

## GENERAL

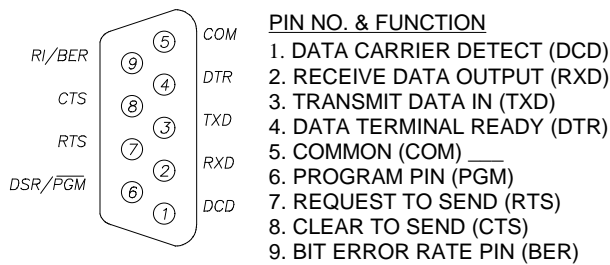
The Trio DataCom Pty Ltd TC-450DR is a Half Duplex 400 MHz Radio featuring a fully integrated 4800/9600 bps Data Radio Modem. Configuration of the unit is fully programmable, with parameters held in non volatile memory (NVRAM). All configuration parameters are accessible using the TC-DRPROG installation package, consisting of a programming lead, manual and software which will run on a PC under Windows 95/98/NT. It is essential that each unit is programmed to suit individual requirements prior to operation. For detailed information refer to the TC-450DR Handbook.

## DATA CONNECTION

The data connection is via a DB9 connector labeled 'Port A' (shown below), which is wired as a DCE.

### User Serial "Port A" Pin Assignment.

#### EXTERNAL VIEW OF 'PORT A'

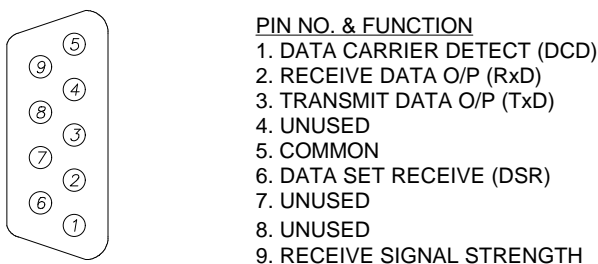


**NOTE:** Pins 6 & 9 provide a dual function dependent on operating mode of the TC-450DR.

### User Serial "Port B" Pin Assignment.

Port B can be used as a secondary data stream (independent of Port A) once configured by the programmer. Port B also has one connection that may be of use for installation. This connection (Pin 9) is Receive Signal Strength Indicator (RSSI) output. 0-5V where 1.5V typically indicates -110dBm and every 0.5V increase indicates an improvement of » 10dBm.

#### EXTERNAL VIEW OF 'PORT B'



**NOTE:** Port B Pin 9 output has a high impedance of around 50K OHMS and loading will decrease accuracy of the RSSI measurement.

## POWER CONNECTIONS

The power required is 13.8VDC nominal, at 1.5A (Tx) nominal for 5W operation.

If the POWER LED indicator is not illuminated once power is applied, check the internal 3 Amp fuse fitted within the unit.

POWER CONNECTOR	PIN ASSIGNMENT	Ext. view
TOP PIN	+VE SUPPLY (13.8vdc)	of socket
BOTTOM PIN	GROUND	



## USER INDICATIONS

The TC-450DR provides four LED's that show status information to the user - POWER, RXSIG, SYNC, and TXMIT indications.

The POWER is indicated by a green LED and simply signifies that power has been applied to the unit.

The RXSIG LED (yellow) indicates the level of RSSI signal from the radio IF strip, compared to a threshold level set in the configuration data programmed by the user. If the signal is above the threshold, then the LED indicator is turned on.

In all operation modes except "Programmer mode", the SYNC LED (yellow) indicates when the modem has detected a valid data stream. The SYNC LED is activated, when the modem detects a valid HDLC flag sequence, and remains active until an invalid sequence of seven or more consecutive "1" bits is detected.

The SYNC LED will not be turned on if the RSSI signal strength (as indicated by the RXSIG LED) is below the minimum threshold. This prevents false SYNC detection from noise.

The TXMIT LED (red) indicator is connected directly to the modem's PTT output transistor. Whenever the radio is transmitting, this TXMIT LED indicator will be on.

## MOUNTING AND ANTENNA CONNECTION

The radio modem should be mounted in a cool, dry, and vibration free environment, whilst providing easy access to screws and connections. There are four mounting holes on the unit. The antenna should be an external yagi antenna but can be a ground independent dipole mounted via a feeder to the antenna connector (BNC type) for short range applications. However the whole radio modem should be clear of the associated data equipment to prevent mutual interference.

## ASSEMBLY OF POWER LEAD

A small plastic bag containing a molex connector (M5557-2R) and two pins (M5556-TL) is provided in the packing box.

The pins are designed to take 18-24 (AWG) wire size with insulation range 1.3 - 3.10mm.

Please take care when crimping the pins.

## SPECIAL MODES OF OPERATION

Part of the power-up/reset initialisation phase of the TC-450DR are tests to determine whether the modem should enter one of 2 "special operation" modes. Whilst in these modes the TC-450DR won't operate in its standard run mode.

- | Programmer mode.
- | Bit error rate test mode.

These modes are only entered if the required setup conditions are present at power up. An error mode of operation can also be entered into, if during normal operation, an error condition occurs.

### Programmer Mode

CABLE - Pins 2, 3, 4, 5 straight through with Pin 6 on the DB9 connector of Port A, connected to pin 5. When the modem is powered up with this fitted, the controller senses this and attempts to enter "Programmer mode" and the "SYNC" LED will flash approx. once per second. (Note, the TC-DRPROG programming software and lead has the required connections). Failure to supply the correct password in time, will cause the modem to abandon the "Programmer mode" attempt, and go on with it's normal power-up procedure.

### Bit Error Rate Test Mode

Pin 9 of the DB9 connector of Port A, is normally the Ring Indicate output line. However, if this pin is driven positive (typically by connecting it to pin 6), then the modem's data transmitter and receiver will enter the BER test mode.

Note: As the TC-450DR is a half duplex device, BER testing can only occur in one direction at a time. To initiate the transmitter BER generator you must connect pins 6, 7 and 9 while the receive end has pin 6 & 9 connected to enable the BER receiver.

When the RF transmitter is activated it will generate a scrambled bit pattern which should be decoded at a receiver as a constant logic "1" level in the unscrambled data. Any errors in the decoded bitstream, will be "0", and the receiver portion of the modem in this mode, will activate the SYNC LED every time it sees a "0" bit.

Every error bit detected, will activate the SYNC LED. For error rates of 1 in 103 and above, the SYNC LED will be ON most of the time. A 1 in 10<sup>-4</sup> error rate will show the SYNC LED active for approximately 10% of the time. This function provides a crude indication of Bit Error Rate for installation purposes. The state of pin 9 is constantly monitored in this mode. If the pin ceases to be driven positive, then the BER Test mode is terminated, and the modem restarts it's initialisation phase.

## ERROR INDICATION MODES

There are 3 error conditions that will cause the RXSIG and SYNC LEDs to be used for error indications and not their normal purpose. Two of these are fatal conditions, that cause the modem to restart after the duration of the error indication phase.

### Transmit Power Low

While the modem activates the radio transmitter, it periodically checks the transmit power.

If the power measurement is less than a threshold set in the non-volatile memory, then the RXSIG and SYNC LEDs are made to alternate, approximately four times per second. The TXMIT LED will also be on during this process. This indication condition will persist for the duration of the transmission. As soon as the transmission is discontinued, the error indication will cease, and the two LEDs revert to their normal function. Factory set to 100 milliWatts.

### NVRAM Read Error

The DFM4-9DR modem accesses the non-volatile memory as part of it's initialisation phase, to read programming configuration data. If the communication protocol with the device is violated, or the non-volatile memory CRC checksum is found to be incorrect, then the modem indicates this by flashing the RXSIG and SYNC LEDs twice alternately. That is, one LED operates ON and OFF twice, then the other. A total of five cycles of this occurs, then the modem restarts it's initialisation.

### Synthesiser Lock Detect Error

If at any time during normal operation, BER mode, or handset mode, the TBB206 frequency synthesiser indicates an out of lock condition, the modem enters an error indication mode for a short time before restarting.

One LED is turned ON (☼), the LEDs are swapped, then both turned OFF (●). Then the latter LED ON again, swap LEDs, and then OFF. This will give the appearance of a sweeping motion between the LEDs. The following table shows all error condition displays.

Tx PWR Err		NVRAM Err		SYNTH Err	
RXSIG	SYNC	RXSIG	SYNC	RXSIG	SYNC
☼	●	☼	●	☼	●
●	☼	●	●	●	☼
☼	●	☼	●	●	●
●	☼	●	●	●	☼
☼	●	●	☼	☼	●
●	☼	●	●	●	●
☼	●	●	☼		repeat
●	☼	●	●		
continue			repeat		