

Raider Installation and Operation Manual

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Table of Contents



INTRODUCTION	9
SECTION 1 - INSTALLATION	10
Unpacking and Mounting.....	10
Power.....	10
Power Indicator	10
Grounding	10
Terminal Emulation	10
SECTION 2 - REAR PANEL FEATURES	11
Repeater Connector DB-25 Female Pinout	11
Receiver Discriminator Input - Pin 1	11
EXT RDD - Pin 2	11
TX Audio Output - Pin 3	11
TX Data Output - Pin 5	12
TX PTT Output - Pin 7	12
TX PTT Output - Pin 20	12
Ground - Pin 25.....	12
Power - Pin 13	12
Comm Port Connector DB-9 RS-232 Male Pinout	12
Direct Connection to Computer	13
About Modems	13
T-NET Connectors and the T-NET Data Bus	14
Final Connections.....	15
Repeater Levels - Adjustments	16
CW LEVEL	16
RPT AUDIO	16
TONE LEVEL.....	16
TX DATA	16
SQUELCH LEVEL	16
RX DATA	16
Switch 2 Dipswitches.....	17
Data Inversion Switches.....	17
TX DTA	17
RX DTA.....	17
TX DCS	17
RX DCS	17
Setting the Repeater Number - 1, 2, 4, 8 and 16	17
The Area Bit.....	18
Setting Sync	18
Baud Rate	18
LGC SQ.....	18
TX TEST	18
Test Point - TP1	19
TP1 RX DATA	19

SECTION 3 - QUICK START	20
What Is Quick Start?	20
Quick Start Pre-Tune	21
Quick Start Tuning	22
Raider Jumper Locations and Factory Default Settings	24
Raider LED, Potentiometer and Test Point Locations	25
ALIGNMENT PROCEDURE.....	26
What Is the Alignment Procedure?	26
Alignment Preparation	26
Alignment Procedure	26
Preset the Pots	27
Set Repeater Type	27
Set Sync	27
Set Area Bit	28
Terminal Connection	28
Set up the CWID	28
Squelch LEVEL	28
RX Data	28
RPT AUDIO	29
TX Data	29
Morse Code CWID	29
Handshake Testing	29
TONE LEVEL.....	29
OPERATIONAL TESTING.....	30
INITIALIZATION.....	31
COMMUNICATING WITH THE RAIDER.....	32
Connections	32
Passwords	32
Menu Tree	33
Main Menu	33
A - Airtime Logging Menu	34
V - Viewing Logged Airtime	34
D - Download Airtime Data	35
C - Clear Airtime Data	35
C - Download Config	36
R - Real Time Status	37
Validation Channel	37
E - Edit Parameters	38
S - System Parameters	38
Max TX Time	38
CTCSS/DCS Hang Time	38
CTCSS/DCS Drop Time	38
System Parameters Display	39
Carrier Fade Time	40
LTR Fade Time	40
RDD Fade Time	40
RDD Carrier Only	40

RDD Act Time	40
CWID Repeater #	40
Idle Msg Time CH#	41
DCS code # for CH#	41
U - User Parameters	42
How To Enter The Value of a DCS Code	44
How To Enter The Value of a CTCSS Tone	46
S - Setup	47
S - Sign On Message	47
P - Change Password	47
I - Initialization	47
U - Upload Config.	48
APPENDIX A	50
CTCSS Tone Frequencies	50
APPENDIX B.....	51
DCS CODES	51
APPENDIX C.....	52
Tuff-Modem Instructions	52
Before You Begin	52
Originate Mode call:	52
Answer Mode Call:	53
APPENDIX D	54
T-Comm Instructions	54
T-Comm Commands	55
APPENDIX E.....	56
External RDD and Auxiliary Receiver	56
APPENDIX F.....	58
Generic Repeater Interface	59
GE Master II Repeater Interface	60
Johnson 8000 LTR Repeater Interface.....	62
Kenwood TKR-820 Repeater Interface	63
Maxon TR4800 Repeater Interface	64
Micor Repeater Interface	65
Motorola MTR2000 Repeater Interface	66
Motorola GR1225 Repeater Interface.....	76
Motorola MSF5000 Repeater Interface	81
Ritron RRX-450 Repeater Interface	82
TAIT T885, T881 Repeater Interface.....	83
TAIT T855, T856, T857 Repeater Interface	87
Raider Universal Repeater Interface.....	89

ADDENDUM 90
 Motorola MX800 Repeater Interface 90

WARRANTY AND SERVICE..... 92

FCC COMPLIANCE STATEMENT 93

SCHEMATICS

REVISION NOTES:

1.4.1 09-12-04 Addendum - Motorola MX800 Repeater Interface Instructions

INTRODUCTION



Thank you for choosing the Trident Micro Systems Raider. This trunking logic controller is designed by a team of engineers that has their finger on the pulse of today's ever changing radio industry. The features and functions found in the Raider are there in direct response to the needs and requests of the user. Trident is driven by *your* success.

The Raider offers a Morse Code identifier, Remote Disable Device, a single period airtime logger, real-time display of system activity and decoding of DCS codes and CTCSS tones. All accounting data can be downloaded using the XMODEM protocol for error free transmission. This transfer procedure will copy the accrued airtime onto a computer disk ready for customer invoice processing. Dual passwords help protect the Raider from unauthorized access.

The Raider simply gives you more *'bang for your buck'*.

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ProComm Plus® is a registered trademark of Datastorm.

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INSTALLATION



The Raider is easy to install. Six connections into an existing DCS (Digital Coded Squelch) compatible repeater are required. There are repeater interface diagrams in the back of this manual. Trident also offers factory built interface cables for easy connection to your repeater. Ask your Trident sales representative for a list of available repeater interface cables.

Unpacking and Mounting

The Raider comes covered in plastic bubble wrap. Inspect the unit for any shipping damage. If any damage is noticed, please contact Trident Micro Systems immediately.

The Raider should be mounted in a system rack located near the repeater that is to be used, adjusting the mounting ears to fit (adjustment should not be required for standard EIA racks). Secure the unit using 4 rack screws.

Power

Clean DC voltage (free of noise and transients) between 11 and 16 volts should be applied to the Raider. A wall transformer capable of at least 1 amp will work fine. The Raider draws 750mA. If the DC voltage drops below 10 volts, a low voltage reset circuit will interrupt the flow of current and the unit will not function. The Raider will begin functioning again when the voltage rises above 10 volts.

A 2amp 3AG fast blow fuse is mounted on fuse clips on the PCB. On the circuit side of the fuse is a Metal Oxide Varistor (like a zener diode). If a spike over 18 volts enters the unit it is clamped by the Metal Oxide Varistor at 18 volts until the spike passes or the fuse blows.

Power Indicator

On the front panel of the Raider is a green LED marked POWER. This LED lights up when DC power is applied to the unit. If the LED does not light up, check to see if the fuse is blown.

Grounding

Grounding is essential for the Raider to operate properly. Make sure the unit is securely mounted to the rack and that the rack is securely connected to the building ground.

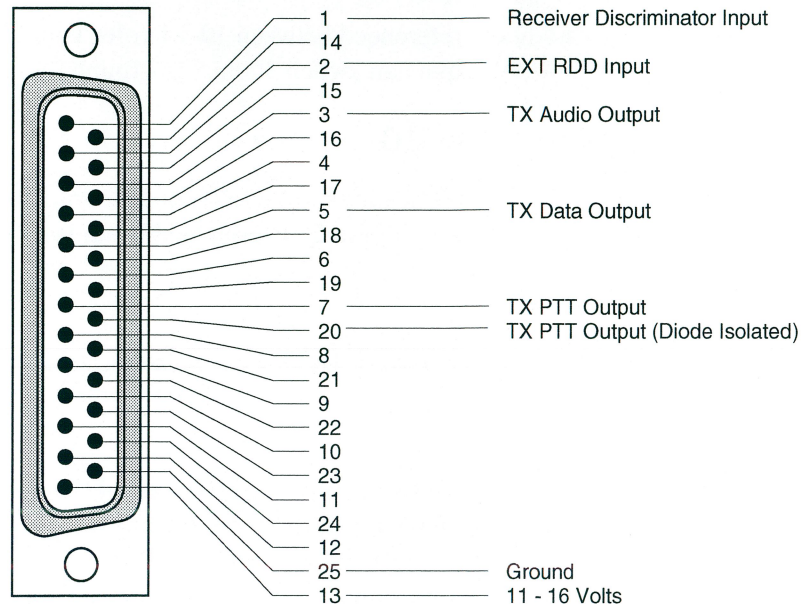
Terminal Emulation

The Raider uses the TELEVIDEO 920 terminal emulation commands. Please configure your computer terminal program to TVI-920. If your current program does not have this emulation, Trident recommends the T-Comm Communications program or other compatible program such as ProComm Plus®. The display may appear distorted and unreadable if the proper emulation mode is not selected.

REAR PANEL FEATURES



Repeater Connector DB-25 Female Pinout



Receiver Discriminator Input - Pin 1

Connect the repeater receiver discriminator to Pin 1. The Raider will handle up to 16 volts DC on this input. Signals from 50mV to 1 volt can be accommodated.

It is very important that a connection be made **directly** to the discriminator IC or detector. Since the LTR® data is very low frequency, AC coupling may not provide accurate data response. With most repeaters the nominal voltage on the discriminator is 2 to 5 volts DC. There are repeater interface diagrams in the back of this manual to aid you in making the direct connection to the discriminator.

EXT RDD Input - Pin 2

The RDD is jumper controlled. Select internal monitoring to check for a foreign tone on the input of the repeater (factory shipped) or it can be connected to an external receiver (active low carrier) which can monitor the output of the repeater (jumper W1). Refer to Appendix E for more information on connecting an auxiliary receiver to the Raider using External RDD.

TX Audio Output - Pin 3

Connect the repeater TX Audio Input to Pin 3. The transmit audio that goes to the repeater transmitter is adjustable from 0 to 1 volt peak to peak. This level is sufficient to drive most transmitters. The output is AC coupled through a 10 μ capacitor.

TX Data Output - Pin 5

Connect the repeater TX Data Input to Pin 5. The transmit LTR data is adjustable from 0 to 1 volt peak to peak. The output may be either AC or DC coupled depending on the transmitter used. DC coupling is always preferable to AC coupling. With the TX DATA potentiometer fully "ON" (clockwise) the DC voltage is between 4.2 and 4.8 VDC with up to 1 volt of AC data. Transmitters designed to be DCS compatible are usually able to drive the modulator directly. After connecting the Raider to the transmitter, the RF frequency should be checked and adjusted if necessary.

TX PTT Output - Pin 7

If the repeater PTT line is referenced between 10-14 volts, connect the repeater TX PTT Input to Pin 7. The push-to-talk output can switch 300mA to ground through an FET transistor.

TX PTT Output - Pin 20

If the repeater PTT line is referenced to +5 volts or low voltages (below 10 volts), connect the repeater TX PTT Input to Pin 20. Pin 20 is protected by an isolation diode.

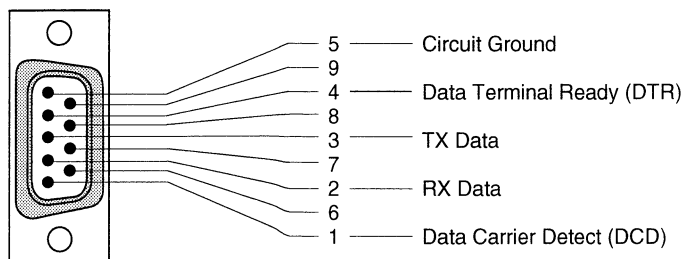
Ground - Pin 25

Connect the cable ground to Pin 25. Be sure the Raider is secured to a properly grounded rack.

Power - Pin 13

Clean DC voltage (free of noise and transients) between 11 and 16 volts should be applied to Pin 13. The power received from the repeater or wall transformer that is capable of at least 1 amp will work fine. The Raider draws 750mA or in the Low Power version, less than 300mA. Contact a Trident Representative for Low Power or solar applications. If the DC voltage drops below 10 volts, a low voltage reset circuit will interrupt the flow of current and the unit will not function. The Raider will begin functioning again when the voltage rises above 10 volts. **Note:** The Raider has been designed with a SECONDARY lightning protection system. If the site is located in an area where lightning is a problem, make sure that good PRIMARY lightning protection is installed. Primary protection of either *gas tube* or *carbon type* is recommended.

COMM PORT Connector DB-9 RS-232 Male Pinout



The COMM PORT (Communications Port) carries RS-232 signals between the Raider and the modem or computer. The Raider side of this interface is called DTE (Data Terminal Equipment) and connects directly to any DCE (Data Communication Equipment) device. A modem is a DCE device.

Direct Connection to Computer

Both, the Raider and the PC are DTE devices and will not communicate with each other on a 1 to 1 (straight through) cable. When connecting the Raider directly to a computer for testing or programming, a null modem cable must be used. The null modem cable swaps Pins 2 & 3 (send and receive) in its connection from the computer to the Raider. The only connections needed for most computers are pins 2 RX Data, 3 TX Data and 5 Circuit Ground.

The Raider uses the TELEVIDEO 920 terminal emulation commands. Please configure your computer terminal program to TVI-920. If your current program does not have this emulation, Trident recommends the T-Comm Communications program or other compatible program such as ProComm Plus®. The display may appear distorted if the proper emulation mode is not selected.

About Modems

A "modem" (**mod**ulator-**dem**odulator) is a device that converts RS-232 signals to tones that can be passed over telephone lines. This allows digital communication devices like the Raider to send information from a remote site to your local phone line. As key strokes are entered on your keyboard the computer converts them to **ASCII** data (**A**merican **S**tandard **C**ode for **I**nformation **I**nterchange). The ASCII data is then converted to a serial bit stream similar to the data that goes back and forth between the mobile and trunk system. This serial bit stream is converted to a series of RS-232 voltage levels that are fed into the modem (+12 volts = 1 and -12 volts = 0). The modem sends a different tone for each voltage level it receives (2200Hz for 1 and 2100Hz for 0).

When the modem on the "other end" sends a character, two more frequencies are introduced into the communication stream so that data can be passed in "full duplex" (both directions, simultaneously). The sending modem converts these tones into RS-232 voltage levels and passes them to your computer. The computer decodes the ASCII data and displays it on the screen as characters for you to read.

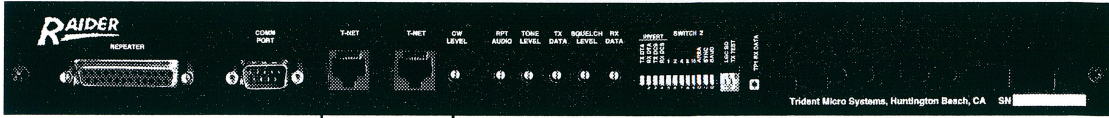
A dial-up phone line at the remote site, a modem connected to the Raider and a modem capable of auto-dialing connected to your computer are required in order to make remote contact with the Raider. The modem at the Raider site should be set to "auto answer". When you want to communicate with the Raider, you must instruct the modem connected to your computer to dial the phone line connected to the Raider's modem. When the Raider's modem sees the ringing it will answer the phone and start the data communication between your computer and the Raider.

Certain modems tend to behave unreliably under the adverse conditions sometimes occurring at a radio site (unreliable AC power, lightning and extreme temperatures). For those reasons, Trident recommends using the Trident Tuff-Modem at all radio sites. The Tuff-Modem is controlled by a special microprocessor which is much more reliable under the extremes of site conditions. The Tuff-Modem requires +12v DC and may be supported by the Raider's power supply.

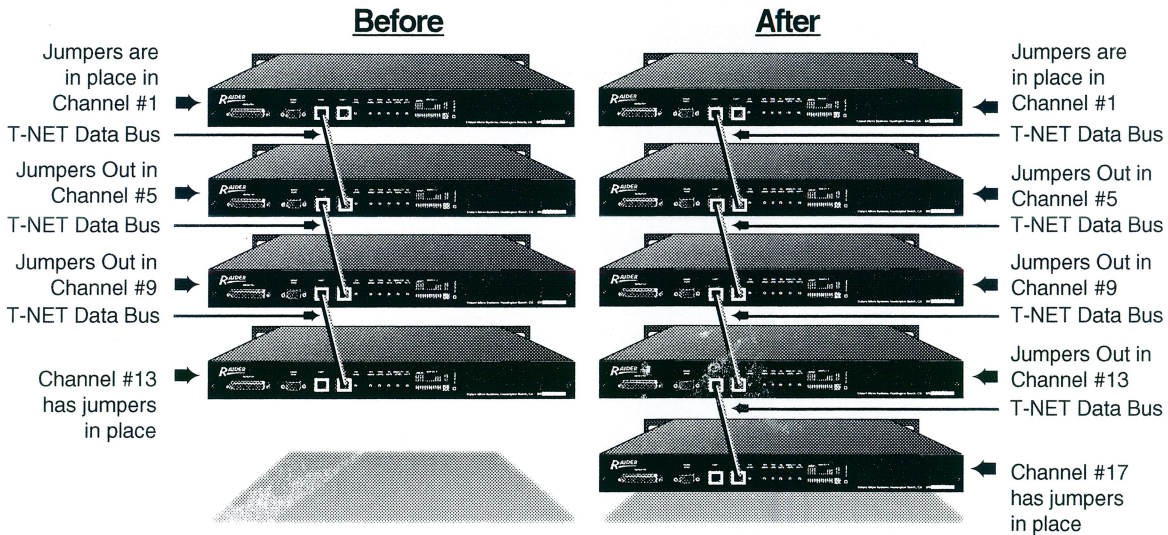


T-NET Connectors and the T-NET Data Bus

The T-NET Connectors are RJ-45 jacks and require 8 Conductor shielded cables running 1 to 1. They enable the Raider(s) (and Marauders) to be daisy chained together forming a local area network (T-NET) that allows trunking and other data to pass between channels.



The units at each end of this chain must have jumpers W6, W7, W8, W9, W23 and W24 in place for proper termination. All other units in the chain should have these jumpers removed. Not having proper termination can seriously hamper trunk system operations. Jumpers not in use should be set on one pin as a means of storage, making them readily available at a later time. Refer to page 24 for *Raider Jumper Locations and Factory Default Settings*.



Note: Any ONE of these units, in the BEFORE or AFTER diagrams, may be set to generate sync.

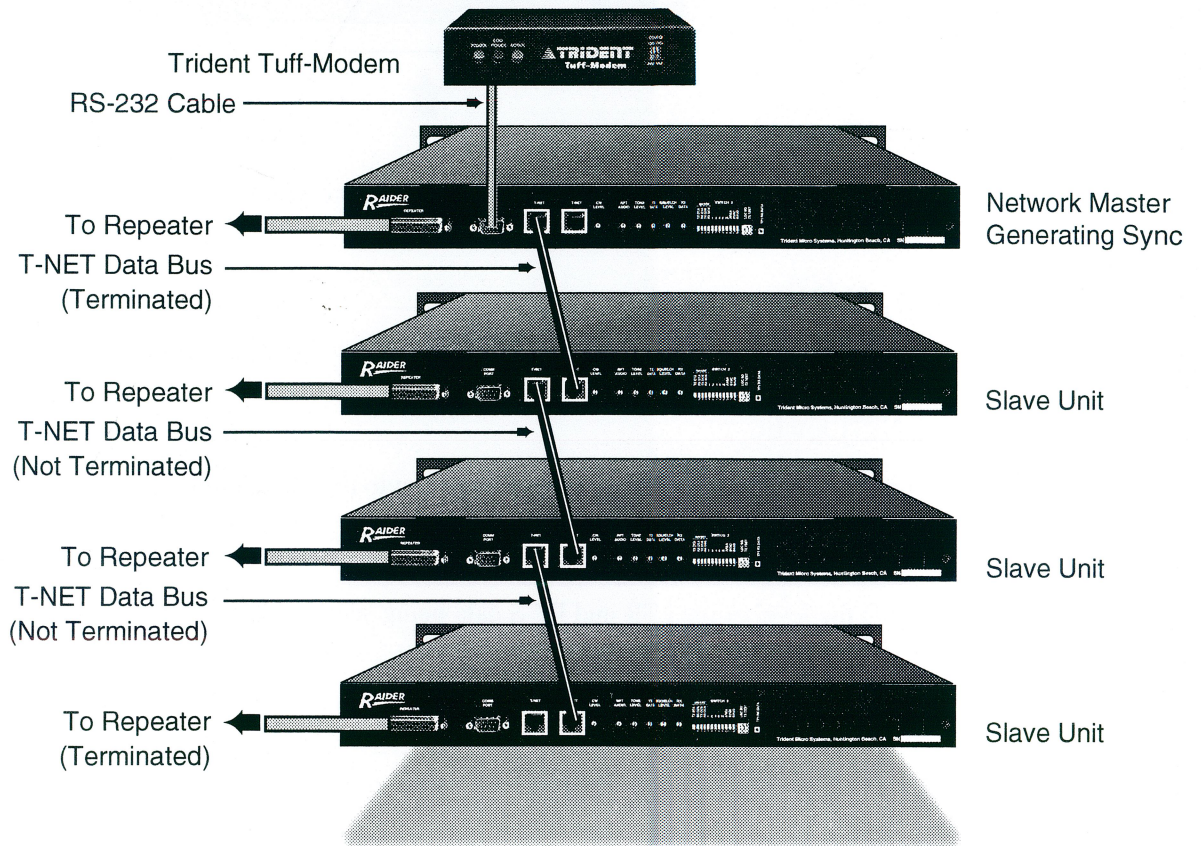
Each unit has two LEDs on the front panel that show activity on the T-NET Data Bus. These LEDs are labeled TALK and LISTEN. The TALK and LISTEN LEDs will flash in unison at a steady rate on the Network Master Raider indicating that that particular unit is generating sync for the data bus (see *Setting SYNC* on page 18). The LISTEN LED on all Slave Raiders (units not generating sync) will flash when they hear the Network Master Talk. Each Slave Raider's TALK LED will flash once for every 40 LISTEN flashes. Make sure that each Slave controller is talking and listening. It takes up to 45 minutes for the Network Master to update the Slave controllers with any database information.

Note: If either TALK or LISTEN LEDs of the Network Master or Slave units are steadily ON, it is an indication of a jumper, cable or termination problem.

Note: The SYNC LED on the front panel of the Network Master and all Slave units should be steadily ON. If this LED is blinking, it is an indication of a termination problem or that more than one unit is generating sync.

Final Connections

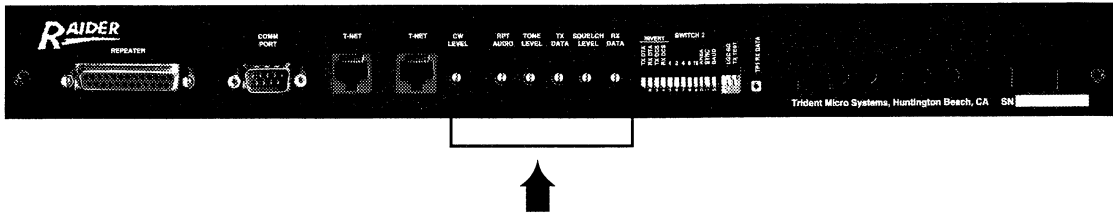
When all connections are complete there should be one data bus with properly terminated units, a modem connected to the Network Master, and each Raider connected to its repeater. The modem must be connected to the Network Master, the unit that is generating sync. The following diagram shows how a four channel system should be connected. Your system may have up to 20 channels in series.



Note: If a Raider must be powered down, it is recommended that the unit be disconnected from the data bus. If the data bus is not longer than ten feet it is unlikely that leaving an unpowered unit on the bus would cause any adverse effects. Regardless, it is still not recommended. It is not unusual to find data buses up to 40' in length. The capacitance found in such data bus lengths with an unpowered Raider is likely to distort the data, prohibiting the system from operating within specs.

Repeater Levels - Adjustments

There are six potentiometers to the immediate right of the T-NET connectors for the adjustment of communication levels.



CW LEVEL

Adjusts the Morse Code ID level. The Morse Code ID is your repeater station identification which is transmitted every 30 minutes.

RPT AUDIO

Adjusts the Repeater Audio level to the transmitter. This is the master control.

TONE LEVEL

Adjusts the level of the CTCSS tones being sent to the transmitter.

TX DATA

Adjusts the level of the LTR and DCS data being sent to the transmitter.

SQUELCH LEVEL

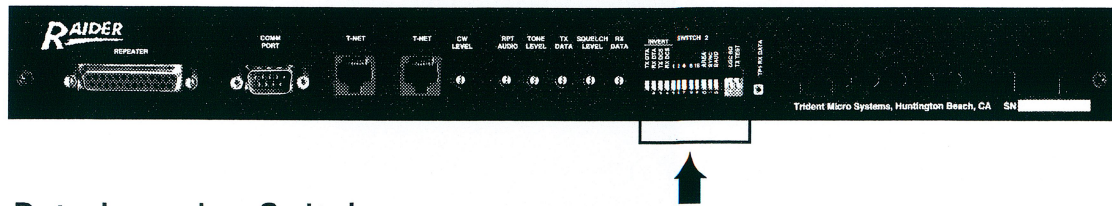
Adjusts the Internal Squelch threshold. Activity of the internal squelch circuit is displayed by the CARRIER LED on the front panel.

RX DATA

Adjusts the receiving level of LTR and DCS data being applied to the internal decoder circuitry.

SWITCH 2 Dipswitches

The following sections describe the functions of the Raider's dipswitches.



Data Inversion Switches

The four Data Inversion switches are a subset of the SWITCH 2 switches and are marked with the word INVERT over them. These switches may be set in different combinations to accommodate a variety of repeater information formats.

TX DTA

This switch sets TX LTR data polarity. Used if the transmitter inverts data.

RX DTA

This switch sets RX LTR data polarity. Used if the receiver inverts data.

TX DCS

This switch sets TX DCS data polarity. Used if the transmitter inverts data.

RX DCS

This switch sets RX DCS data polarity. Used if the receiver inverts data.

Setting the Repeater Number - 1, 2, 4, 8 and 16

The Raider's home repeater number must be set to a value of 1 through 20. This setting must be unique and not copied by another channel in the same system. Set the desired repeater number with the five numbered switches, 1, 2, 4, 8 and 16. The number/name of each switch is the binary value of the switch and may be set as follows: Turn "on" (DOWN) each switch that is needed to produce a total value equal to the number of the desired home repeater. *See example below.*

Note: Switches may be changed hot. You need not reset the power.

Example:

The desired repeater number is 13.

Turn "on" (DOWN):

Switch 1 = value 1

Switch 4 = value 4

Switch 8 = value 8

repeater #13

The AREA Bit

The Area Bit is set to 0 in the factory. When two separate systems have overlapping coverage with identical frequencies (co-channeled) the Area Bit can make one system distinguishable from the other. Set one system's Area Bit to 0 and the other system's Area Bit to 1. This prevents mobiles homed to one system from accessing the neighboring system. Care should be taken to make sure that all mobiles on each system have been programmed with the corresponding Area Bit.

AREA Switch "off" (UP) = 0
AREA Switch "on" (DOWN) = 1

Setting SYNC

Any ONE of the Raiders in the T-Net Data Bus, regardless of its position (1st, 2nd, 3rd, etc.) may have sync enabled. The Raider that has sync enabled is automatically designated the "Network Master". All other Raiders in the chain are referred to as Slave units. Sync must be enabled in one unit (and only one unit) on the data bus in order for bus communications to function properly. These operations include validation, logging interconnect airtime and allowing communications with the Raiders via modem.

SYNC Switch "off" (UP) = use sync from data bus
SYNC Switch "on" (DOWN) = generates sync for T-NET data bus

BAUD Rate

The Raider's RS-232 port can communicate at two common speeds (baud rates) of 1200 or 2400 baud. The Network Master Raider baud rate should be set to the same rate as the modem that is interfaced to that system. For example, when using the Trident Tuff-Modem (1200 or 2400 baud) the Raider's BAUD switch should be set in the "on" (DOWN) position for 2400 baud if the Tuff-Modem is set at 2400 baud.

BAUD Switch "off" (UP) = 1200 baud
BAUD Switch "on" (DOWN) = 2400 baud

LGC SQ

This switch holds the Logic Squelch open when turned "on" (DOWN), enabling carrier test signals to be repeated.

TX TEST

This switch puts the channel into a busy test mode when turned "on" (DOWN). A 255 LTR Busy ID is transmitted, which busies out the channel.

Test Point - TP1



TP1 RX DATA

This test point is used to read the RX DATA level. Check for 200mV RMS with the repeater receiving a full quieting signal modulated with a 100Hz tone deviating at 1kHz (800Hz for 12.5kHz operation).

QUICK START



What Is Quick Start?

Quick Start is the procedure by which the Raider may be quickly set up with basic level adjustments to get the unit on the air. For those of you who wish to set up the unit with greater precision, please proceed to the *ALIGNMENT PROCEDURE* on page 26.

The Raider should be connected to the repeater and disconnected from other logic units. All dipswitches should be "off" (UP). The repeater should be "on" giving power to the Raider.

Note: All references to dipswitches, test points and potentiometers are made by the component's name imprinted on the back of the chassis. If the component is not accessible from the back of the Raider, i.e., the part is inside the chassis, mounted on the PCB, it will be referred to by its PCB silkscreen name.

Note: You may wish to refer to the *Raider Jumper Location* and *Raider LED, Potentiometer and Test Point Location* charts at the end of the Quick Start section.

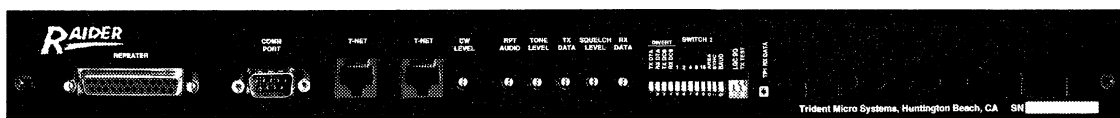
Equipment Required:

- RMS DVM (volt meter)
- Service Monitor
- Small flat head screwdriver for potentiometer adjustment
- Medium Philips screwdriver for opening chassis
- IBM compatible PC computer (laptop)
- Communications software
- A null modem cable

Raider Front View LEDs



Raider Back View Components



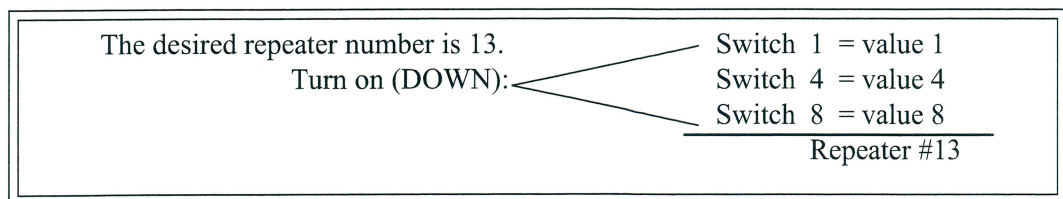
Quick Start Pre-Tune

Before starting the Quick Start Pre-Tune, you must have an IBM compatible computer with a communication program (T-Comm, ProComm Plus or similar) installed. Set communications for either 1200 or 2400 baud (it must match the Raider's setting), 8 data bits, 1 stop bit, and no parity. The computer must be connected to the Raider with a null modem cable. Begin the Quick Start Pre-Tune Procedure with the computer off.

1. Install the Raider in the system rack.
2. Connect the Raider to its repeater. Apply power to the repeater.
3. The Raider should be disconnected from the T-NET Data Bus (RJ-45 connectors).
4. If this unit is a new installation, all dipswitches should be "off" (UP). Or, if this is not a new installation, check all dipswitches to verify:
 - a. Repeater Number - Refer to *Setting the Repeater Number Example*, below.
 - b. Data Inversion - Refer to the INVERT SWITCHES in the *Jumper and Switch Chart* in Appendix F for the appropriate repeater.
5. Set the SYNC switch to "on" (DOWN). This enables sync, designating the unit as Network Master (even though the network is temporarily disconnected). This condition is necessary for the duration of the Alignment Procedure.
6. Remove the Raider's lid and set the necessary jumpers and switches for the connected repeater. See Appendix F - Repeater Interfaces.
7. The Raider's home repeater number must be set to a value of 1 through 20. This setting must be unique and not copied by another channel in the same system. Set the desired repeater number with the five numbered switches, 1, 2, 4, 8 and 16. The number of each switch is the binary value of the switch and may be set as follows: Flip each switch that is needed to produce a total equal to the number of the desired home repeater number to the "on" (DOWN) position.

Note: Switches may be changed hot. You need not reset the power.

Setting the Repeater Number Example:



8. Set the AREA switch to the desired area. See *The AREA Bit* on page 18.
9. Connect your computer to the Raider's COMM PORT with the null modem cable. Make sure your communications software is set to the computer COMM Port that the null modem is plugged into.
10. Turn your computer "on" and start your communications program. Set the baud rate for either 1200 or 2400 (it must match the Raider's baud setting), 8 bits, 1 stop bit, and no parity. Press ENTER repeatedly until the Trident Micro Systems greeting appears on your computer screen.

Quick Start Pre-Tune - Continued

11. At the password prompt type "CONTROL". Press "S" for Setup, then press "I" for Initialization. You will be notified that "All data will be lost." in this initialization process. The next line asks "Are you sure? [Y/N]". Press "Y". You will then be asked "Positive or Negative Validation? [+ or -]". Entering a "+" initializes the unit with all ID codes VALID. Entering a "-" initializes the unit with all ID codes INVALID. This choice is at the discretion of the operator. After making your selection the unit will be initialized and you will be taken back to the Trident Micro Systems greeting and the password prompt.
12. Again, log on with the CONTROL password. Press "E" for Edit then "U" for User Settings.
13. Set up a valid LTR ID for dispatch in the Raider that matches your test mobile radio. When finished, press the ESC key.
14. Press "S" to access the System Parameters. Using the ENTER key, move the cursor to the CWID entry position. You may skip over pages by typing "+# ENTER" or "-# ENTER" where # = the number of pages to skip over. A maximum of 9 pages at a time may be skipped. Do not type the quotation marks "". Enter the call sign of this repeater at the same repeater number that you previously entered in Step 7. When finished, press the ESC key repeatedly until you are asked if you want to log off. Type "Y" for yes to return to the Log-on Screen. This will return you to the Trident Micro Systems greeting.
15. Position the following jumpers accordingly.
 - W22, W26, W30 Dependent upon repeater type, refer to Appendix F for your particular repeater.
 - W2, W3, W28 in NORM position.
 - W16 in '+' position.
 - W1 in INT position for Internal Squelch indication for RDD -OR- W1 in EXT position for External Monitor Receiver.Replace the Raider's lid.
16. Adjust TX DATA & TONE LEVEL potentiometers fully counterclockwise (all the way to the left).

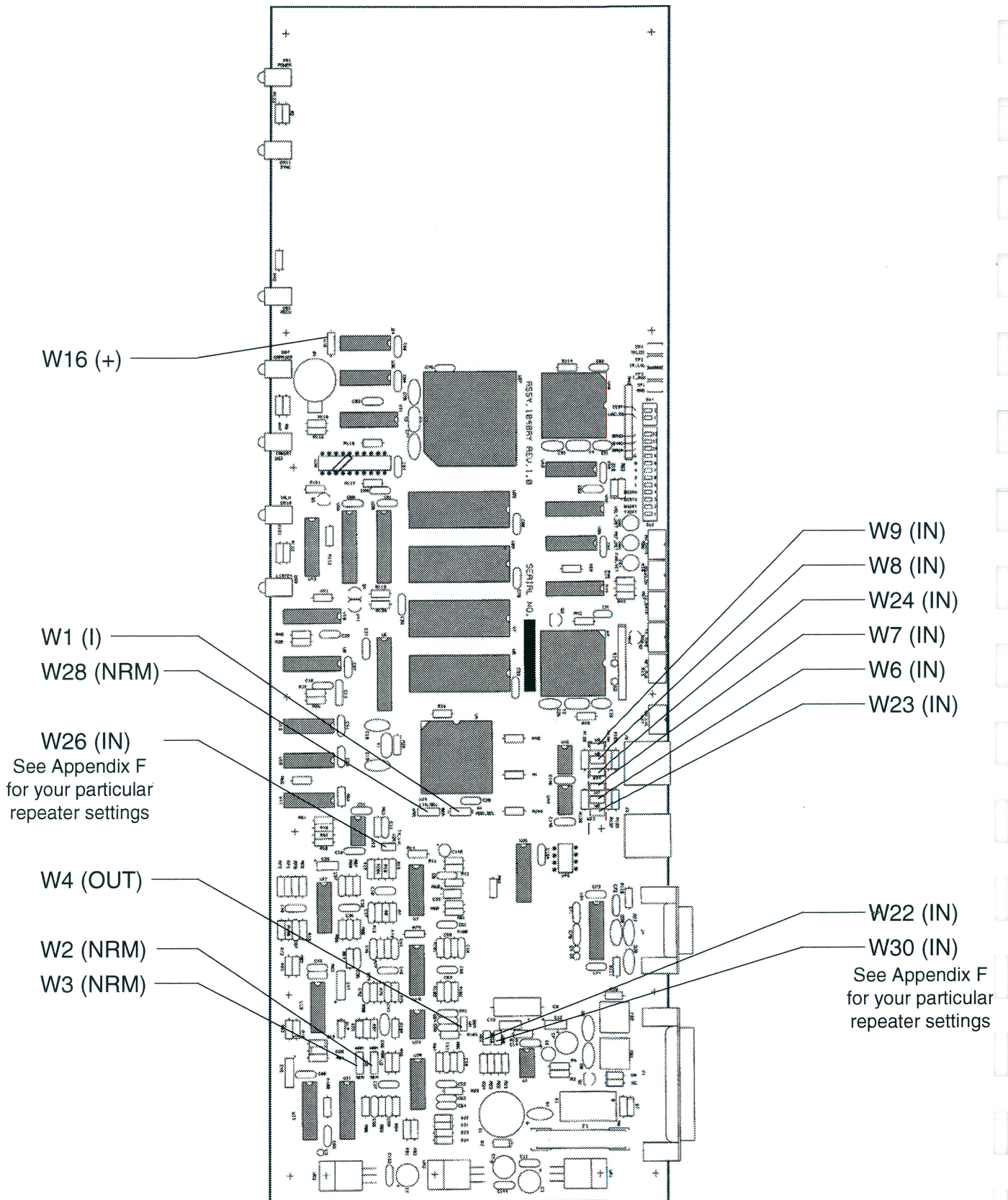
Quick Start Tuning

1. Make sure that the repeater is not receiving a signal from your service monitor or a mobile radio. Adjust the SQUELCH LEVEL potentiometer to the point that the CARRIER LED just goes out and does not flicker.
2. Inject a full quieting signal into the receiver of the repeater. Modulate the signal with a 1kHz tone deviating at 2kHz (1kHz for 12.5kHz operation). Measure the amplitude of the sinewave at pin 1 of U1 and adjust the repeater's Discriminator output or change the controller's gain jumpers, W22 and W30, to obtain a 2Vp-p signal.
3. Set up your service monitor to generate a 100Hz tone deviating at 1kHz (800Hz for 12.5kHz operation). Make sure to have a full quieting signal generated into the repeater. The repeater's BUSY LED should be "on". The POWER, SYNC, RECEIVE and CARRIER LEDs on the front panel of the Raider should be "on". The Raider's TALK and LISTEN LEDs should be blinking.

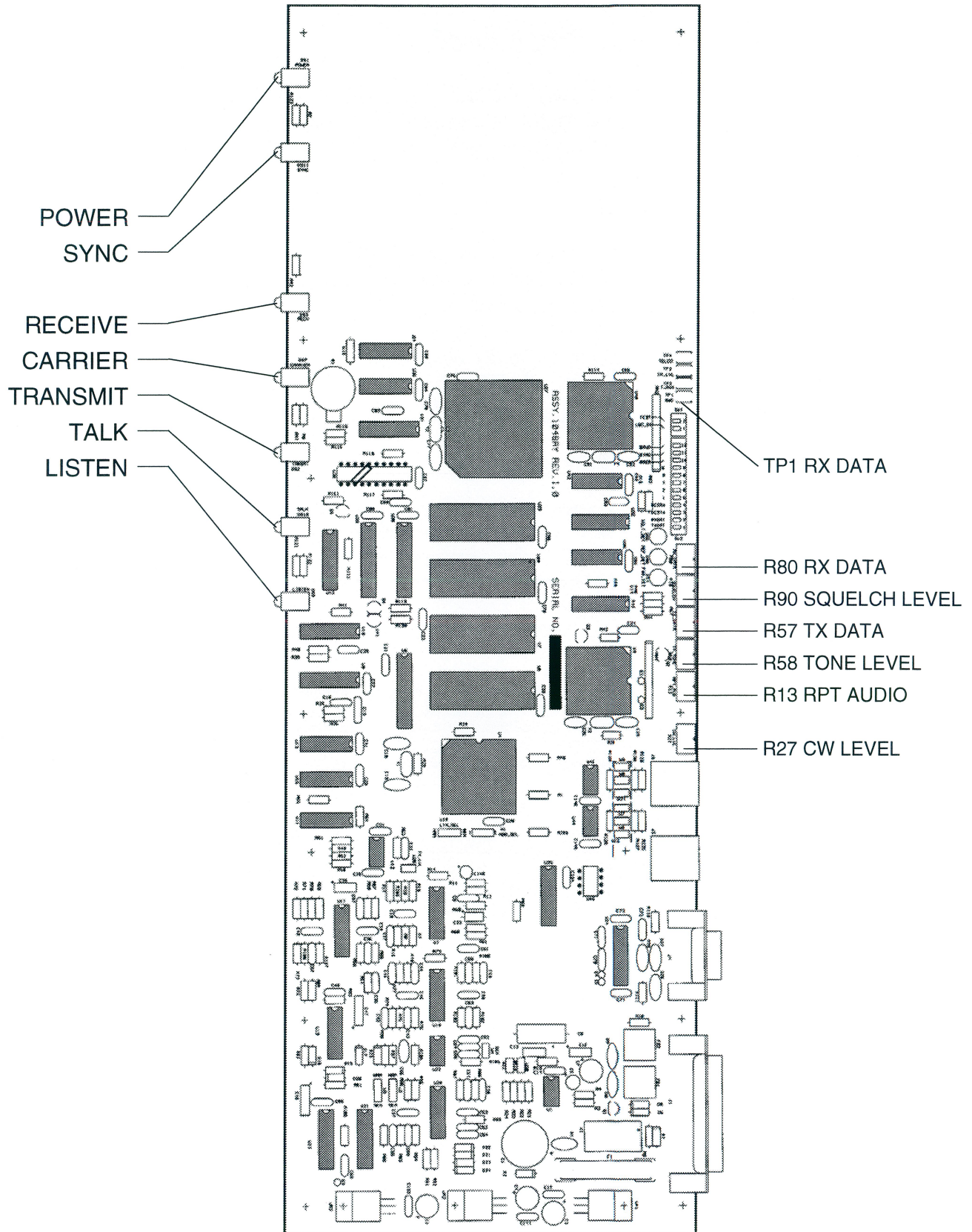
4. Set your volt meter to AC volts. With a 100Hz tone present, connect the meter probe to TP1 RX DATA. Adjust RX DATA R80 to 200mV RMS.
5. Set the LGC SQ and TX TEST switches to "on" (DOWN). The RECEIVE and TRANSMIT LEDs on the front panel of the Raider should be "on".
6. Set the service monitor to generate a 1kHz tone deviating at 2kHz (800Hz for 12.5kHz operation).
7. Set the service monitor to duplex mode and select the repeater's output frequency with the correct offset. Adjust RPT AUDIO R13 to 2kHz deviation (800Hz for 12.5kHz operation). Turn the LGC Sq switch "off" (UP) and tune TX DATA R57 for 1kHz of deviation (800Hz for 12.5kHz operation).
8. Set the TX TEST switch to "off" (UP). Set the service monitor to Receive mode on the repeater's output frequency.
9. You should now be able to handshake with the Raider. Please verify before continuing.
10. Enable a tone user in the User Entry screen (see *How To Enter the Value of a CTCSS Tone* on pg 46) then key up a tone radio. Monitor the output of the repeater and adjust TONE LEVEL R58 so that the TX tone level out of the repeater is between 600Hz and 800Hz.
11. Toggle the BAUD switch up and down. You should hear the CWID. Adjust CW LEVEL R27 to 2.5kHz (1.5Hz for 12.5kHz operation).
12. Reconnect the T-NET Data Bus if this is a multi-channel system. Set the sync switch for proper system operation.

Quick Start tuning of your Raider is now complete.

Raider Jumper Locations and Factory Default Settings



Raider LED, Potentiometer and Test Point Locations



ALIGNMENT PROCEDURE



What Is the Alignment Procedure?

The Raider comes from the factory with basic settings but requires proper adjustments and fine-tuning to become an integral part of your system. These steps will walk you through interface requirements and bring all system input and output levels to within tolerance for peak performance.

Alignment Preparation

All references to dipswitches, test points and potentiometers are made by the component's name imprinted on the back of the chassis. If the component is inside the chassis, mounted on the PCB, it will be referred to by its PCB silkscreen name.

Note: You may wish to refer to the *Raider Jumper Location* and *Raider LED, Potentiometer and Test Point Location* charts on the previous pages.

Equipment Required:

- RMS DVM (volt meter)
- Service Monitor
- Small flat head screwdriver for potentiometer adjustment
- Medium Philips screwdriver for opening chassis
- IBM compatible PC computer (laptop)
- Communications software
- A null modem cable

Raider Front View LEDs



Raider Back View Components



Alignment Procedure

1. Install the Raider in the system rack.
2. Connect the Raider to its repeater. Apply power to the repeater.
3. The Raider should be disconnected from the T-NET Data Bus (RJ-45 connectors).
4. If this unit is a new installation, all dipswitches should be "off" (UP). Or, if this is not a new installation, check all jumpers and dipswitches to verify:
 - a. Repeater Type - Refer to Appendix F for your particular repeater settings.
 - b. Repeater Number - Refer to *Step 8, Set the Home Repeater Number*.

- Set the SYNC switch to "on" (DOWN). This enables sync, designating the unit as Network Master (even though the network is temporarily disconnected). This condition is necessary for the duration of the Alignment Procedure.

Preset the Pots

- Several adjustments must be completed to bring the Raider into precise alignment. Begin by setting the potentiometers in the back of the unit as follows.

Repeater Side

- | | |
|---------------------|------------------------------------|
| • CW LEVEL R27 | Full Counterclockwise |
| • RPT AUDIO R13 | Mid-range (12 o'clock straight up) |
| • TONE LEVEL R58 | Full Counterclockwise |
| • TX DATA R57 | Full Counterclockwise |
| • SQUELCH LEVEL R90 | Full Counterclockwise |
| • RX DATA R80 | Mid-range (12 o'clock straight up) |

Set Repeater Type

- Remove the Raider's lid and set the necessary jumpers and switches for the connected repeater. See Appendix F, *Repeater Interfaces*.

Set the Home Repeater Number

- The Raider's home repeater number must be set to a value of 1 through 20. This setting must be unique and not copied by another channel in the same system. Set the desired repeater number with the five numbered switches, 1, 2, 4, 8 and 16. The number of each switch is the binary value of the switch and may be set as follows: Flip each switch that is needed to produce a value equal to the number of the desired home repeater to the "on" (DOWN) position.

Note: Switches may be changed hot. You need not reset the power.

Example:

The desired repeater number is 13.

Turn "on" (DOWN):

Switch #1 = value 1

Switch #4 = value 4

Switch #8 = value 8

Repeater #13

Set SYNC

- Check to make sure the SYNC switch is turned "on" (DOWN) and that the SYNC LED is on steady. Remember, if you do not wish for this unit to generate sync under normal operation, you must turn this switch "off" (UP) when the Alignment Procedure is completed. Only one Raider on a system may generate sync.

The AREA Bit

- The Area Bit should be set to 0 (factory default). When two separate systems have overlapping coverage with identical frequencies (co-channelled) the Area Bit of one system will be set for 0 and the Area Bit for the second system will be set for 1. This prevents mobiles homed to one system from accessing the neighboring system. Care should be taken to make sure that all mobiles on each system have been programmed with the corresponding Area Bit.

Terminal Connection

11. Connect your PC to the COMM PORT on the back of the Raider with the null modem cable. Turn your PC "on" and start your communication program. Set the PC's communications for either 1200 or 2400 baud (it must match the Raider's baud setting), 8 data bits, 1 stop bit, and no parity. Press ENTER repeatedly until the Trident Micro Systems greeting appears on your PC screen and you are prompted to enter a password.
12. Type the word "CONTROL" at the password prompt then press ENTER. The Main Menu will appear. Select "S" for Setup, the Setup Menu will appear. Select "I" for Initialization. You will be notified that "All data will be lost." in this initialization process. The next line asks "Are you sure? [Y/N]". Press "Y". You will then be asked "Positive or Negative Validation? [+ or -]". Entering a "+" initializes the unit with all ID codes VALID. Entering a "-" initializes the unit with all ID codes INVALID. This choice is at the discretion of the operator. After making your selection the unit will be initialized and you will be taken back to the Trident Micro Systems greeting and the password prompt.

Set Up The CWID

13. Enter "CONTROL" at the password prompt then press ENTER. At the Main Menu, press "E" for Edit Parameters. Now press "S" for System Parameters. Page through the display by pressing "+" then ENTER, repeatedly, until the parameter "CWID for CH#xx ->" is displayed (xx is the repeater number you entered back in "Set Repeater Number"). You may skip over pages by typing "+# ENTER" or "-# ENTER" (where: # = the number of pages to skip over, a maximum of 9 pages at a time may be skipped, do not type the quotation marks "). Move the cursor, by pressing ENTER, to the CWID parameter line that shows your repeater number. Enter the alphanumeric characters (maximum of 10) you wish to have broadcast then press ENTER. The character string is duplicated to the left of the characters you typed. When finished, press the ESC key repeatedly until you are prompted to log off. Press "Y" for yes. This will return you to the Trident Micro Systems greeting.

SQUELCH LEVEL

14. Inject a full quieting signal into the receiver of the repeater. Modulate the signal with a 1kHz tone deviating at 2kHz (1kHz for 12.5kHz operation). Measure the amplitude of the sinewave at pin 1 of U1 and adjust the repeater's Discriminator output or change the controller's gain jumpers W22 and W30 to obtain a 2Vp-p signal.
15. This potentiometer adjusts the internal audio squelch level and affects the CARRIER LED on the front panel. With no carrier on the repeater's input frequency, adjust the SQUELCH LEVEL R90 to the point at which the CARRIER LED goes out and then a little beyond that point.

RX DATA

16. Set up the service monitor to generate a signal on the repeater input frequency. Make this signal full quieting and modulate it with a 100Hz tone. Set deviation at 1kHz (800Hz for 12.5kHz operation). This signal is used to adjust the LTR data recovery circuit.
17. Connect a volt meter set for AC volts RMS to TP1 RX DATA and adjust the RX DATA potentiometer R80 for a reading of 0.200 volts AC RMS on the meter.

RPT AUDIO

18. Set the service monitor to duplex mode and select the repeater output frequency with the correct offset. Generate a 1kHz tone at 2kHz deviation (800Hz for 12.5kHz operation). Turn "on" (DOWN) LGC SQ and TX TEST. This enables the audio signal to pass through the Raider. Adjust the RPT AUDIO R13 for 2kHz of deviation (800Hz for 12.5kHz operation). For optimum performance, the audio going into a repeater should be the same level coming out.
19. The repeater has a master level potentiometer or deviation limiter internal to the exciter which, if the range is too limited, may have to be adjusted and balanced with RPT AUDIO. What goes in should also come out.

TX DATA

20. Turn the LGC SQ switch "off" (up). Keep the TX Test switch "on" (down). Set the service monitor to receive on the repeater output frequency and adjust the TX DATA R57 level for 1kHz deviation (800Hz for 12.5kHz operation).
21. Set the TX Test switch to "off" (up). Set the service monitor to receive mode on the repeater's output frequency.

Morse Code CWID

22. Adjustment of the CW LEVEL should be performed even if the channel is not the ID channel. Toggle the BAUD switch, first in one direction then back to the original position and adjust the CW LEVEL R27 for 2.5kHz deviation (1.5kHz for 12.5kHz operation) including data.
Remember to set the BAUD switch back to the correct baud rate position.

Handshake Testing

23. The term "handshake" in these instances gives reference to the successful effort of the radio and the repeater to communicate. Try to access the Raider by keying the test radio. The CARRIER, RECEIVE and TRANSMIT LEDS should come "on" steady. If they do, this is an indication that the two units have made the handshake.
24. If the CARRIER LED is "on" and the RECEIVE LED is "off", try changing the RX DATA switch. If the CARRIER and RECEIVE LEDS come "on" and the TRANSMIT LED also comes "on" but the unit does not handshake, try inverting the TX Data switch. If a problem still occurs, check all connections.

TONE LEVEL

25. TONE LEVEL becomes active when a CTCSS tone is keyed on the repeater. TONE LEVEL controls the TX tone level when a tone user is active on the repeater. To set this level, enable a tone user for a 100Hz tone. Set the service monitor to duplex mode and select the repeater output frequency with the correct offset. Generate a 100Hz tone deviating at 750Hz while monitoring the output of the repeater. Adjust TONE LEVEL for 750Hz of deviation.
26. Reconnect the T-NET Data Bus if this is a multi-channel system. Set the sync for normal system operation.

The Raider Alignment Procedure is now complete.

OPERATIONAL TESTING



1. Program a mobile or portable radio to each repeater channel being added or converted.
2. Make sure that all controllers are programmed with the correct repeater number and area bits.
3. With all components of the system receiving power, key the radio. Notice that the CARRIER LED comes "on" with each handshake request. The RECEIVE LED should come "on" each time a correct ID code is received.

If the repeater has been adjusted correctly, it will handshake with the radio. Make sure that the Raider handshakes on the first or second attempt each time the radio is keyed up.

It is normal to see the TRANSMIT LED come "on" every 10 seconds or so. This is an idle message that is being transmitted to the mobiles.

Every 30 minutes the Raider broadcasts the station CWID (Morse Code identification) if enabled. If a conversation is in progress, the CWID transmission will wait until the conversation has completed before identifying.

INITIALIZATION



Once the Raider has been aligned, connected to the system and handshake tested it must be initialized. This procedure can be performed on the bench, in the shop or at the site. Do each item in order as follows.

1. Access the Raider by entering "CONTROL" as the password.
2. Set the system sign-on message under the Setup menu.
3. Set the Passwords, both for **Monitor** and **Control**.

Remember: "CONTROL" is the factory default Control password that grants access to view AND to edit all settings. "MONITOR" is the factory default Monitor password that grants access to view settings but not to edit them.

WARNING! Record your new passwords on paper as you change them for future reference. You may think you will always remember them, but... write them down!

4. From the Main Menu press "**S**" for Setup then press "**I**" for Initialize. Press "**Y**" for Yes. When prompted for Positive or Negative Validation, enter a "+" to initialize with all ID codes valid or enter a "-" to initialize with all ID codes invalid. This is done at the operator's discretion.

After completing this list of initialization commands the Raider will be ready to operate.

Circle M or C for Monitor or Control	New Password	Date
M C	_____	_____
M C	_____	_____
M C	_____	_____
M C	_____	_____
M C	_____	_____
M C	_____	_____
M C	_____	_____
M C	_____	_____
M C	_____	_____
M C	_____	_____

COMMUNICATING WITH THE RAIDER

Connections

Communications may be established with the Raider by one of two means. By direct serial connection to your computer or by modem and telephone line from a remote location.

If the connection to be made is with a local computer, a null modem cable must be extended from the computer to the COMM PORT in the back of the Raider.

If the connection is to be made from a remote location via modem, the telephone line becomes the medium. A call is made to the site on the line that the Raider's modem is connected to utilizing a communications program such as Trident's T-Comm software (see Appendix D for instructions).

Once communications are established, locally or remotely, the computer screen will display a sign-on message similar to the one below.

Trident Micro Systems, Copyright © 1998

Raider Logic Controller S/W Version 1.0

Password :

Passwords

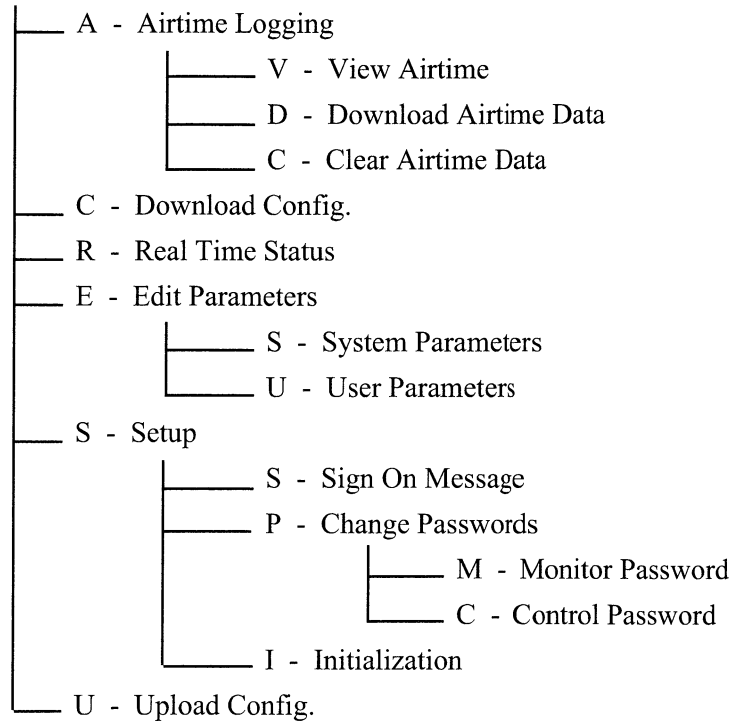
You have a choice to enter either a Control Password or a Monitor Password to gain access to the unit. The Monitor Password will only allow viewing of menu items while the Control Password will allow access to view and make changes. The default for the Control Password is "CONTROL" and the default Monitor Password is "MONITOR".

If, for some reason, the passwords are changed, lost or forgotten, removing the battery temporarily will restore the default passwords **but** will also destroy any stored logged data. This procedure should be avoided if at all possible. Contact the Trident Technical Support Team to assist in recovery, without going to the site.

Menu Tree

The following diagram is an illustration of the structure and substructures of the Raider's menu system. You may wish to copy this illustration and keep it by the computer.

Main Menu



Main Menu

Once a correct password is entered, the Trident Micro Systems greeting and Main Menu will be displayed. Make a selection from the menu by pressing the corresponding letter on your keyboard.

Trident Micro Systems

Main Menu:

A = Airtime Logging

C = Download Config.

R = Real Time Status

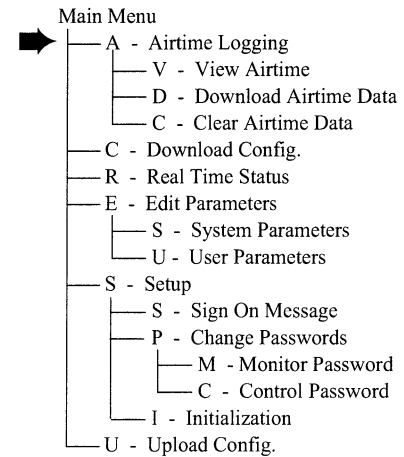
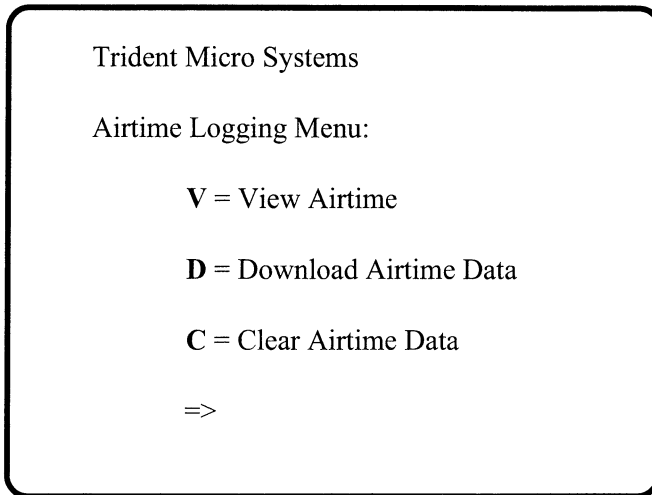
E = Edit Parameters

S = Setup

U = Upload Config.

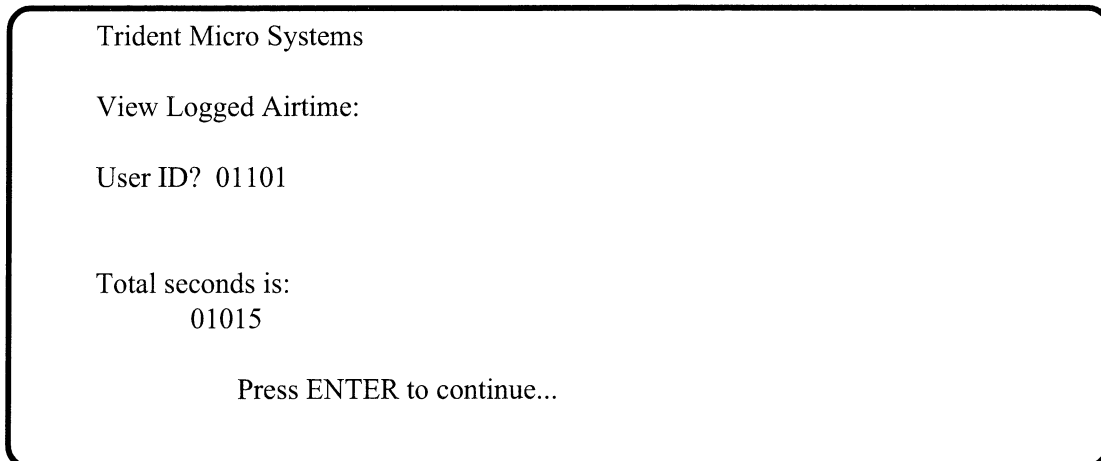
A - Airtime Logging Menu

This menu will be displayed when an "A" is entered from the Main Menu.



V - Viewing Logged Airtime

Any of the 5000 ID codes using the trunking system connected to the Raider will be logged. If the maximum count of 65535 seconds is reached (about 18hr 12sec) the counter will hold at that amount until the airtime is cleared. An example of the airtime menu is shown below.



Enter the user's ID whose airtime you wish to view and press **ENTER**. That ID's accumulated airtime will then appear in real time. Press **ENTER** again to view another user's ID code.

D - Download Airtime Data

The airtime that has accrued for each ID can be downloaded from the Raider to an office computer for further processing, billing, etc. You must be familiar enough with the communications program you are using to be able to initiate the download when the computer notifies you that "Downloading is ready" (see example below).

Trident Micro Systems

Download Logged Data

Downloading is ready,
To abort the download, press ESC then press X.

Note: Please refer to your communications program documentation for download procedure.

It is recommended that you use the XMODEM (checksum) protocol for the download. This is a universal protocol for transferring data between computers. The sending station (Raider) sends a block of data 128 bytes in length to the receiving station. The data includes a block number, control characters, data and checksum.

The receiving station checks for the proper order and the checksum. If the data shows an error, the data is rejected and a NACK (Not Acknowledged) is sent to the sending station. The sending station will, in turn, send the data block again. The sending station will retry a maximum of 10 times before quitting and reverting back to the prompt. If the data was correct, the receiving station sends an ACK (acknowledged) to the sending station and the next block of data is sent.

If there is not enough data to fill the 128 byte block, spaces (20H) are used as fill characters, with a Carriage Return (0DH) and Line Feed (0AH) at the end.

C - Clear Airtime Data

Logged airtime can be cleared after a successful download has taken place. Always remember to check all downloaded data to make sure that it is intact and that all of the data has been properly downloaded into your computer. After you are sure that all data has been transferred correctly, use the Clear Logged Airtime Data command.

Trident Micro Systems

Clear Logged Airtime Data:

Caution!!

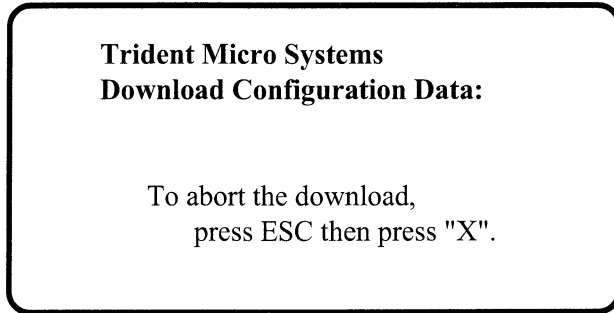
All logged data will be lost.

Are you sure? [Y/N]

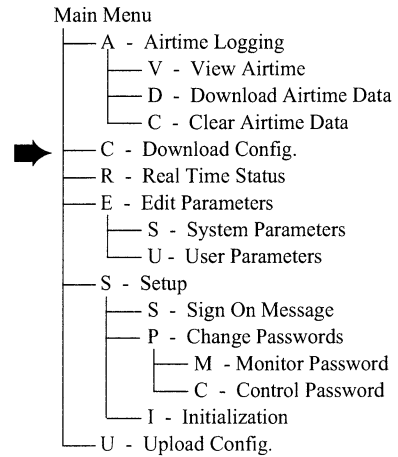
C - Download Config

The Raider allows the system manager to back up its programming by downloading the existing configuration data. Should lightning hit the site and scramble the data inside of the Raider, the system manager can upload the latest backup copy of the programming back into the Network Master to get it back on line fast.

Download the system configuration into a file and save it in a safe place. Do this procedure on a regular basis to insure that customer programming information can be restored easily, should something go wrong at the site.



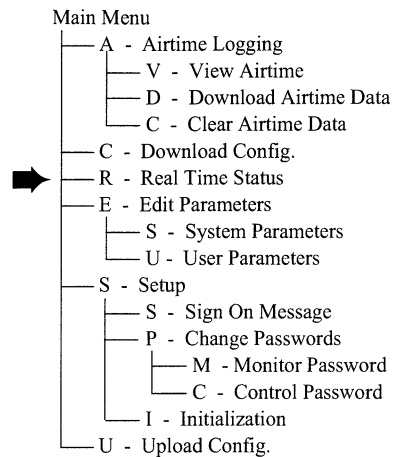
Note: Please refer to your communications program documentation for download procedure.



R - Real Time Status

The Real Time Status is brought to the screen by selecting the command "R" from the Main Menu. The status field is updated each time a mobile keys or unkeys the mic. On busy systems, the display may slow down slightly. The Status Field will display one of three possible conditions.

- 1) A valid customer's dispatch ID code.
- 2) "No Rptr" will be displayed in the status field if a repeater does not exist.
- 3) "Idle" will show in the status field if the channel exists but is not in use.



Trident Micro Systems

REAL TIME STATUS

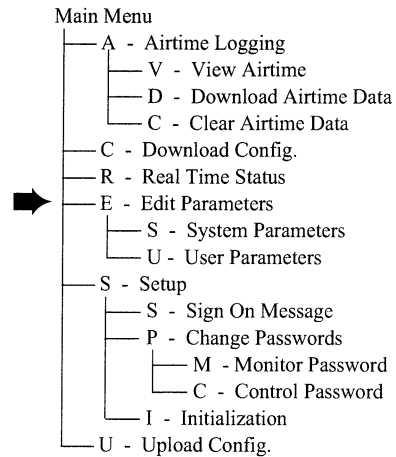
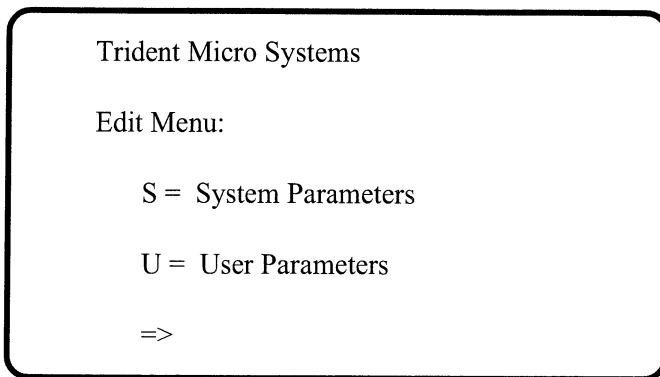
01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
xxx	---	---	---	xxx	---	---	---	---	xxx	---	---	---	xxx	---	---	xxx	---	---	---
01	-	Idle					08			No Rptr				15			No Rptr		
02	No Rptr						09			No Rptr				16			No Rptr		
03	No Rptr						10	-	Idle					17	-	Idle			
04	No Rptr						11			No Rptr				18			No Rptr		
05	05101	Valid					12			No Rptr				19			No Rptr		
06	No Rptr						13			No Rptr				20			No Rptr		
07	No Rptr						14			17034	Valid			21	-	Idle			

Validation Channel

Channel 21 is also shown on the display, however, it is not a user available channel. It is the channel slot that the validator uses to validate customers on the system. If an **invalid** ID code attempts to use the system, the ID code is displayed in the 21 slot. The channels on the system see this ID code and the channel to which the invalid ID code is logged, sends a shut-down code to all radios in the field that have that invalid ID. This keeps their radio's RX Audio muted.

E - Edit Parameters

The following menu is displayed when "E" is selected from the Main Menu.



S - System Parameters

The Systems Parameters list is displayed by pressing "S" in the Edit Parameters menu. Use the ENTER key to move the cursor to the parameter you wish to change. Enter the new value then press ENTER. The new value will be duplicated in the CURRENT VALUE column. The System Parameters list is made up of several pages. You may advance multiple pages by pressing "+#" then ENTER (# = the number of pages you wish to jump over, maximum of 9 pages per jump, do not type the quotation marks "). You may advance single pages by pressing "+" then ENTER. The following are descriptions (listed in the order displayed) of each parameter and their functions with some suggested settings for optimum performance.

Max TX Time

This is a transmitter Time Out Timer (TOT). It sets the maximum amount of time that a mobile may continuously transmit before the repeater transmitter is disabled. The TOT has a maximum limit of 6 minutes and can be set in 1 minute increments by entering any integer value from 1 to 6. The timer may be disabled by entering a 0.

CTCSS/DCS Hang Time

The Hang Time is used to force the transmitter to continue encoding the CTCSS or DCS code after the mobile has unkeyed or is no longer detected. The timer is adjusted in 32 millisecond increments by entering any integer value from 40 (1.28 seconds minimum) to 254. NOTE: This timer is directly affected by the Carrier Fade Timer.

CTCSS/DCS Drop Time

The Drop Time is the amount of time that the Transmitter will stay keyed after the Hang Timer has expired. It is activated when a mobile unkeys. It keeps the transmitter up so that the conventional radios can hold the channel during a conversation. This is an operator adjustable count down timer that is adjustable in 32 millisecond increments by entering an integer from 40 (1.2sec) to 254 (7.6sec). The digital value in this field translates into seconds when multiplied by .03.

S - System Parameters Display

Trident Micro Systems

(Type + or - to advance or back up a page, +9 (CR) will advance 9 pages)

NAME	LOWER LIMIT	UPPER LIMIT	CURRENT VALUE	NEW VALUE
Max TX Time Min 0=OFF	000	006	000	
CTCSS/DCS Hang Time (.03)	040	254	040	
CTCSS/DCS Drop Time (.03)	040	215	040	
Carrier Fade Time (.03)	000	255	001	
LTR Fade Time (.03)	040	254	040	
RDD Fade Time (.1)	010	254	024	
RDD Carrier Only	000	001	001	
RDD Act time, CH #1 (.1)	000	254	000	
RDD Act time, CH #2 (.1)	000	254	000	
↓	↓	↓	↓	
RDD Act time, CH #20 (.1)	000	254	000	
CW ID repeater #1 -->				
CW ID repeater #2 -->				
↓				
CW ID repeater #20 -->				
IDLE msg for CH #1	00066	65535	00333	
IDLE msg for CH #2	00066	65535	00333	
↓	↓	↓	↓	
IDLE msg for CH #20	00066	65535	00333	
DCS code 1 for CH 1	000	104	000	
DCS code 2 for CH 1	000	104	000	
↓	↓	↓	↓	
DCS code 20 for CH 1	000	104	000	
↓	↓	↓	↓	
DCS code 1 for CH 20	000	104	000	
DCS code 2 for CH 20	000	104	000	
↓	↓	↓	↓	
DCS code 20 for CH 20	000	104	000	

DCS code entry for channels 1 through 20 will cover approximately 25 pages. You may skip over pages by typing "+# ENTER" or "-# ENTER" (# = number of pages to skip over, maximum of 9 pages at a time, do not type the quotation marks).

S - System Parameters - Continued

Carrier Fade Time

The Carrier Fade Timer causes the drop of the transmitter by forcing the CTCSS/DCS Hang and Drop times to zero. The Fade Time is the amount of time from the loss of a carrier, indicated by the internal squelch circuit, until the forced zeroing of the other timers. This timer is adjustable in 32 millisecond increments by entering an integer from 1 to 255. To disable, enter 0.

LTR Fade Time

The LTR Fade Time is used to force the transmitter to continue encoding an LTR code if the mobile's data is no longer detected due to a signal fade. After expiration, a turn off code is sent to all receiving mobiles and the transmitter is unkeyed. The timer is adjusted in 32 millisecond increments by entering an integer from 40 (1.28 seconds minimum) to 254.

RDD Fade Time

The RDD Fade Time (Repeater Disable Device) is the amount of time that elapses from RDD going inactive until the controller becomes available for voice traffic again. This timer is adjustable in 100 millisecond increments by entering any integer value from 10 to 254. Note: The RDD Fade Timer is operational only when the RDD Act Time feature is enabled.

RDD Carrier Only

This feature allows the user to select either carrier only or carrier & tone to start the RDD Activate timer. If a 1 is entered, a carrier only, sensed from the controller's internal squelch circuit, will start the RDD Activate timer. If a 0 is entered, the presence of carrier and an invalid CTCSS/DCS code is required to start the RDD Activate timer.

NOTE: RDD Carrier Only must be set to a value of 1 if using External RDD.

RDD Act Time CH# ?

Each controller, 1 through 20, has its own RDD Activate Timer. When this timer is activated by the presence of a carrier or a carrier and a tone (see RDD Carrier Only) it begins to count until it reaches a user defined time limit and then disables the controller for voice traffic, idle messages and CW IDs. It also places a busy on the LTR HSDB so that the channel is removed from the free repeater messages going to mobile radios in the field. The proper decoding of a valid CTCSS/DCS code or a valid LTR ID will zero the timer and prevent it from counting. The timer RDD Activate Timer is adjustable in increments of 100 milliseconds by entering any integer value from 1 to 254.

Caution must be used when using carrier only so that the controller is allowed time to decode a valid user before the RDD Activate Timer reaches its programmed count and disables the controller. Trident suggests setting a minimum value of 10 for the RDD Act Timer. Entering a 0 will disable this feature. External monitoring for RDD is available by moving jumper W1 from the internal (Factory Default) position to the external position and providing a TTL logic low to the radio connector to start the RDD Activate Timer. Refer to Appendix E for more information on connecting an auxiliary receiver to the Raider using External RDD.

NOTE: LTR MOBILES CANNOT BE HOMED ON A CHANNEL THAT HAS RDD ENABLED!

CWID Repeater

The CWID (station identification) entry is located in the system parameters. CWID is now supported on all 20 channels. Simply enter the CW message for the repeater number you want the ID broadcast on. If no CWID is desired, then enter spaces to omit CWID for that repeater.

S - System Parameters - Continued

Idle Msg Time CH#

The Idle Message is a Data Packet that is sent to the mobiles every 10 seconds. The Idle Message Timer allows for extension or elimination of the interval of the Idle Message transmission.

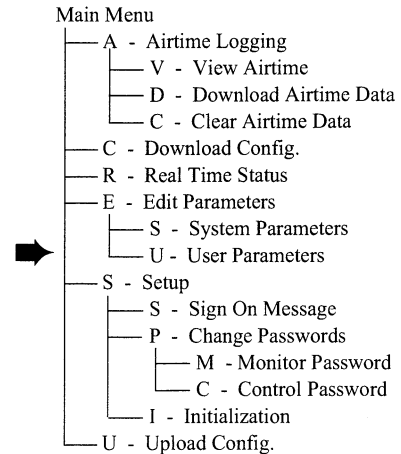
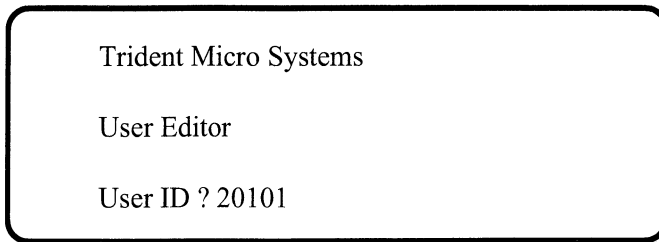
DCS code # for CH#

Each Raider independently supports any combination of up to 20 DCS codes out of the 104 possible codes in the DCS Code Table in Appendix B. The same DCS code may be used on more than one channel in the same system. To use a DCS code on the system, it must be assigned to an LTR ID. For example, let's plan on putting a conventional user using DCS code 423 on our channel with a repeater number of 15. Scroll through the System Parameters Display until you see DCS code 1 for CH 15. Using the DCS Code Table in Appendix B, look up code 423. Code 423 is value 68. So 68 will be entered as the new value in the System Parameters screen. After 68 is entered, the Current Value column will change from 000 to 068. If you want another DCS user on this same channel, look up the second DCS code in the table and enter the corresponding value in the DCS Code 2 for CH 15 location. This may be repeated up to 18 more times.

The DCS code should never be directly entered, only the corresponding value from the table in Appendix B. After all DCS values have been entered for each channel, refer to *How To Enter the Value of a DCS Code* on page 44 to assign the DCS code to an LTR ID and enable the user.

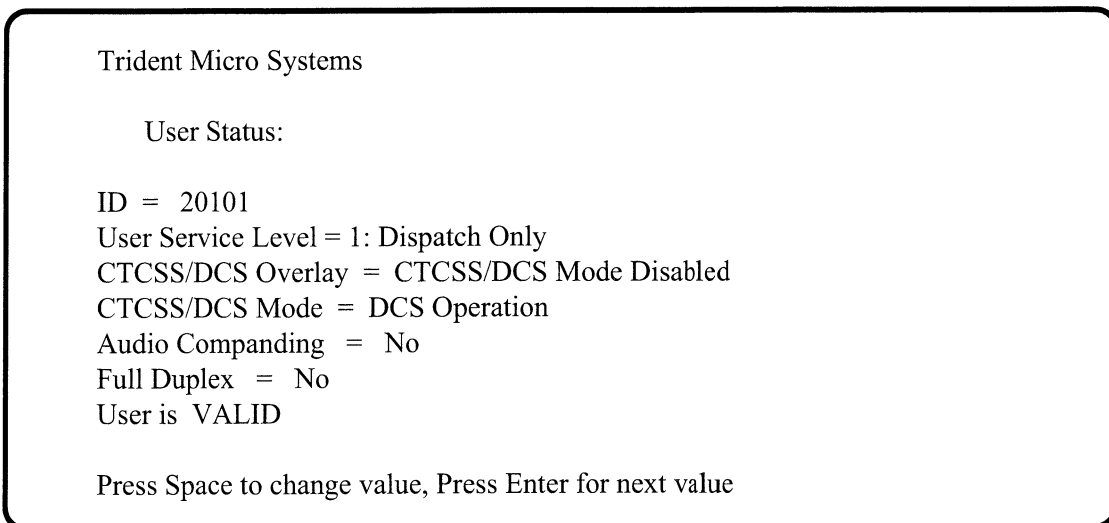
U - User Parameters

When " U " is selected from the Edit Parameters menu the User Editor screen is displayed and requests a User ID.



Enter the ID number of the user whose parameters you wish to view or edit, then press ENTER.

In the example above, the ID code 20101 has been entered (Home repeater is 20, the ID is 101). After pressing ENTER, the User Status menu (below) will appear.



Press the ENTER key to advance through the menu to the parameter you wish to edit. Press the SPACE BAR to toggle through the different options available for each parameter. The following are the parameters and options available for selection in the User Status menu and a brief description of each.

ID

This is the ID of the user that you currently have selected to view or edit. It consists of the two digit Home channel and the three digit Talk Group ID.

User Service Level

The User Service Level in the Raider controller is Dispatch Only. This option cannot be changed.

U - User Parameters - Continued

CTCSS/DCS Overlay

The Raider controller supports three signaling formats, CTCSS, DCS, and LTR. If the CTCSS/DCS overlay is disabled, the user will be LTR. If CTCSS/DCS overlay is enabled, the user will be conventional and a three digit CTCSS/DCS number will need to be entered.

NOTE: The default protocol in the Raider is LTR.

NOTE: See *How to Enter the Value of a DCS Code* or *How to Enter the Value of a CTCSS Tone* on the following pages for more information.

CTCSS/DCS Mode

This parameter selects whether the number entered on the line above is the value of a CTCSS Tone or a DCS Code. The only options available are CTCSS Operation or DCS Operation.

Audio Companding

Audio companding is not available on the Raider controller and this option cannot be changed.

Full Duplex

The Raider controller always operates in full duplex. This option has been permanently set at the factory and cannot be changed.

User is VALID

This option is used to Validate a customer. If the user is changed to invalid, the user's radio will handshake with the system but no audio will be passed. All receiving radios will remain muted.

How To Enter The Value of a DCS Code

Each Raider supports all 104 DCS codes in the DCS Code Table, 20 of which may be activated for use at one time. You may use the same DCS code on more than one channel in a system. There are three key points necessary to understanding the configuration of a DCS code. Please read these points very carefully.

1. Each **DCS CODE** is permanently assigned to a **DCS VALUE** as found in Appendix B.
2. In order for a **DCS CODE** to be recognized by a repeater, that code's **VALUE** must be entered into the **System Parameters** (under Edit Parameters) in one of the 20 **DCS entry** positions that are available for each channel.
3. A **DCS Code** is assigned to a **User ID** in the **User Parameters** (under Edit Parameters) by completing the following four steps. Press the Space Bar to change settings.
 - a. Set the parameter "CTCSS/DCS Overlay =" to **ENABLE**.
 - b. At the parameter "CTCSS/DCS Number =", type in the **DCS ENTRY NUMBER** (1-20, in System Parameters) that shows the required **DCS VALUE** (which represents the desired DCS Code) for the appropriate channel.
 - c. Set the parameter "CTCSS/DCS Mode =" to **DCS Operation**.
 - d. Set the parameter "User is" to **VALID**.

Example: We're going to assign DCS code 065 to ID code 01 101 (which keys up on channel 1).

1. In this manual, locate Appendix B. The **DCS CODEs**, 023 through 754, are each given a **VALUE**, 1 through 104. DCS code 023 has a value of 1, DCS code 025 has a value of 2, and so on. Locate **DCS CODE** 065. Make note of its corresponding **VALUE** which is 12.

<u>CODE</u>	<u>VALUE</u>
023	1
025	2
etc.	etc.

2. At your computer, go to the Main Menu. Press "**E**" for Edit Parameters then press "**S**" for System Parameters. When the System Parameters are displayed, advance to "DCS entry 1 for CH1". You may advance multiple pages by pressing "+#" then ENTER (# = the number of pages you wish to jump over, maximum of 9 pages per jump, do not type the quotation marks "). You may advance single pages by pressing "+" then ENTER. The entry appears as follows:

Name	Lower Limit	Upper Limit	Current Value	New Value
DCS entry 1 for CH1	000	254	000	—

Use the ENTER key to bring the cursor down to this position

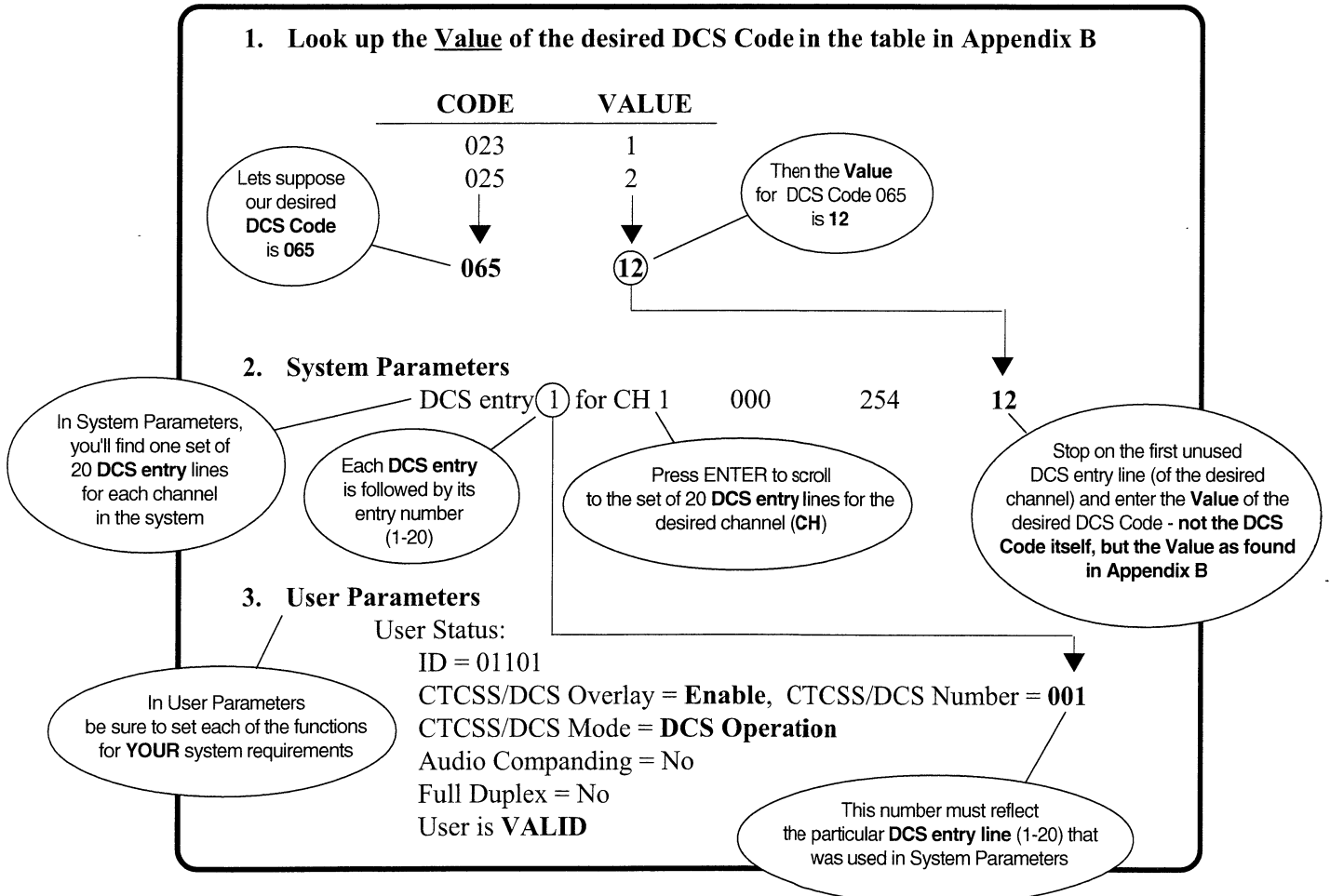
DCS code 065 has a value of 12. Type the number 12 in the New Value column at the "DCS entry 1..." prompt for the channel (CH#) that the mobile will key up on, then press ENTER. The value that WAS listed under Current Value, 000, meaning disabled, is replaced by 012.

How To Enter The Value of a DCS Code - Continued

- 3.a. From the Main Menu select "E" for Edit Parameters then select "U" for User Parameters.
- 3.b. When Prompted for a "User ID:" enter 01101 (the first two digits of the ID designate the channel that the user will key up on), press ENTER.
- 3.c. At the "CTCSS/DCS Overlay =" prompt, press the Space Bar to set to Enable, press ENTER.
- 3.d. At the "CTCSS/DCS Number =" prompt, type in the **DCS ENTRY NUMBER** (1-20), as described in System Parameters, where you entered the desired **DCS VALUE** for the appropriate channel (in the example below, it is 001 for entry 1). Press ENTER.
- 3.e. Press the Space Bar to set "CTCSS/DCS Mode =" **DCS Operation**.
- 3.f. Press ENTER 3 times to edit the "User is" prompt. Press the Space Bar to set to VALID.

User Status:
 ID = 01101
 CTCSS/DCS Overlay = **Enable**, CTCSS/DCS Number = **001**
 CTCSS/DCS Mode = **DCS Operation**
 Audio Companding = No
 Full Duplex = No
 User is **VALID**

These three steps, in simplest form, are as follows:



How To Enter The Value of a CTCSS Tone

The Raider supports all 38 CTCSS tones per repeater. These codes are reusable on a per repeater basis. CTCSS tone entry is similar to the DCS code entry except that CTCSS tones are not entered into the System Parameters. Instead, you must select CTCSS Operation in the User Parameters and use the CTCSS translation table in Appendix A.

There are two key points necessary to understanding the configuration of CTCSS tones. Please read these points very carefully.

1. Each **CTCSS TONE** is permanently assigned to a **CTCSS VALUE** as found in the table in Appendix A.
2. A **CTCSS TONE** is assigned to a **User ID** in the **User Parameters** (under Edit Parameters) by completing the following four steps. Press the Space Bar to change settings.
 - a. Set the parameter "CTCSS/DCS Overlay =" to **ENABLE**.
 - b. At the parameter "CTCSS/DCS Number =" type in the **CTCSS VALUE** that represents the desired **CTCSS Tone**.
 - c. Set the parameter "CTCSS/DCS Mode =" to **CTCSS Operation**.
 - d. Set the parameter "User is" to **VALID**.

Example: We're going to assign CTCSS Tone number 27 (167.9) to ID code 01101.

1. In this manual, locate Appendix A. The **CTCSS TONES**, 1 through 38, are each given a **VALUE**, 001 through 038. Locate **CTCSS TONE** 167.9. Make note of its corresponding **VALUE** which is 027.

<u>TONE</u>	<u>FREQUENCY</u>	<u>VALUE</u>
1	67.0 Hz	001
2	71.9 Hz	002
etc.	etc.	etc.

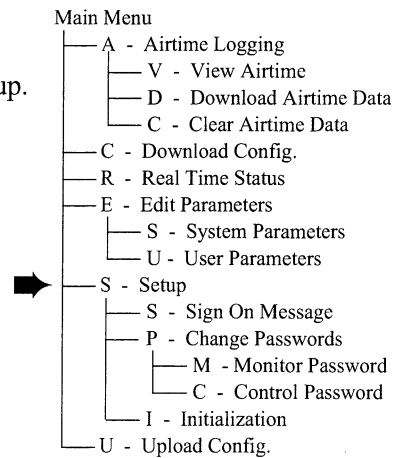
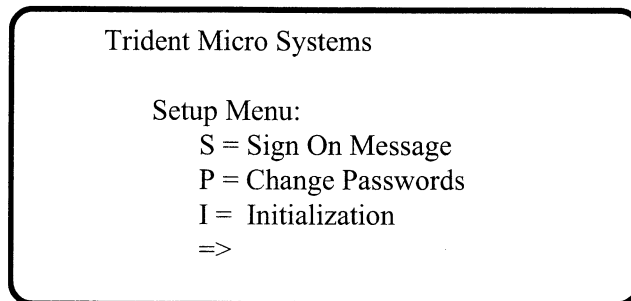
- 2.a. From the Main Menu select "**E**" for Edit Parameters then select "**U**" for User Parameters.
- 2.b. When Prompted for a "User ID:" enter 01101. Press ENTER.
- 2.c. At the "CTCSS/DCS Overlay =" prompt, press the Space Bar to set to **Enable**. Press ENTER.
- 2.d. At the "CTCSS/DCS Number =" prompt, type the **VALUE** of tone 167.9 (027). Press ENTER.
- 2.e. Set CTCSS/DCS Mode = **CTCSS Operation**.
- 2.f. Press the Space Bar 3 times to move to "User is". Press the Space Bar again to set to **VALID**.

```

User Status:
ID = 01101
CTCSS/DCS Overlay = Enable, CTCSS/DCS Number = 027
CTCSS/DCS Mode = CTCSS Operation
Audio Companding = No
Full Duplex = No
User is VALID
    
```

S - Setup

The following menu is displayed when "S" is entered for Setup.



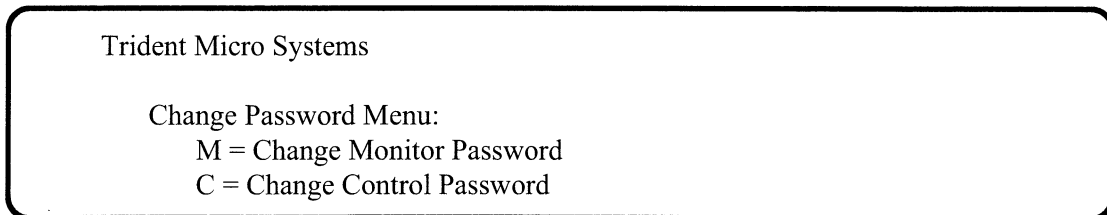
S - Sign On Message

This option displays the Sign On Message and allows the user to change the content of the message. The default message reads, "Trident Micro Systems".

P - Change Password

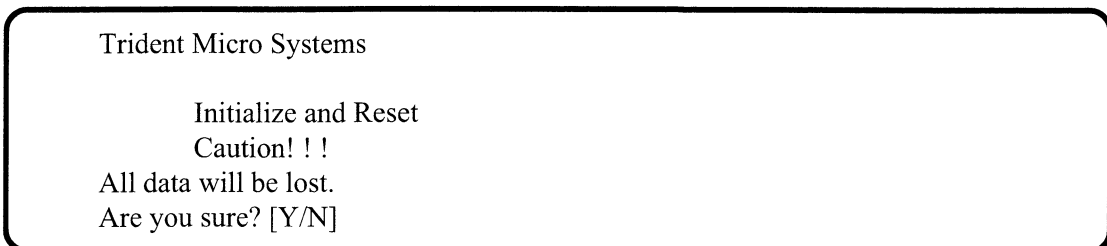
This menu allows you to change either the Control Password or Monitor Password to any ASCII string up to 8 characters in length. You will be prompted to enter the password twice, EXACTLY the same. The password is never retransmitted. Make sure you RECORD the new password for future reference on page 31. If the passwords get lost, the battery can be removed and then replaced after 5 minutes. The passwords will then be restored to "CONTROL" and "MONITOR".

Warning! All programming and logged data will be lost if the battery is removed.



I - Initialization

The memory can be initialized by pressing "I" for the **Initialization** command. Doing this will CLEAR ALL memory and ALL stored data will be cleared. The passwords will default to "CONTROL" and "MONITOR" and a hardware reset will be performed. When prompted "Are you sure?", if you enter "Y" for yes, you will be prompted to designate all ID codes valid or invalid. Enter a "+" to initialize with all ID codes valid or enter a "-" to initialize with all ID codes invalid. The validation feature itself is always enabled.



U - Upload Config.

If the system has lost its programming, go through the initialization procedure to clear out all memory locations. Come back to this menu and, using the XMODEM protocol, upload the latest system software configuration **back** to the Raider. This operation can only be performed if you have at sometime performed a backup of your system software. Refer to the section *C - Download Config.* on page 36. Once the Raider has received this entire file, it will restore all programming back to its latest condition.

Upload Configuration Data:

Uploading is ready.

Begin UPLOADING now.

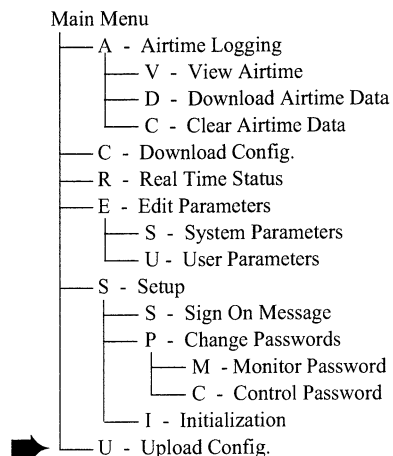
Please wait 90 seconds to abort the upload.

Note: Please refer to your communications program for upload procedure.

The menu below is displayed if the data has failed to upload or the 90 second abort time has expired.

Upload Configuration Data:

The upload has failed. Press ENTER to continue.



APPENDIX A

CTCSS Tone Frequencies

The numbers under "Value" are to be entered into the User Parameter menu. Do NOT enter the "FREQUENCY" or "TONE" numbers.

TONE#	FREQUENCY	VALUE
1	67.0 Hz	001
2	71.9 Hz	002
3	74.4 Hz	003
4	77.0 Hz	004
5	79.7 Hz	005
6	82.5 Hz	006
7	85.4 Hz	007
8	88.5 Hz	008
9	91.5 Hz	009
10	94.8 Hz	010
11	97.4 Hz	011
12	100.0 Hz	012
13	103.5 Hz	013
14	107.2 Hz	014
15	110.9 Hz	015
16	114.8 Hz	016
17	118.8 Hz	017
18	123.0 Hz	018
19	127.3 Hz	019
20	131.8 Hz	020
21	136.5 Hz	021
22	141.3 Hz	022
23	146.2 Hz	023
24	151.4 Hz	024
25	156.7 Hz	025
26	162.2 Hz	026
27	167.9 Hz	027
28	173.8 Hz	028
29	179.9 Hz	029
30	186.2 Hz	030
31	192.8 Hz	031
32	203.5 Hz	032
33	210.7 Hz	033
34	218.1 Hz	034
35	225.7 Hz	035
36	233.6 Hz	036
37	241.8 Hz	037
38	250.3 Hz	038

APPENDIX B

DCS CODES

The numbers under "Value" are to be entered into the System Parameters menu. Do NOT enter the "CODE" number.

CODE	VALUE	CODE	VALUE	CODE	VALUE
023	1	223	36	445	71
025	2	225	37	446	72
026	3	226	38	452	73
031	4	243	39	454	74
032	5	244	40	455	75
036	6	245	41	462	76
043	7	246	42	464	77
047	8	251	43	465	78
051	9	252	44	466	79
053	10	255	45	503	80
054	11	261	46	506	81
065	12	263	47	516	82
071	13	265	48	523	83
072	14	266	49	526	84
073	15	271	50	532	85
074	16	274	51	546	86
114	17	306	52	565	87
115	18	311	53	606	88
116	19	315	54	612	89
122	20	325	55	624	90
125	21	331	56	627	91
131	22	332	57	631	92
132	23	343	58	632	93
134	24	346	59	654	94
143	25	351	60	662	95
145	26	356	61	664	96
152	27	364	62	703	97
155	28	365	63	712	98
156	29	371	64	723	99
162	30	411	65	731	100
165	31	412	66	732	101
172	32	413	67	734	102
174	33	423	68	743	103
205	34	431	69	754	104
212	35	432	70		

APPENDIX C

Tuff-Modem Instructions

The Tuff-Modem is specifically designed to work in hostile environments such as those that occur at the repeater site. The unit is based on a Special Micro Controller as a precaution against modem lock-up. The Tuff-Modem has no internal buffer and will pass all data immediately through to the phone line or from the phone line to the serial connector.

When in the Answer Mode the unit will answer on the first ring. A full hardware reset is performed each time the modem answers an incoming call. This is done to insure that all hardware components are initialized to the best of their ability for error free operation.

Before You Begin . . .

Please read through these instructions before you begin this operation to eliminate any questions that may arise. Also, note that all work being performed on radio electronics should be performed in a static free environment. If you experience any problems with these instructions, please call the Trident Technical Support Team at 1-800-798-7881.

Originate Mode call:

The Tuff-Modem can call a remote modem by placing the unit into the Originate Mode. To perform an "off hook and dial" function:

- 1) Connect the DTE device to the Tuff-Modem.
- 2) Set DTR active
- 3) Send a carriage return (OD hex) followed by "ATDT" followed by the phone number to be dialed followed by another carriage return.

Example: "<CR>ATDT5551212<CR>"

The Tuff-Modem will accept only upper case letters and will not accept delimiters or spaces in the phone number string. Maximum length of a phone number is 11 digits. The Tuff-Modem will only echo back characters that are valid in the dialing command string (this applies to the first 5 digits only). As each character is sent to the Tuff-Modem it echoes back the valid character. When in the Dialing Mode, NO NEW CHARACTERS may be sent to the Tuff-Modem until it has echoed back the last character. This provision is in effect only during the entry of the dial command string.

After receiving the last carriage return, the Tuff-Modem will go offhook, wait for 2 seconds then dial the DTMF number at a 100ms on/off duration. The Tuff-Modem has no dial tone detector on board. While the Tuff-Modem is seeking an answer tone from the remote modem, it displays a "." or "+" to show that it is in a Seek Answer Tone Mode. When the "." or "+" stops printing, a connect or time-out has occurred. The modem will wait for 30-50 seconds looking for a remote modem's answer tone. If an answer tone is detected, a handshake will take place. If the handshake with the remote modem is successful the DCD will become active and the green LED will remain on for the duration of the call. Communications will continue until DCD is lost or DTR is set to "inactive" by the DTE device. If a time-out occurs or the handshake was unsuccessful, the modem will return to the idle state. For answer and originate modes, valid DTR must be present before the modem will operate!

Answer Mode Call:

When the Tuff-Modem is powered up in the Answer Mode for the first time, it will cycle off hook for approximately 20-30 seconds. After the seek carrier detect time-out expires, it will resume an on hook state waiting for the phone line to ring. When DTR is ACTIVE (+12 volts) the Tuff-Modem will answer the phone on the first ring. If DTR is INACTIVE (-12 volts) then no operation will be performed by the Tuff-Modem.

When the Tuff-Modem detects a phone line ring of approximately 35-120 volts AC, it will perform a full hardware reset, go off hook, wait for 2 seconds then provide an answer tone. If the Tuff-Modem does not detect carrier from the remote calling modem within 20-30 seconds it will automatically go back on hook and wait for the next telephone line ring signal.

If a remote carrier is detected from the calling modem, a handshake will occur and DCD will become active, signalling the DTE device that a valid handshake with the remote modem has been completed (DCD is +12 volts active, -12 volts inactive). Communication with the remote modem will continue until DCD is lost or DTR is set to "inactive" by the DTE device.

NOTE: The DTE device can override the Tuff-Modem's phone line ring requirement forcing the Tuff-Modem to go off hook and perform a full answer operation. This is accomplished by toggling the DTR line from active to inactive then back to active all within a second of each other. Neither CTS nor RTS handshaking is utilized.

Electrical:

6 to 16 volts DC or 6 to 14 volts AC @ 100mA

Physical:

Size 1.25"H x 5.25"W x 5.875"D
Weight 25oz

Environmental:

Operating Temperature -20 to 140 F
Humidity 90% Non-condensing

Dip Switch Settings:

Dip#1: On=2400 baud, Off=1200 baud
Dip#2: On=Answer mode, Off=Originate mode

RS-232 DB-25 Pin Definitions:

Pin 2 = TX data to remote modem
Pin 3 = RX data from remote modem
Pin 7 = Ground
Pin 8 = DCD
Pin 20 = DTR

LED Lights:

Power - Green LED: Unit is turned on
Low Power - Yellow LED: Power supply to low
Active - Green LED: Successful handshake with remote modem

Text Definitions:

DTE = Data Terminal Equipment	DTR = Data Terminal Ready
DCE = Data Communications Equipment	CTS = Clear To Send
DCD = Data Carrier Detect	RTS = Ready To Send

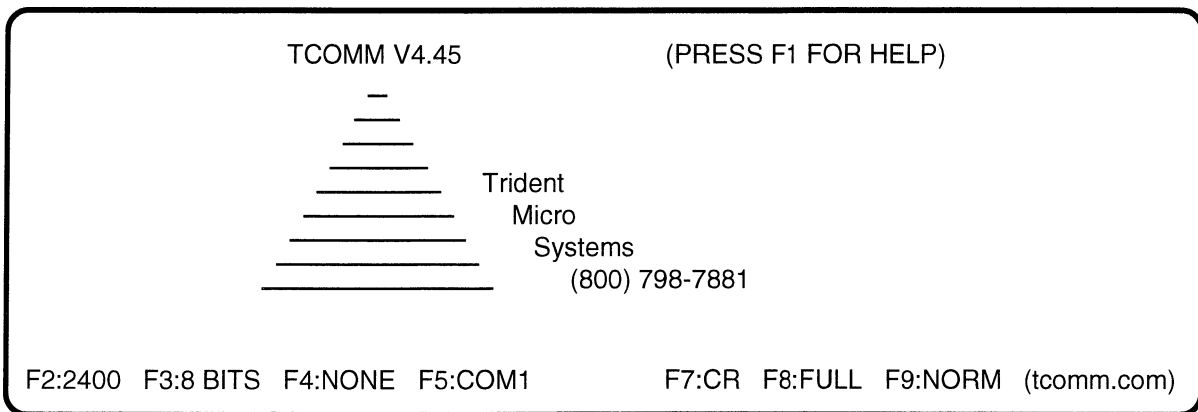
APPENDIX D

T-Comm Instructions

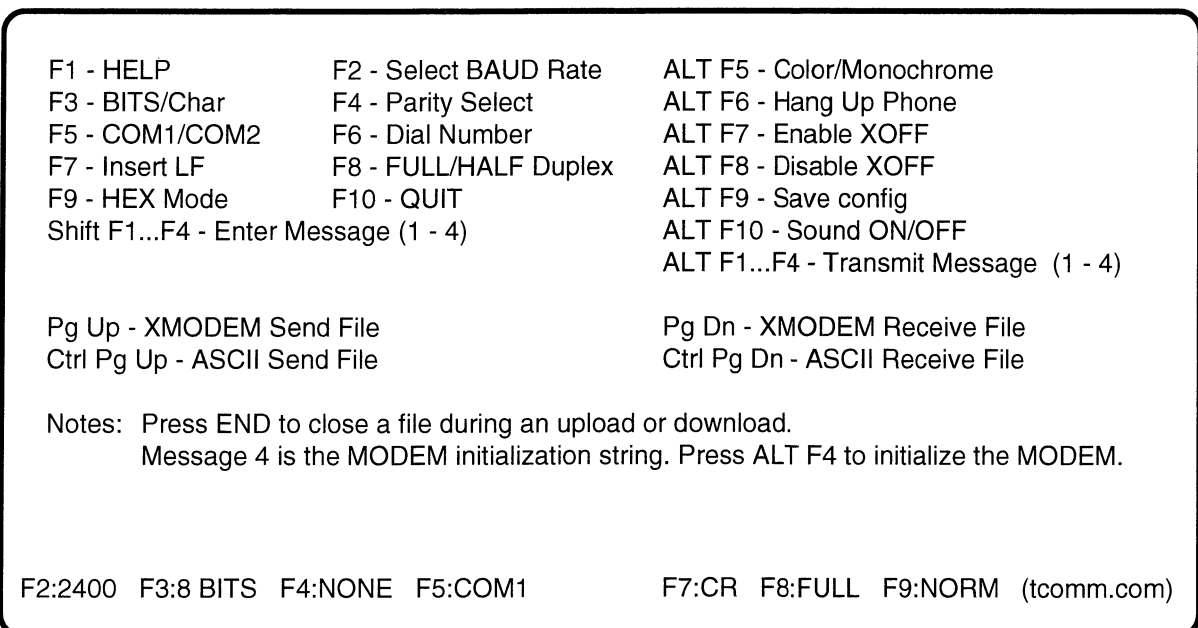
T-Comm is a communications program that will allow your PC to talk to the Raider either directly connected or over the phone line using a modem.

To install the T-Comm program you must copy the contents of the T-Comm 3.5" diskette to the directory of your choice on the hard drive of the computer that will be used to communicate with the Raider. To run the T-Comm program, type TCOMM then press ENTER.

When the T-Comm program starts, you will notice a STATUS BAR at the bottom of the title screen as shown in the following illustration.



The STATUS BAR indicates seven variable communication parameters. The first four, F2 - F5, are specific to opening and holding communications with the Raider. The last three, F7 - F9, pertain to the handling of data. The Help Menu, displayed by pressing the F1 key, is shown below.



T-Comm Commands

- F1 - Produces the Help Menu, shown above.
- F2 - Communications baud rate. Must match the baud rate the Raider is set for.
- F3 - Number of data bits. Raider uses 8.
- F4 - Type of parity. Raider uses NONE.
- F5 - Communication port on your computer.
- F6 - To begin entering the telephone number of the Raider's modem.
- F7 - Line Feed insertion after carriage return. Raider uses CR.
- F8 - Half or Full duplex operation. Raider uses FULL.
- F9 - HEX or NORMAL modes. Raider uses NORMAL.
- F10 - To exit T-Comm.

ALT F6 - After logging off the Raider, press ALT F6 to hang up the modem.

ALT F9 - After selecting the options you want in T-Comm, you must save the configuration file. To do this, hold down the ALT key and press F9. T-Comm will then prompt you for confirmation. Answer "Y". Save the file as TCOMM.COM in the same directory as TCOMM.COM.

ALT F10 - Toggles sound on/off.

Shift F1...F4 - Your T-Comm program will store up to four programmable macros to help you in the task of to typing the same words or commands over and over. To initialize a macro, hold down the CTRL key and press "F1", "F2" or "F3". You may then type the message you wish to have stored in the macro key you have chosen. When finished typing, press ENTER. To display the message, hold down the ALT key and press the correct "F" key. "F4" is reserved for the modem initialization string. This string is sent to the modem whenever T-Comm is run. It allows the modem to be preset for correct operation.

Pg Up - Once you're on line with the Raider and you have initiated the upload from the Raider's Main Menu (press "U" to Upload Config.) press the page up key. T-Comm will then prompt you for the file name to upload.

Pg Dn - Once you're on line with the Raider and you have initiated the download from the Raider's Main Menu (press "C" to Download Config.) press the page down key. T-Comm will then prompt you for the file name to download.

Ctrl Pg Up - This function works the same as "Pg Up" but should only be used to send ASCII files (text files).

Ctrl Pg Dn - This function works the same as "Pg Dn" but should only be used to send ASCII files. (text files). NOTE: you should press the "END" key when finished receiving a file.

APPENDIX E

External RDD and an Auxiliary Receiver

When using the external RDD feature in the Raider controller with an external auxiliary receiver, certain conditions must be observed for proper operation.

Configuration:

1. The carrier only feature in the system parameters must be programmed with a value of “1”.
2. RDD Act Time in the system parameters must be set to enable RDD.

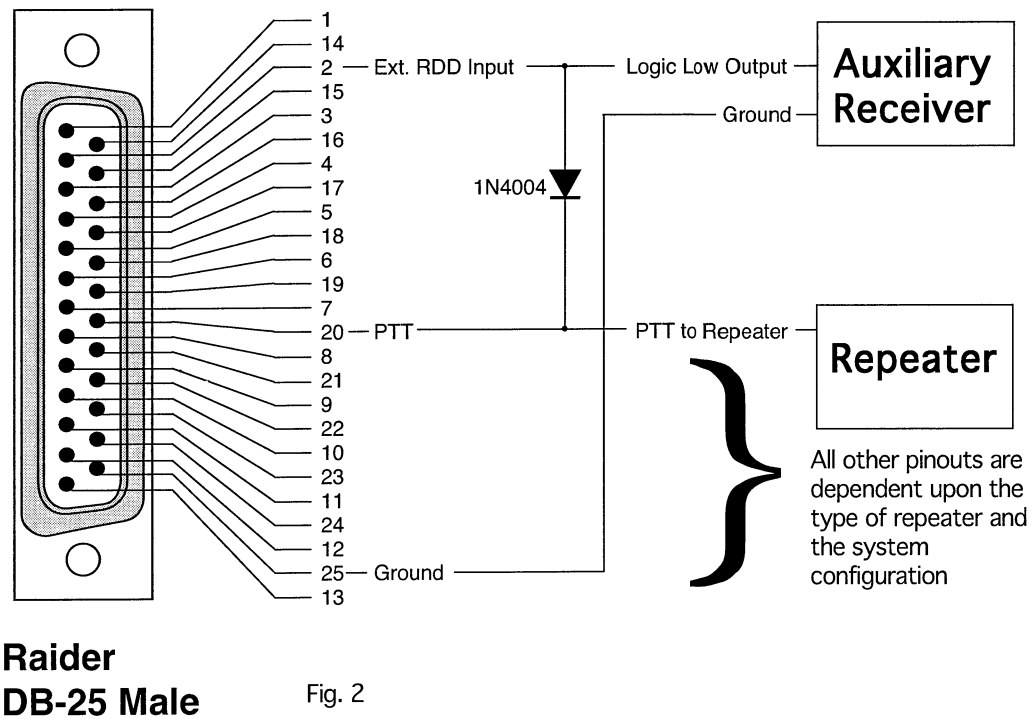
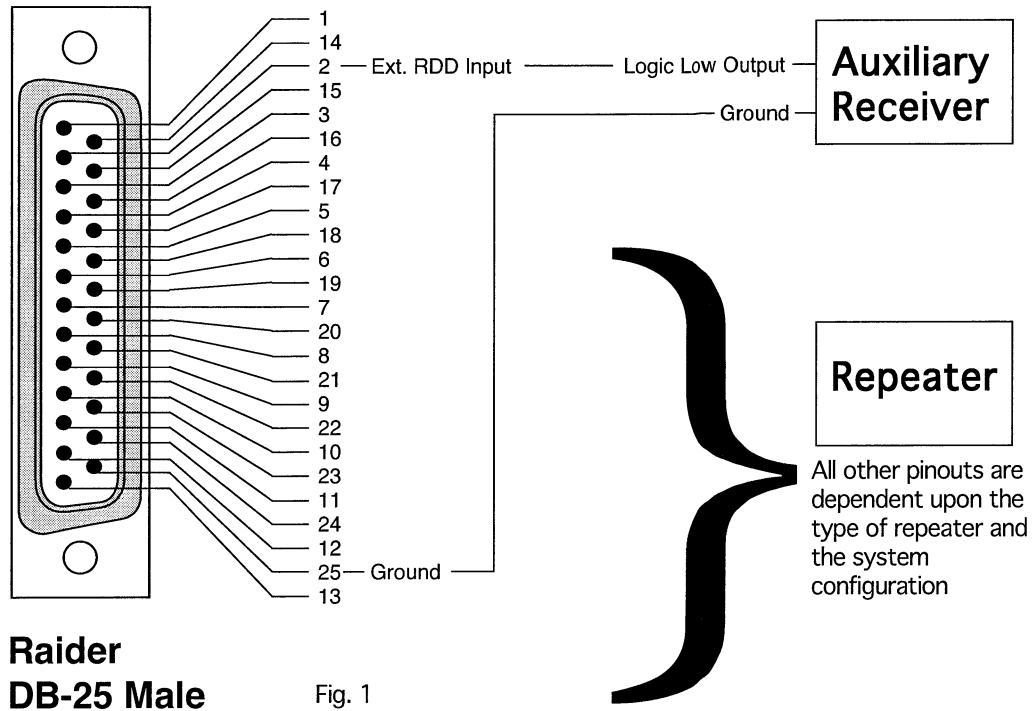
Connection:

1. The W1 jumper on the Raider board must be set to the “E” (external) position.
2. Construct the interface cable as shown in figure 1.

NOTE: A logic low must be seen at pin 2 of the DB-25 radio connector to start the RDD Activate timer. This input is diode isolated and internally pulled up to the 5 volt line, so receivers with open drain or collector outputs may be used without modification. It is important that the auxiliary receiver provide a logic low when the co-channel carrier is detected and must remain low until the carrier goes away. If you wish to detect specific CTCSS or DCS codes, then it is important that the auxiliary receiver can be programmed with all tones or codes that are to be detected and, only then, provide the logic low output for the entire time these codes or tones are present. No momentary or pulsed outputs may be used with the external RDD input.

3. Construct the interface cable as shown in figure 2. **ONLY** if the following conditions exist:
 - a. The auxiliary receiver is programmed to detect CTCSS and/or DCS codes from the co-channel repeater.
 - b. The Raider has valid CTCSS or DCS users on it.

IMPORTANT!! If the diode jumper between pin 2 and 20 of the DB-25 radio connector is omitted, the conventional users will be unable to use the controller even though they have been programmed as valid in the user database.



APPENDIX F

Repeater Interfaces

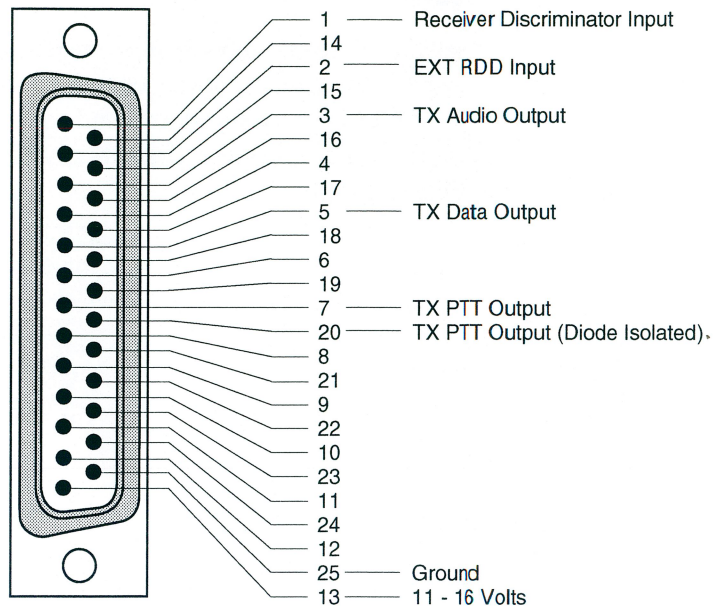
This Appendix contains a series of interface instructions for connecting the Raider to a variety of different radio repeaters. All RF equipment is unique to its own system installation. The jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

Generic Repeater Interface _____	59
GE Master II Repeater Interface _____	60-61
Johnson 8000 LTR Repeater Interface _____	62
Kenwood TKR-820 Repeater Interface _____	63
Maxon TR4800 Repeater Interface _____	64
Micor Repeater Interface _____	65
Motorola MTR2000 Repeater Interface _____	66-75
Motorola GR1225 Repeater Interface _____	76-80
Motorola MSF5000 Repeater Interface _____	81
Ritron RRX-450 Repeater Interface _____	82
TAIT T885, T881 Repeater Interface _____	83-86
TAIT T855, T856, T857 Repeater Interface _____	87-88
Raider Universal Repeater Interface _____	89
ADDENDUM	
Motorola MX800 Repeater Interface _____	90

Other Raider jumper and switch settings:

Repeater	Raider Jumpers			Raider Invert Switches			
	W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
Kenwood TKR-900	IN	IN	IN	OFF	OFF	OFF	OFF
Standard RP70K	IN	OUT	IN	ON	ON	ON	ON
Uniden MRS 802	IN	OUT	OUT	ON	OFF	ON	OFF
Uniden MRS 804	IN	OUT	OUT	ON	OFF	ON	OFF

Generic Repeater Interface - page 1 of 1



**Raider
DB-25 Male**

	Raider Jumpers			Raider Invert Switches			
	W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
Factory Default	IN	IN	IN	OFF	OFF	OFF	OFF

All RF equipment is unique to its own system installation. These jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

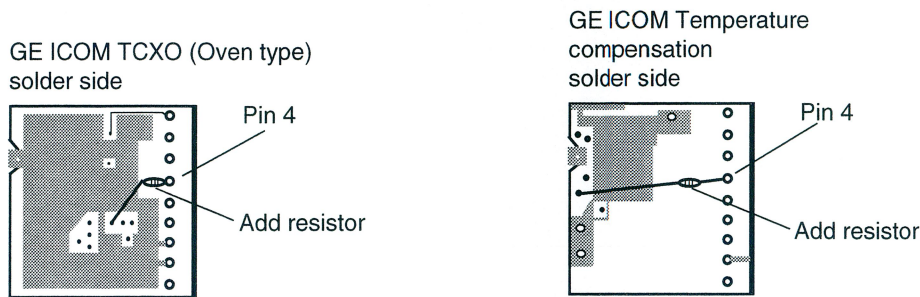
**A Universal Interface Cable is available from Trident.
Please contact your Trident Representative for details.**

GE Master II Repeater Interface (800MHz) - page 1 of 2

The GE Master II Repeater can be modified to allow the Raider to be connected and function as an LTR repeater. Remove all plug-in cards from the repeater **except** the 10 volt regulator card. This card is required to supply power to the repeater.

Modifying the Exciter

Locate the exciter and remove the TX ICOM module from the repeater. Remove the set HEX screw and carefully open the case and remove the insides. Connect a 1/8W resistor with a value of 47K ohms to 100K ohms (1K on TCXO) to the point shown and connect the other end to Pin 4 of the ICOM module. Make sure the resistor does not short to anything else, use tape to insulate if necessary. Assemble the ICOM module.



Remove the exciter PCB and locate the ICOM module. Cut the etch on the TOP of the PCB around Pin 4 of the ICOM pins. Test the pin with an ohm meter to be sure it is free of ground. Solder a wire to the pin on the bottom of the PCB and reassemble the exciter PCB making sure the wire isn't pinched. Connect the other end of the wire to a spare pin on P8/J933. This will be the TX data input.

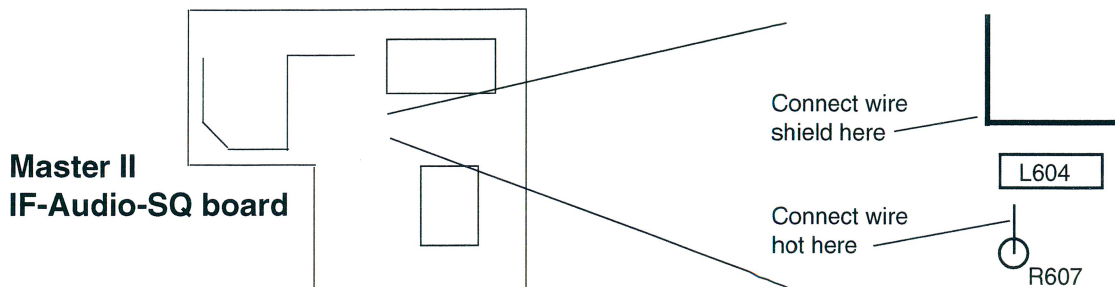
NOTE: The frequency will now be slightly different. The ICOM will, therefore, need to be adjusted!

NOTE: For UHF applications, call Trident tech support at 800-798-7881.

Modifying the receiver

The Raider must be directly connected to the GE discriminator. Due to the low frequency response of the LTR data, a connection to the receiver is required for reliable handshaking.

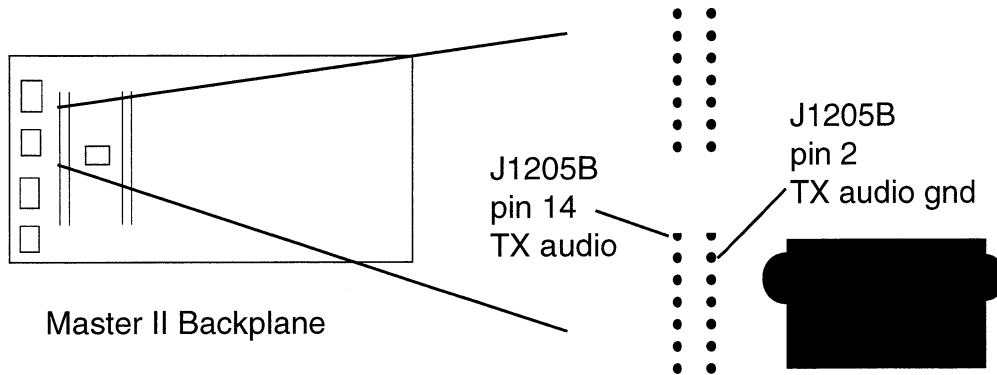
Locate the receiver IF-AUDIO-SQ PCB inside of the repeater housing. Attach the center of the shielded cable to the R607 exposed end as shown. Solder the outer conductor to the metal shroud. Route the wire out through one of the existing holes and follow the wiring harness up to the backplane and connect it to the Raider.



GE Master II Repeater Interface (800MHz) - page 2 of 2

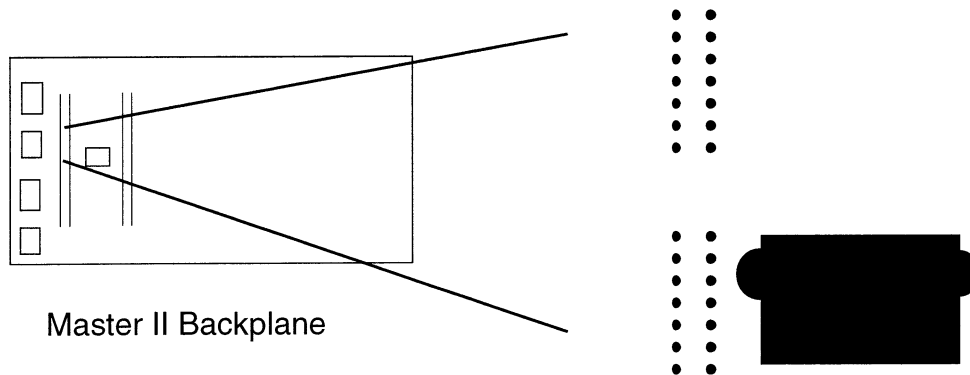
Transmit Audio connections

Remove the 10 volt regulator card from the card shelf. Locate pads 13 and 14. Cut the wire connecting these two points. This disconnects the local mic amp. Connect the TX audio output from the Raider to the pins shown on the backplane.



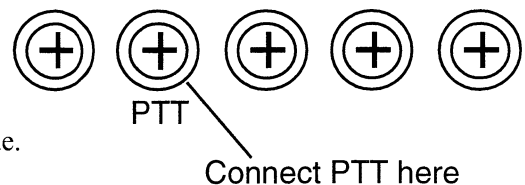
PTT connections

The PTT out of the Raider can be used directly to key the GE Master II transmitter. Connect the PTT output from the Raider to the PTT on the backplane screw as shown.



DC power

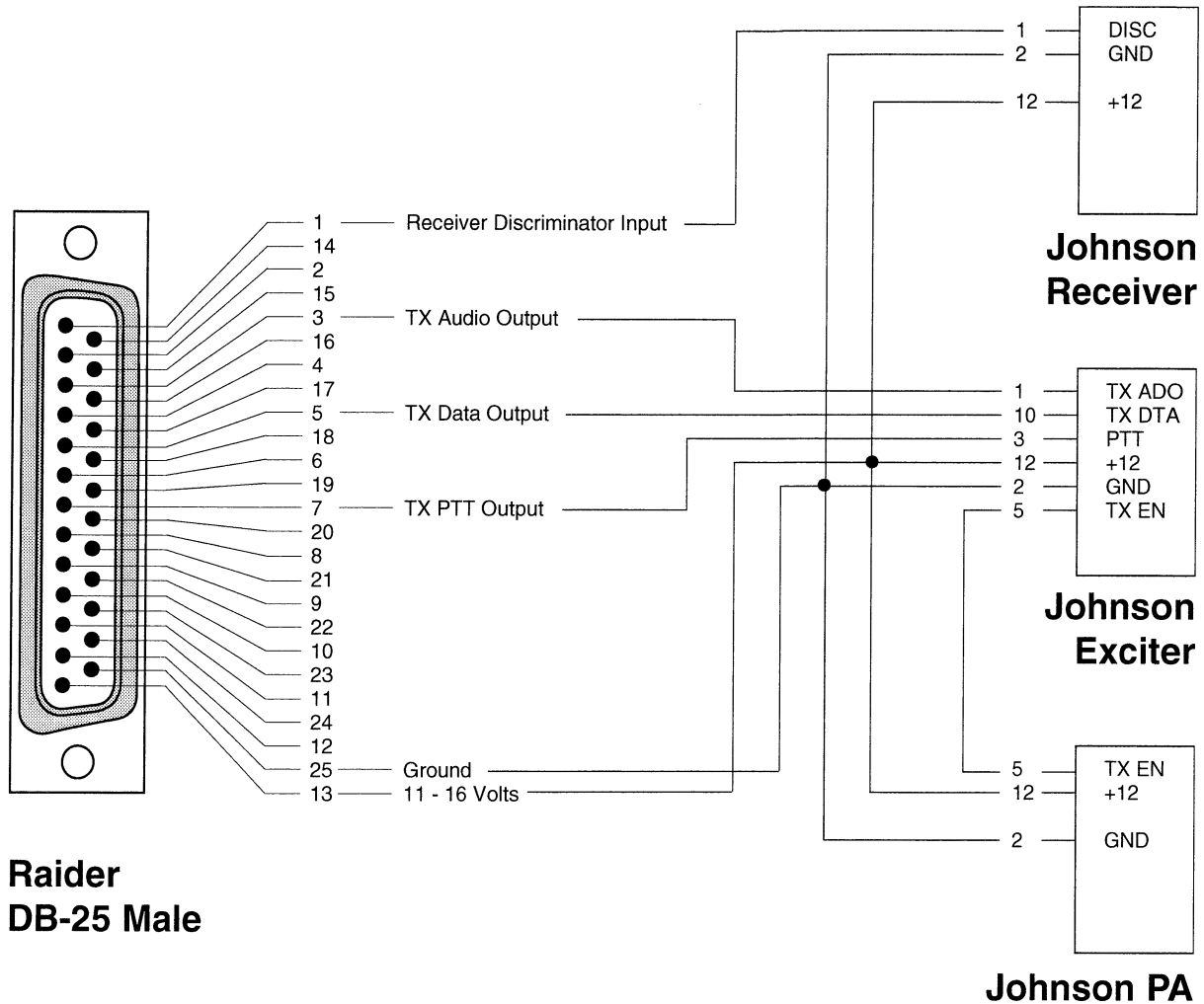
The Raider should be connected directly to the 12 volt power source, not to the backplane. Digital audio noise can be picked up and transmitted if proper power connections are not made.



Raider Jumpers			Raider Invert Switches			
W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
IN	OUT	OUT	OFF	OFF	OFF	OFF

All RF equipment is unique to its own system installation. These jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

Johnson 8000 LTR Repeater Interface - page 1 of 1



Raider Jumpers			Raider Invert Switches			
W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
IN	IN	OUT	OFF	OFF	OFF	OFF

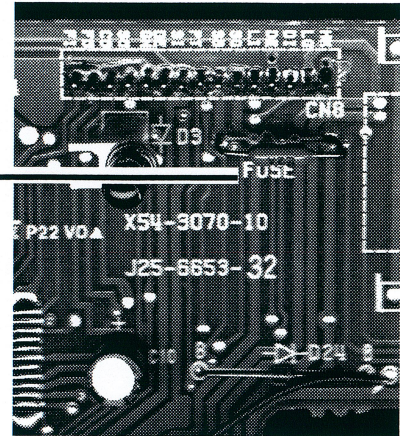
All RF equipment is unique to its own system installation. These jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

**This cable is available from Trident.
Please contact your Trident Representative for details.**

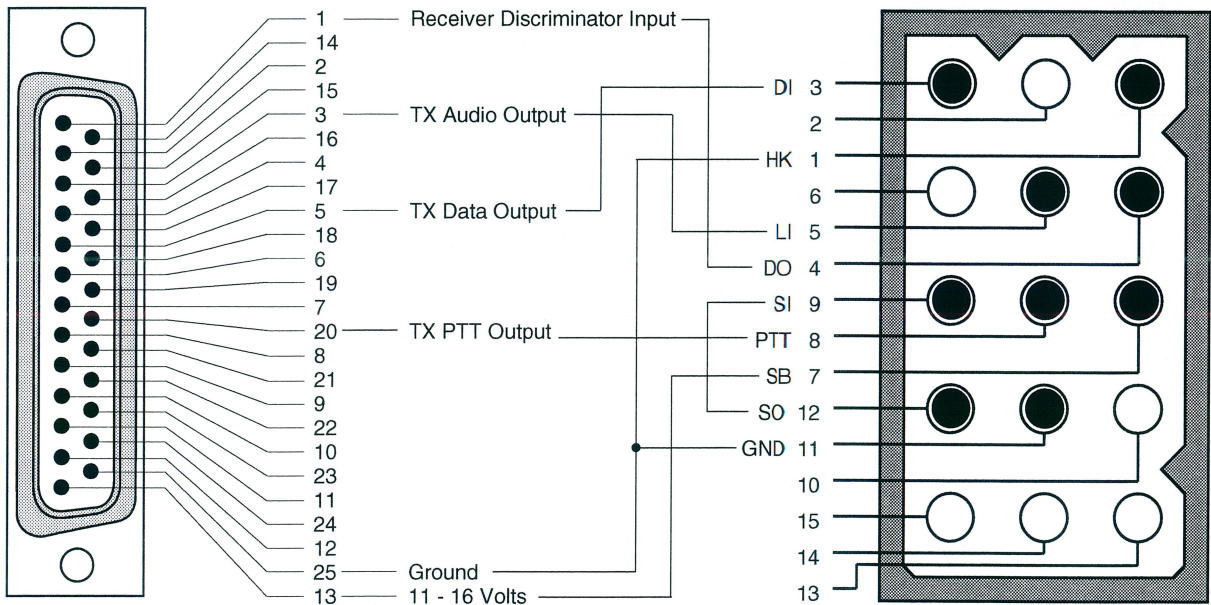
Kenwood TKR-820 Repeater Interface - page 1 of 1

TKR-820 Repeater Display Board

In the Kenwood TKR-820 Repeater: the signaling unit should be removed and the shorting plug W10, PT#E31-3270-05 should be installed onto the CN6 connector on the Receiver Board. This shorting plug brings the I/Os out to the rear accessory plug (J101). On the Display Board capacitor C22 must be jumpered and the fuse F1~2A (just below connector CN8) must be replaced with a 3A Pico fuse.



In the Raider: Jumpers W22, W26 and W30 should be installed. Dipswitches TX DCS, TX DTA and RX DCS should be "off" (UP) and dipswitch RX DTA should be "on" (DOWN).



Raider DB-25 Male

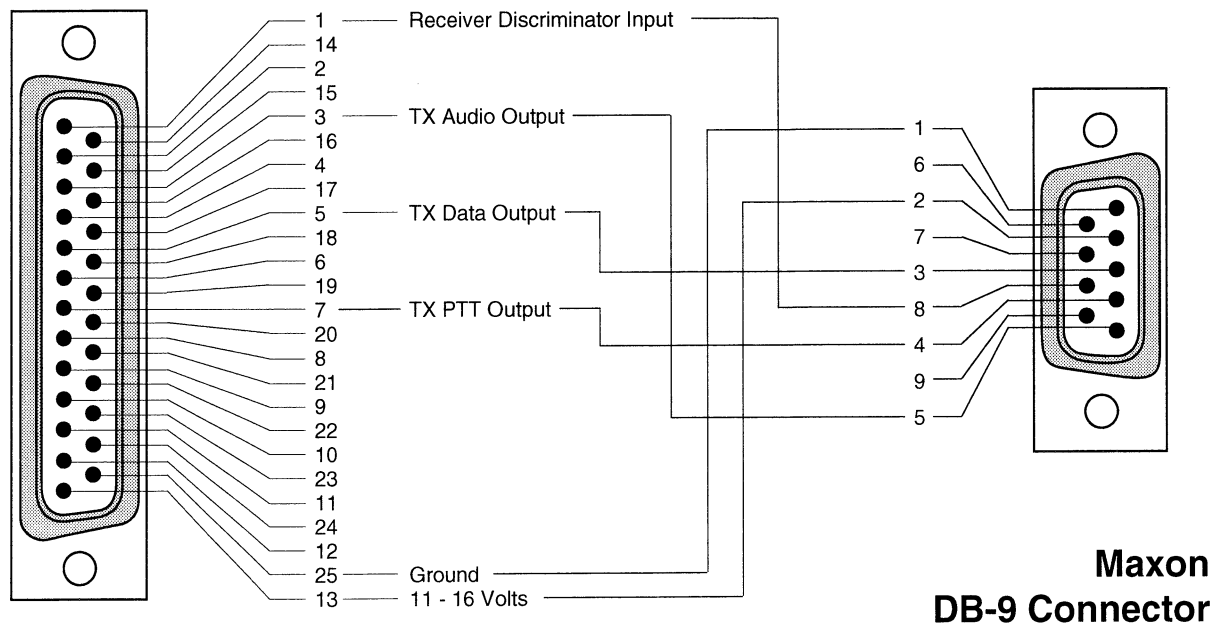
TKR-820 15 Pin Molex

Raider Jumpers			Raider Invert Switches			
W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
IN	IN	IN	OFF	ON	OFF	OFF

All RF equipment is unique to its own system installation. These jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

**This cable is available from Trident.
Please contact your Trident Representative for details.**

Maxon TR4800 Repeater Interface - page 1 of 1



Raider DB-25 Male

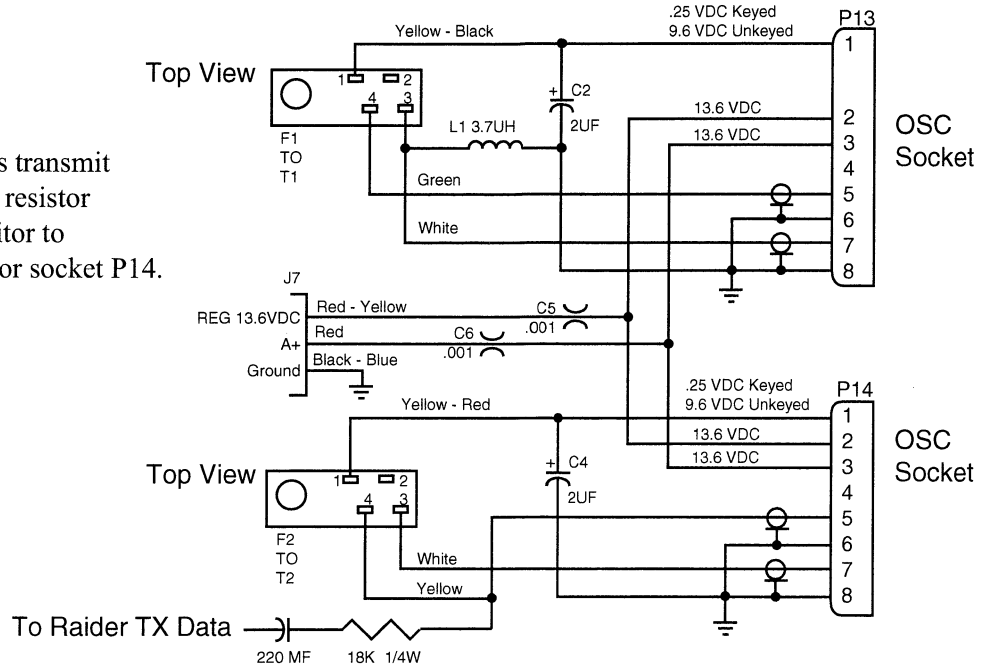
Raider Jumpers			Raider Invert Switches			
W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
OUT	IN	OUT	ON	OFF	ON	OFF

All RF equipment is unique to its own system installation. These jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

**This cable is available from Trident.
Please contact your Trident Representative for details.**

Micor Repeater Interface (800MHz) - page 1 of 1

Connect the Raider's transmit data through an 18K resistor and a 220 MF capacitor to pin #5 of the oscillator socket P14.



1. Connect the Raider's receive audio to Pin #2 of the 18 pin connector on the RECEIVER AUDIO and SQUELCH BOARD of the Micor Repeater.
2. Connect the transmit audio from the Raider to Pin 24 of connector J5 located on the MAIN MOTHER BOARD. Cut the trace going to Pin 24 of J5 to prevent the Micor Repeater from repeating the TX audio.
3. Connect the PTT from the Raider to J100-10 (KEYED A-) located on the MAIN MOTHER BOARD.
4. Power for the Raider is provided on the MAIN MOTHER BOARD connector TB2. Pin 1 is positive and Pin 2 is ground.
5. Inversion of the Transmit Data and Receive Data is required for the Micor Repeater. To do this, turn "on" (DOWN) switches TX DTA, RX DTA, TX DCS and RX DCS on the back of the Raider.
6. This completes the interface. Carefully reassemble the Micor Repeater.

Raider Jumpers			Raider Invert Switches			
W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
IN	IN	IN	ON	ON	ON	ON

All RF equipment is unique to its own system installation. These jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

**This cable is available from Trident.
Please contact your Trident Representative for details.**

Motorola MTR2000 Repeater Interface - page 1 of 10

Using the Motorola Radio Service Software (RSS), installed on a suitable IBM compatible computer, and these instructions, the Motorola MTR2000™ station can be configured for use with the **Raider** (dispatch only) and **Marauder** (dispatch & interconnect) series controllers. This supplement supports MTR RSS revisions up to R03.02.01. Answers to specific questions pertaining to the use of the RSS can be found in the Radio Service Software Start-up Manual provided with your software.

MTR2000 Setup Instructions

1. Start the Radio Service Software (RSS) and connect the MTR2000 station to your computer. Read the contents of the station's Codeplug.
2. From the **Station Configuration** window, click on the **Edit Config** button. The Station Configuration window will appear. (Fig. 1)
3. The options in the Configuration window marked by the arrows are items that must be selected just as they are shown. Other options may or may not be selected depending on the exact options installed in the MTR2000 or your particular installation.
4. Now click on **OK** to return to the **Station Configuration** window. The pull down menus will become active now.
5. Click on **Personality**, and click on **RF Options**. Compare the window that opens with Fig. 2 and make any necessary changes in the RSS. When done, click **OK** to close the window.
6. Click on **Personality**, and click on **Wireline**. Compare the window that appears with that in Fig. 3 and make any necessary changes in the RSS. Everything must appear exactly as shown. The options in the Configuration window marked by the arrows are items of particular importance. When done, click **OK** to close the window.
7. Click on **Personality**, and click on **TRC Commands**. All eight **Command List Options** should show **None**. When done, click **OK** to close the window.
8. Click on **Personality**, and click on **Channel Information**. A window, as in Fig. 4, will appear. Make sure that the **TX Idle** frequency is the same as the **Transmit** frequency. Re-enter the frequency if necessary.
9. In the upper left hand corner of the **Channel Information** window under **Option**, click on **Audio**. A window as shown in Fig. 5 will appear. Every option in this window must be set to match Fig. 5 exactly. **Alarm Tone** and **Call Sign** are the only options that may differ. The options in the Configuration window marked by the arrows (⇒) are items of particular importance.
10. Continue on by clicking **PTT**, in the **Option** window. A window as shown in Fig. 6 will appear. Make sure that you correctly select the two options as indicated by the arrows. Failure to do so can cause loss of transmit data.
11. The next item to be selected from the **Option** window is **Encoder** and **Decoder**. These two should both have **None** in the **Type** window as indicated by the arrows in Fig. 7 and Fig. 8. Click **OK** to close the **Channel Information** window.
12. Write the current profile to the station and save it to disk. As soon as you get the **Station Successfully Written** message, proceed to the alignment portion of these instructions.

Motorola MTR2000 Repeater Interface - page 2 of 10

Alignment Procedure

1. Make sure that all alignment procedures from the **Service** pull down menu have been performed except for the **TX Wireline**, **Discriminator** and the **Aux TX Input**. These will need to be performed separately.
2. Connect a telephone transmission test set, in the terminated mode, to the Line 1 input of J6 on the rear of the station. Set it to transmit a 1004Hz tone at -20.0dBm .
3. Click on **Service** in the pull down menu and select **Station Alignment**. Now select the **TX Wireline** button from **Audio Input/Output**. See Fig. 9.
4. After you click **TX Wireline** a window as shown in Fig. 10 will appear. With the Transmission Test Set in the generate mode, type -20 in the box for the **Level of test tone** and click on **Save**. The station will immediately auto-calibrate, temporarily store the value and then return you to the **Station Alignment** window.
5. Connect the Raider controller to the MTR2000 station at this time. With the top cover of the controller removed, install jumpers W22, W26 (remove W26 in the Marauder) and W30 if they are not already installed.
6. Remove the Telephone Transmission Test set and connect an Oscilloscope to pin 1 of U1 in the controller. Connect a Service Monitor to the RX port of the MTR Station set in the generate mode at an RF level of approximately -80dBm .
7. Generate a 1kHz tone deviating at 2kHz (1kHz for narrowband operation) and click on the **Discriminator** button in **Audio Input/Output**. See Fig. 9.
8. Adjust the slider, (see Fig. 11), to obtain a 2Vp-p signal on pin 1 of U1 measured with an Oscilloscope. Click **Save** to return to the **Station Alignment** window of Fig. 9.
9. Set the Service Monitor to Receive on the Station's transmit frequency. Move the controller's TX Test switch, SW4-2, to the down position and adjust the TX Data potentiometer, R57, to obtain a 2Vp-p signal of low speed data, measured with an Oscilloscope, at pin 8 of U2.
10. Click on the **Aux TX Input** button under **Transmitter**, (see Fig. 9), and adjust the slider, as in Fig. 12, to obtain 1kHz deviation (800Hz for narrow band operation) of low speed data as measured by the service monitor. Click **Save** to temporarily save the calibration data.
11. Now, click **Save** from the **Station Alignment** window to permanently write all the calibration data, from the previous steps, to the codeplug. If a "**Station Successfully Aligned**" message appears in the Message Window, you may proceed to the **Alignment Procedure** beginning on page 26 to complete system integration.

Motorola MTR2000 Repeater Interface - page 3 of 10

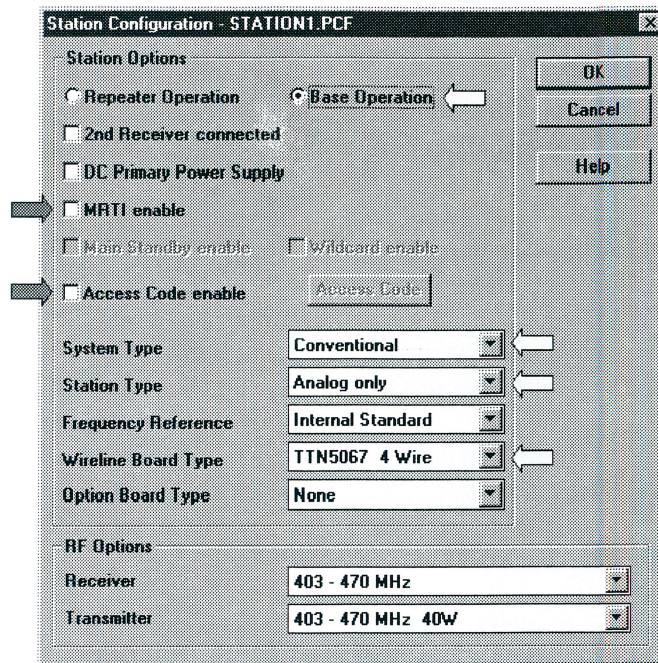


Fig. 1

Please note the 6 items identified by the arrows. These options must be selected exactly as shown for the external controller to function properly. The other options may be left just as they are.

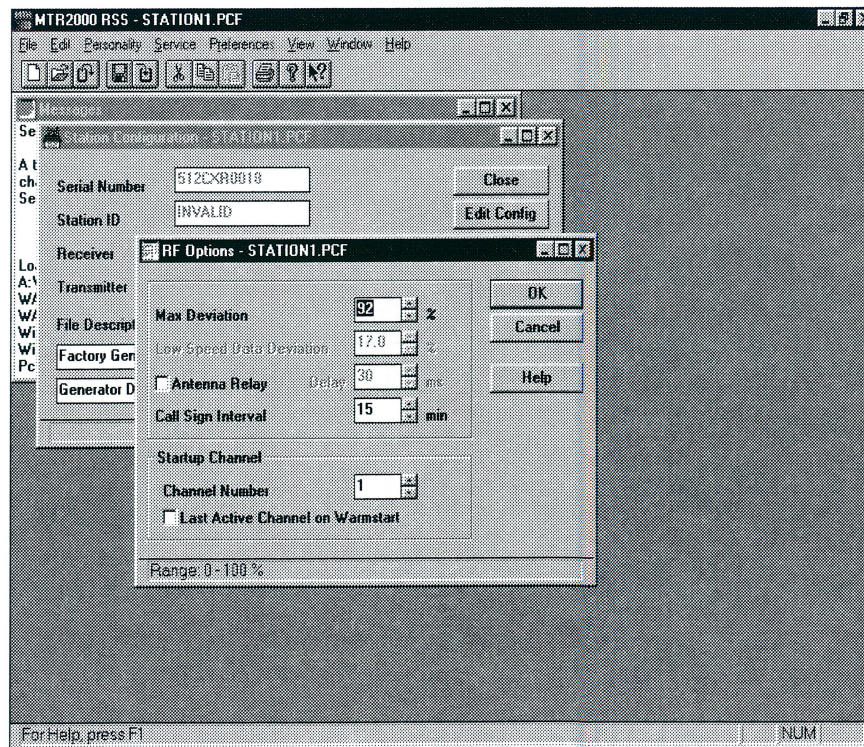


Fig. 2

The Raider and Marauder series controllers have a built in Time Out Timer (TOT) and CW Station ID. It is recommended that these features be disabled in the MTR2000 station and programmed into the controller.

Motorola MTR2000 Repeater Interface - page 4 of 10

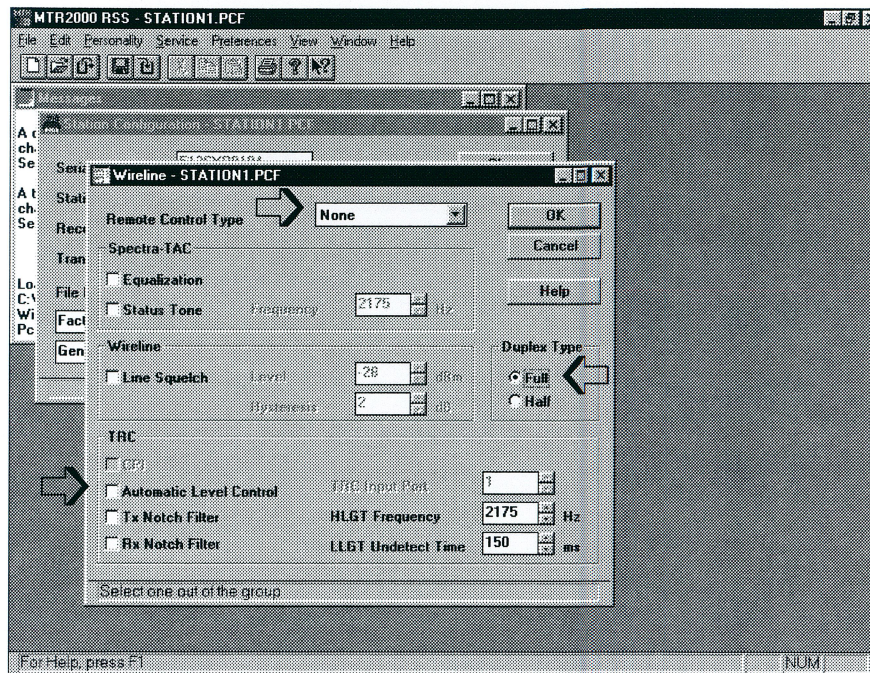


Fig. 3

The options on this screen must be selected exactly as shown except for the HLGT and LLGT frequencies. If any item is overlooked, improper operation or the inability to correctly align the station for an external controller will result.

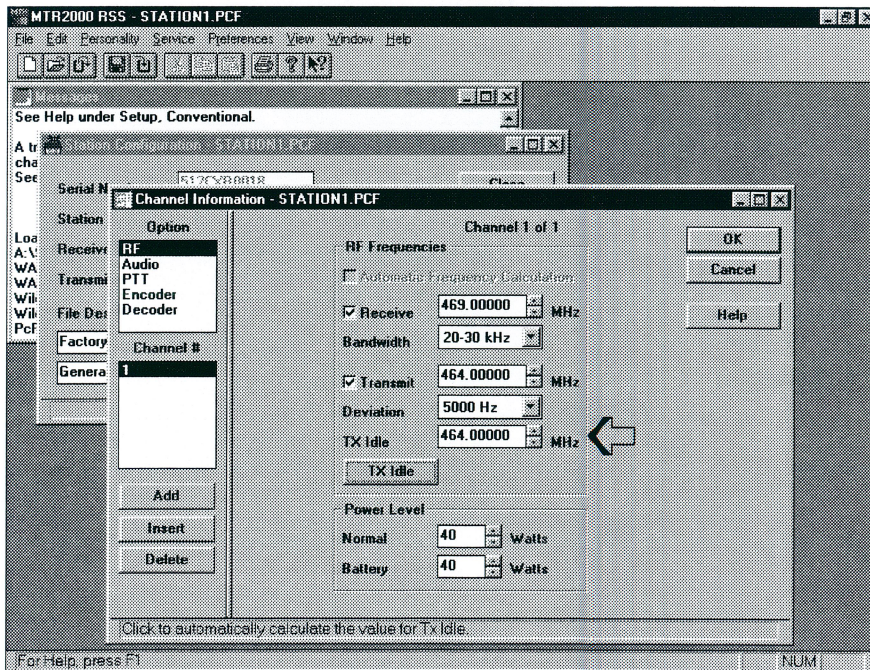


Fig. 4

Make sure that the correct Bandwidth and Deviation have been selected for your particular mode of operation. Also, be sure to enter your transmit frequency into the TX Idle window. These two frequencies should match for proper LTR handshake.

Motorola MTR2000 Repeater Interface - page 5 of 10

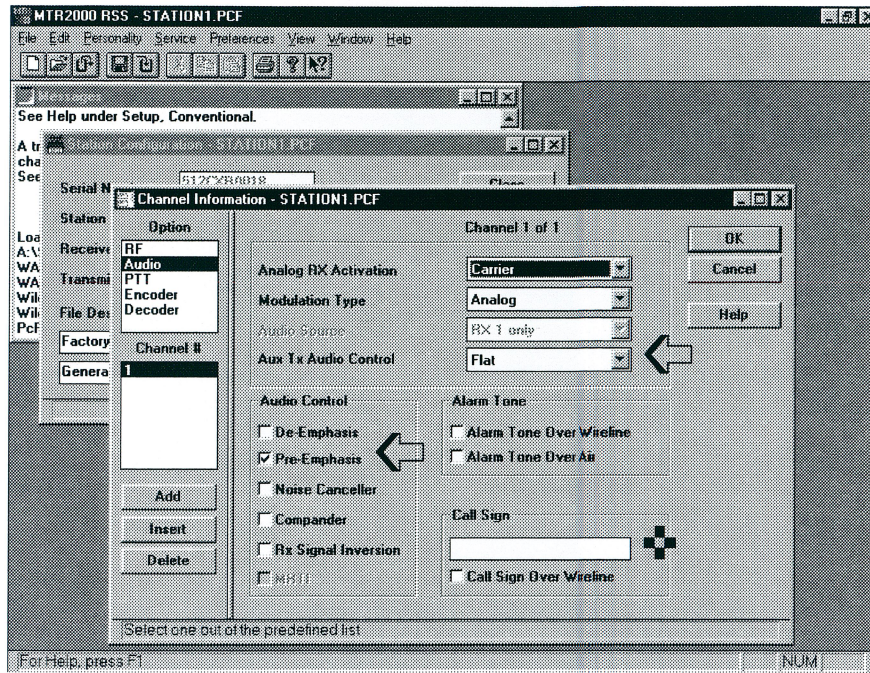



Fig. 5

Every option on this screen must be selected exactly as shown except for Call Sign and Alarm Tone. If any item is forgotten, the external controller will not operate properly. Items of extra importance are indicated by the arrows. The Raider and Marauder have a built in CW Station Identifier that is fully programmable over a modem. It is recommended that this Identifier is used instead of the one built into the MTR station, indicated by the .

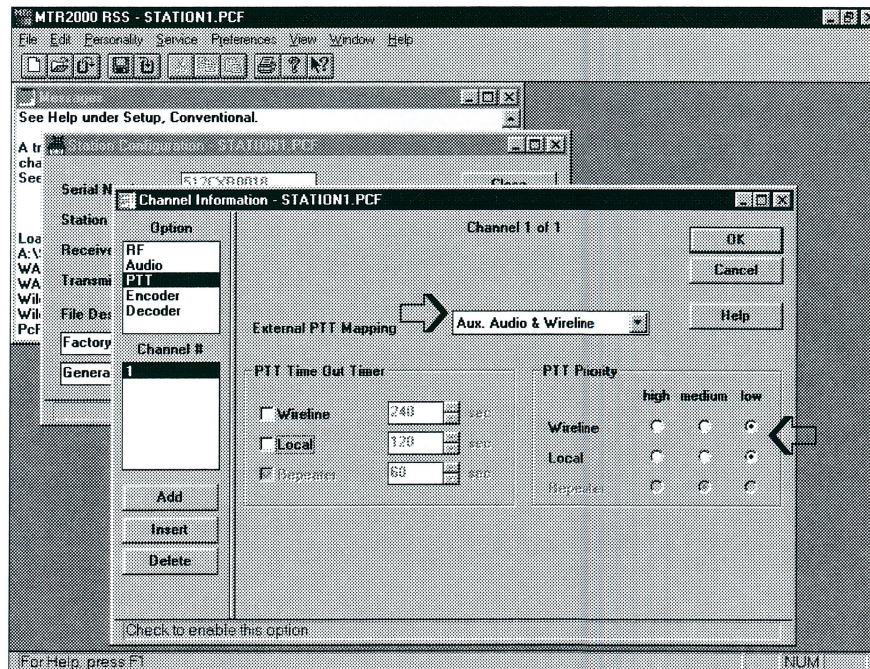


Fig. 6

The options shown here must be selected in the new station being programmed. Specific items of importance are indicated by the arrows. The Raider and Marauder have a built in TOT. It is recommended that those be used instead of the PTT TOT in the MTR station.

Motorola MTR2000 Repeater Interface - page 6 of 10

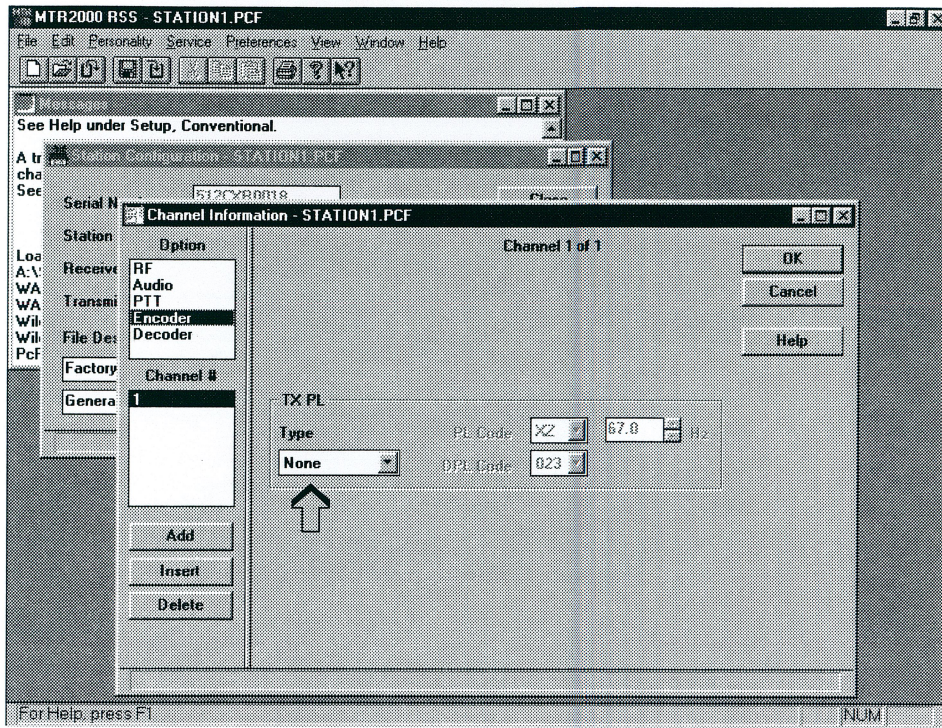


Fig. 7

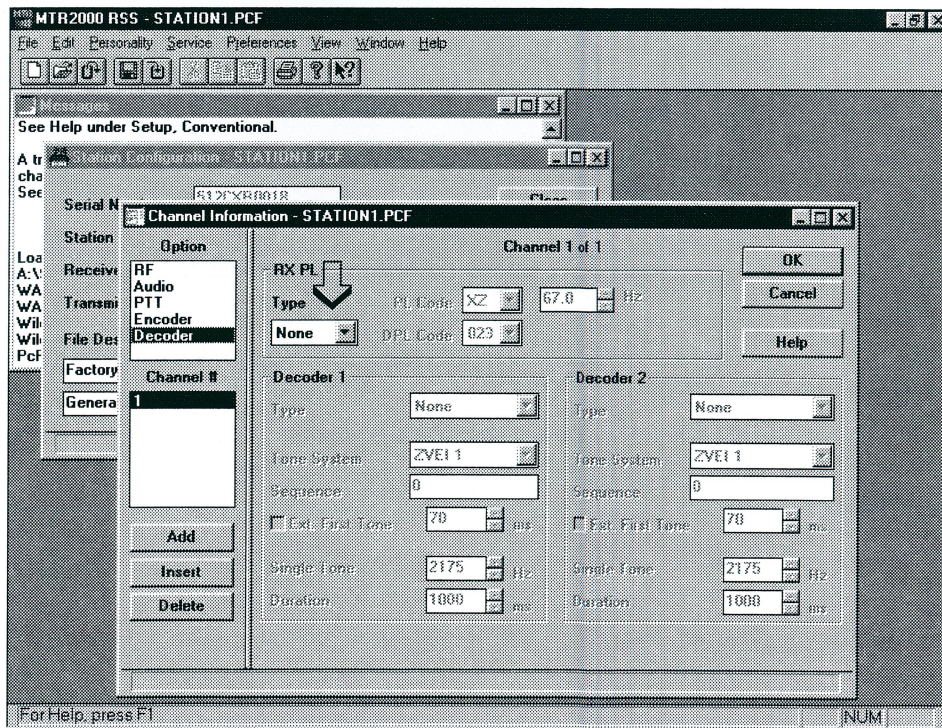


Fig. 8

Motorola MTR2000 Repeater Interface - page 7 of 10

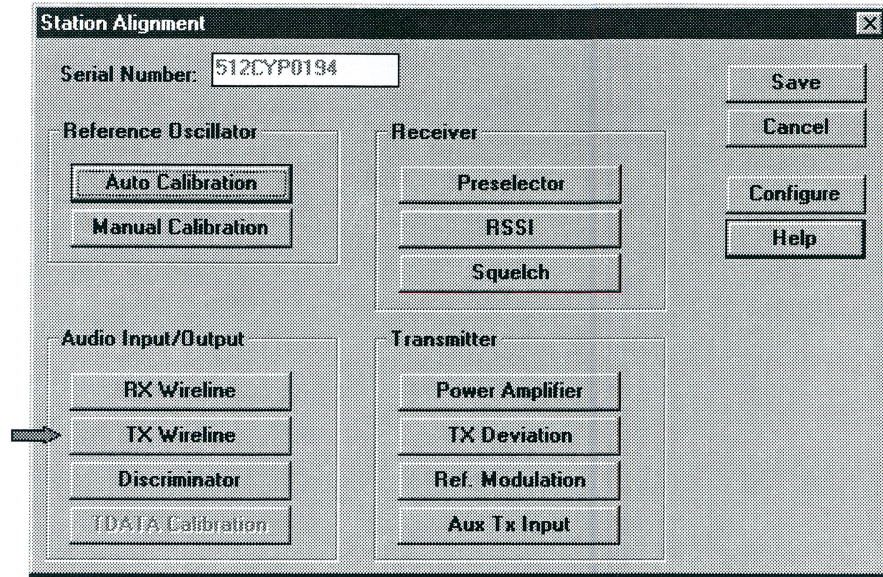


Fig. 9

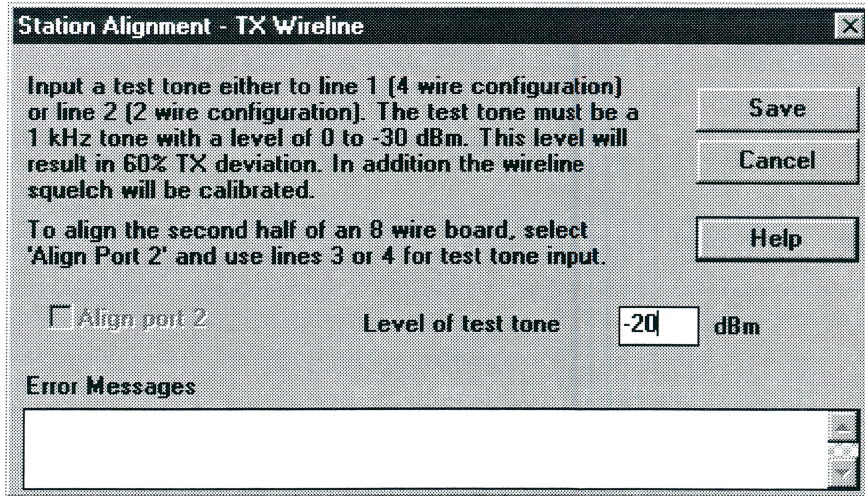


Fig. 10

Using an audio signal generator that will supply a 600 ohm source impedance, generate a -20dBm signal into the line 1 input of J6, enter -20 into the Test Tone window, and click the save button.

Motorola MTR2000 Repeater Interface - page 8 of 10

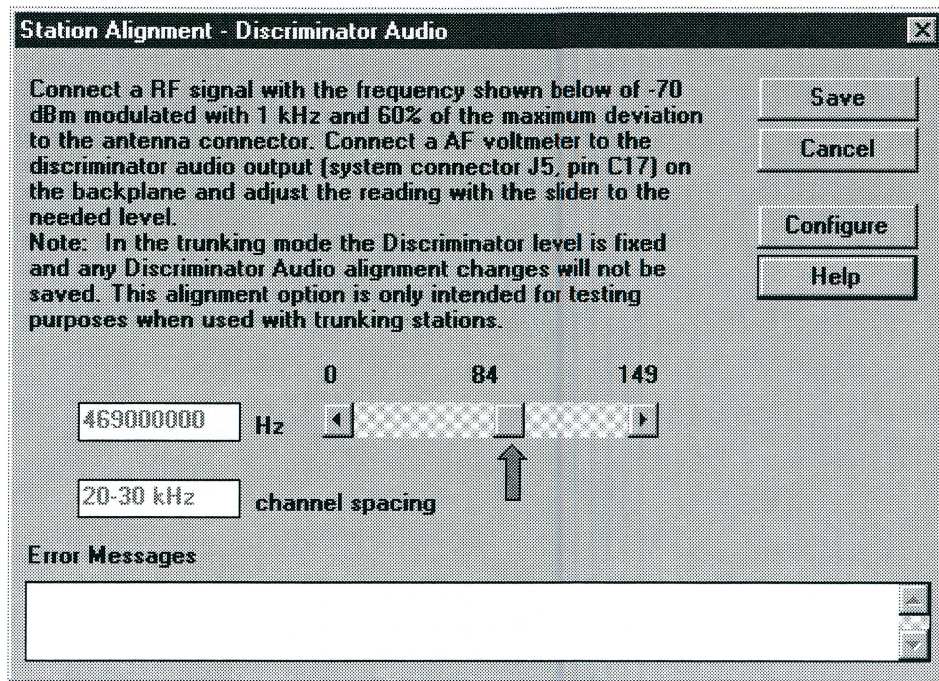


Fig. 11

Adjust this slider to obtain a 2Vp-p signal as measured with an O'scope connected to pin 1 of U1 in the controller. The input to the station is receiving a -80dBm signal modulated with a 1kHz tone deviating at 2kHz (1kHz for 12.5kHz operation).

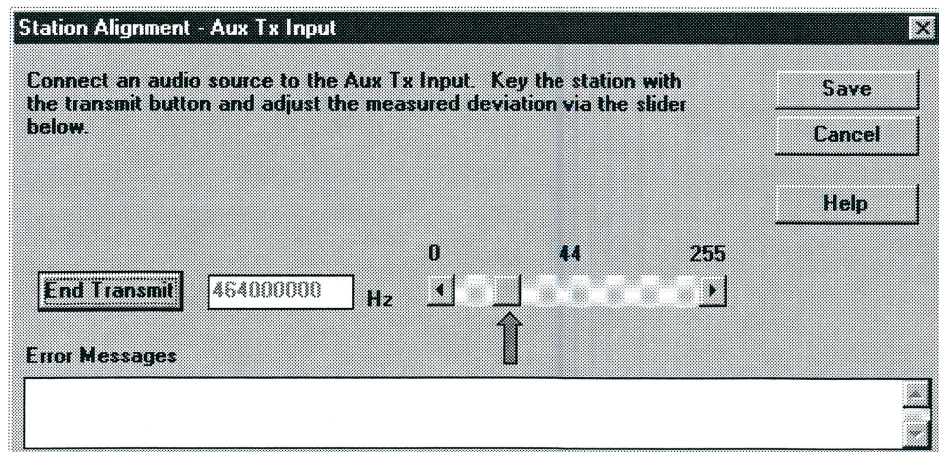
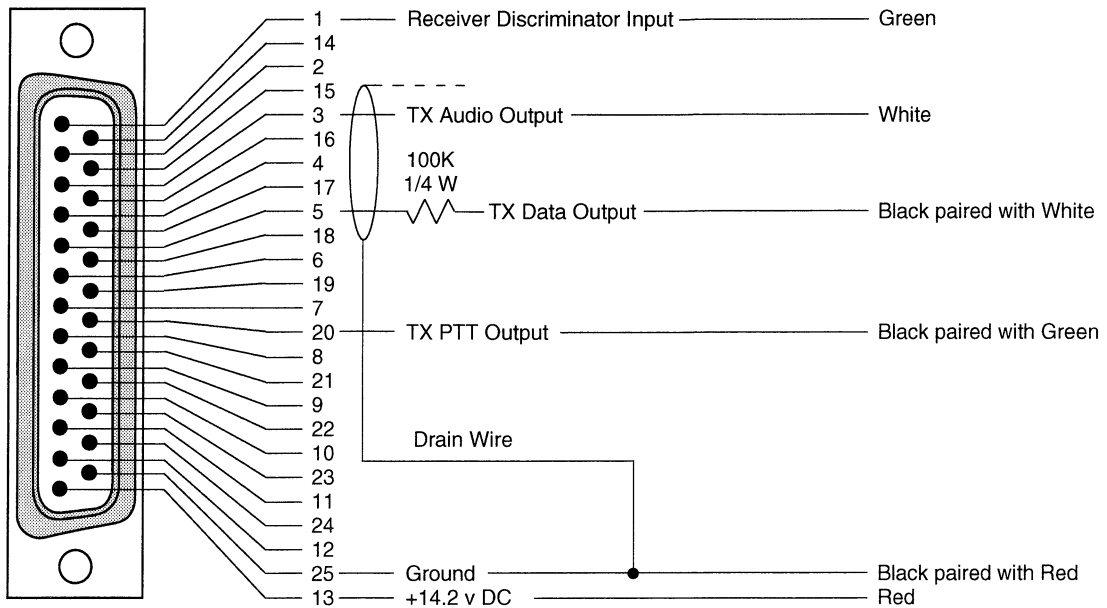


Fig. 12

Flip dipswitch SW4-2 down (test mode) on the controller and adjust TX Data pot R57 to obtain a 2Vp-p signal as measured with an O'scope connected to pin 8 of U2 in the controller. Adjust this slider to obtain 1kHz deviation (800Hz for 12.5kHz operation) of low speed data as measured with a service monitor receiving on the stations transmit frequency.

Motorola MTR2000 (Universal) Repeater Interface - page 9 of 10

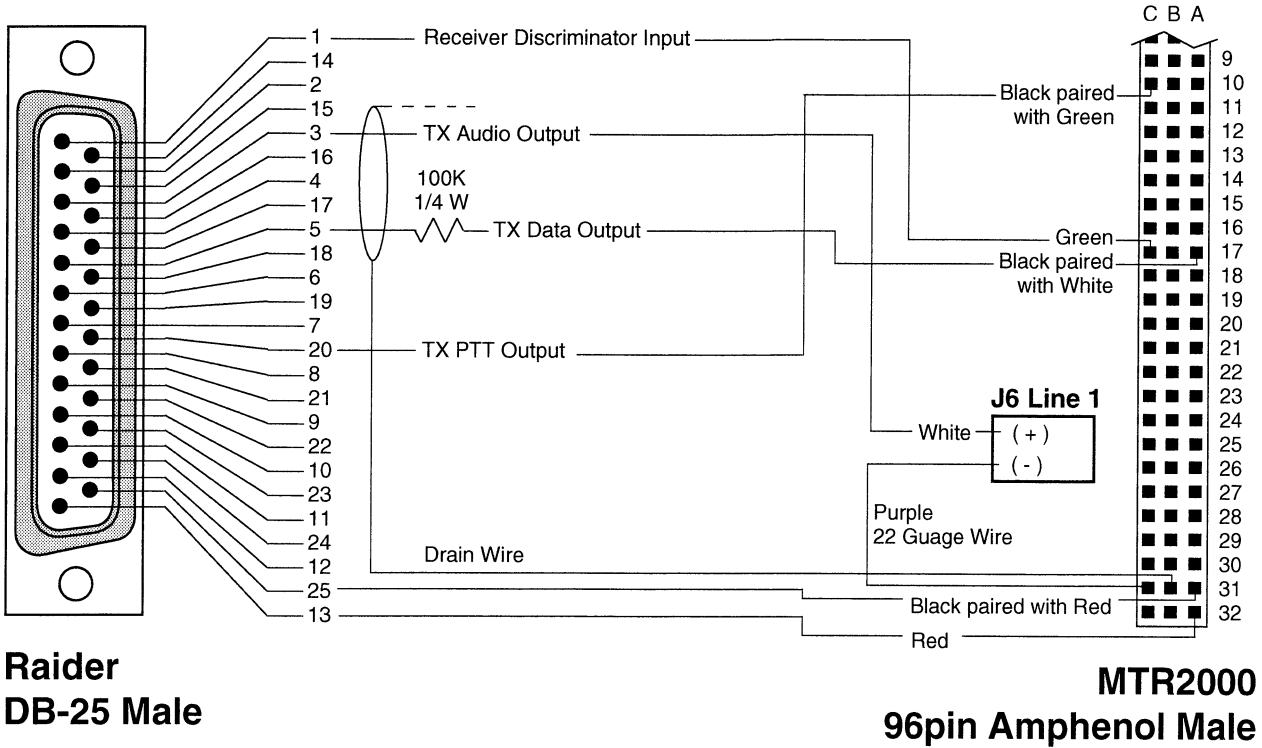


Raider DB-25 Male

Raider Jumpers			Raider Invert Switches			
W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
IN	IN	IN	ON	OFF	ON	ON

All RF equipment is unique to its own system installation. These jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

Motorola MTR2000 (Direct) Repeater Interface - page 10 of 10



Raider Jumpers			Raider Invert Switches			
W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
IN	IN	IN	ON	OFF	ON	ON

All RF equipment is unique to its own system installation. These jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

**This cable is available from Trident - PN 500-486.
Please contact your Trident Representative for details.**

Motorola GR1225 Repeater Interface - page 1 of 5

Requirements

Trident Universal Interface Cable # 500-464
 Motorola Connector Kit # HLN9457A
 One 2.2K 1/4W Resistor
 One 220K 1/4W Resistor
 GR1225 RSS (Radio Service Software)
 Full Duplex Service Monitor
 RMS Voltmeter
 Various Hand Tools

NOTE:

If you have purchased a custom built cable from Trident Micro Systems for the GR1225 repeater, you may proceed directly to the *Programming and Set-up Procedure*. If you have the Universal Interface that comes with the controller, please proceed with *Construction of the Interface Cable*.

Constructing the Interface Cable

1. Unpack the Trident Universal Interface Cable and remove the cover from the DB-25 connector.
2. Remove the green wire from pin 3 of the DB-25. Solder the 2.2K resistor to pin 3 so that the conformal coating on the resistor is flush with the end of the pin.
3. Cut the other lead of the resistor to 1/8" in length and solder the green wire to this lead.
4. Remove the brown wire from pin 5 of the DB-25. Solder the 220K resistor to pin 5 so that the conformal coating on the resistor is flush with the end of the pin.
5. Cut the other lead of the resistor to 1/8" in length and solder the brown wire to this lead.
6. Remove the white wire from pin 7 of the DB-25 and solder it on pin 20.
7. Reinstall the cover on the DB-25 connector.
8. Open up the Motorola connector kit and remove the shell and pins. Cut the flying leads on the Trident universal cable to 3/4" in length and strip and tin the leads to fit the crimp pins.
9. Crimp and solder pins to all wires on the universal cable except the shield wire which should be cut flush with the outer insulation of the cable.
10. Remove the cover from the GR1225 repeater and push the cable through the vaned grommet, on the rear of the chassis, to the interior of the cabinet. Pull enough cable through so that you can work with the crimp pins.
11. Insert the crimp pins into the shell as follows, using Fig. 1 as a guide:
 Note: This diagram is for cable part Number 500-464 only.

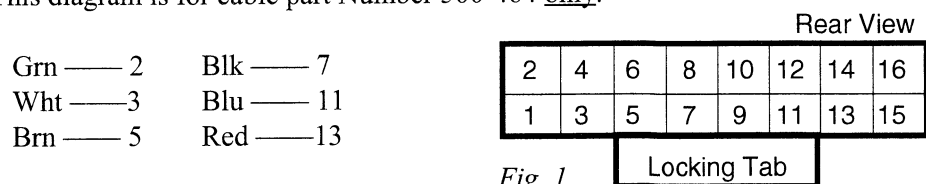


Fig. 1

12. Be sure to use the wire tie, included in the kit, to securely fasten the control cable to the tab on the connector. This will provide adequate strain relieve for the connections.

Motorola GR1225 Repeater Interface - page 2 of 5

13. Position the connector so that the locking tab is downward, as in Fig. 1, and plug it into the 16 pin accessory jack on the back of the GR1225 Transceiver.
14. You may now proceed to the Programming and Setup Procedure for the GR1225.

Programming and Setup Procedure

1. Install your Motorola RSS Program on your PC if you haven't already done so.
2. Connect your PC to the new GR1225 station and read the configuration from the code plug.
3. As soon as *Read Successful* appears in the status bar, click the **Radio Wide** icon to open up the General Options and External Accessories folders.
4. Using Fig. 2 and 3 as a guide, select the options shown with your mouse.
5. Next click the **Mode** icon and enter your transmit and receive frequencies. Make sure that you select CSQ for your Squelch Type on both Transmit and Receive.
6. Be sure to notice the channel spacing that has been selected, as this information is necessary when following the tune up procedure for the controllers.
7. Now click the **Get/Save** icon and select the **Read/Program/Clone Radio** tab. Click the **Program** button. As soon as *Radio Successful* appears in the status bar, immediately go to **Service** and follow the station alignment procedure outlined in the Motorola service manual.
8. From the **Service** pull down menu select **Receive Level Set Adjustments** and read the station. Using Fig. 4 as a guide, select 6dB for microphone gain and write the station. When the write is complete, close the window.
9. As soon as the station alignment is completed, remove the 6 screws securing the lid to the Raider and remove the lid.
10. Configure jumpers W22, W26 and W30 as follows:
 - W22 – Out
 - W26 – In
 - W30 – In
11. Remove bus jumpers W6, 7, 8, 9, 23 and 24 on all controllers except the two controllers that will be at each end of the T-NET data bus.
12. Place the lid back on the controller and reinstall the 6 screws. Configure the dipswitch on the rear of the unit labeled SWITCH 2 as follows:

1 – Up	5 thru 9 – Depends on LTR Bus address
2 – Up	10 – Up for Area = 0, Down for Area = 1
3 – Up	11 – Up = Sync off, Down = Sync on
4 – Down	12 – Up = 1200 baud, Down = 2400 baud
13. Follow the *Alignment Procedure* beginning on page 26 to set the proper data and repeat audio levels. After completing the alignment, use a radio programmed for the channel to check for proper handshake and operation.

Motorola GR1225 Repeater Interface - page 3 of 5

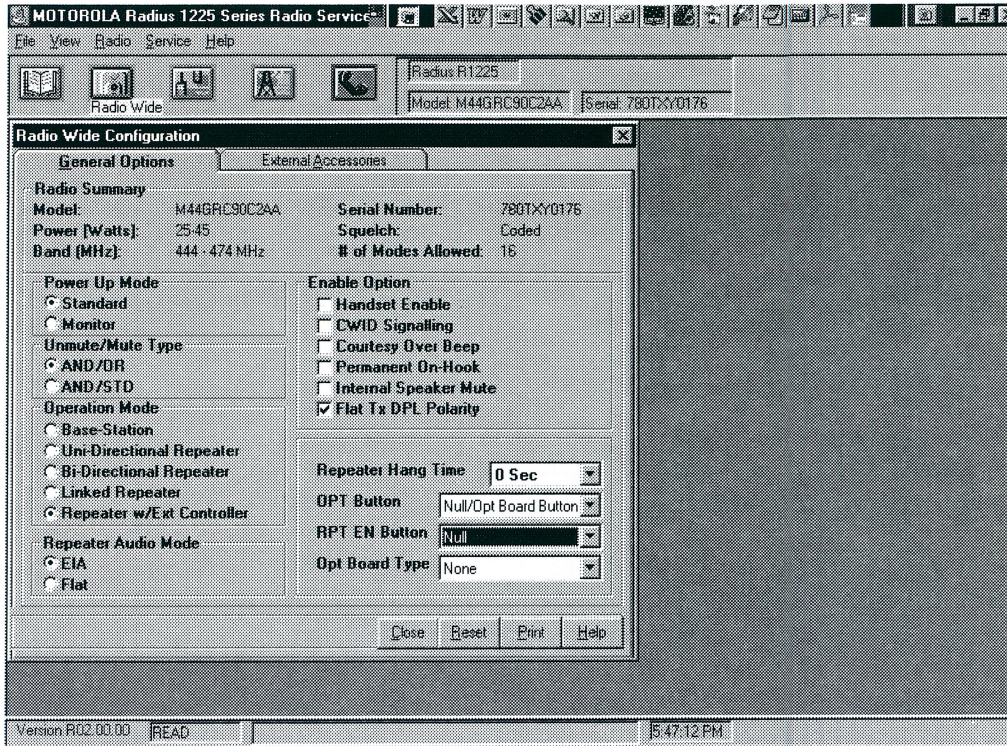


Fig. 2

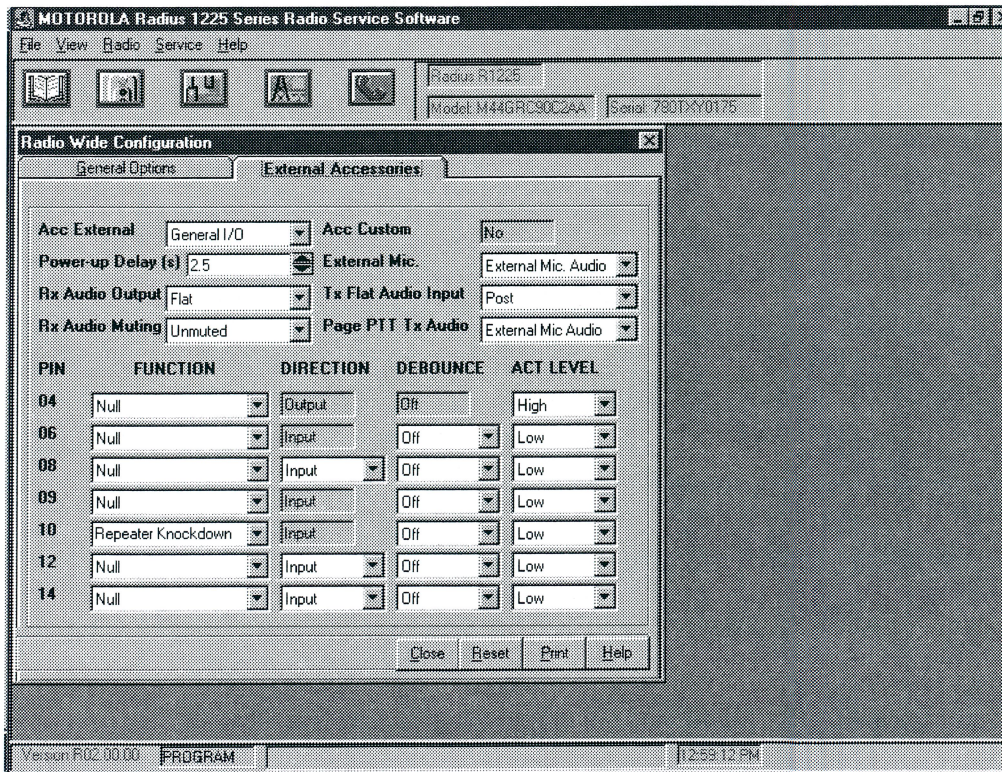


Fig. 3

Motorola GR1225 Repeater Interface - page 4 of 5

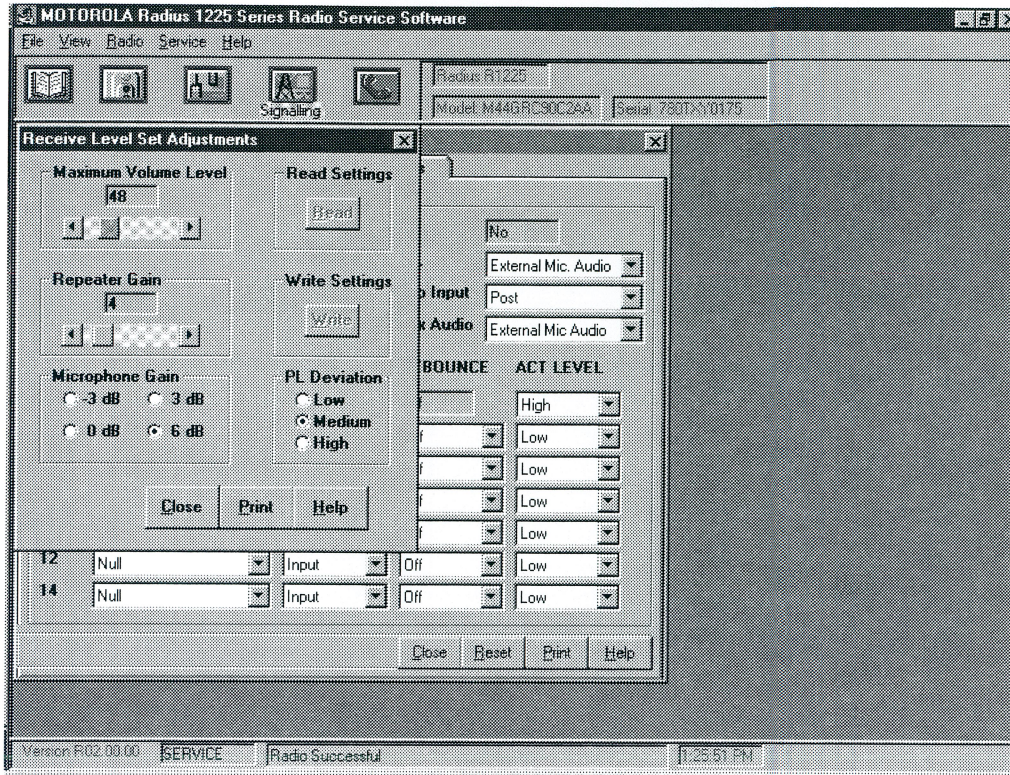
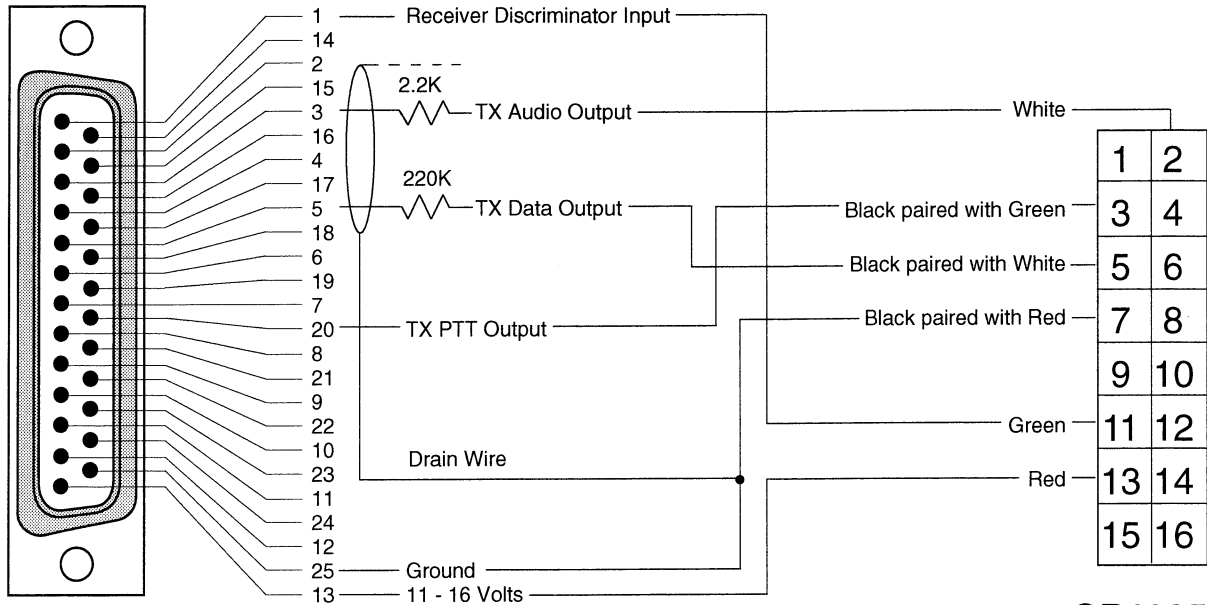


Fig. 4

Motorola GR1225 Repeater Interface - page 5 of 5



**Raider
DB-25 Male**

**GR1225
J3 Connector**

Raider Jumpers			Raider Invert Switches			
W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
OUT	IN	IN	OFF	OFF	OFF	ON

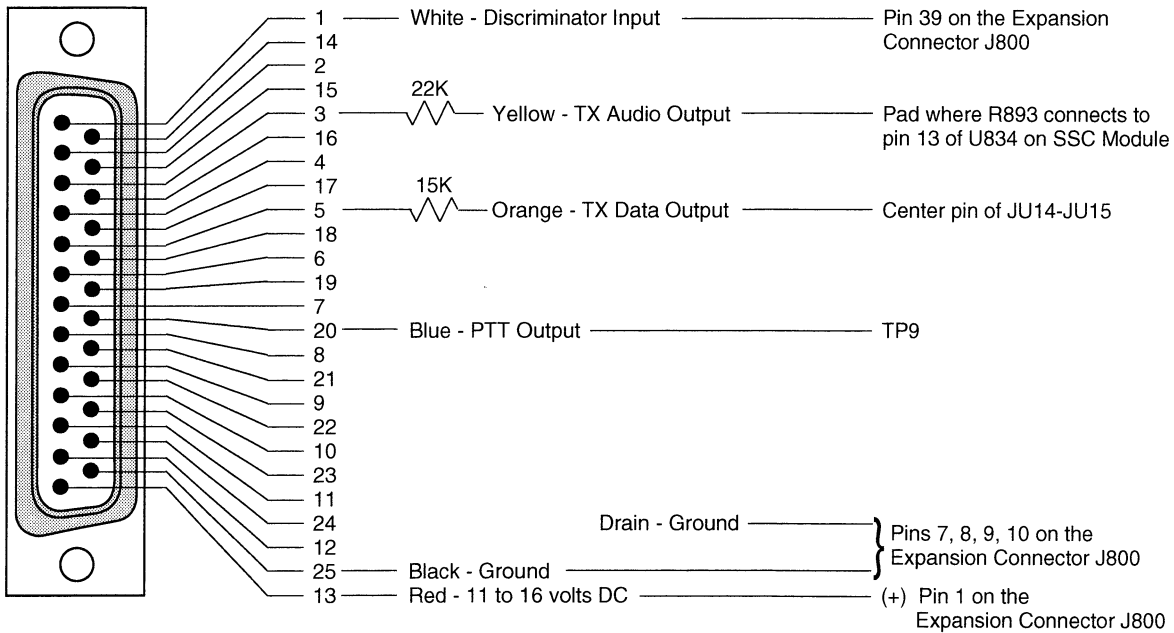
All RF equipment is unique to its own system installation. These jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

**This cable is available from Trident - PN 500-484.
Please contact your Trident Representative for details.**

Motorola MSF5000 Repeater Interface - page 1 of 1

Analog Control Tray Models Only

1. Strip 1/16" of insulation from each of the flying leads of the 500-443 interface cable and tin.
2. Pull the Control Tray out on the repeater and lift it open so that the SSC module and the TTRC Audio Board are visible.
3. Remove JU14A from the SSC Module to disable PL/DPL Encode in the station.
4. Disable Repeat on the Station.
5. Solder the Red wire from the interface cable to pin 1 of the Expansion Connector J800.
6. Solder the Black/Shield wire to pins 7,8,9,10 on the Expansion Connector J800.
7. Solder the White wire to pin 39 on J800.
8. Solder the Orange wire to the center pin of JU14-JU15.
9. Solder the Yellow wire to the pad where R893 connects to pin 13 of U834 on the SSC Module.
10. Solder the Blue wire to TP9.
11. Set the Raider's jumpers and switches per the chart below.
12. Perform the Alignment Procedure in this manual to complete the installation.



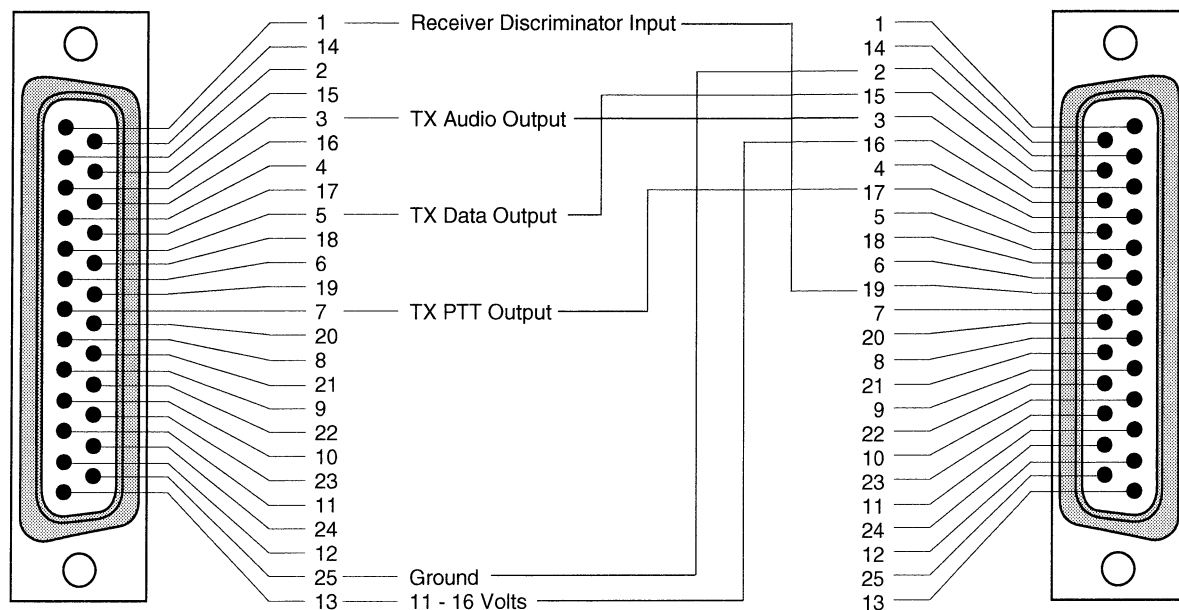
Raider DB-25 Male

Raider Jumpers			Raider Invert Switches			
W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
OUT	IN	IN	OFF	OFF	OFF	ON

All RF equipment is unique to its own system installation. These jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

**This cable is available from Trident.
Please contact your Trident Representative for details.**

Ritron RRX-450 Repeater Interface - page 1 of 1



**Raider
DB-25 Male**

**RRX-450
DB-25 Female**

Raider Jumpers			Raider Invert Switches			
W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
IN	IN	OUT	ON	OFF	ON	OFF

All RF equipment is unique to its own system installation. These jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

**This cable is available from Trident.
Please contact your Trident Representative for details.**

TAIT T885, T881 Repeater Interface - page 1 of 4

Interfacing the Raider to the TAIT T885 receiver and T881 transmitter requires the removal and dismantling of both units.

1. Remove power from the TAIT repeater and disconnect all cabling from the units.
2. Remove the TOP cover of the transmitter. Locate resistor R-257 (Fig. 5) and remove it. This is to disable the transmit time out. The transmitter is still thermally protected and will automatically shut down if over heated.
3. Make sure the following transmitter jumpers are "in" :

PL100	5-6
PL101	3-4
PL102	5-6
PL103	3-4

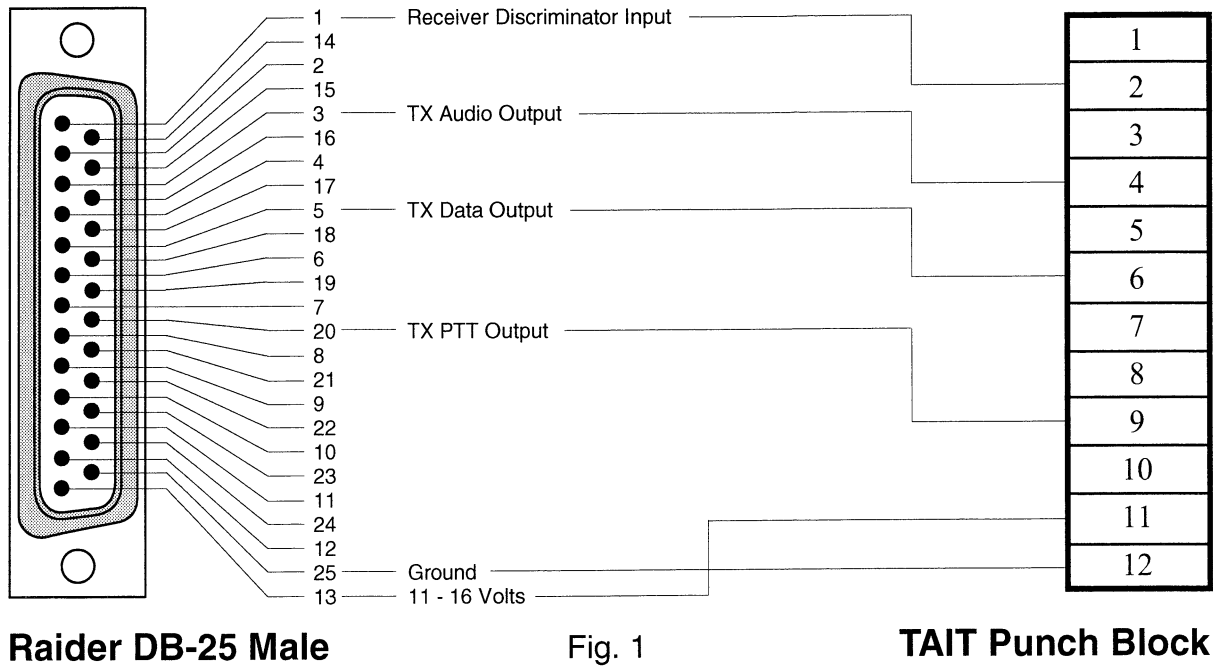
4. The main deviation control (RV106) may need to be increased and the line sensitivity should be increased moderately. Reassemble and install the transmitter.
5. Connect the Raider to the TAIT punch block as illustrated in Figs. 1, 2 and 3.
6. Remove the TOP cover of the receiver. Locate IC 101 (Fig.4) and solder a wire from pin 7 of IC 101 to an unused pin on the receiver D-connector, if no unused pin can be found then cut the trace going to pin 5 of the D-connector and use this pin.
7. Make sure the following jumpers are set in the receiver:

PL102	1-2
PL105	2-3
PL101	2-3
PL103	2-3
PL100	1-2
PL104	1-2
PL106	2-3

8. Connect the Raider discriminator input to the pin that was tied to IC 101 pin 7 on the receiver.
9. Install the jumper wire as illustrated in Fig. 6.
10. The gating and line level adjustments are not used by the Raider. Reassemble and install the receiver.

This completes the interface to the TAIT repeater. Proper tuning of your Raider should now be performed.

TAIT T885, T881 Repeater Interface - page 2 of 4



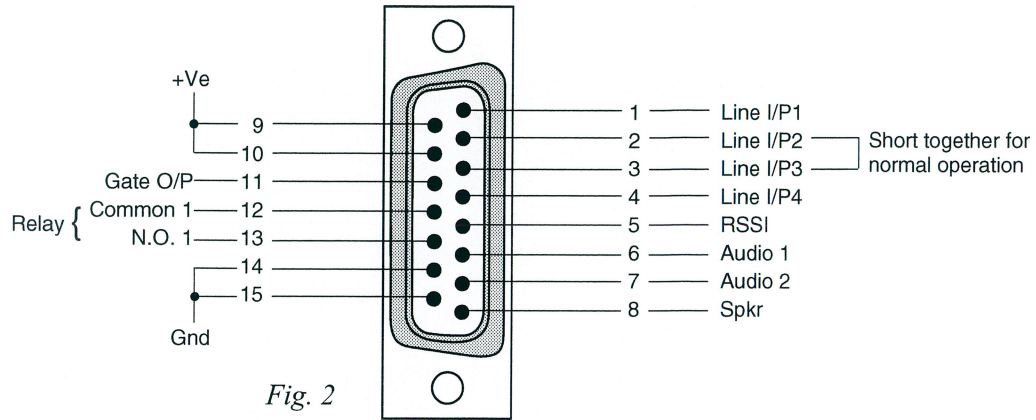
Raider Jumpers			Raider Invert Switches			
W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
IN	OUT	OUT	OFF	ON	OFF	ON

All RF equipment is unique to its own system installation. These jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

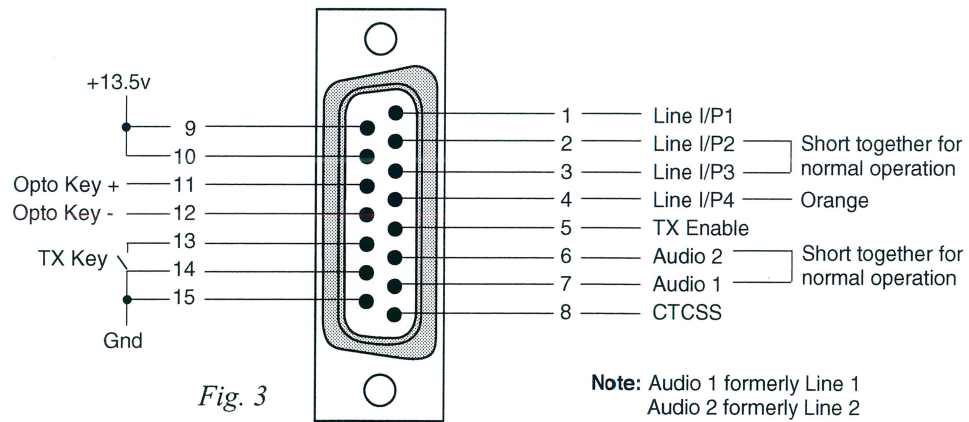
**This cable is available from Trident.
Please contact your Trident Representative for details.**

TAIT T885, T881 Repeater Interface - page 3 of 4

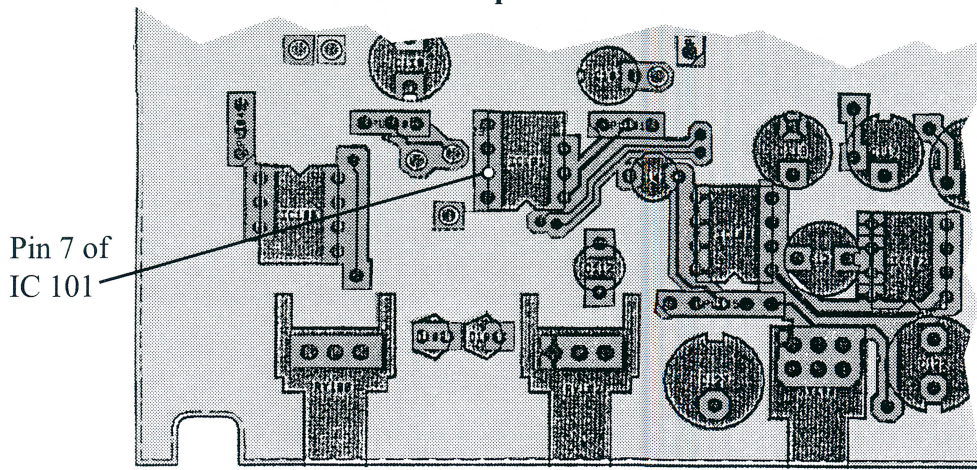
Receiver D Connector Rear View



Transmitter D Connector Rear View

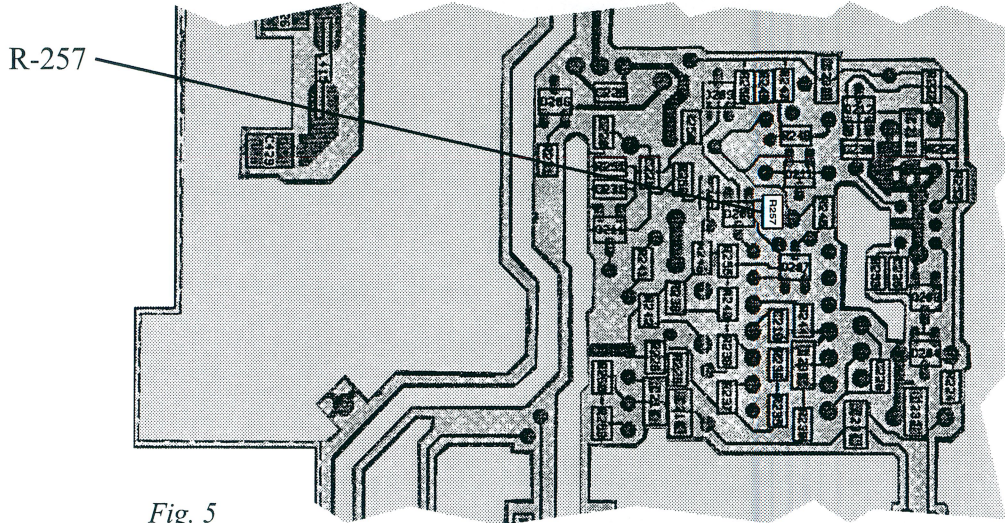


Receiver - Top view

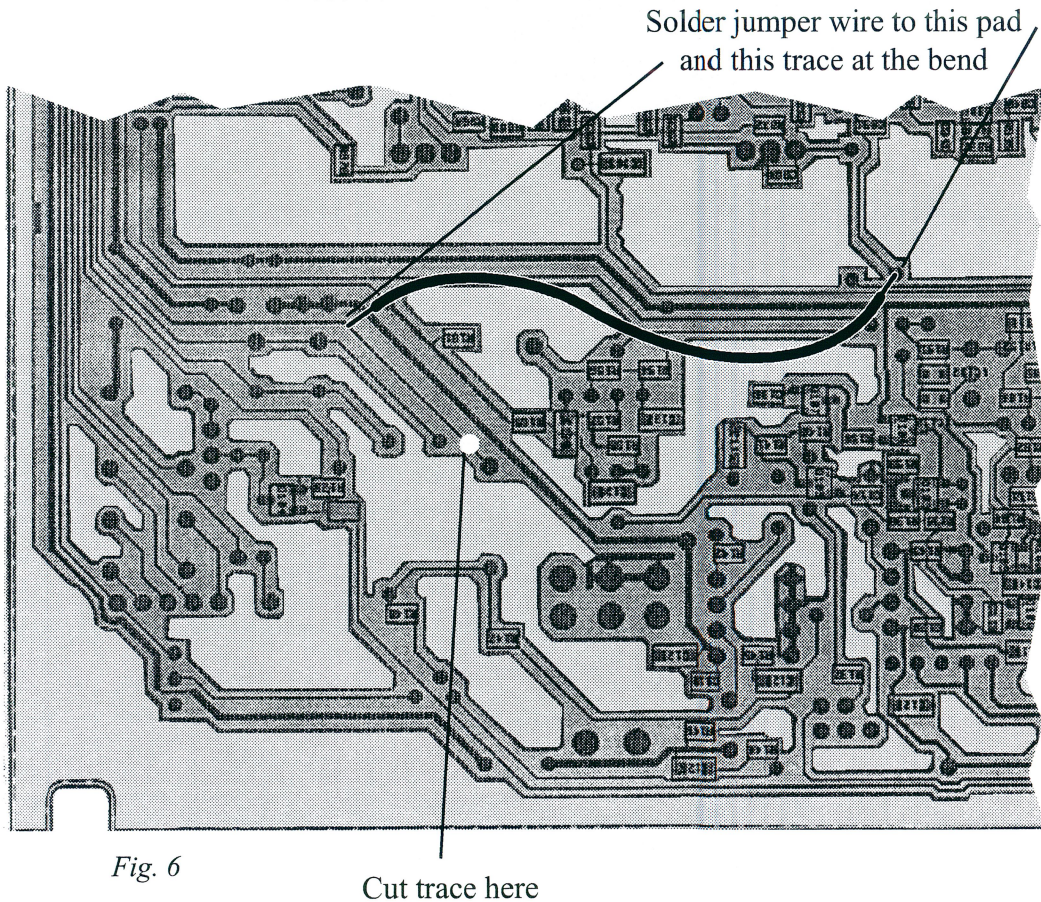


TAIT T885, T881 Repeater Interface - page 4 of 4

Transmitter - Bottom View



Receiver - Bottom View



TAIT 855, 856-857 Repeater Interface - Page 1 of 2

Interfacing the T850 requires the removal of both modules from the rack frame and the removal of the top covers.

1. Discriminator Output (T855) - Connect a wire from Pad 111 to pin 8 of the T800-03 D-Range connector. Pin 8 may be connected directly to the Controller interface harness or connected to the Terminal Blocks on the Rack Frame Interface. If the connector is not installed in the rear of the receiver module, the wire will have to be brought out through a separate opening.
2. Remove Jumper PL103 and save it on pin 1.
3. If the Rack Frame Interface Board is installed, remove jumpers LK5, 6, 7, 13, 14 and 16.
4. Remove any jumpers or wires that may be connecting the balanced Line outputs and Line Inputs between the receiver and exciter/transmitter modules.

Jumper the Exciter module as follows:

PL100	5-6	PL101	1-2
PL102	3-4	PL103	3-4

5. Reinstall the covers on the Tait modules and reinstall the modules in the Rack Frame.
6. Connect the Raider controller to the repeater as follows:

Trident DB25		TAIT
Disc. Audio	1	Wire from Pad111 in T855
TX Audio	3	PL200 Pin6 on T856-857
TX Data	5	PL200 Pin8 on T856-857
+13VDC	13	PL200 Pin9-10 on T856-857
PTT	20	PL200 Pin5 on T856-857
Ground	25	PL200 Pin14-15 on T856-857

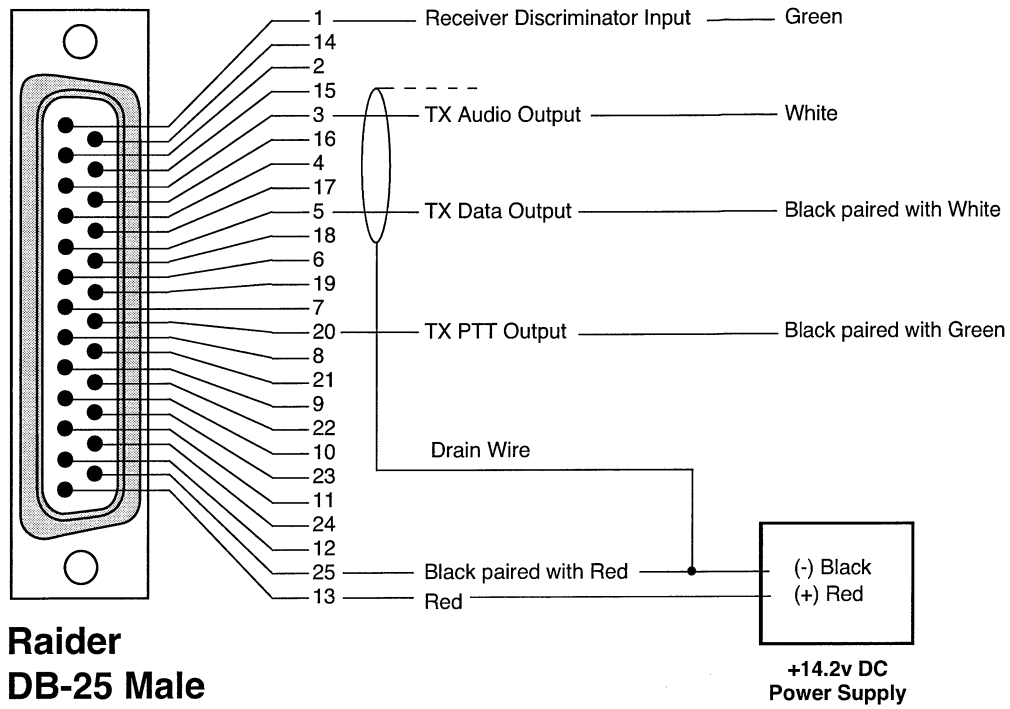
7. Disable the Tail Timer and the Time Out Timer in the T856-857.
8. Position the Jumpers in the Raider as follows:
 - W22 OUT
 - W30 IN
 - W26 IN (Marauder OUT)
9. Set the Dip switches as follows:
 - 1 UP 2 UP
 - 3 UP 4 DOWN
 - 5 thru 9 According to buss addressing
 - 10 thru 12 According to system design
10. Inject a full quieting signal into the T855 receiver (-80dBm or better) modulated with a 100Hz tone deviating at 1kHz (800Hz for 12.5kHz operation). Using a digital RMS voltmeter set for AC volts, adjust RX DATA for a reading of 200mV RMS at TP1.

TAIT 855, 856-857 Repeater Interface - Page 2 of 2

11. Move the LGC SQ and TEST dip switches to the ON or down position and inject a full quieting signal into the T855 receiver (-80dBm or better) modulated with a 1kHz tone deviating at 2kHz (800Hz for 12.5kHz operation). Adjust RPT AUDIO, pot R13, for no less than 200mVp-p and no more than 400mVp-p drive to the T856-857. Adjust the Line Sensitivity control on the T856-857 Exciter module for 2kHz deviation of repeated audio (800Hz for 12.5kHz operation).
12. Turn the LGC SQ switch off, UP, and adjust the TX DATA control for 1kHz deviation of low speed data (800Hz for 2.5kHz operation). Turn the Test switch off (UP).
13. Turn the RF generator off so the receiver is not detecting a carrier and adjust the SQUELCH LEVEL control so that the carrier light on the front of the controller just goes out and does not flicker.

Raider Universal Repeater Interface

This cable is available through your Trident Representative - Part Number 500-464



Motorola MX800 Spectra Repeater (T99 Option) - page 1 of 2 (220 MHz and 700 MHz Models)

1. **Do Not** change any hardware components in the repeater.
2. Verify that the repeater firmware version is 2.9.6.

Repeater TX Alignment



NOTE: Repeater Models DDN6725 and DDN6726, purchased from Motorola, are factory tuned and the TX Alignment should not be changed. For these models, proceed directly to the Raider Set-up. There should be no need to perform the TX Alignment except in the event of damage, or repair that may cause loss of tuned settings.

1. Peak Deviation – Place JMP8 in position 1-2. Inject a 1kHz Sine wave at 2.0Vrms (2.0Vrms set at source generator into 600 ohms) into Pin 13 of CN1 coupled with a 1uF capacitor. Adjust the VCO level via MXTools Channel Edit screen to a Max of 1.7kHz.
2. Change the injected level to (1Vp-p) 350mVrms – this level will be the same at the generator or pin 13 when matched to 600ohms - and set nominal Deviation to 1.5kHz via RV2.
3. Mod Balancing – Change the injected level back to 2.0Vrms and change the frequency to 400Hz. Adjust the Ref Osc Level (LF Audio) on the Channel Edit screen so that the top and bottom of the ‘square’ wave are flat. Reference the Mod Balance procedure in the MX800 Technical Manual if necessary.



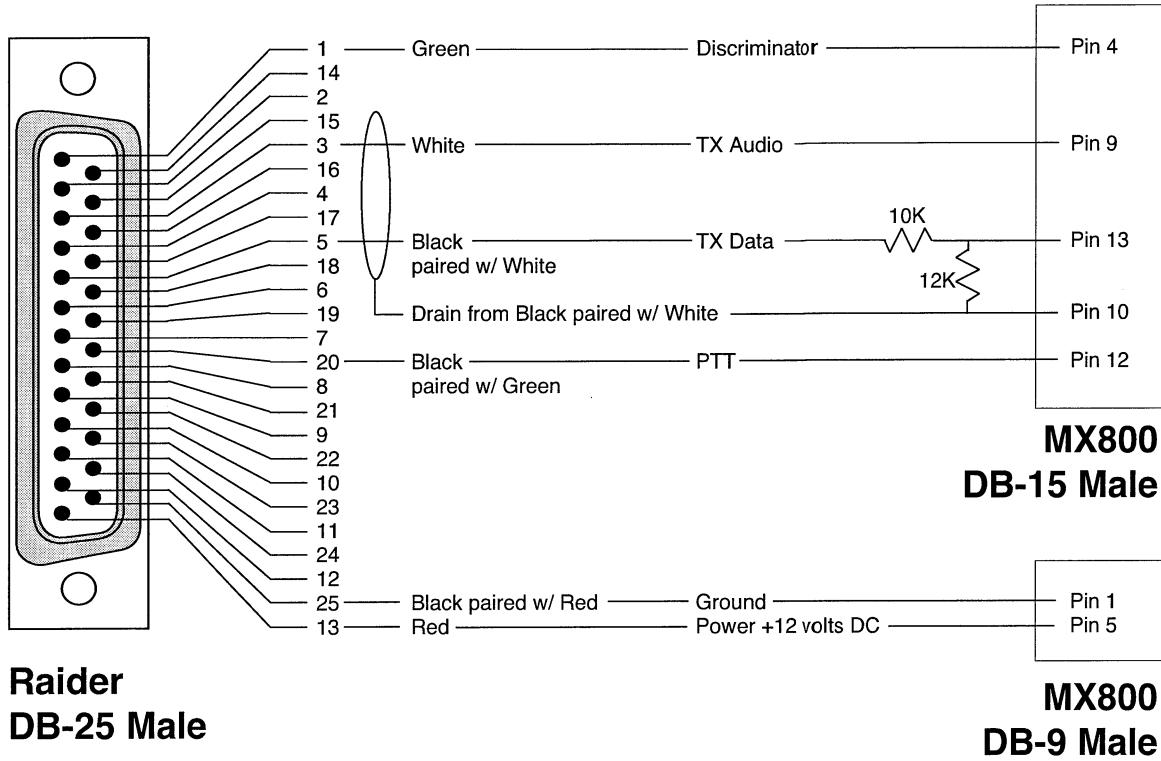
NOTE: Replace JMP8 to the 2-3 position when deviation tuning is complete.

4. Audio Through Level – Apply 1kHz at 1.1Vrms (1.1Vrms set at source generator into 600 ohms) to Pin 9 of CN1, set nominal Deviation to +/- 1.5kHz via RV4. (If the input is measured at pin 9 of the DB15, CN1 you should see 550mVrms)

Raider Set-up

1. Set jumpers in the Raider as follows:
 - W30 – “IN”
 - W22 – “OUT”
 - W26 – remove the jumper and install a 33K jumper. A 33K jumper (PN250-600) is included in the R/M to Spectra MX800 cable kit (PN500-512).
2. There should be no need to amplify the signal from the Raider to the MX800.
3. Install the R/M to Spectra MX800 cable. (cable kit PN500-512).
4. Align station with Raider and verify acceptable levels.

Motorola MX800 Spectra Repeater (T99 Option) - page 2 of 2
(220 MHz and 700 MHz Models)



Raider Jumpers			Raider Invert Switches			
W22	W30	W26	TX DTA	RX DTA	TX DCS	RX DCS
OUT	IN	*	ON	**	OFF	OFF

* W26 – remove the jumper and install a 33K jumper. A 33K jumper (PN250-600) is included in the R/M to Spectra MX800 cable kit (PN500-512).

** RX DTA – ON for 700 MHz model, OFF for 220 MHz model.

All RF equipment is unique to its own system installation. These jumper and switch indications are meant to be used as initial settings. Adjustments to these settings may be required, dependent upon your system configuration.

This cable is available from Trident - PN 500-512.
Please contact your Trident Representative for details.

Warranty and Service

Limited Warranty

Trident Micro Systems will repair or replace, at our option, any parts found to be defective in either materials or workmanship for a period of **one year** from the date of purchase. If a defective part causes a Trident Micro Systems product to operate improperly during the one year warranty period, we will service it free of charge (original owner only) if shipped and delivered to Trident Micro Systems at owner's expense. No other warranty, expressed or implied is given. Trident Micro Systems is not responsible for consequential damages, lightning, failure to read printed instructions, misuse or abuse, unauthorized modifications, use of our products in applications other than those intended by Trident Micro Systems, fire, theft, or accidents.

Repair and Return

Obtain a Return Merchandise Authorization (RMA) number by calling our Technical Support Team at 800-798-7881. All defective or repair products are to be sent with complete details as to what the problem is **and** have the RMA number printed on the outside of the shipping box.

SEND TO:

Trident Micro Systems
Two Trident Drive
Arden, North Carolina 28704
Attn.: Repair

Out of warranty service charges are determined on an hourly rate plus parts.

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FCC Compliance Statement

The LTR Trunking Controller Model: Raider meets all of the **Class A** specification limits defined in FCC Title 47, Part 15, Subpart B.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

FCC Warning Statement

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to attempt correction of the interference by one of the following measures:

- Re-orientate or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CAUTION:

CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE COULD VOID THE USER'S AUTHORITY TO OPERATE THIS EQUIPMENT.

