INSTRUCTION MANUAL

AEA Morse-Baudot-ASCII Reader/Code Converter

Model MBA-RC

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Congratulations on your decision to purchase the AEA Morse-
Baudot-ASCII Reader/Code Converter. This equipment is extremely
versatile and will provide many hours of enjoyment to you.

The MBA-RC has two primary functions. It will read Morse code,
Baudot and ASCII RTTY (Radio Teletype). It will also allow you
to transmit Morse, Baudot or ASCII via hand key, electronic
keyer, or a keyboard.

There are a number of secondary functions available. You may
transmit cross mode. For example, if you have only CW cap-
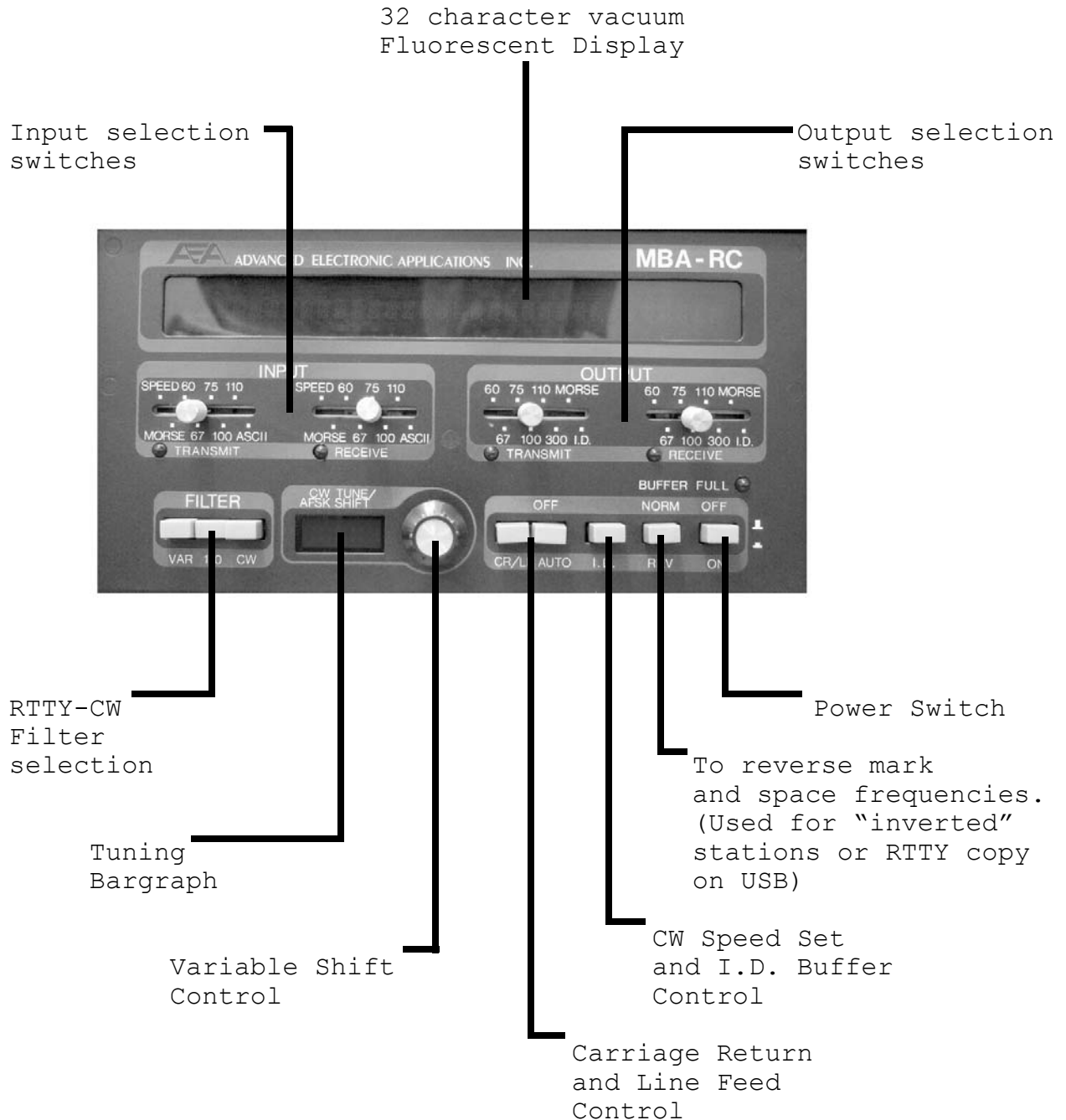ability you can still work a RTTY station either via Baudot or
ASCII.

The MBA-RC provides a visual monitor for your message trans-
missions as well as visual copy of stations received on a com-
munications receiver.

The unit is compact and easily assimilated into an average
amateur station. It requires only 13 VDC at approximately 1.5
Amps for operation, making it ideal for both fixed and portable
two-way RTTY operation.

TABLE OF CONTENTS

FRONT PANEL DESCRIPTION

32 character vacuum
Fluorescent Display

Input selection
switches

Output selection
switches

RTTY-CW
Filter
selection

Power Switch

To reverse mark
and space frequencies.
(Used for "inverted"
stations or RTTY copy
on USB)

Tuning
Bargraph

CW Speed Set
and I.D. Buffer
Control

Variable Shift
Control

Carriage Return
and Line Feed
Control

REAR PANEL DESCRIPTION

Internal Speaker for
monitoring regenerated
CW and CW I.D

AFSK Level Control
to Transmitter

AFSK Transmit
Shift Selector

RTTY feeback
control

Used in Baudot
for printers

AFSK to Xmtr

To Xmtr Key
Jack for C W

Ground Center
Conductor for
Transmit mode

Parallel
ASCII Port

Input
Power Socket

Rcvr Audio
Input

External Speaker
or Tape Input

Use for Ground

Ext. Scope
Tuning Outputs

Input for Key, Keyer,
or CW Keyboard

TTL Level
TTY Output

20/60 ma
Current Loop Port
or RS 232 Drive port

Hook Up Instructions
(Rear Panel Connectors)

POWER

The MBA-RC requires a 13 ±3 VDC, well filtered power source
capable of supplying 1.2 amperes. The power connector is a
2.1 mm center pin coaxial type, the center pin is positive.

AUDIO

The audio IN-OUT jacks are 3.5 mm phone jacks and are paralleled
in the MBA-RC. The IN (input) jack is used to provide receiver
audio, CW or RTTY signals to the MBA-RC. Receiver audio can
be taken from the headphone jack or by tapping the speaker leads.
The audio OUT (output) jack is provided for an external speaker
or tape recorder.

KEY

The key input is a contact closure input for CW. A standard two
conductor ¼" plug is used. It may be connected to a hand key,
keyer POSITIVE keyed output, or keyboard output.

SCOPE OUT

The mark and space filters output are provided at these
connectors for tuning RTTY signals with the aid of an X-Y scope.

KEYED + AND -

The + and - keyed outputs are for CW keying of the transmitter.
The + keyed output is for use with transistor and cathode keying,
and the - output is for use with transmitters using blocked
grid keying.

DATA OUT

The Data Out jack is a TTL level teletype output and is active
only in teletype modes. The output level is low during MARK.

CURRENT LOOP

The current loop input and output may be used with 20 or 60 mA teletype loops. <u>Warning! The Teletype Current Loop Supply must be externally limited to 60 mA maximum.</u> Optical couplers isolate the current loop input and output from the rest of the MBA-RC electronics.

PARALLEL ASCII

The parallel ASCII input and output are provided on the right and left sides of the 26 pin parallel connector. The parallel output is Centronics compatible parallel and may be used with Centronics, Epson and other parallel input ASCII printers. The parallel input is seven bit ASCII, TTL Level, high true with a low true strobe.

TRANSMIT/RECEIVE

The XMIT/RCV input requires a contact closure during transmit to select the front panel transmit mode switches. This input provides automatic switching of the input and output modes when switching between transmit and receive if activated with an auxilliary set of contacts on your transmitter.

TONE OUT

The Tone Out connector is the AFSK tone output and is 2125 Hz Mark and 2295 Hz space on 170 Hz Shift, and 2125 Hz Mark and 2975 Hz Space on 850 Hz shift. This input may be connected to the microphone or phone patch input of your transmitter for RTTY operation. The AFSK Output Level of the AFSK tone is set with a screwdriver at the adjustment pot.

TRANSMISSION OF BAUDOT-RTTY

WARNING.....WARNING.....WARNING.....WARNING.....WARNING

During RTTY transmissions your transmitter operates in a key-
down mode. Most amateur transmitters can be damaged by con-
tinous operation at the1r normal CW input power levels. It
will be necessary to reduce input power when using AFSK tele-
type to about 40% of the normal CW input power. Consult the
Owner's Manual for the transmitter you are using.

AFSK SHIFT

The AFSK Shift push switch selects 170 Hz (In position) or
850 Hz (Out position) AFSK output.

SPEAKER LEVEL

Spk Lvl set adjustment pot for CW monitor tone level.

DOWNSHIFT ON SPACE

The two Down Shift on Space switches are used for Baudot tele-
type reception and transmission. With the Down Shift on Space-
RCVR switch OUT, an automatic downshift is generated when
a space character is received for reducing the amount of
garbled print. To reduce transmission errors, it is recom-
mended that you operate with the Down Shift on Space-Xmit switch
in the IN position.

PRINTER LOCK UP

Printer Lock Up On Receive push button has two functions. When
the MBA-RC is used with a current loop input, the switch in the
OUT position prevents input to the MBA from the keyboard when
in the receive mode. This allows local loop operation without
'feedback' through the input and output of the MBA-RC.

PRINTER LOCK UP ON XMIT

The Printer Lock Up On Xmit push switch, when in the OUT po-
sition, prevents operation of the printer by the MBA-RC when
transmitting. These two lock up functions are particularly
useful during mode conversion operation, e.g., Baudot transmit
and receive while using an ASCII teletype machine.

REAR PANEL CONNECTOR GUIDE

REAR PANEL CONNECTIONS	2.1 mm COAXIAL	3.5 mm	RCA	¼" STANDARD 2 CONDUCTOR	CURRENT LOOP 3 PIN CONNECTOR	PARALLEL ASCII IN/OUT PLUG
POWER PLUG	X					
AUDIO IN		X				
AUDIO OUT		X				
SCOPE MRK SPACE			X			
KEY				X		
DATA OUT		X				
CURRENT LOOP					X	
Parallel ASCII						X
XMIT/RCV		X				
- KEYED		X				
+ KEYED		X				
TONE OUT		X				

WARNING:

All interconnecting cables should be shielded and the equipment
properly grounded, use one of the two screws on the rear panel
(see Rear Panel Description, page 2). Extra care in this re-
gard will payoff in proper performance of your equipment. If
you have questions about grounding procedures please refer to the
Amateur Radio Handbook published by ARRL.

REAR PANEL CONNECTIONS
BLOCK DIAGRAM
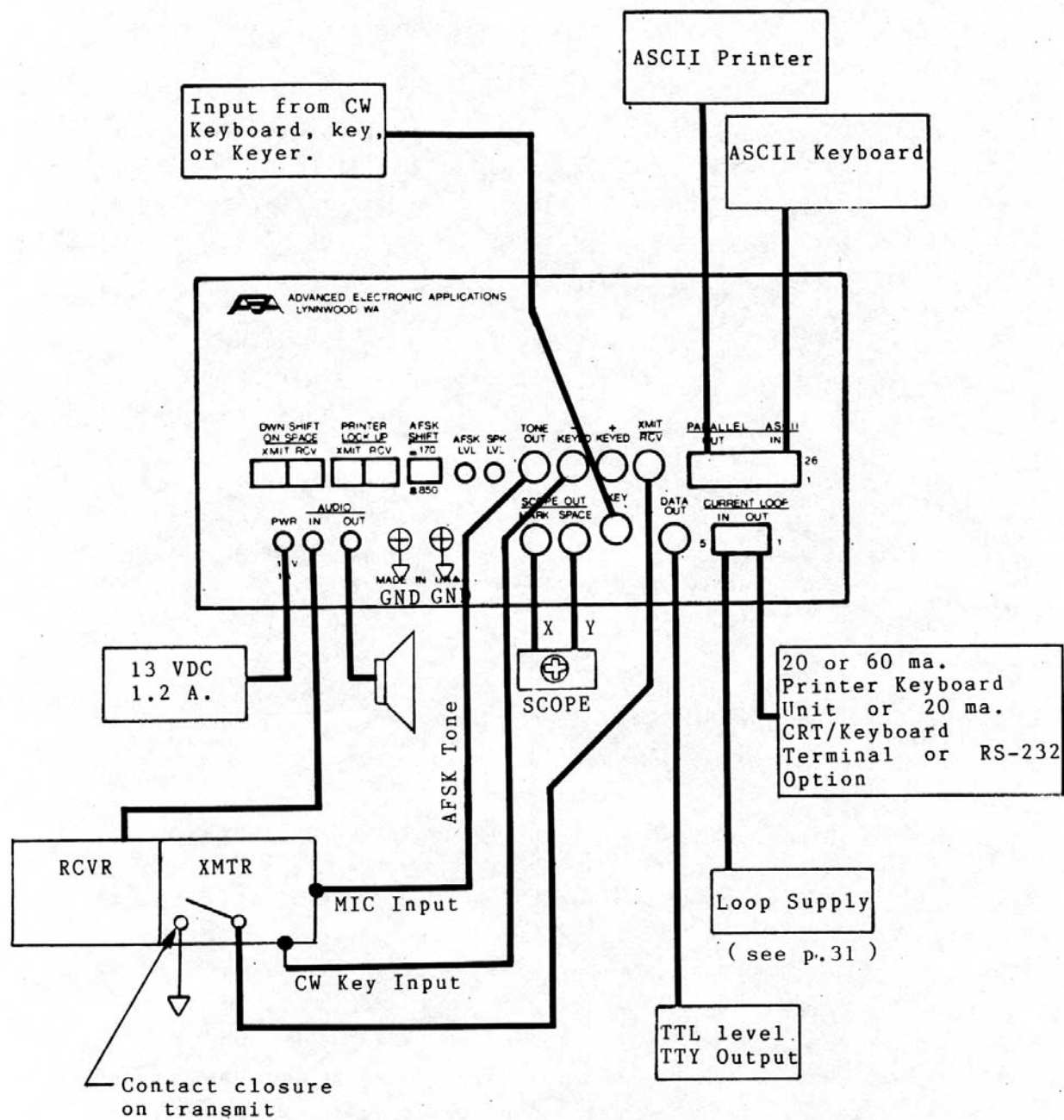
FRONT PANEL CONTROLS

The front panel controls may seem somewhat confusing because of the tremendous flexibility of the MBA-RC. Therefore it is extremely important that you read and understand this section thoroughly.

Immediately beneath the display there are two switching areas marked <u>Input</u> on the left and <u>Output</u> on the right. This needs explanation since the two switches under each refer to transmit and receive. The <u>Input</u> refers to inputs <u>to the MBA-RC</u> and <u>Output</u> refers to outputs <u>from the MBA-RC</u>.

There are basically three ways you can transmit using the MBA-RC, CW using a hand key or paddle via a keyer, Baudot or ASCII TTY using a keyboard, or TTY machine. <u>Input</u> is usually from two sources:

    1. The station you hear via your receiver.
    2. Your key/keyer, keyboard, TTY machine or terminal.

For input from the receiver, the slide switch will be set on the <u>Receive</u> side for the mode and speed being received. For input from your key/keyer, keyboard, etc. you will set the input transmit switch to the proper speed and mode desired.

Under the Output area there are again two switches, one for transmit and one for receive. In this case you will be setting the switches to do two things:

    1. Set the MBA-RC to transmit a particular mode.
    2. Set the receive switch at the Output mode and speed desired when receiving the other station. This is the switch used to select the proper output for generating printer hard copy of received signals.

If this is still confusing, some examples of the Input/Output transmit and receive switch settings are given for various modes of operation. These illustrations cover settings used in the Input and Output controls and controls on the rear panel.

ILLUSTRATION 1

CONDITION:

Your Station: Working Morse Code-using 32 character display
Other Station: Working Baudot, 60 WPM

INPUT   OUTPUT

SPEED 60 75 110	SPEED 60 75 110	60 75 110 MORSE	60 75 110 MORSE
MORSE 67 100 ASCII	MORSE 67 100 ASCII	67 100 300 I.D.	67 100 300 I.D.
TRANSMIT	RECEIVE	TRANSMIT	RECEIVE

You are input-   You are receiving   The MBA-RC is out-   This setting
ting Morse to   Baudot at 60WPM   putting Baudot at   is for use to
MBA-RC with key,   On 32 character   60WPM to your Xmtr.   drive your own
keyer, or CW   display.   current loop
keyboard.   printer.

**NOTE: SEE PAGE 21 AND
PROGRAM " DE _____ "
(your call letters)
INTO THE I.D. BUFFER.**

Place transmit output
switch in Morse and
push ID button at end
of transmission.

In   On   On

With your receiver   Norm (Tune
tune for Max.   Receiver into
closure with no   LSB position)
flickering.

Adjust for
suitable level
into TX MIC
Input

To TX MIC
Input

To 12 V Pwr.
Supply
@ 1.2 A

To RX
Speaker out

To Remote
Spkr.

In

Adjust for
reasonable CW
monitor level
during I.D. Mode

Input from
Key, Keyer, or
CW Keyboard

RX

TX

Current Loop
Output to
Printer

Pins   5 4 3   1

Keyboard and
Selection Magnets
in Series

ADVANCED ELECTRONIC APPLICATIONS
LYNNWOOD WA

DWN SHIFT   PRINTER   AFSK.
ON SPACE   LOCK UP   SHIFT   AFSK SPK   TONE   −   +   XMIT   PARALLEL   ASCII
XMIT RCV   XMIT RCV   ▲170   LVL   LVL'   OUT   KEYED KEYED RCV   OUT   IN
                           ▲850   26
                                                                                                     1

                  AUDIO   SCOPE OUT   KEY   DATA   CURRENT LOOP
PWR IN   OUT   MARK SPACE   OUT   IN   OUT
                                                                      5   1
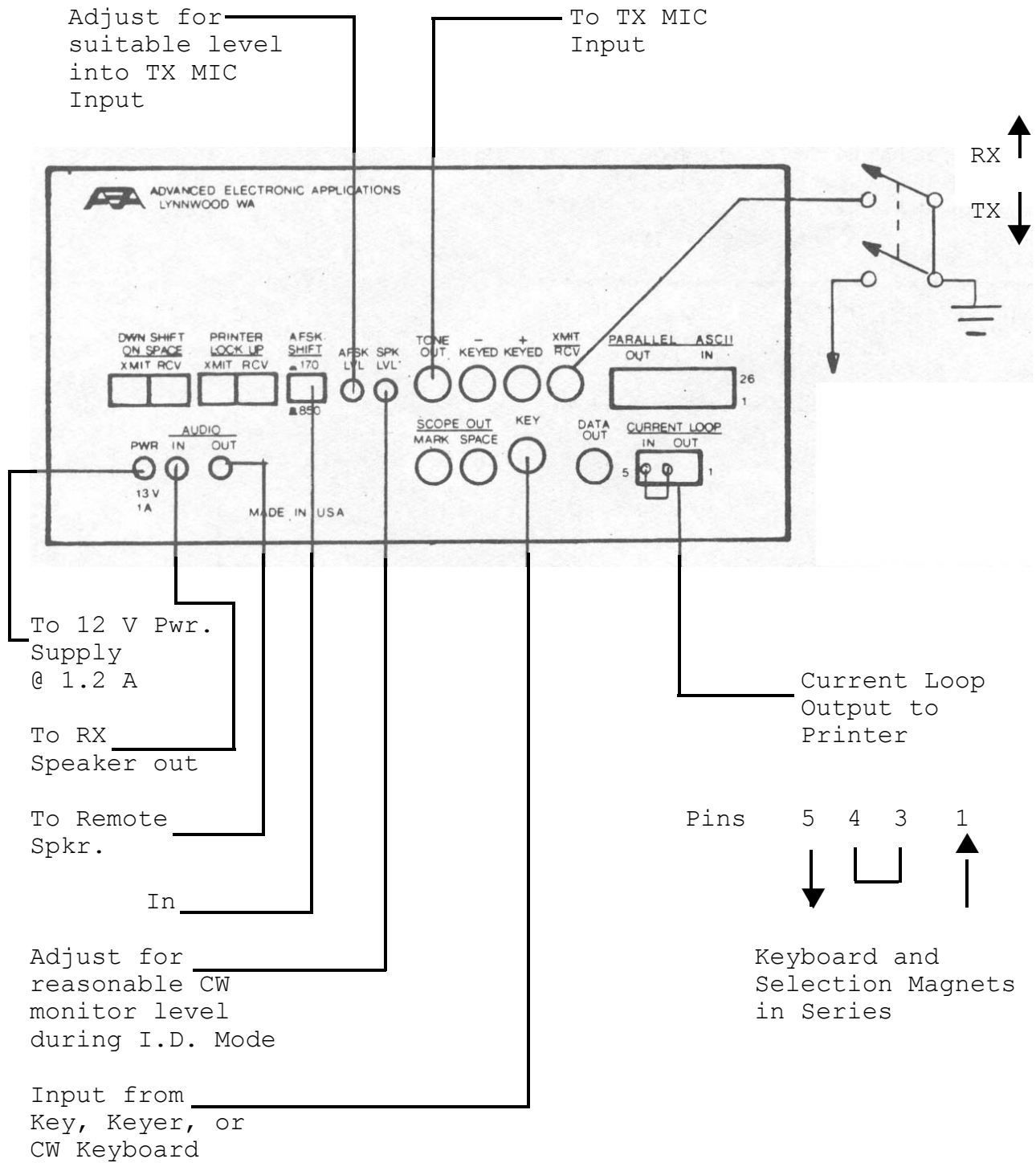13 V
1 A   MADE IN USA

ILLUSTRATION 2

CONDITION:

Your Station: Working Baudot 60 WPM-using Model 15, 19, 26, etc.
Other Station: Working ASCII 110 Baud.

INPUT

TRANSMIT

Inputting Baudot
at 60WPM to
MBA-RC from key-
board via the

RECEIVE

Receiving 110
Baud from your
receiver.
(audio)

OUTPUT

TRANSMIT

The MBA-RC is out-
putting 110 Baud
AFSK to your Xmtr.

RECEIVE

You are getting
hard copy of the
receive signal
on your Baudot
printer.

170 HZ   Tuned for Max.   CR/LF   Norm   On
   In   closure with no   Off
                flicker

AFSK to Xmtr
MIC input.

To TX/RX switch

Loop output to
your printer.

Loop input from
your keyboard

Out   Out   To RX   Out   Out   170 HZ (in)
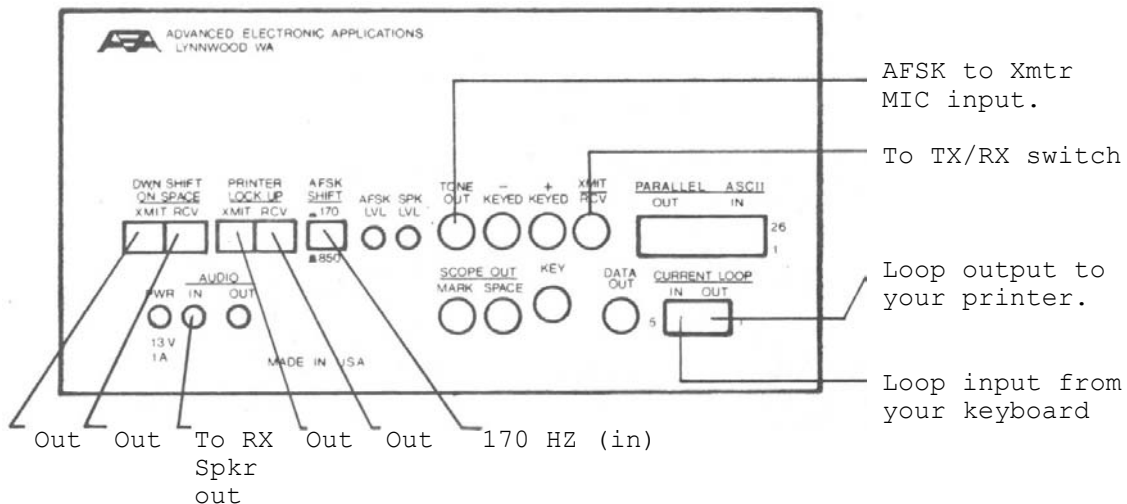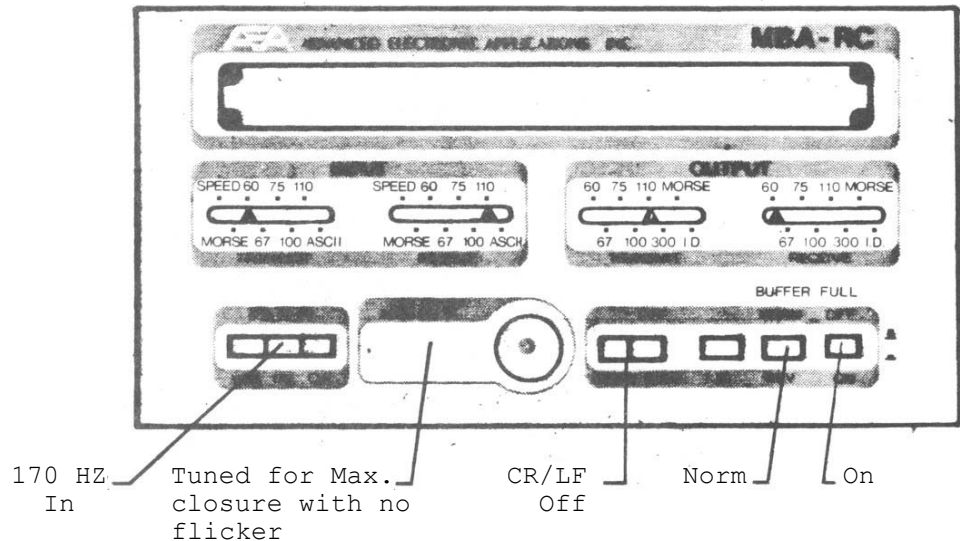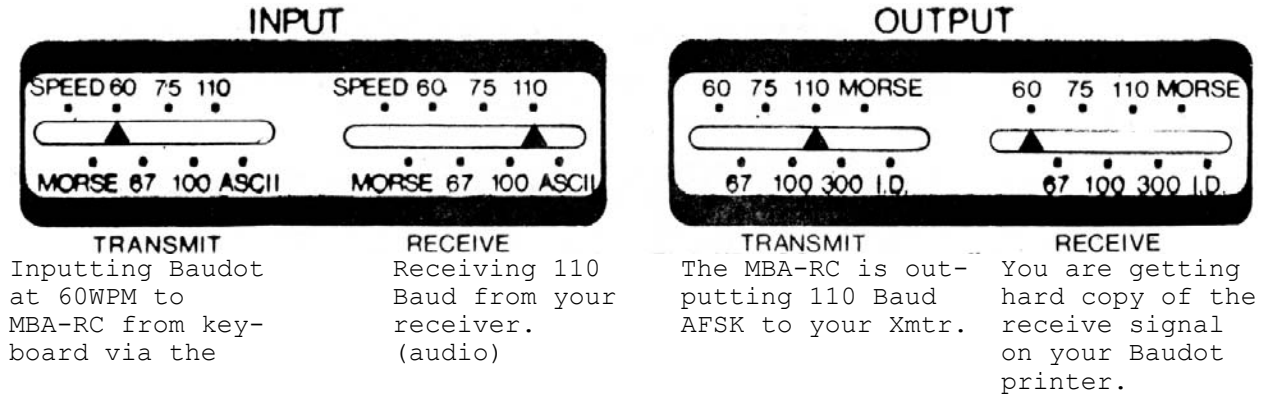   Spkr
              out

ILLUSTRATION 3

CONDITION:

Your Station: Working 110 Baud ASCII-using ASCII printer or CRT terminal.
Other Station: Working Morse Code.

INPUT   OUTPUT

SPEED 60 75 110	SPEED 60 75 110	60 75 110 MORSE	60 75 110 MORSE
MORSE 67 100 ASCII	MORSE 67 100 ASCII	67 100 300 I.D.	67 100 300 I.D.
TRANSMIT	RECEIVE	TRANSMIT	RECEIVE

| Your are sending 110 Baud ASCII into the MBA-RC from the ASCII | You are reading Morse on the display and your printer. | The MBA-RC is out-putting Morse to your Xmtr. | You receive a hard copy of Morse received signal on your ASCII printer |

In __   __ Tuned for Max   __ CR/LF   Norm   On
              closure   Auto

Out __   To TX key
              input (see text)

                                             To TX/RX switch

                                             Parallel ASCII
                                             output (centronics
                                             compatible)

                                             Parallel ASCII
                                             Keyboard input

                                             (Alternate) 20 ma
                                             current loop out to
                                             ASCII printer or CRT
                                             terminal.

                                             (Alternate) 20 ma
                                             current loop input
                                             from Keyboard (or
                                             CRT terminal.)

ADVANCED ELECTRONIC APPLICATIONS
LYNNWOOD WA

DWN SHIFT PRINTER AFSK   AFSK SPK   TONE KEYED KEYED XMIT   PARALLEL ASCII
ON SPACE   LOOK UP SHIFT   LVL LVL   OUT   RCV   OUT   IN
XMIT RCV   XMIT RCV 170

         AUDIO   SCOPE OUT   KEY   DATA   CURRENT LOOP
PWR IN OUT   MARK SPACE   OUT   IN   OUT
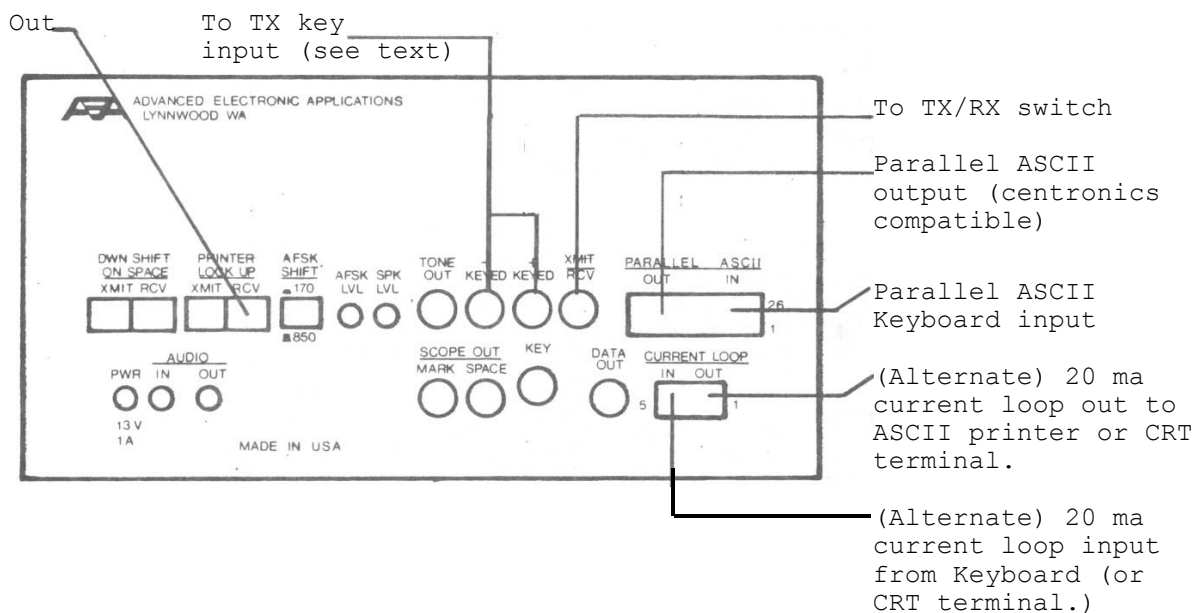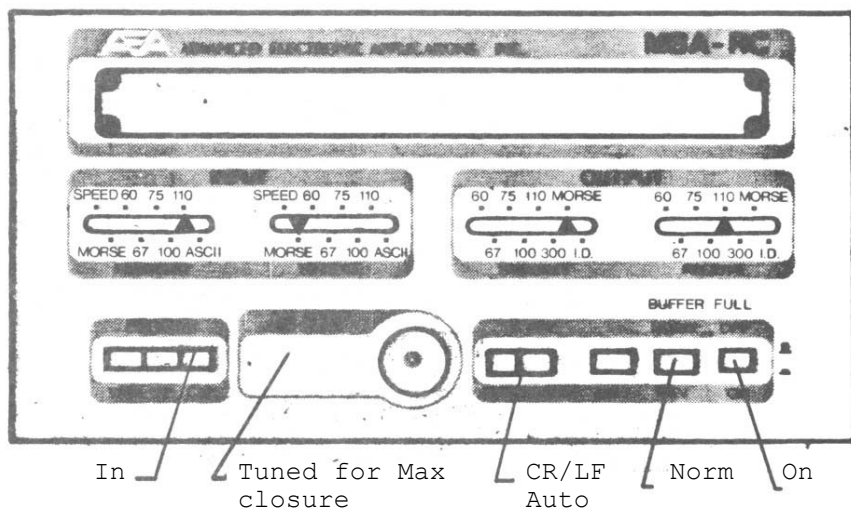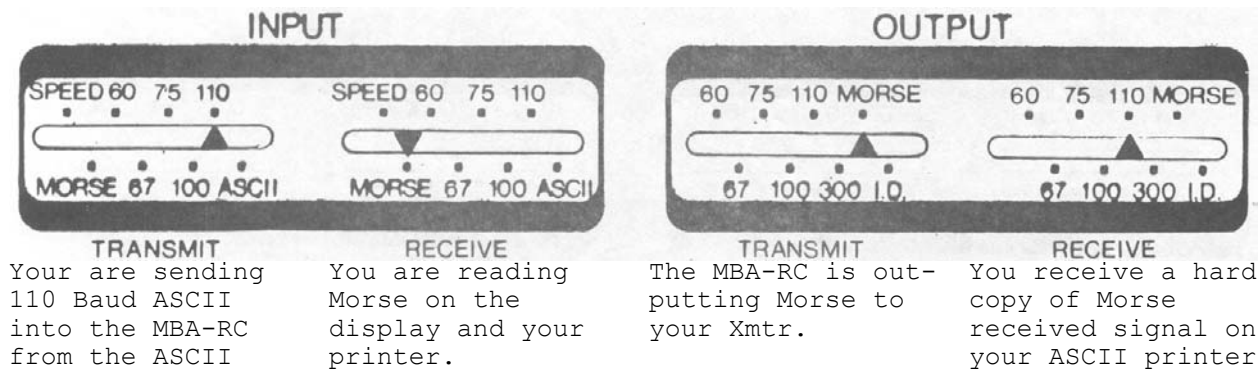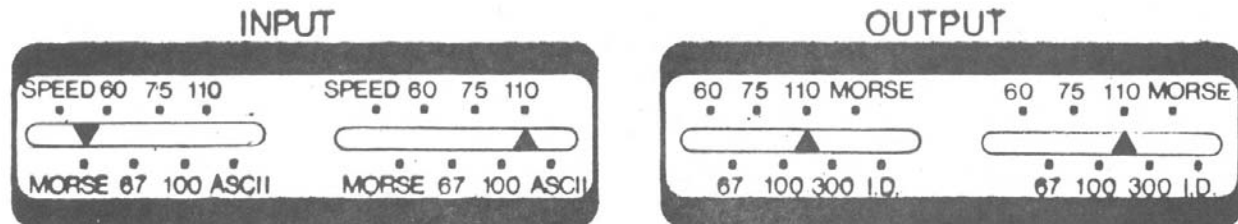
13 V
1A   MADE IN USA

ILLUSTRATION 4

CONDITION:

Your Station: Working Morse Code-using 32 character display
Other Station: Working 110 Baud ASCII

You are input-
ting Morse to the
MBA-RC from a key,
keyer or keyboard.

You are reading
110 Baud ASCII
on the 32 chara-
cter display.

The MBA-RC is out-
putting 110 Baud
ASCII, AFSK to
your Xmtr.

You are reading
from display so
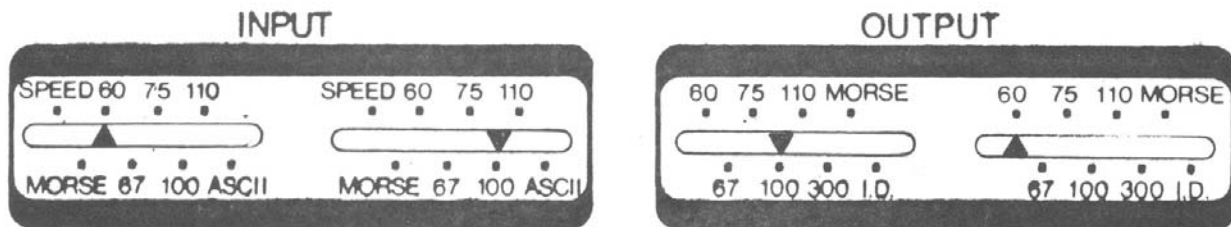use 110 Baud
ASCII position
so buffer will
not overflow.

170 HZ   Tune for Max.   On   On
                closure with no
                flickering
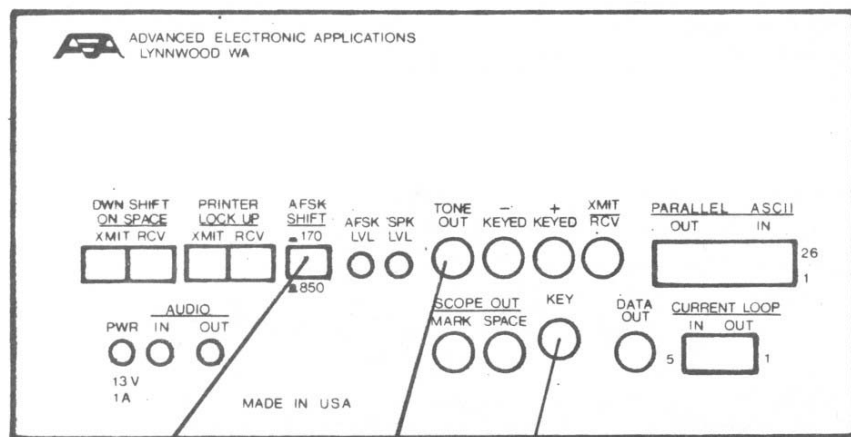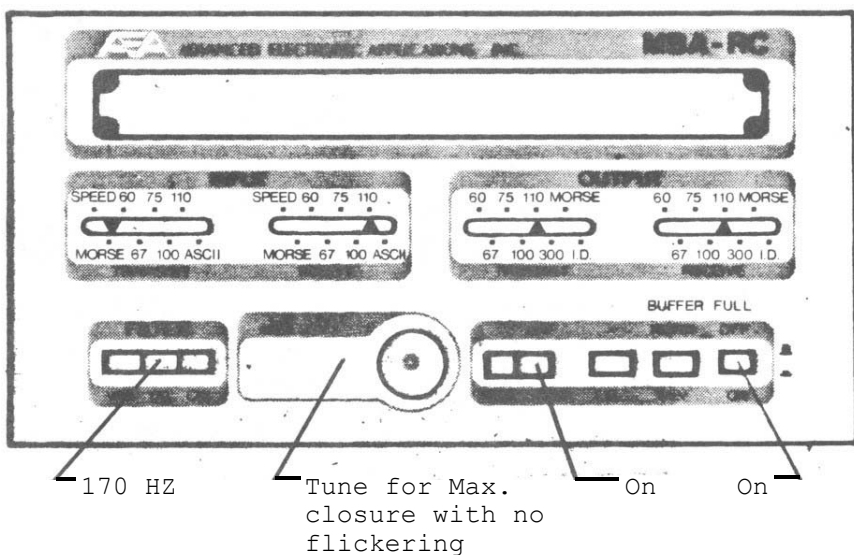
In   AFSK to   From key, keyer, or CW keyboard
            Xmit MIC input

ILLUSTRATION 5

<u>CONDITION</u>:

Your Station: Working Baudot 60 WPM- using current loop Baudot printer.
Other Station: Working Baudot 100 WPM.

INPUT

OUTPUT

SPEED 60 75 110   SPEED 60 75 110   60 75 110 MORSE   60 75 110 MORSE

MORSE 67 100 ASCII   MORSE 67 100 ASCII   67 100 300 I.D.   67 100 300 I.D.

TRANSMIT   RECEIVE   TRANSMIT   RECEIVE

You are out-   You are re-   The MBA-RC is out-   You are out-
putting 60WPM   ceiving Baudot   putting Baudot at   putting the re-
Baudot into the   at 100 WPM   100WPM, AFSK to   ceived signal to
MBA-RC from a   your Xmtr.   your Baudot
keyboard via the   60WPM printer
Loop Port Input.   via the current
                                                            Loop Port.
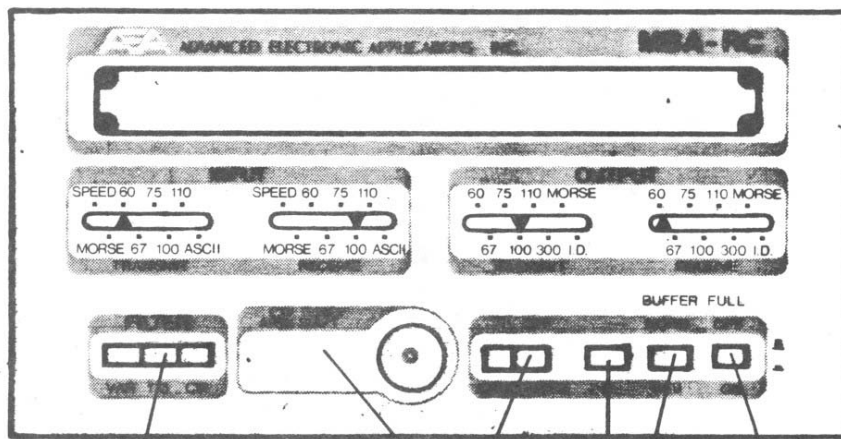
170 HZ   Tune for Max   Off   Norm   On
          closure with
          no flicker.

For ID at end of
Xmission (with
Xmit output switch
in Morse position)
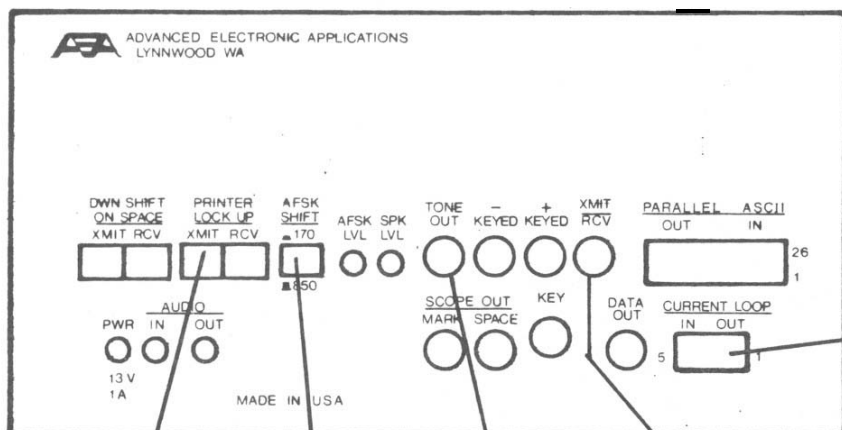
Keyboard printer
hookup.

In   170 Hz   AFSK to   To TX/RX
                Xmit MIC   switch
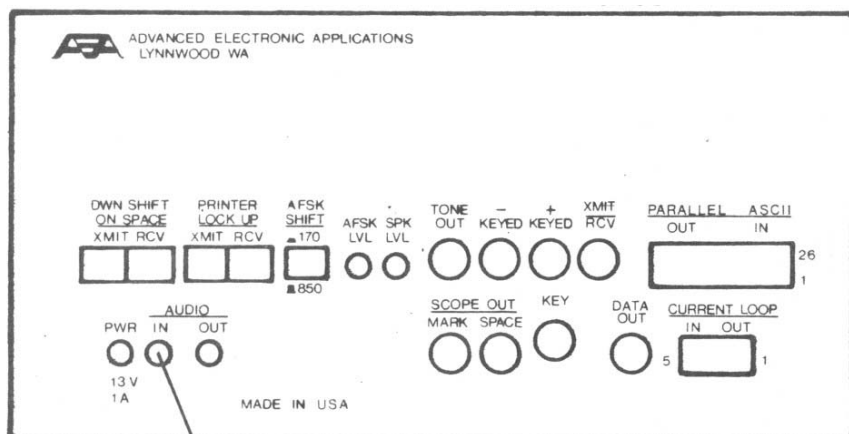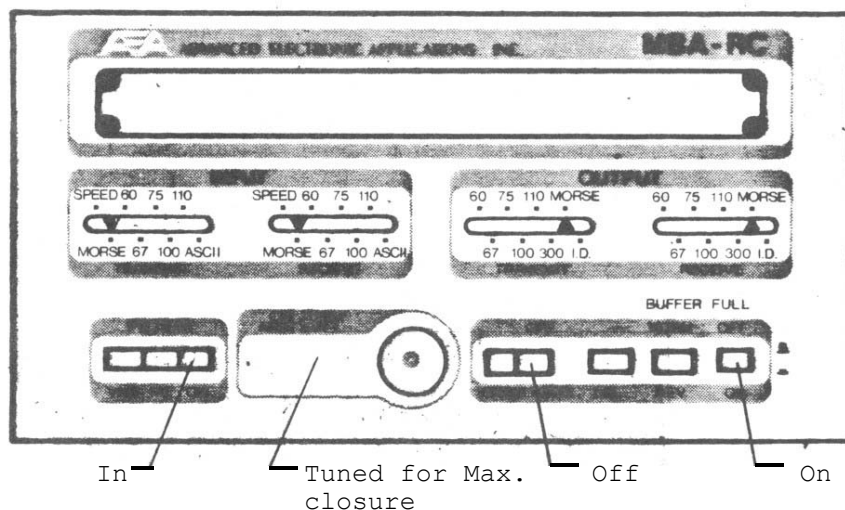   input

ILLUSTRATION 6

CONDITION:

Your Station: Working Morse-using 32 character display.
Other Station: Working Morse

| TRANSMIT	RECEIVE	TRANSMIT	RECEIVE
You are output-ting Morse into Xmtr direct from keyer, any posi-tion will do.	You are reading Morse from 32 character display.	With no input in transmit mode, any position will do.	Can use key in-put to MBA-RC to set lower Morse speed that is regenerated with internal speaker

In —   — Tuned for Max.   — Off   — On
              closure

— From RX speaker output

ILLUSTRATION 7

<u>CONDITION</u>:

Your Station: Working 110 Baud ASCII- using 300 Baud ASCII printer.
Other Station: Working 110 Baud ASCII.
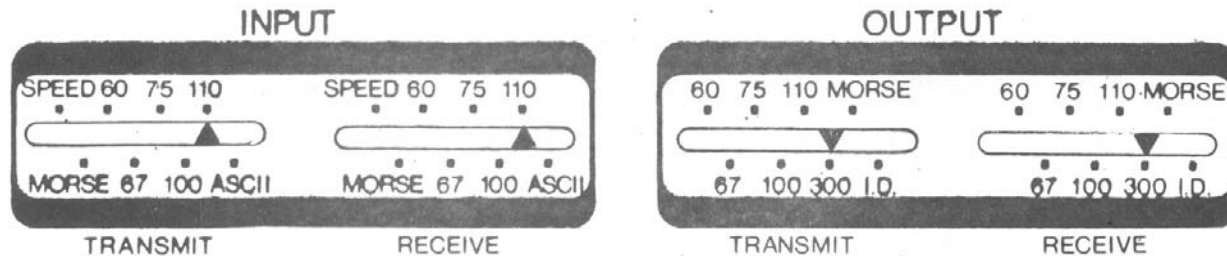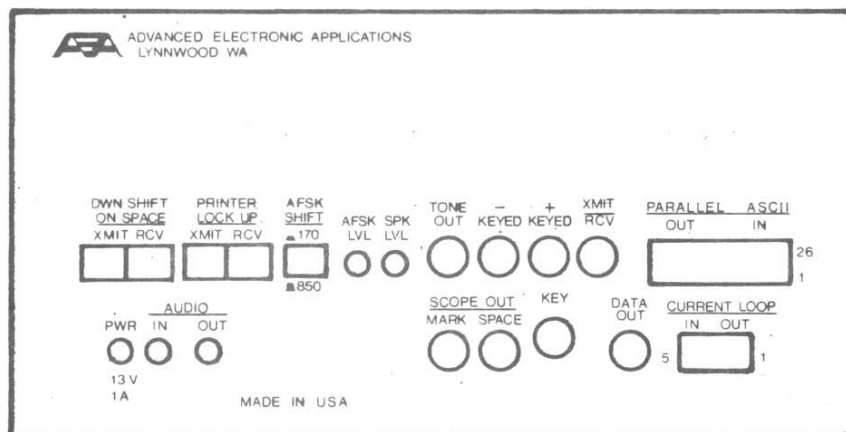

NOTE: You cannot input
      300 Baud to MBA-RC.

      You could work the other
      station if you set your
      ASCII keyboard to 110 Baud.

You can get hard
copy of the re-
ceived signal on a
300 Baud ASCII
printer.
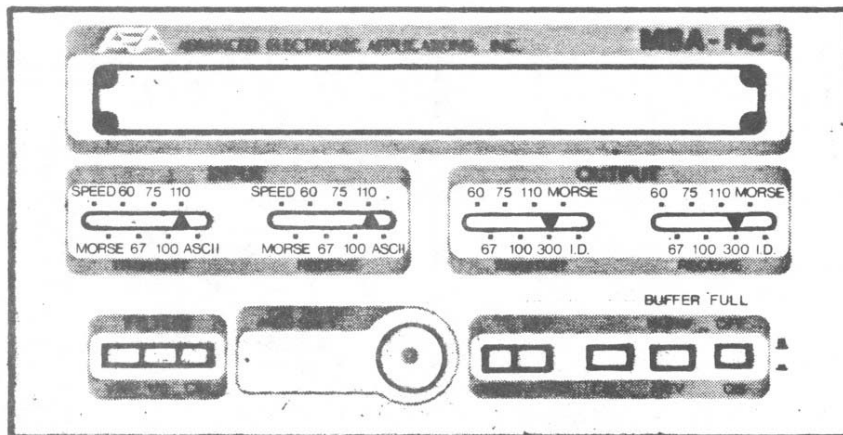
N.A.

N.A.

ILLUSTRATION 8

CONDITION:

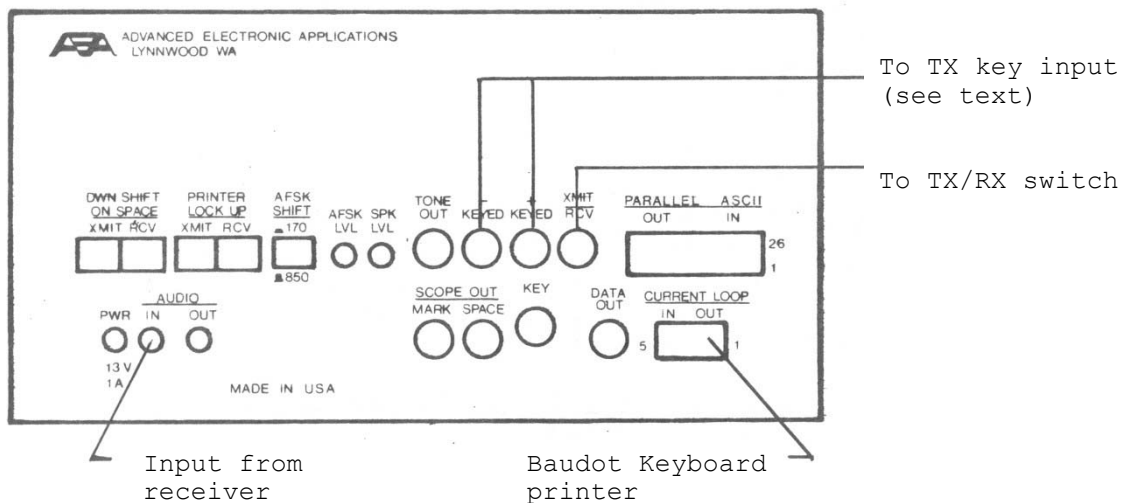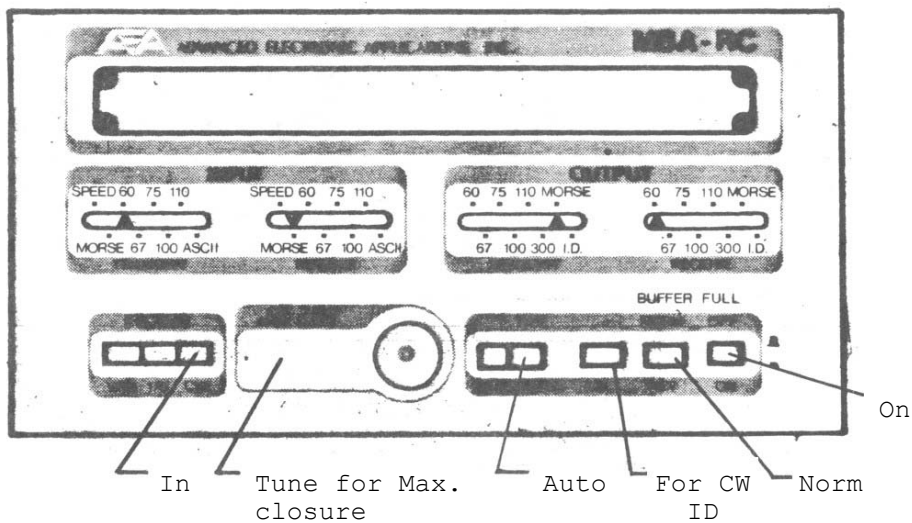Your Station: Working 60 WPM-using Teletype Machine
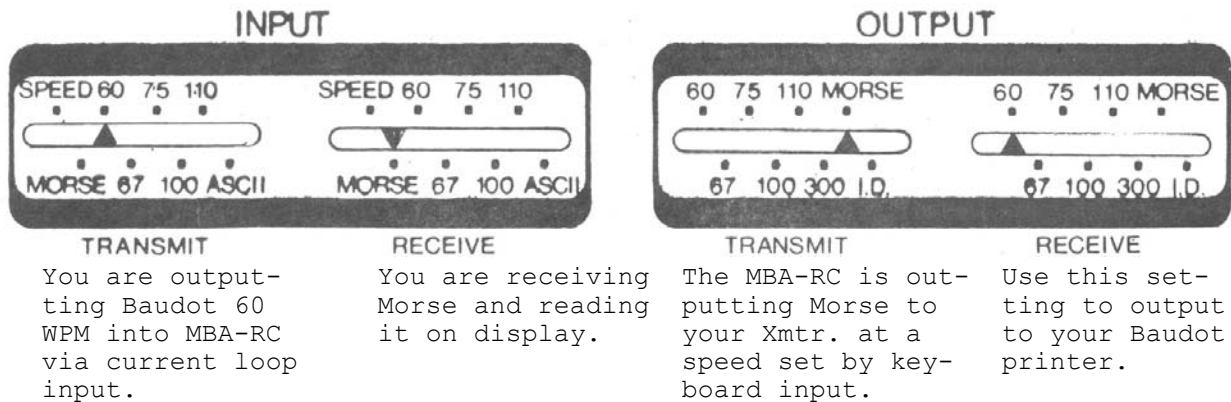Other Station: Working Morse.

INPUT

TRANSMIT

You are output-
ting Baudot 60
WPM into MBA-RC
via current loop
input.

RECEIVE

You are receiving
Morse and reading
it on display.

OUTPUT

TRANSMIT

The MBA-RC is out-
putting Morse to
your Xmtr. at a
speed set by key-
board input.

RECEIVE

Use this set-
ting to output
to your Baudot
printer.

In   Tune for Max.   Auto   For CW   Norm
            closure   ID

To TX key input
(see text)

To TX/RX switch

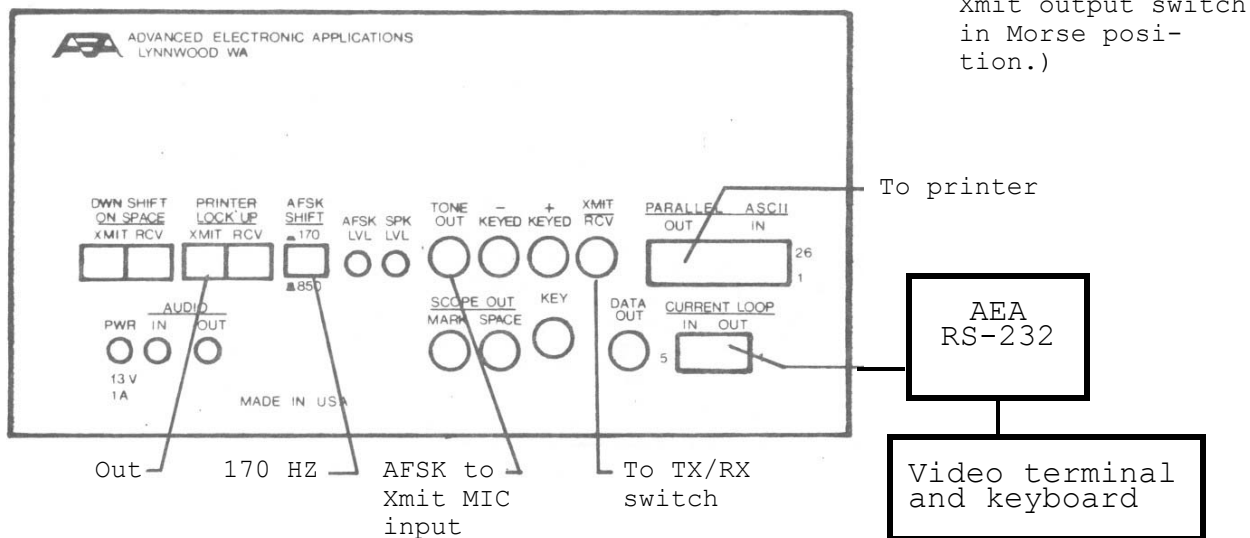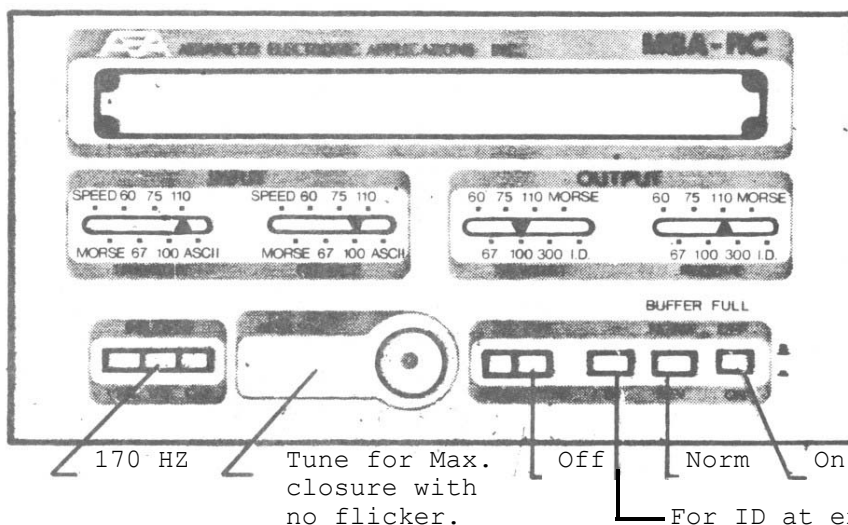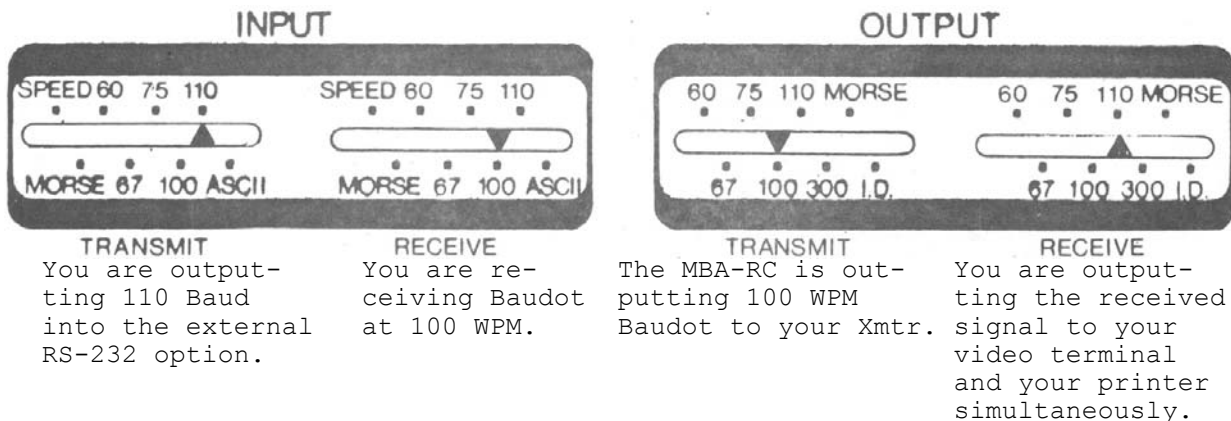Input from
receiver

Baudot Keyboard
printer

ILLUSTRATION 9

CONDITION:

Your Station: Working ASCII 110 Baud-using video terminal and printer.
Other Station: Working Baudot 100 WPM.

INPUT

SPEED 60 75 110   SPEED 60 75 110

MORSE 67 100 ASCII   MORSE 67 100 ASCII

TRANSMIT   RECEIVE

You are output-   You are re-
ting 110 Baud   ceiving Baudot
into the external at 100 WPM.
RS-232 option.

OUTPUT

60 75 110 MORSE   60 75 110 MORSE

67 100 300 I.D.   67 100 300 I.D.

TRANSMIT   RECEIVE

The MBA-RC is out- You are output-
putting 100 WPM   ting the received
Baudot to your Xmtr. signal to your
                    video terminal
                    and your printer
                    simultaneously.

170 HZ   Tune for Max.   Off   Norm   On
              closure with
              no flicker.

For ID at end of
Xmission (with
Xmit output switch
in Morse posi-
tion.)

To printer

AEA
RS-232

Out   170 HZ   AFSK to   To TX/RX   Video terminal
                 Xmit MIC   switch   and keyboard
                 input

Review these illustrations until you can quickly set up the
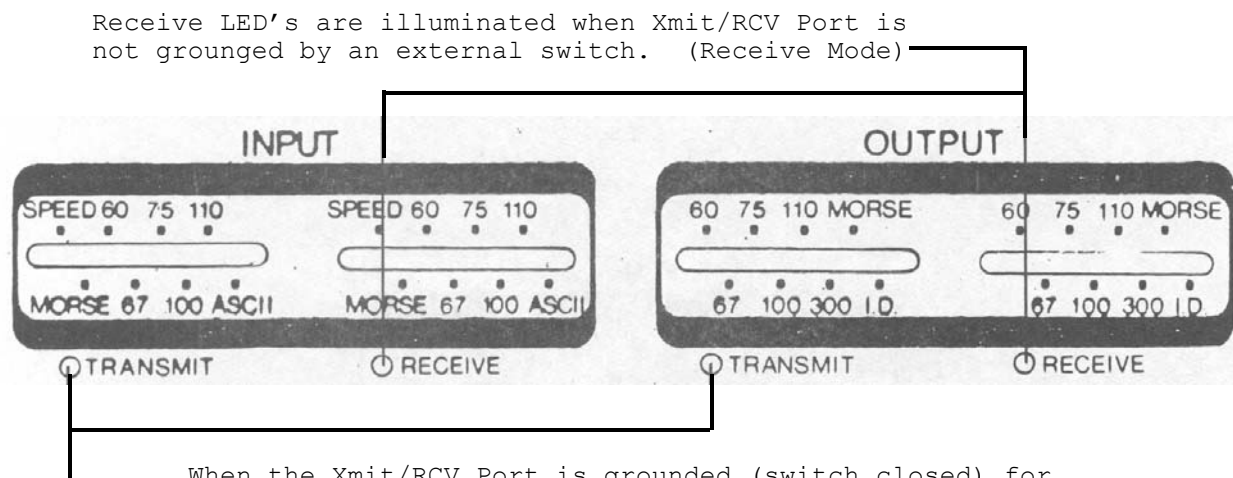MBA-RC for the type of contact you wish to make.

For Morse operation you can monitor the receiving speed.
See illustration for this setting. Similarly you may monitor
your Morse sending speed. (See illustration). The input and
output Morse speeds will appear on the extreme right side of
the display.

Speed indication of Morse Transmission

Morse Speed of Received Signal
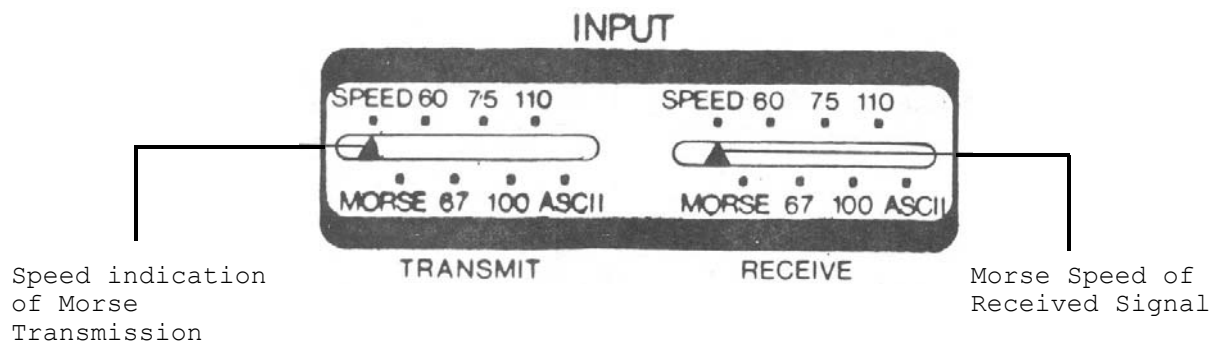
Morse Code Speed Shown On Display

When in the receive mode for Input and Output, you will see
two LED's as shown:

Receive LED's are illuminated when Xmit/RCV Port is
not grounged by an external switch. (Receive Mode)

When the Xmit/RCV Port is grounded (switch closed) for
transmitting, the receive LED lights are extinguished
and the transmit LED's are illuminated.

On the Output Side, the two slide switches each have an I.D.
setting. In addition there is an I.D. push button beneath
this Output area.

The I.D. function has two uses. First for loading an 1den-
tification message such as tIDE K6RFK" and two, changing the
CW output speed. If the MBA-RC I.D. is not programmed, the
CW output will be at 20 WPM. Higher or lower speeds can be
programmed as follows:

Using a Keyboard: If a keyboard input of any type, Baudot,
serial or parallel ASCII is being used, the Output mode switch
must be in-'Morse and the speed change is accomplished by typing

the Bell function followed by a two digit speed. On ASCII
keyboards, the BELL function is generated by Control G. On
Baudot keyboards, the BELL function is generated by figures "S".
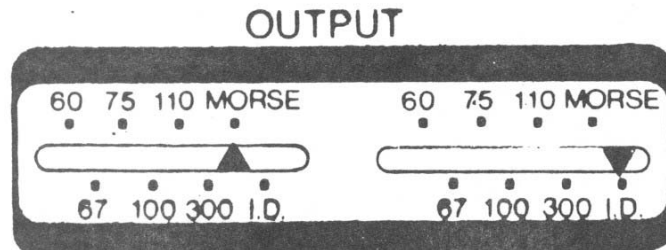
If a keyboard is not being used, place the mode switch in I.D.
and press and release the I.D. button, then send the two digits
by key or paddle. If there is a word space delay between the
two digits on the display, the entry will not be accepted. To
try again, move the mode switch from I.D. to Morse and back to
I.D. and again press I.D. button and send the two digits.
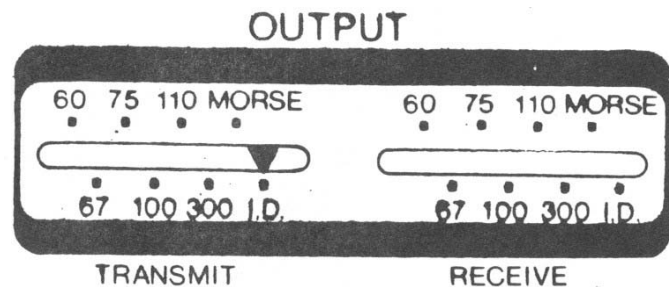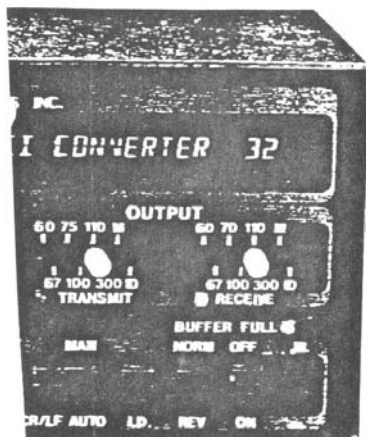
To load an I.D. message, ie. DE ------ (your call letters) put
the mode switch in the I.D. position. Message loading in the I.D.
position is limited to 40 characters. The Buffer Full indicator
will light when the 40 character message memory is full. After
the Buffer Full LED is on, additional characters will not be
loaded. To finish loading the message, switch the Output mode
switch out of the I.D. position.

There are three filter selections available from the front
panel. Two are for AFSK teletype use, one is for CW use. The
position marked 170 is for use with Amateur and Commercial
170 Hz shitt teletype with MARK TONE at 2125 Hz and SPACE at
2295 Hz.

In the VAR position, the SPACE tone filter is tunable with the
Tune Control from approximately 2225 Hz to 3125 Hz giving a
frequency shift range of approximately 100 Hz to 1 KHz.

The CW position is also used with the Tune Control to set the
internal CCW filter frequency. The range in CW is from
approximately 900 Hz to 950 Hz.
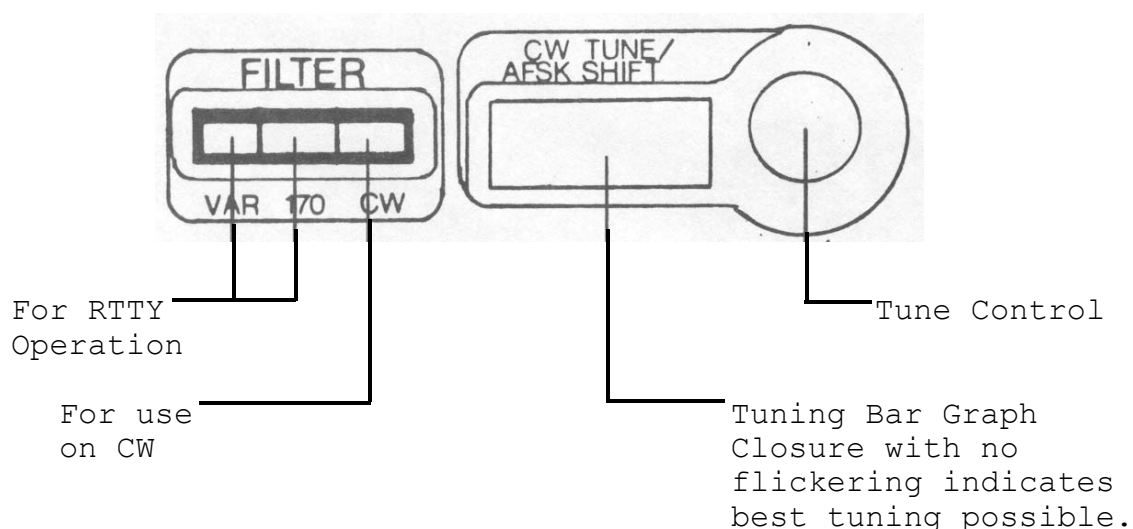
CR/LF stands for Carriage Return and Line Feed. The CR/LF push
switch generates a carriage return followed by a line feed output
when any of the Baudot or ASCII output modes are used. This
allows manual control of the carriage and line feed of printers.

The Auto CR/LF switch, in the depressed position, activates an
internal character counter which generates an automatic car-
riage return-line feed signal at the first space following
60 characters or at the end of 71 characters. No data is lost
during the carriage return-line feed operation. This mode should

be used with CW input and teletype output modes as it will pro-
vide automatic insertion of the carriage return line feed
signals at the proper number of characters. It may also be used
with teletype input signals but will probably cause short lines
of copy due to the transmission of carriage return line feed
signals from the originating station.
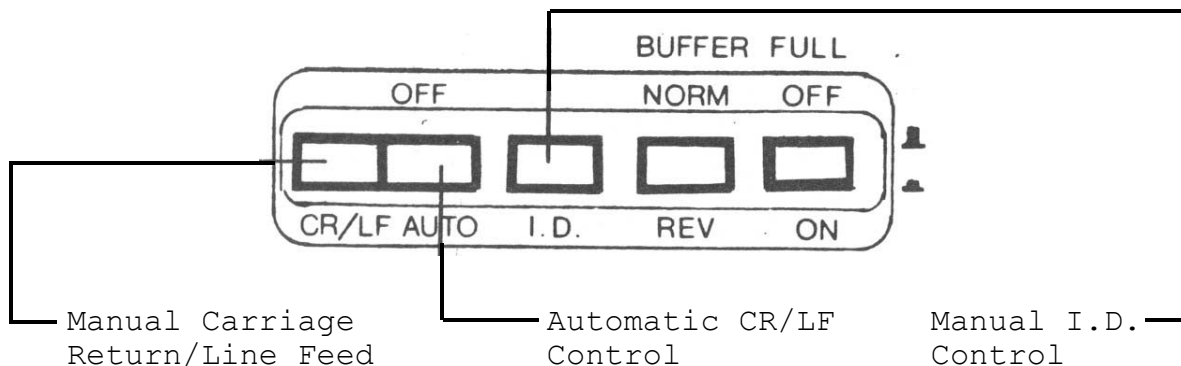
The I.D. Memory Message Send switch is used to activate the
memory message system. The memory message may be sent in any of
the output modes and may, for example, be sent in RTTY and again
in CW for CW identification when using RTTY.

The Normal-Reverse switch is used on the audio input teletype
modes to select the tones used for Mark and Space. Normal AFSK
uses 2125 Hz for the Mark tone and the Space tone is higher
in frequency by 170 Hz shift for a 2295 Hz tone.

In some applications (sometimes by error) the mark and space
tones are reversed. The Norm-Rev switch is used in such cases to
re-invert the tones. If a HF receiver is used for RTTY copy on
Upper Side Band, the Norm-Rev switch should be in the Rev
position. In the Lower Side Band setting on the HF receiver, the
switch should be in the Norm position.

The Buffer Full LED lights when the 1024 character buffer has 25
characters left. If the buffer is over flowed, the vacuum
fluorescent display will blank out. When the overflow is relieved
the display will resume operation. Data in the buffer when the
display blanks out will not be lost. To avoid having the display

blank out during normal operation, if no output device is being
used, it is a good practice to leave the receive output switch in
the 300 Baud ASCII position to avoid inadvertent filling of the
buffer. Also, the Buffer Full LED is used with the I.D. memory
message unit. It will light when more than 40 characters have
been entered. The first 40 characters will be loaded in the I.D.
memory. Characters sent after the Buffer Full LED is illumi-
nated will not be loaded.
The On/Off push button controls the power to the MBA-RC.

CHECK OUT PROCEDURE

RECEPTION OF CW

1.   Be sure the MBA-RC is set up with the proper supply, 10 to
     VDC at 1.2 amperes.
2.   Have audio from either your receiver's headphone jack or
     from your speaker leads and have the Audio In input
     connection made to the MBA-RC.
3.   With your receiver, tune in a strong CW signal with good
     fist quality.
4.   Turn MBA-RC power On. The display should be illuminated.
5.   On the receive input section: slide the switch to Morse.
6.   Set the Filter to CW and with the receiver frequency tuning
     control, tune for maximum closure of the Bar Graph. This
     should cause the copy to appear on the 32 character display
     and progress from right to left across the panel. The MBA-RC
     Tune Control can be used for fine tuning.

If you make any but the finest adjustment in the receiver tuning,
you will lose the copy on the 32 character display. It will be
necessary to re-tune to retrieve the copy. If your receiver has
CW filtering, switching in or out of the filters may also be
cause for receiver and MBA-RC re-tuning.

Be sure your receiver has been turned on long enough to assure

good frequency stability. An unstable receiver will result in loss of CW copy due to frequency drift. You will find that a receiver noise blanker can be most useful at times when copying CW in the presence of noise spikes.

The MBA-RC will do a good job of copying signals with QRM. With your receiver, tune to a frequency where there is some QRM and isolate a CW signal. Using the above tuning procedure tune for effective copy on the MBA-RC display. You will note that with careful tuning you can obtain copy. When excessive noise or static is present the MBA-RC microcomputer will read these as E's and T's and they will appear on the display.

Practice the tuning of a CW signal until you can obtain good copy under a variety of receiving conditions.

If you have never before used a computerized Morse code copying unit, you may initially be disappointed because solid copy is not the rule. The MBA-RC should perform as well as, or better than, most all other Morse code readers on the market.

In general, you will note the following:

1.   Many slow speed signals on the air are accompanied by sloppy
     fists. Quite often, the faster the station's sending, the
     better his fist.
2.   At speeds within your own ability to copy, the reader will
     not perform as well as your own brain, particularly when
     noise spikes are as strong, or stronger than, the signal or
     when the signal is sent with a sloppy fist.
3.   Sometimes a slow AGC will be better than fast AGC and
     vice versa, depending on your receiver.
4.   The MBA-RC Morse reading function is most useful for
     teaching you to copy code at a higher speed than you would
     normally copy comfortably. The large 32 character display
     allows you to "piece together" what would otherwise be

     poor copy.
5.   The MBA-RC is very useful for those operators who cannot
     seem to copy code without a pencil and paper. After suffi-
     cient practice using the MBA-RC, copying CW in your head
     will become second nature.
6.   Probably one of the biggest uses for the MBA-RC in CW mode
     is in monitoring your own transmitted fist as it goes out
     over the air. Many operators are surprised to learn just
     how sloppy their automatic keyer generated CW can be. This
     is normally a result of improper spacing between characters
     and words.
7.   The ⌀ symbol is an indication of an invalid character
     that is seven elements or less in length. Any invalid
     character of seven elements or more in length is simply
     ignored by the reader.
8.   You will note that the MBA-RC copies RTTY much better than
     CW. This is due to the inherent noise rejection features
     of RTTY operation.

TRANSMISSION OF CW

Transmission of CW would normally be accomplished by using a
Baudot or ASCII keyboard. It is possible to use a hand key or
electronic keyer as an input and use the MBA-RC to change the
speed, but that is really impractical. From the rear panel of
the MBA-RC, make the correct connection from the keying out port.
For a cathode keyed transmitter and most transistor rigs, use the
+ keyed output. For blocked grid keyed transmitters use the
- keyed output.

Be sure the Transmit/Receive switch is operable. You may use an
external toggle switch or a transmit relay contact closure on
your transceiver.
Refer to Illustration 6 for the proper front and rear panel
switch settings.

KEYING PROCEDURE

1. If using separate receiver and transmitter be sure you are
    zero beat with the receiver frequency and you have a clear
    frequency.
2. Effect closure of the Transmit/Receive switch.
3. Key the transmitter, with your selected method.
4. Using accepted operating procedures either call CQ or
    respond to a calling station. Upon completion of your call,
    if using an external switch, be sure you are in the receive
    mode.
5. You should have been able to visually monitor your
    transmission on the 32 character display.
6. Proceed with your QSO, observing the display in both
    transmit and receive modes.

RECEPTION OF BAUDOT - RTTY

Please study Illustration 5 for the correct connections on the
rear panel of the MBA-RC.

1. With your receiver, tune in a strong RTTY signal. Be sure
    your receiver is set at LSB, and tune to the high audio
    tone side of the RTTY signal.
2. Apply power to the MBA-RC, the 32 character display should
    be illuminated.
3. With your receiver, tune to the lowest tone frequency
    up through the RTTY signal until the Bar Graph on the MBA-RC
    reaches maximum closure, but flickers on and off with the
    signal. Then tune for maximum closure of the Bar Graph on a
    slightly lower frequency with no or only minimum flicker.
    The two peaks are close together, it is important to be able
    to tune right to the one that causes no flicker of the
    Bar Graph.
4. Minor adjustments can be made to the receiver tuning to peak
    up copy if the receiver or transmitter frequencies are
    drifting.

Practice tuning a RTTY signal so you can achieve good copy in a
minimum of time. If you experience difficulty tuning RTTY follow
the steps outlined here:

A.   Be sure all switch settings are as shown in Illustration 5.
B.   Make sure all rear panel connections are correctly made.
C.   Try selecting a different speed, e.g. 60-67-75-100 to
      ascertain you are tuned to the right speed. Most amateur
      RTTY is at 60 WPM.
D.   If copy is garbled, push the Norm/Rev switch in. If the
      originating station is transmitting in Reverse mode the
      copy will be garbage.
E.   Switch the Filter to Var (variable) in case the originating
      station is using something different than 170 Hz shift.
      When you switch to Var you will need to re-tune the Bar
      Graph for maximum closure.
F.   The 2125 - 2295 Hz tones used for most RTTY is a higher
      pitch than most CW operators are used to. If your
      transceiver has passband tuning of I.F. Shift, be sure both
      controls are properly centered.
G.   If you have an X -Y oscilloscope, you can connect it to the
      scope output jacks on the rear panel of the MBA-RC for
      precise tuning. The ARRL Amateur Radio Handbook is an
      excellent reference source for more information on RTTY.

If none of these remedial moves clears up the problem, don't
dispair. If you are copying Commercial RTTY you should know that
much of their transmission is encrypted so you cannot intercept
the copy (especially much of the news service RTTY).

TRANSMISSION OF BAUDOT - RTTY

WARNING.....WARNING.....WARNING.....WARNING.....WARNING.....WARNING

      During RTTY transmissions your transmitter operates in a key-
      down mode. Most amateur transmitters can be damaged by con-
      tinous operation at their normal CW input power levels.
      It will be necessary to reduce input power when using AFSK

teletype to about 40% of the normal CW input power. Consult
the Owner's Manual for the transmitter you are using.

Study Illustration 5 for the proper rear panel control and connection
procedures. Make sure all connections are secure. Now look at the
front panel switches. The only change will be in the Output/Transmit
slide switch. Put this switch on <u>60</u>.

                        TRANSMITTING PROCEDURE

1.   If you are using a separate transmitter and receiver, be sure
      the transmitter is zero beat with your receiver.
2.   Effect closure of the Transmit switch either manually or via
      a transmitter contact closure.
3.   Using your Baudot keyboard, either respond to a RTTY station
      calling CQ or initiate a CQ call. When completed be sure the
      T/R switch is set for receive.
4.   When a station responds, carryon with the QSO per the above.
5.   To prevent your printer from repeating your transmissions you
      should set the Xmit Printer Lock Up button into the OUT position
      on the rear panel.
6.   The 32 character display will be operative and show your Baudot
      transmissions.

<u>RECEPTION OF ASCII - RTTY</u>

Please study Illustration 9 carefully for the rear panel connections.
If you are not using a video terminal the RS-232 option is not
required. However, your parallel output keyboard would be connected
to the ASCII parallel input port.
The tuning procedure for ASCIL is identical to the Baudot tuning
procedure. Be sure to learn the tuning by practice.

<u>TRANSMISSION OF ASCII - RTTY</u>

Be sure to observe the WARNING as set forth in the Baudot transmis-
sion. The RTTY transmitter input should be about 40% of the normal
CW input power, or the level specified in the Owner's Manual.

Again study Illustration 9 for the proper switch settings. Proceed to transmit, observing the same procedure as outlined in Baudot Transmission.

                         IN CASE OF DIFFICULTIES

If, after re-reading this manual, you are having difficulties, a phone call to the factory Customer Service Department will likely provide a quick answer to your problems. Before calling the factory, try to have the MBA-RC in operation near the tele-phone so that our technician can talk you through the problems.
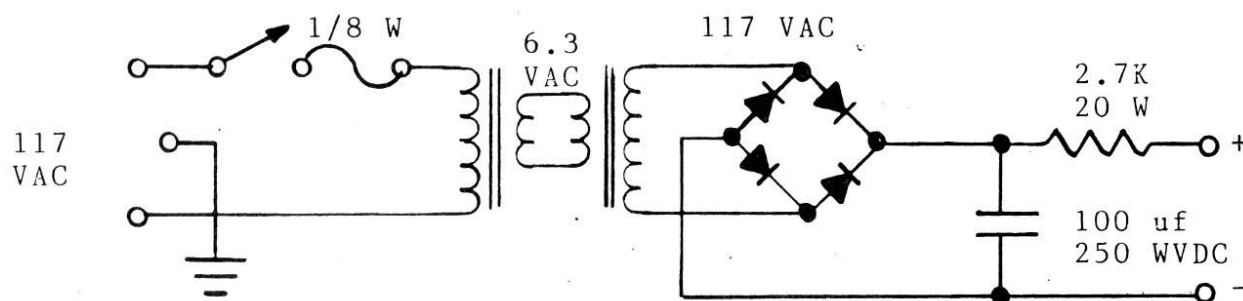
Our telephone number is 206-775-7373. office hours are 0800 to 1630 Pacific Time Zone.

SUGGESTED 60 ma. LOOP SUPPLIES
For Mechanical Teletype Machines
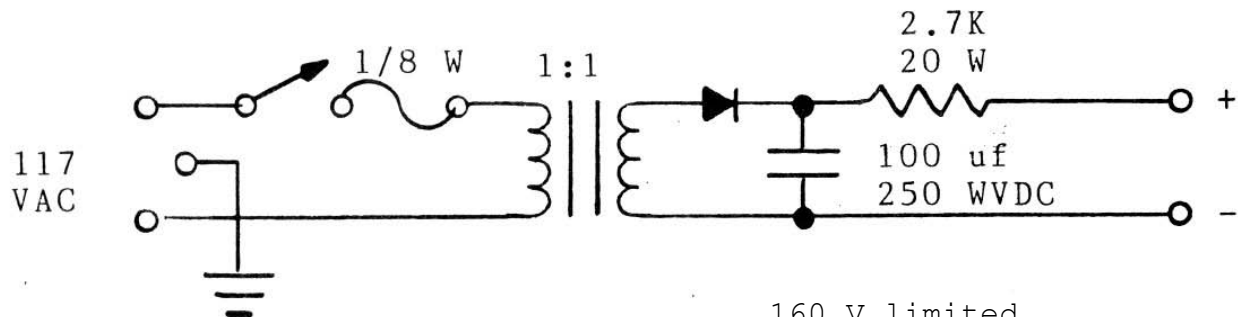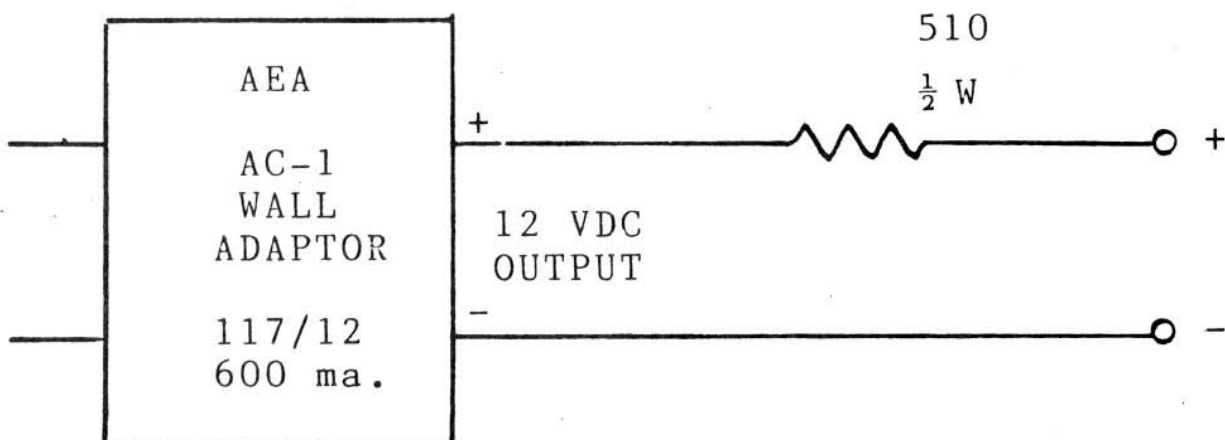

160 V limited
to 60 ma.

CAUTION: Lethal voltage
          and current.

SUGGESTED 20ma LOOP SUPPLY

For CRT Terminals
(Not recommended for Mechanical
Teletype Machines)

PARALLEL & SERIAL CONNECTIONS

1.   PARALLEL ASCII OUTPUT PINS

```
PIN               CONNECTION
 18                  DO
 9                   D1
 17                  D2
 10                  D3
 16                  D4
 11                  D5
 15                  D6
 12                  D7
 13                  BUSY
 14                  STROBE
 21                  GROUND
 20                  GROUND
 8                   + 5
 19                  + 5
```


2.   PARALLEL ASCII INPUT PINS

```
PIN               CONNECTION
 26                  D0
 1                   D1
 25                  D2
 2                   D3
 24                  D4
 3                   D5
 4                   D6
 23                  STROBE
 6                   GROUND
 21                  GROUND
 5                   + 5
 22                  + 5
```
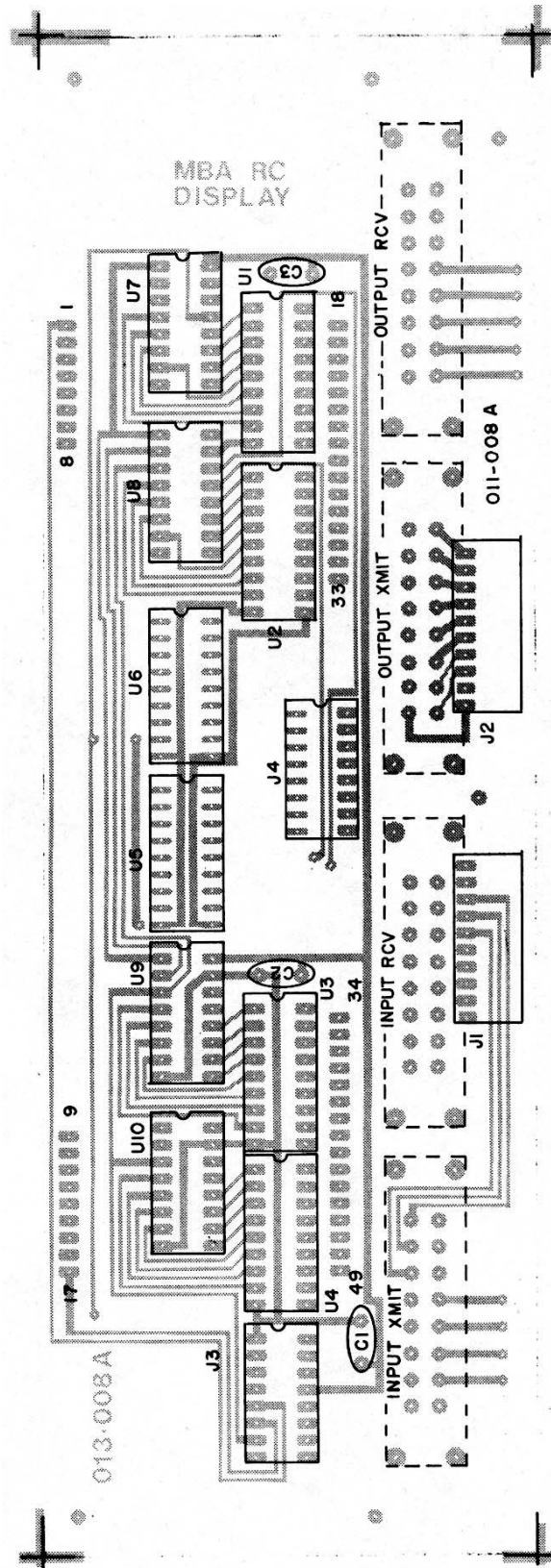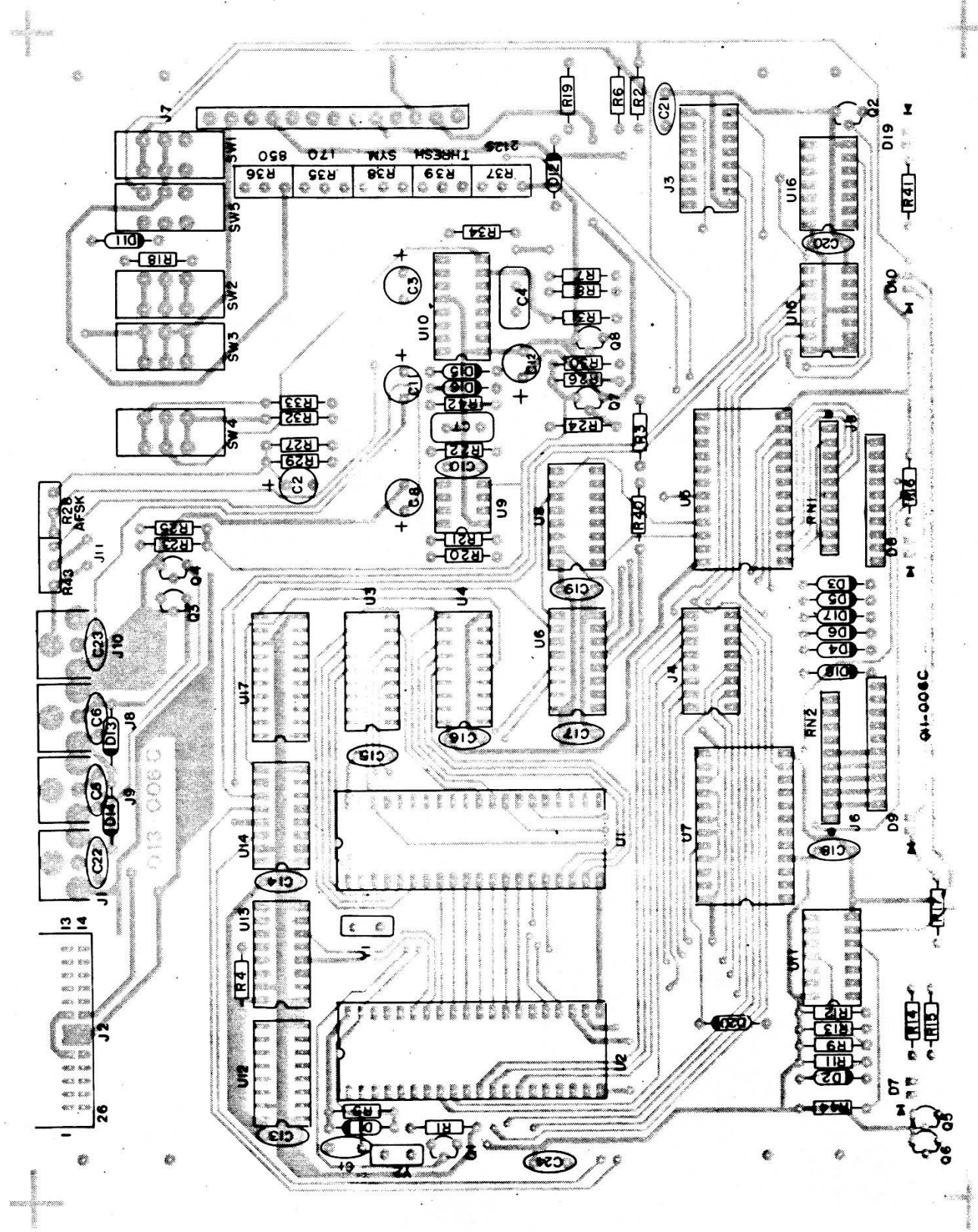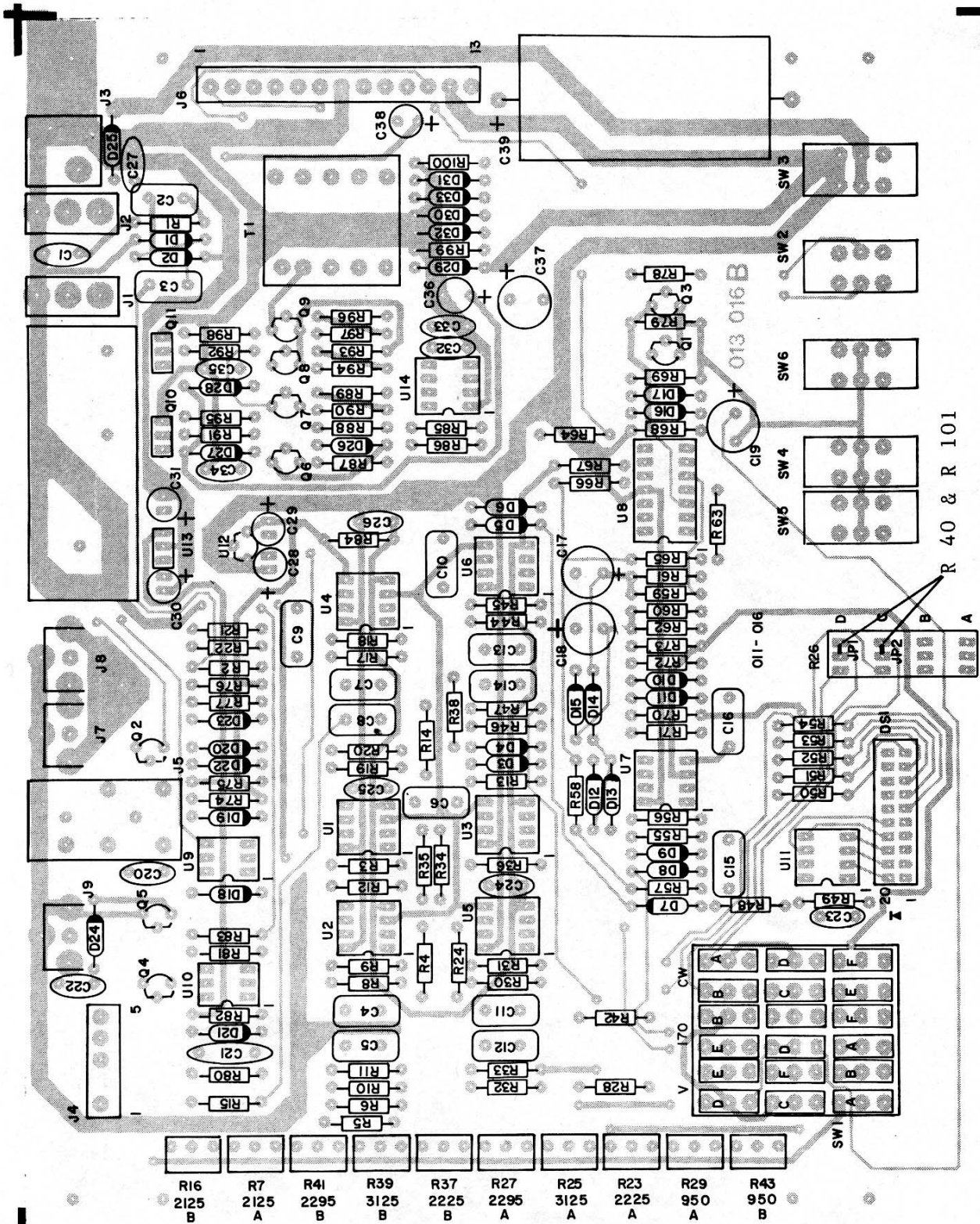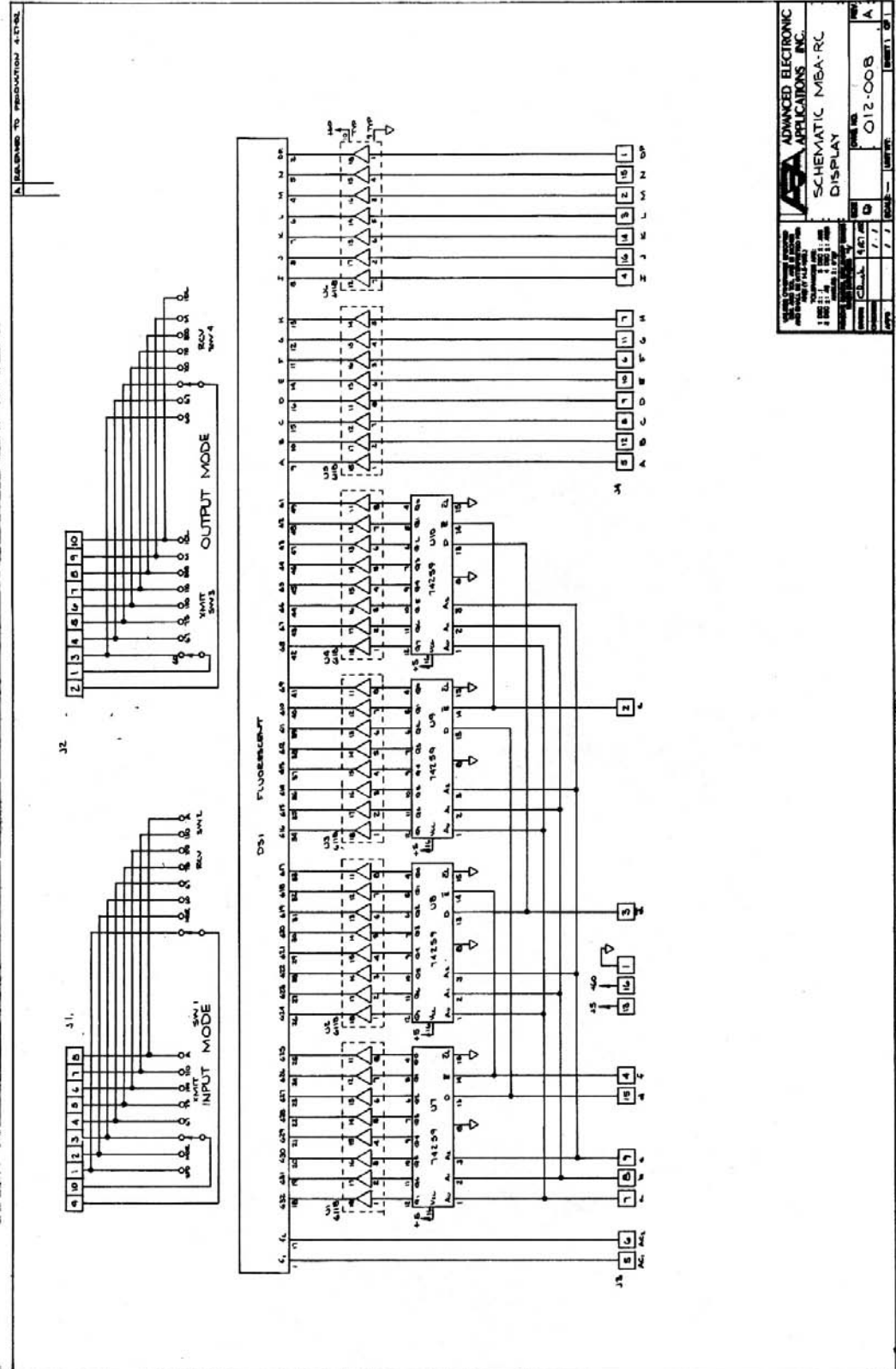

3.   CURRENT LOOP

```
PIN               CONNECTION
 1                   + LOOP OUT
 3                   - LOOP OUT
 4                   + LOOP IN
 5                   - LOOP IN
```

SYMBOLS

Letter		Symbol		Special		
A	Ꭿ	1	1	Å		
B	ꓭ	2	2	Á		
C	Ꮯ	3	3	Ē		
D	Ꭰ	4	4	CH		
E	Ε	5	5	Ñ		
F	F	6	6	Ö		
G	Ꮆ	7	7	Ü		
H	Η	8	8			
I	Ɪ	9	9	Non Valid Characters		✳
J	J	Period	.	Error		BLANK
K	Κ	Question Mark	?	Understood		Ʊ
L	L	Colon	┃			
M	Μ	Semi-colon	⌿	Additional Teletype Character		
N	Ν	Parenthesis	⟨ ⟩			
O	ꞇ	Apostrophe	'	Bell		↺
P	Ρ	Exclamation Point	!	CR		⟨
Q	Ꝙ	Quote	''	LF		↑
R	Ꞧ	Fraction Bar	/	#		⊎
S	Ꮥ	AS	ᎪᏕ	$		Ꮥ
T	Τ	SK	ᏕᏦ	%		✕
U	∐	BK	ꓭᏦ	&		⌮
V	Ꮙ	KN	ᏦᏒ	*		✳
W	Ꮃ	AR	ᎪᏒ	+		╋
X	Χ	Double Dash	╌	Null Character		Σ
Y	Υ	Hyphen	-	[or		⟨
Z	Ζ	Zero	Ø	) or		↘
				Del		✶

MBA RC
DISPLAY

C3
U7
U1
18

U8
33
U2

U6
J4

U5

U9
C2
U3
34

U10

U4
49
J3
C1

013·008 A

OUTPUT RCV

011-008 A

OUTPUT XMIT
J2

INPUT RCV
J1

INPUT XMIT

Schematic MBA-RC LOGIC

ADVANCED ELECTRONIC APPLICATIONS INC.

DWG. NO. 012-006

SCHEMATIC DIAG.
ANALOG MBA-RC.CCl

ADVANCED ELECTRONIC
APPLICATIONS INC.

012-016

PARTS LIST

Display Board

Reference	Value
DS 1	Vacuum Fluorecent Display
C 1,2,3	Ceramic Cap. .01 50V.
U 1,2,3,4,5,6	I. C. Fluorecent Display Driver XR6118
U 7,8,9,10	I. C. 8 Bit ADD LAT. 74LS259

PARTS LIST

Analog Board

Reference	Value
C 1,22,23,24,25,26,32	Ceramic Cap. .01 50V.
C 2,3,6,9,10,15,16	Mylar Cap. .1 10% 50V.
C 4,5,7,8,11,12,13,14	Mylar Cap. .068 2% 50V.
C 17,18,28,29,30,31,36	Electrolytic Cap. Rad. 10uf 25V.
C 19	Electrolytic Cap. Rad. 47uf 35V.
C 20,27	Ceramic Cap. .1
C 21	Ceramic Cap. .1 500V.
C 33	Ceramic Cap. 330p .1
C 34,35	Ceramic Cap. 33p 50V.
C 37	Electrolytic Cap. Rad. 4700uf 25V.
C 38	Electrolytic Cap. Rad. 3.3uf 100V
C 39	Electrolytic Axial Cap. 4700 uf 25V
D 3,4,5,6,8-17, 19,20, 1,2, D 26,27,28,30,31,32,33	Diode, Signal 1N4448
D 7	Diode, Zener 4.7V. 1N751
D 21 - 25	Diode, Power 1N4006
D 29	Diode, Zener 6.8 V. 1N5235A
Q 1,3,5,6,7	Transistor NPN 2N3904
Q 2	Transistor NPN MPS 6521
Q 4	Transistor NPN MPS A42
Q 8,9	Transistor PNP 92 PU51
Q 10,11	Transistor PNP MPS U51

<u>PARTS LIST</u>

Analog Board

<u>Reference</u>	<u>Value</u>
R 1,21,22,34,35,69,83,87 ,65,66	Resistor ¼w. 5% 10K
R 2,3,12,78,100,72	Resistor ¼w. 5% 20K
R 4,14,55,56,70,71	Resistor ¼w. 1% 20K
R 5	Resistor ¼w. 1% 7.87K
R 6, 15,28,42	Resistor ¼w. 5% 270
R 7,16,25,27,39,41	Pot. Trim 500
R 8,17,30,34	Resistor ¼w. 1% 2.26K
R 9,18,31,45	Resistor ¼w. 1% 4.53K
R 10,19,32,46	Resistor ¼w. 1% 27.4K
R 11,20,33,47	Resistor ¼w. 1% 7.32K
R 13.63.67	Resistor ¼w. 5% 200K
R 23,27	Pot Trim 1K
R 24	Resistor ¼w. 5% 30K
R 26	Pot 2 Gang 1K-1K
R 29,43	Pot Trim 5K
R 36	Resistor ¼w. 5% 360
R 38	Resistor ¼w. 5%
R 48,82	Resistor ¼w. 5% 180
R 49	Resistor ¼w. 5% 620
R 94,97	Resistor ¼w. 5% 750
R 75	Resistor ¼w. 5% 2.2K
R 76	Resistor ¼w. 5% 200
R 77	Resistor ¼w. 5% 300
R 79	Resistor ¼w. 5% 2K
R 80,89,101,40	Resistor ¼w. 5% 3.6K
R 74,81	Resistor ¼w. 5% 5.1K
R 88	Resistor ¼w. 5% 2.4K
R 64,6B,73	Resistor ¼w. 5% 47K
R 50,51,52,53,54,84	Resistor ¼w. 5% 470
R 57,58,59,60,61,62,86	Resistor ¼w. 5% 100K
R 85,90,91,92,93,95,96,98,99	Resistor ¼w. 5% 1K
U1	I.C. DUAL OP AMP. LM358
U 2,3,4,5,6,7	I.C. DUAL BI-FET XR082
U 8	I.C. COMPARATOR LM319
U 9	I.C. OPTO ISOL. 4U25
U 10	I.C. OPTO ISOL. H11D2
U 11	I.C. LED LADDER DR. TL487C

<u>PARTS LIST</u>

Analog Board

<u>Reference</u>	<u>Value</u>
U 12	I.C. REGULATOR 78l05
U13	I.C. REGULATOR 7805

<u>PARTS LIST</u>

Logic Board

<u>Reference</u>	<u>Value</u>
C 1, 24	Ceramic Cap. .1 50V.
C 2,3,8,11	Electrolytic Cap. 10uf 25V.
C 4,7	Mylar Cap. 10% .033
C 5,6,10,13 - 23	Ceramic Cap. .01 500V.
D 1,11,12	Diode, Signal IN4448
D 2,13,14,15,16	Diode, Power IN4006
D 3,4,5,6,17,18,20	Diode, Germanium IN270
D 7,8.9.10,19	Diode, LED Red
Q 2,8	Transistor NPN 2N3904
Q 3	Transistor PNP MPSA92
Q 4	Transistor NPN MPSA42
Q 5,6	Transistor PNP 2N3906
Q 7	Transistor NPN MPS6561
R 1,2,3,6,7,8,9, 11,13,20,26	Resistor ¼w. 5% lK
R 21,42, 5, 44	Resistor ¼w. 5% 10K
R 14,15	Resistor ¼w. 5% 20K
R 16,17	Resistor ¼w. 5% 150
R 18,19,30,40	Resistor ¼w. 5% 15K
R 22	Resistor ¼w. 5% 100
R 23	Resistor ¼w. 5% 130
R 25	Resistor ¼w. 5% 470
R 31	Resistor ¼w. 5% 510K
R 32	Resistor ¼w. 5% llK
R 33	Resistor ¼w. 5% 6.8K

PARTS LIST

Logic Board

Reference	Value
R 12,24,27,29	Resistor ¼W. 5% 5.1K
R 4	Resistor ¼w. 5% 4.7K
R 41	Resistor ¼w. 5% 180
R 34	Resistor ¼W. 5% 12K
R 38	Pot Trim 25K
R 39	Pot Trim 500
R 35,36,37	Pot Trim 5K
R 43	Pot Trim 50
R 28	Pot Trim 50K
U 1	I.C. uP AEA MBA-RO
U 2	I.C. uP AEA MBA-RC
U 3,4	I.C lKX4 MOS RAM 2114
U 5,7	I.C 16 to 1 MUX 74150
U 6	I.C. 8 BIT ADD LAT. 74LS259
U 8	I.C. CMOS LATCH 4044
U 9	I.C. TIMER 555
U 10	I.C. FUNCTION GEN. XR2206
U 11	I.C. HEX INVERTER 7416
U 12,13,14	I.C. HEX BUFFER 74LS367
U 15	I.C. DUAL NAND 7420
U 16	I.C. QUAD NAND 7400
Y 1,2	XTAL 4.000 MHz

TECHNICAL SPECIFICATIONS

Morse Speed Range	2 to 80+ WPM
Baudot Speed Range	60-67-75-100 WPM
ASCII Speed Range	110 Baud, (300 Baud transmit only)
I.D. Buffer Capacity	40 Characters
Buffer Capacity	1024 Characters
TTY Current Loop	20 to 60 mA
Parallel ASCII Port	26 Pin Socket
RS 232 Provision (optional)	VIA Current Loop Connector
Tuning LED Bar Graph Indicator	Scope Output (X-Y)
Keying Output	Cathode, Blocked Grid and Transistor
Switching	Manual Transmit/Receive or from Automatic Transmit/Receive Contact Closure
AFSK Output	Tone Out Connector
AFSK Shift	170 and 850 Hz Front Panel Variable 100 to 1000 Hz Shift
AFSK Output	Rear Panel Adjustable
Speaker Level Control	Rear Panel Adjustable
Printer Lock Up	For Transmit & Receive
Down Shift On Space	For Transmit & Receive
Audio Input	Rear Panel Connector
Speaker Output or Tape Input of Audio	Rear Panel Connector
Power Required:	13 VDC ± 3 V @ 1.2 Amperes.
Weight:	4 lb. 6 oz.
Dimensions:	7¼" deep x 9¼" wide x 5" high
Scope Output	2.5 to 6.0 Volts PP

LIMITED WARRANTY

ADVANCED ELECTRONIC APPLICATIONS, INC. warrants to the original purchaser that this product shall be free from defects in material or workmanship for ninety days from the date of original purchase. In order to obtain warranty service: (1) Complete and mail the warranty registration card to Advanced Electronic Applications, Inc., and (2) Send written notification to the address below as soon as possible after discovering a possible defect:

Advanced Electronic Applications, Inc.
Attention: Service Department
2006 -196th S.W.
Lynnwood, Wa. 98036

The written notification must include a copy of the invoice. Include a description of the defective part or condition, with details of the electrical connections to associated equipment and list such equipment. Please enclose your name, phone number, and address. Shipping charges for any parts or units submitted for replacement under this warranty must be paid by the purchaser.

Correct maintenance, repair, and use are important to insure proper performance from this product. Carefully read the Instruction Manual. This warranty does not apply to any defect AEA determines is caused by (1) improper maintenance or repair, including the installation of parts or accessories that do not conform to the quality and specification of the original parts; (2) misuse, abuse, neglect, or improper installation; (3) accidental or intentional damage.

All implied warranties, if any, terminate ninety days from the date of original purchase. AEA is not responsible for damage to other equipment or property or any other consequential or incidental damage of any kind whether based on contract, negligence, or strict liability. Maximum liability shall not, in any case, exceed the purchase price of the unit.

The foregoing constitutes AEAs entire obligation with respect to this product. The original purchaser and any user or owner shall have no other remedy and no claim for incidental or consequential damages. Some states do not allow limitations on how long an implied warranty lasts or do not allow the exclusion of incidental or consequential damages, therefore, the above limitations and exclusions may not apply to you.

This warranty gives specific legal rights. You may also have other rights which vary from state to state.