
Hamsoft for the TI-99

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TABLE OF CONTENTS

INTRODUCTION.....1
GROUNDING.....2
INSTALLATION.....3
INITIAL OPERATION.....5
OPTIONS.....7
TIME.....10
MESSAGE PORTS.....11
RECEIVE MODE.....13
TRANSMIT MODE.....14
FUNCTION KEY DEFINITIONS.....15
CONTROL COMMAND DEFINITIONS.....18
SPECIAL CHARACTERS.....20
PRINTER ATTACHMENT.....20
ALTERNATE TU CONNECTION.....22
TROUBLESHOOTING.....23
WARRANTY.....24

INTRODUCTION

The growing popularity of personal computers has added a new dimension to amateur radio. Software, or the program that defines the job for the computer, has become an important tool in the hobby. Kantronics has created Hamsoft to give you the ability to use a computer in the shack. Features of Hamsoft include:

SEND/RECEIVE MORSE CODE 5-99 WPM
SEND/RECEIVE RADIO TELETYPE 60, 67, 75, 100 WPM
SEND/RECEIVE ASCII 110, 300 BAUD
OPTIONAL UNSHIFT ON SPACE
OPTIONAL DIDDLE
PARALLEL PRINTER COMPATIBILITY
KEYBOARD AUDIO FEEDBACK
OPTIONAL AUTOMATIC ID
WORD WRAPAROUND
OPTIONAL AUTOMATIC CARRIAGE RETURN
OPTIONAL AUTOMATIC LINE FEED
MESSAGE PORTS STORAGE
TIME TRANSMISSION
CALLABLE FROM BASIC

Please take time to read the manual before you attempt operation of the program. You must understand the manual to use Hamsoft to it's fullest potential. If you have trouble in operation you can call Kantronics Customer Assistance during regular business hours: 8am to 12, 1pm to 5pm Central Time.

GROUNDING

The TI-99/4A and your transceiver were not designed to be connected together. The Kantronics Interface will do the job, but unless grounding precautions are taken, the results can be damaging to the computer or the Hamsoft module.

Simply grounding each of the components may not insure against damage. ALL PARTS OF THE SYSTEM MUST BE CONNECTED TO A COMMON GROUND. Let's look at the connection between the TI-99/4A and the Interface.

At this connection, a potential voltage difference may arise for a number of reasons, and this voltage can be the cause for damage.

1. Your transceiver ground may not be at the same voltage potential as the TV ground.

2. Your TV may be an older type and present a negative or large voltage to the TI-99. This may be OK if you are only using the TI-99, but may damage the Interface components.

As you can see, there are many ways in which a voltage difference can exist between the TI-99 and the Interface. To insure that this potential voltage is eliminated, you must ground all system components to a common ground. One word of caution, if you have an old TV, make sure that the TV antenna leads are isolated from the TI-99 TV connection since they may have a voltage potential.

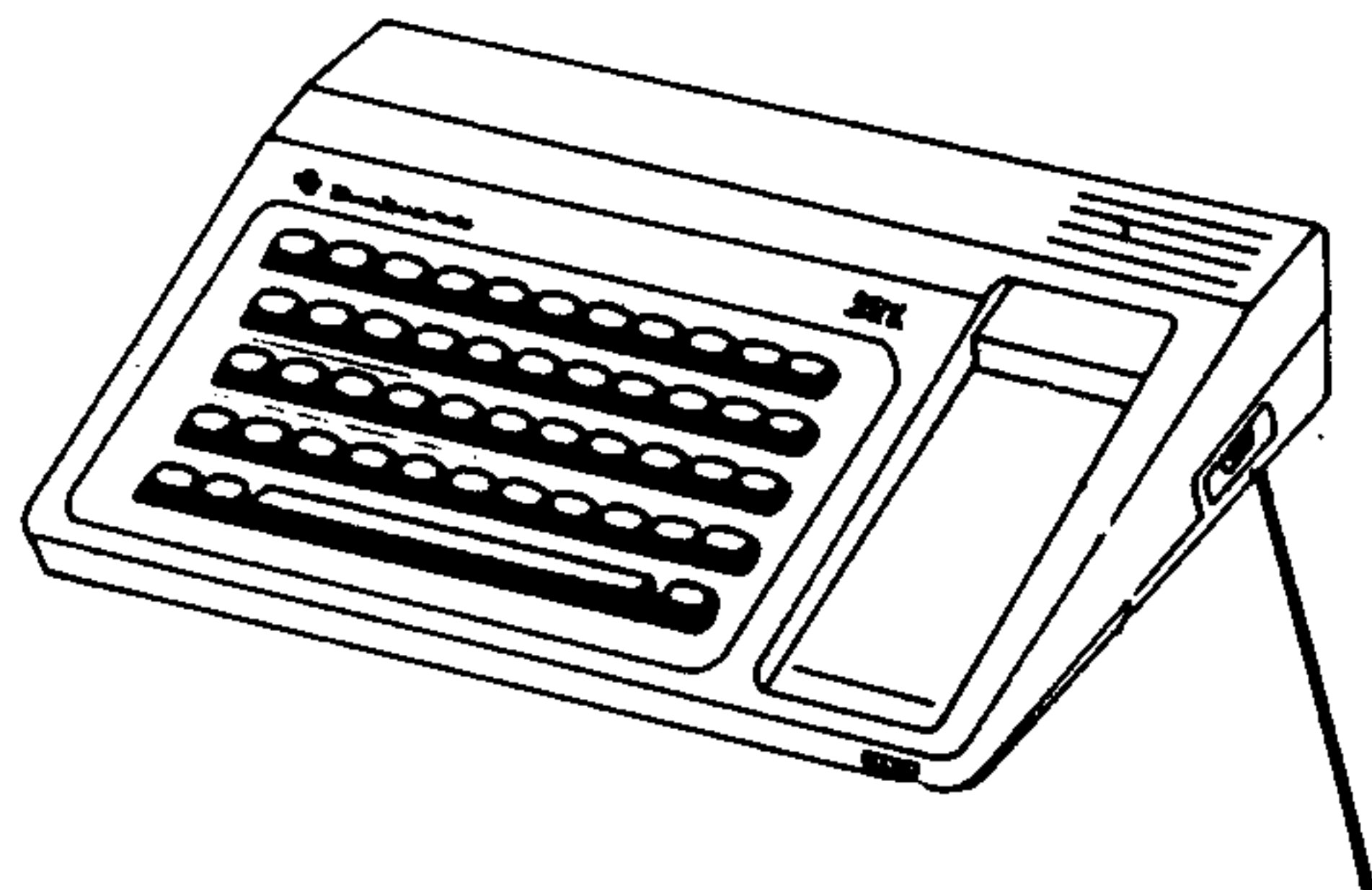
The 9901 chip can also be damaged by static electricity. Take care to avoid shocking the Hamsoft module. Always disconnect the Interface from the Hamsoft module before removing or inserting the module.

INSTALLATION

WARNING: DO NOT CONNECT THE HANSOFT MODULE TO THE TI-99/4A UNLESS ALL CABLES TO THE MODULE ARE DISCONNECTED, AND THE COMPUTER IS TURNED OFF.

Installation of the Hamsoft program is a simple three step process.

First, with the computer power off, and no other cables connected to the Hamsoft module, connect the module to the peripheral jack on the side of the computer. See diagram.



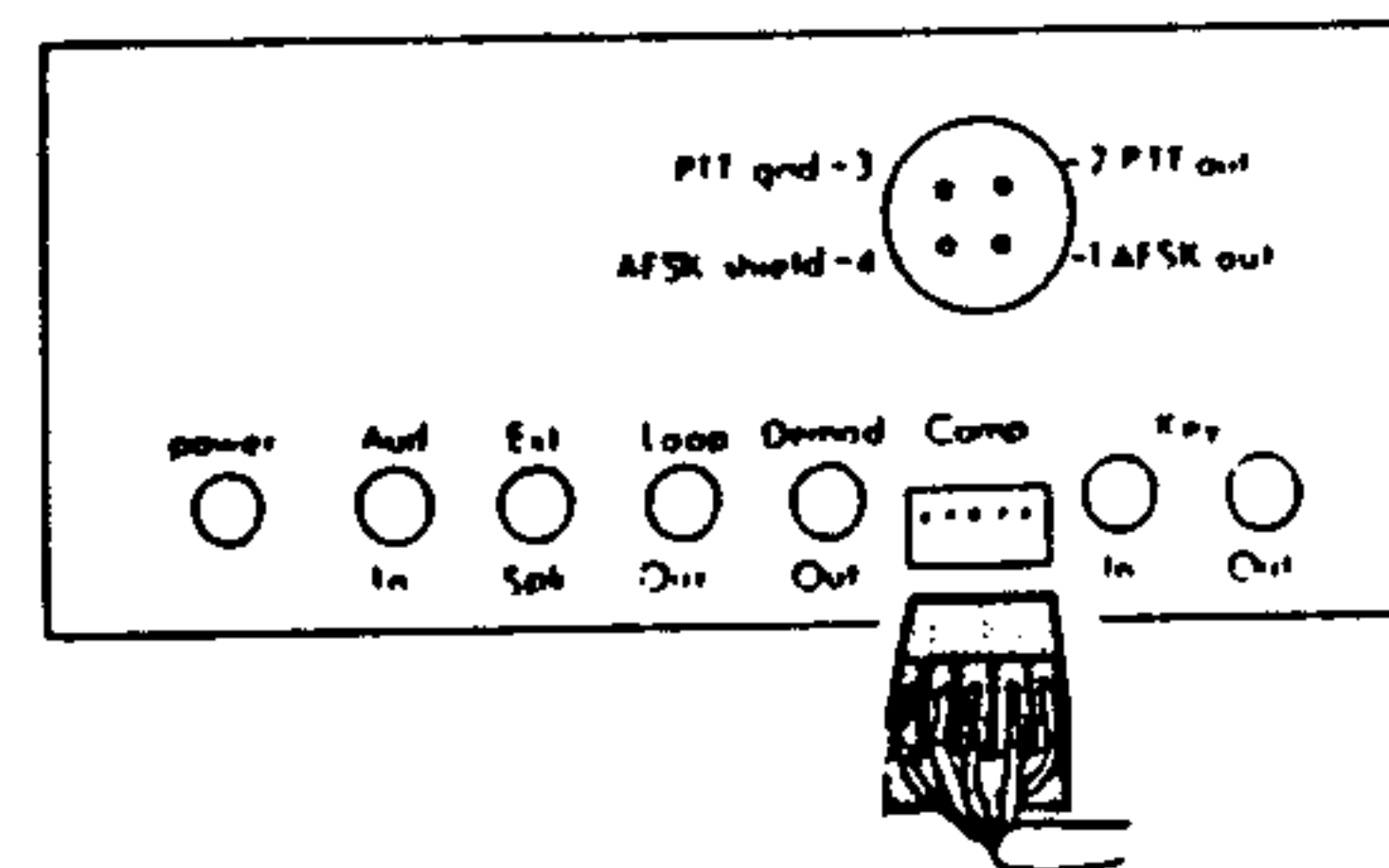
PERIPHERAL JACK

The Hamsoft module **MUST** be connected directly to the computer. Hamsoft cannot be used with any other peripheral, or the expansion box. Possible electrical damage could occur if the Hamsoft module is connected to a peripheral.

Second, remove the cable from the Hamsoft package and connect it to the Hamsoft module. Use the end marked with the blue dot. Insert the cable into the module with the blue dot on the bottom side.

Third, With the Interface power off, insert the other end of the cable into the Interface with the exposed wire side face up. See diagram.

The Interface Back Panel



Follow the instructions in the Interface manual for connecting the Interface to the transceiver. The single cable to the Hamsoft module is the only connection necessary to the computer.

Hamssoft is a versatile program with several options. To become familiar with Hamssoft, connect the Hamssoft module and leave the Interface cable disconnected. This allows you to practice in an "off the air" mode.

INITIAL OPERATION

WARNING: INITIALIZING THE HAMSFT PROGRAM WILL ERASE ALL INFORMATION IN THE COMPUTER MEMORY. TO RETAIN THE COMPUTER MEMORY SAVE THE INFORMATION TO TAPE OR DISK.

Once the Hamssoft module has been connected to the computer, you are ready to initialize the program.

IT IS IMPORTANT THAT YOU FOLLOW THESE INSTRUCTIONS STEP BY STEP, TO BETTER UNDERSTAND OPERATION OF THE PROGRAM.

Turn on the computer and step into the BASIC mode. Since the program is addressable from BASIC you will need to type in the following command to initialize the program.

OPEN#3:"HAMSFT"

The screen should look like this:

```
TI BASIC READY
OPEN#3:"HAMSFT"
```

The command must be given in upper case. Make sure the ALPHA LOCK is down, placing the keyboard in the upper case mode. Once the screen is exactly as above, press the ENTER key. This will initialize the program.

Now the main menu will appear on the screen:

```
00:00:00
KANTRONICS HAMSFT
COPYRIGHT 1 APRIL 1983
CHOOSE
M(MORSE)
R(RTTY)
A(ASCII)
T(TIME)
P(MESSAGE PORTS)
O(OPTIONS)
```

The menu gives you six choices. Each of the first three choices will give you a Transmit/Receive mode, either Morse code, Radio Teletype, or ASCII (American Standard Code for Information Interchange). The fourth choice sets the clock while the fifth choice enters the message ports mode. The sixth choice, OPTIONS, gives a menu of options that affect operation of the program.

First, lets look at the last choice on the menu, OPTIONS. Again, to better understand this program you should review the OPTIONS sections first, before attempting to use one of the Transmit/Receive modes. All options have a pre-set value or position. You should check each option to make sure it is in the proper position for your use.

TO RETURN TO THE MENU FROM ANY SPOT IN THE PROGRAM, HOLD DOWN THE FUNCTION (FCTN) KEY AND PRESS THE NUMBER 4 KEY. THIS IS THE ESCAPE TO MENU COMMAND.

OPTIONS

To select the OPTIONS mode depress the letter O on the computer keyboard.

The following should appear on the screen.

```
00:00:00
TRANSMIT/RECEIVE OPTIONS
A. UNSHIFT ON SPACE      ON
B. DIDDLE                OFF
C. AUDIO FEEDBACK        OFF
D. AUTO ID               OFF
E. WRAPAROUND            ON
F. AUTO CR               ON
G. AUTO LF               ON
H. TU                    KANTRONICS
```

The following options directly affect operation of the Transmit/Receive modes. CAREFULLY READ THROUGH THESE INSTRUCTIONS BEFORE ATTEMPTING TO USE THE TRANSMIT/RECEIVE MODES.

Each option is set in an ON or OFF position. To change the option from ON to OFF, depress the letter to the left of that option. For Example, to turn the Unshift On Space feature OFF, you will depress the letter A. Press A again to change the option back to it's original ON position.

A. UNSHIFT ON SPACE ON - With this option ON, the program will automatically return to the letters mode after each space received in RTTY. When receiving some transmissions with multiple numbers transmitted in groups, such as National Weather Service Teletype, you will want to switch the UNSHIFT ON SPACE feature OFF. If a received signal seems to print illegibly, you might attempt changing the

UNSHIFT ON SPACE option to the OFF position. Normal operation would be to leave the unshift on space feature ON.

B. DIDDLE OFF - This option gives the program the ability to send a null character when there is no character in the transmit buffer. This allows the receiving station to have a solid signal, for tuning purposes, during pauses in transmission. The DIDDLE feature only affects RTTY/ASCII transmissions.

C. AUDIO FEEDBACK OFF - Option C allows you to hear an audio feedback of the computer keyboard if you are using a television as a monitor. With the option ON a "click" will be heard through the television speaker as each key is depressed.

D. AUTO ID OFF - With this option ON, the program will automatically transmit a CW-ID in the RTTY/ASCII transmit modes. Following every ten minutes of continuous transmission, message port number 0 (zero) will be transmitted in the CW-ID mode. If you wish to use this option, place your ID into message port 0 (zero). How to place a message into the message port is covered in the MESSAGE PORTS section of the manual.

E. WRAPAROUND ON - To keep the program from breaking words at the end of a screen display line, the signal display jumps to the next line if a space is encountered in the last five spaces of the screen display line. To get more characters per line turn the wraparound option OFF. Wraparound works on both the receive and transmit displays.

F. AUTO CARRIAGE RETURN ON - During transmission of RTTY/ASCII this feature sends a carriage return automatically at the first space encountered after 65 characters, or after the 71st character if there is no space. This option should not be used during transmission of data files where spacing and carriage returns should be embedded. For example, RTTY pictures.

G. AUTO LINE FEED ON - Again, in RTTY/ASCII transmit a line feed will be sent automatically with each carriage return. If the auto carriage return (Option G) is OFF the line feed will not be sent, as the line feed is programmed to occur with each carriage return.

To allow use of a printer in reception of Morse code, the program will also send a Carriage Return and Line Feed to the printer automatically during Morse reception.

H. TU KANTRONICS - Hamsoft is designed to be used with the Kantronics Interface. If you decide to use an alternate terminal unit, you will need to change Option H by pressing the letter H. This will change the screen to show OTHER in place of KANTRONICS. To connect your terminal unit check the ALTERNATE TU CONNECTION section of the manual.

Hamsoft is warranted to work with the Kantronics Interface. We cannot guarantee operation of the program with any other terminal unit.

This completes the OPTIONS portion of the manual. To familiarize yourself with all the options available, attempt using the options without connecting the computer cable. Once you feel comfortable with the options, return to the main menu and follow the Transmit/Receive Instructions.

TIME

To enter the proper time into the 24 hour clock, select TIME from the main menu by pressing the T key.

The following screen should appear.

00:00:00
ENTER TIME HH:MM:SS

Enter the proper numbers to fill in the six digits. The program will not accept letters, or numbers that do not normally appear on a 24 hour display.

You must enter all six digits to exit this mode. Once all six digits are given, the program will return to the main menu.

MESSAGE PORTS

Hamssoft has a message ports feature, allowing you to preprogram up to 10 separate messages, that can be loaded into the transmit buffer with a single command.

The message ports can be used to retain information that is used often during transmission. For example, your CQ or BRAG tape.

From the main menu press the P key for message ports. Now the screen will look like this.

```
00:00:00
ENTER NUMBER TO EDIT MESSAGE
ENTER S TO SAVE MESSAGES
ENTER L TO LOAD MESSAGES
```

Each of the 10 message ports are entered by pressing the number of the message port, 0 through 9.

Press a message port number and the screen will look like this.

```
00:00:00
MESSAGE 1
```

To place information into the message port you simply type at this time. The normal TI-99 Function keys used for cursor control, and the Delete, Insert, and Erase keys work in the

Hamssoft program. Use these commands to place the text into the message port. For more information on the Function Keys see the Function Key Definition section of the manual.

Once the text placed into the message port is complete, use a Function 4 command to return to the menu. This is done by holding down the Function (FCTN) key and pressing the number 4. This places the text into the message port for use in the transmit/receive modes.

Each message port will hold a maximum of 256 characters.

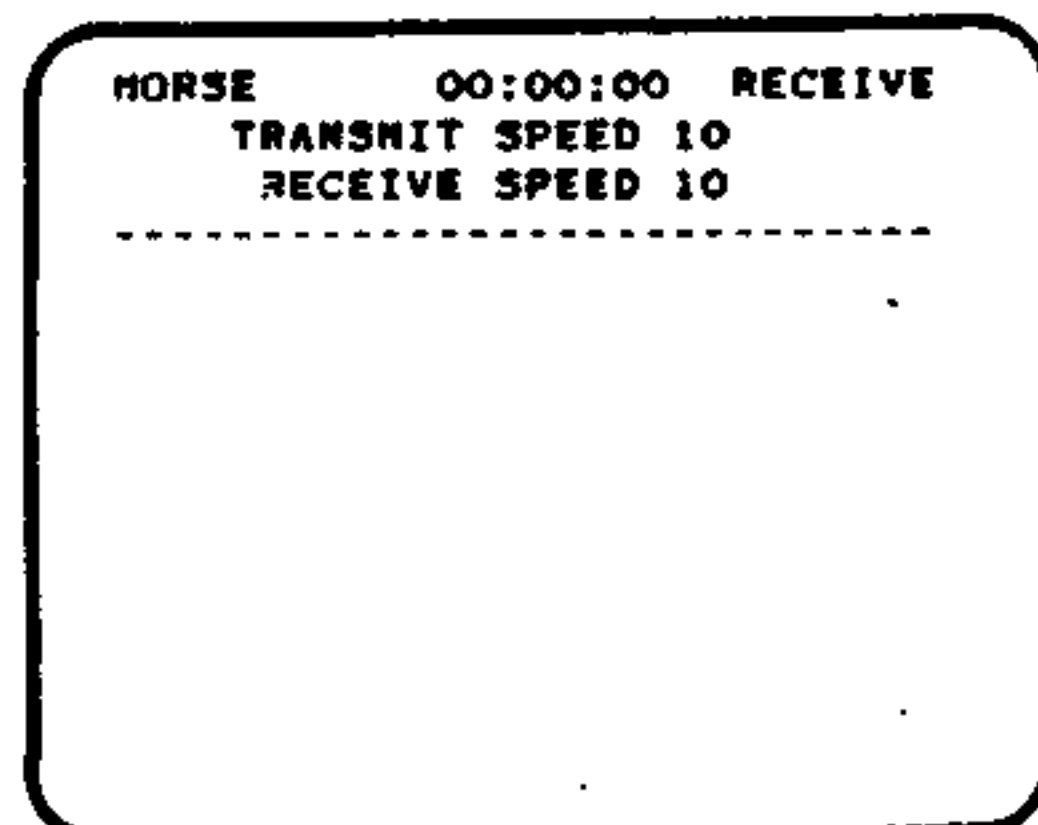
When you turn the computer off, or exit the program, the message ports will be erased. You can save the message ports to cassette tape by following the saving procedure. From the message ports mode select S to save messages. From this point on the procedure to save the message ports is the same as the saving procedure outlined in the TI-99 reference manual. See page 1-10 in the TI-99 manual.

To load your message ports back into the computer memory select the L to load messages. Again follow the standard TI-99 procedures for this function. Loading message ports from the tape will erase any message ports in the computer, replacing them with the loaded information.

RECEIVE MODE

To explain operation of the Receive modes we will step through operation of the Morse Code Receive mode. All three of the modes are very similar, and operation is almost identical.

From the Main Menu select the Morse Code Transmit/Receive mode by pressing the letter M key. Your screen should look like this:



The lower portion of the screen is the receive area. Incoming Morse code signals are decoded and displayed on this portion of the screen. As the signal is received it will scroll upward and off the screen.

The top portion of the screen is the Status Banner. On the present screen you will see MORSE in the upper left hand corner. This reminds you that you are in the Morse Transmit/Receive mode. Directly below this you will see TRANSMIT SPEED 10 and RECEIVE SPEED 10. The Receive Speed indicator will automatically give you the speed of the incoming morse signal. The Transmit Speed indicator allows you to set your transmit speed from 05 to 99 words per minute.

In the upper right hand corner is the RECEIVE indicator. When you go to the transmit mode the indicator will change to TRANSMIT.

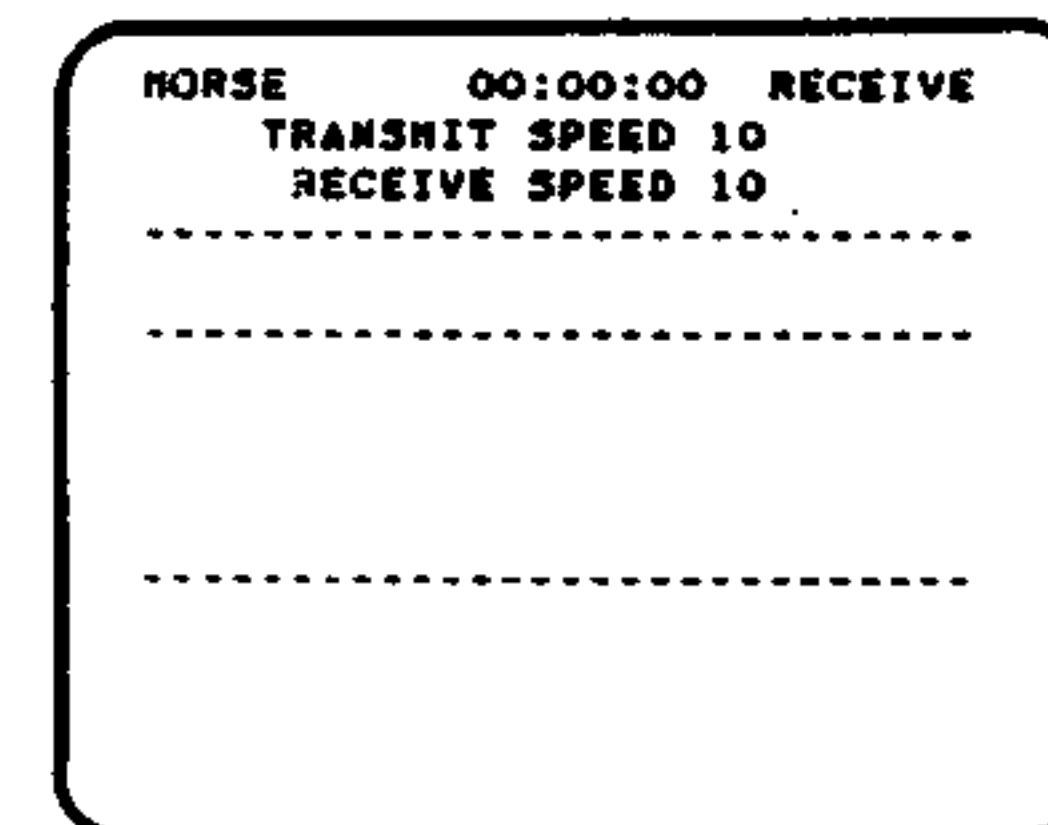
Follow the tuning instructions in the Interface manual and tune in a Morse Code signal. Make sure you have connected the computer cable to the Interface and the Hamsoft module.

The only differences for receiving RTTY or ASCII instead of Morse Code, are in tuning the signal and selecting the speed. For RTTY or ASCII signals you must select the proper speed of the incoming signal, while the program automatically adjusts to incoming Morse signal speeds. To change the receive speed for RTTY or ASCII, press the Function 7 command by holding down the Function (FCTN) key and pressing the number 7. The function keys are explained in detail in the Function Key Definitions section of the manual.

TRANSMIT MODE

During the receive mode most of the screen is used for reception. The type ahead feature of the Hamsoft program allows you to type information into the transmit buffer while receiving.

With the first character typed while receiving, the screen will divide into four sections:



While in the receive mode depress function 7. Your screen should look like this:

```

HORSE      00:00:00  RECEIVE
ENTER 2 DIGITS
RECEIVE SPEED 10
-----

```

Enter two digits to set the transmit speed. Once the digits are entered the display will show the new transmit speed.

In the RTTY/ASCII Transmit/Receive modes function 7 will cycle through the available speeds. RTTY 60, 67, 75, and 100 words per minute - ASCII 110 and 300 baud. With each speed change a Carriage Return/Line Feed is sent to the printer.

FCTN 8 - INVERT - A common practice in using radio teletype is to invert a signal, reversing the space and mark frequencies. Function 8 allows you to invert the incoming radio teletype or ASCII signals, to check for inversion. In the inverted mode the letter R in RTTY status banner will be reversed on the screen. In the ASCII mode the letter A will be reversed. Transmitted RTTY/ASCII signals will not be affected by Function 8.

FCTN 9 - PRINTER ON/OFF - Function 9 toggles the printer ON and OFF. A letter P will appear in the status banner when the printer is ON.

All received and transmitted signals will be dumped to the printer. For printer connection instructions check the PRINTER ATTACHMENT section of the manual.

FCTN = - QUIT - Holding down the FCTN key and pressing the = key will return the computer to it's initial power on stage. This allows the operator to exit the Hamsoft program while leaving the Hamsoft module connected. This feature gives versatility to the operator in use of other programs quickly and easily.

CONTROL (CTRL) COMMANDS

In addition to the ten Function Key commands, Hamsoft has seven Control (CTRL) commands. The CTRL commands are given by holding down the CTRL key and pressing the proper letter or number. Each of the control commands appears on the screen as a reverse letter or number. For example, Placing message port number 1 into the transmit buffer will appear as a reversed number 1 on the screen.

CONTROL COMMAND DEFINITIONS

CTRL E - RETURN TO RECEIVE - When encountered in the transmit buffer this command returns the program to the receive mode. For an automatic return to receive at the end of transmission, place a CTRL E at the end of the message.

CTRL T - TIME TRANSMISSION - To place the clock time into the transmit buffer give a CTRL T command. When the command is encountered in the buffer, the hours and minutes displayed on the clock will be sent. The CTRL T command can be placed into a message port, and the time displayed when the command is transmitted will be sent.

CTRL I - CW-ID - A CW-ID is necessary for identification during transmission of RTTY or ASCII. To place your CW-ID into the transmit buffer, put a CTRL-I command before and after the ID. The ID will be sent at the Morse mode transmit speed. For ease of operation, place your ID into message port 0.

This will allow you to send the ID manually with a single command, or to use the AUTO ID, outlined in the OPTIONS section of the manual. Make sure to place the CTRL I commands both before and after the ID when programming the message port.

CTRL (NUMBER 0-9) - MESSAGE PORTS XMIT - To transmit a message port, use a control command with the number of the message port. For example, if your ID is in message port 0, hold down the CTRL key and press the 0 key. This will place the port into the transmit buffer. The reversed number of the port will appear in the transmission portion of the screen, but the actual message . port will appear on the transmission line as the signal is sent.

CTRL M - CARRIAGE RETURN - If you wish to send a manual carriage return give the CTRL M command.

CTRL J - LINE FEED - To send a line feed manually use a CTRL J command.

ENTER - Pressing the ENTER key will send both a carriage return and line feed.

SPECIAL CHARACTERS

The following abbreviations can be placed in the transmit buffer for transmission of special characters.

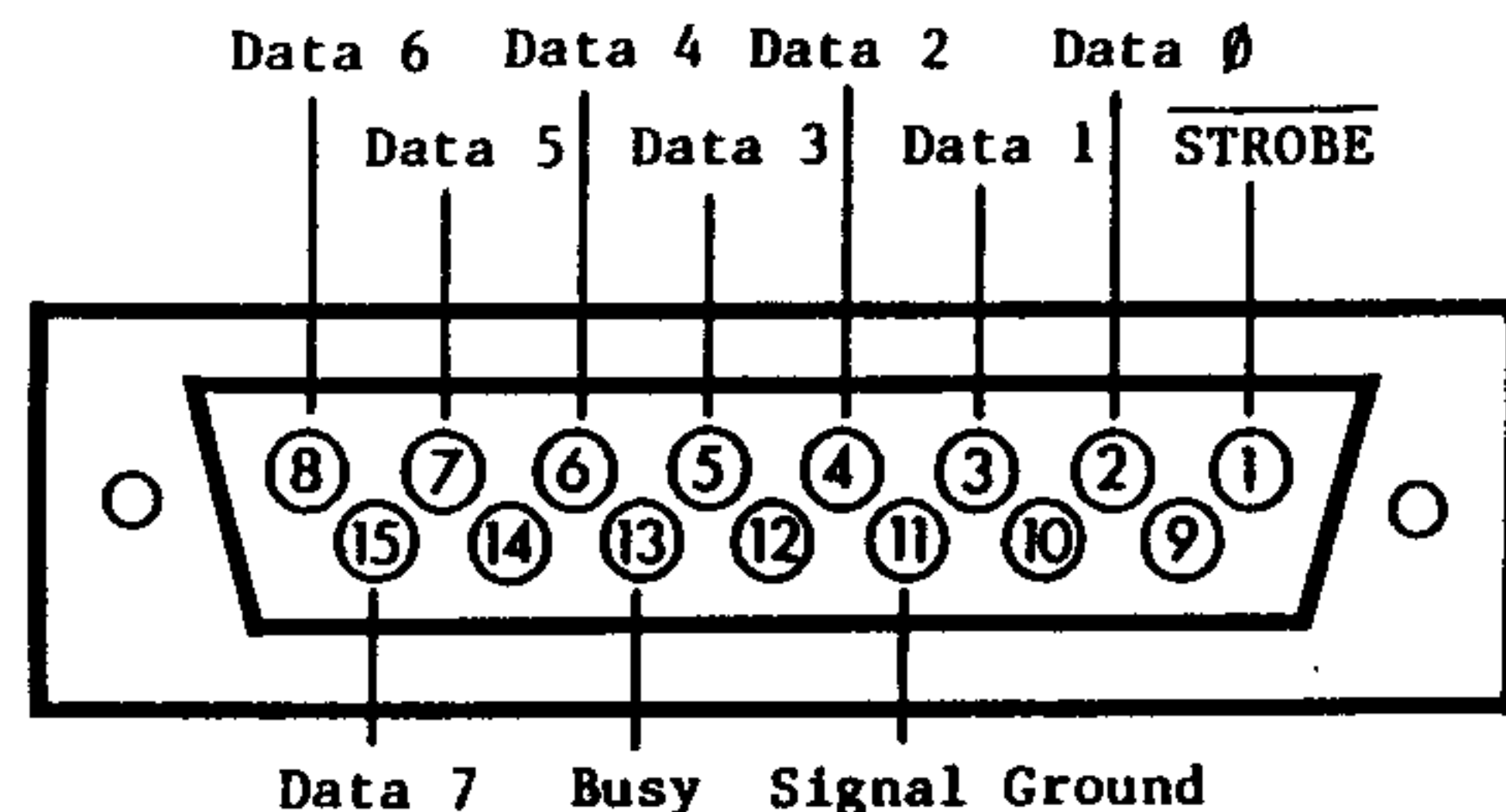
SYMBOL	ABBREVIATION	MEANING
\$	AR	End of message
=	BT	Break or pause
x	AS	Wait
&		Attention
#	SK	End of transmission
+	KN	Invitation to transmit
*	AA	All after

PRINTER ATTACHMENT

The following guide will allow you to connect any Centronics compatible parallel printer to the Hamsoft module. You will need a 15-pin male D connector and the proper connector for your parallel printer port.

Wire the 15-pin male D connector as shown, and attach to the Hamsoft module. Connect the lines to the corresponding function pins of

the printer connector, according to the printer manual. Make sure the signal ground is used, not the chassis ground. If your data lines are labeled 1 through 8, instead of 0 through 7; use pin 2 for data 1, pin 3 for data 2, pin 4 for data 3, and so on.



The Hamsoft module can also be used as a parallel printer interface, for use with the basic functions of the TI-99. To use this function the printer device name is "PP". This means you would use the following program to simply print information.

```
10 OPEN #1: "PP"
20 PRINT #1: "QUICK BROWN FOX"
30 CLOSE #1
```

This program would print QUICK BROWN FOX. To LIST a program, a LIST "PP" command would be used.

ALTERNATE TU CONNECTION

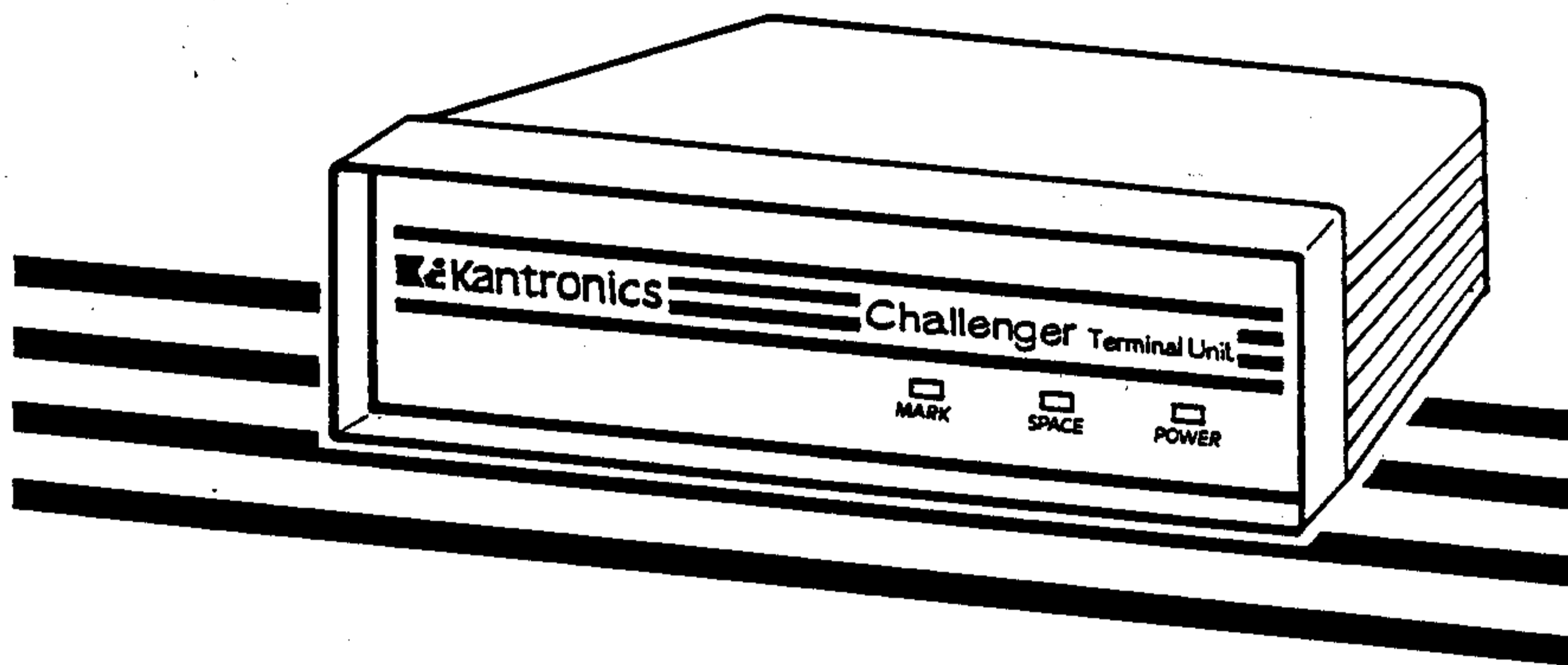
This software is written for use with the Kantronics Interface; therefore Kantronics does not warrant the use of Hamsoft with any other terminal unit. However, if you choose to use an alternate TU we suggest the following connections:

TERMINAL UNIT	FUNCTIONS
White-CW Key Out	Morse signals, active low
Red-RTTY Out	RTTY/ASCII signals, Mark high, Space low
Brown-Receive/Send	Normally high, active low for RTTY/ASCII transmitting
Green-Demod In	Normally high, active low when Morse signal present, active low when space frequency present.
Black-Ground	

CAUTION-Make sure the voltages on the lines of your transceiver and TU are TTL level compatible, not RS232. Kantronics is NOT responsible for inter-connection of any hardware not of our manufacture.

Challenger Terminal Unit

RTTY ■ ASCII ■ AMTOR ■



OPERATOR'S MANUAL

 **Kantronics**

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Table of Contents

Specifications.....	Inside Front Cover
Introduction.....	1
Precautions.....	1
Installation.....	2
Computer Connection.....	3
Tuning Procedures.....	5
Modifications.....	6
Component Placement Diagram.....	7
Parts List.....	8
Schematic.....	9
Return/Repair Procedures.....	10
Warranty.....	10

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CHALLENGER SPECIFICATIONS

INPUTS	CONNECTOR	
Audio In	3.5mm plug	Minimum levels are 5mvRMS Input impedance is 600 ohms unbalanced. Accepts baudot or ASCII code up to 110 baud. Max input level is 12VRMS
OUTPUTS	CONNECTOR	
Audio Out	3.5mm plug	Looped through from Audio In
FSK Out	3.5mm plug	Open collector + 40 VDC Max
Scope Out	5 Position DIN plug	10K ohm output impedance
PTT Out	5 Position DIN plug	Open collector +40 VDC Max.
AFSK Out	5 Position DIN plug	Crystal controlled - Mark is 2125Hz; Space is 2295Hz (170 shift) Level 100mvpp (35mvRMS) standard. Optional 500mvpp (175mvRMS) Output impedance 600 ohm unbalanced.
COMPUTER CONNECTOR		
Demod Out Ground RTTY 1 RTTY 2	5 Position DIN plug	All TTL compatible. Inputs also RS232C level compatible.
Power Requirments	2.1 or 2.5mm barrel plug center positive	11 to 15 VDC (12VDC nominal) 75 ma

Input Filter Specifications

170Hz Shift RTTY - Four pole switched capacitance filter
with bandwidth of 260Hz nominal

Indicators - Power LED, Mark LED, and Space LED

Construction - Precision Extruded Aluminum Alloy Case

Dimensions - 1.9"H X 5.9"W X 7"D

Weight - 1 3/4 LB.

INTRODUCTION

Challenger is a radio transceiver-to-computer terminal unit. With the proper software, a computer, and the Challenger TU, you can send and receive Radioteletype, ASCII, and AMTOR.

Since software is an integral part of the total system, Kantronics has developed programs for many of the popular computers. See the Computer Connection section of this manual for more information concerning software requirements.

PRECAUTIONS

Please read through your operator's manual for this product before attempting to operate the unit. The warranty does not cover accidents incurred due to wiring not of Kantronics specification, or to use in violation of instructions provided by Kantronics.

Operator repairs or unauthorized modifications automatically void the Challenger warranty. Refer all repairs during the warranty period to Kantronics. Instructions for returning units to be repaired are included in this manual.

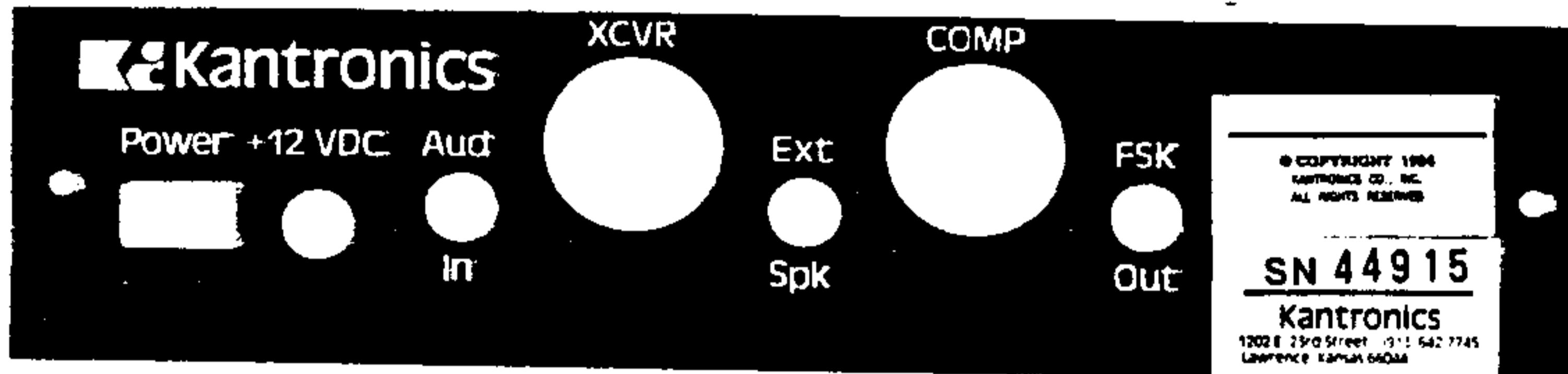
Kantronics does not warrant the use of Challenger with software other than that manufactured by Kantronics. For complete information about software, check the Computer Connection section of this manual.

CAUTION: CHALLENGER IS GROUNDED THROUGH ITS CONNECTION TO YOUR TRANSCEIVER. MAKE SURE YOUR TRANSCEIVER IS PROPERLY GROUNDED. FOLLOW THE GROUNDING INSTRUCTIONS IN YOUR TRANSCEIVER MANUAL.

CAUTION: Some transceivers that do not have a special RTTY mode require a lower power level for safe RTTY operation. Check with your transceiver manufacturer if the transceiver was not designed for RTTY use.

INSTALLATION

Challenger is attached to your transceiver via jacks and connectors on its back panel. Referring to the back panel line drawing below, six connections are possible; Power, Audio In, Transceiver, External Speaker, Computer, and FSK Out.

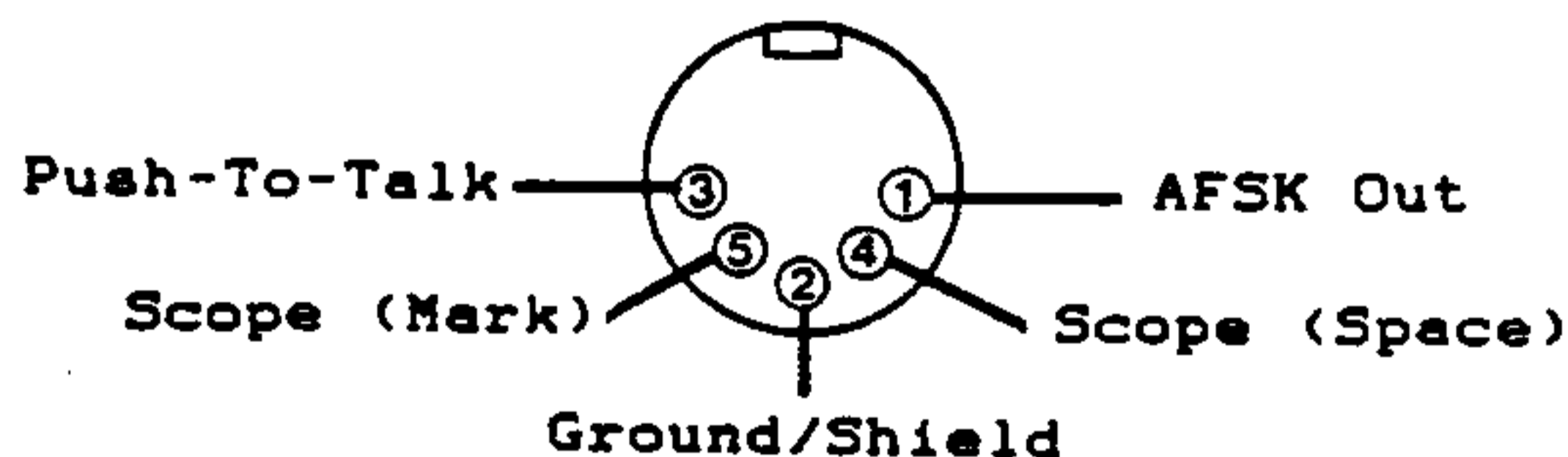


CAUTION : Make sure the power of the transceiver, computer, and Challenger are OFF before connecting any cables.

POWER-Attach power to the unit at the DC power jack. Use a well filtered power supply with 12 Volts DC and at least 75 milliamps. The center is positive. The connector will accept a 2.1 or 2.5 mm barrel plug.

AUDIO IN-Attach a shielded audio cord with a 3.5mm plug to the Audio In jack of Challenger and the external speaker jack of the transceiver. This carries the audio signal from the transceiver to Challenger.

TRANSCEIVER-This connector has three lines that connect to the Microphone jack of your transceiver, and two lines for scope connection.



Pins 1, 2, and 3 must be connected to your transceiver Mic-jack. You will need to provide a Mic-jack connector and wire the connector to the provided cable.

WARNING-Check your transceiver manual to correctly wire the corresponding pins of the transceiver mic-jack.

Pin 1 - AFSK OUT - White lead - This line carries the AFSK tones generated by Challenger to the Audio In line of your transceiver.

Pin 2 - GROUND/SHIELD - Black & Silver lead - Connect the push-to-talk ground and AFSK shield to this pin.

Pin 3 - PUSH-TO-TALK - Brown lead - This line controls the PTT line in your transceiver allowing the computer to switch the transceiver from/to transmit or receive. Connect directly to the PTT line of the Mic-jack connector.

Pins 4 and 5 are outputs for scope tuning. Challenger displays both Mark and Space signals, but pins 4 and 5 allow use of an external scope. Leave these lines unattached if you are not using an external scope.

Pin 4 - Space Signal - Red lead - This line outputs the Space of the received signal.

Pin 5 - Mark Signal - Green lead - This line outputs the Mark of the received signal.

EXTERNAL SPEAKER-This jack is used to loop the audio through Challenger to an external speaker. Attach your external speaker here. Use a 3.5mm plug and shielded audio cable.

FSK OUT - This output can be used if your transceiver has a direct connection for Frequency Shift Keying. This will replace the AFSK connection through the Transceiver connector. Follow your transceiver instructions for FSK operation. Use a 3.5mm plug for connection.

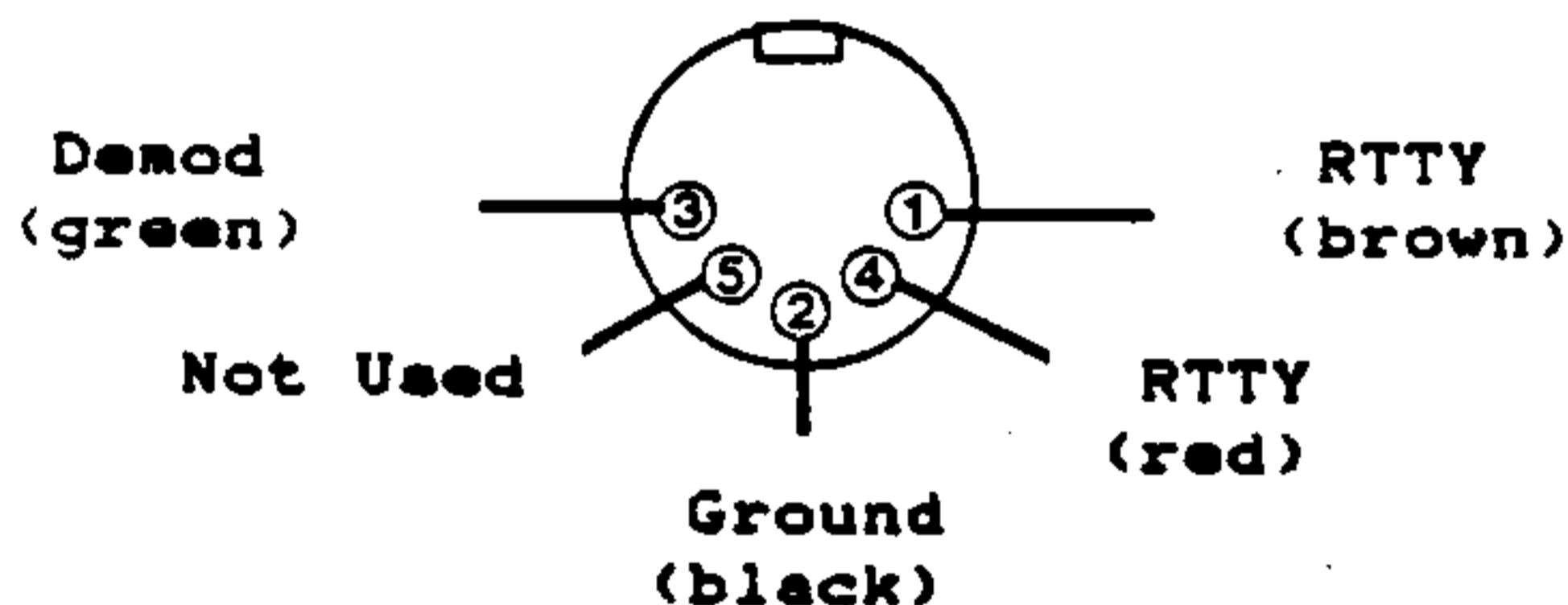
COMPUTER CONNECTION

A five conductor cable connects Challenger and your computer. This cable is included with the Kantronics software. Challenger uses a DIN plug for connection, instead of the five pin crimp connector used for the original Interface and Interface II. You will need to change the connector on the software cable. Use the DIN connector provided.

DO NOT USE THE PREWIRED DIN CONNECTOR CABLE. THIS CABLE IS FOR CONNECTION TO THE TRANSCEIVER.

Cut the flat crimp connector off the software cable and prepare the wires for the DIN connector. The White line will not be used. This line is the CW keying line, used with Interface and Interface II. But since Challenger has no CW keying circuits, this line is not necessary.

Connect the DIN connector as shown below.



These four lines are used to receive information from Challenger and to control it. The functions of the lines are as follows.

DEMODO OUT-This is the RTTY/ASCII demodulator line that presents a processed TTL (transistor to transistor logic) received signal to your computer.

GROUND-This line references Challenger to your computer ground.

RTTY 1 and RTTY 2-These two lines work in combination to control the AFSK frequencies and PTT output in Challenger.

RTTY 1 high and RTTY 2 high

This places Challenger in the receive mode. PTT is off. FSK transistor ON (low).

RTTY 1 low and RTTY 2 low

In this position a 2125 Hz tone, mark, is generated and transmitted through the XCVR connector of Challenger. PTT is on. FSK transistor ON (low).

RTTY 1 high and RTTY 2 low

In this position a space tone, 2295 Hz, is generated and transmitted through the XCVR connector of Challenger. PTT is on. FSK transistor OFF (high).

By toggling on and off one of the lines it is possible, with the proper computer program, to transmit the necessary tones for RTTY and ASCII.

TUNING PROCEDURES

Once you have completed interconnection of Challenger, transceiver, and computer, you are ready to tune in coded signals. When used with the proper software Challenger can decode RTTY, ASCII, and AMTOR signals. CW signals can be decoded with Challenger, but you must tune to a very high pitch (2125 Hz), instead of the 750 Hz normally used for CW. Challenger has no CW keying circuits for transmission.

A few simple steps will help you to learn proper tuning with Challenger.

1. Practice on a signal you know. WIAW broadcasts are a perfect opportunity to perfect your new skill.
2. Use Lower Sideband for tuning RTTY, ASCII, and AMTOR signals. Normal RTTY signals can be received on LSB, inverted signals on Upper Sideband.
3. Use your software program to check for the proper speed of the signal. Most RTTY signals are 60 WPM on the amateur bands, but other speeds are not uncommon. If the signal is properly tuned and not printing, cycle through the speeds of the program.
4. Not all signals can be copied. Some signals outside the amateur bands may not be standard codes. Bit inversion, altered bit order, and several types of encoding are used for commercial signals. Unless your software has special decoding abilities you will not be able to decode these signals.

Challenger is a very sensitive TU with the ability to receive very weak signals, but the operator must properly tune the unit. Be patient as learning to tune for the Challenger filters, and not your ear, takes practice.

Power on the unit with the rear panel button. The POWER LED on the front panel should light. If the LED does not light, check your power supply and power connection. The Mark indicator may light if the computer is connected and not in receive status.

The Mark and Space LED indicators will assist you in tuning for RTTY signals. You are tuning for a 2295 Hz Space tone and 2125 Hz Mark tone (170Hz Shift). These tones are very high pitched. For comparison, a normal CW signal is a 750 Hz tone.

Most operators find tuning from the low side of the signal up to the proper tones the easiest. As the LEDs begin to flash, watch your monitor for copy of the signal. Both LEDs should flash when data is being received.

If the signal is not 170 Hz shift, you can use Challenger to copy a single tone, and still receive copy. Tune to the Mark tone for other shifts.

Follow the instructions of your software program for computer operation.

MODIFICATIONS

Several modifications to Challenger are possible should you wish to tailor it to a specific use. Careful consideration should be given to these modifications prior to application. These changes constitute factory approved modifications and will not void the unit warranty PROVIDED THAT PROPER CONSTRUCTION TECHNIQUES AND PROCEDURES ARE USED. Refer to the component placement diagram and schematic when applying the modifications.

ASCII 300 BAUD OPERATION - The Challenger low pass filter does not allow 300 baud signals to pass. If you intend to operate this mode, move the board jumper from the 110 to 300 position.

LOOP OUT - If you wish to attach a mechanical teleprinter to Challenger for obtaining hard copy, make the following changes:

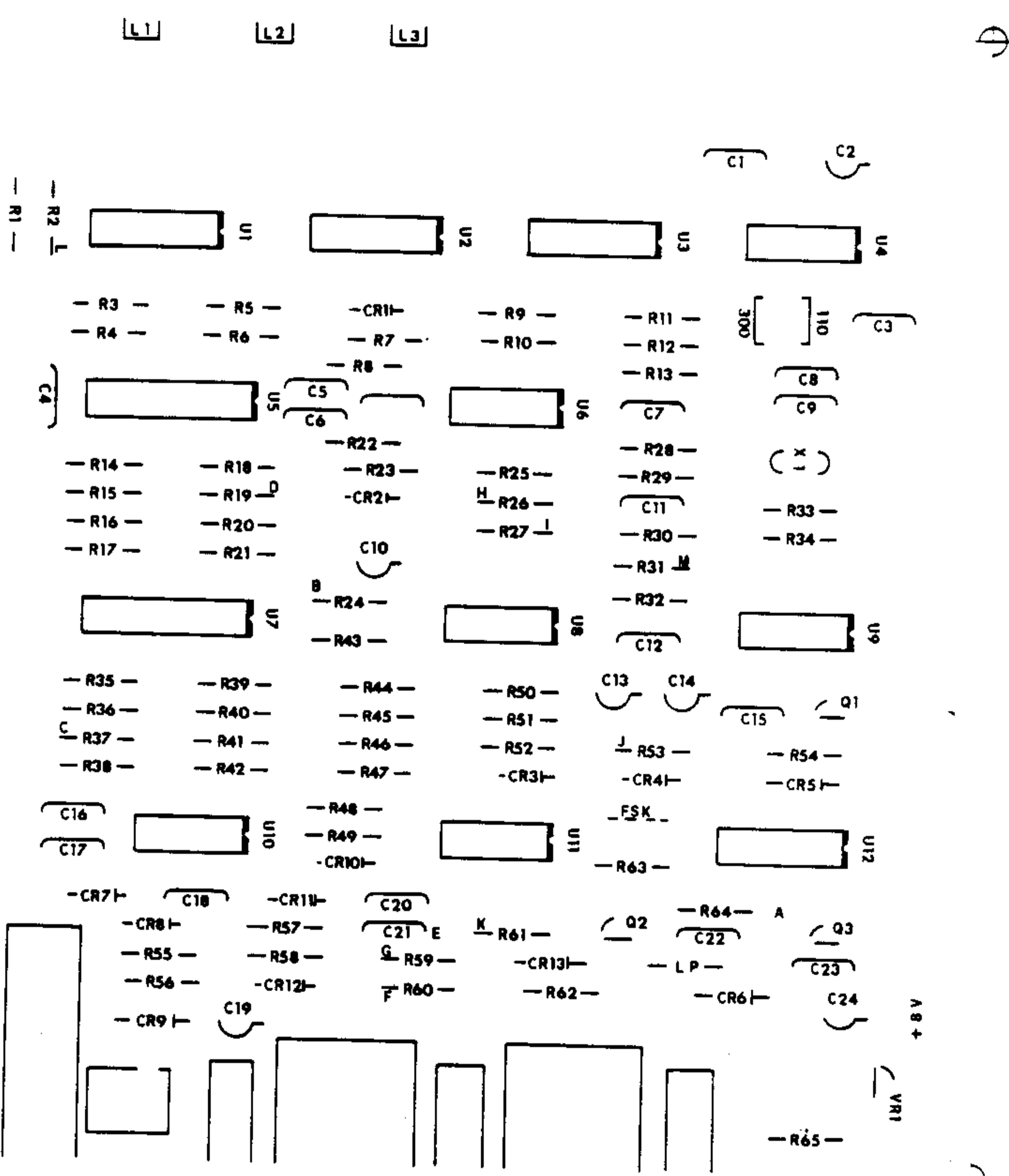
1. Remove R63 and place a 4.7K resistor in the board position marked LP.
2. Replace Q3 (PN2222) with a high voltage transistor, MPS A42 or equivalent.

The jack marked FSK out now becomes a Loop Out jack. Terminate your teleprinter loop supply in this jack for teleprinter operation. No speed conversion is available. You can only print signals at the speed your teleprinter normally operates.

AFSK Level Modification - Some transceivers using preamplified microphone systems, such as the ICOM 720, 730, 740 series, may require a higher level AFSK tone input at the microphone input jack. To increase the AFSK output level to 500 mvpp clip out resistor R 42.

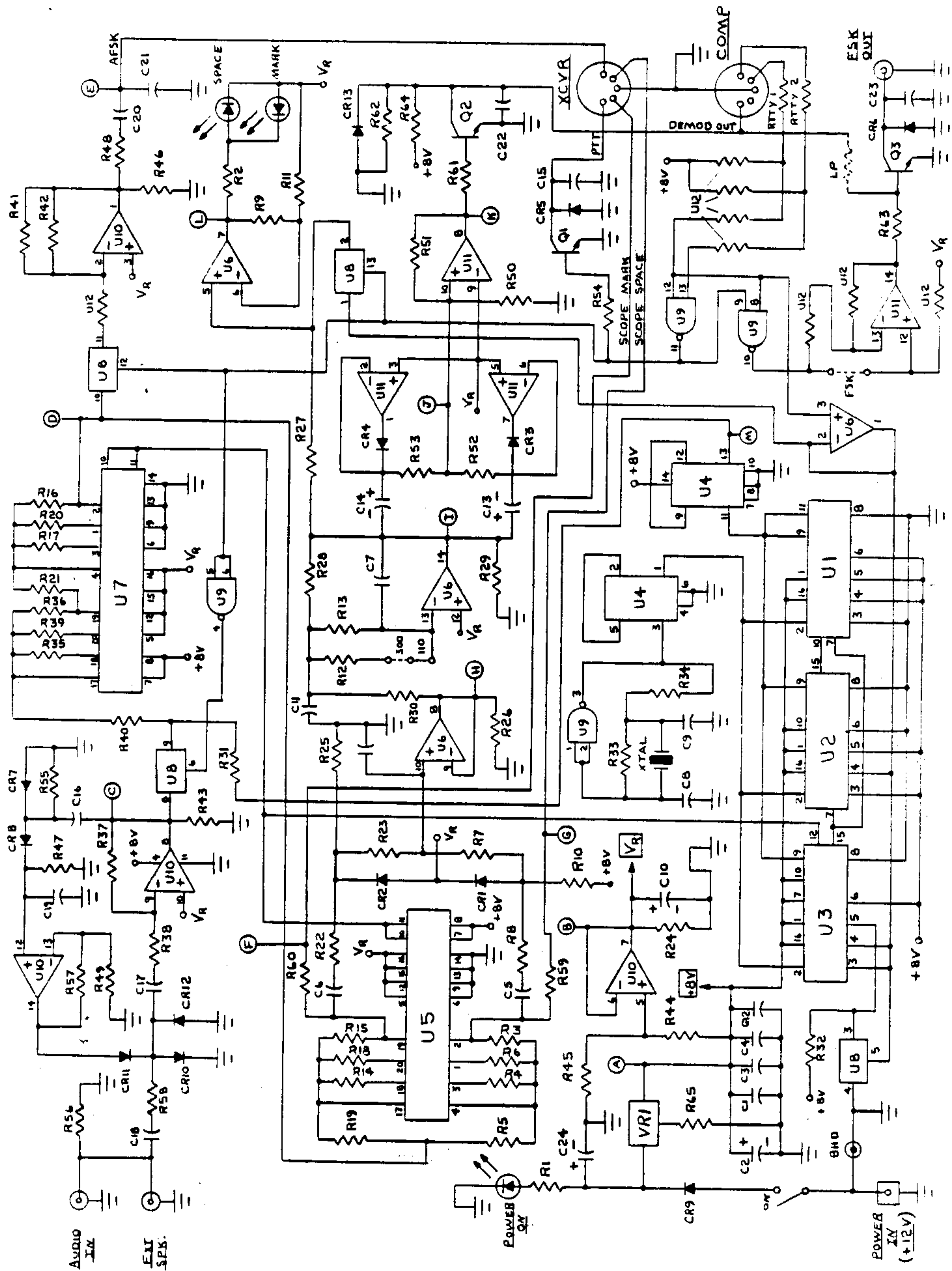
FSK Inversion - To invert the FSK output, cut the board jumper marked FSK. With the jumper in place the FSK output is Mark low, Space high.

Component Placement Diagram



Challenger Parts List

R1 - 620	R52- 33K	CR10- 1N914
R2 - 100	R53- 33K	CR11- 1N914
R3 - 100K	R54- 1.5K	CR12- 1N914
R4 - 9.31K MF	R55- 1M	CR13- 1N4003
R5 - 100K	R56- 620	
R6 - 9.09K MF	R57- 100K	
R7 - 100K	R58- 10K	Q1 - PN2222
R8 - 22K	R59- 10K	Q2 - PN2222
R9 - 10K	R60- 10K	Q3 - PN2222
R10- 120K	R61- 10K	
R11- 10K	R62- 2.2K	
R12- 33K	R63- 4.7K	VR1 - 78L08
R13- 150K	R64- 1.5K	
R14- 8.45K MF	R65- 100	
R15- 100K		U1 - 40161
R16- 100K	C1 - .01uf	U2 - 40161
R17- 9.09K MF	C2 - 4.7uf	U3 - 40161
R18- 9.53K MF	C3 - .01uf	U4 - 4013
R19- 100K	C4 - .01uf	U5 - MF10CN
R20- 8.45K MF	C5 - .01uf	U6 - LM324
R21- 33K	C6 - .01uf	U7 - MF10CN
R22- 22K	C7 - .001uf	U8 - 4066
R23- 100K	C8 - 20pf	U9 - 4011
R24- 10K	C9 - 20pf	U10- LM324
R25- 100K	C10- 4.7uf	U11- LM324
R26- 10K	C11- .1uf	U12- 100K Resnet
R27- 100K	C12- .01uf	
R28- 68K	C13- 4.7uf	
R29- 10K	C14- 4.7uf	
R30- 6.8K	C15- .01uf	
R31- 330K	C16- .01uf	
R32- 22K	C17- .01uf	
R33- 1M	C18- .01uf	
R34- 2.2K	C19- 4.7uf	
R35- 9.31K MF	C20- .1uf	
R36- 100K	C21- .01uf	
R37- 1M	C22- .01uf	
R38- 10K	C23- .01uf	
R39- 11K MF	C24- 10uf tant	
R40- 22K		
R41- 15K	CR1 - 1N914	
R42- 4.7K	CR2 - 1N914	
R43- 10K	CR3 - 1N914	
R44- 5.6K	CR4 - 1N914	
R45- 4.7K	CR5 - 1N4003	
R46- 4.7K	CR6 - 1N4003	
R47- 100K	CR7 - 1N914	
R48- 620	CR8 - 1N914	
R49- 10K	CR9 - 1N4003	
R50- 330K		
R51- 330K		



Challenger Circuit Schematic

RETURN/REPAIR PROCEDURES

Consult the limited warranty policy in this manual for the service provisions offered by Kantronics at no charge. This warranty is considered to be in force only when the customer has submitted his completed warranty registration within 10 days of purchase and when the stipulations of the warranty have been met. Violations of warranty clauses will automatically void the warranty and service or repairs will be charged to the owner.

Service outside the warranty will be charged at the cost of parts, labor, and return shipping. Payment for repairs must be received before the repaired unit can be returned. Money order or cashier's check payment will speed the return of the unit by at least 10 days over payment of personal check.

When service or repairs appear necessary, it may be wise to call or write Kantronics to determine if the problem can be solved without returning the unit. When calling report the product name and ask for the amateur radio service department. The Service department hours are 8-12 AM and 1-5 PM central time, Monday through Friday. When writing, include a clear description of the problem.

Returns to the factory for refund or exchange are strictly regulated. Any return for refund or exchange must be approved by the service department.

WARRANTY

Kantronics Inc. warrants each Challenger to be free from defects in material and workmanship under normal use and service for a period of one year after delivery to the ultimate user. Kantronics will repair or replace Challenger, at our option, at no charge should it become defective and should our examination disclose Challenger to be defective under warranty.

This warranty shall not apply to any Challenger that has been subject to misuse, neglect, accident incurred due to wiring not of our own installation, or to use in violation of instructions furnished by Kantronics. This warranty will not be extended to units that have been repaired or altered outside our facilities.

This warranty does not cover broken or cracked cabinets, or any accessory used in connection with Challenger. This warranty is in lieu of all other warranties expressed or implied, and no representative or person is authorized to assume for Kantronics any other liability in connection with the sale of its products.