

Eclipse Series

RF Technology
rinfo@rftechnology.com.au

October 2005

Exciter Data Interface

Operation, Maintenance and Installation Manual

This Manual is produced by RF Technology Pty Ltd
10/8 Leighton Place, Hornsby NSW 2077 Australia
Copyright © 2003 RF Technology Pty Ltd

Contents

1	Operating Instructions	3
1.1	Data Inputs	4
1.2	Tx Input	4
1.3	Centre Frequency Transmission	4
1.4	Timing Considerations	4
1.5	Transmission Delay	5
1.6	Data Bit Rates	5
1.7	Data Errors	5
1.8	Support Software	5
2	I/O Connections	6
2.1	Polarity Selection	6
2.2	Delay and Test Frequency Selection	6
3	Circuit Description	6
4	Installation	8
5	Alignment Procedure	9
6	DMTX with OCXO and DMTX standard photos	10
7	Component layout drawing	11
8	DMTX Schematic with OCXO	12
9	DMTX Schematic (standard)	13
10	JP23 and R159 positions	14
11	Modifications to VHF TX board version 3 or earlier	15
12	Modifications to UHF TX board version 3 or earlier	16

WARNING

Changes and modifications not expressly approved by RF Technology could void your authority to operate this equipment. Specifications may vary from those given in this document in accordance with requirements of local authorities. RF Technology equipment is subject to continual improvement and RF Technology reserves the right to change performance and specifications without further notice.

1 Operating Instructions

Identifying DMTX cards

Part number 30/9114/003 or later have onboard facility to accommodate the OCXO high stability oscillator option.

Part number 30/9114/001 is the standard DMTX card which relies on the main board TCXO for the reference signal.

Identifying Transmitter main boards

UHF transmitter main board 30/9103/0004 or later and
VHF transmitter main board 30/9116/0004 or later have installed jumper link JP23 and audio signal routing for easy plug-in operation of the DMTX card.

Note: Transmitter main board versions earlier than the above part numbers require modification as detailed in the rear sections of this manual for satisfactory operation with the DMTX card.

DMTX Part no. 30/9114/003 or later with OCXO high stability oscillator

The high stability oscillator (OCXO) option is available with the DMTX part no. 30/9114/003 or later. This option is for VHF transmitters only. In operation, the high stability oscillator replaces the 12.8MHz crystal in VHF transmitters as the reference oscillator. The OCXO has a stability specification of +/- 0.05 ppm at temperature range -30 deg C to 60 deg C. i.e. +/-7.5Hz accuracy at 150MHz.

Digital and audio modulation inputs are provided without modification to VHF transmitters with main board version 30/9116/0004 or later with JP23.

The digital modulation input is through the data interface and supplied DB9 connector.

The audio modulation input is via the standard DB25 connector.

DMTX Part no. 30/9114/001 (standard card)

This card utilizes the transmitter TCXO as the reference signal input.

Digital and audio modulation inputs are provided without modification to VHF transmitter main board 30/9116/0004 or later with JP23 and UHF transmitter main board 30/9103/0004 or later with JP23.

The digital modulation input is through the data interface module and supplied DB9 connector.

The audio modulation input is via the standard DB25 connector.

1.1 Data Inputs

Jumper JP1 can be set to accept either TTL or RS-422 input levels. The data polarity is selected by jumper JP3. The normal polarity is set so that a logic 1 input produces a negative frequency shift.

1.2 Tx Input

The data Tx input is used to turn the transmitter ON. Both TTL and RS-422 level inputs are provided and are selected by JP2. The polarity of the Tx input is set by jumper JP4. The normal polarity is set so that a logic 0 turns the transmitter ON.

1.3 Centre frequency Transmission

The interface module can be configured by setting JP5 to transmit on the channel centre frequency during the delay period or when the test button is pressed. This is useful for transmitter tests and frequency calibration. In the normal configuration, the frequency output always follows the data input.

1.4 Timing Considerations

The Tx input must be true at least 25mSec. before the start of the first data bit. This is to allow time for the transmitter to turn ON and for the receivers carrier detect circuit to operate.

The Tx input may return to false coincident with the end of the last data bit, but it is more usual to keep the transmitter ON for a short period after the last data bit is sent.

Some operators like to keep the transmitter ON between successive short data bursts to avoid the 25mSec. delay. This can easily be accomplished by programming the transmitter delay. The transmitter delay can be set in one second increments between 0 and 15 seconds.

1.5 Transmission Delay

The total transmission delay from the transmitter data input to the receiver data output is approximately $(500 + 3.33 * \text{Km.})$ uSec. Where Km is the radio path distance in kilometres. System designers should keep in mind since at the higher data speed this is equivalent to several bits.

1.6 Data Bit Rates

The direct FSK/NRZ transmission system employed can accept speeds up to 4800 Bps. It will provide low bit error rates on a clear channel at that speed.

1.7 Data Errors

Radio channels are subject to various types of interference. In most cities interference free channels are rare if not impossible to find.

As with any data transmission system which is prone to interference, error detection and correction schemes should always be used where the integrity of the transmitted data is of concern.

1.8 Support Software

The transmitter delay can be set using the TechHelp Software or Service Monitor. TechHelp and Service Monitor can be obtained through your dealer or distributor.

2.0 I/O Connections

9 Pin Connector (DB9)

Functions/Signal	Pin	Specification
TTL Tx Input	1	0<0.8V, 1>2.2V
+Tx Input	2	RS-422
-Tx Input	3	RS-422
Ground	4	
Ground	5	
Ground	6	
TTL Data Input	7	0<0.8V, 1>2.2V
+Data Input	8	RS-422
-Data Input	9	RS-422

2.1 Polarity Selection

	Data	Tx
Jumper Positions (-)	JP3_	JP4_
Normal Polarity	1-2 3	1 2-3
Reverse Polarity	1 2-3	1-2 3

2.2 Delay and test Frequency Selection

Jumper Positions(-)	JP4_
Frequency Follows Data	1 2-3
Frequency Shifts to Centre During Delay/Test	1-2 3

3.0 Circuit Description

The following descriptions should be read as an aid to understanding the schematic diagram at the rear of this manual.

Data and Tx Inputs:

The TTL logic level inputs from the 9 pin connector are buffered by CMOS invertors U2b,c,d,e to obtain the complementary logic levels to control analog switches U3a-d. Jumpers JP1 and JP2 can be set to select the RS-422 inputs instead of TTL. Differential line receivers U1a and U1b convert the RS-422 inputs to TTL levels.

Reference Voltage Source:

D3 is a band-gap reference diode which supplies a very stable 2.5 volts. The U5a is used to double the voltage to 5 volts. VR1 is used to set the low frequency voltage reference. It can be adjusted between 2.5 and 5 volts. VR2 is used to set the high frequency voltage reference and can be set between 0 and 2.5 volts.

Analog Data Signal:

The buffered data input signal is connected to analog gates U3b and U3d. These are used to switch between the two pre-set reference voltages so that the input to voltage follower U5b follows the data input.

Data Filter:

Two four pole flat delay low pass filters are used to remove the high frequency components from the data waveform. The attenuation of the filter is sufficient to ensure that the transmitters modulation products do not encroach on the adjacent radio channels. The filter uses operational amplifiers U4a-d as voltage controlled voltage sources.

The filter output is connected to the transmitters frequency control input to produce FSK modulation.

4.0 Installation

1. Remove the transmitters two side covers. Temporarily disconnect the cables to the power amplifier.
2. Locate the “D” connector cut-out on the rear panel and remove any labels which may be covering the holes.
3. From the top side of the exciter board install the 9 pin “D” connector using two 4-40 screws.
4. Mount the four M3x12mm spacers on the PCB in the holes provided. The spacers mount from the component side of the board with the screw thread end of the spacer through the hole. A shake-proof washer is used on the component side of the board and a flat washer and nut are used on the bottom side.
5. For **DMTX with OCXO** option fitted:
Remove the following components from the transmitter main board if the OCXO option is installed on DMTX card
 - a. Remove R152
 - b. Remove Q29
 - c. Remove R143
6. For transmitters with **JP23, main board version 0004 or later:**
Move JP23 links from Pins 1-2, 5-6 to 2-3, 4-5
Add R159, 270 ohm ¼ watt resistor for VHF transmitter or
Add R159, 1 ohm ¼ watt resistor for UHF transmitter
7. For **VHF** transmitters with main board version 0003 or earlier
Refer to the modification drawings at the rear of this manual
Remove C112 and C117, connect the negative pads of C112 and C117 on the bottom of the board.
Connect JP15 pin 5 to the positive terminal of C117 position (U7 pin 7)
Bridge R140 with a 270 ohm ¼ watt resistor on the bottom of the board.
Short across R139 on the bottom of the board.
Using 7 x .2mm PVC insulated hook-up wire to connect JP15 pin 6 to the anode of D10.
8. For **UHF** transmitters with main board version 0003 or earlier
Refer to the modification drawings at the rear of this manual
Remove C117, connect JP15 pin 5 to the positive terminal of C117 position (U7 pin 7)
Short across C112, R139 and R140 on the bottom of the board.
Using 7 x .2mm PVC insulated hook-up wire to connect JP15 pin 6 to the anode of D10.
9. Plug the 10 pin socket connector on the end of the flat input cable into P1 on the interface module. Plug the interface module into JP15 on the exciter board and secure with four M3x6mm screws.
10. Re-connect the power amplifier cables and set the frequency shift according to the alignment procedure.
11. Set the jumper options as required and replace the covers.

5.0 Alignment Procedure

Test Equipment Required

Dummy Load - 50ohms, 50 watts
 Frequency Counter - 500MHz min., 0.1ppm accuracy
 Signal Generator - 1KHz square wave capable (TTL)
 Comms test Set - RF Demodulation

OR

Receiver (Discrim output) - RF Demodulation
 CRO - View signal waveform
 Jumper Configuration - Normal Polarity, TTL default

VHF transmitter with DMTX Part no. 30/9114/003 or later (OCXO option)

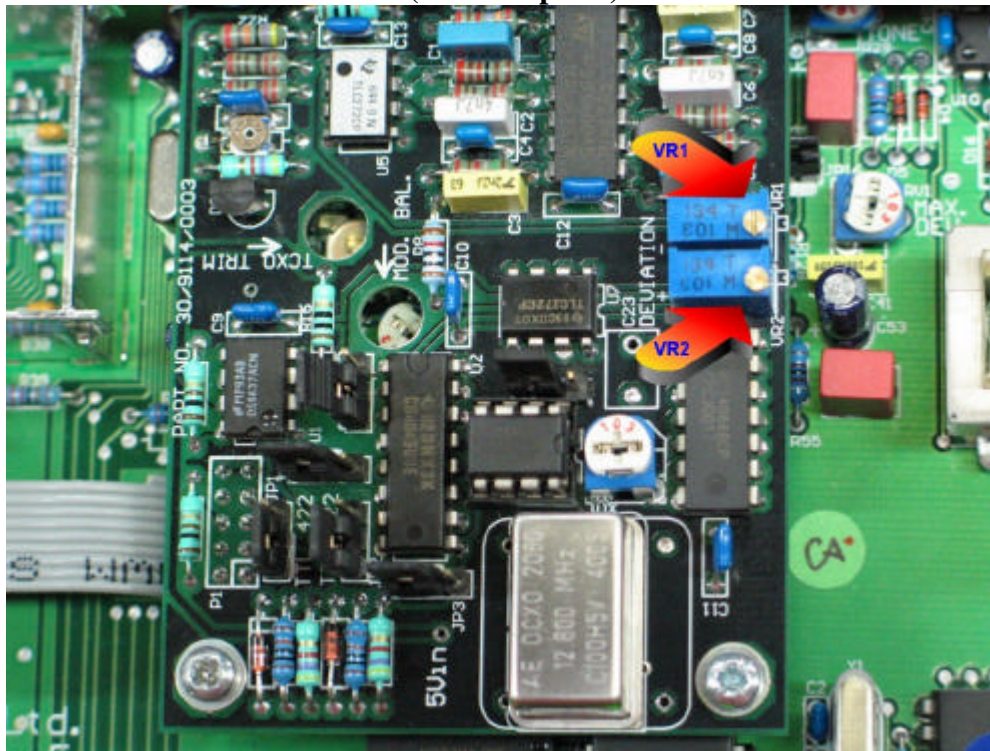
Step	Input	Measure	Adjust for 25KHz Model	Adjust for 12.5KHz Model	Adjust for 12.5KHz Model with OCXO
1	Press Front panel TX PB switch	Frequency	Check centre frequency is correct	Check centre frequency is correct	Check centre frequency is correct
2	Tx Input = 0 Data Input = 1	Frequency	VR1 to obtain the centre frequency -4.5KHz	VR1 to obtain the centre frequency -2.5KHz	VR1 to obtain the centre frequency -2.0KHz
3	Tx Input = 0 Data Input = 0	Frequency	VR2 to obtain the centre frequency +4.5KHz	VR2 to obtain the centre frequency +2.5KHz	VR2 to obtain the centre frequency +2.0KHz
4	Tx Input = 0 Data Input = 600Hz TTL square wave	Use CRO to view demod. waveform	MOD BAL for best square wave shape ie flat tops and bottoms	MOD BAL for best square wave shape ie flat tops and bottoms	MOD BAL for best square wave shape ie flat tops and bottoms

VHF or UHF transmitter with DMTX Part no. 30/9114/001

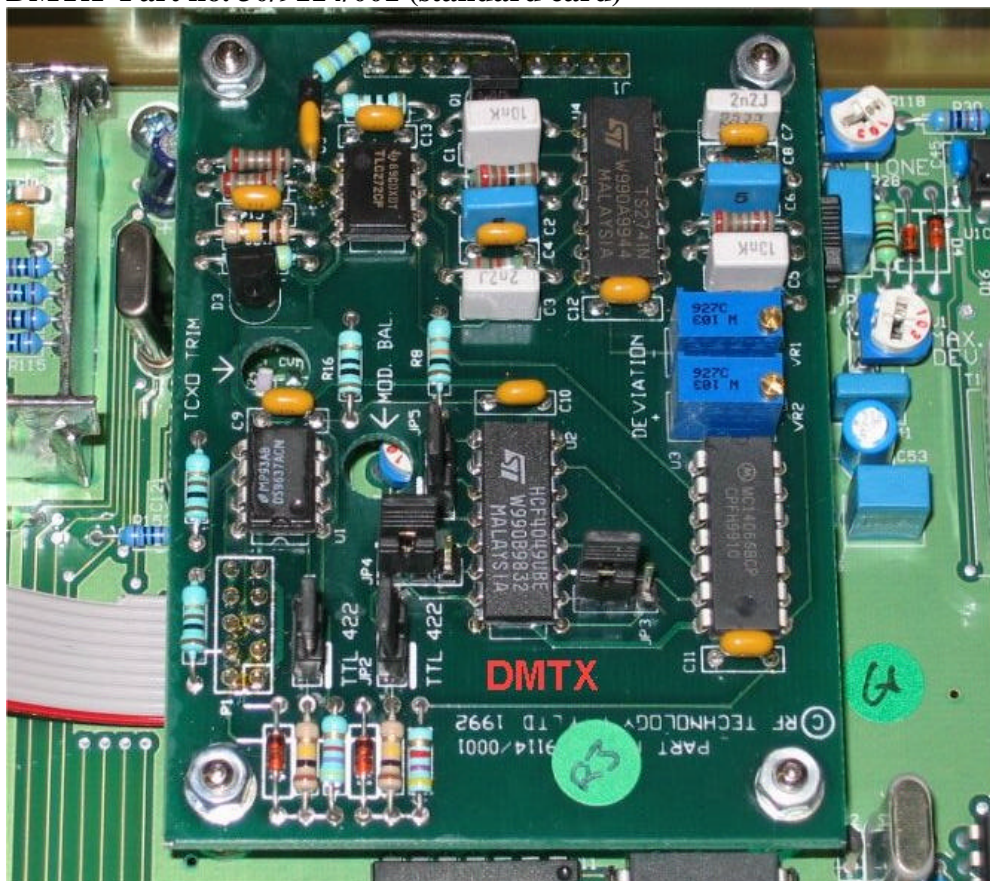
Step	Input	Measure	Adjust 25KHz Model	Adjust 12.5KHz Model
1	Press Front panel TX PB switch	Frequency	Check centre frequency is correct	Check centre frequency is correct
2	Tx Input = 0 Data Input = 1	Frequency	VR1 to obtain the centre frequency -4.5KHz	VR1 to obtain the centre frequency -2.5KHz
3	Tx Input = 0 Data Input = 0	Frequency	VR2 to obtain the centre frequency +4.5KHz	VR2 to obtain the centre frequency +2.5KHz
4	Tx Input = 0 Data Input = 600Hz TTL square wave	Use CRO to view demod. waveform	MOD BAL for best square wave shape ie flat tops and bottoms	MOD BAL for best square wave shape ie flat tops and bottoms

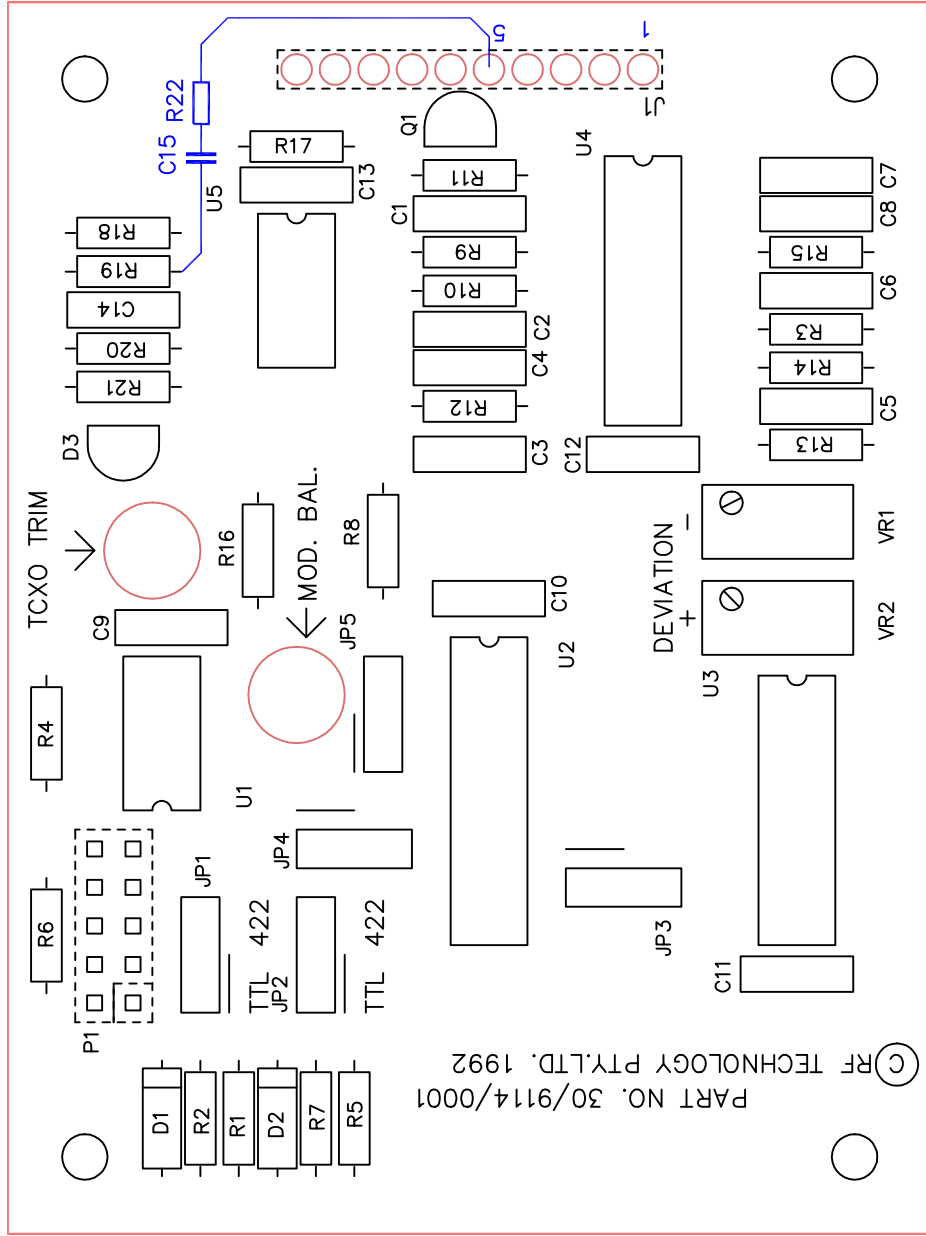
6.0 DMTX with OCXO and DMTX standard

DMTX Part no. 30/9114/003 (OCXO option)



DMTX Part no. 30/9114/001 (standard card)

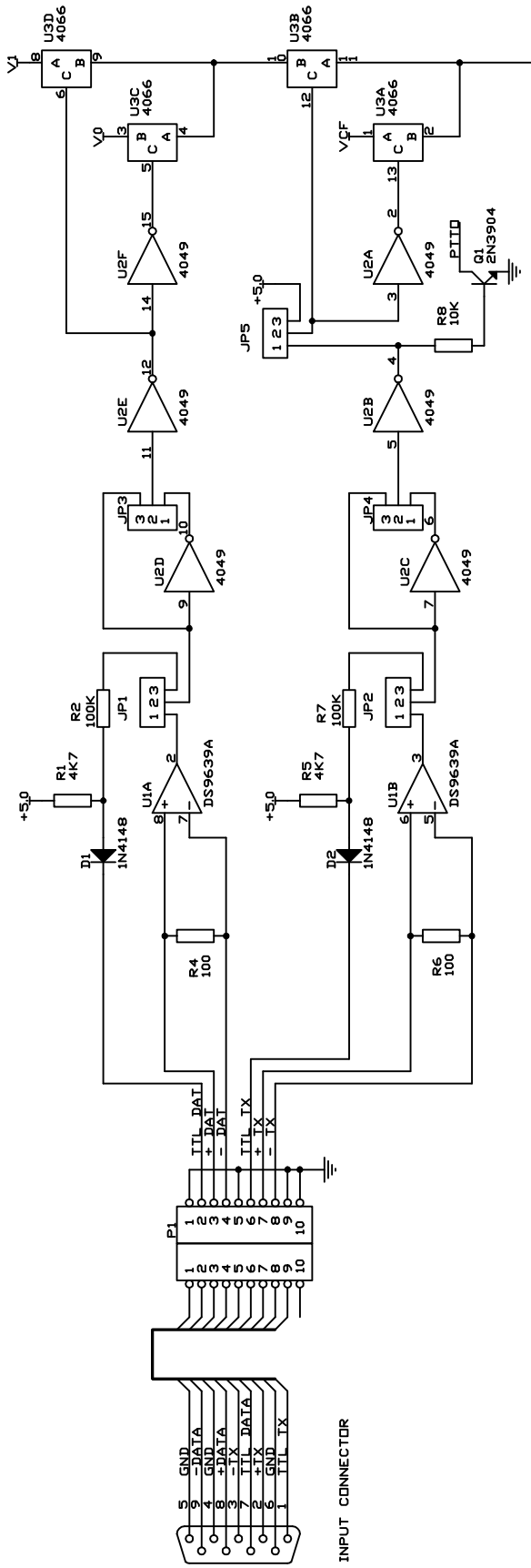




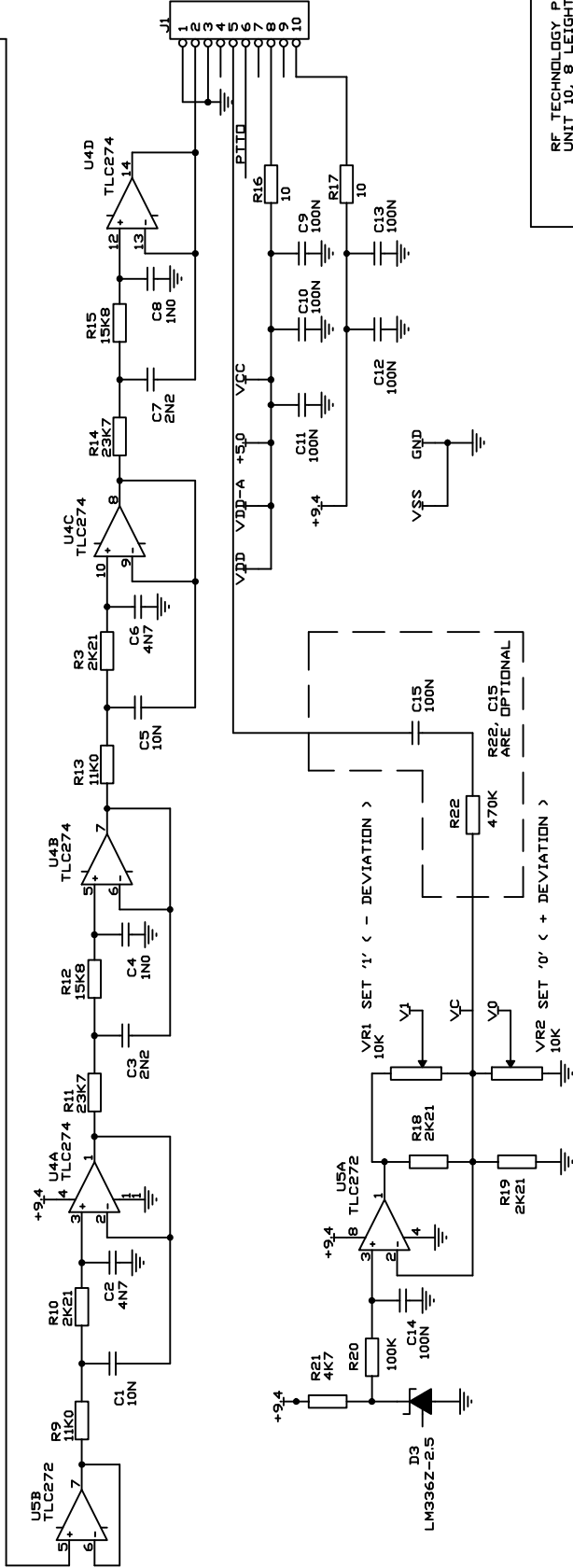
PRT NO. 30/9114/001
 © RF TECHNOLOGY PTY.LTD. 1992

ADD R22 470K
 C15 100N
 CONNECT R22 TO J1 PIN5
 CONNECT C15 TO R19 AS SHOWN

EXCITER FSK INTERFACE COMPONENT LAYOUT



DATA INPUT CONNECTOR



RF TECHNOLOGY PTY. LTD. SUITE 8 LEIGHTON PLACE HOBENSBY N.S.W. 2077 AUSTRALIA	
Title	EXCITER FSK INTERFACE
Size	Document Number 05/9114/R7
REV	B
Date	October 15, 2002 Sheet 1 of 1

Move jumper links JP23 to inside position

For pcb with JP23

VHF TX- R159 is 270 ohm

UHF TX- R159 is 1 ohm

pcb vhf

pcb uhf