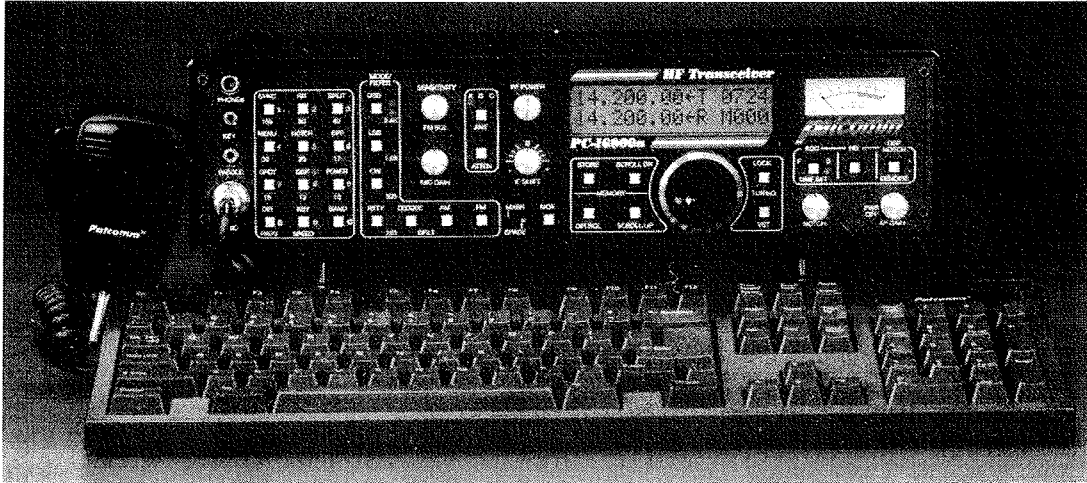# PC-16000A/E

PRODUCT OVERVIEW:

The PC-16000A/E utilizes two 8 bit micro-computers with 32K of EPROM and 32K of RAM to implement sophisticated digital communications functions within the Transceiver itself. An IBM AT keyboard interface is provided to allow full control of the Transceiver as well as alphanumeric data input from the keyboard.

The PC-16000A/E includes an internal TNC which "digitizes" CW and FSK signals allowing the internal microprocessor to decode and display the received data on the large front panel LCD. Baudot RTTY is supported in selectable rates of 60, 67, 75 and 100 WPM in Normal and Reverse polarity as well as Narrow (170 Hz) and Wide (850 Hz) shifts. These options can be selected via menus displayed on the front panel LCD. 110 Baud ASCII is also supported with selectable Normal/Reverse polarity, Wide and Narrow shift and Even, Odd or No Parity.

Advanced Direct Digital Synthesis techniques are combined with PLL (Phase Locked Loop) technology to allow precise generation of VFO carriers. CW and FSK signals are directly generated by the DDS VFO system. CW and FSK Transmit/Receive offsets are directly controlled by the microprocessor. This is possible because of the extremely fast settling time of the DDS VFO. This allows smooth and accurate operation even under CW QSK conditions.

A Dual Up-conversion receiver is used to provide continuous coverage from 1.5 to 29.9 MHz and Transmit coverage on all Amateur Bands. Receiver performance is enhanced by the use of Rockwell Collins Mechanical Filters in the IF stage in conjunction with "brick wall" audio DSP (Digital Signal Processing) filters.
The PC-16000A/E provides excellent HF Transceiver performance plus providing all the necessary hardware and software for digital mode operation in one cost effective package.

TABLE OF CONTENTS

Front Panel Connections

Front Panel Connector Definitions:

1. **Head Phone Output:** This jack is for Mono or Stereo Headphones. When using headphones the external / internal speaker will be disabled.

2. **Straight Key Input:** This jack is for an external electronic keyer or control from a computer or straight key to key the transmitter in CW mode.

3. **Paddle Input:** This jack is for a three wire paddle used to drive the built-in electronic keyer. The DASH on the paddle should be connected to the tip of the stereo phone plug.

4. **Microphone Input:** This is a standard 8 pin Microphone connector wired as shown below:
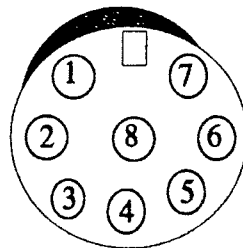
- Pin 1: N/C
- Pin 2: N/C
- Pin 3: N/C
- Pin 4: N/C
- Pin 5: GND
- Pin 6: PTT
- Pin 7: Shield (GND)
- Pin 8: Microphone Input

Back Panel Connections

PC-16000 Back View

ANT 3 | ANT 2 | ANT 1

KEYBOARD | AUX 1 | AUX 2
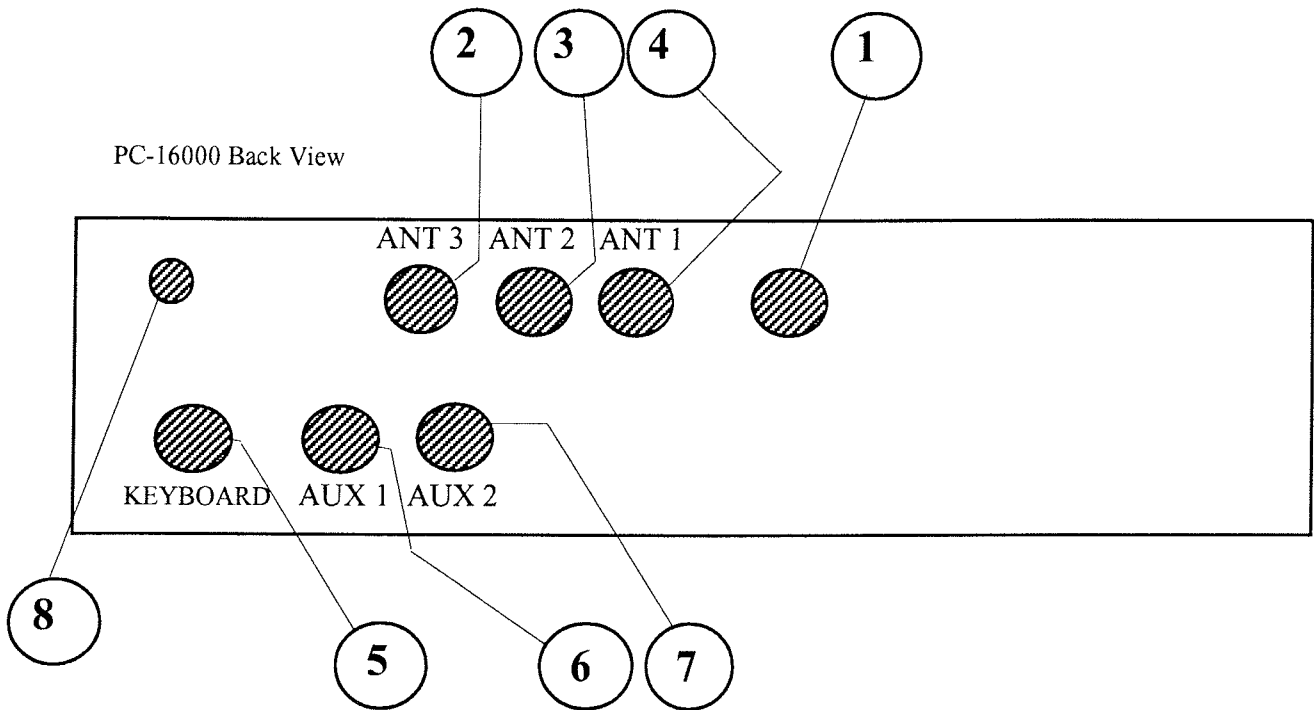
Back Panel Connector Definitions:

1. **DC Power Input:** 12.0 - 14.0 VDC regulated at 15 Amps max.
Wide terminal = +12 VDC
Narrow terminal = Ground

2. **50 Ohm Antenna Jack**

3. **50 Ohm Antenna Jack**

4. **50 Ohm Antenna Jack**

5. **IBM AT Keyboard Interface Jack**

6. **Auxiliary Jack #1:**

7 Pin Din Connector

Pin 1: Amplifier Key - used to key an external amplifier. This is an open collector NPN transistor capable of 2.5 Amps at 85 VDC.

Pin 2: FSK/CW Key
This is used to key an external transceiver.

Pin 3: External ALC
This can be used to bring an ALC in from an external amplifier (0 VDC to -5 VDC).

Pin 4 through Pin 7: Band Number
For each band there is a binary number associated with it. The numbers are as follows:

7654 = Pin Order	0100 = 20 meters
0000 = 160 meters	0101 = 17 meters
0001 = 80 meters	0110 = 15 meters
0010 = 40 meters	0111 = 12 meters
0011 = 30 meters	1000 = 10 meters

Back Panel Connector Definitions Continued:

7.   Auxiliary Jack #2:   **8.   External Speaker**

7 Pin Din Connector
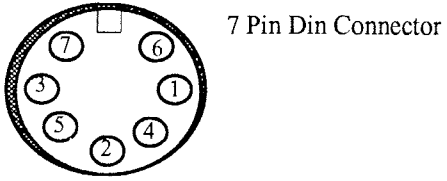
Pin 1: Output to Computer

Pin 2: Input from Computer

Pin 3: Osilloscope Output Space Signal

Pin 4: Osilloscope Output Mark Signal

Pin 5: Ground

Pin 6: Not Used

Pin 7: Output to Terminal

PART II - CHANGING FREQUENCY

1.   TUNING USING THE CONTROL KNOB

By turning the knob, the RX and/or TX frequency(s) will be changed in 10 Hz steps, unless the variable speed tuning (VST) mode is on. With the VST mode on the step size will vary with the speed of rotation of the tuning knob. Step size varies from 1 Hz to 10 Khz in this mode.

2.   TUNING USING THE IBM ARROW KEYS

The RX and/or TX can be changed in 10 Hz steps by pressing the IBM AT left and right gray arrow keys. The right arrow key will increase the frequency, and the left arrow key will decrease the frequency.

The frequency cannot be changed this way when 1) the KEYSPEED mode is on (since the arrow keys are used instead to change the keyspeed), and 2) when the MESSAGE mode is on (since the arrow keys are used to move the cursor around the 256 character buffer).

3.   VARIABLE SPEED TUNING (ALT-F5)

When the VST mode is turned on, the green LED by the main tuning knob will be lit. By turning the knob, the RX and/or TX frequency(s) will be changed in increments of 1 Hz, 10 Hz, 100 Hz, 1000 Hz or 10 Khz depending on the speed at which the knob is turned. The faster, the larger the increment. Once in the desired frequency range, turn the VST mode off by pressing the button again, this will return you to the normal 10 Hz step mode.

4.   DIRECT-FREQ ENTRY (SHIFT-F1 OR GRAY "*")

When the DIR FREQ SEL button is pressed, the second line of the LCD will display a prompt at which the desired frequency is to be entered. The frequency can be entered using either the keypad on the front panel or the numbers on the IBM keyboard or keypad.

Once the frequency is entered, hit the ENT button, which will set the TX and/or RX frequencies. If in the SPLIT or RIT mode, only the "active" frequency will be changed (the frequency which is pointed to by an arrow). If in the split mode and the frequency entered is in a different band, then both the TX and RX frequencies will be changed, so they are both in the same band.

It is expected that the frequency be entered in the MHz range (with a decimal followed by up to six digits). A frequency that is entered and is not in a band is considered not valid and will flash "INVALID". If entering a frequency and you desire to start over, press the CLR button, which will delete any digits that were entered. If you wish to leave this mode, without changing the frequency, press CLR

to delete any digits that were entered, and then press ENT.

5.   BAND-SELECT (F8)

This function is used to select a different band. When the BAND SEL button is pressed (or F8 of the keyboard), the second line of the display will indicate that the band select mode is on.

In this mode, the numbers on the front panel keypad will correspond to the twelve bands. By pressing either the numbers on the front panel or the numbers on the IBM keyboard, the corresponding band number will be displayed. The IBM keyboard keys are listed with their corresponding bands:

1 = 160 meters	7 = 15 meters
2 = 80 meters	8 = 12 meters
3 = 40 meters	9 = 10A meters
4 = 30 meters	
5 = 20 meters	NOTE: 10B, 10C, and 10D are not
6 = 17 meters	used at this time

Once the ENT button is pressed, the unit will set itself to the first memory that is saved in the chosen band. If no memories are present, then the RX and TX frequencies will be set to the lower limit of the chosen band.

If no bands were selected (the band number field is still empty), you can exit this mode by hitting ENTER on the PC-16000 front panel or on the keyboard.

PART III - SELECTING TX/RX

1.   SYNC FUNCTION (F1)

This synchronizes the RX & TX frequencies, so they are both tunable and maintain a fixed offset when tuned. When in sync mode, the SYNC LED will be lit and arrows will point to both the TX & RX frequencies on the display to indicate that they are both tunable.

2.   RIT FUNCTION (F2 - hit 1 time)

This function allows only the RX frequency to be tuned. When in the RIT mode, the RIT LED will be lit and an arrow will point only at the RX frequency. A short period of time (~5 sec) after the main tuning knob has not been moved, the RIT mode will be turned off and the SYNC mode turned on. This is done so that the TX frequency will not be left behind accidentally once you resume tuning after transmitting.

Once the RIT function has been turned off (and the SYNC mode turned on), then the RIT LED will blink if the offset between the TX and RX frequencies was altered from a standard offset for the current mode. The standard offset can be regained by selecting the RX -> TX (F3) or TX -> RX (F4) functions. If the RIT mode is turned off and the tuning knob has not been moved, you can return to the RIT offset by pressing the RIT button.

3.   SPLIT FUNCTION (F2)

To enter the SPLIT mode, press the SPLIT button on the front panel. The SPLIT LED will light and only the RX will become tunable, as a default. Pressing the SPLIT button again will move the arrow to the TX frequency on the display and the TX will now be tunable by the main tuning knob. Repeated pressing of the SPLIT key will choose which VFO becomes tunable, the TX or RX. Whichever VFO is selected, RX or TX, will be the frequency for which the receiver is currently tuned. That is, if the TX is selected for tuning, the receiver will be listening to the TX frequency. This allows for monitoring of the transmit frequency in split mode operation. **NOTE: the PC-16000A/E will not transmit unless the RX frequency is selected.**
To exit SPLIT Mode, press the SYNC key. This will move the transmit frequency back to the receive frequency with the proper offset for the current mode.

PART IV - SETTING MODES

1.   MODE SELECT FUNCTION (F5)

When any of the four MODE buttons are pressed, the selected mode (USB, LSB, CW or RTTY) will be turned on and the standard offset for that mode will be set. If the IBM keyboard is used, then the modes will be selected sequentially, one after the other as the F5 key is pressed.

Note that the BPF (Band Pass Filter) function must be OFF for Mode selection to work otherwise the Band Pass Filters will be selected instead.

The standard offsets used are as follows:
USB/LSB = 0 Hz, CW = 800 Hz and RTTY = 2290 Hz.

If CW is selected the LSB mode is turned on. CW always uses the LSB convention.

2.   BANDPASS FILTER FUNCTION (SHIFT-F3)

When the BPF button is pressed, the BPF LED will be lit, and the MODE buttons will represent the five filters; 2.4 KHz, 1.8 KHz, 500 Hz, 250 Hz and the RTTY Filter. The chosen filter's LED (vertical row to the left of the BPF button) will be lit accordingly.

If the keyboard is used, the MODE key (F5) can be used to sequentially step through the five filters once the SHIFT-F3 function has been used.

The filters work in the following way:

There are two IF Mechanical filters - 2.4Khz and 500Hz
There are five DSP Audio filters - 2.4Khz, 1.8Khz, 500Hz, 250Hz and the RTTY filter.

When 2.4Khz or 1.8Khz filters are selected the 2.4Khz IF filter is used in conjunction with the 2.4K or 1.8K DSP audio filter. When 500Hz or 250Hz is selcted, the 500Hz IF filter is used in conjunction with the 500 or 250 Hz DSP audio filter. The RTTY filter uses the 2.4Khz IF filter.

PART V - MEMORIES

1.   MEMORY STORE (F7)

Each band has ten memories which are numbered 0 through 9 (appended to the band number). For example, 20 meters has memories: 200, 201, 202,...209. The only exception is 160 meters, which has memories: 160, 161, 162, ...169.

When the MEM STORE button is pressed (or F7 on the keyboard), the right side of the second line will display a blinking cursor where the memory number is to be entered. The number can be entered using the number pad on the front panel or the numbers on the keyboard. Once the ENT button is pressed, the state of the machine will be saved in that memory. The completion of a STORE command will be indicated by a BEEP from the PC-16000. If the number entered is not valid for the current band, the number entered will be deleted and the cursor will return to the first position, to wait for a new number.

If CLR is hit while in this mode, then the number entered will be deleted. If CLR is hit again (2nd time), then the memory store mode is turned off and nothing will be saved.

NOTE: THE MEMORY STORE FUNCTION WILL NOT STORE IF DECODE MODE IS ON.

2.   MEMORY RECALL (F6)

When the DIR MEM RCL button is pressed (or F6 on the keyboard), the right side of the second line will display a blinking cursor where the memory number is to be entered. The number can be entered using the number pad on the front panel or the numbers on the keyboard. Once the ENT button is pressed, the machine will be restored to the state saved in the entered memory. If the number entered is not valid for the current band it will be deleted and the cursor will return to the first position to wait for a new number. If nothing is saved in the chosen memory, then nothing will be recalled and the machine will remain in its current state.

If CLR is hit while in this mode, then the number entered will be deleted. If CLR is hit again (2nd time), then the memory recall mode is turned off and nothing will be restored.

3.   SAVE/RECALL THE SCRATCH PAD (F7/F6 -2 times)

The state of the unit can be saved in the SCRATCH PAD memory by pressing the MEM STORE button twice, or the F7 key on the keyboard twice. The scratch pad is indicated by memory number zero (M000). To recall the state stored in the scratch pad, press the MEM RECL button twice, or F6 on the keyboard twice.

4.   SCROLL THROUGH MEMORIES (arrow keys of IBM Keyboard)

To scroll through the memories, press the SCROLL UP or SCROLL DOWN buttons on the PC-16000 front panel, or the Gray UP and DOWN arrows on the IBM AT type keyboard. The numeric keypad UP and DOWN arrows will also work for this but they are not recommended for this function since these keys also serve to select and send memory buffers 8 and 2 when in the Keyboard Send mode. These keys will step through the memories sequentially, changing the state of the unit to that of the memories stored for THE CURRENT BAND. If no memories have been setup, then the scroll function will be ignored.

NOTE: Frequencies outside of the HAM Bands cannot be stored in the memories. Only the scratchpad memory will save the PC-16000 setup in the general coverage areas.

PART VI - SENDING/RECEIVING CW & RTTY

1. SEND FUNCTION (ALT-F1 - only usable with IBM keyboard)

To send CW or RTTY, first change the mode to CW or RTTY, and then hit the ALT-F1 keys on the keyboard. The second line of the display will clear and show a blinking cursor to indicate that a message may be sent. In this mode, the characters will be sent out as they are typed in. If sending RTTY, the transmitter must be on for sending (hit F10 or the T/R tune button). At this point, any characters typed will be sent out. The BACKSPACE may be used to quickly correct any errors.

If the second line of the display becomes full while typing, then no more characters will be accepted and a BEEP will be sounded as an indication that the buffer is full. You can resume typing once characters are sent out.

If characters are being sent out and you wish to pause the transmission (to fix any errors), hit the ESC key on the keyboard. Then you can use the BACKSPACE key to fix the errors (this can also be done without pausing). When done, hit RETURN to resume sending. If you want to clear the typed message, hit ESC twice. If sending, hitting ESC once pauses the transmission, hitting ESC again will delete the message.

In RTTY and CW, some of the IBM keys on the keyboard serve a different function. These are listed below:

RTTY:
      TAB KEY = RYRYRYRYRYRYRY
      "\"   =   WRU; who are you? (an "x" with a line over it will be
                                            displayed)
      " "   =   BELL code (a " " will be displayed)

CW: From the IBM keypad (gray keys)
      "-"   =   AR   (an "@" will be displayed)
      "+"   =   SK   (a "+" will be displayed)
      "\"   =   AS   (a "*" will be displayed)
      "SHIFT-DEL" = error message (a "!" will be displayed)

To turn the SEND FUNCTION OFF, hit ALT-F1 again.

2. APPENDING MESSAGES

If sending a message in the SEND mode, a stored message may be appended to the end of the message being sent.

To APPEND a message that is saved in the 8 available message memories, simply press the number of the memory on the IBM keypad (keys 2 to 9). The memory number will be appended to the message already being sent. When this message is

done being sent, the message held in the memory will be displayed and transmitted.

The saved messages can also be sent out directly without appending them to another message. This is done the same way as when appending, simply press the number of the memory buffer you wish to send and it will immediately send the stored message.

3.   MEMORY MESSAGE FUNCTION (ALT-F3 only IBM keyboard)

There are 9 buffers which can hold up to 256 characters each. Eight of the buffers (2-9) can be saved and edited, however, buffer 1 cannot be saved. The buffers are accessible through the IBM keypad, keys 1 to 9.

This mode can only be turned on if already in the SEND mode. By hitting ALT-F3, when the SEND mode is on, the second line will display the first buffer, which will always be empty since buffer 1 cannot be saved. At this point, a message can be typed in, edited and sent.

If you wish to save a message, then you must choose another buffer, other than buffer 1. To do this, type ALT-S (turns off the edit mode) and then choose the number of a buffer from the IBM keypad (2 to 9), the buffer number will be displayed along with any message held in the buffer.

To EDIT the buffer, press ALT-E to bring up the cursor. Characters can then be entered until the buffer is full. By using the right and left arrow keys, the cursor can be moved to different positions. If the message is longer than the 16 character window of the LCD, the arrow keys can move the window to view other parts of the message. The EDIT MODE has other basic word-processor functions such as BACKSPACE, INSERT, OVERSTRIKE, SAVE and DELETE. These are defined below:

1.   ALT-E = Turn on EDIT MODE
2.   BACKSPACE= Deletes the character to the left of the cursor
3.   ALT-I= Toggle function to turn INSERT MODE on and off. Moves message to the right one time and inserts the character at cursor position.
4.   OVERSTRIKE=(default mode) If INSERT MODE is off, this mode is on. Character is placed on top of existing character at cursor position.
5.   ALT-S = To SAVE the message
6.   ALT-X= To DELETE the message (and turns on EDIT MODE)

The MESSAGE MODE can be turned OFF at any time by hitting ESC, on the keyboard. This will return you to the normal SEND MODE, where characters are sent out as they are typed in.

To SEND the message that is currently displayed, hit the RETURN key. To stop (pause) transmission hit ESC, and to resume transmission hit RETURN. To stop sending the message and to exit the MESSAGE MODE, hit ESC twice, the fist time

will pause transmission, and the second will bring you to the normal SEND MODE. Once the message has been transmitted, the MESSAGE MODE is automatically turned off, leaving the SEND MODE on. Thus, any characters entered will be immediately sent out.

To send a saved message in the SEND MODE, simply hit the number of the stored message on the IBM keypad. The stored message will be displayed and transmitted. The stored message can also be APPENDED to a message in the SEND mode. To APPEND a stored message to another message, see APPENDING MESSAGES.

4.   DECODE FUNCTION (ALT-F2)

To turn the DECODE Mode on or off, press the DECODE key on the front panel of the PC-16000 or press ALT-F2 on the keyboard. This mode can only be turned on if in the CW Mode or RTTY Mode. If DECODE is on and one of the SSB modes are selected, then the DECODE Mode will automatically be turned off.

a.)   Decoding CW:

To decode a CW transmission, the signal should be tuned in as described in Part VII. The sensitivity control on the front panel should then be adjusted to allow the M and S LED's follow the incoming CW. At that point, the decoder may be switched on using the DECODE key. The top row of the LCD will blank and the decoded CW will be displayed. Characters will scroll across the display from right to left.

Fine tuning of the decoding may be done with the Key Speed function. The key speed does not have to be exactly matched to the incoming CW. It can decode over approximately a 10 wpm spread (+/- 5 wpm), however the word spacing may be improved by using the key speed control to more closely approximate the incoming data speed.

In addition to the keyer speed, the sensitivity control must be adjusted to allow the best "following" of the CW signal by the M & S LED's on the front panel. This control acts as a squelch for the decoder and should be adjusted so that the LED's follow the incoming CW signal accurately but do not change at all when the signal has stopped and only background noise is present.

b.)   Decoding RTTY:

For RTTY/ASCII decoding the PC-16000 should be placed in the RTTY Mode. A signal is then tuned in (see PART VII, Tuning Signals) and the RTTY filter switched on. The signal should be retuned for a peak with this filter on. The Front panel sensitivity control is then adjusted to allow the Mark and Space LED's to follow the signal. The decoder can now be switched on and the incoming data will appear on the top line of the LCD as was described in the CW case. All the correct parameters for the desired type of digital operation must first be set before attempting to decode a signal (see Part VIII to set RTTY parameters).

c.) Sending to Terminal or PC:

Any decoded text displayed on the PC-16000 display can also be viewed on a terminal or a personal computer running a terminal program.

To send the data to a terminal, connect the PC-16000's "Terminal Output" pin (pin 7 of AUX 2, see Back Panel Connections of Part I) to your terminal's "Receive Data" pin (see your terminal's instruction manual). In addition, you must connect the GROUND pin of the PC-16000 (pin 5 of AUX 2) to the Signal Ground pin of your terminal. Next, set your terminal to 2400 baud, for a 7 bit signal with no parity, 1 startbit and 1 stopbit.

To send the data to a personal computer running a terminal program, make sure the cable to the COM port is wired the same as that for the terminal as described above. Then set your terminal program to emulate an ASCII terminal and have the communication parameters set as that for the data terminal described previously (2400 baud, 7 bit, 1 startbit & 1 stopbit).

PART VII - TUNING SIGNALS IN

1. TUNING CW

CW signals are generated and received on lower sideband. Exceptionally strong signals may generate a weak image on the opposite sideband. A signal should always be tuned for the stronger of the two signals (on LSB this will occur when the VFO is tuned above zero beat).

2. TUNING RTTY

RTTY signals are tune in a similar manner as CW, except the tone is 2290 Hz and should occur above the zero beat since LSB is used.

Before executing the tuning procedure, turn the RTTY filter on. To do this, turn the BPF mode on by pressing the BPF LED on the front panel (or SHIFT-F3 on the keyboard) and then select the RTTY filter (to the right of the 250 Hz filter in the MODE group) or press the F5 key of the keyboard until the RTTY filter LED is lit (this LED is next to the BPF button under the 250 Hz filter LED). Note that to select a new mode (such as CW or LSB) you must first turn the BPF mode off. There are two ways to tune to a RTTY station; using an oscilloscope or using the Mark and Space LEDs on the PC-16000 front panel.

1. TUNING USING AN OSCILLOSCOPE:

To use an oscilloscope, connect the outputs for the Mark and Space (pin 3 and 4 of AUX 2) to the two channels of the scope. Put the scope into the X-Y setting to obtain a Lissajous Figure. Then, while the other station idles (diddles), slowly change the frequency until the Lissajous pattern to the right appears, at which point the station will be tuned in. At this point you should see characters scrolling across the top line of the display. Note that the Sensitivity control will also need to be adjusted to obtain the best copy. The Sensitivity control can be considered as a Squelch for the decoder. It should be adjusted so that when an RTTY signal is present the M & S LED's follow the signal and a good decode is obtained. When the signal disappears the Sensitivity setting should prevent background noise from triggering the decoder and placing random characters on the display.
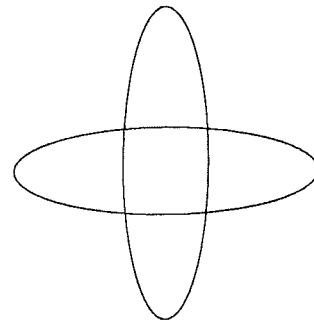
Lissajous figure for tuned RTTY signal

2. TUNING USING PANEL LEDS:

When tuning to a RTTY station using the front panel LEDs, change the frequency slowly while the received station idles (diddles). Keep changing the frequency until the Mark LED is lit longer than the Space LED. The Space LED should appear as if it is blinking. At this point the signal should be correctly tuned and characters should scroll across the top line of the display when data is sent by the transmitting station. Again, the Sensitivity control must be adjusted properly to provide a good decode.

ADJUST THE SENSIVITY:

Once you see characters scrolling across the top line of the display, turn the sensitivity knob clockwise until decoding stops or is incorrect. At this point, the control should be backed off slightly until proper decoding starts again. This will reduce or eliminate garbage characters from being displayed (which are created from noise) after the received station stops transmitting. Don't turn the knob too much or you may eliminate valid characters. The sensitivity control acts as a squelch for the digital modes. The stronger the incoming signal, the further clockwise the control may be turned to eliminate background noise decoding when the tranmitting station stops sending.

RTTY AND IF SHIFT SETTINGS:

Since the RTTY tones are in the 2Khz region, a properly tuned RTTY signal will appear near the edge of the passband of the 2.4Khz IF filter. This causes some rolloff of the signal along with reduced signal strength. To compensate for this, the IF shift control can be rotated to the "-" side (counterclockwise) which will shift the signal back to the center of the IF filter passband.

NARROW IF FILTER SELECTION IN THE RTTY MODE:

The 500 Hz IF filter may be selected in the RTTY/ASCII modes using the following procedure. The function is enabled by pressing the SPOT key on the front panel keyboard when in the RTTY mode and the RTTY filter is selected. If the SPOT LED

is lit, the 500 Hz filter is selected. Pressing the SPOT key again will turn the LED off and revert back to the 2.4 Khz filter.

PROBLEMS:

> YOU TRIED #1 & #2, BUT NOTHING IS BEING DEODED:
Once one of the tuning methods described above has been used you should see characters scrolling across the top line of the display. If you do not see any characters:

1) Check to make sure that the DECODE mode is on (the LED above the DECODE button should be lit and the top line of the LCD should be blank).

2) Check to make sure the RTTY mode is on (the LED above RTTY in the "MODE" group should be lit). Note, don't confuse the RTTY mode button with the RTTY filter button. The RTTY mode button is to the right of the CW button.

3) Make sure that the transmitter is off (the PC-16000 will not decode when the transmitter is on).

> CHARACTERS ARE BEING DECODED, BUT MAKE NO SENSE:

1) Make sure that you are tuned to the proper sideband (LSB). In some instances, strong incoming signals may be audible on the upper side band in the RTTY mode. A properly tuned RTTY signal can be recoginized by noting the change in tone as you approach zero beat. The lower sideband can be recognized by a lowering of the pitch as you tune from higher to lower frequency, i.e. you should be tuned to the high side of zero beat.

2) Make sure that you are centered within the RTTY filter passband. A simple way to accomplish this is to turn the RTTY filter on and tune for the maximum signal output (maximum S-meter reading). A properly tuned RTTY signal will produce the elipse pattern shown in the diagram(see the Lissajous figure shown eariler when a oscilloscope is used .

3) Check to make sure that your RTTY parameters are set correctly. Normally RTTY is done in the Baudot, normal mode, with a narrow shift (170 Hz) at 60 wpm (45 baud). Thus the following should be set:

a.) Press the RTTY MENU button (or ALT-R) to make sure that BAUDOT is listed as the current RTTY type. You should see:

BAUDOT	1>MENU
2> PARAMS	3>EXIT

b.) The REV (reverse) LED (to the left of the filter LEDs) should be off.
c.) The 170 LED should be lit (the 850 LED not lit).

d.) The parameter menu should have the current word per minute value listed at #5. Note that 60 wpm is 45 baud (refer to "to select RTTY baud rate).

Baudot Parameter Menu: 1> N   3> 170   5> 60
                          2> R   4 >850   6> EXIT

3.   EXAMPLE TUNING PROCEDURE

The following is a procedure which can be followed for properly tuning a signal for decoding:
First, be sure that the radio is in the proper mode for decoding. For example, if you want to decode RTTY you cannot have the unit in CW or SSB. Similarly, to decode CW the unit cannot be in RTTY or SSB. We will examine the CW case first. This is the more difficult of the two modes to to tune since the speed and fist will vary. Decoding will depend upon Keyer Speed setting, tuned audio pitch and the Sensitivity Control setting. You should start with the Sensitivity Control in the fully counter clockwise position (most sensitive). Tune in a CW signal (it is advisable to start with a fairly strong signal that has properly formed characters (such as from a keyboard or a W1AW transmission) and adjust the main tuning until the note is around 800 Hz. At this point the Mark and Space LED's should be blinking "in step" with the incoming signal. Adjust the Sensitivity Control clockwise until the LED's stop blinking and then back off again until the lights follow the signal again. This is the point that should provide good noise immunity (i.e. there won't be any garbage on the display due to random noise triggering the decoder when the station stops sending). At this point, if the DECODE button has been pressed, you should begin to see decoded characters. If they are not correct, the speed of the incoming code may be way off from the currently selected Keyer Speed. Go into the Keyer Speed mode and adjust the speed to better match that of the incoming signal and the characters should decode properly. The trick is to be sure that the Mark and Space LED's always follow the incoming signal. If this is happening then a touch up of the Keyer Speed is all that should be required for proper decoding. The speed does not have to match exactly. There is about a 10 WPM window around the actual speed that should allow proper decoding.

Now a procedure for RTTY decoding will be described:
Be sure that the RTTY Mode has been selected. Be sure also that the Digital Filter is selected (do not use the normal 2.4K, 1.8K, 500 or 250 Hz filters - use the one marked RTTY). Remember that RTTY signals must be tuned for a much higher pitch than a CW signal. The tone is around 2200 Hz so the signal will be way at the end of the IF filter passband. To compensate for this the IF Shift control must be adjusted to roughly the 9 O'clock position. Now tune in an RTTY signal and remember the pitch will be higher than for CW. You will be able to see the Mark and Space LED's following the tones of the incoming signal. This will be most evident when listening to a signal sending an idle or "diddle" character. The Sensitivity Control should be roughly in the 1 O'clock position for this mode but make sure it is adjusted so that the

LED's will follow the incoming signal. At this point, if the DECODE button has been pressed, you should start to see decoded text appear on the display. If this is not happening then be sure you have not accidentally changed any of the default RTTY settings in the RTTY Menu area (i.e. baud rate or polarity, etc.). The signal should be peaked with the IF Shift control and if necessary switch the 500 Hz IF filter in by pressing the SPOT switch (the IF Shift control may need to be re-adjusted with the narrower filter in place).

These are the general guidelines for tuning and decoding CW and RTTY signals. With a little practice the procedure will become quite easy and signals will decode easily.

PART VIII - RTTY

1. RTTY MENU DEFINITIONS

The RTTY menu lets you select the type of RTTY mode (Baudot or ASCII), and enables you to set the parameters for that mode (such as the baud rate). To turn on the Main RTTY Menu select SHIFT-F5 (or ALT-R) from the keyboard or the RTTY Menu key from the PC-16000 front panel. The menu below will be displayed.

Main RTTY Menu: [TYPE of RTTY]   1> MENU
                        2> PARAMS   3> EXIT

The "type of RTTY" will be either "BAUDOT" or "ASCII", depending on what was last selected, or what was previously stored in the current memory. To change from one RTTY type to another, simply select MENU by pressing #1 of the PC-16000 front panel or the IBM Keyboard. From this new menu pressing #1 will turn the BAUDOT mode on, and pressing #2 will turn the ASCII mode on.

          1> BAUDOT
          2> ASCII   3>EXIT

If in the BAUDOT mode and #2 (PARAMS) of the MAIN RTTY MENU was selected, then the following menu would be displayed:

Baudot Parameter Menu: 1> N   3> 170   5> [current WPM]
                           2> R   4 >850   6> EXIT

The menu is defined below:
1. N - For NORMAL MODE
2. R - For REVERSE MODE
3. 170 - For 170 Hz offset (narrow shift)
4. 850 - For 850 Hz offset (wide shift)
5. WPM - This will turn on the WPM MENU (for baud rate)
6. EXIT - To exit the RTTY menu

*Note that usually the normal mode is used with a 170 Hz shift at 60 wpm(45 baud). If in this menu and #5 (WPM) is selected, then the following menu would be

displayed with a blinking cursor over the current wpm:

Baudot WPM Menu: 1> 60   2> 67   3> 75
                     4> 100   <ESC/CLR>

If in the ASCII mode and #2 (PARAMS) of the main RTTY MENU was selected,
then the following menu would be displayed:

ASCII Parameter Menu: 1> N   3> 170   5> PAR
                          2> R   4 >850   6> EXIT

The menu is defined below:
                1. N - For NORMAL MODE
                2. R - For REVERSE MODE
                3. 170 - For 170 Hz offset (narrow shift)
                4. 850 - For 850 Hz offset (wide shift)
                5. PAR - This will turn on the PARITY MENU
                6. EXIT - To exit the RTTY menu

*Note that usually the normal mode is used with a 170 Hz shift at NO Parity. The
baud rate for ASCII is set to 110 baud and cannot be changed.
If in this menu and #5 (PAR) is selected, then the following menu would be displayed
with a blinking cursor over the current parity setting:

ASCII Parity Menu: 1> EVEN   3> NO PAR
                       2> ODD   4> EXIT

2.   RTTY QUICK KEYS:

All of the RTTY menus can be accessed through the Main RTTY Menu (by
SHIFT-F5), however the Parameter Menus can be accessed directly using the "Quick
Keys". In addition, the Main RTTY Menu is also is given a "Quick Key", ALT-R (for
RTTY) which is easier to remember. The "Quick Keys" are listed below:
                ALT-R: Turns on the Main RTTY Menu
                ALT-B: Turns on the Baudot Parameter Menu (Baudot must be ON)
                ALT-A: Turns on the ASCII Parameter Menu (ASCII must be ON)

3.   SELECT RTTY TYPE:

To select one of the available RTTY types (ASCII or BAUDOT):
                - Enter the Main RTTY Menu (SHIFT-F5 or ALT-R)
                - Choose #1 for "MENU"
                - Choose #1 for BAUDOT or #2 for ASCII or #3 to exit the menu

4. SELECT NORMAL OR REVERSE MODE:

To send and receive RTTY in the normal or reverse mode:
- Enter the Main RTTY Menu (SHIFT-F5 or ALT-R)
- Choose #2 to enter the Parameters Menu
- Choose #1 for NORMAL mode or #2 for REVERSE mode

Note: Usually the normal mode is used.

5. SELECT WIDE OR NARROW SHIFT:

To send and receive RTTY with the 850 Hz shift (wide shift) or with the 170 Hz shift (narrow shift):
- Enter the Main RTTY Menu (SHIFT-F5 or ALT-R)
- Choose #2 to enter the Parameters Menu
- Choose #3 for the narrow 170 Hz shift or # 4 for the wide 850 Hz shift
    Note: Normally the 170 Hz shift is used.

6. SELECT RTTY BAUD RATE

To select the RTTY baud rate for the BAUDOT mode:
- Enter the Main RTTY Menu (SHIFT-F5 or ALT-R)
- Choose #2 to enter the Parameters Menu
- Choose #5 to enter the Baudot WPM Menu
- Choose desired word per minute (or baud rate)
    #1 = 60 wpm or 45 baud
    #2 = 67 wpm or 50 baud
    #3 = 75 wpm or 57 baud
    #4 = 100 wpm or 75 baud
- Hit the ESCAPE key to exit the RTTY Menu
Note: Normally 45 baud, 60 wpm, is used.

The ASCII baud rate is fixed at 110 baud.

7. SELECT PARITY:

To select the PARITY for the ASCII mode:
- Enter the Main RTTY Menu (SHIFT-F5 or ALT-R)
- Choose #2 to enter the Parameters Menu
- Choose #5 to enter the PARITY Menu
- Choose desired PARITY
    #1 = EVEN
    #2 = ODD
    #3 = NO PARITY BIT
    #4 = EXIT

Note: Normally no parity bit is used.

8.   VALID RTTY SYMBOLS

The valid Baudot RTTY symbols are listed below:

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z,
0, 1, 2, 3, ,4 5, 6, 7, 8, 9,
-, ?, :, (,), ., ",", ', =, /, +, and a space.

The valid ASCII RTTY symbols are listed below:

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U,V, W, X, Y, Z,
a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z,
0, 1, 2, 3, 4, 5, 6, 7, 8, 9,
', ~, !, @, #, $, %, ^, &, *, (,), _, -, =, +, |, \, [, {,], }, ;, :, ", ', <, ",",>, >,/, ?,and a
space.

PART IX - MISCELLANEOUS FUNCTIONS

1-A.   T/R TUNE FUNCTION (F10)

The T/R TUNE button, or F10 of the keyboard, is a toggle function to turn the transmitter ON and OFF.

When the transmitter is on, due to the T/R TUNE function being on or if sending, the frequency cannot be changed by turning the main tuning knob. This is to avoid changing frequencies accidentally when transmitting.

1-B.   TRANSMITTER TUNE UP PROCEDURE

When using the antenna with an adjustable transmitter matching system, the following procedure should be used:

1.   The RF power control should be turned fully counter clock wise (for minimum power).
2.   Turn the transmitter on using the tune function and slowly adjust the power control clock wise until the transmitter produces approximately 10 Watts of output power as indicated on the built in power meter function or on an external power meter.
3.   The external matching device should now be adjusted for minimum SWR (note that for SWR values greater than 3:1 the maximum power available will be reduced. Additionally, the transmitter should always be run at an SWR of 2:1 or less to insure maximum efficiency of the output filters and minimum load on the Power Amp transistors).
4.   Once the matched condition is achieved, the RF power control may be rotated to produce the desired output power.
5.   Refer to Part XI - Section 6 for details on how to adjust the Mic Gain in conjunction with the Output Power control for SSB / AM operation.

Note:
On some bands the output power will tend to reach a maximum value at a relatively low setting of the RF power control. When the point of maximum output power is reached, the RF power control should be turned slightly past this point (turned CW) a bit. This will result in maximum output power and best ALC action. For 100 Watts of output power, the PC-16000 will draw between 18 and 23 Amps of Power Supply current. For continuous duty operations as in RTTY, ASCII or other digital modes, the output power should be adjusted so that the maximum power supply current to the PC-16000 should never be allowed to exceed 18 Amps.

2.   KEYSPEED FUNCTION (SHIFT-F2)

For sending and receiving CW, the KEYSPEED can be adjusted from 5 wpm to 75 wpm. This is done by pressing the KEYSPEED button, or shift-F2 of the keyboard.

The second line of the display will show the current keyspeed, which can be adjusted by turning the Main Tuning knob or the gray right and left arrow keys on the AT IBM Keyboard. The keyspeed can be changed while sending and receiving messages.

3.   ATTENUATOR FUNCTION (SHIFT-F4)

The ATTENUATE Key is used to insert a resistive attenuator at the input of the receiver. It should be used to limit the input of very strong signals at the receiver input. The LED lights when the attenuation is in effect.

4.   AGC FUNCTION (SHIFT-F6)

This key is used to change the receiver AGC time constant. There is a SLOW setting (recommended for SSB operation) and a FAST setting (recommended for CW operation). Each time the Key is pressed, the AGC will move to the next setting (i.e. SLOW, FAST, SLOW)

5.   SPOT FUNCTION (SHIFT-F7)

This function is used in the CW mode for matching the transmitter frequency to an incoming signal. Pressing the SPOT key will cause an 800 Hz tone to be heard in the receiver output along with the normal received audio. The main tuning knob should now be adjusted until the pitch of the incoming signal matches the pitch of the sidetone. At that point, the TX will be exactly on the frequency of the received signal. Note that the standard VFO frequency offset of 800 Hz must be in place for this function to be accurate. Pressing the SPOT key again will disable the tone.

6.   POWER FUNCTION (SHIFT-F8)

The power function allows the operator to monitor the transmitter output power and the SWR of the antenna circuit. When the POWER key is pressed (or shift-F8 of the keyboard) the display changes to:

POWER>   0 WATTS
SWR> 1.0:1

If the PC-16000 is in the CW or RTTY modes, the DC output power will be displayed when the transmitter is keyed. The SWR will also be displayed.

If the current mode is SSB, the peak output power will be displayed along with the SWR. Pressing the POWER key again will disable this function and restore the display.

Note that if the Decode Mode is on, then the Power Mode can NOT be turned on.

7.   QSK FUNCTION (SHIFT-F9)

This feature is used in the CW mode. When ON (indicated by the LED over the key switch) the transceiver is in the QSK (break-in) mode. The receiver will recover between code elements to allow the receiving station to interrupt. If the QSK feature is switched off the receiver will remain muted for a period of time after a code element is completed. The actual delay time is linked to the current keyer speed setting. The higher the keyer speed the shorter the time out period.

8.   ANTENNA SELECT (ALT-F4)

This allows you to choose one of the three antennas that can be used with the PC-16000. See the Back Panel Layout for the location of the ANT A, ANT B and ANT C jacks.

a.)   TX Antenna Select

This feature allows you to transmit and receive on separate antennas. However, this function can not be used if in the CW-QSK mode, since the break-in mode would cause the antennas to switch with every dot and dash.

To select a sparate TX antenna first make sure the QSK mode is off, then hit ALT-F8 on the IBM keyboard or hit the "ENT"-"ANT SEL" keys on the PC-16000 front panel . Note that when entering this menu from the front panel, you will first go into a Direct Frequency Entry mode upon hitting the "ENT" key. When the "ANT SEL" key is hit, then the Direct Frequency Entry mode is turned off and the "Select TX Antenna Menu" is turned on. Note that the menu can not be turned on if the SEND/DECODE mode(s) are on.

The "Select TX Antenna Menu" is as follows:

<div align="center">

SELECT TX ANT:
1>ANT ? 2> ANT ?

</div>

The question marks will be either "A", "B", "C", depending on which antenna is used to receive. For example, if antenna "A" was originally used to receive, then the menu would let you choose either antenna "B" or "C" as the TX antenna.

At this point you can choose #1 or #2 (from the front panel or IBM keyboard). Once your selection is made, the LEDs will lite accordingly when transmitting or receiving. Note that there is a small delay to turn the RX antenna on once the transmitter is turned off. This is to allow the antenna relays to switch.

If you wish to change the RX antenna, simply press the ANT SEL key as normally done to change the antenna.

If you chose a separate TX antenna and you wish to receive and transmit with one antenna, then go into the TX antenna menu and press the "CLR" key on the front

panel, or the "ESC" key on the keyboard. This will enable you to transmit and receive on the antenna previously set to receive.

Note: This function can not be stored in the scrachpad or other memories.

9. TIME FUNCTION (SH IFT-F1 & SHIFT-F6)

The time is displayed (in military time) in the upper right corner of the display. To change the time, press the ENT button, which will turn the direct frequency mode on, and then press the TIME SET button. This will turn the direct frequency mode off and turn the TIME mode on. Enter the time using either the numbers on the PC-1610 front panel keypad or on the IBM keyboard. The CLR button, or ESC key on the keyboard, will clear any digits that were entered. If nothing was entered, and the ENT button is hit, the old time is restored. Once a time is entered the time will start to blink, hit the ENT button (or the RETURN on the keyboard), and the time will be set. If the time is not a valid military time, it will not be accepted.

10. FREQUENCY LOCK (F9)

This key allows the operator to disable the Main Tuning knob from changing the RX or TX frequency. This does not stop the Main Tuning knob from working for other features such as Keyer Speed. Only the VFO tuning is locked. This feature is provided so as to prevent accidental change in frequency if the tuning knob is bumped (especially in VST mode).

11. LISTEN TO FREQUENCY (ALT-F)

This will send the current TX and RX frequency in morse code to the user.

12. CW SEND ONLY (ALT-F6)

Alt-F6 turns the CW send mode on and off. When an external transceiver is used, the PC-16000 may be used as a CW Keyboard/Iambic keyer. Pin 1 of Auxiliary Jack #1 (see the Back Panel Connector Layout) follows the internal keyer, straight key and keyboard. This pin is used to key the other transceiver.

13. CODE PRACTICE (ALT-F7)

Alt-F7 turns the code practice mode on and off. In this mode the user may practice sending code to himself. The decoded text will scroll across the bottom line of the display.

14. ID TIMER (ALT-T)

To sound an alarm every 10 minutes, to remind you that its time to send your call press ALT-T (for timer mode ON) on the IBM keybord. The "ID TIMER ON" nessage will flash to let you know that the ID Timer mode is ON, and then every 10 minutes you will hear 4 beeps. To turn the mode off press ALT-T again (from the

keyboard). The "ID TIMER OFF" message will flash and the ID Timer mode will be turned off.
Note 1: This function can not be turned ON or OFF if the KEYSPEED mode is ON.
Note 2: This function can not be stored in the scratchpad or other memories nor is it saved once the PC-16000 is turned off.

15. NOISE BLANKER

The PC-16000 includes a pulse type Noise Blanker which is useful in reducing or eliminating pulse noise such as that produced by ignaition systems, etc. The blanker is engaged by pressing the NB key on the front panel. The LED in the NB box will light when the Noise Blanker is on. The Noise Blanker is disabled when in the AM mode. If the blanker is ON when AM is selected it will be turned OFF. If you try to engage the blanker while in the AM mode the key switch will be ignored. This function should be turned off if noise is not present to avoid the audio distortion that can occur due to the blanking process.

16. AM OPERATION (F5)

The PC-16000 includes an AM Mode for receiving and transmitting. The AM mode on receive is useful for General Shortwave listening or for 2 way HAM Band communication. The AM mode may be invoked by pressing the AM switch on the front panel or by using the F5 key on the external keyboard. The AM mode will also be stored in memory if it was selected at the time a memory save was done. All DSP filtering functions are inactive in the AM mode. A fixed 4 Khz wide ceramic filter is used for receive filtering in this mode. The Noise Blanker is also defeated in this mode. IF Shift is not functional in this mode. Transmitter output power should be limited to approximately 40 Watts in this mode.

17. GENERAL COVERAGE RECEIVE

The PC-16000 is based on a dual upconverting design which allows continuous frequency coverage from 1.5 to 29.9 Mhz. The first IF is at 45 Mhz and includes a 4 pole 7.5 Khz wide crystal filter. The second IF is at 455 Khz and has selectable 2.4 Khz, 500 Hz and 4Khz filters. The 2.4Khz and 500Hz filters are Collins Mechanical filters while the 4 Khz is ceramic and used for AM operation only. A 1.8 Khz mechanical filter is also available as an option. Contact the factory for more information. Octave bandpass filtering is alos provided at the front end of the receiver to improve out of band signal rejection.

Further filtering is applied at the baseband level by the DSP filters. The 2.4Khz and 1,8Khz DSP filters are used with the 2.4 Khz Mechanical IF filter. The 500 Hz and 250 Hz DSP filters are used with the 500 Hz Mechanical IF filter. There is also a 200 Hz wide RTTY filter which is used with the 2.4 Khz mechanical filter centered at 2125 Hz. The IF Shift control must be significantly offset to properlt place the signal in the RF/AF passbands. See the IF Shift section for further information.

Any frequency in the range of 1.5 to 29.9 Mhz can be accessed by Direct Frequency

Entry on the front panel keypad or the external keyboard or by using the Main Tuning knob to find a particular frequency.

PART X - DIGITAL SIGNAL PROCESSOR (DSP) FUNCTIONS

The PC-16000 is equipped with a DSP audio filtering circuit. The advantage of the DSP filter over Analog filtering is that sharper cutoff may be obtained without ringing and more "intelligent" filtering may be done such as auto-notching tones and heterodynes and reducing background noise level (de-noising) without any appreciable effect on the desired signal. The PC-16000 contains 5 "Brick-wall" Bandpass filters with bandwidths of 2.4 Khz, 1.8Khz, 500 Hz, 250 Hz and a special 200 Hz filter for RTTY and ASCII operation. These filters are selected by the front panel switches. There are also two special filtering functions that have been added. There is an auto-notch function which, when engaged, will lock onto and notch any constant tone in the passband. This is intended for use on SSB where an interfering carrier(s) may be significantly reduced or eliminated by the use of this function. The auto-notch is only available when either the 2.4Khz or 1.8Khz filters are selected. It will be automatically defeated for other filter widths. Note also that multiple tones will be eliminated with this filter. It is recommended that the manual notch filter be used for CW or RTTY operation since the auto-notch will tend to suppress the CW and RTTY tones at any pitch.
It may be difficult to lock onto and totally suppress very weak signals. The stronger the signal strength the faster the notch will lock on and the greater it will suppress the tone. Since the filtering is being performed at audio, the S-Meter reading of the notched signal will not change and the AGC will still be affected.
The second special filter that is included is a De-noiser. This filter will lower the overall background noise and can reduce fatique during long listening periods in high noise levels. The De-noiser will lower the overall audio level of the receiver so compensation with the AF Gain control may be required. Also, if the De-noiser is activated in very quiet conditions (low noise) and the received signal is weak, the De-noiser may eliminate the entire signal. As with the auto-notch function, the De-noiser will only function with the 2.4Khz and 1.8Khz filters. The De-noiser and auto-notch functions are also mutually exclusive. That is, only one or the other may be selected at a given time. Both cannot be on together. The functions are selected by the front panel switch labeled DSP with the NOISE and NOTCH LED's above it. Each time the switch is pressed the next function will be selected.. BOTH OFF, NOISE, NOTCH, BOTH OFF..

PART XI- PANEL CONTROLS

1. RF OUTPUT POWER

This knob on the PC-16000 front panel controls the output power.

When operating RTTY, the maximum output power should be limited to 75 Watts. Also, the maximum power supply current should not be allowed to exceed 17 Amps for the digital modes (i.e RTTY, ASCII).

When operating CW or SSB, the output power may be run as high as 100 Watts out. The maximum power supply current at 100 Watts will be between 18 and 23 Amps depending on the band.

Note that it is good practice to reduce the output power once contact is established if the link is solid.

2. AF GAIN

This knob functions to turn the main power on and off. This also serves as a volume control.

3. SENSITIVITY

The CW/RTTY Digitizer Sensitivity Control works in conjunction with the M(Mark) and S(Space) LED's on the front panel. This control functions basically as a squelch for the decoder, this prevents "garbage" from being displayed while no signal is present. It should be set to just cut off decoding when the signal stops.

4. NOTCH

This function can only be accessed from the PC-16000 front panel (not the keyboard). Pressing the NOTCH button engages the Manual Notch Filter circuit. The LED above the key indicates the Notch Filter is in line. The notch frequency is adjusted by the NOTCH control on the front panel. The knob is turned slowly until the offending tone is maximally reduced or eliminated. Pressing the NOTCH key again will remove the notch filter from the circuit. Since this filter is in the audio circuit, it will not effect the S-Meter reading.

5. IF SHIFT

Since the PC-16000 utilizes a dual conversion design, the Local Oscillators for the second mixer (45.455 Mhz) and the Product Detector (455 Khz) may be shifted synchronously causing the received signal to shift within the passband of the selected 455 Khz Mechanical filter (the IF shift function is not available in the AM mode

where the 4 Khz ceramic filter is used). This function allows interfering signals to be shifted out of the passband or near the skirt of the filter improving reception of the desired signal. Since both oscillators are being shifted by the same amount, the tone (CW) or voice pitch (SSB) will remain constant. In SSB, some of the high or low frequency voice components (depending on shift direction) of the voice spectrum will be attenuated or removed. This can also be used to improve intelligibility. IF Shift is accomplished by turning the IF Shift control knob on the front panel. With the control at the 0 (mid) position the incoming signals are centered in the passband of the filter. In LSB operation, turning the control CCW (-) will cut the low frequency components of the received LSB signal. Turning the control CW (+) will cut the high frequency components. The control will have the opposite effect on USB. On CW with a narrow filter selected, the signal can be completely shifted out of the passband with about half the range of the shift control. The entire range will be required on SSB with a wide (2.4Khz) filter.

6.   MIC GAIN

The PC-16000 has a Microphone Gain control on the front panel. This is mainly to allow compatibility with other types of microphones besides the Patcomm high level ceramic microphone supplied with the transceiver. The microphone signal level is AGC controlled. This has the effect of leveling the mic gain even when the control is advanced beyond the point where maximum output signal is first obtained. The correct procedure for settting the microphone gain is as follows:

1> Start with the Mic Gain control at the 3 o'clock position and the RF Power control at minimum (full counter clockwise)
2> Place the radio in USB or LSB mode
3> Whistle into the microphone while pressing the PTT button and slowly advance the RF Power control until the desired power is reached.
4> If the Mic PTT button is pressed without any audio, the output power should be negligible (if significant power is present, the Mic Gain control was probably not set high enough)
5> Again, press the PTT button and whistle into the microphone. Back off the Mic Gain control (counter clockwise) until output power just begins to fall off. This is the optimum setting for the control. The average output power on an in-line (averaging type) wattmeter should show between 50-60 watts for average speech at 100 Watts peak output power. Depending on the volume of the voice, the mic gain may need to be increased a little bit to obtain this number.

Following this procedure will produce a clean SSB signal with good carrier suppression.

PART XII - RESETTING THE PC-16000 & UPDATING SOFTWARE

1.   RESETTING THE PC-16000A/E

To reset the PC-16000A/E first turn the power off, and then remove the 7 screws holding the top cover in place. Carefully lift the cover off and be sure not to rip the cable from the speaker on the top cover. Either unplug the speaker cable and remove the cover or stand the cover on end to the right of the unit. There are two small pins which can be seen on the left edge of the CPU Board (board immediately behind the Front Panel PC Board. Take a small mettallic screwdriver and short the pins together while turning the main power on.   The PC-16000 will reset itself to its original parameters. Note that any memories and messages that were stored will now be erased (sorry).

2.   UPDATING PC-16000 SOFTWARE

In the future, you may receive new software for the PC-16000. This software is programmed into Programmable Read Only Memory chips (called PROMs for short). To install the new PROM(s) first turn the power off, and then remove the 7 screws holding the top cover in place. Carefully lift the cover off and be sure not to rip the cable from the speaker on the top cover. Either unplug the speaker cable and remove the cover or stand the cover on end to the right of the unit. Next remove the small access plate (2 screws) on the front inside panle directly behind the exterior front panel plate. The PROM(s) will now be visible. Remove the old PROM(s) from their sockets and replace them with the new PROM(s). Be sure to put the correct PROM into the correct socket, they should be labeled (follow the directions that come with the new PROM(s)). Also make sure that the PROM chips are not in upside-down (the notch on the socket is to be matched with the notch on the PROM chip). When done, replace the access panel and the top cover.

Since new software has been installed, you will have to reset the PC-16000. To do this, follow the instructions in the previous section.

NOTE: In the European CE Certified Version of the PC-16000 there is a shield over the CPU section which must be unsoldered in order to gain access to the PROM sockets. This shield must be re-soldered in place after a PROM replacement in order to maintain CE compliance.

The following statement applies to PC-16000's shipped with the European CE Marking:

The PC-16000 complies with the essential requirements ofthe89/336/EECdirectiveforElectromagnetic Compatibility. This Compliance is based on conformity with the ETSI specification ETS300 684 (EMC product standard for Commercially Available Amateur Radio Equipment).

PART XIII - TECHNICAL SPECIFICATIONS

1.   RECEIVER SPECIFICATIONS

FREQUENCY COVERAGE:
1.5 Mhz to 29.9 Mhz
CIRCUIT TYPE:
Upconversion design
Dual Conversion: 1st IF: 45 Mhz 2nd IF: 455 Khz
Sideband elimination using Phasing Techniques with digitally generated Quadrature carriers and Image Reject Mixers preceded by Mechanical Filters

RIT RANGE: Anywhere within selected band.

SENSITIVITY: 0.25 uV for 10db S+N/N

DYNAMIC RANGE FIGURES:
Noise Floor (MDS) = -128 dbm (0.09 uV)
Blocking Dynamic Range = 111 db
IMD Dynamic Range = 95 db (20 Khz spacing)

SELECTIVITY:
5 "Brick Wall" DSP filters available in the following bandwidths:

    2.4 Khz Filter
    1.8 Khz Filter
    500 Hz Filter
    250 Hz Filter

Ultimate attenuation of filters are 60 db
DE-NOISER: Ultimate attenuation of 20 db
AUTO-NOTCH: Ultimate attenuation of 50 db for 1 to 4 tones. Lock time approximately 4 mS
AM/FM MODES: Fixed 4 Khz Filters in IF and Audio stages. DSP functions are not available in these modes.

MANUAL NOTCH FILTER: 500 Hz to 3 Khz - 30 db minimum.

IF SHIFT: +/- 2.5 Khz

MAXIMUM AUDIO OUTPUT: Minimum of 2.5 Watts into an 8 ohm load with 10% THD

2. TRANSMITTER SPECIFICATIONS

FREQUENCY COVERAGE:
160M... 1.800 to 2.000 Mhz
80M... 3.500 to 4.000 Mhz
40M... 7.000 to 7.300 Mhz
30M...10.100 to 10.150 Mhz
20M...14.000 to 14.350 Mhz
17M...18.068 to 18.168 Mhz
15M...21.000 to 21.450 Mhz
12M...24.890 to 24.990 Mhz
10M...28.000 to 29.000 Mhz

MARS and CAP coverage is also available upon proof of eligibility

EMISSION TYPES: SSB: J3E / CW : A1A / FSK: F1B / AM: A3E

OUTPUT POWER: SSB: 100 WATTS PEP
                          CW : 100 WATTS DC
                          FSK: 75 WATTS DC
                          AM: 40 WATTS CARRIER

SSB CARRIER SUPPRESSION: Minimum of 40 db below peak with a 1Khz tone

UNWANTED SIDEBAND SUPPRESSION: Minimum of 45 db below peak with a 1 Khz tone.

SPURIOUS RADIATION: Better than -50db for harmonic and better than -45 db for non-harmonic spurious.

3rd ORDER IMD: -28 db Minimum @ 100 W PEP

RF SPEECH COMPRESSOR: Provides approximately 10 db of compression

SIGNAL GENERATION TECHNIQUES:
SSB: Passive Double Balanced Modulator using digitally generated Quadrature carriers for phased SSB generation.
CW : Direct generation with DDS controlling TX offset.
FSK: Direct generation via computer control of DDS.
AM : Unbalance DBM with in phase audio applied

3. GENERAL SPECIFICATIONS

VFO STEP SIZE:
1 Hz minimum in Variable Speed Tuning Mode - steps available are 1Hz, 10 Hz, 100 Hz, 1 Khz and 10 Khz depending on speed of Main Tuning Dial. 10 Hz in Standard Tuning Mode.

MEMORIES: 90 Memories are available (10 per band) plus 1 scratchpad memory.

FREQUENCY STABILITY / ACCURACY: Stability: +/- 20 Hz for 0 to +40 C , Accuracy : +/- 200 Hz.

ANTENNA IMPEDANCE: 50 ohms unbalanced

SUPPLY VOLTAGE:
13.8 VDC +/- 10 % (Negative Ground)
15 Amps maximum current consumption @ 75 W DC output

DIMENSIONS: 13 in (W) x 12 in (D) x 3.5 in (H) not including knobs and feet.

WEIGHT
Approximately 12 lbs

* All specifications in this document may be subject to change without   notice or obligation.

PATCOMM CORPORATION
FLOWERFIELD M100
ST. JAMES, NEW YORK 11780

LIMITED WARRANTY

Warranty Terms:

Subject to the Limitations of Warranty and the Warranty Procedures described below, PATCOMM CORPORATION hereby warrants this product to be free of defects in materials and workmanship in normal use for a period of twelve (12) months (the " Warranty Period") from the date of the original purchase at retail (the "Limited Warranty").

Limitations of Warranty:

A. PATCOMM CORPORATION is not liable for any express warranties except the Limited Warranty described above.

B. The Limited Warranty extends only to the original retail purchaser, and shall not be valid or enforceable unless such original purchaser fully completes, signs and mails to PATCOMM CORPORATION, within ten (10) days from the date of such original purchase at retail, the Owner's Warranty Registration Card included with this product.

C. The Limited Warranty shall be limited to repair or replacement of any materials found to be defective, any servicing or adjustment of the product which PATCOMM CORPORATION believes is necessary, or replacement of the product should such repair, servicing, or adjustment be deemed by PATCOMM CORPORATION, to be ineffective. The repair or replacement of defective materials, and the servicing, adjustment, or replacement of the product, under the terms of this warranty, shall be performed free of charge by PATCOMM CORPORATION, or by an authorized PATCOMM CORPORATION Amateur Products Dealer.

D. Any tampering with, misuse or unauthorized modifications of, or damage (for any reason) to this product shall relieve PATCOMM CORPORATION from any further obligations under this Limited Warranty.

E. The Limited Warranty applies only to the product as it existed at the time of the original purchase by the original purchaser, and shall not preclude PATCOMM CORPORATION from later making any changes in design, adding to, or otherwise improving subsequent versions of this product, or impose upon PATCOMM CORPORATION any obligation to modify or alter this product to conform to such changes, additions, or improvements.

F. PATCOMM CORPORATION assumes no responsibility for any consequential damages caused by, or arising out of, any such defect in materials or workmanship.

G. TO THE FULLEST EXTENT PERMITTED BY LAW, PATCOMM CORPORATION SHALL NOT BE RESPONSIBLE FOR ANY IMPLIED WARRANTY WITH RESPECT TO THIS PRODUCT.

H. If the original retail purchaser timely complies with the Warranty Procedures described below and PATCOMM CORPORATION elects to send the purchaser a replacement product rather than repair the product returned to PATCOMM CORPORATION, (the "original product"), then the Limited Warranty shall apply to the replacement product only for the remainder of the original product's Warranty Period.

I. Warranty statures vary from state to state, so some of the above limitations may not apply to you.

Warranty Procedures:

A. To obtain the benefits provided by this Limited Warranty, the original purchaser at retail must comply with the following procedures:

    1. As a first step in seeking warranty assistance, and without expense to PATCOMM CORPORATION, contact the authorized PATCOMM CORPORATION Amateur Products Dealer from whom this product was originally purchased (the "Dealer") and describe fully the defect for which the warranty assistance is sought. The Dealer may be able to advise you regarding field adjustments or procedure changes which may resolve the difficulty.

    2. If the dealer's suggestions do not remedy the product's problems, then without expense to PATCOMM CORPORATION, return this product to the dealer or to PATCOMM CORPORATION, 7 Flowerfield M100, St. James, New York 11780. PATCOMM CORPORATION assumes no responsibility for any PATCOMM CORPORATION product or other items, sent to such dealer or PATCOMM CORPORATION not in accordance with PATCOMM CORPORATION instructions.

    3. Include with the PATCOMM CORPORATION product being returned for warranty service a copy of the original purchase receipt, without which warranty service will not be provided.

B. Upon receipt by PATCOMM CORPORATION or the dealer of this product returned in accordance with the above-described Warranty Procedures, all reasonable efforts will be expended by PATCOMM CORPORATION to cause this product to conform to its specifications. PATCOMM CORPORATION will return the repaired product (or a replacement product) free of charge to such purchaser, with the decision as to whether to repair or replace this product to be made at the sole desecration of PATCOMM CORPORATION.

MODEL #_____ SERIAL #_____