Hz at TP-3. Remove the link.
- Install the 'Ring test' link, and adjust VR2 for 1289Hz at TP-2.
- Inject a 1kHz 0dBm (.7VRMS or 2.2VPP) audio signal into the telephone line
- Install SW 3 (Off hook) on the controller board and adjust the Tx level for 3.5kHz deviation.

Rx line level (J3 on the interface board may be removed for this test to prevent Tx)

- Remove link SW3
- Inject an RF signal into the antenna modulated at 1kHz and 3.5kHz deviation
- Adjust the Rx line level for -4dBm into the line.
- Adjust Hybrid balance for minimum at TP-6

Ring detection

- Remove the RF signal from the antenna
- Re-install J3 if it was removed)
- Inject a 20Hz 75Vrms ring voltage between Tip and ground
- Verify that the transmitter turns on and dual tone combination A&C is transmitted
- Inject a ring voltage between Ring and ground
- Verify that the transmitter turns on and dual tones A&B are transmitted at +4kHz deviation

Links installed

LK5B, LK6B

Jumpers installed

LK1A, LK3B, LK10B, LK7A, LK8A

RT9080 Subscriber Radio

General: The RT9080 Subscriber Radio consists of an RT8000 Sub controller board mounted piggyback onto the 9080 interface board. The Sub controller board provides the regular RT8000 C.O. functions and is connected to the radio via the interface board. Radio parameters are programmable from a PC.

Functionality:

- Functionally the unit operates like an RT8000 Sub radio.
- An off hook condition causes the unit to transmit
- Depending on the tone combination received, it will ring Tip to ground or Ring to ground.
- Caller ID is not supported

Test procedure

Receive audio

- To prevent the transmitter from keying during receive tests, link 3 on the interface board may be removed.
- Inject an RF signal modulated with 1037 Hz at 3.5kHz deviation into the antenna
- Adjust VR1 on the controller board for maximum at TP1
- Change the modulating frequency to 1289Hz and adjust VR2 for maximum on TP2
- Change the modulating frequency to 1632Hz and adjust VR3 for maximum on TP3
- Change the modulating frequency to 1kHz and adjust the Rx line level for 0dBm on the line.

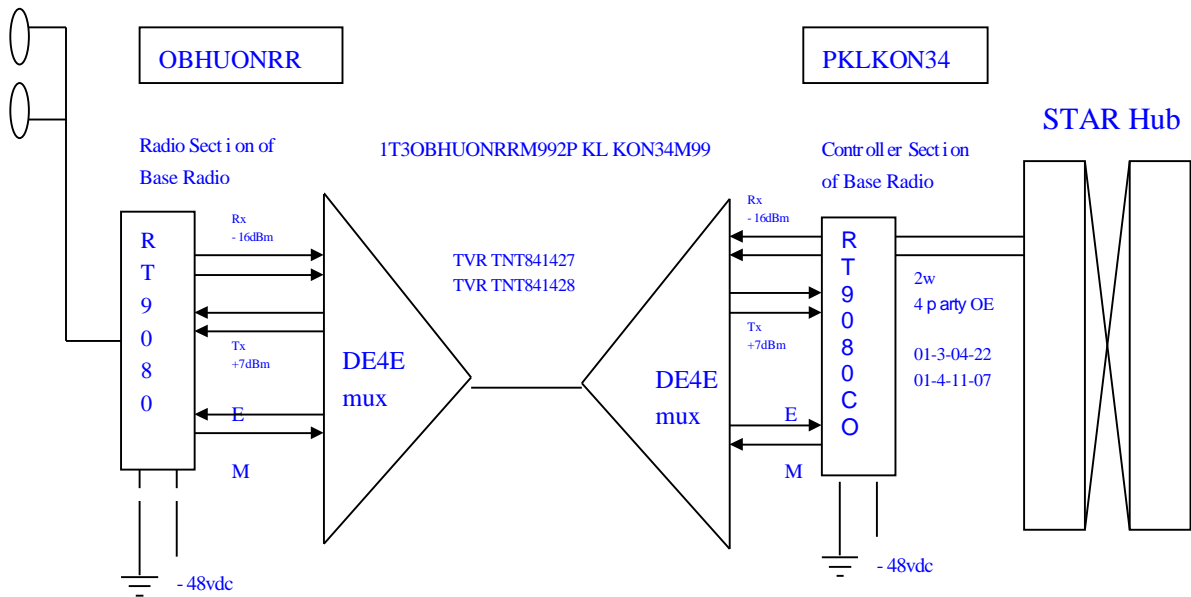
Transmit audio

- Install link 3
- Go off hook and inject a 1kHz 0dBm signal into the line.
- Adjust the Tx line level control for 3.5kHz deviation

Ring circuit

- Connect a telephone to the line
- Modulate the signal generator with dual tone combination A&B and verify that the phone rings ring to ground.
- Modulate the signal generator with dual tone combination A&C and verify that the phone rings tip to ground.

System Schematic Example



E & M Polarities for Trunk Signaling

Originating Office			Direction of Signal	Terminating Office		
Calling Subscriber or Trunk State	E Lead	M Lead		E Lead	M Lead	Calling Subscriber State
Trunk Idle	OPEN	GROUND	NONE	OPEN	GROUND	On Hook
Trunk Seized	OPEN	BATTERY	→	GROUND	GROUND	On Hook
Off Hook (Conversation)	GROUND	BATTERY	←	GROUND	BATTERY	Off Hook
On Hook (Disconnect)	GROUND	GROUND	→	OPEN	BATTERY	Off Hook
Trunk Disconnected	OPEN	GROUND	NONE	OPEN	GROUND	On Hook

RT9080 Repeater

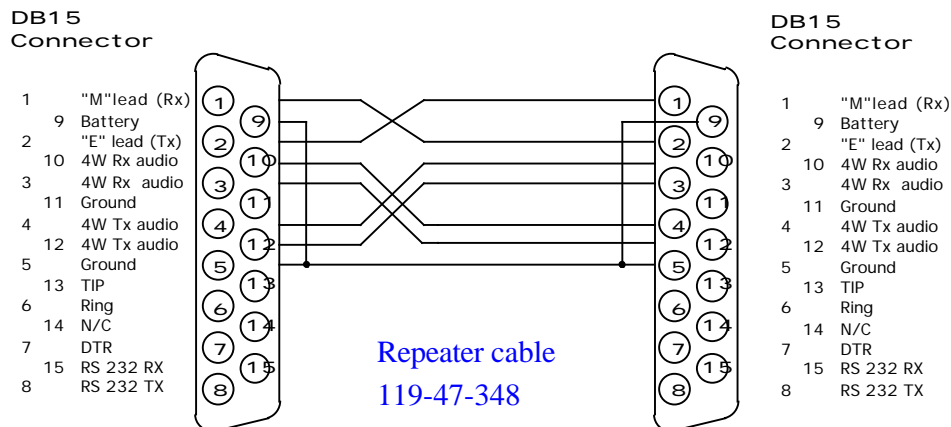
General

- To setup a cross repeater, connect two RT9080 E&M radios back to back using a repeater cable, part no: 119-47-348.
- Transmit 4W audio is on pins 4 and 12;
- Receive 4W audio is on pins 3 and 10. The Rx and Tx audio levels in the cable between the radios are 1VPP at 3.5 kHz deviation.
- Receive COR of one radio activates the 'M' relay which places a ground on pin 2 of the DB15 of the other radio (Tx key).



Test procedure

- Connect the RT9080 Repeaters back to back via a repeater cable.
- Terminate radio no. 2 into an RF load
- Inject a receive signal modulated with 1kHz at 3.5 kHz deviation into radio no 1.
- On the interface board of radio no 1 adjust VR-1 for 1VPP at TP-1.
- On the interface board of radio no 2 adjust VR-2 for 3.5 kHz deviation.
- Repeat the above in the other direction



RearPanel

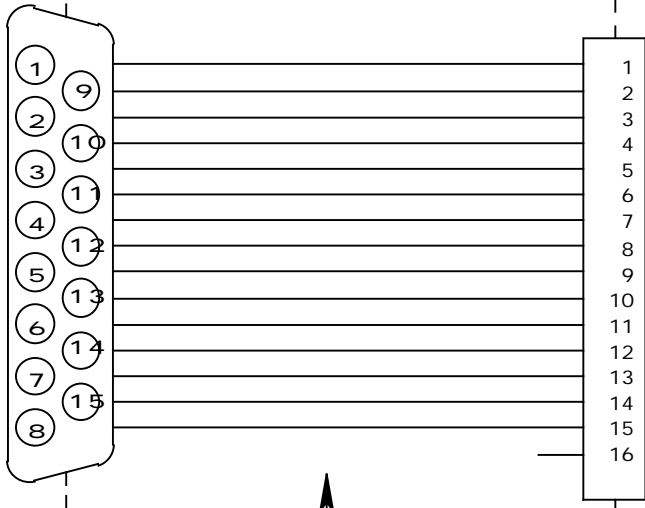
ControllerPCB

DB15 RearPanel Connector

16PinPCBHeader

- 1 "M" lead (Rx)
- 9 Battery
- 2 "E" lead (Tx)
- 10 4W Rx audio
- 3 4W Rx audio
- 11 Ground
- 4 4W Tx audio
- 12 4W Tx audio
- 5 Ground
- 13 TIP
- 6 Ring
- 14 N/C
- 7 DTR
- 15 RS 232 RX
- 8 RS 232 TX

- 1 "M" lead (Rx)
- 2 Battery
- 3 "E" lead (Tx)
- 4 4W Rx audio
- 5 4W Rx audio
- 6 Ground
- 7 4W Tx audio
- 8 4W Tx audio
- 9 Ground
- 10 TIP
- 11 Ring
- 12 N/C
- 13 DTR
- 14 RS 232 RX
- 15 RS 232 TX
- 16 GND



Ribbon Cable

DRAWN		RF TEL COMMUNICATIONS
CHKD		
APPRVD		
TOLERANCES	TITLE DB15to16pinheadercableassy	
	SIZE	DRAWING NO. 631-27-127
		REV

RT 9080 Interface Board Parts list

250-00-123	DIODE	1N 4148	1N 4148	4
250-00-128	LED, RED		MV6053	5
250-00-130	LED, YELLOW		MV6353	3
250-00-131	LED GREEN		QL332GD	3
280-00-125	INTEGRATED CIRCUIT, QUAD NOR GATE		4001BE	1
280-00-126	INTEGRATED CIRCUIT, BUFFER		ULN2804	1
280-00-135	INTEGRATED CIRCUIT, VOLT. REGULATOR		MC7810	1
280-00-141	INTEGRATED CIRCUIT, VOLT. REGULATOR		MC7805	1
280-00-178	INTEGRATED CIRCUIT, OP AMP		MC3403	1
280-00-179	INTEGRATED CIRCUIT, MICRO-PROCESSOR		MC68HC711E9CFN2	1
280-00-195	INTEGRATED CIRCUIT, RS 232 TRANSCEIVER		MC145407	1
280-00-204	INTEGRATED CIRCUIT, EEPROM		93C56	1
280-00-246	INTEGRATED CIRCUIT AUDIO AMPLIFIER		MC34119	1
280-00-999	INTEGRATED CIRCUIT RESET CHIP		DS1705	1
310-00-201	TRANSFORMER, HYBRID		RF-TEL	2
350-00-101	RELAY, DPDT OMRON		(G2VN-234P-US-DC12)	1
410-00-102	RESISTOR 1/4WATT 5%		1K	3
410-00-103	RESISTOR 1/4WATT 5%		10K	2
410-00-104	RESISTOR 1/4WATT 5%		100K	6
410-00-106	RESISTOR 1/4WATT 5%		10M	1
410-00-151	RESISTOR 1/4WATT 5%		150	1
410-00-153	RESISTOR 1/4WATT 5%		15K	1
410-00-471	RESISTOR 1/4WATT 5%		470	11
430-00-203	POTENTIOMETER		BOURNS 3386F(P)-1-502	2
510-00-160	CAPACITOR, MONOLYTIC NPO		AVX NPO SR151A270JAA	2
530-00-101	CAPACITOR, TANTALUM		AVX TAP105K035SCS	2
530-00-103	CAPACITOR, TANTALUM		LXF25VB10RM4X7LL	5
530-00-108	CAPACITOR, ELECTROLYTIC RADIAL		UVX1E102MHA	1
530-00-110	CAPACITOR, ELECTROLYTIC RADIAL		100uF/25V	3
620-00-101	FUSE 8A		8A	1
710-00-520	I/C SOCKET,		AUG ICO 143-S8A	2
710-00-522	I/C SOCKET,		AUG ICO 183-S8A	1
710-00-545	CONNECTOR, HEADER LINK		PROLEX 2556P02TA00	1
710-00-558	I/C SOCKET,		AUG ICO 083-S8A	2
710-00-580	TELEPHONE JACK PROLEX		PROLEX 7621-0604WA	1
710-00-601	CONNECTOR BOX HEADER		PROLEX 3575P16VUAO	3
710-00-606	IC SOCKET PLCC 52 PIN		AUGAT PCSZT-052A-1	1
710-00-635	CONNECTOR BOX HEADER		PROLEX 3575P26VTAO	1
710-00-643	CONNECTOR, MALE POWER. PC MOUNT		PROLEX 3941P03V000	1
710-00-649	CONNECTOR, SINGLE ROW HEADER		PROLEX 2556P40TA00	1
730-00-208	TERMINAL BLOCK, 2 POSITION		ELSON 33206	2