



# TC-900DH14/15 USER GUIDE

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## GENERAL

The Trio DataCom TC-900DH is a full duplex 900MHz Hot Standby Automatic Changeover Base Station featuring a fully integrated 4800/9600 bps data radio modem and inter digital antenna cavity diplexer.

The complete unit consists of dual TC-900DR exciters, high reliability hybrid coupled microwave stripline power amplifiers (PA and LNA), cavity diplexer, RF lightning protection, front panel display PCB and static gate array control logic PCB.

The TC-900DH has been designed to ensure utmost reliability. Capabilities and functionality of the unit is the same as the TC-900DR.

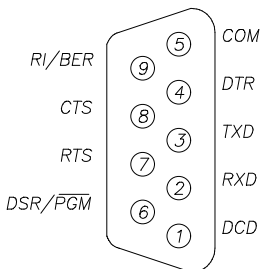
Configuration of the unit is fully programmable, with parameters held in non volatile memory (NVRAM). All configuration parameters are accessible using the TC-DRPROG installation package, consisting of a programming lead, manual and software which will run on a PC under Windows 95/98/NT. It is essential that each unit is programmed to suit individual requirements prior to operation. For detailed information refer to the TC-900DR and TC-900DH 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'



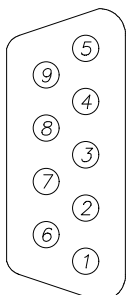
- PIN NO. & FUNCTION**
1. DATA CARRIER DETECT (DCD)
  2. RECEIVE DATA OUTPUT (RXD)
  3. TRANSMIT DATA IN (TXD)
  4. DATA TERMINAL READY (DTR)
  5. COMMON (COM)
  6. PROGRAM PIN (PGM)
  7. REQUEST TO SEND (RTS)
  8. CLEAR TO SEND (CTS)
  9. BIT ERROR RATE PIN (BER)

NOTE: Pin 6 and pin 9 provide a dual function which depends on the mode that the TC-900DR is operating in.

### 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'



- PIN NO. & FUNCTION**
1. DATA CARRIER DETECT (DCD)
  2. RECEIVE DATA O/P (RxD)
  3. TRANSMIT DATA O/P (TxD)
  4. UNUSED
  5. COMMON
  6. DATA SET RECEIVE (DSR)
  7. UNUSED
  8. UNUSED
  9. RECEIVE SIGNAL STRENGTH

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 4.7 Amp (5Watt Tx) nominal. Power is supplied by way of dual power inputs. All modules run from separate regulated and over voltage protected supplies.

The "Supply 1" & "Supply 2" indications on the front panel indicate the status of each supply. NOTE: Dual internal 3A slow blo fuses are located on the front panel PCB.

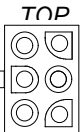
NOTE: Upon power up both LEDs will indicate fail condition as part of the powerup health check. This can be reset by *Ext. view* of the "Select" switch on the front panel.

### POWER CONNECTOR

- SUPPLY NO. 1
- CENTRE ROW
- SUPPLY NO. 2

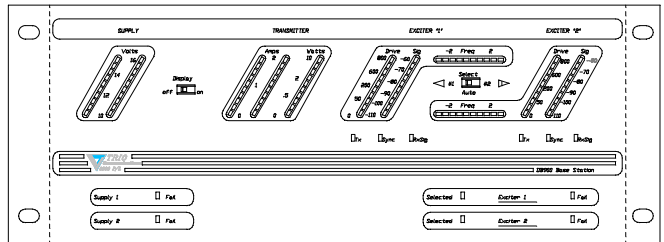
### PIN ASSIGNMENT

- Left -ve Right +ve (13.8V)
- Not Connected
- Left -ve Right +ve (13.8V)



## USER INDICATIONS

The TC-900DH provides a front panel LED display that shows status information to the user - "SUPPLY", "TRANSMITTER", "Supply 1 & 2" Fail Indications, EXCITER 1&2 - "Drive", "RxSig", "Frequency Error", "Selected Online Unit", "Fail", "Tx", "RxSig" and "Synch" Indications for each Exciter half.



The SUPPLY bar graph shows DC volts level of each supply. The TRANSMITTER bar graphs show RF output power and current drive for each half of the hybrid PA's. The SUPPLY 1&2 fail LED indications show the status of each supply. NOTE: Upon power up both LEDs will indicate fail condition as part of the powerup health check. This can be reset by toggling the "Select" switch on the front panel. The EXCITER 1&2 LED indications include: DRIVE bar graphs indicating the amount of RF power being fed to the PA from each exciter. SIG bar graphs Indicate the amount of Received Signal Strength (RSSI) for each exciter. NOTE: Both receivers are on line at all times. FREQ bar graphs indicates the incoming received frequency error for each exciter. SELECTED LED's indicate which exciter is on line and operating. FAIL LED's indicates that an exciter has failed and has changed over. NOTE: This does not necessarily indicate a fatal failure of any module within the base stations as changeovers do occur due to spontaneous errors caused by external interference or the like. 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 exciter PTT output transistor. Whenever the exciter is transmitting, this TXMIT LED indicator will be on.

**FRONT PANEL SWITCH FUNCTIONALITY**

The front panel has two switches.

The left hand switch is a two position type which is used to turn the front panel display ON or OFF.

The right hand switch has two functions. The switch is a three type switch which is used to manually select either exciter 1 OR exciter 2 as the operating unit. Alternatively for normal Hot Standby Automatic Changeover operation, the switch should be left in the central position.

The second function of the switch is as a RESET to clear SUPPLY failed LED's and EXCITER 1&2 failed LED indications.

**SPECIAL MODES OF OPERATION**

Part of the power-up/reset initialisation phase of the TC-900DR are tests to determine whether the modem should enter one of 3 "special operation" modes. Whilst in these modes the TC-900DR won't operate in its standard run mode.

- Programmer mode.
- Bit error rate test mode.
- Handset 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**

When programming a hot standby base station, it is important to note that each of the exciter halves needs to be programmed individually with the SAME configuration. This is done by using the front panel switch to select Exciter 1, programming the unit in the usual way, then move the front panel switch to Exciter 2 position, reapply power to the complete base station and program the second unit.

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. To activate the transmitter, connect pin 6 to pin 9 (BER mode) to pin 7 (PTT) this 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.

Note: As the TC-900DH is full duplex this test can operate in both directions simultaneously.

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 104 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. Note: Error count messages (ET:XXXX) for every 10,000 bits are presented to Port A for the user. If pin 9 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 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 4 times / second. The TXMIT LED will also be on during this process. This indication condition will persist for the duration of the transmission. When 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 TC-DFM9 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 initialisation.

**SYNTHESISER LOCK DETECT ERROR**

If at any time during normal operation, BER mode, or handset mode, the 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 |           |        |

**MOUNTING AND ANTENNA CONNECTION**

The TC-900DH is a 19" 4RU rack mount unit which is naturally cooled and does dissipate a moderate amount of heat. Allow at least 1RU clearance top and bottom for cooling purposes.

The RF connector is located at the rear of the unit. It is an N Type Female for connection directly to the antenna feeder tail. This N Type connector is actually the inbuilt inline lightning surge suppresser. A grounding lug is also provided at the rear of the unit to connect a secure earthing strap.