



**TRIO**  
DATA COM

# TC-450SR DATA READY RADIO USER GUIDE

41 Aster Avenue Carrum Downs 3201 Australia Tel: 61 3 9775 0505 Fax: 61 3 9775 0606  
www.trio.com.au

## GENERAL

The TC-450SR is a 5 Watt high quality, miniature, full featured, half duplex radio transceiver (receiver and transmitter) designed for narrow band data transmission applications which employ filtered baseband or audio subcarrier data modulation.

*As the basic product is designed for data - the transmitter circuitry does not contain audio limiting or shaping and it is the users responsibility to ensure that the applied modulation does not infringe on spectrum management planning rules.*

The unit is housed within a simple tin plated copper enclosure for excellent heat dissipation and shielding. The unit can be easily mounted within third party equipment via the right angle mounting feet.

## PROGRAMMING

Configuration of the unit is fully programmable, with parameters held in non volatile memory (NVRAM). Configuration parameters are accessible using the TC-SRPROG installation package, consisting of a programming lead, manual and software which will run on an IBM compatible PC under Windows 95. The programming interface cable includes an RS-232 level translator within the DB25 way backshell, providing direct connection to a PC serial port (a 25 pin to 9 pin converter may be required). It is essential that each unit is programmed to suit individual requirements prior to operation. When connected, the programmer can download the radio's current configuration which will then be displayed on the screen. Similarly, once variables have been modified and written to the radio, the programmer will confirm the "success of" completion of this operation.

## CONFIGURABLE ITEMS

### Tx/Rx Frequencies

The transmit and receive frequencies can be configured individually and are designed to operate in the 400 to 520MHz region.

Various band segments are available within this range and are manufactured by types (refer to manual for model numbers) to accommodate for the various Tx/Rx offsets and channel spacings. Most 450MHz channel assignments are split frequency (the go and return frequencies are markedly different). In this case, the radio's supplied will be manufactured differently in the factory such that one receives on the high frequency assignment and transmits in the lower frequency assignment and vice versa with the other radio. The programmer will automatically display the radio's default transmit and receive frequencies when connected.

### Reference Frequency Trim

Frequency adjustment of the main reference oscillator can be performed by the programmer to allow retuning of the unit for service purposes. NOTE: This should only be performed by qualified radio technicians equipped with the appropriate test equipment. If altered, the programmer will indicate the frequency shift which has been applied to the unit since the initial factory calibration.

### PTT Timer

To avoid permanent transmission in the case of data equipment failure, the TC-450SR has a transmission time limiter which can be disabled (although not recommended) or set in 1 second increments to a maximum time of 65 seconds. This PTT Timer function is factory preset to 60 seconds.

## Received Signal Strength Threshold

The TC-450SR has a programmable receive signal level detect circuitry which is factory set to activate at approximately -110dbm (0.75uV). This level is typical and should generally be left at the default value unless system design dictates otherwise.

## Transmitter Output Power

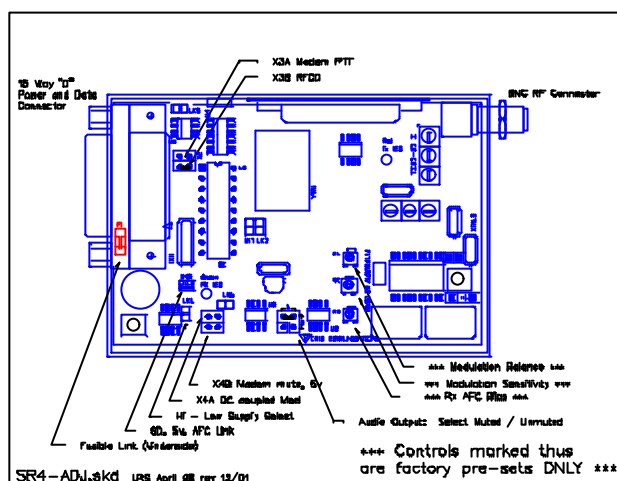
The transmitter output power can be programmed from 0.1 watt to 5 watt. The factory standard setting is 1 watt.

## INTERNAL ADJUSTMENTS & SELECTIONS

The TC-450SR has been designed for minimal alignment requirements. To this end, there are few internal adjustments and selections.

### Low Voltage Operation

For less than 10.8 Volt operation, LK4 **MUST BE SHORTED**. For 13.8 Volt operation (10.8V to 15.6V) LK4 should be open circuit.



## TELEMETRY

Analogue outputs available include Tx power, temperature, received signal strength, AFC frequency error and carrier detect output which can be used to offer remote diagnostic facilities.

NOTE: Interface protocol specification for direct diagnostics monitoring via our progressor is also available.

## TC-12SR/24SR/48SR MODEM OPTIONS

When using TC-12SR/24SR/48SR modems with TC-S Series radios, the following linking/shorting links must be applied.

Normal operation (no modems) jumper link config:

- Solder blob LK5 and LK6 (If shorting tracks have been cut)
- X5 - Link A to B (RxSig Out DC coupled)
- X3 - Link C to D (CD out. open collector)

With Modem Fitted:

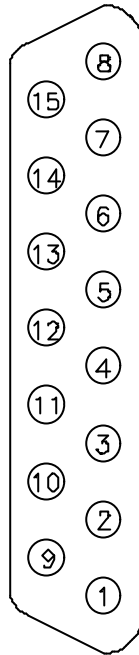
- Remove Link X5 and X3
- Unsolder / Cut links 5(LK5) and 6(LK6)

## EXTERNAL CONNECTIONS

The antenna connector is a high quality female BNC connector while all other external connections are accessible via an RF Filtered 15 way DMin Female connector as shown;

**NOTE:** When a TC-12SR, TC-24SR or TC-48SR is installed the normal connections change:-

- ❖ TxSig pin (3) becomes RS-232 serial input (TxD)
- ❖ RxSig pin (5) becomes RS-232 serial output (RxD)
- ❖ TxEn pin (8) (PTT input) becomes an RS-232 control input (RTS active HIGH to Tx)
- ❖ RFCD pin (6) becomes an RS-232 control output (DCD) which is data carrier qualified by RF signal level.



|    |           |  |
|----|-----------|--|
| 8  | Tx En     | Tx enable (PTT) TTL active low (0.1mA) for transmit          |
| 15 | PRGM      | Programming mode pin. Accessed with TC-SR9IP                 |
| 7  | SDO       | Programming mode serial data output                          |
| 14 | SDI       | Programming mode serial data input                           |
| 6  | CD        | Carrier Detect output. TTL active low open collector sink    |
| 13 | TxPwr     | Analogue DC square law output (Tx forward power)             |
| 5  | RxSig     | Receive Signal Output 2VDC ±0.25V/kHz                        |
| 12 | RSSI      | Received Signal Strength Output 0.5V/10dB (2V@-90dBm)        |
| 4  | Temp      | Temperature sense output. Analogue DC voltage.               |
| 11 | PD/5v/AFC | Linkable Power-Down (std), 5v output, AFC monitor (opt ctrl) |
| 3  | TxSig     | Transmit signal input  |
| 10 | GND       | Ground   |
| 2  | GND       | Ground   |
| 9  | V+        | 6 to 16V DC (17.5V DC Max.)                                  |
| 1  | V+        | 6 to 16V DC (17.5V DC Max.)                                  |

## GENERAL SPECIFICATIONS

### Receiver

|  |   |
|--|---|
| <i>Frequency range</i>                         | 400...520 MHz (model dependant)   |
| <i>Channel selection</i>                       | Synthesised (12/25kHz model dependant)  |
| <i>AFC (internal)</i>                          | ±5kHz tracking @ -90dBm/attack time <10Ms   |
| <i>Rx sensitivity</i>                          | -115dBm for 12db SINAD  |
| <i>Audio output response</i>                   | 600mV nominal for 1.5kHz deviation<br>AC coupled 300-2500Hz with de-emphasis                  |
| <i>Data output response</i>                    | (2v DC±0.25V/kHz deviation (Zout 1Kohm)<br>DC to -6dB @ 5kHz                                  |
| <i>Distortion</i>                              | < 5% THD  |
| <b>Transmitter</b>                             |   |
| <i>Power output</i>                            |   |
| @7.2V  | 1Watt +1.5/-2dB (for VCC=6.25..8.5 V)<br>Duty Cycle - 50% @ 25°C, 10% @ 60°C                  |
| @13.8V   | 5Watt +/- 1.5dB (for VCC = 12...16V)<br>Duty Cycle - 25% @ 25°C, 10% @ 60°C                   |
| <i>Modulation audio response gain (preset)</i> | 300-2500Hz with Pre -Emphasis & Limiting<br>450mV nominal for 1.5kHz Deviation<br>(1kHz tone) |
| <i>Impedance</i>                               | 47k ohm nominal   |
| <i>Data response bias gain (preset)</i>        | Direct FM DC to 25kHz<br>1v DC I/P<br>4kHz/V  |
| <i>Impedance</i>                               | 15k ohm nominal   |
| <i>Harmonic and spurious</i>                   | <-30dBm   |

### General

|                                |  |
|--------------------------------|--|
| <i>Frequency stability</i>     | ±1kHz (-10 to 60°C)  |
| <i>Temperature range</i>       | -10 to +65°C<br>(Optional -30 to +70°C)  |
| <i>Tx / Rx changeover time</i> | 25mS to 500Hz  |
| <i>Supply voltage</i>          | Note: Internal link to select range.<br>7.2 to 16V DC (17.5V DC MAX)   |
| <i>Supply current</i>          | Std-by <1mA @17V DC (typ 1uA @ 7.2V DC)  |
|                                | Rx 80mA  |
|                                | Tx 1W @ 7.2V 650 mA  |
|                                | Tx 5W @ 13.8V 1600mA   |
| <i>Case dimensions</i>         | 64mm x 103mm x 25mm high   |
| <i>Mounting footprint</i>      | 64mm x 131mm   |
| <i>Power-Down Active</i>       | 3 - 16 V   |
| <b>Controls and Telemetry</b>  |  |
|                                | Analogue outputs available for remote diags monitoring.  |
| <i>Tx enable input</i>         | TTL active low (0.1mA)   |
| <i>RSSI output</i>             | 0.5V/10dB (ref 2V@-90dBm) nom.<br>(10K ohm source)   |
| <i>Rx AFC error volt</i>       | 2.0kHz/V ref 2V DC via 1K  |
| <i>Rx CD (RSSI) out</i>        | TTL active low (program -120 to -70dBm)  |
| <i>Tx power sense out</i>      | Analogue DC square law output (calculate<br>$P_{O(Watt)} = 0.02 * (7 * (V_{sens} + 0.15))^2$ -in<br>100k load)       |
| <i>Temp sense out</i>          | Analogue DC voltage proportional to<br>Absolute temp (calculate T <sup>0</sup> (Kelviin)<br>=Vsens*100 in 100k load) |
| <i>Power down mode</i>         | Active high 3-16V (Sleep mode)<br>internal 50K pull down resistor  |

## OPTIONS and ACCESSORIES

- 1.5 ppm Frequency accuracy.
- -30°C to +70°C Temperature Range (reduced specs).
- 12.5 -30kHz Channel Spacing
- Internal Modem option:  
Internal fit 1200/2400/4800 bps FFSK modem
- Speech interface option:  
Providing PRE/DE emphasis and modulation limiting
- Customised O.E.M. design for high volume applications
- Antenna's
  - Power Supplies
- Feeder Tails
  - RF Connectors

Please refer to Trio DataCom for additional assistance or available options.