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MODEL AVR-2

DECODER-VIDEO GENERATOR

INSTRUCTION MANUAL

A SUBSIDIARY OF OLD DOMINION SYSTEMS, INC.

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INTRODUCTION

Welcome to the world of automatic CW and silent RTTY. Your Microlog AVR-2 is a sophisticated microprocessor system utilizing state-of-the-art digital processing techniques. Through its computer program, the Motorola 6800 microprocessor will convert Morse Code and RTTY Audio Signals from your receiver speaker to an alpha-numeric visual CRT display. The decoded characters are presented on any standard video monitor in plain text featuring an easy-to-read format of up to 40 characters per line. The unit will accurately decode the received Morse signal over large variations of code speed, weight, and signal strength. The computer automatically adjusts for moderate speed and signal level changes during the course of a QSO without any operator assistance. The AVR-2 will copy code originating from any source such as straight keys, bugs, electronic keyers, and keyboards. The system will automatically start a new line and scroll up previous text without breaking most words. The display is essentially the same as would be seen on a page printer, or typewriter, where the paper feeds through the printer. The AVR-2 starts printing at the bottom of the screen and fills from bottom to top, just as the paper would advance in a typewriter with each carriage return. In addition, a 24-hour 6-digit clock is included in the display format.

When the AVR-2 is ordered with options, it will also decode RTTY (Baudot Code) and ASCII (American Standard Code for Information Interchange). It can also output the received text to an external printer.

SPECIFICATIONS

General:

Output - Composite Video	1 Volt P-P Video signal compatible with standard USA video monitor.
Output - Audio Tone Reference	200mw maximum audio output
Display Format	Normal: 24 lines, 40 characters per line Zoom: 12 lines, 20 characters per line Automatic line feed/scroll without breaking most words. 5 by 7 dot matrix character
Clock Display	- 6 Digit; Hours, Minutes, Seconds in 24 hour time. Located in upper right corner of screen.
Clock Accuracy	Locked to 60 Hz power line frequency.
Input Audio Level	Requires approximately 100 mv. AF input from speaker.
Input Impedance	1 KΩ min. Will not load speaker.
Internal AGC	30db range; fact attack; slow (2-4 second) decay.
Input Protection	1KΩ and back to back diodes to ground.
Internal Band Pass Filter	6 Pole active Chebychev audio filter; 750 - 800 Hz center frequency; 100 Hz band width; ½ db ripple
Auxiliary Input	TTL compatible for digital input. Internal pull up resistor provided for direct key connection.
Power Requirements	230/117 VAC 50/60 Hz 35 watts
Dimensions	13 3/4" width x 13" depth x 3" height
Shipping Weight	13 lbs.

SPECIFICATIONS

CW Morse Decoder:

Auto Track Speed Range	3 to 100 wpm minimum (120 wpm typical upper limit).
Weight(Dot/Dash Ratio) Range	1:2 to 1:10 Heavy to very light weight.
Morse Characters Recognized	All International Morse; 26 Letters, 10 Numerals. Standard punctuation marks - , ./?():;
Transmission Status Codes	Non Morse punctuation marks are used for the following symbols:
	BT (pause) prints =
	AS (wait:standby) prints #
	The following symbols do not print but cause a carriage return/line feed
	AR (End of Transmission)
	KN (Specific Station Go-Ahead)
	BK (Break)
	SK (End of Contact

RTTY Baudot:

Acceptable Speeds	60, 66, 75 and 100 wpm; 5 level baudot code.
Input Logic	Mark - One - Keydown Space - Zero - Keyup

ASCII:

Speed	Fixed at 110 Baud (100 wpm) 8 level code.
RTTY Demodulator	Selectable high/low tone, normal or invert, PLL demodulator. Narrow and wide shift.

Preliminary Checkout

If you have also purchased our (VM 4209 or VM 4215) video monitor, decide on a location for it and the AVR-2 and make up the required cable length using the coax and connectors supplied with the monitor. The switch on the back of the VM 4209 should be in the 75 ohm position. Connect the coax to the "video" jack on the AVR-2 and the "video input" on the monitor. Plug in both units to a 115 Vac outlet and switch to "MORSE". A raster should appear and at the top of the screen the words:

Microlog AVR-2 Set Clock: ØØ:ØØ:ØØ

This tells you that the clock must be set before normal operation can begin. Push and hold the calibrate button and watch as the hours advance. Release the cal. button just as the proper hour appears.

After a slight pause you are ready to set "minutes". The next push of the cal. button will advance the minutes. Do not release the button too soon or it will step through to the next lower time unit. If you make a mistake, simply turn the AVR-2 off and back on again to start over. A third push will start the time at ØØ seconds. The display should read the time you have just set, for example:

Microlog AVR-2 Morse 20 WPM 14:30:08

Note that 20 WPM timing parameters are pre-loaded into the computer even though there has been no code input.

If you are too anxious to bother with setting the clock, just punch the cal. button three times after turn-on to cycle through the time set routine.

With the unit in the Morse Decoder Mode, and demod switch in the 'direct' position, momentarily connect a short across the aux input

with a straight key or even a piece of wire for now. Whenever this connection is made the front panel L.E.D. tuning indicator will light, and upon release, either an "E" or a "T" will be displayed depending on the code speed. Also, if the front panel reference tone switch is in the "UP" position, a tone will be heard in the internal speaker. (See "Front Panel Controls" section for explanation of this switch). Try sending some V's. If something other than "V" is displayed (such as EEET) push and hold the calibrate button while sending some more V's. It should only take a few V's to get the automatic speed tracking synchronized. If you use the system as a code practice oscillator by connecting a key between auxiliary input and ground, the video monitor should display any code sent. (It may be necessary to hold the calibrate push button down while keying a few letters before proper code reading is achieved.)

As you send code the text should appear on the bottom of the video monitor. Whenever the end of a line is reached the text should "scroll" up one line and permit you to enter new text on the new bottom line.

In the event your unit fails this preliminary checkout, proceed with the section <u>In Case of Difficulty</u>.

If your unit is equipped with the RTTY option, proceed with the following checkout.

Connect a shielded cable between the rear panel 'AUX' jack on the AVR-2, and the 'AUX' jack on the AKB-1 keyboard. Turn your keyboard on and enable it for Baudot operation at 60 WPM. Position the AVR-2 front panel mode select switch to the BAUDOT position. The top display line should indicate that the unit has been placed in the BAUDOT 60 WPM mode. Now type

some characters on your keyboard and observe that they are properly displayed on the screen. Now select the next Baudot speed of 66 WPM by pushing the button marked 'calibrate' once. Note that the top line display has changed to indicate 66 WPM. Select the 66 WPM speed on your keyboard and enter some text which will be properly displayed on the screen. Proceed in a similar fashion to verify RTTY operation at 75 and 100 WPM. Note that each push of the 'calibrate' button changes the speed. To check the ASCII mode, set the AVR-2 mode switch to ASCII. Note the top display line indicating the ASCII mode. Enable your keyboard for ASCII operation and type some text. Note that typed text is properly displayed.

SPLIT-SCREEN OPTION

If your units are equipped with this option be sure to connect special multi-conductor cable between the AKB-1 and AVR-2. Then, to enable this option, type CTRL SPACEBAR on your keyboard by pressing and holding the CTRL key with one finger while pressing the SPACEBAR key with another finger. Characters entered on your keyboard will now be displayed on upper part of T.V. monitor screen. To move the 'split' line on your screen press and hold the CAL button for at least 5 seconds then the split line will start moving down in steps until it reaches its lowest point, then it will restart at its top position. Remove finger from CAL button when line is at desired position. Set mode switch to desired operating mode.

Split-Screen Operating Notes

1. The Split-Screen mode allows the AVR-2 to actually look into the text buffer on the keyboard and display this information before it is sent out. This data is transferred on the 5 conductor cable between the AKB and the AVR. Heretofore, this data was locked in the AKB text buffer until it was called for. This option gives the operator the ability to correct errors and format the text exactly as it will appear when transmitted.

2. Split-Screen option is functional in both the normal size display mode and in the magnified text mode.

3. CTRL SPACEBAR enables the Split-Screen mode (hold down CTRL key and hit the spacebar).

4. To disable the Split-Screen mode, hit CTRL SPACEBAR again. Note the flip-flop action - 1st hit enables, 2nd hit disables.

5. If interconnecting cable is inadvertently disconnected, and Split-Screen mode is enabled, the units will automatically disable the Split-Screen mode after a short "TIME OUT" and will revert to normal operation of both AKB and AVR. "TIME OUT" is about 8 seconds in MORSE; shorter in RTTY codes.

6. The location of the "SPLIT" line can be moved so that the number of lines allotted for receive and transmit can be changed to suit your needs. The range of variation is from a mimimum of 1 to a maximum of 19 lines of transmit text.

   To change the "SPLIT" location, push and hold the calibrate button for at least five (5) seconds. Then the "SPLIT" line will start to step down the screen. Hold the button in until the desired number of lines of display are selected. Note that, if you release the button and push it again, you must wait for the time delay before the line will start to move.

7. If the repeat key is pushed on the keyboard the symbol "▪▪" will be displayed for each push, instead of the entire text being repeated.

Checkout & Operation

1. Both* units should be connected for normal operation. The AVR AUX input should be connected to the keyboard as before. Connect the 5 conductor 'Split-Screen' cable between the AKB and AVR.

2. Turn on both units and go through the normal start-up procedure of setting the clock on the AVR and enabling the desired code on the keyboard. The keyboard should beep normally and the AVR-2 display will be the same as before except for the addition of a 2nd underscore line, three line spaces below the top line underscore. This is the dividing line between the transmit or edited text on the top of the screen and the received or "REAL TIME" transmitted text on the bottom of the screen.

3. Hold the CTRL key down and press the SPACEBAR once. Release the SPACEBAR first, then the CTRL key. This enables the Split-Screen mode of operation. If this mode is not enabled, there will be no text appearing above the dividing line.

4. Type a string of characters on the keyboard. They should appear instantly on the lowest line above the dividing line. As the line is filled, the text scrolls up the screen just as the received text does on the bottom.

5. Try storing a message in one of the storage locations--"HERE IS", etc. The stored text should appear on top just as before. At this point this message can be edited for mistakes by typing the "BACKSPACE" key however many times it may be necessary to correct the error and retype the desired text. Recalling the text for transmission by typing "HERE IS", etc., will cause the message

*See NOTE on next page.

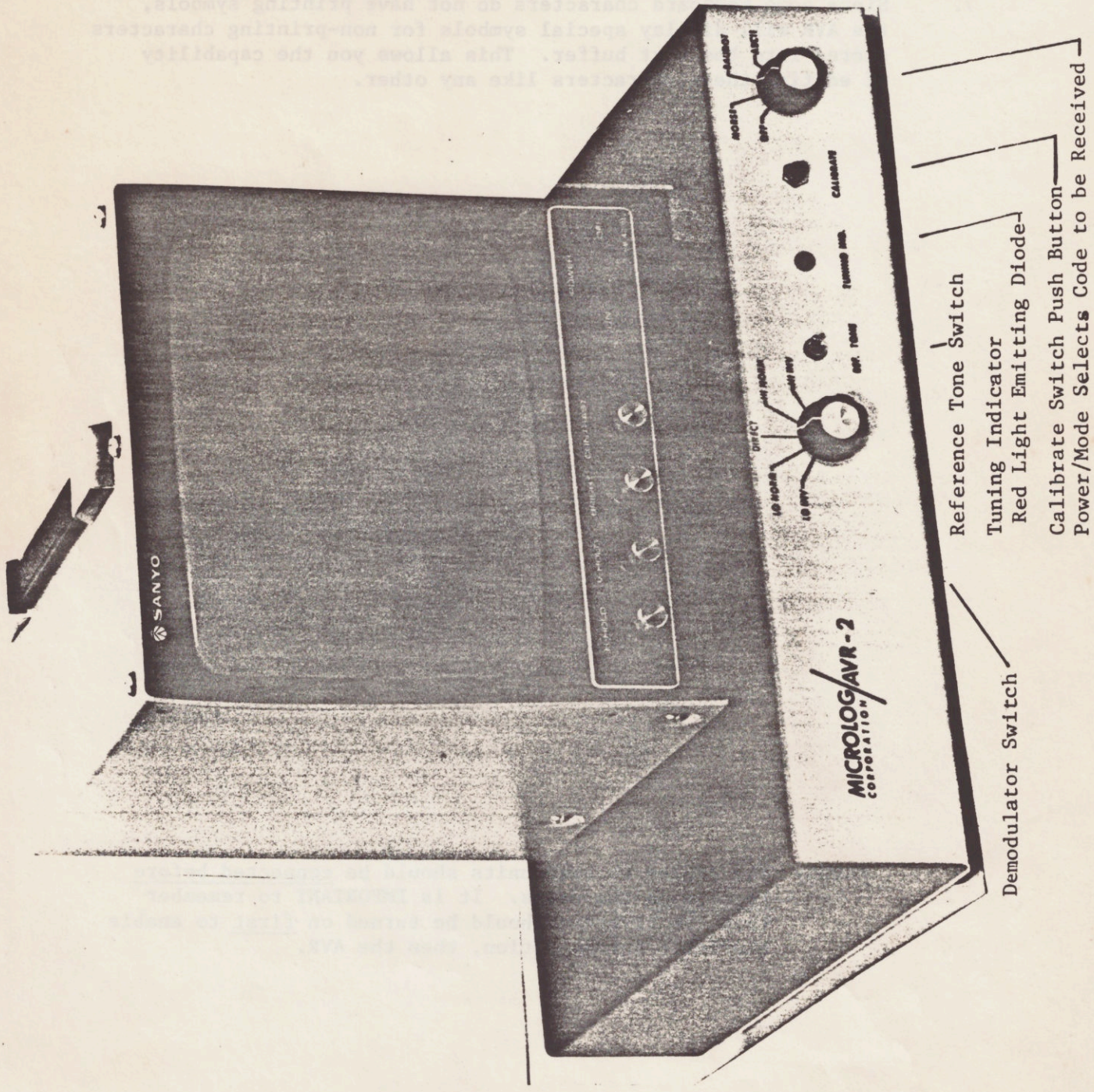
to again appear instantly on the top of the screen. The top display will remain stationary as the text is outputted and printed in "REAL TIME" as in normal operation.

6. To edit text for "on-the-air" transmission, you can put the keyboard in the stand-by mode by typing SHIFT SK and typing your text. Edit via the BACKSPACE key as before.

7. Since some keyboard characters do not have printing symbols, the AVR will display special symbols for non-printing characters stored into the text buffer. This allows you the capability of editing these characters like any other.

*NOTE: The cables to both units should be connected before turning on the units. It is IMPORTANT to remember that the keyboard should be turned on first to enable the split screen option, then the AVR.

Front Panel Controls



Front Panel Controls

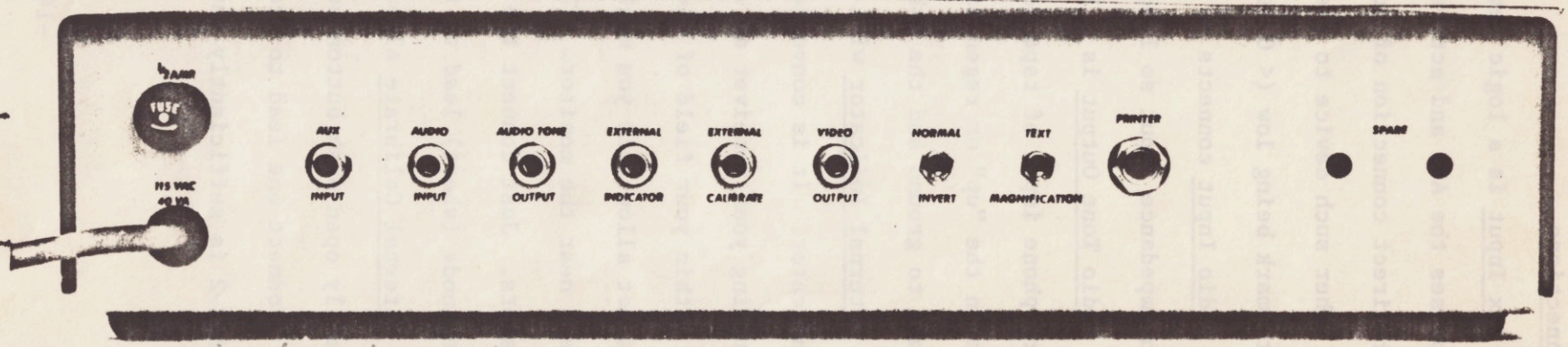
A. Power/Mode Switch CCW position is power off. The mode switch will select whatever code options are installed. For example, if you specified an AVR-2 with Baudot and ASCII options, all positions will be active. A 'MORSE' only AVR will stay on MORSE for all positions. Unspecified options will revert to "Morse Decoder". Clearing of screen is automatic when mode is changed.

B. Calibrate push button is used to tell the computer to recalculate the input speed range in MORSE. In Baudot/RTTY it is used to change standard RTTY speeds to 60, 66, 75 and 100 WPM.

C. Tuning Indicator tracks the incoming signal; keydown for MORSE, Mark for RTTY. You will note that as the receiver is tuned, the L.E.D. will light when the tone from the speaker is about 750 Hz. This is the tone to tune for since it is in the center of our 6 pole active filter passband. Tune the receiver for the same pitch. (See next paragraph for further explanation.)

D. Reference Tone mode select switch. There are two modes by which this tone can be used. You will note that the switch has three (3) positions; up, middle and momentary down. In the middle (off) position, no tone will be heard. The "down" switch position keys the tone on continuously and can be used as an aural tuning reference to adjust the pitch of the received signal. In this mode the switch is spring loaded and will return to the off position upon release. The "up" position will cause the tone to track the incoming signal just as the L.E.D. tuning indicator. Thus, a regenerated CW is produced which is also useful as an aural tuning aid. In this mode, the AVR-2 makes a fantastic code practice oscillator by connecting a hand key to the aux input on the AVR-2.

E. Demodulator Switch The 'direct' position is used for reception of CW signals or for single tone (MARK only, space only) RTTY signals. For reception of Frequency Shift Keying (FSK) RTTY signals the switch may be placed in one of the other positions. The low tone position is set for 800/970 Hz, and the high tone position for 2225/2295 Hz assuming the popular 170 Hz shift. Mark is the lower frequency in the normal position; the high frequency in the invert position.



uscita x altoparlante esterno

Audiotone Output for External Speaker

entrata audio dall'altoparlante

Audio Input from Speaker

Aux Input - Switch

lettere nere su fondo bianco

Normal - Black Letters on White Background

lettere bianche su fondo nero

Invert - White Letters on Black Background

Text Magnification (Optional) Changes screen to larger letters in fewer lines.

amplificazione del testo

½ Amp Fuse

115v AC Line Cord

all'indicatore esterno LED (filo lungo a massa)

External Indicator L.E.D. Driver (Long Lead to Ground)

esterno

External Calibrate SPST N.O. Push Button

pulsante

uscita alla stampante

Printer Output - Isolated Loop Switching

uscita video collegare al Video monitor

Video Output Connect to Video Monitor

Rear Panel Connections

A. Aux Input is a logic level (+12 volts DC max-to-ground) input that bypasses the AGC and active filter section of the AVR-2. It is used for direct connection of our keyboard, a handkey, an external RTTY T.U., or other such device to the AVR-2. It is TTL compatible for mark/space with mark being low (< 0.7v).

B. Audio Input connects to the speaker output of your receiver. This is a high impedance input so loading of the speaker is negligible.

C. Audio Tone Output is a low level output that is designed to drive the micro phone input of tape recorder. Front panel Ref. tone switch must be in the "up" or regenerated position for tone output. Connect one lead to ground and the other lead to the center pin.

D. External Indicator will drive an outboard L.E.D. for use as a tuning indicator. It is convenient to be able to watch the monitor screen while tuning your receiver as well as having the front panel tuning L.E.D. within your field of view. If the physical placement of the AVR-2 does not allow this you might want to install an external L.E.D. somewhere near the monitor. There is no need for any current limiting resistors. Just connect the cathode (long) L.E.D. lead to ground and the anode (short) lead to the center pin.

E. External Calibrate allows for connection of a SPST momentary normally open push button switch in parallel with the front panel switch. Connect one lead to ground and the other lead to the center pin. If the AVR-2 is sufficiently out of reach, it might be handy to

install the external L.E. D. tuning indicator in the same box as the external calibrate switch.

F. Video Output is a 1 volt P-P standard sync video output for connection through coax to a video monitor. (≈ 8 MHz video bandwidth required as well as XFMR isolated chassis) for runs over 6' use RG59/u 75 ohm coax.

NOTE: Do not connect video output to a TV or monitor chassis that is not transformer isolated as severe shock and injury could result.

G. Normal/Invert switch changes the screen from a positive to negative. Normal has black letters on a white (grey) background. Invert has white letters on a black background. Use whichever is most pleasing to your eye. Note that a slight adjustment of the monitor brightness and contrast controls may be necessary when changing from normal to invert.

H. Text Magnification is an optional feature that expands the display to show the letters twice their normal size with half as many lines. Normal size has 24 lines of 40 characters. The Text Magnification mode has 12 lines of 20 characters. This is very useful for group displays or "when you step on your bifocals".

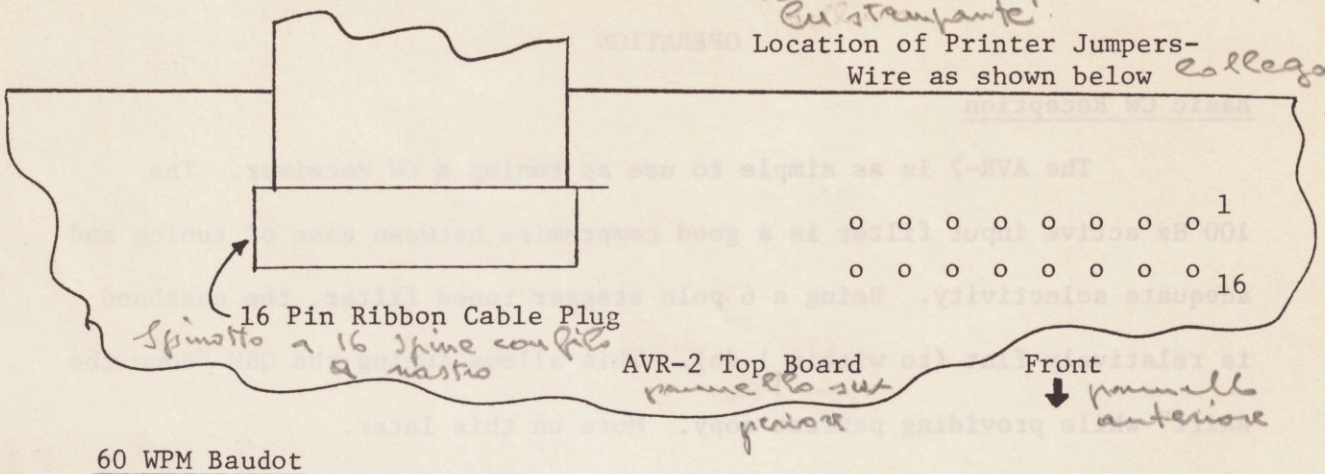
I. Printer Output is an optional feature that provides isolated contacts to switch your local loop supply and drive a hard copy printer. If your unit has been equipped with printout option, it has been supplied with an additional "stereo headphone" type jack on the rear panel of your unit labeled "Printer". By using only the "tip" and "ring" of this plug and not the "sleeve" or ground, the current loop is isolated from chassis ground. A mating plug has also been supplied that will interconnect this jack to the printer current loop. Connect your printer by connecting the tip and ring in series with your printer and the loop supply. The AVR-2 will output

either Baudot and ASCII code at the appropriate speed depending on which jumpers are installed on the computer board. Decide which speed and code your printer needs and install the proper jumpers as shown on the next page (17). Note that the unit is shipped set up for 60 WPM baudot output which requires NO jumpers.

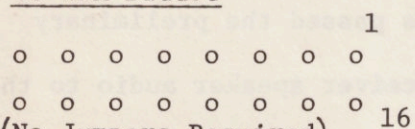
Posizione del ponticello per la stampante

Location of Printer Jumpers- Wire as shown below

collegare con quì sotto

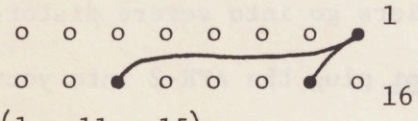


60 WPM Baudot



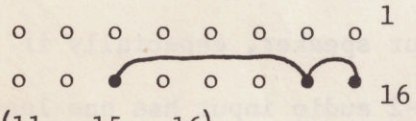
(No Jumpers Required)

66 WPM Baudot



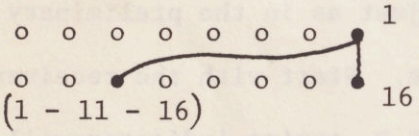
(1 - 11 - 15)

75 WPM Baudot



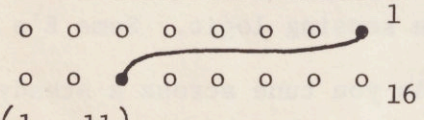
(11 - 15 - 16)

100 WPM Baudot



(1 - 11 - 16)

100 WPM (110 Baud) ASCII



(1 - 11)

OPERATION

Basic CW Reception

The AVR-2 is as simple to use as tuning a CW receiver. The 100 Hz active input filter is a good compromise between ease of tuning and adequate selectivity. Being a 6 pole stagger tuned filter, the passband is relatively flat (to within 1 db). This allows tuning the QRM "down the skirt" while providing perfect copy. More on this later.

Assuming the unit is hooked up and has passed the preliminary checkout, all that remains is to connect the receiver speaker audio to the AVR-2 audio input. This input is high impedance and will not load the speaker. NOTE: It is not recommended that the station speaker be disconnected, since some transceiver audio amplifiers go into severe distortion when not loaded properly. In other words, do not plug the AVR-2 into your external speaker jack so that the existing speaker is cut off. The AVR-2 has at least 1000 Ω input impedance whereas the typical speaker is only 4-8 Ω. Also, watch the ground connection on your speaker, especially if you run a twisted pair of wires to it. The AVR-2 audio input has one lead common to chassis ground (phonojack).

Turn on everything and set the clock just as in the preliminary checkout. Turn on/off sequence is not important. Start with the receiver volume low. As you increase the volume, the L.E.D. tuning indicator will blink rapidly as normal receiver noise trips the sensing logic. Some E's and T's should start appearing on the screen. As you tune across a steady carrier, (use your frequency calibrator in your rig), you will note the limits of the AVR-2 bandpass filter. Rock the tuning knob back and forth and watch the L.E.D. Bear in mind that you must tune the receiver so that the CW signal is within this passband. The design is such that the

center of the AVR filter coincides with the center frequency of your narrow bandwidth CW IF filter if installed in your rig. Even though the AVR filter has adequate selectivity, using your 400-500 Hz wide CW filter will aid in reception because it will prevent strong signals normally outside the narrow bandwidth from affecting the transceiver AGC and thus lowering the gain. If you flip the "ref tone" switch to the up position, the tone will track the L.E.D. and provide a second indicator for tuning.

You are now ready to copy CW off the air. To start, find a reasonably solid signal and tune it in. If conditions are fair you should be getting good copy on the screen. If nothing but E's or T's appear it means that the AVR-2 automatic speed tracking is either too fast (thinks everything is a dash) or too slow (all "dot" letters: E.I.S's.). Simply press the calibrate button to allow the AVR to "hear" some dots and dashes.

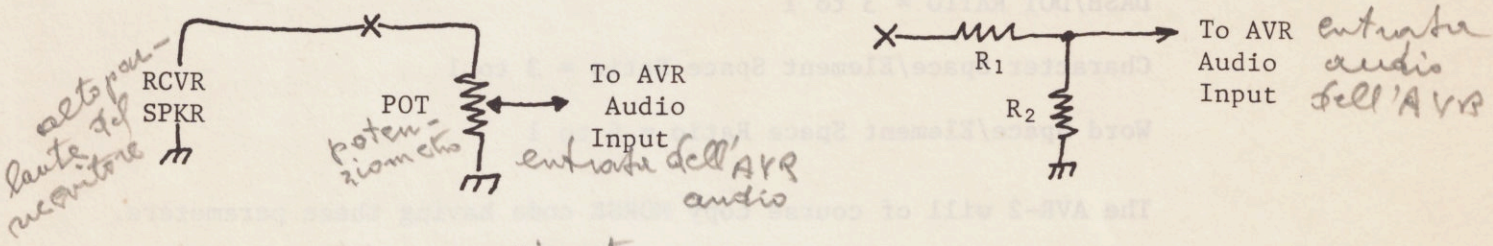
The AVR-2 computer keeps track of all timing parameters of the Morse Code being received. It independently stores information about dot length, space length, element length and word length. This allows the AVR-2 to track and copy less than perfect code. When the unit is first turned on,or is changed from another mode to CW Morse, the computer is pre-loaded with the proper timing parameters to copy 20 word per minute Morse. It is possible in the presence of noise and QRM for the AVR to hear and store incorrect information regarding the input code timing. If this happens, copy will be lost. If you were copying CW from about 15 to 30 words per minute when copy was lost, you might try switching to "baudot" and back to Morse first before pushing the calibrate button. Especially if conditions are very noisy.

There is a "software" (computer program) filter in the AVR-2 that works in conjunction with the automatic speed tracking program. This

tells the computer to ignore any signal input that is less than half a "dot" in length. It, therefore, does not see short noise bursts unless they are wider than this minimum. When the calibrate button is pressed, this filter is deactivated so that it can jump from slow to very fast CW. This inevitably makes the AVR more susceptible to noise lockup. When this occurs the AVR thinks that the noise is actually very fast MORSE code and of course prints E's and T's rapidly across the screen. Under noisy conditions it is difficult to calibrate. The easiest thing to do is to turn down the receiver audio and hand send (or with a keyboard) some slow code V's while holding the calibrate button. Once the computer "slows down" it will be relatively immune to noise.

On a quiet band, the AVR will copy CW signals that are barely audible, but as QRN/QRM conditions worsen the minimum signal requirements increase. Under deep fading conditions the AVR may miss a letter or two because of the long recovery time of its internal AGC. It responds to the audio level supplied to it by the receiver. If the receiver AGC is too fast or is subject to pumping, the AVR AGC will "set" at too high a level, running the risk of missing a character if the signal takes a small fade. The AGC dynamic range is about 30 db. The instantaneous dynamic range is 9 db. In other words, the input level can vary slowly over a 30 db range to set the AGC level, and the audio signal can drop 9 db before copy is lost. Note that this is a 9 db audio level drop, not an RF or S meter reading. Typically, a good quality receiver will hold the audio output within 6 db for a signal level range of about S-2 to 40 db over S-9.

When using the AVR-2 on VHF, the background noise from the receiver may become bothersome if it continually triggers the L.E.D. or tone. If you would like to raise the minimum audio level required, a simple resistive divider can be installed between the AVR and the receiver. Either an adjustable pot, or 2 fixed resistors can be used. Wiring and values follow:



POT ——— ——— ——— ——— ——— 100 Ω

R1 For ≈ - 6db (÷2) ——— ——— 100 Ω
≈ -12db (÷4) ——— ——— 330 Ω
≈ -20db (÷10) ——— ———1000 Ω

R2 ——— ——— ——— ——— ——— 100 Ω

After experimenting with some strong, clean signals you may want to try your hand with weaker signals. You should still tune your receiver so as to hear a clean regenerated signal note. If the signal is weak and subject to fading, you may note that the regenerated tone drops in and out. If you don't have too much background noise, you will do better by increasing the receiver gain control and turning the AGC off. In general, in a high noise environment you want to keep the gain low. In a fading environment you want to keep the gain high, so as to avoid dropouts. As one would except, you will always do better under favorable signal-to-noise conditions.

Whenever you hear a 'raspy' regenerated signal it is an indication that you are not tuned to the center frequency or the signal may be too weak to copy.

The AVR-2 is designed to accept and decode less than 'perfect' MORSE code provided the code meets some reasonable criteria. First let us examine what we mean by 'perfectly' sent MORSE code, such as that sent by machine (e.g., AKB-1). By definition 'perfect' MORSE has the following parameters:

DASH/DOT RATIO = 3 to 1

Character Space/Element Space Ratio = 3 to 1

Word Space/Element Space Ratio = 6 to 1

The AVR-2 will of course copy MORSE code having these parameters. It will however also copy much less than 'perfect' code provided the received code meets the following minimum specifications:

a. Ratio of character space to <u>average</u> element space greater than 1.5

b. Ratio of dash to <u>average</u> dot greater than 2.0

c. Ratio of word space to <u>average</u> element space greater than 5.

Note that in the above specifications we have used the word 'average'. This is because the AVR-2 continuously tracks the sender's code speeds, and continuously computes the lengths of average element space, and the average dot length.

Thus, as long as the sender's code is 'more or less' consistent, i.e., he does not change his speed suddenly, the AVR-2 will be able to copy him. You should in general have no problem with code generated by electronic keys, or even with straight keys. The only problem you are likely to encounter is that word spacing is off. If the sender leaves <u>long</u> spaces (greater than 5 times the average element space) between characters, the AVR-2 will insert an extra space between characters since it 'thinks' that a

new word has started. On the other hand, if the sender does not allow for enough spacing between his words, there is no way for the AVR-2 to know if a new word has started.

Some senders using a 'mechanical bug' key may cause the AVR-2 severe copying difficulties due to the fact that within any given character the 'mechanical bug' user will drastically vary his element spacing. Between dots, the 'mechanical bug' will generate very accurately timed element spacing, but between dashes, element spaces are generated manually and tend to be quite long. This fact fools the AVR into thinking that these long element spaces are in fact character spaces. For example, suppose the sender wants to send a '3' (DI-DI-DI-DAH-DAH). If his element spacing between dashes are long this will be decoded as 'STT' (DI-DI-DI----DAH----DAH).

Remember, the AVR does not care how long element spaces are, so long as all element spaces are more or less the same within a given character!

If you are having a QSO with an amateur using such a keying technique, simply ask him to correct his sending by being consistent with his element spaces.

You have heard people sending NNMA NNMA NNMA DE W3XXX. It is obvious that they are calling "CQ" but they are <u>not</u> sending C-Q. So naturally the AVR copies NNMA. Likewise printing TN for G, or AN for P. The AVR will take dot/dash ratios from 1:2 up to 1:10 but of necessity is intolerant of spacing. There are three distinct space lengths in MORSE. Spaces between dots and dashes; letters; words. There is very little room for error between say a letter space and a word space. Therefore, a slight hesitation in sending the word "THE" will print "TH E". Likewise from element/letter space variations, the "TN" for "G".

In no way are we saying that "perfect" code is a must for the AVR to copy. It has as much margin for error as is technically feasible with regard to dot/dash ratio and spacing. But a combination of noisy conditions and poor inter element spacing can make its use less than pleasurable. Just try sending into it with a hand key purposely sending poor CW to see how tolerant it actually is with variations.

When using the AVR-2 and the AKB-1 together, the keyboard talks to the AVR-2 via the AVR AUX input, which is connected to the keyboard AUX or ⊕ output. This way, the transmitted text is displayed on the video screen. When using this combination with a transceiver that has a CW sidetone monitor, the sidetone must be turned down (or off) so that when in CW, the AVR does not hear both signals; that is, the digital logic signal on the AUX input line and the sidetone on the audio input line. These two signals are invariably out of phase in time and will confuse the AVR when copying your transmitted text. Most radios have a "sidetone level" or similar adjustment for this purpose. Note that this dual signal situation does not exist in RTTY because there is no transceiver generated sidetone. To audibly monitor your transmission, you still have available the keyboard sidetone as well as the AVR regenerated tone. In the event you have not connected the AVR AUX input and <u>ARE</u> able to display your transmission, the transceiver sidetone frequency probably just happens to fall in or near the audio passband of the AVR input filter. Any drift in the sidetone frequency will make copy improbably.

Reception of Baudot RTTY

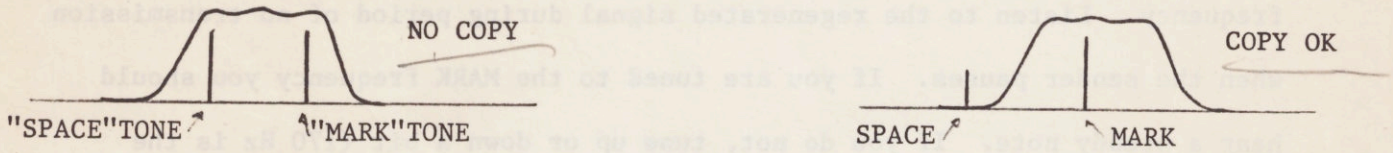
If your unit is equipped with this option you will be able to decode RTTY signals directly from your receiver without the need for an external terminal unit. You have the choice of using the built-in PLL AFSK demodulator, or the single tone digital (MARK or SPACE) decoder. Tuning a RTTY signal with the single tone decoder is very similar to tuning a CW signal except that you must make sure you are tuned to the RTTY MARK frequency. Listen to the regenerated signal during period of no transmission when the sender pauses. If you are tuned to the MARK frequency you should hear a steady note. If you do not, tune up or down a bit (170 Hz is the usual frequency shift) to the other frequency.

The AVR-2 will decode Baudot by rotating the mode control to RTTY. At this point the monitor should display "Baudot 60 WPM". The unit will now decode RTTY code at 60 WPM. For other speeds, pushing the calibrate push button will allow you to select 66, 75 and 100 WPM as indicated on the video monitor.

Single Tone Decoding

To tune in a RTTY signal using the single tone decoder, the same procedure should be followed as in tuning CW, and make sure the demod switch is in the 'direct' position. Each FSK signal has 2 notes, one note is the "Mark" and the other note is the "Space". Tune your receiver such that the "Mark" is being decoded by the input filter. The filter is very narrow so that by normal tuning to the mark an absence of tone detection will be whenever a "space" is received. If the received signal does not appear to be decoding properly (Gibberish on monitor), try tuning the receiver to the other note as you may be receiving the "Space" instead of the "Mark".

It is possible to mis-tune the receiver so that the AVR filter passes both the "Mark" and "Space" tones. See Figure 1(a). This will be evidenced by a steady reference tone and the L.E.D. on continuously. Under these conditions there is a constant logic level applied to the computer, and no decoding takes place. Tune the receiver so that the "Mark" signal is centered and the "Space" signal is down the slope of the passband, Figure 1(b).



(a) (b)

Figure 1

It is possible to switch from "Mark" decode to "Space" decode by grounding the aux input to the AVR-2. If there is QRM near the "Mark" signal as in Figure 2a, ground the aux and retune so that the space tone is centered Figure 2b.

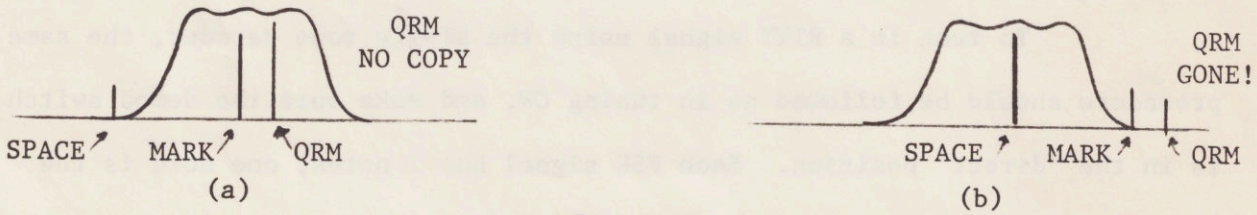


Figure 2

If you still cannot decode the signal, try the different speeds available. After some practice you will be able to identify the sound of RTTY code at each of the different speeds. There are signals that may sound like RTTY

but you may not be able to make sense of them. These signals could be telemetry, facsimile, slow scan or other FSK signals not in baudot code. There are some semi-secure military communications using selective inversion of data bits that are impossible to copy without knowing the pattern of the inverted bits.

It may appear that RTTY transmission using the 2125/2295 Hz tones are incompatible with 800 Hz input of the AVR-2. By utilizing your receiver offset (RIT, clarifier, incremental tuning, delta tune, etc.) the difference in frequency can be compensated for. Once this offset is established no further adjustments will be necessary. Follow this simple procedure. First, disable the receiver offset tuning and either call CQ or transmit to a prearranged station. Then when someone answers your CQ or your friend transmits to you, don't touch your main tuning, but use your receiver offset to tune in the signal so that the AVR-2 is receiving properly. From this point on, leave the receiver offset control set as it is and use your main tuning only. Make note of the position of the offset control and just pre-set it when you switch to RTTY from other modes. You will now be all set for transceive operation on RTTY. Just remember to pre-set the offset then don't adjust it anymore, except for a small "tweak".

Dual Tone PLL Demod

The demodulator employs a 565 Phase Locked Loop in conjunction with diode limiting, and post detection filtering to convert the input AFSK signal into a digital (Mark/Space) output. Rotating the 'demod' switch to any position other than the one labled 'direct', activates the PLL circuitry. The digital output of the demodulator is internally connected to the 'AUX'

input of the AVR-2. Since a keyboard (MICROLOG AKB-1) may also be connected to this 'AUX' input, a priority logic circuit is included in the demodulator circuitry. It essentially listens for activity on the 'AUX' line so that it will not interfere with keyboard input during transmit periods. There is also a time out circuit that delays enabling of the demodulator for 3-4 seconds after AUX line activities cease, or when the switch is changed from the 'direct' position to one of the other four demodulator positions.

The demodulator has been factory set for 170 Hz shift with 2125 Hz Mark, and 2295 Space in the high tone position, and 800 Hz Mark, 970 Hz Space in the low tone position. HF RTTY is almost all 170 Hz shift, as well as most VHF AFSK. While copying HF RTTY with the demod switch in the 'direct' position, you should be able to switch to 'Lo Norm' and obtain the same copy (after a 3-4 second delay) without having to retune your receiver. Switching to 'Lo INV' will require changing to the other sideband position on your receiver. The high tones can also be used for HF FSK copy. For AFSK on VHF FM, use the high tones, in either normal or inverted modes depending on the signal.

Unless your HF receiver has band pass tuning you will find it easier to use the low tone pair for RTTY reception. Also, most receivers will have a CW filter centered around 800-1000 Hz, thus affording additional selectivity for RTTY when using the low tone pair (800/970 Hz). To copy a RTTY signal, place your receiver in the LSB mode. Tune in an amateur 60 WPM RTTY signal (look around 14,080-14,100 KHz). Place the AVR-2 demod switch in the 'Lo Norm' position, and turn the reference tone switch to the up position. If you are properly tuned, the reference tone generated in the AVR-2 should sound 'clean' and the L.E.D. tuning indicator should flash in unison with it.

Note that a steady carrier corresponds to a Mark condition. If the decoded characters appearing on the screen do not make sense, try the 'Lo Inv' position as he may be sending 'upside down'. Also be sure the transmission is 60 WPM RTTY, if it is some other speed, simply push the 'calibrate' button on the AVR-2 front panel to select another speed. Most all amateur RTTY is at 60 WPM, with some operation at 100 WPM.

Using the high tones is quite similar except that the received audio has a higher pitch, above 2000 Hz, and may be more difficult to identify in the presence of QRM unless your receiver has bandpass tuning. On the other hand, if you are using an AFSK modulator with same 2125/2295 tone pair, you will not have to use the receiver RIT for offset tuning as you will if you use the low tone pair. See previous comments associated with Single Tone Decoding.

Calibration

As mentioned earlier, the demodulator is set at the factory for 170 Hz shift on both high and low tones. The high and low tones* can be set for different shifts as well as different frequencies. If you wish to change frequencies or if the unit requires adjustment, only a calibrated signal generator is needed. The VCO (voltage controlled oscillator) frequency is adjusted to the geometric mean of the desired Mark and Space tones. This setting is easily determined when adjusting the VCO set pot by listening to the regenerated tone in the AVR. When you are very close to the proper setting, rocking the VCO set pot very slightly (1/8 turn) will cause the regenerated tone to go on and off. Start with the pot at the full CW end of rotation and turn CCW until the regenerated tone (and LED) come on. Note that since

* See Sketch on page 31.

the PLL circuit will try to lock-up on sub-harmonics and harmonics of the BCO frequency, you may tune through a region where the regenerated tone sounds raspy or droning. Continue adjusting CCW until there is an abrupt transition between on and off. Leave the pot set at the point where the one just turns on. That is, turning the pot back 1/8 turn CW causes the tone to stop. The geometric mean frequency can be calculated by the following formula.

$$\sqrt{F\ Mark \times F\ Space} = F\ geo.\ mean$$

Example:

$$\sqrt{2125 \times 2295} = 2208\ Hz$$

Therefore when setting the high tones at the factory, our signal generator is set for 2208 Hz and the VCO HIGH set pot is adjusted for the critical point of stability of the PLL error voltage which controls the regenerated tone.

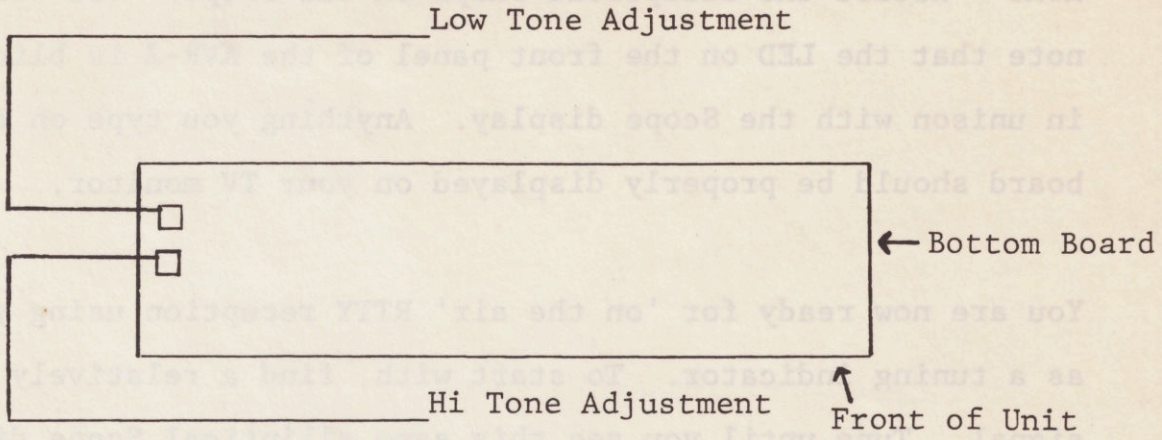
The geometric mean is the point where the percentage change is equal from each extreme. Since the VCO changes a "percentage" rather than a fixed number of cycles for a given change in control voltage, the VCO must be set to this frequency rather than the numerical mean. Common geometric means are listed below:

Battimento?

SHIFT	MARK	SPACE	GEO. MEAN
170	800	970	880
170	1275	1445	1357
170	2125	2295	2208
425	800	1225	990
425	1275	1700	1470
425	2125	2550	2328
850	800	1650	1149
850	1275	3135	1646
850	2125	2975	2517

ZF FF
1 2 3 4

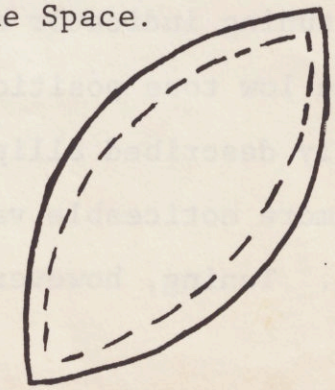
Location of VCO Controls



Scope Interface

The scope interface allows for truly "silent" RTTY operation. By tuning for a particular pattern, perfect adjustment can be accomplished without a sound.

Before you actually use this Scope tuning indicator on the air, we recommend the following checkout procedure. Connect your AKB-1 AFSK modulator output to the AVR-2 audio input (and Scope vertical input). Turn the AKB-1 modulator switch to the 'on' position. Place the AVR-2 demodulator switch to the position marked HI-NORM. Enable the keyboard in the RTTY modes by typing SHIFT KN. You should see an elliptical shape on your Scope after adjusting the horizontal and vertical gain controls. Disabling the keyboard by typing SHIFT SK, should have only a slight affect on this elliptical shape. In the figure below, the solid line represents the Mark, and the dotted line the Space.



Now with the keyboard enabled, type CTRL R to output a series of RYRY - notice the elliptical shape on the Scope. You will also note that the LED on the front panel of the AVR-2 is blinking in unison with the Scope display. Anything you type on the keyboard should be properly displayed on your TV monitor.

You are now ready for 'on the air' RTTY reception using your Scope as a tuning indicator. To start with, find a relatively strong signal. Tune until you see this same elliptical Scope display with the LED blinking. When these two conditions occur simultaneously you are properly tuned. Because of variations in incoming signal amplitude, you may want to readjust the gain controls on your Scope. If your TV does not display readable text, make sure you have selected the proper RTTY speed, or he may be sending 'upside down' in which case simply switch the demod to the HI-INV position.

With such a Scope, display tuning becomes very easy. You will be able to tell when there is noise, interference, or fading on the received signal. Remember, try to tune for a 'clean' elliptical shape with a blinking LED. Of course, if the signal is in a steady Mark or Space condition, the LED will not blink. A bit of on the air experimentation, should make you an expert "RTTY tuner".

This tuning indicator also works if you are using the demodulator in the low tone position. The main difference is that the previously described elliptical shape is more like a 'box' and there is a more noticeable variation between the Mark and Space conditions. Tuning, however, is the same as described above.

Always tune for a 'clean' elliptical shape in unison with the blinking LED!

Circuit Description

The 565 PLL Circuit consists of VCO (Voltage Controlled Oscillator) and a phase detector to sense the direction that the incoming signal is away from the VCO. The phase detector outputs an error signal which controls the VCO frequency. The free-running (no input) VCO frequency is set between the Mark and Space frequencies. As the input signal goes above and below this median frequency, the error voltage tries to move the VCO to this frequency. In this case, the loop is said to be "locked" in phase. This error voltage then becomes the detected RTTY logic signal. If no input exists or if the input is too far away, the loop is not "locked". The signal at pins 4 and 5 is the square wave VCO frequency. The R-C network integrates this square wave into a sine wave suitable for driving the horizontal sweep input of your oscilloscope. Since the vertical input is the received audio, the scope pattern will be stable only in this "phase-locked" condition. In the case of the input being too far away, only one of the RTTY tones might cause lock -- that is the VCO will lock on only the Mark (or Space) tone and will be out of lock (unstable display) on the other.

ASCII Code Input Option

With this option your AVR-2 can decode ASCII at the standard data rate of 110 baud or 100 wpm. By rotating the mode switch the full CW position, ASCII, the video monitor will display ASCII when this mode is selected. All comments applicable to Baudot RTTY also apply to the ASCII code.

Copying Commercial RTTY with the AVR-2

The AVR-2 can be used to copy many commercial RTTY stations transmitting news bulletins and weather information. While the use of a general coverage receiver is most useful, you will find some commercial RTTY just above most amateur HF bands so that your present amateur receiver will provide some coverage.

Most of these transmissions will be at 66 WPM (50 baud) with a few, especially weather stations, transmitting at 100 WPM (75 baud). These two speeds are within the capability of the AVR-2. You will also find many stations which utilize non-Latin alphabets like Cyrillic (Russian), Arabic, etc. These, of course, you will not be able to read. You should, however, find numerous stations using Latin alphabets with transmissions in English, Spanish, French and German which are easily decoded. Most of these stations use 425 Hz shift which can be copied with the AVR-2.

Tuning procedure is quite straight-forward and after some experimentation you will be able to identify and tune these signals with ease. You should have no problem in recognizing and identifying speeds of 100 WPM vs. 66 WPM. If you have a keyboard such as the MICROLOG AKB-1 it can be used as an aid to familiarize yourself with the sound of RTTY code at 66 and 100 WPM.

Assuming you have identified a solid RTTY signal, set the AVR-2 mode switch to the Baudot position and press the CAL button once. The TV display will indicate that the AVR-2 is set for 66 WPM reception. If your AVR is equipped with the built-in demodulator, set the rotary switch to the position marked 'direct'. This lets you copy a single channel, mark or space. If your unit does not have the demodulator built-in, it is automatically set

to this position. Now, tune the signal carefully and in case of QRM use your receiver's CW filter. To aid in tuning, turn on the AVR-2 reference tone switch (up). You should now hear the regenerated RTTY signal via the AVR-2 speaker. This regenerated tone should sound 'clean' and have the same pitch as the signal coming in via the receiver's speaker. The front panel LED should flash in sync with the regenerated tone. If you are tuned to the RTTY 'mark' frequency, the signal should be decoded and displayed properly on the TV screen. You may, however, be tuned to the RTTY 'SPACE' frequency and thereby not be able to decode. To correct this, you can do one of two things. You can simply return slightly (by 425 Hz) to find the 'MARK' frequency, or you can simply ground the 'AUX' jack on the real panel of the AVR-2. This serves to invert the sense of the signal so you may decode properly when tuned to the 'SPACE' frequency. If you still do not decode properly, try another speed by pushing the CAL button on the front panel of the AVR-2. The RTTY speed will be indicated on the top display line. If you still do not decode, it is likely that you are tuned to a station transmitting a non-latin alphabet, or some encrypted transmission. ARQ codes utilizing a 7 level code (baudot +2) and the 'inverted data bit' codes fall into this category. Multiplex and fax transmissions also require specialized equipment for copy. These all sound very similar to standard RTTY but are much different in coding.

If your AVR-2 is equipped with the built-in domodulator you may use it instead of the single channel 'direct' method. Place the switch in the 'Normal High' position. Place your receiver in the LSB mode and tune in a RTTY signal. You should be listening for a higher note, over 2000 Hz, from your receiver. Turn on the reference tone switch in the AVR. If you are properly tuned, this reference tone should sound 'clean' and the LED should

flash in sync with it. If decoded characters do not make sense try to reverse the switch from "NORMAL HIGH' to 'INVERT HIGH'. With the demodulator switch in the high tone position, the AVR-2 decoding scheme considers audio tones above 2300 Hz to represent the 'MARK' frequency, and tones below 2300 Hz as the 'SPACE' frequency. If the switch is in the invert position, the above logic is reversed. Thus, if the station uses 425 Hz shift, a tone of 2525 Hz will be the 'MARK' and 2100 Hz the 'SPACE'. Note that in this case your receiver band pass must be sufficiently wide to pass these frequencies. You will not be able to make use of your narrow CW filter as was the case when you use the 'Direct' position.

We have copied many commercial RTTY stations using either of the above methods with equal success. A DRAKE TR-7 which has full general coverage plus band pass tuning was used. Here is a short list of some commercial RTTY transmissions which we have regularly copied.

Approximate Frequency	WPM	Remarks
14483 KHz	66	English news bulletins
14976	66	English news bulletins
14827	66	French news bulletins
14845	66	English (UPI)
14802	66	English News
14930	66	Spanish News
14855	100	WX Report - English
14640	100	English News
16187	66	Spanish News
13892	66	Spanish News
14437	66	WX Report - French

Weather stations transmit bulletins in some fixed format. The start of the bulletin is indicated by the group ZCZC and its end by NNNN. The actual information consists of 5 figure groups. The AVR will decode these as letter groups because it 'unshifts' on space--e.g., any time a

character space is detected, the AVR switches to the 'letter' mode. Thus unless the transmitting station sends a figure shift code (WX bulletins do not) prior to each group, the AVR decodes these as letters. For those interested in reception of these bulletins, you can obtain a replacement ROM without the 'unshift on space' feature by writing MICROLOG, Customer Department.

SYSTEM DESCRIPTION & THEORY OF OPERATION

To properly decode a MORSE signal as heard on your receiver, it is first necessary to convert the received audio note into a digital (on/off) signal. Thus, the presence of an audio tone (dash or dot) must be converted into a 'one' level (MARK) digital signal, and its absence into a 'zero' level (SPACE) digital signal. The choice for a 'one' level for Mark, and 'zero' level for SPACE is completely arbitrary as these may be easily inverted.

Due to noise and fading conditions one usually encounters on the HF bands, it is not possible to use an envelope detector or a phase lock loop to convert the received audio note into a digital signal. In the AVR-2 (see Figure 1 - System Block Diagram), we first condition the received signal by passing it through a narrow band active filter. This filter includes an AGC loop designed to maintain a constant signal level at the filter output despite any input signal level variations. This AGC exhibits a fast attack, slow decay characteristic with a dynamic range of 30 db. This constant level filtered signal output is then applied to a correlation detector together with a reference signal from an audio oscillator. The reference oscillator frequency is factory adjusted to be identical with the filter center frequency. The output from this correlation detector is a digital on/off (Mark/Space) signal. It is then input to the microcomputer for further processing, and is also used to key the audio oscillator output to provide an audible "regenerated signal". (Ref. tone switch "UP"). Whenever the "regenerated signal" sounds clean, and is identical in tone with the unprocessed received audio, the receiver is properly tuned.

The Morse decoding algorithm is designed to adapt to variations in code speeds and weights. It continuously evaluates and keeps track of the average dot length and the average element space length. A Mark which is longer than twice the average dot length is considered to be a 'dash', and one which is less than twice this average dot length is defined to be a 'dot'. Similarly, a space longer than two times the average length of the element space is defined as a character space, and a space longer than four times the average length of the element space is defined as a word space. The algorithm is designed to automatically adapt to moderate speed variations, but a sudden change from say 15 wpm to 50 wpm may cause it to lose track. It is a simple matter to reinitialize it by momentarily pushing the Calibrate button while receiving characters with both dots and dashes. Once a character has been recognized it is converted into the equivalent 5 by 7 dot matrix character for video display.

For local loop applications an auxiliary input (AUX;TTL level) is available. A hand key, bug, electronic keyer or a keyboard such as the AKB-1 may be hooked directly to this AUX input. Digital signals applied to the AUX input will also cause the audio oscillator output to be keyed and heard through the AVR monitor speaker.

The microcomputer algorithm which is permanently stored in a Read Only Memory, provides the necessary instructions for processing the digital signal. The computer algorithm includes a variable bandwidth digital filter designed to pass the signal information rate. Thus when receiving code at slow speeds, the digital filter narrows its bandwidth. Conversely, at high code speeds, its bandwidth is increased to accommodate the higher information rate.

Reception of RTTY signals is usually done with the aid of a TU (Terminal Unit) which converts the received RTTY MARK/SPACE tones into an on/off digital signal. Such a digital signal may be connected directly to the AVR-2 AUX input. By using the MARK only frequency, the AVR-2 may be made to copy and decode RTTY signals even without a separate TU. In this mode the receiver is tuned so that the MARK frequency note corresponds to the input filter (750 Hz) center frequency. The MARK note is then converted to a digital signal in the same manner as for the reception of MORSE. In either case, once in digital on/off form, the RTTY signal is decoded by means of the AVR-2 microcomputer. The RTTY decoding algorithm utilizes a single master clock to shift in the serial data bits for each of the 4 built-in standard speeds of 60, 66, 75 and 100 wpm. Each received character is then decoded into the corresponding 5 by 7 dot matrix for display on the video monitor.

An AFSK demodulator is available as an optional accessory for RTTY. For use on VHF FM such an accessory Terminal Unit is necessary since AFSK (Audio Frequency Shift Keying) is the normal mode for RTTY on VHF FM. This AFSK PLL demodulator may also be used for the reception of RTTY on the HF bands as previously described in the 'Dual Tone PLL Demod' section of this manual. A post detection narrow band with digital filter (computer algorithm) is utilized for enhanced RTTY reception in the presence of noise.

AVR-2 SYSTEM BLOCK DIAGRAM

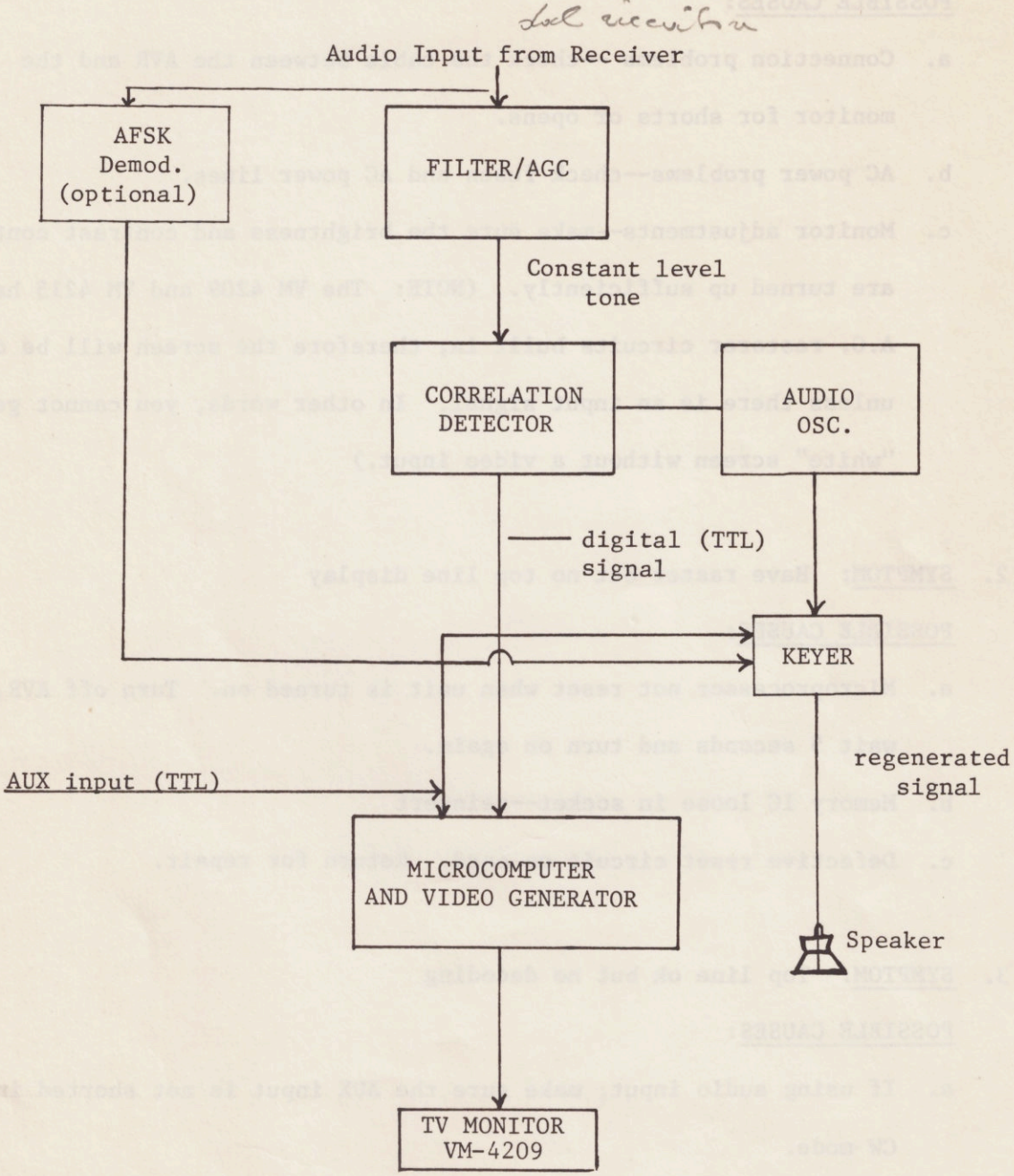


FIGURE 1

IN CASE OF DIFFICULTY

1. SYMPTOM: No raster on video monitor

   POSSIBLE CAUSES:

   a. Connection problems --check the cable between the AVR and the monitor for shorts or opens.

   b. AC power problems--check fuses and AC power lines.

   c. Monitor adjustments--make sure the brightness and contrast controls are turned up sufficiently. (NOTE: The VM 4209 and VM 4215 have A.C. restorer circuits built in, therefore the screen will be dark unless there is an input signal. In other words, you cannot get a "white" screen without a video input.)

2. SYMPTOM: Have raster but no top line display

   POSSIBLE CAUSES:

   a. Microprocessor not reset when unit is turned on. Turn off AVR, wait 5 seconds and turn on again.

   b. Memory IC loose in socket--reinsert

   c. Defective reset circuit on card. Return for repair.

3. SYMPTOM: Top line ok but no decoding

   POSSIBLE CAUSES:

   a. If using audio input, make sure the AUX input is not shorted in CW mode.

   b. Mode switch set to wrong code

   c. Open or shorted audio input cable

d. Wrong terminal of speaker connected to common ground

e. Receiver audio amplifier not loaded properly and distorting. Add 10 Ω resistor or actual speaker for proper load.

f. Receiver volume too low--requires about 100 mv. to operate

g. Try hand key only into aux input, if this fails, then a problem exists within the microprocessor circuitry and should be returned for repair.

4. SYMPTOM: Wrong characters displayed

POSSIBLE CAUSES:

a. Auto track speed program settled at wrong range. Push calibrate button again.

b. Items b), d), e), f), g) of Symptom 3 above

c. Unit not tuned to proper pitch--AVR must hear 750 Hz ± 100 Hz to decode properly--retune receiver.

d. Very high noise level. Use noise blanker if available. If signal is fairly strong, try switching off your receiver AGC and using your RF gain control to prevent the noise from affecting the received AGC. Each radio is slightly different, so experiment with AF, RF gain and AGC speed for varying signal conditions.

e. Defective video display board--return for repair.

f. Readjust pot located on right hand side of top computer board for 2000 Hz square wave at pin 3 of 555 IC next to pot.

5. SYMPTOM: No regenerated tone

POSSIBLE CAUSES:

a. Could be same as 3c, d, or f.

b. Defective speaker in AVR--check audio tone output on back panel.

SYSTEM INTERCONNECTIONS

The MICROLOG System has provisions for direct interfaces with your amateur rig without the need of any additional equipment. For details of AKB-1 and AVR-2 rear panel connections see the respective instruction manual.

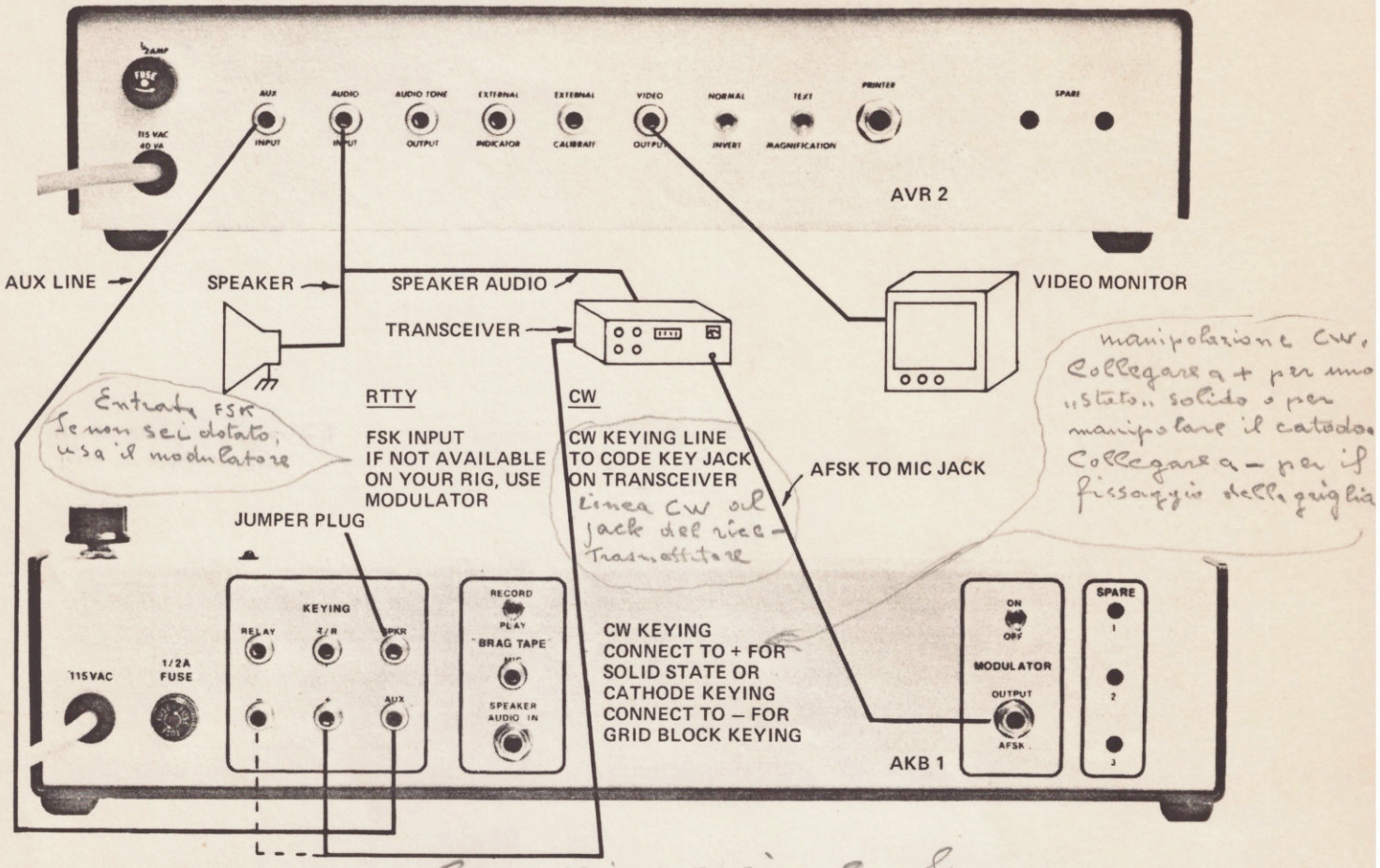
A 'local loop' connection between the 'AUX' jack on the AKB-1, and the 'AUX' jack on the AVR-2 allows you to monitor the keyboard output on the video monitor. Make sure that audio from your receiver is disabled in order not to interfere with this monitoring function. If your rig has an audio sidetone built in which lets you hear the sent code, you should disable it completely. Most rigs have provisions for disabling this audio sidetone by turning down its volume. During transmit period your normal receiver audio will be disabled so that you will not experience any interference with the 'local loop' between the AKB-1 and AVR-2. If your receiver audio is on, turn down the volume when you want to monitor your keyboard output on the TV screen

If your system is equipped with the 'Split-Screen' option, an extra 5 wire cable is provided by interconnecting the AKB-1 and AVR-2. This option is enabled by typing CTRL SPACEBAR on the keyboard as explained in the AKB-1 instruction manual.

Minimo delle connessioni richieste per RTTY e CW
RG 58/U raccomandate per tutte le connessioni eccetto che per la modulazione AFSK.

MINIMUM REQUIRED CONNECTIONS FOR RTTY AND CW

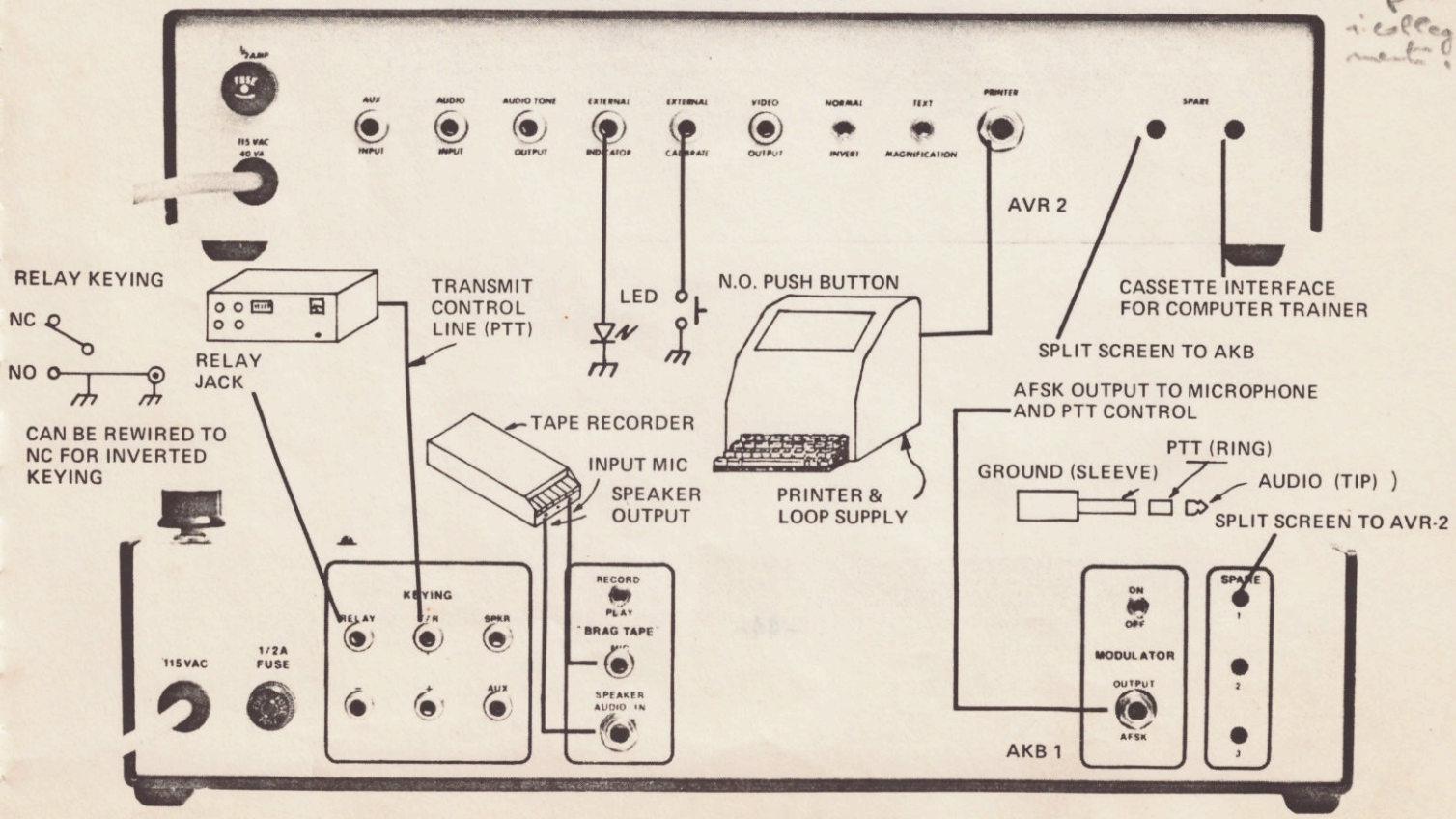
RG 58C/U RECOMMENDED FOR ALL CONNECTIONS EXCEPT AFSK MODULATION



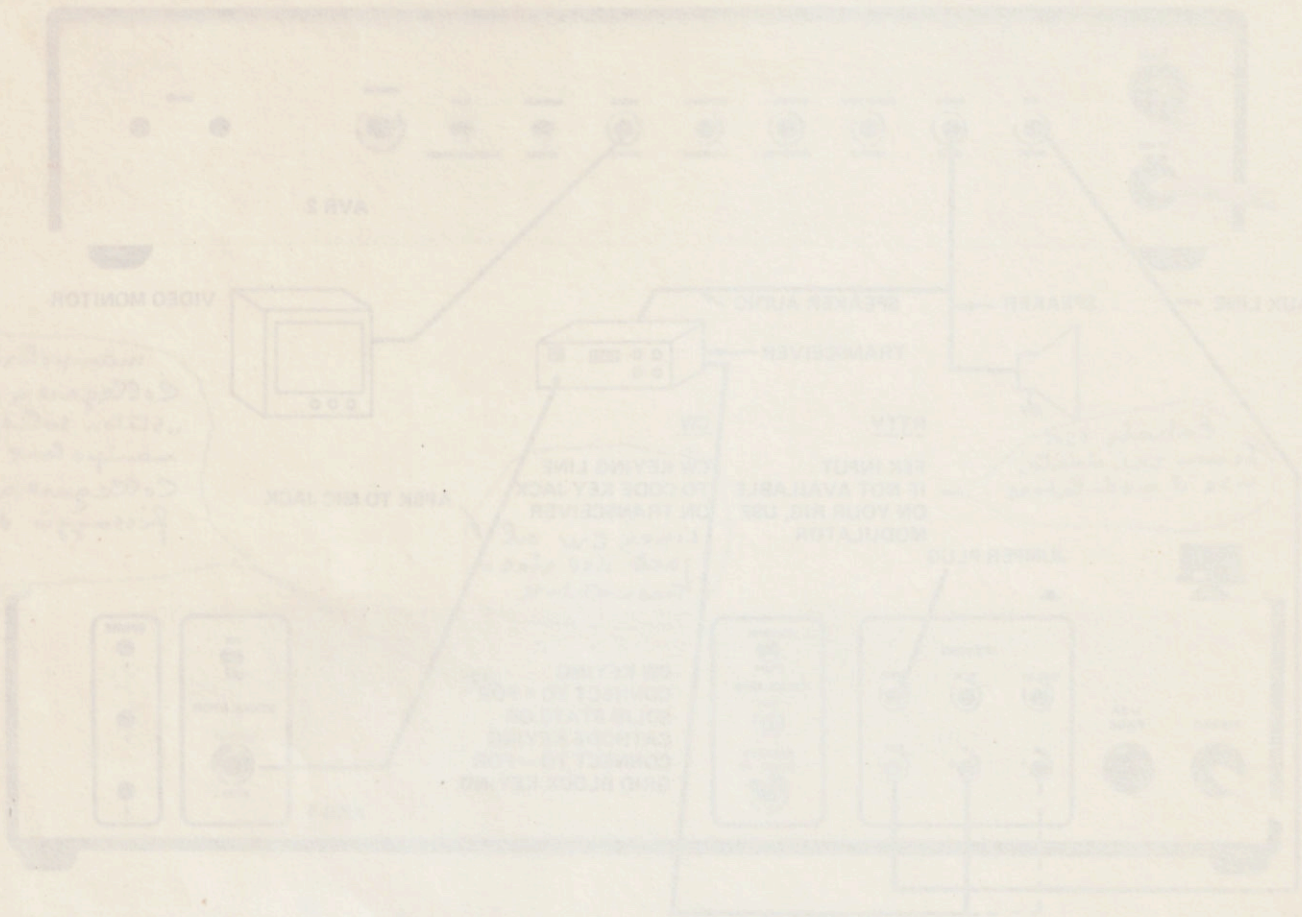
OPTIONAL WIRING CONNECTIONS

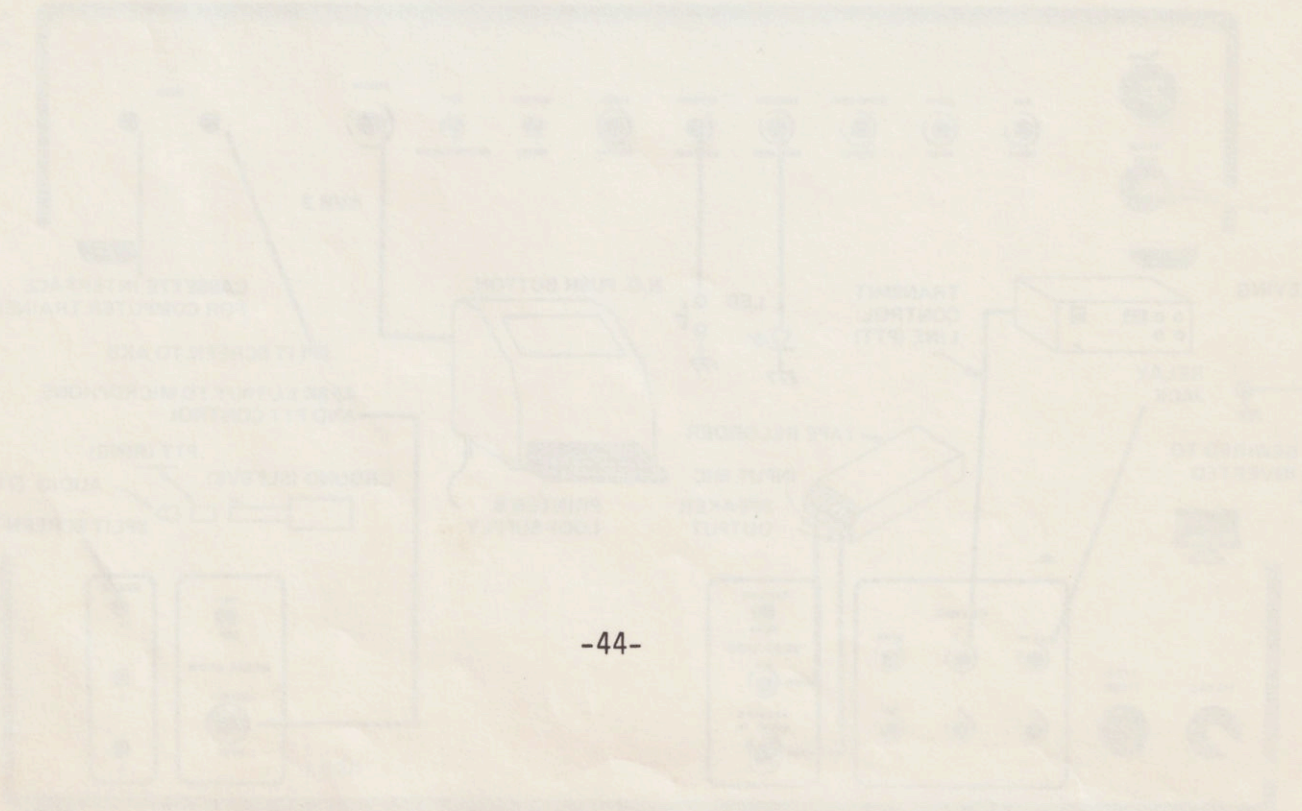
GOOD QUALITY SHIELDED LINES RECOMMENDED FOR ALL CONNECTIONS

Connessioni opzionali. Si raccomandano cavi schermati di ottima qualità per tutti i collegamenti.



NOTES





APPENDIX A

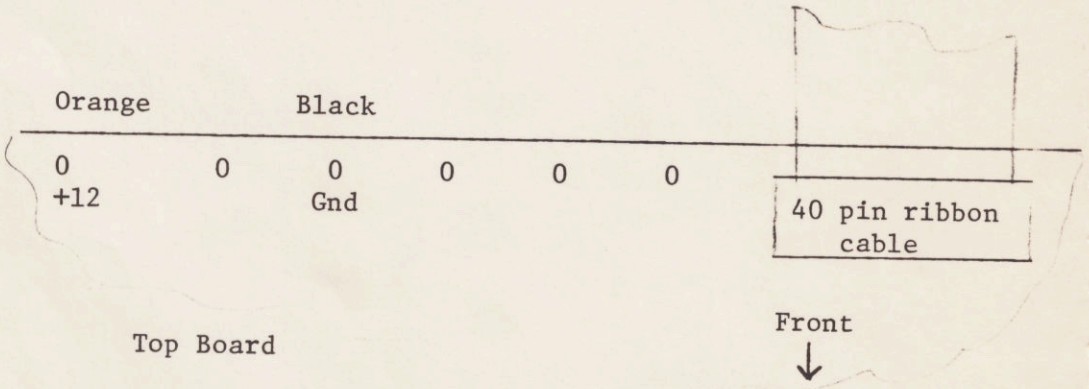
INSTALLATION OF THE RF VIDEO MODULATOR

Description

The Supr-R Mod II Video Modulator manufactured by M & R Enterprises in Sunnyvale, CA. is designed to output on UHF Channel 33.

Installation

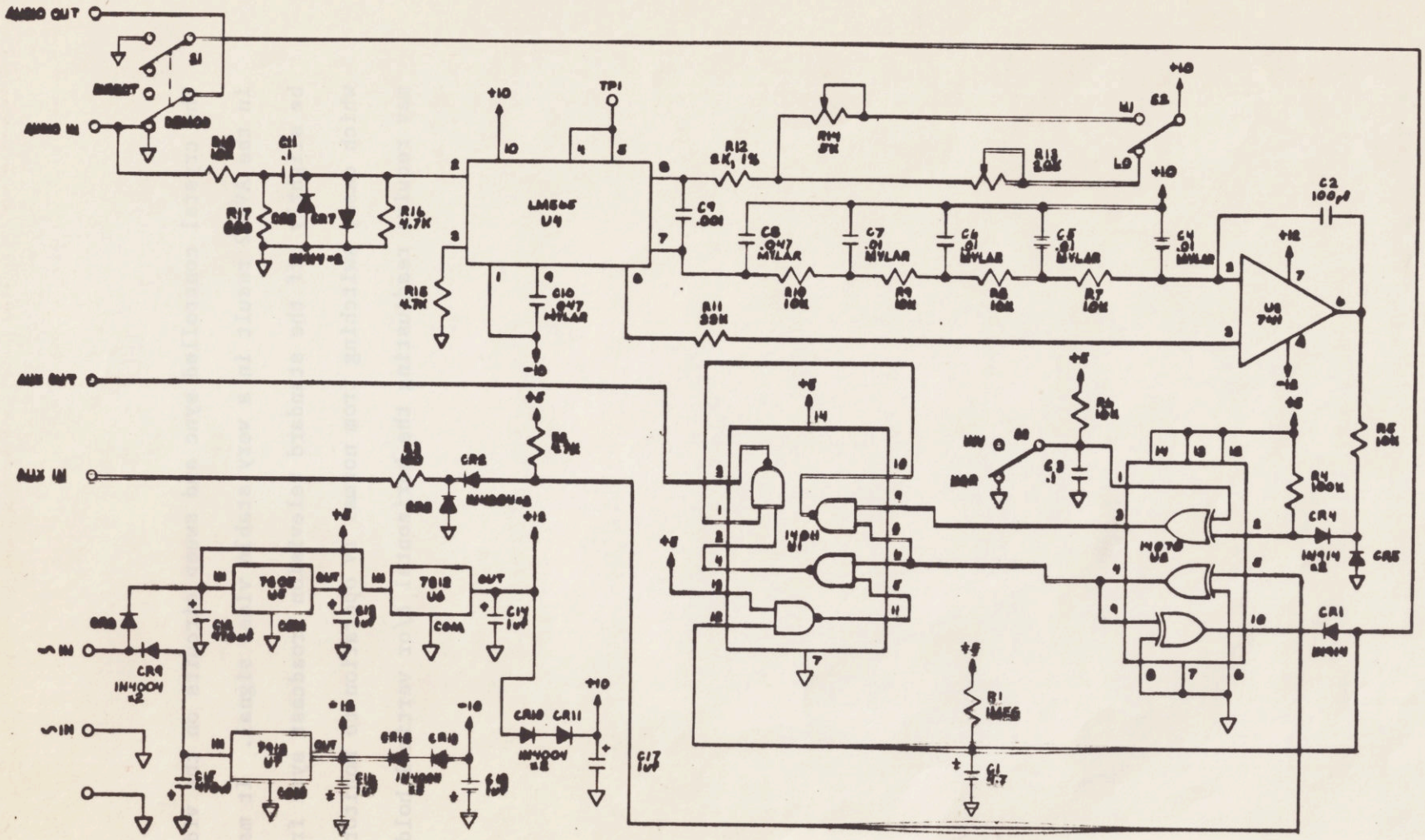
It is suggested that the modulator package be installed in or near the AVR-2. Power and video connections can be made with the four wire cable coming from the Supr-R Mod. The four conductor plug should be cut off and the wires cut to their appropriate lengths. The brown lead should be soldered to the video output jack on the rear panel of the AVR-2. The orange (+ power in) and black (ground) can be connected to pads on the computer (top) board in the AVR-2 as shown. The red wire is not used and be cut off.



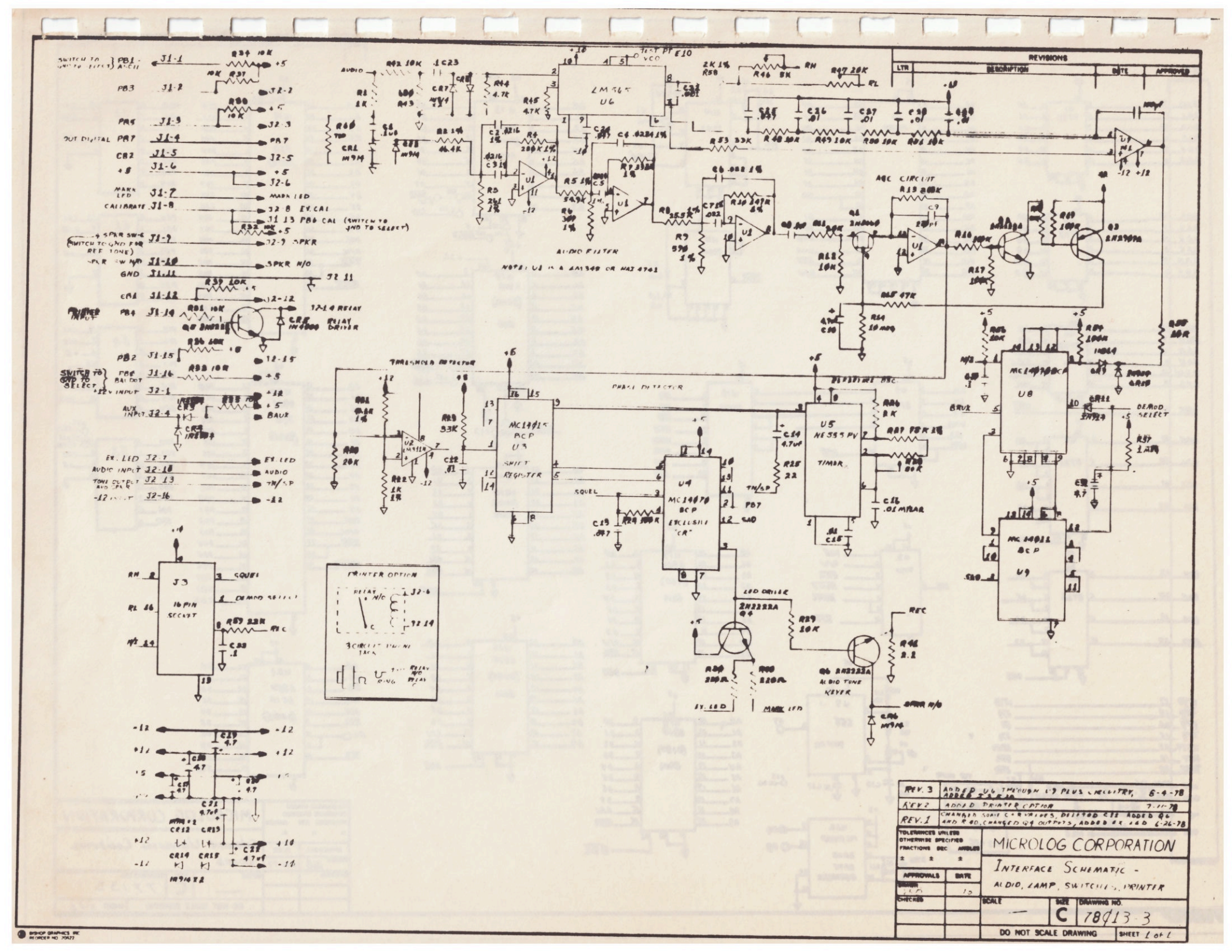
The modulator should be mounted using the double sided tape provided. A suggested location would be either outside of the left rear panel of the AVR or inside near the left rear panel using one of the "spare" jacks as the RF output. This would require mounting a phono jack in one of the "spare" holes and connecting it to the "video" (RF) output of the modulator.

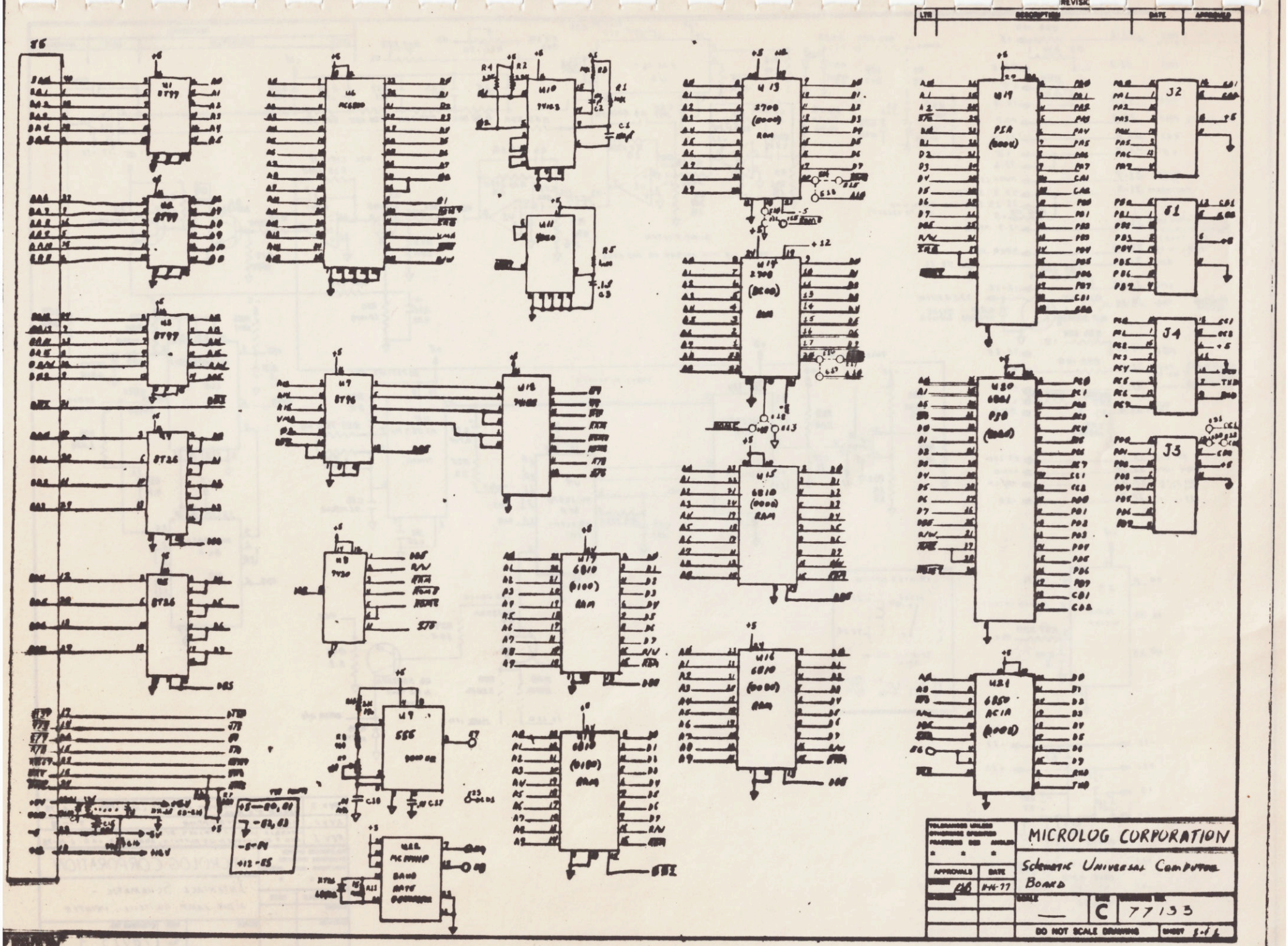
The crystal controlled sync and sweep circuits on the video board in the AVR-2 result in a very stable video signal. It may, however, be slightly off the standard television broadcast sync frequency, in which case, switching from normal TV operation to monitor/AVR operation may require readjusting the horizontal &/or vertical hold controls.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

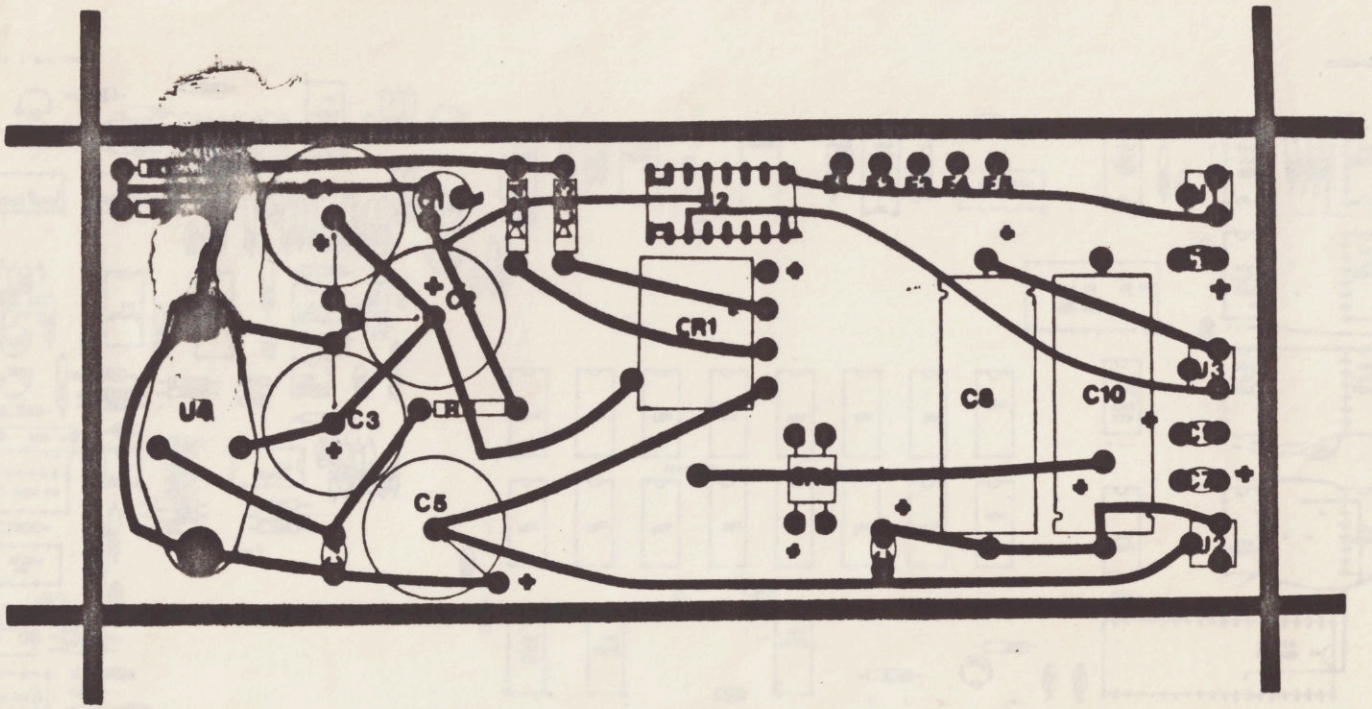


TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS ± DECIMALS ± ANGLES ±	MICROLOG CORPORATION	
APPROVALS / DATE	AFSK DEMODULATOR SCHEMATIC	
	SCALE —	SIZE C / DRAWING NO. 78047
	DO NOT SCALE DRAWING	SHEET 1 of 1


REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
REV. 3
ADDED U6 THRUUGH U9 PLUS CIRCUITRY, 6-4-78
REV 2
ADDED PRINTER OPTION 7-11-78
REV. 1
CHANGED SOME C + R VALUES, DELETED C22 ADDED Q4 AND R40, CHANGED Q4 OUTPUTS, ADDED DX LED 6-26-78
TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS DEC ANGLES
APPROVALS
DATE
DRAWN
CHECKED
MICROLOG CORPORATION
INTERFACE SCHEMATIC - AUDIO, LAMP, SWITCHES, PRINTER
SCALE —
SIZE C
DRAWING NO. 78013-3
DO NOT SCALE DRAWING
SHEET 1 of 1
AUDIO FILTER
NOTE: U1 IS A XR1540 OR MAX 4741
AGC CIRCUIT
THRESHOLD DETECTOR
PHASE DETECTOR
DEMOD SELECT
LED DRIVER
AUDIO TONE KEYER
PRINTER OPTION
SWITCH TO GND TO SELECT
SPKR SW (SWITCH TO GND FOR REF TONE)
OUT DIGITAL
AUX INPUT
MARK LED
CALIBRATE
SPKR
GND
RELAY
RELAY DRIVER
EX. LED
AUDIO INPUT
TONE OUTPUT AND CAL
-12 INPUT
SQUEL
DEMOD SELECT
REC
MARK LED
SPKR N/O


REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
MICROLOG CORPORATION
SCHEMATIC UNIVERSAL COMPUTER BOARD
APPROVALS
DATE
8-16-77
SIZE
C
77133
DO NOT SCALE DRAWING
SHEET 1 of 1

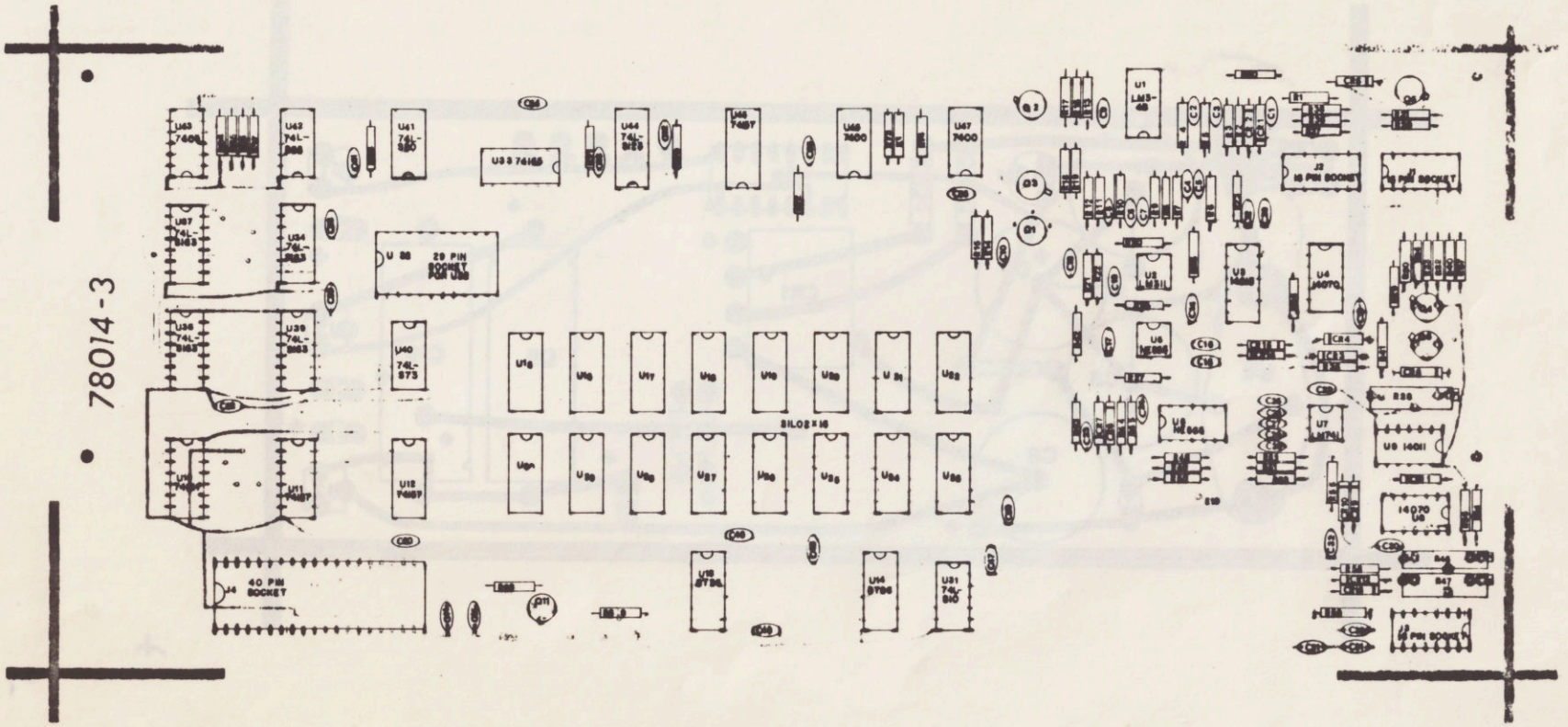
VISIONS			
LTR	DESCRIPTION	DATE	APPROVED



NOTES:

1. J2 IS MOUNTED ON BACK OF BOARD.
2. U1-U3 ARE MOUNTED ON BRACKET BEFORE SOLDERING.
3. U4 IS MOUNTED THROUGH THE BRACKET THEN THROUGH THE BOARD.

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±	MICROLOG CORPORATION	
APPROVALS / DRAWN: RAC.	DATE: 7-8-80	AVR-2 Power Supply Assembly DRAWING
SCALE: 2/1	SIZE: C	DRAWING NO: 78038-B
DO NOT SCALE DRAWING		SHEET 2 of 2



REV	DESCRIPTION	DATE	APPROVED
REV 3	[illegible]	8-1-78	
REV 2	[illegible]	6-28-78	
REV 1	UPDATED EQNS (U5 - U61) ON VIDEO BOARD	6-1-78	

TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONS ±1/64 ANGLES ±1°

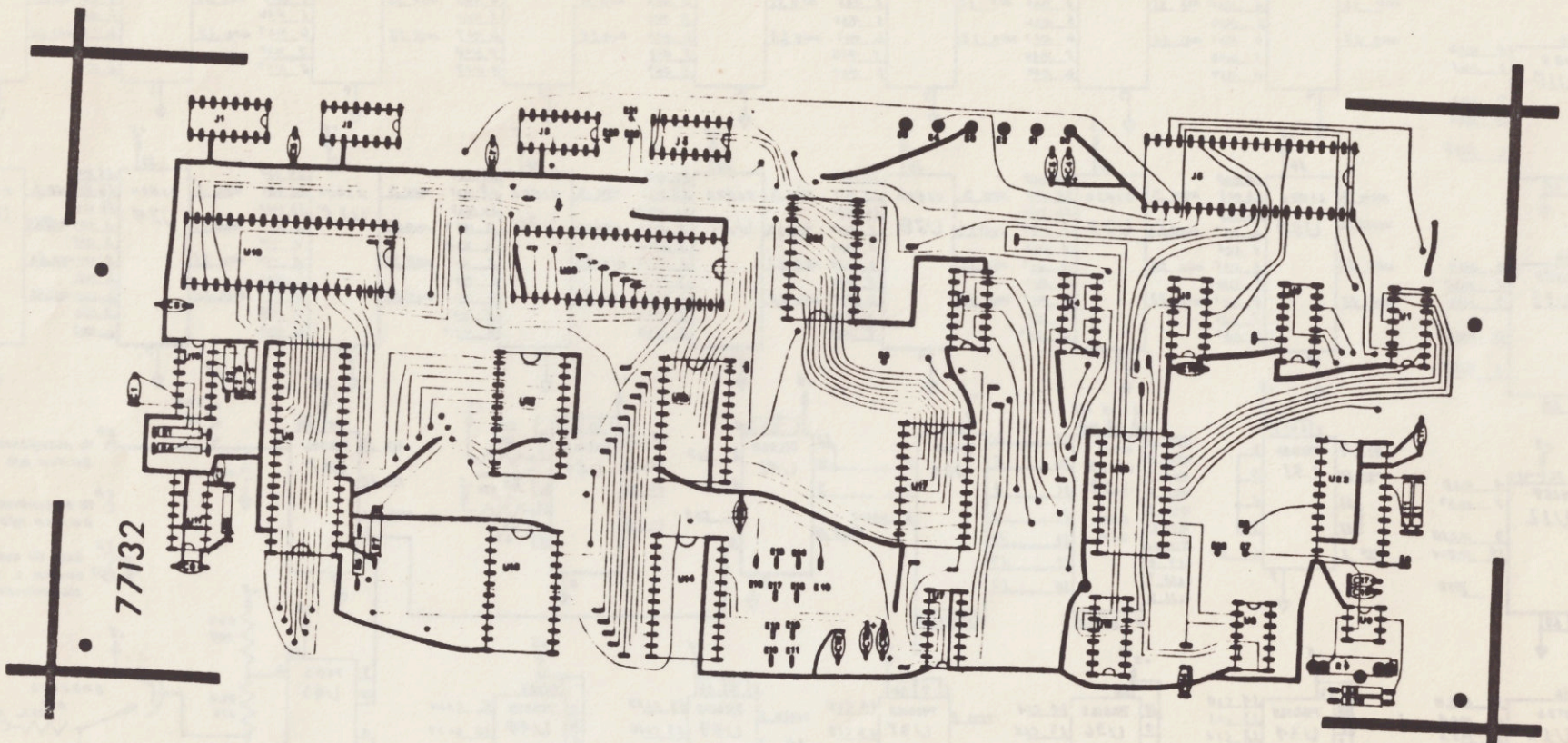
APPROVALS	DATE
[illegible]	6-2-78

MICROLOG CORPORATION

UNIVERSAL VIDEO BOARD AND INTERFACE ASSEMBLY DRAWING

SCALE 2/1 | SIZE D | DRAWING NO 78014-B-3

DO NOT SCALE DRAWING | SHEET 2 of 2



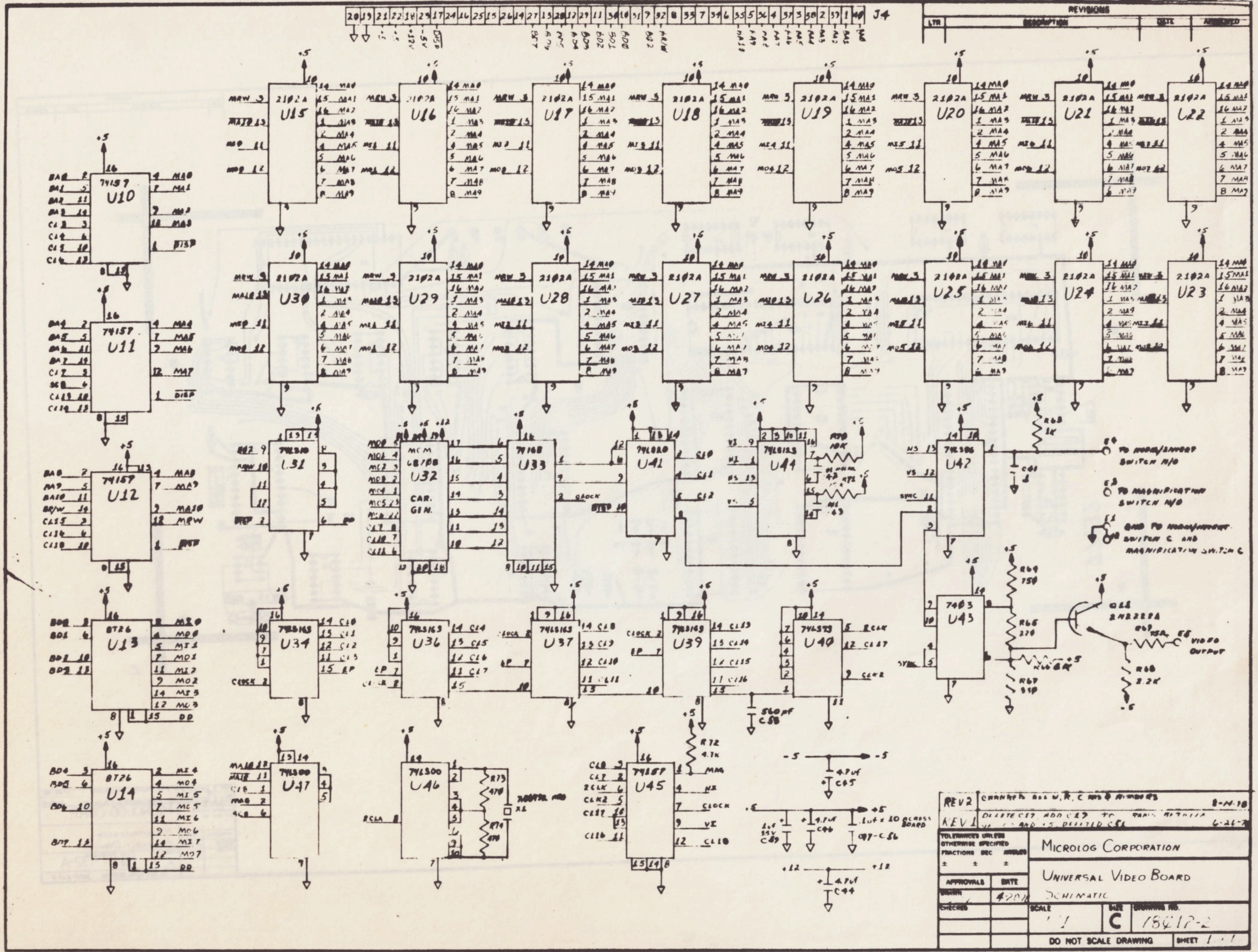
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

MICROLOG CORP.

MICROPROCESSOR
ASSEMBLY DRAWING

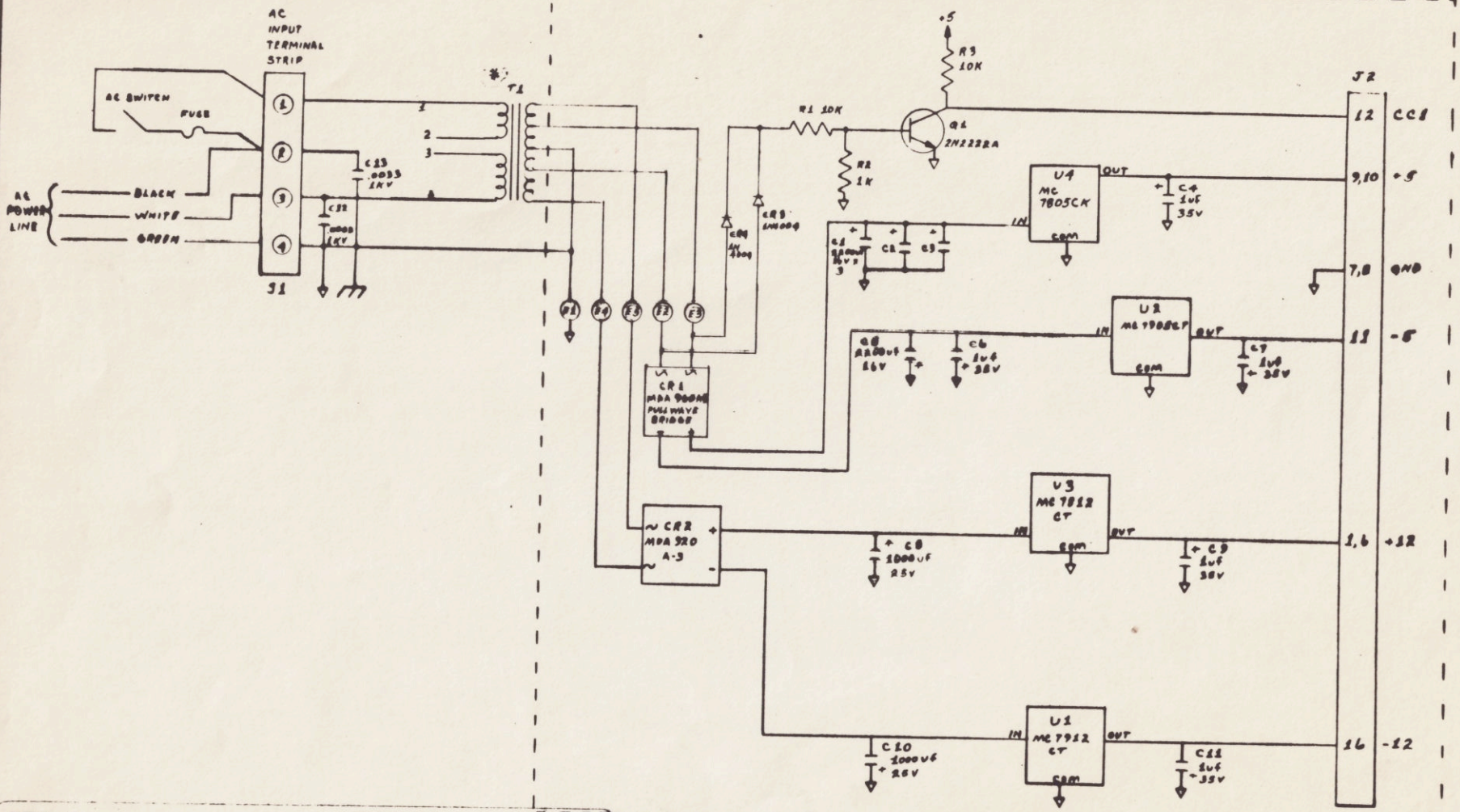
SCALE 2/1 | SIZE D | DRAWING NO. 77132-A

DO NOT SCALE DRAWING | SHEET 1 of 2



J4
REVISIONS
U10 U11 U12 U13 U14 U15 U16 U17 U18 U19 U20 U21 U22 U23 U24 U25 U26 U27 U28 U29 U30 U31 U32 U33 U34 U36 U37 U39 U40 U41 U42 U43 U44 U45 U46 U47
TO NORMAL/INVERT SWITCH N/O
TO MAGNIFICATION SWITCH N/O
GND TO NORMAL/INVERT SWITCH C AND MAGNIFICATION SWITCH C
VIDEO OUTPUT
REV 2
REV 1
MICROLOG CORPORATION
UNIVERSAL VIDEO BOARD
SCHEMATIC
DO NOT SCALE DRAWING

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



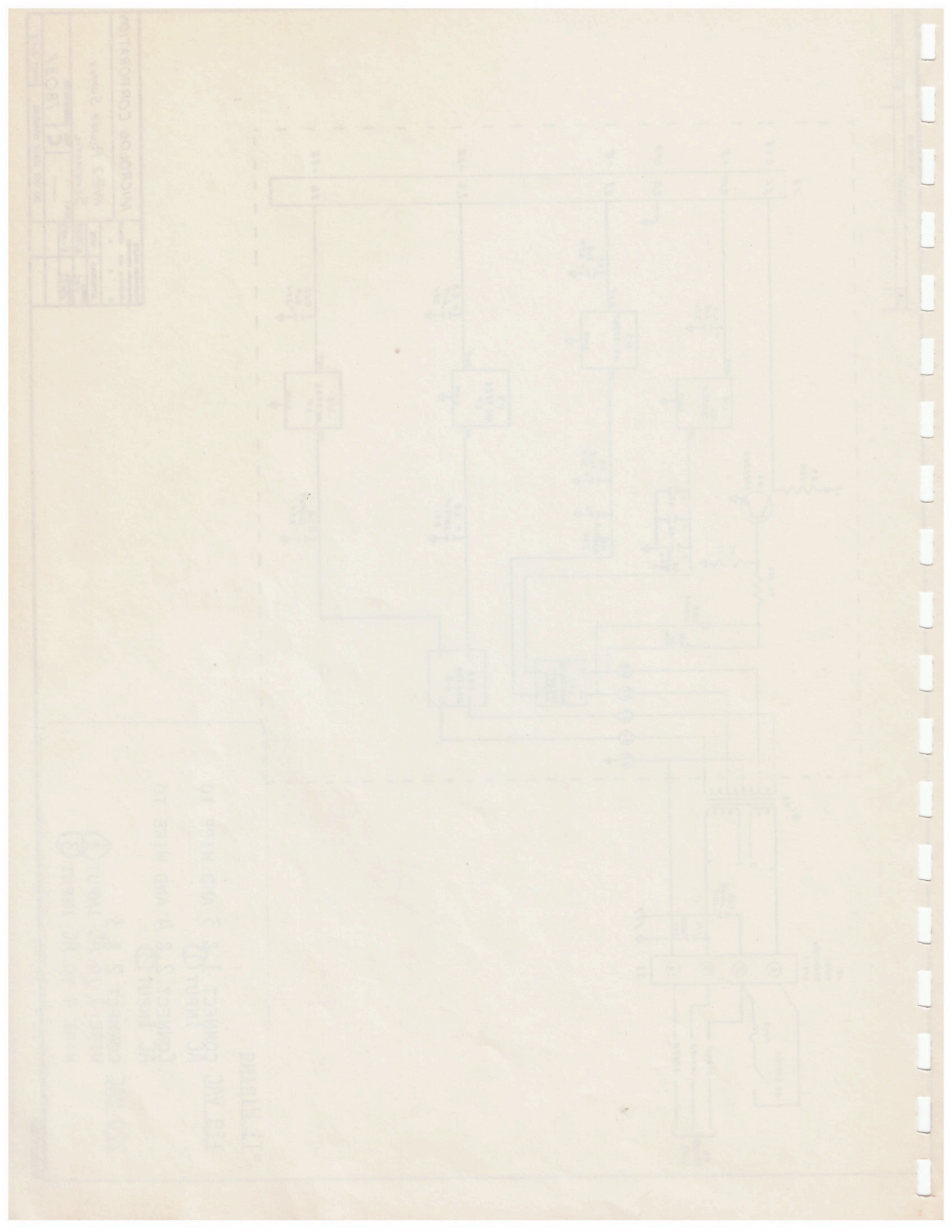
*T1 WIRING

110 VAC CONNECT 1 & 3 AND WIRE TO AC INPUT (1)

CONNECT 2 & 4 AND WIRE TO AC INPUT (3)

220 VAC CONNECT 2 & 3
WIRE 1 TO AC INPUT (1)
WIRE 4 TO AC INPUT (3)

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±		MICROLOG CORPORATION	
APPROVALS	DATE	AVR-2 POWER SUPPLY SCHEMATIC	
DRAWN RAC	8/8/78		
CHECKED	8-14-78	SCALE —	SIZE C
		DRAWING NO. 78037	
		DO NOT SCALE DRAWING	SHEET 1 of 1



WARRANTY

The MICROLOG CORPORATION MORSE VIDEO DECODED Model AVR-2 is covered by a One (1) Year Warranty against defects in materials and workmanship.

Further questions or requests for assistance may be addressed to Customer Service.

MICROLOG CORPORATION
4 Professional Drive, Suite 119
Gaithersburg, Maryland 20760

301-948-5200