INFO-TECH

MODEL 500 TRI-MODE ASR

AMATEUR TERMINAL

OPERATING MANUAL

You are about to enter a new realm of Amateur Radio enjoyment. The M-500 is capable of providing a wide variety of communication functions and is a highly sophisticated electronic device.

While it is by no means necessary to be familiar with all of the operating functions to successfully operate and enjoy this unit, it will be worthwhile to completely read the operating instructions of this manual. Doing so will give an insight as to the flexibility of operation, and will help to prevent 'surprises' while operating this unit.

It is not recommended, however, that the user attempt to completely absorb or memorize all operations in one reading or one sitting with the M-500. Rather, after an initial familiarization reading, select operating controls to be used most often and try them to become familiar with them before going on to others.

You may now begin what will certainly be many years of enjoyable state-of-the-art Amateur Operation.

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1. M500 ASR SPECIFICATIONS

CODES & DATA RATES

Morse:	5 to 100 + W.P.M.
Baudot (Murray):	45,50,57,74,100 Baud (60,66,75,100,132 W.P.M.)
	7.5 unit code (1 start bit, 5 data bits, 1.5 stop bits)
ASCII:	110,150,300,600,1200 Baud
	11 unit code (1 start bit, 7 data bits, 1 parity bit, 2 stop bits)
	Parity - Mark, Space, even, or Odd.

TRANSMITTING MODES

Letter Mode - each letter is transmitted as it is typed.
Word Mode - each word is transmitted upon completion.
Line Mode - each line is transmitted upon completion.
Buffer Mode - pre-loaded buffer memory is transmitted upon command.
Clocked Mode - output is transmitted at slower rate than normal.

MEMORY

Standard configuration has 8 K of E Prom and 12K of static RAM.
2K of the static RAM can be battery protected.
4K of the static RAM is dedicated to video.

MESSAGE SYSTEMS

10 messages of 144 characters each for recallable messages.
User programmable and recallable C.W.I.D. and I.D. messages of 72 characters each.
Sel-Cal - 14 sel cal codes of 8 characters each can be programmed to activate other systems in the M500.
Test Messages - Built-in QBF & RY's on all modes.
Mail Box - optional system with 2 K E-PROM and 8 K static RAM.

VIDEO

72 characters x 25 lines, 5 x 7 dot matrix, upper case only.
25th line is reserved for Status indicator.
Split Screen - user programmable xmit portion of 2-15 lines on lower portion of screen. Receive on upper portion.
Composite Video - 1.5v p-p negative sync. white letters on black background.
Standard vertical refresh rate is 60hz (50hz avail.)
Multiple Cursors
Note: Do not hook video output of the M500 to "hot chassis" video monitors.

DEMODULATORS

Morse - active filter, envelope detector set at factory for 1000hz - user adjustable 750-1250hz.

RTTY/ASCII - Thru 110 baud uses separate active filters for each of the three shifts - tones are shown below:

Shift	Mark	Space
170hz.	2125hz.	2295 hz.
425hz.	2125hz.	2550hz.
850hz.	2125hz.	2975hz.

ASCII - 150 baud thru 1200 baud uses a separate active filter demodulator with a single shift (Mark = 2125hz., space = 2975hz.).

MODULATION & KEYING SYSTEMS

Morse - All solid state keying for both high voltage and solid state keying systems.

Low potential Keying (J-7 Tip) for use with transmitters requiring very low impedence keying.

Max Ratings - 30 V.D.C. @ 200 MA.

Grid or Cathode Keying - (J-7 Ring) for use with transmitters using more conventional keying circuits - maximum ratings Grid -150V at 75MA, Cathode +150V @ 75MA.

RTTY/ASCII - A.F.S.K. three shift function generator derived AFSK Generator for all RTTY & ASCII speeds - high tone set standard.

Output 1.5V into 500Ω load user adjustable.

Adjustable Level (AFSK may be inverted)

FSK/$\overline{\text{FSK}}$ -

FSK, Mark = Low

$\overline{\text{FSK}}$, Mark = High

Max. ratings 150V @ 50MA.

Transmit RS232, - Mark = -11V space = +11V

Auto-start - open drain VMOS output Max. ratings 30V.D.C. @ 200MA.

Function 1 & 2 outputs - system controlled. Open drain VMOS transistors for accessory control. Max. ratings each 30 V.D.C. @ 200MA.

PRINTER OUTPUTS

Loop - Fully isolated loop switching (requires external 60MA. loop supply 140V.D.C. @ 60MA. standard), 75MA. current limited maximum.

RS-232 mark = -10 V.D.C., space = +10 V.D.C.

MIL-188 mark = +10 V.D.C., space = -10 V.D.C.

Printer baud rates (user selectable)

Baudot (Murray) 45, 50, 57, 74 Baud

ASCII - 110 & 300 Baud

SIDETONE - Morse sidetone from keyboard, may also be used on Morse reception. 100MW into 8 speaker - level control on front panel.

TUNING & STATUS INDICATORS

Power ON	Input Limiting LED
Mark & space tuning LED's	Transmit LED
Auto-start on LED	Peak Tuning "Cross Display"
Morse tuning LED	Aux. power indicator
Shift selection LED's (3)	

CLOCK - a real time clock backed-up by an internal battery supply gives a continuous indication of the current time and is displayed on the status line.

PHYSICAL SPECIFICATIONS -

Size : 17" wide x 3½" high x 11" deep (Main Cabinet)
12-3/4" wide x 2-5/8" high x 6-3/8" deep (Keyboard)

Weight: Shipping weight 38 lbs. (including video monitor)

Cabinet: All metal with textured polyurethene paint. Main cabinet is black, keyboard is gray with black keytops.

Power Requirments: 115V 50/60hz. @ 70 watts (230V. available on special order).

2. CONNECTORS - NOMENCLATURE and PINOUTS

J-24	Interconnect Jack on I/O board to indicator board (16 pin dip)
J-102	Interconnect Jack on logic board (16 pin dip)
J-103	Interconnect Jack on logic board (16 pin dip)
J-104	Auxilliary power Jack (3 circuit std. phone)
J-105	Expansion Board Jack (40 pin dip)
J-106	Video output Jack (Switchcraft 3501FR)
J-107	Keyboard connector (15 pin D sub min.)
J-23	Interconnect Jack on I/O board (16 pin dip)
J-22	Interconnect Jack on I/O board (16 pin dip)
J-34	Interconnect Jack on indicator board (16 pin dip)

J-24 PINOUT

1	Mark space LED drive
2	170 shift indicator drive
3	"xmit" indicator drive
4	425 shift indicator drive
5	850 shift indicator drive
6	Auto-start indicator drive
7	CWID indicator drive
8	+10 V unregulated
9	Ground
10	Space display drive
11	Limiter indicator drive
12	Audio
13	Ground
14	Input level control (high)
15	Input level control (arm)
16	Mark display drive

J-105 PINOUT

1	C.P.U. RD.	21	D3
2	5V regulated	22	D4
3	5V regulated	23	D5
4	Power down	24	D6
5	NC	25	D7
6	NC	26	NC
7	Ground	27	A10
8	5V (Battery backed)	28	C.P.U. RD.
9	A7	29	WE
10	A6	30	A9
11	A5	31	A8
12	A4	32	NC
13	A3	33	5V
14	A2	34	GND
15	A1	35	74LS154 Pin 13
16	AØ	36	74LS154 Pin 14
17	DØ	37	74LS154 Pin 11
18	D1	38	74LS154 Pin 15
19	D2	39	74LS154 Pin 16
20	GND	40	WE

J-102 (& J22) PINOUT

1	KB P10, (Break key)
2	P2 ACIA, (Tape) input
3	P2 ACIA, (ASCII) input
4	P5 ACIA, (Tape) RTS
5	P6 ACIA, (Tape) output
6	Ground
7	3850 P28, Aux. 2 drive
8	3850 P31, auto-start drive
9	3850 P13, RTTY out
10	3850 P27, RTTY in
11	3850 P14, Printer out
12	3850 P16, Morse out
13	3871 P26, 850hz. control
14	3871 P23, 425hz. control
15	3871 P20, 170hz. control
16	Pin 6 ASCII ACIA, output

J103 (& J23) PINOUT

1	3871 P29, 170hz. prefilter
2	3871 P32, ACIA N/R select
3	3850 P33, Aux. 1 drive
4	3850 P36, Printer inhibit
5	Ground
6	+12 reg
7	-12 reg
8	+10 unreg
9	+10 unreg
10	+5 reg
11	+12 reg
12	3871 P1, Hi/Lo Demodulator sel
13	3871 P38, Lo pass filter select
14	3850 P5, Morse in
15	3871 P35, ATC control
16	3850 P34, PTT/ AFSK

REAR PANEL JACKS (J1-14)

	Tip	Ring
J1	Spare	Auto-start
J2	Tape output	Tape ACIA run (Tape Motor Control).
J3	RTTY Aux.	-------
J4	Function 1	Function 2
J5	PTT	FSK
J6	Loop (+)	Loop (-)
J7	Lo potential Morse Keying	Morse keying (grid or cathode)
J8	ASCII Aux.	Morse Aux.
J9	PTT	AFSK
J10	PTT	RS-232 (xmit)
J11	Printer inhibit	RS-232 (printer)
J12	Audio in	-------
J13	Scope (mark)	Scope (Space)
J14	Tape output	Tape input

3. HOOK-UP

As there are a multitude of transmitter-Receiver combinations on the market and each one uses slightly different techniques to accomplish their Morse keying and FSK keying we will, in this manual, be unable to give specific instructions on hook-up to the specific tranceiver.

Generalized instructions follow:

RTTY - ASCII HOOK-UP (using AFSK method on HF tranceivers)

Receiver section -
Connect the audio output (earphone or speaker) to the tip of J12 using a shielded cable.
Transmitter section -
Transmit audio - Connect the tranceiver microphone high to J9 (ring) microphone ground to the shell of J9 (shell) using shielded cable.
Push to Talk -
Connect the tranceiver push to talk line to J9 (tip) using a shielded cable.

Notes: (1) RTTY is a continuous duty operation and most tranceivers are not rated for this type of operation. Be sure to lower your output level to at least 50% of normal ICAS ratings.
(2) The M500 AFSK output level may be varied by adjusting R120 (see alignment section).

RTTY/ASCII HOOK-UP (using AFSK on VHF)

Receiver section -
Connect the audio output of the tranceiver to tip of J-12 using a shielded cable.
Transmitter section -
Audio - connect the tranceiver MIC hi to J-9 (ring) and MIC ground to J-9 (shell), using shielded cable.
PTT - connect the tranceiver PTT line to J9 (tip) using shielded cable.

RTTY/ASCII HOOK-UP (using FSK on HF)

Receiver section -
Hook up same as AFSK section.
Transmitter section -
FSK Keying - the FSK line from the transceiver should be hooked to J-5 (ring) using shielded cable - hook shield to (J-5 shell) and ground on the tranceiver.
If your tranceiver requires a low signal at its FSK terminal for Mark then JU-3 should be hooked A to C.
If your tranceiver requires a high signal at its FSK terminal for Mark then JU-3 should be hooked B to C.
PTT keying should be hooked up as in the AFSK section.

MORSE HOOK-UP (HF & VHF)

Receiver section - same as RTTY section.
Transmitter section -

A. Solid state tranceivers that require very low voltage, low impedence keying: (refer to your tranceiver manual). Using shielded cable hook the tranceiver key jack or key line to J-7 tip the shield should be connected to J-7 shell and the tranceiver ground.

B. All other tranceivers requiring higher voltage keying circuitry: (Refer to your tranceiver instructions). Cathode (positive voltage) Keying - Using a shielded cable hook the tranceiver Keying Jack or line to J-7 (ring). The shell of J-7 should be connected to the tranceiverground. Make sure that JU-2 is connected correctly. Grid (Negative Voltage) Keying - Using shielded cable hook the tranceiver key Jack or Keying line to J-7 (ring). The shell of J-7 should be connected to the tranceiverground. Make sure that JU2 is connected correctly as explained on page 8 under Conversion of the Morse output Keying Jack.

Note: Improper hookup may cause your tranceiver to be keyed all the time or destroy the keying transistors.

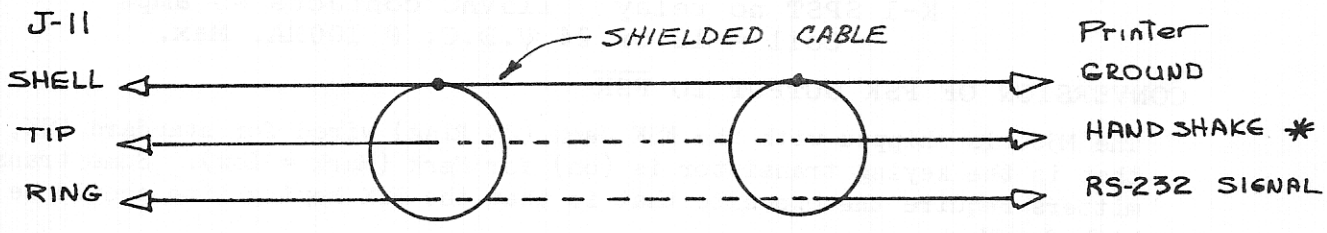
VIDEO HOOK-UP -

The video monitor should be hooked to the video output jack on the rear of the M500. Switch the impedence switch on the rear of the monitor to high. Video controls for the monitor are under the front fold down panel. Adjust the brightness and contrast controls for a pleasing picture. The height control (screwdriver adjustment on rear of Monitor) may have to be adjusted to get the whole display on the screen. The VM-4512 monitor must be set up with hi-Z and DC restoration switches on.

PRINTER HOOK-UP AND PROGRAMMING -

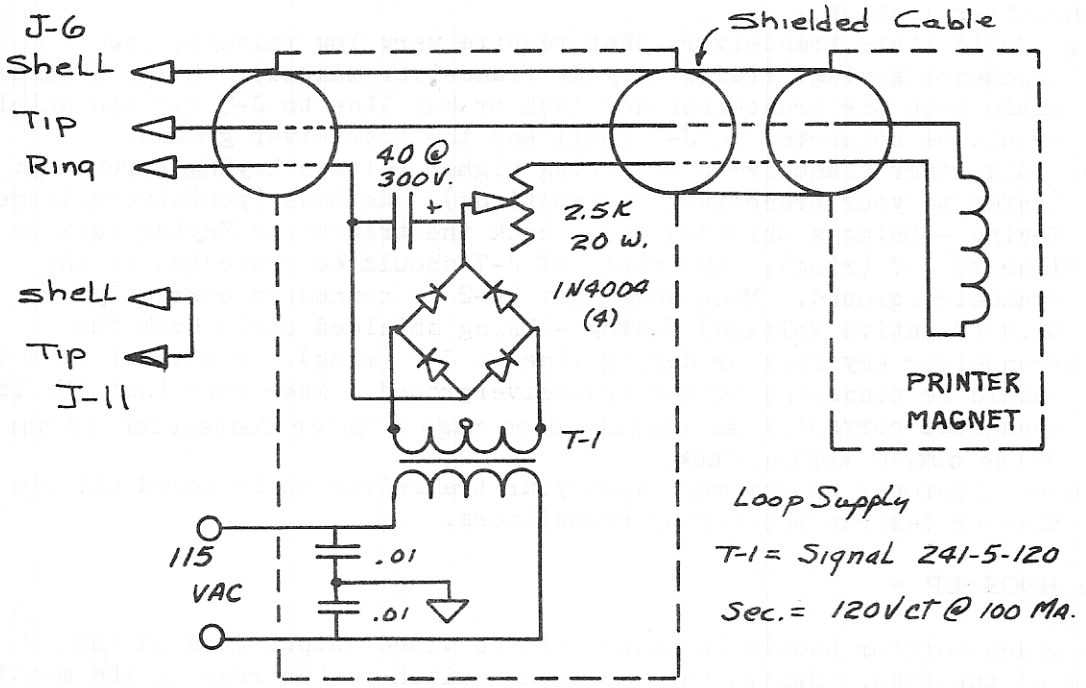
Sooner or later you will find that a printer will become very useful as a station accessory. The M500 will drive various printers either Baudot (Murray) or ASCII.
The Mode and speed of the printer to be used must be programmed into the M500 from the keyboard as shown in the Complex Command section.

ASCII printers with RS-232 input should be hooked up as shown below:

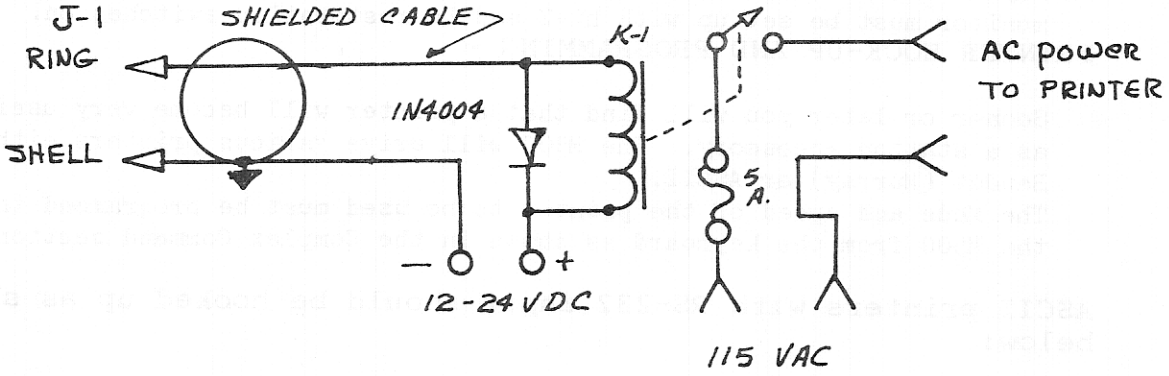


* For printers that do not require handshaking tie tip to shell (J-11)

Baudot (Murray) printers should be hooked up as shown in the following diagram:



Auto-start output - An auto-start driver (open drain transistor) is provided for auto-start system. The hook-up is as follows:



K-1 SPST no relay 115VAC contacts @5 amps
Coil = 12 or 24 V.D.C. @ 100MA. Max.

CONVERSION OF FSK OUTPUT TO $\overline{\text{FSK}}$

The M500 is shipped with the FSK Jack (J5 Ring) wired for standard FSK, that is the keying transistor is (on) for Mark (Mark = Low). Some transmitters require the opposite that is that the FSK keying line should be high for Mark.

JU3 should be wired as follows:
FSK, connect JU3 A to C

$\overline{\text{FSK}}$, connect JU3 B to C
(For the location of JU3 refer to the chip layout drawing portion of the I/O Board schematic)

CONVERSION OF THE AFSK OUTPUT TO $\overline{\text{AFSK}}$

The M500 is shipped with the FSK Tones normal, that is Mark is the lower of the two tones to convert to $\overline{\text{AFSK}}$ observe the following Jumper Table:

JU4	AFSK	A to C
	$\overline{\text{AFSK}}$	B to C

CWID ON FSK

The M500 is shipped so as to provide CWID on FSK. If this function is not desired cut JU6.

CONVERSION OF THE MORSE OUTPUT KEYING JACK TO GRID KEYING

The M500 is shipped from the factory with the standard Morse keying output Jack J7 (Ring) wired for Cathode (positive) keying.

To change this jack to GRID (negative) keying follow the chart below:

JU2	Cathode Keying	connect B to C
	GRID Keying	connect A to C

For the location of JU2 refer to the chip layout drawing on the I/O Board schematic.

CONVERSION OF THE PRINTER DRIVER FROM RS232 TO MIL188

The M500 is shipped with the printer driver output (J-11 Ring) wired for RS232 output.

To change this to MIL-188 follow the chart below:

JU5	RS-232,	connect B to C
	MIL-188,	connect A to C

For the location of JU-5 refer to the chip layout drawing of the I/o board.

AUX. POWER & BATTERY BACK-UP SYSTEMS

The M-500 has provisions for various auxilliary power supplies to aid in memory retention for short term power failures or long term power down.

1. Built-in Battery Pack

In the right rear corner of the M500 main cabinet you will find a battery holder that will hold three regular Penlite cells (Penlite cells not furnished).

The purpose of this battery pack, when used, is to keep power on the clock chip and its associated circuits when there is a short term power failure (up to 24 hours).

The current drain of these circuits are such that operation only on the internal batteries after 48 hours will cause rapid discharge of the batteries and time loss. Note: Check battery voltage frequently

and replace when pack voltage goes below 4.3v.

2. Auxilliary Power Supplies

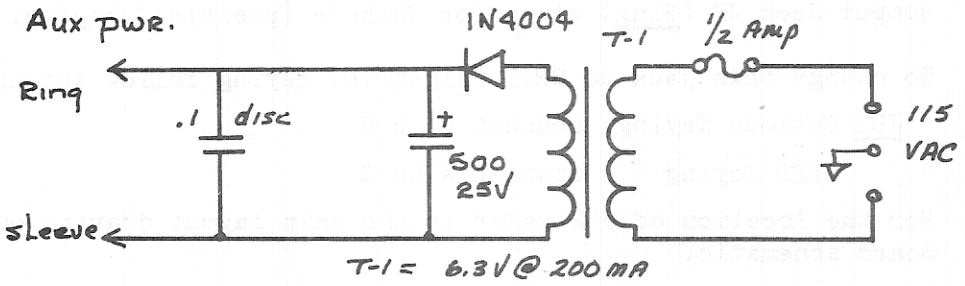
By the use of the auxilliary power jack and various external supplies you can keep the memory alive and still not drain power from the internal battery pack.

External supplies are not furnished by Digital Electronic Systems, Inc. but are quite easy to build as per the following:

Option 1 - This supply will provide power to the memory & clock circuits when the main power is turned off but the power to the option 1 supply must be left on at all times if memory is to be retained.

The use of option 1 supply assumes that you are also using the internal battery pack for short term protection.

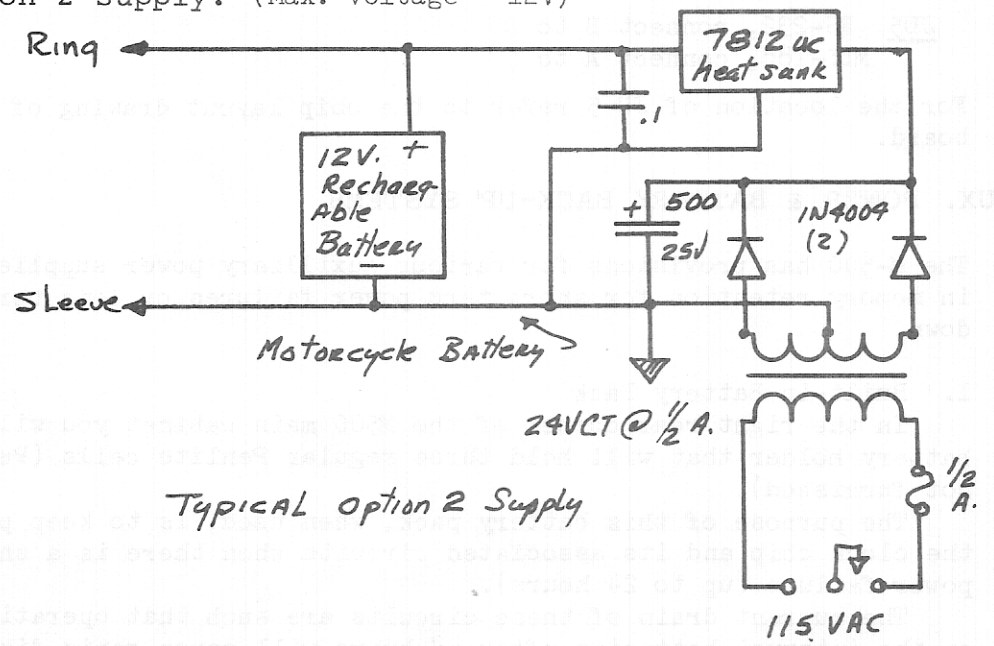
Option 1 supply:



Typical Option 1 Supply

Option 2 Supply - This supply uses a large external battery/charger system which will eliminate the need for the option 1 supply or the internal battery pack.

Option 2 supply: (Max. voltage = 12V)

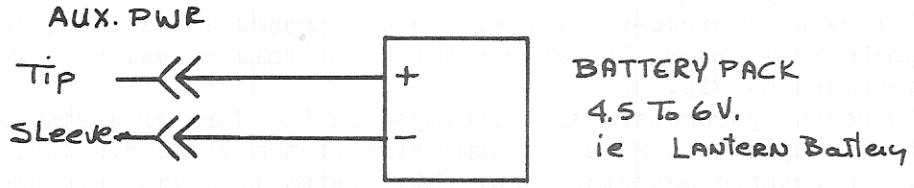


Typical Option 2 Supply

Note: When option 1 or 2 supplies are activated an LED on the right side of the front panel will be on.

Option 3 supply - Simply allows an external battery to replace the internal battery pack.

Option 3 Supply:



Typical Option 3 Supply

WARNING - The Maximum voltage to be used on the ring of the Aux. power jack is 12.6 and the maximum voltage on the tip is 9.

NOTE: With the A.C. power to the M-500 off, power drain at the ring of the Aux. Pwr. Jack will be in the order of 60 ma.

Additional savings in power consumption will be made if IC-13 (Toshiba 2016) is changed to a Toshiba 5517 (or equivalent) CMOS RAM.

USING THE INTERNAL BATTERY PACK FOR MEMORY PROTECTION

The internal battery pack in the M-500 may be used to protect your message, and initialization memories if the following modifications are made:

MODIFICATION 1. (for use when expansion board is NOT used).

A. Remove diode D-31 and replace with a jumper.
B. Remove diode D-29 and replace with a 51 ohm, 1 watt resistor.
C. Remove IC-13 (2016) and replace with a CMOS equivalent (Toshiba 5517, NEC PD446, Fujitsu MB-8416)
D. Insert three, 450 MAH, nicad batteries in the internal battery holder.
E. You are ready to go.

MODIFICATION 2. (for use when the expansion board is in place).

A. Perform MOD. 1.
B. Remove and return expansion board to factory for modification and installation of new RAM.
C. Install modified expansion board.

4. GENERAL OPERATION:

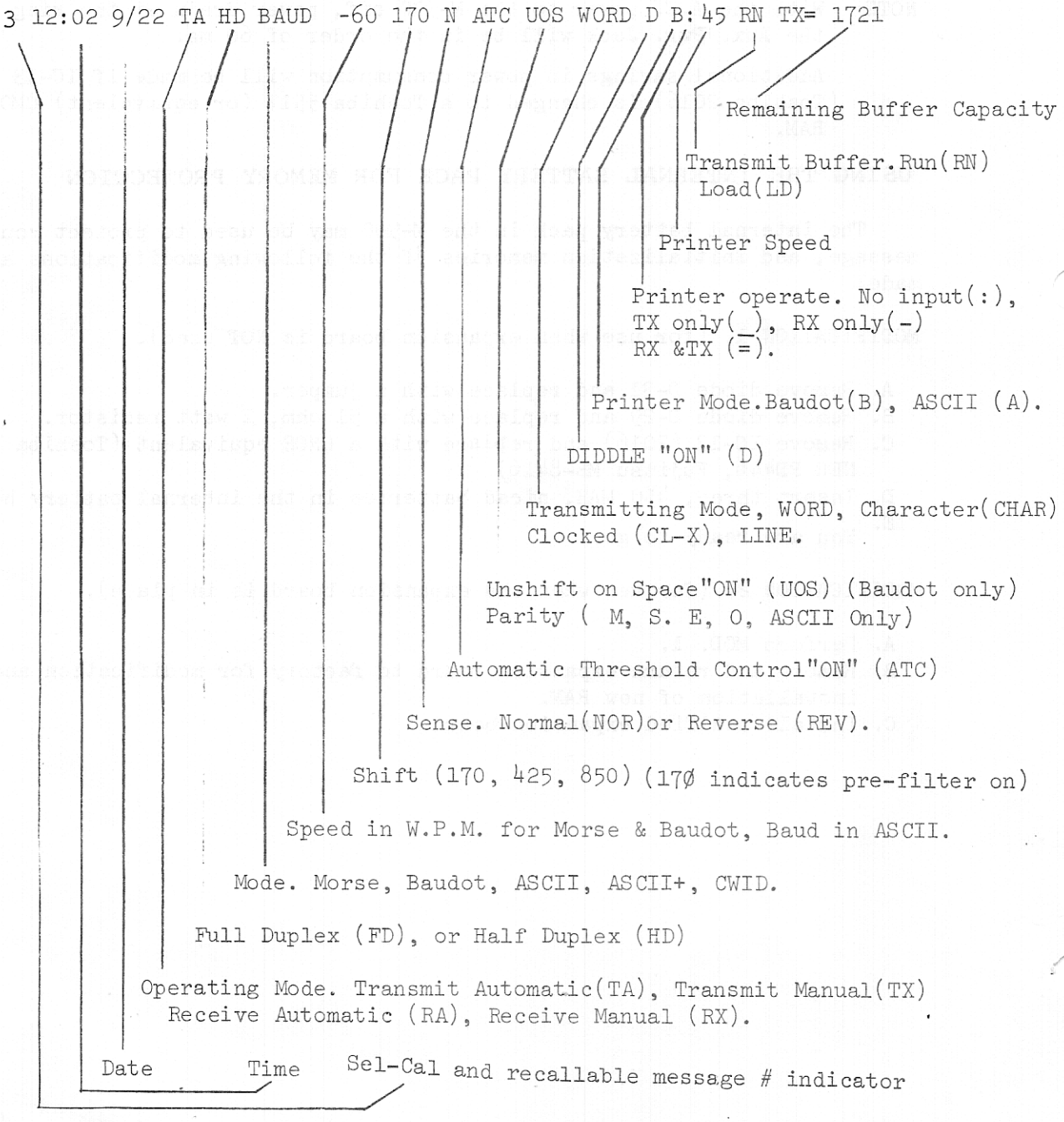
OPERATING CONTROLS:

With the exception of the rack-unit front panel controls (power, input and side-tone levels) and a few control inputs on the rear panel, all operating parameters are controlled by command inputs from the keyboard.

For ease of cross-reference, these commands are listed, in alphabetical order, in later sections of this manual and are summarized on Fig. 2.

Operating parameters are displayed in the form of a status line which occupies the 25th (bottom) line of the video display. Fig. 1 gives a graphic description of this status line and interpretation of its various symbols.

STATUS LINE FORMAT FIGURE 1



KEYBOARD CONTROL COMMANDS FIGURE 2.

"CONTROL" COMMANDS

A- ATC Toggle
B - BROWN FOX test message
C - CWID recallable message
D - Full/Half Duplex toggle
E - Exit from quick reply buffer
F - "FIGURES" (Baudot only)
G - Not assigned
H - HALT (switch to load)
I - ID recallable message
J - CARRIAGE RETURN (C/R)
K - Clocked Output value change
L - "LINE FEED" (LF)
M - MULTIPLE SCROLL INHIBIT(Toggle)
N - NORMAL/REVERSE Toggle
O - OUTPUT METHOD select
P - PARITY Select
Q - Enter QUICK REPLY BUFFER
R - RECEIVE
S - SHIFT select
T - TRANSMIT
U - UNSHIFT ON SPACE TOGGLE (UOS)
V - "LETTERS" (Baudot only)
W - WIDE toggle (170 pre-filter enable)
X - TRANSMIT MODE SELECT (Auto/Manual)
Y - RY's to end of line
Z - TIME AND DATE output
/ - Split recallable message (1-Ø)
. (Period)- End loading of recallable
1-Ø- Play recallable message 1-Ø
: (Colon)- Immediate action command
RESET- SPECIAL ENTRY COMMAND
BLANK- DIDDLE TOGGLE

SHIFT/CONTROL COMMANDS

A - ASCII Mode
B - BAUDOT Mode
C - CWID Load
D - Display RECALLABLES or SEL-CALS
E - Clear Transmit Buffer
F - Not assigned
G - "
H - Printer, Auto CR/LF toggle.
I - ID MESSAGE load
J - Mailbox message"A" load
K - Output, Auto CR/LF, Toggle.
L - Transmit data to printer(Toggle)
M - MORSE Mode
N - Receive data to printer (ON)
O - Receive data to printer (OFF)
P - PRINTER- MODE /SPEED SELECT (Scan)
Q - QUICK REPLY
R - Restore Received Screen
S - SEL-CAL Load
T - TAPE
U - Aux Output #1 "ON"
V - Aux Output #1 "OFF"
W - WEIGHT (Morse only)
X - MAILBOX MODE
Y - Aux Output #2 "ON"
Z - Aux Output #2 "OFF"
1-Ø - Load RECALLABLE MESSAGE 1-Ø
, (Comma) - MAILBOX Message "B" Load
: (Colon) - Immediate Action command
BLANK - Loads INITIALIZATION MEMORY

VIDEO:

The M-500 utilizes a "split screen" video display. That is the video display is divided between received and transmit information, both of which are displayed simultaneously.

The upper portion of the display area is normally used to display received information and is hence called the receive video area.

The lower portion of the display area, called the transmit video area, is used to display the data input from the keyboard which is to be transmitted. On-screen editing or correction of transmitted text can be accomplished previous to its transmission.

The 24 lines of useable video may be divided between transmit and receive in a number of different ratios by keyboard command to provide operating flexibility.

Both the transmit and receive video areas scroll independently.

Scrolling is the process where all of the video lines in the affected area move up one line leaving the bottom line of that area clear for new data.

The receive video area has a word wrap-around feature which causes any word of less than 15 characters, which would be only partially displayed at the end of a video line with the balance displayed on the next line, to be entirely displayed on the next line after scrolling. The transmit video area has the same feature when operated in either the word or line output method. When the character or clocked outputs are selected, the transmit video uses a non-breakup feature which has a similar effect, but is ofter somewhat less efficient. There is no wrap-around on the transmit screen.

BUFFERS:

This system contains multiple buffer systems.

A buffer, in this instance, is defined as an area in the RAM (Read and Write Memory) that is used for storage of data.

The buffer systems are used in receive, transmit, and auxilliary systems.

More detailed descriptions of the buffer operations follow in later sections.

CURSORS:

The M-500 utilizes twin cursors.

One cursor, called the keyboard cursor, indicates where, on the video screen, the next character (key), entered from the keyboard, will be placed.

The other cursor, the transmit cursor, indicates what character is next to be transmitted from the unit.

The transmit buffer counter (on the status line) indicates the remaining space in the buffer, the separation of the two cursors will serve to indicate the number of characters in the buffer which remain to be transmitted. When the transmit buffer is empty (all characters have been transmitted) the cursors will merge together as one and will appear brighter.

SPECIAL KEYS:

There are several special keys on the M-500 keyboard.

CQ - Pressing this key causes three characters (C, Q and SPACE) to be entered into the transmit buffer.

DE - Pressing this key causes three characters (D, E and SPACE) to be entered into the transmit buffer.

The balance of the special keys do not, by themselves, cause any entry into the transmit buffer.

BREAK - This key, while pressed, causes the RTTY outputs to remain in the spacing condition, and the Morse outputs to remain in the key-down condition. No other operating functions are affected.

RUN/LOAD - Each time this key is pressed, the state of the transmit buffer output control will toggle. That is, it will switch from run to load or load to run depending upon the state of the output control before the key is pressed. When the transmit buffer control is in the load state, input from the keyboard may continue, but there will be no output from the transmit buffer until the control is returned to the run state. Any character in the process of being sent when the output control changes to load will be completed before the output stops.

REPEAT - When this key is held down in conjunction with any other key, that key will be repeated until one or the other keys is released.

SHIFT - This key is used in conjunction with another key to designate the use of the upper character in double-marked keys. It is also used in conjunction with the control key and certain other keys for some commands. When using this key, it is important that the shift key be pressed before, and held down while the other key is pressed.

CONTROL - This key is used in conjunction with other keys to designate control or command functions, also with the shift key and another key to designate other control functions. When using this key it is important that the control (and shift, if required) key(s) be pressed before, and held down while, the other key is pressed.

BLANK - When this key is pressed the keyboard cursor will move backward one space provided that the transmit buffer is not empty and the keyboard cursor is not already at the extreme left of the line. This key can be used for correction of

errors occurring on the bottom transmit line (before any entered errors are scrolled up). If the CURSOR is moved back, any characters, to the right of the new cursor location must be re-entered.

RESET

Pressing this key causes the unit's microprocessor system to be reset. All transmit buffer area will be cleared and all operating parameters initialized. The various RAM segments will be tested and initialized if indicated by the tests.

SPECIAL KEYS FOR C.W. ONLY.

The following special signals are for operation in the MORSE mode only:

MORSE OUTPUT	KEYBOARD LOCATION	VIDEO PRESENTATION TX	RX
AR	SHIFT COMMA (<)	<	?
AS	SHIFT 4 ($)	$	$
BK	SHIFT COLON (*)	*	*
BT	SHIFT - (=)	=	=
SK	SHIFT . (>)	>	>
ATTENTION	SHIFT 1 (!)	!	!
UNDERSTAND	SHIFT SEMI-COLON (+)	+	+

INITIALIZATION

The M-500 will reset when the "RESET" key is pressed, or when power is removed and reapplied.

The occurance of a reset condition will cause a series if initialization procedures to automatically take place.

In reality, there are two initialization procedures that are possible in the M-500 system, they are:

1. Normal Initialization.
   In this mode the default mode of operation is set.(Baudot Mode, 45 baud, 170 hz. shift, 170 hz. prefilter on, half duplex, receive auto running buffer on run, printer output on baudot-45, receive data to printer, ATC and UOS on, Diddle off.
   Non-battery backed RAM (except receive video) is cleared, battery-backed RAM is tested and cleared if affected by the reset, otherwise it is left alone.
   The Status Line will then be set to display the total system condition.

2. Initialization using the Initialization Buffer.
   The Initialization Buffer is a special buffer, which can be battery backed, that will allow the user to specify exactly how he wants his M-500 to initialize.

   When this special buffer is used, the unit will initialize as in 1. (above) and then immediately switch to the parameters, loaded by the user, in the Initialization Buffer.

   Details on the use of the initialization will appear later in this manual.

5. BASIC OPERATING INSTRUCTIONS.

The operation of the M-500 is completely controlled from the 53 key keyboard.

Set-up and mode changing operations will require the use of the control keys. (SHIFT, CONTROL, SHIFT CONTROL, and RESET)

When the instructions call for you to press "CONTROL B", you must press the"CONTROL" key and then the "B" key without releasing the "control" key.

After the "B" key is pressed, you may release both keys specified

Should the instructions call for you to press "SHIFT CONTROL C", you must press"SHIFT"and "CONTROL" and "C" all at the same time, and then you may release the keys.

Should the instruction call for placing the M-500 in Baudot mode at 74 baud, ("SHIFT/CONTROL","B") you would hold down the SHIFT and CONTROL keys while repeatedly pressing the B key until 74 baud appeared in the proper place on the STATUS line.

The following are typical set-up commands:

1. To set up the M-500 in Baudot, 45 baud(60 WPM), 850 hz. shift:
   A. Press "SHIFT CONTROL B", release. You are now in Baudot at 45 baud. (Note the appearance of "BAUDOT-45" on the status line)

   B. Hold down the "CONTROL" key and repeatedly press the "S" key until 850 appears in the proper place on the status line

2. To set up the M-500 in Morse, 25wpm.
   Press "SHIFT CONTROL M", release, then press "2", release, then press "5"., release, press "/".

3. To set up in ASCII, 110 baud, 170 hz. shift:
   A. Press "SHIFT CONTROL A", The first entry of this command will place the M-500 in ASCII at 110 baud.
   B. Hold down the "CONTROL" key and repeatedly press the "S" until 170 appears on the status line.

4. To transmit in the "Manual" mode.
   A. Press "CONTROL T" (This turns on the PTT line), type your message.
   B. Press "CONTROL R" (This turns off the PTT line and returns to receive manual).

5. To transmit "Quick Brown Fox" message in Automatic mode:
   Press "CONTROL B". release.

6. To transmit "Quick Brown Fox" message in Manual mode:
   A. Press"CONTROL T".
   B. Press"CONTROL B".
   C. After message is complete press "CONTROL R"(The ONTROL R may be pressed before the message is complete).
7. To place system in Automatic mode(RA/TA)
   Press "CONTROL X".(This command toggles the system between Automatic and Manual modes).

8. To set up to use an ASCII, 110 baud printer:
   Press "SHIFT CONTROL" and then repeatedly press"P" until A-110 appears on the status line in the proper position.

9. To set up for a Baudot printer, 74 baud:
   Press and hold "SHIFT CONTROL" and then repeatedly press "P" until B-74 appears at the proper place on the status line.

10. Loading the ID message "DE WRØAJJ" in ID memory:
    A. Press "SHIFT CONTROL I", release.
    B. Type text of message "DE WRØAJJ ,space."
    C. Press "CONTROL PERIOD"

11. To play the ID message:
    Press "CONTROL I", release.

12. To load a message in recallable memory no. 3:
    A. Press "SHIFT CONTROL 3", release.
    B. Type in contents of desired message.
    C. Press CONTROL PERIOD.

13. To play the contents of recallable message no. 3:
    Press "CONTROL 3".

14. To view the contents of recallable message no.3:
    A. Press "SHIFT CONTROL D", release the "D", while holding SHIFT CONTROL.
    B. Press "3", release. (The contents of the message will be displayed on the receive portion of the screen, displacing the received video.
    C. Press "SHIFT CONTROL R", (This restores the received video to the screen.)

15. To load C.W.I.D. message at 12 WPM in C.W.I.D. memory "DE W4ABC":
    A. Press "SHIFT CONTROL C", release
    B. Press "SHIFT CONTROL M", release
    C. Press "1", release, press "2", release, press"SLASH" release.
    D. Type contents of C.W.I.D. message.
    E. Press "CONTROL PERIOD", release.

16. To play C.W.I.D. message:
    Press "CONTROL C", release.

These examples and the many other functions of the M-500 are explained in depth in later sections of this manual.

6. RECEIVING WITH THE M-500

MORSE OPERATION

To receive Morse signals, place the M-500 in Morse mode.(The Morse transmitting speed selected will have some effect on the receiving speed so that the speed selected should approximate the received speed.

Tune in a Morse station, adjust the receiver BFO so that the tone from the receiver approximates 1000 hz.(The regenerated sidetone from the M-500 is set to 1000 hz. and thus can be used as a tone to compare with.)

Set your receiver's bandwidth to its' most selective position.

Carefully tune the BFO control until the C.W. lock light flashes in unison with the incoming code. (The horizontal portion of the "cross" display should also indicate maximum deflection and brilliance at the proper tuning point)

Since noise can disable the Morse section or cause garble, care should be used to drive the M-500 with only enough audio to cause actuation of the Morse Lock Light. Excess gain and thus excess noise will be indicated by the constant illumination of the "LIM" light.

The use of the "LEVEL" control on the front panel of the M-500 and the receiver RF GAIN control will allow the operator to closely control the audio and noise level presented to the M-500 demodulators.

Ideal settings of the receiver RF and AF gain controls and the M-500 LEVEL control will be indicated by the CW lite, the Horizontal Bar lite, and the LIM light all flashing in unison with the incoming code.

RTTY/ASCII OPERATION

To receive RTTY (ASCII or BAUDOT) signals on the M-500, the unit must be set to the same mode, speed, and shift as the incoming signals.(For amateur use, Baudot, 45 baud, 170 hz. shift is common).

Once the M-500 is properly set you may proceed to locate a RTTY station and attempt its reception.(Agood place to start is 14095. Khz ± 15 Khz.)

The receiver should be set for the reception of FSK, or Sideband,(or CW, if it has a tunable BFO). Selectivity should be set to about 400-600 hz.

Tune the receiver across the signal of interest until both the MARK and SPACE LEDS are flashing and the CROSSPOINTER display is fully illuminated.

If the unit appears to be properly tuned but is printing garble, try reversing the sense of the demodulator (press "CONTROL N").

As in the reception of Morse, you should use only as much audio input as is necessary to obtain consistant deflection of the CROSS POINTER display.

The LEVEL control should be adjusted so that the LIM light is barely illumnated with reasonable signal input.(Excessive audio may cause distortion and thus misprinting, especially on the HF bands.)

The 170 hz. pre-filter is provided for extra selectivity on the HF bands, and will perform satisfactorily thru 110 baud.

Reception of ASCII on the HF bands is quite similar to the reception of BAUDOT, with the exception that ASCII is more suseptible to error because of fading and noise pulses.

The tuning for ASCII would be identical to the tuning for BAUDOT except the mode selected would be ASCII at whatever the baud rate being used.

7. M-500 CONTROL COMMANDS

Figure 2 is a list of all of the CONTROL COMMANDS used in the M-500 system.

The following is a more detailed discription of these commands:
(NOTE: Whenever a command is given to the M-500, the letter of that command will appear in the transmit portion of the screen as a letter with a greater intensity).

Two expressions will be used in the discription of the commands, they are "TOGGLE", and "SCAN".

A TOGGLE operation will turn a function on or off depending upon the present state of that function.

A SCAN operation is similar to the toggle operation except, with the scan, there are more than two possible conditions, similar to the repeating high, low, off cycle of a three way lamp.

CONTROL A - ATC Toggle (RTTY modes only)

This command toggles the automatic threshold circuit(ATC) in the RTTY RTTY demodulator on and off.

The ATC circuit helps to correct for selective fading and single tone (mark only or space only) reception.

CONTROL B -Brown Fox Test Message

This command sends the pre-programmed test message: "C/R THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 123456789Ø".

CONTROL C - C.W.I.D. RECALLABLE MESSAGE

This command sends the CWID recallable message. For proper operation, this message must be loaded exactly as shown in the section on recallable messages, which will be covered in later sections.

When properly loaded, the CWID message will switch the M-500 from a RTTY mode to the Morse mode at the selected speed, transmit the CWID text, and then return to the origional mode and speed.

NOTE: The receive portion of full duplex RTTY operation will be sus-

pended during CWID.

If the unit is already in the Morse mode when the CWID is selected, the mode and speed will remain the same and the CWID text will be sent.

The text of the CWID MEMORY is limited to 72 characters including control characters and the required EOM character.

The maximum CWID speed is 99WPM.

CONTROL D - FULL/HALF DUPLEX TOGGLE

This command switches operation between Full Duplex(FD) and Half Duplex (HD).

In the Full Duplex mode, simultaneous transmission and reception of the same mode and speed are allowed.

While true Full Duplex operation is not permitted in amateur service, there are times when it may be desirable to operate the unit in the Full Duplex mode.

If the station has a monitor receiver or the transceiver in use has a suitable sidetone, where outgoing transmissions can or would be copied by the receiving equipment, the FD mode would allow "off-the-air" monitoring of the station transmissions.

If there is no such monitoring provision, and it is not desired to have the transmitted text appear in the receive portion of the screen, then the FD mode must be selected.

If the Half Duplex(HD) mode is selected, then the incoming signals will only be processed if the unit is in the receive mode (RX or RA).

When the unit is in the transmit mode(TX or TA), no incoming data will be displayed on the receive video portion of the screen, but the transmitted text will appear in the receive video, with low intensity characters, distinguishing transmitted from received data.

The transmitted character will appear on the receive screen at the beginning of the transmission of that character, not at the end, as with off-the-air or echo monitoring as in the FD mode.

CONTROL E - EXIT FROM QUICK REPLY BUFFER

This command is used to instruct the system to return to its previous status before the Quick reply message system was used. Additional information on this command will be found under CONTROL Q.

CONTROL F - FIGURES (BAUDOT ONLY)

Causes the Baudot code of "FIGURES" to be sent.

CONTROL G - NOT ASSIGNED (No operation will be performed)

CONTROL H - HALT, SWITCH TO LOAD

This command will switch the transmit buffer to the "load" mode.

If a number of messages are to be transmitted, intermixed with periods of receiving, this command would be placed at the end of each message which will cause the output to stop automatically at the end of each message.

To restart the output, simply press the RUN/LOAD switch momentarily.

NOTE: If the manual(TX/RX) mode is selected, be sure to include the proper transmittes control codes. (see later section).
If the automatic mode(TA/RA) mode is selected, transmitter control will operate just as it would if the running buffer had been placed in the "LOAD" mode with the RUN/LOAD switch.

CONTROL I - ID RECALLABLE MESSAGE

This command will send the text of the ID recallable message. This message is limited to 72 characters (Including all control and EOM characters)

CONTROL J - CARRIAGE RETURN (C/R)

Causes "CARRIAGE RETURN" character to be sent in Baudot or ASCII only.

CONTROL K - CLOCKED OUTPUT VALUE CHANGE SCAN (RTTY only)

This command causes the CLOCKED OUTPUT speed to step by a value each tome the the key is pressed.
The count steps from 1 thru 5 and back to 1 again.

A clock value of 1 would be full speed, 2 would be 1/2 speed, 3 would be 1/3 speed, 4 would be 1/4 speed, and 5 would be 1/5 speed.(More information on the clocked output operation will be found under CONTROL O)

CONTROL L - LINE FEED

Causes the "LINE FEED" character to be sent.

CONTROL M - MULTIPLE SCROLL INHIBIT TOGGLE

Limits multiple received linefeeds to one linefeed. This feature saves screen room.

CONTROL N - NORMAL REVERSE TOGGLE

This command toggles the SENSE of the RTTY demodulators between NORMAL and REVERSE. In the normal(NOR) sense, the mark tone is the lower of the two frequencies. In the reverse(REV) sense, the mark tone is the higher of the two frequencies.

CONTROL O - OUTPUT METHOD SELECT (SCAN)

This command selects the desired transmit output method.

The scan sequence is: Character (CHAR), Clocked (CL-X), Word (WORD), and Line (LINE). Explanations of each method follow:

Character (CHAR) - Each character in the transmit buffer is transmitted as soon as the character before it has been completely sent, until the buffer is empyt or the buffer output is stopped(LOAD).

Clocked (CL-X) - The buffer output is transmitted an a reduced rate depending upon the clocked output value(X). See CONTROL K.

If this method is selected while in the MORSE mode, the output will operate as in the CHAR method.

Word (WORD) - Similar to the CHAR output method, except that the last word in the transmit buffer will not be sent until the space,following that word, has been entered. That is, no word will start to transmit until that word has been completed by a SPACE.

Line (LINE) - Similar to the WORD method, except that no line of text will start to transmit until that line has been terminated by thr press of the RETURN key.

As mentioned above, if the WORD method has been selected, there will be no output from the buffer, including control codes and characters, until a space is entered after that word or character.

THEREFORE, the CONTROL O command will not be processed to scan to the LINE mode until a SPACE follows the command.

CONTROL P - PARITY SELECT (ASCII Mode only)

The Parity scan command selects the desired output parity generation on output and detection on receive..The sequence is:
MARK (P=M), SPACE (P=S), EVEN PARITY (P=E), ODD PARITY (P=O).

If even or odd parity is selected and a received parity error is detected, that character will be displayed at a dim intensity.

CONTROL Q - Enter QUICK REPLY BUFFER

The Quick Reply Buffer is an auxilliary running buffer of 500 characters, that can be loaded and played without affecting the main running buffer.
The sequence for use of the Quick Reply Buffer is as follows:

Type CONTROL Q , type your message,then type CONTROL E.

The Quick Reply Buffer is useful in Quick Break operations, and for interrupting your own pre-loaded main running buffer with a correction, etc.

CONTROL R - RECEIVE

This command places the unit in the Receive(RX or RA) mode. Refer to CONTROL X section for furthur discription.

CONTROL S - SHIFT SELECT SCAN

This command selects the frequency shift of the low speed RTTY demodulator.
The scan sequence is: 170, 425, 850, 170. When 170 is selected the 170 pre-filter is automatically selected.

The high speed (ASCII+) demodulator is a single shift filter set for 850 hz. only. When the ASCII+ mode is selected, the CONTROL S command will not change the status line and front panel shift indicators,and the actual receive shift will remain at 850 hz.

CONTROL T - TRANSMIT

This command places the unit in the Transmit mode (TX or TA), turning ON the PTT lines, and enabling the AFSK output.

CONTROL U - UNSHIFT-ON-SPACE TOGGLE (Baudot only)

This command turns the Unshift-On-Space feature ON and OFF.

When active, the Unshift-On Space causes the Baudot receive section to switch to the LETTERS case whenever a SPACE character is received.

CONTROL V - LETTERS

Causes the Baudot code of LETTERS to be sent.

CONTROL W - WIDE TOGGLE (170 shift only)

As described in the CONTROL S section, when the 170 hz. shift is selected, a 170 hz. prefilter is automatically enabled.
The CONTROL W command toggles this pre-selector filter, ON and OFF.

If other than 170 hz. is selected, the perselect filter is disabled and cannot be activated by this command.

The condition of the prefilter can be observed on the STATUS LINE. When the prefilter is enabled, 170 will appear in the shift section, but when the prefilter is disabled the shift will appear as 170.

CONTROL X - TRANSMIT MODE SELECT

This command toggles between the manual(TX/RX) and automatic(TA/RA) operations.
In the manual mode(TX/RX), switching between transmit and receive only occur through the use of the CONTROL R, and CONTROL T commands.

When in the automatic mode (TA/RA), the status of the transmit/receive function is determined by keyboard activity. When any key on the keyboard is pressed(except RUN/LOAD, REPEAT, BREAK, SHIFT, or CONTROL), the unit will shift to the transmit mode (TA) unless the transmit buffer control is in the LOAD position.

If the unit was in the receive mode before the key was pressed, there will be a brief delay between the switch to transmit and the start of the output of the first character.

If the buffer control is in the LOAD position, and there are characters in the buffer, the the unit will switch to transmit when the control is switched to RUN. Again there will be a delay before the contents of the buffer begin to be sent.

When there would be no output from the buffer because it is empty, or the switch is in the LOAD position, a turn-off timer is started.

If this timer "Times-Out", then the unit will automatically switch back to the receive mode.

If, however, there is additional output from the buffer, before the "Time-Out" occurs, the timer will be reset, and is reset every time a new character is outputted from the transmit buffer.

Note that when WORD or LINE mode is selected and a new word or line has been started, and all preceding words or lines have been outputted, "Time-Out" will not occur. Any characters remaining in the buffer must be sent before "Time-Out" will occur, unless the transmit buffer switch is in the LOAD position.

CONTROL X (Continued)

When the unit is in automatic mode, the manual transmit commands may still be used, but their use will not inhibit the automatic operating features

It should be noted that for the purpose of the automatic function, control characters don't count as characters outputted from the buffer with respect to turning on the transmit mode.

The Off and ON delays are a function of the output speed, that is, the higher the output speed, the shorter the delay, however, the delays have been selected to be adequate for most normal operations. If the delays are not suitable for some particular application, then the manual transmit commands should be used.

CONTROL Y - RY's TO THE END OF THE LINE (RTTY Modes only)

This command causes a teleprinter test signal to be sent until the end of the current transmitted line is reached.

In Baudot mode actual RY's(64's in upper case) are sent.

In ASCII the output will be U*'s.

At the end of the test lines, the C/R sequence will be sent.

CONTROL Z - TIME AND DATE OUTPUT

Causes the Time and Date (as indicated on the left hand portion of the STATUS LINE) to be transmitted.

CONTROL / - SPLIT RECALLABLE MESSAGE (1-Ø).

This command allows the user to effectively change his 10 recallable messages of 144 characters each to 20 recallables of 72 characters each.

In actual operation, only one message memory is split at a time by this command.

To play the second half of message no. 3: Type"CONTROL /, 3". This will cause the message, previously loaded in the second half of 3, to be transmitted.

To play the first half of a previously split memory, simply press: "CONTROL 3", and the first half will be transmitted.

CONTROL PERIOD (.) - END THE LOADING OF A RECALLABLE MESSAGE(EOM)

This command is used when loading indirect commands and recallable messages to indicate the end of the message or indirect command.

Recallable messages MUST have this command at the end of the message.

CONTROL 1 thru Ø - PLAY RECALLABLE MESSAGE 1 thru Ø

These commands will cause the contents of the corresponding recallable message to be transmitted.

A recallable message is one, which is entered by the user and stored in system RAM. These messages can be recalled, that is, inserted into the transmitted character stream, on command, any number of times, without causing erasure or alteration of the message

There are ten such message memories in the M-500, not including the ID and CWID messages covered earlier.

Each of these ten memories has a 144 character capacity(including any control characters and the EOM command which must occur at the end of each recallable message.

Additional information on these memories will be found under the Shift/Control Commands.

CONTROL COLON (:) - IMMEDIATE ACTION COMMAND

All of the commands, previously discussed, are executed(cause an operation or event to occur) as they are outputted from the transmit buffer.

For example, if the unit is in the Baudot mode at 74 baud and six lines are entered into the transmit buffer, and then a command to change to Baudot 45 baud (SHIFT CONTROL B x 2) is entered, the six lines already entered will be sent at 74 baud before the change to 45 baud occurs.

There are some cases where this may not be desirable, as in the above example if all of the text was intended to be sent at 45 baud, but the command had been mis-entered, omitted, or forgotten until a large ammount of text had been entered

Other times it may be desirable or even necessary to enter a command "on the fly", that is, while transmission continues such as the clocked output rate, or when pre-loading the transmit buffer while receiving, or changing the shift, sense, ATC, UOS, or even a mode or speed change.

The IMMEDIATE COMMAND entry allows these non-transmit buffer dependent changes

IMMEDIATE ACTION COMMANDS perform the same function as other commands previously mentioned, and must be of the same format except the are preceded by a CTRL ,or SHIFT CONTROL,COLON.

To indicate that the COLON is a request for an IMMEDIATE COMMAND, the CONTROL or SHIFT CONTROL keys must be held down while the COLON is being pressed.

It is important to note, that since the IMMEDIATE commands are not entered into the transmit buffer, the entries are not displayed on the video screen and are thus entered "blind".

CONTROL RESET

This command is an entry command for the TIME, DATE, and VIDEO SPLIT ASSIGNMENT routines.

Details on the setting of these parameters will be given in later sections of this manual.

CONTROL BLANK - DIDDLE TOGGLE

This command turns the DIDDLE or BLANKFILL on and off.

Aside from the amusing effect this feature has on the sound of the transmission and rhythm of the mechanical printer on the receiving end of the link, when the sender is typing at less than machine speed, the diddle function can, under certain circumstances, increase the reliability of the communications link.

The DIDDLE feature automatically inserts non-printing characters into the transmitted data stream when there would be otherwise be no output from the buffer.

This prevents the transmitted signal from going to an idle mark-hold condition.

Often, under noisy conditions, noise pulses and spikes are interpreted by a demodulator to be spacing signals. If the receiving equipment, particulary, a mechanical printer, is resting in mark-hold when such a noise pulse occurs,it may interpret that noise spike as a start pulse and begin the uninterruptable character receive/print sequence. This can throw the transmit and receive ends of the link out of sync. if a valid character or character stream begins while the receive printer is going through a cycle caused by a false start pulse.

One way of minimizing the possibility of such out-of-synch operations is to reduce or eliminate the idle mark-hold time during which, a noise pulse could cause a false start. The DIDDLE feature accomplishes this end.

In Baudot, the fill chatacter id the case(FIGS or LTRS) of the last character sent before the would-be idle time.

In ASCII, the fill character is "BLANK", a start pulse, followed by 7 marking data bits, parity, and stop.

M-500 SHIFT CONTROL COMMANDS

The SHIFT CONTROL commands are similar to the CONTROL commands except that the SHIFT key and theCONTROL key are held down togeather to accomplish another set of instructions to be given to the M-500.

SHIFT CONTROL A - ASCII MODE (Scan)

This command will place the unit in ASCII mode and repeated presses of the A key will step the unit through the ASCII speeds of 110, 150, 300, 600, and 1200 baud. (Note: The SHIFT and CONTROL keys must be held down while pressing the "A" key.

There are actually two separate ASCII modes: one for speeds at 110 baud and lower, and another for speeds of 110 baud and up.

The lower speed ASCII uses the same demodulator as the Baudot mode, while the high speed ASCII(ASCII+) uses a separate, high speed, single shift(850 Hz.), demodulator.

The demodulator selection takes place automatically, depending upon the selected speed except that 110 baud may use either demodulator.

The status line will indicate the use of the high-baud demodulator by placing a "+" between "ASCII" and the following ASCII speed indication.

SHIFT CONTROL B - BAUDOT(MURRAY) MODE SCAN

This command selects the Baudot mode of operation. Repeated presses of the B key, while the SHIFT and CONTROL keys are held down will step the unit through the Baudot speeds of 45, 50, 57, 74, and 100 baud.

SHIFT CONTROL C - C.W.I.D. LOAD

This command allows the loading of the C.W.I.D. message memory. The CWID memory is limited to 72 characters including the EOM(CONTROL PERIOD) character.

The entry of your message must be terminated by the EOM character.

SHIFT CONTROL D - DISPLAY RECALLABLES or SEL-CALS.

The actual contents of the user loaded RECALLABLE messages and SEL-CALS may be displayed in the screen by using this command.

To display the contents of RECALLABLE MESSAGE 5:
Press SHIFT CONTROL D, release D,while still holding SHIFT CONTROL and then press 5. The contents of message 5 will be displayed
To restore the screen to its previous status; Press SHIFT CONTROL R.

SHIFT CONTROL D (continued)

To display the contents of the second half of Recallable 7:
Press SHIFT CONTROL D, release all three, press 7. The contents of the second half of Recallable 7 will be displayed.

To restore the screen: press SHIFT CONTROL R, release.

To display the SEL-CALS: Press SHIFT CONTROL D, release the D,while holding the SHIFT CONTROL down, press S.
The SEL-CALS will be displayed.
Press: SHIFT CONTROL R, to restore the screen.

Note: The receive portion of the screen is used to display the Recallables and the Sel-Cals.
The received data will continue to be processed and stored during the time you are viewing the Recallables and will be returned to the screen after SHIFT CONTROL R is pressed.

SHIFT CONTROL E - CLEAR TRANSMIT BUFFER

This command erases all of the data in the transmit buffer currently in operation.

Whatever appears on the transmit portion of the screen will be erased.

SHIFT CONTROL F - Unassigned

SHIFT CONTROL G - Unassigned

SHIFT CONTROL H - AUTOMATIC CR/LF FOR PRINTER (TOGGLE)

This command inserts a CR/LF in the data stream to the printer.It may be toggled on and off.

No indication of this command and SHIFT CONTROL K will appear on the STATUS line

SHIFT CONTROL I - ID MESSAGE LOAD

This command allows the loading of the ID message memory. The ID memory is limited to 72 characters, including the EOM Character.

The entry of your message must be terminated by the EOM Character.

SHIFT CONTROL J - MAILBOX, MESSAGE "A" LOAD.

Used when the "MAILBOX OPTION" is installed. See the "MAILBOX" manual for details.

SHIFT CONTROL K - AUTOMATIC CR/LF FOR OUTPUT (TOGGLE)
Inserts CR/LF at ends of line automatically.

SHIFT CONTROL L - TRANSMIT DATA TO PRINTER(TOGGLE)

This command will cause the output from the transmit buffer to also be sent to the printer. Alternate insertions of this command will turn the data stream , from the transmit buffer to the printer output, on and off.

SHIFT CONTROL M - MORSE MODE

This command places the M-500 in Morse Mode. The command must be followed by the speed, in WPM that you desire, and a terminating command.

Example: To place the unit in Morse at 2Ø WPM:

Press SHIFT CONTROL M, release all keys, press 2, release, press Ø, release, press/, release.

To place the unit in Morse at 101 WPM:

Press SHIFT CONTROL M, release all keys, press 1, release, press Ø, release, press 1, release.

By the examples you can see that the entry into Morse Mode is a six keystroke command, with the terminating entry of"/" being used when the desired speed is less than 1ØØ WPM.

Correct entry can be verified by observation of the STATUS LINE.

SHIFT CONTROL N - RECEIVE DATA TO PRINTER

This command directs the received data to the printer output.

SHIFT CONTROL O - RECEIVE DATA NOT TO PRINTER

This command stops the received data from going to the printer output.

SHIFT CONTROL P - PRINTER MODE/ SPEED SELECT (Scan)

This command sets up the printer output,of the M-500, to properly drive your chosen printer.

Repeated presses of the P key,while holding the SHIFT and CONTROL keys down, will scan the various choices as follows: Baudot 45, 50, 57, 74, ASCII 110, 300, Baudot 45, etc.

The STATUS LINE will indicate your position in the scan.

SHIFT CONTROL Q - ENTER QUICK REPLY BUFFER

Same as CONTROL Q.

SHIFT CONTROL R - RESTORE RECEIVED SCREEN

This command is used to exit the "DISPLAY" commands and return the receive portion of the screen back to receive.

SHIFT CONTROL S - SEL-CAL LOAD

For operations under this command see section on the M-500 SEL-CAL SYSTEM

SHIFT CONTROL T - TAPE OPERATING SYSTEM COMMAND

For operations under this command see the section on the CASSETTE TAPE INTERFACE SYSTEM.

SHIFT CONTROL U - AUX. OUTPUT NO. 1 "ON".

This command, whether entered directly or as a response to a SEL-CAL, or recallable message, will cause the AUX. OUTPUT NO.1 to "TURN ON".

SHIFT CONTROL V - AUXILLIARY OUTPUT NO.1 "OFF".

Same as above except turns this line "OFF".

SHIFT CONTROL W - MORSE WEIGHT LEVEL SET.

The timing ratios of the Morse output may be modified somewhat from the M-500 normal of 5.

Changing the weight level modifies the element space to dot ratio from the standard of 1:1, giving the sent code a different rhythm. At initialization, the weight is automatically set to 5 (1:1). Once the weight is set or changed, it will remain at the new value until it is again changed or the unit is reset.

SHIFT CONTROL W - continued

The following is a table showing the 9 weight settings and their corresponding element space to dot ratio:

WEIGHT	ELEMENT SPACE/DOT RATIO
1	1.5
2	1.3
3	1.2
4	1.1
5	1
6	.9
7	.7
8	.6
9	.5

The ratios above are approximations for a Morse speed of 15 WPM. At higher speeds the weight settings have a slightly less effect on the timing ratios.

To change the weight:

Press SHIFT CONTROL W, release, then press the number corresponding to the desired ratio. No other action is required.

SHIFT CONTROL X - MAILBOX MODE

This command enables the user to access the M-500 EXP (MAILBOX) system. (When so equipped)

SHIFT CONTROL Y - AUX OUTPUT NO.2 "ON".

Same as SHIFT CONTROL U except for output No. 2.

SHIFT CONTROL Z - AUX. OUTPUT NO. 2 "OFF".

Same as SHIFT CONTROL V, except for output No. 2.

SHIFT CONTROL 1-Ø - LOAD RECALLABLE MESSAGE 1-Ø

This command allows the loading of the 10 recallable message memories.

To load message No. 3:
Press SHIFT CONTROL 3, release, type your message of up to 144 characters, then terminate the loading with the EOM command(CONTROL PERIOD).

To load a small 45 character message in the lasthalf of memory No. 5:
Press SHIFT CONTROL /, release, press "5", release, type the message, press CONTROL PERIOD.

SHIFT CONTROL 1-Ø - continued.

To play these messages refer to CONTROL 1-Ø.

SHIFT CONTROL ,(COMMA) - MAILBOX MESSAGE "B" LOAD.

Used when MAILBOX option is installed.

SHIFT CONTROL COLON - IMMEDIATE ACTION COMMAND

Same as CONTROL : (COLON).

LOAD INITIALIZATION MEMORY - SHIFT CONTROL BLANK

A special memory has been provided, so that the user can determine his own INITIALIZATION parameters.

This memory is physically located in the RAM that can be battery protected, thus if a battery back-up system is used, the unit will always initialize as selected by the user and programmed into this memory.

To program this memory, press SHIFT CONTROL BLANK, and then observing the STATUS LINE, enter the appropriate commands that change the various parameters to suit your needs.(Note : the STATUS line will not change at this time but reference to it will help the user select items to be changed.
The changes can be entered in any order and any function displayed on the status line can be changed.

Examples: To initialize in Baudot at 74 baud, press SHIFT CONTROL, and then press "B"three times.

To initialize in Morse at 22 wpm, Press SHIFT CONTROL M, 22, release, press "/",release.

To initialize the printer output at Baudot,50 baud, press SHIFT CONTROL P once

To terminate the loading of the INITIALIZATION MEMORY, you must press the EOM command(CONTROL PERIOD).

After the EOM command is given, press RESET, the STATUS LINE should now reflect the changes you made in the initialization routine, if not go back and try again.

SPECIAL ENTRY COMMAND - CONTROL RESET

This entry command allows the user to set the DATE, TIME, and the number of TRANSMIT VIDEO LINES.

The operation is very simple:
A. Press CONTROL RESET.(Hold the CONTROL KEY down until the screen blanks and the word,"DATE", appears on the screen.

B. Enter the date as 4 digits corresponding to the Month and Date. (Oct. 4 would be entered as 1004, Jan. 3 would be entered as 0103)

C. As you enter these numbers, they will appear, on the screen to the right of the word "Date". As the last of these four numbers is entered, the word "Time" will appear,on the screen, directly below the word "Date".

D. Enter the time in the same manner that the date was entered. (0435 hrs. woul be entered as 0435, 2319 hrs. would be entered as 2319)

NOTE: The M-500 real time clock system always operates on a 24 hour format.

E. When the last number of the time is entered, the display will indicate the word "Lines" directly below the word "Time".

F. To select the number of video lines to be dedicated to the transmit function, simply press two keys,corresponding to the number of lines that you desire,between 2 and 15. (9 lines would be 09, 14 lines would be 14).

G. After the entry of the last number above the operation of the M-500 will return to normal.

NOTE: Should you not want to change the Date or Time or No. of Xmit lines when you enter this mode, simply press any NON NUMERIC key and the system will sequence to the next selection.

NOTE: The default value for No. of Xmit Lines is 10. If no selection is made in F, above, the unit will stay with 10 lines.

THE M-500 SEL-CAL SYSTEM

SEL-CAL is a system of codes, usually groups of letters, that are sent to a receiving station, to cause a function to be performed at that receiving location.

In its simplest form,a SEL-CAL code is sent to turn a printer, on or off.

The M-500 SEL-CAL system will recognize specific groups of up to 8 characters as a SEL-CAL, and decode that group to perform a specific function.

The SEL-CAL system will recognize the numbers 1 through Ø, the letters A through Z, and any printing Baudot character.

The following list shows the specific function that each of the 14 available SEL-CAL slots will perform.

SEL-CAL	FUNCTION
A.	Play recallable message no. 1.
B.	Play recallable message no. 2.
C.	Play recallable message no. 3.
D.	Received data to printer.
E.	Received data to tape.
F.	Auxilliary output no. 1 "on".
G.	Auxilliary output no. 2 "on".
H.	Play recallable message no. 4.
I.	Play recallable message no, 5.
J.	Mailbox command prefix.
K.	Received data to printer off.
L.	Received data to tape stop.
M.	Auxilliary output no. 1 "off".
N.	Auxilliary output no. 2 "off".

PROGRAMMING SEL-CALS INTO THE M-500

In each of the SEL-CAL slots there is room for 8 characters.

All 8 character spaces must be used, even if your SEL-CAL is only 4 characters long.

To fill out the unused portion of the SEL-CAL you must insert the "DON'T CARE" symbol (-). Thus if the SEL-CAL desired was "NNNN", you would enter "----NNNN" (DON'T CARES should always preceed the desired SEL-CAL).

To enter the SEL-CAL code of "ZCZCØWRZ" into slot"B":

Press SHIFT CONTROL S, release, press "B", release. Then type"ZCZCØWRZ", then press RETURN. The entry is complete.

If you observe the screen during each step of this entry,you will

NOTES ON LOADING RECALLABLES & SEL-CAL's

Whenever a command is entered to load a recallable or a SEL-CAL code, the outgoing transmission is suspended until the loading is completed.

During this loading the transmit buffer counter will indicate the number of characters remaining in the recallable or SEL-CAL being loaded.

The location at the extreme left will identify the memory being loaded.

SEL-CAL identifiers will be a dim letter from "A" to "N", while recallables will be identified by the bright characters, "1 thru Ø", "C", "I", "J", "@", or "," with a "/" appearing after the numeral if the second half of a split recallable is being loaded.

Messages of more than 144 characters may be stored by "LINKING" consecutive recallable memories.

After 144 characters have been loaded, (the buffer counter will indicate TX = ØØØØ) no further keyboard input (with 3 exceptions) will be recognized.

To end a message without further linking, the message must be shortened by at least one character by entering one or more back spaces (blank key) to allow room for the EOM character (CONTROL PERIOD).

To link to the next message memory (if it is not in current use) from any numbered memory 1 thru 9 press RETURN.

Note that the display will not scroll and a C/R sequence will not be inserted into the message from this action.

The buffer counter will indicate TX = Ø144 and the identifier at the far left of the STATUS LINE will count up to the next message location, which you are now prepared to load.

If you were loading the second half of a split recallable before linking, you will link to the next full memory.

If the memory you link to has been split and you wish to retain the second half, simply end the recallable by entering CONTROL PERIOD, when the buffer counter indicates 73 or more characters remaining in the memory.

It is also possible to terminate the loading of a recallable, regardless of the counter indication by pressing CONTROL E.

Note: Terminating in this manner does not insert the EOM character and could possibly result in unexpected outputs when the message is called.

The CONTROL E allows for changing the first portion of a message without having to terminate the message at the end of the change.

note that a letter(A-N) will appear in the lower left-hand portion of the screen. This indicates the SEL-CAL slot that is to be programmed.

Also note that the transmit buffer capacity indicator (TX=) will indicate 0008, thus indicating that,just before the entry of the actual SEL-CAL code, you have 8 characters to load.

After the completion of the SEL-CAL loading sequence, when the "RETURN" key is pressed, the M-500 will revert back to normal operation.

Each SEL-CAL slot is loaded in a similar manner as shown in the previous manner.

Should a mistake be made in the entry of a SEL-CAL, you may correct the mistake by backspacing (pressing the BLANK key) and then typing the proper characters.

DISPLAYING THE SEL-CALS

To display the actual contents of the SEL-CAL slots:

Press SHIFT CONTROL D, release,press "S", release. The contents of all 14 SEL-CAL slots will be displayed on the receive screen.

To return to normal operation, press SHIFT CONTROL R, release.

Example: Load the ID memory with about 12 CONTROL G's (no-ops) followed by "DE W 4ABC, VENICE, FLA., CONTROL C (for CWID), then enter CONTROL PERIOD.

If you then enter a QSO with K90B enter "SHIFT CONTROL I, K90B, CONTROL E".

Now, when the CONTROL I command is entered, the M-500 will send K90B de W4ABC, Venice, Fla. and your CWID.

The first part of the message may be changed any number of times without affecting the remainder of the message.

Recallable messages may call other messages as long as a message does not call itself or call any other message which would in turn call the original message.

To call one message from another:

Enter the command to call the desired message at the appropriate point in the original recallable.

CASSETTE TAPE INTERFACE SYSTEM

The M-500 Tape Interface System allows data to be transferred from the M-500, to tape, and back again, in a formatted, tape-saving style.

All data, to and from the tape, is transferred in 250 character blocks, preceded by a sync leader and followed by a block terminating sequence.

Data is transferred in an AFSK form at approximately 250 baud.
NOTE: Only tapes cut from the M-500 may be stored and replayed through the M-500.

The tape system also provides a motor control line to facilitate automatic start and stop of the tape drive as required.

A buffer is provided for temporary storage of the tape data to allow for block format transfer.

When a tape output command is entered, there will be no indication of any action until at least 250 characters have been entered into the tape buffer. At this point, the motor control line will turn on and the first formatted block will begin to be transferred to the tape.

Output data, to be stored on tape, may come from either received data or keyboard entry.

The HOOK-UP of the tape recorder should be as follows:
Tape recorder input to J-14 TIP (AUDIO FROM 500)
Tape recorder output to J-14 RING (AUDIO TO 500)
Tape motor control to J-2 RING

NOTE: 1. The tape motor control system operates ONLY with a NEGATIVE GROUND tape recorder motor.

2. Some recorders will mix up their grounds (Radio Shack). In that case, the audio grounds may have to be capacitively coupled back to the M-500.

TO RECORD RECEIVED DATA ON TAPE:

Press SHIFT CONTROL T, release, press "O", release, press "R" release. (Tape Out from Received data).
Tapes of received data may be played back to(1) receive video, (2) transmit buffer, or (3) indirectly to the printer.

TO RECORD KEYBOARD DATA ON TAPE:

Press SHIFT CONTROL T, release, press "O", release, press "K", release. (Tape Out from Keyboard).

Tapes of keyboard entries may be played back to video for identification purposes only. Normally keyboard tapes are played back only to the keyboard.
In this mode the tape stores every keypress. (except RUN/LOAD and RESET).

One use of this mode would be the storage of messages which include control commands which cannot be stored on tape in the other mode.

This mode also allows storage of all recallables and Sel-Cals on tape

To store recallables and Sel-cals, enter a SHIFT CONTROL T, release, "O", release, "K", release, command prior to loading the memories.

When the tape is played back, it will duplicate each keystroke entered.

TO TERMINATE THE TAPE OUTPUT:

Press SHIFT CONTROL T, release, "O", release, "E", release. (Tape Output End)

This is the only proper termination command.

TO PLAY A TAPE TO RECEIVE VIDEO

Press SHIFT CONTROL T, release, press"I", release, press "V", release. (Tape In to Video).

As mentione previously, any of the three formats can be played to receive video, for checking on a tape section identification, however, tapes recorded from the keyboard may not appear completely correct.

When a tape is played to video, normal receive operation is suspended, the receive data being superceded by the tape data.

If the printer is set to accept receive data, and a tape of recorded receive data is played to video, the data will also be printed on the printer.

TO RE-TRANSMIT TAPES OF RECEIVED DATA:

Press SHIFT CONTROL T, release, press "I", release, press "X", release. (Tape In to Xmit).

The data on the tape will appear on the screen similar to keyboard entered data,and the TX buffer will begin counting down as the tape loads.(Load tapes recorded fro receive data in this mode).

During this operation the keyboard is locked-out except for the RUN/LOAD, and RESET keys and the Tape Abort command (SHIFT CONTROL SPACE)

TAPE ABORT COMMAND:

To terminate a tape operation(input or output), prior to normal completion, the Tape Abort command, SHIFT CONTROL SPACE, may be entered. This will immediately terminate any tape transfer in progress.

NOTE: If this command is used to end a tape output(record) function, that tape will never properly terminate when being played back.

If any tape operation command, except "E"(END) or"SPACE"(ABORT), is entered while a tape operation is in progress, that command will be ignored.

Only tapes recorded from the keyboard may be played back to the keyboard.

Attempting to play receive data tapes to the keyboard will cause improper operation.

TO PLAY A TAPE TO THE KEYBOARD:

Press SHIFT CONTROL T, release- press "I", release, press "K", release. (Tape In to Keyboard).

In this mode the tape data will appear on the screen and control functions will occur as they are loaded, just as when the tape was recorded.

The keyboard is also locked out in this mode, except for RESET, RUN/LOAD, and ABORT.

TO RECORD A TAPE OF KEYBOARD ENTERED DATA FOR LATER PRINTING AND TRANSMISSION:

1. Set the M-500 for Tx-HD, LINE mode, xmtr off.
2. Enter the command to record from receive data (SHIFT CTRL T, O, R,).
3. Type the desired text on the keyboard. At the end of each line typed, that line will be pdeudo-transmitted, appearing also in the receive video area and being transferred to the tape buffer.

Control commands will not be recorded, but recallable and test messages will be stored in their expanded form.

NOTE: Do not use time and date commands as that time and date will be stored. Also do not use the CWID command.

ALIGNMENT

The alignment chart, on the following page, gives a brief alignment procedure for the various parts of the I/O circuits-

REAL TIME CLOCK ADJUSTMENT

To adjust the frequency of the REAL TIME CLOCK circuit, attach a high quality frequency counter,of known good accuracy, to TP "F".

Adjust C-49 for exactly 32768.000 KHZ.

TROUBLE SHOOTING

The M-500 ASR is a fairly complex unit and only those who are VERY familiar with microprocessors, and digital techniques should enen try to repair the unit should a failure occur.

Factory repair service, with less than a week turnaround, is available at a reasonable cost.

Adjustment Alignme . Chart

Circuit to be Aligned	M500 setup	Input signal & Location	adjustment	Desired Reading	Reading Location	Test Instrument
AFSK "MARK"	RTTY XMIT	None	R111	2125hz (1275hz*)	AFSK Jack J9-Ring	Frequency Counter
AFSK Space 170	RTTY XMIT	None	R113	2295hz (1445hz*)	AFSK Jack J9-Ring	Frequency Counter
AFSK Space 425	RTTY XMIT	None	R115	2550hz (1700hz*)	AFSK Jack J9-Ring	Frequency Counter
AFSK Space 850	RTTY XMIT	None	R117	2975hz (2125hz*)	AFSK Jack J9-Ring	Frequency Counter
Morse receive tone	Morse-Receive	Audio input J12 desired tone between 750 & 1250hz.	R19	Maximum	IC39 Pin 14	Oscilliscope
RTTY 170hz input filter	RTTY 60-170 filter in receive	2125hz at J-12	R-6	Maximum	IC35 p7	Oscilliscope
RTTY 170hz input filter	RTTY 60-170 filter in receive	2295hz at J-12	R10	Maximum	IC35 p7	Oscilliscope
Low Baud Rate Demodulator filters Mark	RTTY 60-170hz receive	2125 hz at J-12 (1275hz*)	R38	Maximum	J13 tip	Oscilliscope
Space 170hz	RTTY 60-170hz receive	2295hz at J-12 (1445hz*)	R47	Maximum	J13 ring	Oscilliscope
Space 425hz	RTTY 60-425hz receive	2550hz at J-12 (1700hz*)	R54	Maximum	J13 ring	Oscilliscope
Space 850hz	Rtty 60-850hz receive	2975hz at J-12 (2125hz*)	R61	Maximum	J13 ring	Oscilliscope
High Baud rate filters Mark	ASCII 300 receive	2125hz at J-12	R69	Maximum	IC44 p8	Oscilliscope
Space	ASCII 300 receive	2975hz at J-12	R74	Maximum	IC44 p7	Oscilliscope
Morse side tone Frequency	Morse xmit break key doion	None	R33	desired tone in speaker		
AFSK Level	RTTY 60 xmit on	None	R120	desired level	J9-ring	

*(indicates Low Tone Set Frequencies)

Appendix 1

RF INDUCED PROBLEMS

Info-Tech equipment is designed to operate in a normal transmitting and receiving environment, however, excessive RF voltages and/or close proximity to the antenna system may cause problems.

Problems will be indicated if the video screen goes blank or jitters during transmission or the unit responds improperly to the operators commands.

The following steps will normally cure any problem encountered:

1. Use good quality shielded cable on all interfacing leads.
2. Bond the cases of all units together using flexible copper braid.
3. Use a good copper water pipe ground or separate ground system (see ARRL handbook for discussion on ground systems).
4. Operate your transmitter/antenna system at the lowest possible S.W.R.
5. Keep the antenna system removed from the operating system as far as possible.
6. Use <u>good quality</u> coax cable to feed the antenna system when ever possible.
7. In extreme cases operate with reduced power.
8. Don't bundle interfacing cables with RF cables. If they must cross, they should cross at right angles.
9. Try a one-at-a-time lead disconnect procedure to isolate the offending lead(s).
10. Loop the offending lead(s) thru Ferrite Toroids to minimize RF coupling.
11. Operate the transmitter into a good shielded dummy load to see if your antenna system is causing the problem.
12. Operation with an indoor antenna is an open invitation to RFI problems.

LIMITED WARRANTY

DIGITAL ELECTRONIC SYSTEMS, Inc. (here after called DES), of Englewood, Florida hereby warrants to the original purchaser only that any new INFO-TECH equipment manufactured by DES shall be free from defects and workmanship for a period of six months from the date of the original purchase.

In the event of a defect in materials or workmanship during the Warranty period, DES will, at its own expense, re-pair the defective unit and replace any defective parts. Costs of shipping the unit to DES shall be paid by the purchaser. DES will pay the shipping costs incurred in returning the unit to the purchaser. (48 contiguous states only).

To obtain service under the warranty, the original purchaser should do the following:

1. Notify DES of the defect and obtain return permission.
2. Return the unit, freight pre-paid, via UPS whenever possible. (DES cannot be held responsible for damage incurred in shipment).

This warranty does not apply to any defect which DES determines to be due to the following:

1. Improper maintenance or repair, including installation of parts not specified.
2. Misuse, abuse, neglect, improper installation, or operation without a proper safety ground connection.
3. Damage caused by lightning, excessive power line voltage, or intentional or accidental damage.

All implied warranties, if any, are limited to a period of six months from the date of original purchase.

Some jurisdictions do not allow limitations to the length of implied warranty periods, in which case the preceeding limitation may not apply.

DES disclaims any liability for consequential or incidental damages arising out of the use of, or inability to use, this instrument.

You are given specific legal rights under this warranty, and in addition, you may have other rights depending upon your state of residence.

KEYBOARD CONTROL COMMANDS FIGURE 2.

"CONTROL" COMMANDS

A- ATC Toggle
B - BROWN FOX test message
C - CWID recallable message
D - Full/Half Duplex toggle
E - Exit from quick reply buffer
F - "FIGURES" (Baudot only)
G - Not assigned
H - HALT (switch to load)
I - ID recallable message
J - CARRIAGE RETURN (C/R)
K - Clocked Output value change
L - "LINE FEED" (LF)
M - MULTIPLE SCROLL INHIBIT(Toggle)
N - NORMAL/REVERSE Toggle
O - OUTPUT METHOD select
P - PARITY Select
Q - Enter QUICK REPLY BUFFER
R - RECEIVE
S - SHIFT select
T - TRANSMIT
U - UNSHIFT ON SPACE TOGGLE (UOS)
V - "LETTERS" (Baudot only)
W - WIDE toggle (170 pre-filter enable)
X - TRANSMIT MODE SELECT (Auto/Manual)
Y - RY's to end of line
Z - TIME AND DATE output
/ - Split recallable message (1-Ø)
. (Period)- End loading of recallable
1-Ø- Play recallable message 1-Ø
: (Colon)- Immediate action command
RESET- SPECIAL ENTRY COMMAND
BLANK- DIDDLE TOGGLE

SHIFT/CONTROL COMMANDS

A - ASCII Mode
B - BAUDOT Mode
C - CWID Load
D - Display RECALLABLES or SEL-CALS
E - Clear Transmit Buffer
F - Not assigned
G - "
H - Printer, Auto CR/LF toggle.
I - ID MESSAGE load
J - Mailbox message"A" load
K - Output, Auto CR/LF, Toggle.
L - Transmit data to printer(Toggle)
M - MORSE Mode
N - Receive data to printer (ON)
O - Receive data to printer (OFF)
P - PRINTER- MODE /SPEED SELECT (Scan)
Q - QUICK REPLY
R - Restore Received Screen
S - SEL-CAL Load
T - TAPE
U - Aux Output #1 "ON"
V - Aux Output #1 "OFF"
W - WEIGHT (Morse only)
X - MAILBOX MODE
Y - Aux Output #2 "ON"
Z - Aux Output #2 "OFF"
1-Ø - Load RECALLABLE MESSAGE 1-Ø
, (Comma) - MAILBOX Message "B" Load
: (Colon) - Immediate Action command
BLANK - Loads INITIALIZATION MEMORY

PARTS LIST

FIXED RESISTORS. I/O BOARD

R-2.....1.2K
R-4,13,15,21,23,30,32, 27, 72, 77, 83, 88, 91, 92, 94, 84, 93, 107, 110, 140, 121, 127, 128, 131, 133, 138,.....12K
R-9, 71, 85, 96, 123,.....75K
R-7, 11,.....150K
R-16,.....1.8 Meg
R-37, 89,.....220K
R-26, 68, 73, 124, 125, ...4.7K
R-31, 62, 70, 82, 98, 136, ...470
R-29, 45, 80, 86, 87, 104, 106, 108, 44,.....100K
R-20,.....160K
R-34, 79, 102, 102, 135, ...47K
R-35, 126, ...2K
R-28, 36,.....6.8K
R-17, 24,.....39K
R-46,.....200K
R-39, 48,.....160
R-53,.....180K
R-55,.....150
R-60,.....120K
R-8, 12, ...100
R-76,.....56K
R-78, 119,.....470K
R-25,.....68K
R-81, 95, 97, 116, 132, ...22K
R-18, 118,.....15K
R-100, 112, 114,.....27K
R134,.....33K ½w.
R-101,.....1K
R-75,.....330
R-90,.....5.6K
R-5,.....33K

R-40, 41.....221K, 1%
R-43, 49, 50,.....205K, 1%
R-65,.....274K, 1%
R-63, 64,.....257K, 1%
R-66, ...147K, 1%
R-42,.....402K, 1%
R-51, ...374K, 1%
R-52, ...191K, 1%
R-56, 57,.....182K, 1%
R-59,.....174K, 1%
R-58, ...340K, 1%

VARIABLE RESISTORS I/O BOARD

R-301,.....2.5K
R-38, 47, 54, 61, 120,...100 trimmer
R-6, 10, 19, 69, 74, ...500 trimmer
R-111, 113, 115, 117, ...10K, 20t
R-310, ...100
R-14, ...500K trimmer
R-33, ...100K trimmer

CAPACITORS I/O BOARD

C-4, thru 23, 35, 36, 41, 46, 60, 64, ... .01 mfd mylar
C-1, 3, 25, 39, 62, 38, and various unlisted power buss bypasses,..... .1 disc.
C-34, 37, 44, 45, 63, .. .01 disc.
C-61, ... .22 mfd mylar
C-42, 43,..... 15 mfd tantalum or low leakage electrolytic
C-33, ... 100 mfd
C-40,..... .1 Mylar

SEMICONDUCTORS - I/O BOARD

IC-30, 38, 45, 47, 53,.....4011B
IC-31,.....4013B
IC-32, ...4047B
IC-33, 52, ...555
IC-34, 35, 36, 37, 39, 42, 43, 44, ...4741
IC-40, 41,.....HI-201-5
IC-46,.....4070B
IC-48, ...8038
IC-49, 55, ...75492
IC-50, ...4001B
IC-51, ...4023B
IC-54, ...4069B

TR-1, 2, 3, 9, 10,.....VN10KM
TR-6, ...MPSA92
TR-4, 7, 8, 17, ...MPSA42
All other transistors are MPS5172

IC-56,..... 4N28

PARTS LIST,LOGIC BOARD

RESISTORS

R-111, 112, 118, 121, ...470
R-113, ...4.7K
R-117, 119, 122, 123, 124, ...12K
R-115, ...20 meg.
R-116, ...deleted
R-114, ...100K

CAPACITORS

C-53,.....560 pf
C-52, 54, ...220 pf
C-55,.....15 mfd. tantalum
C-56, 57, ...1000 mfd.
C-58, ...2200 mfd
C-48, ...30 pf
C-49, ...: 4-30 pf trimmer
Misc bypass capacitors, ...1 disc.

CRYSTALS

Y-1,..... 32.768 Khz.
Y-2, ... 12.012 Mhz.

TRANSFORMERS

T-1,..... Signal 241-5-24
T-2, ... Signal 241-7-16

SEMICONDUCTORS

IC-1, ... 3850
IC-2, ... 3871
IC-3,.....3853
IC-4, 5, ...68A50
IC-6, 7, 8, 9, ...2716
IC-10, 11, 12, 13, 34, 36, ...2016
IC-14, ... 58167
IC-15, ... 74LS154
IC-16, 18, 24, 29, 37, ... 4011B
IC-17, ... 4071B
IC-19, ... 4001B
IC-20, 25,..... 4029B

IC-21, ...74LS92
IC-22, ...74LS93
IC-26, ...86S64
IC-27, 28, 35, ...7400
IC-31, 32, 33, ...74LS157
IC-29, ...74LS645
IC-30, ...MC 6845 or HD46505

NOTE: All resistors, unless otherwise specified are ¼ watt, 5%.

CHANGING ROM's IN THE M500

1. Disconnect the power cord and any external (battery or other) power supplies. (All RAM data will be lost).

2. Remove the M-500 top cover after removing the 20 phillips head screws which hold the top cover in place.

3. Remove the 14 nuts securing J1 through J14.

4. Remove the 3 phillips head screws holding the upper circuit board in place.

5. Place the M-500 on a flat, level surface, with the right side of the cabinet toward you. The work area should have at least 12 inches of clear space to the left (front side) of the cabinet.

6. Lift up slightly on the upper circuit board while pulling toward the cabinet front panel until all 14 jacks are clear of the rear panel.

7. Turn the upper board over so that it will lay, inverted, to the left of the cabinet (resting on the top edge of the front panel and the work table.) This allows installation without disconnecting the ribbon cables.

8. Identify the 4 ROM's (IC's 6, 7, 8 & 9). They are all 2716 with masking tape on their face.

9. Gently remove each ROM by prying them out with a screw-driver slipped under the exposed end. (Remove IC's 7 & 8 first to get better access to IC 6 & 9).

10. Place the new ROM's in the empty sockets -

    ROM A goes in the IC 6 socket

    ROM B goes in the IC 7 socket

    ROM C goes in the IC 8 socket

    ROM D goes in the IC 9 socket

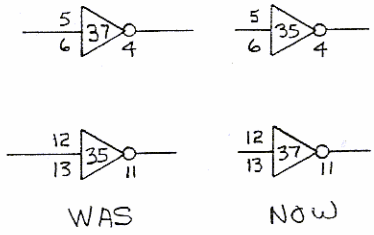
    Make sure that all pins of each ROM goes into the socket and are not bent under the IC or outside of the socket. Make sure the pin ones of the ROMs are oriented properly.

11. Replace the upper Board.

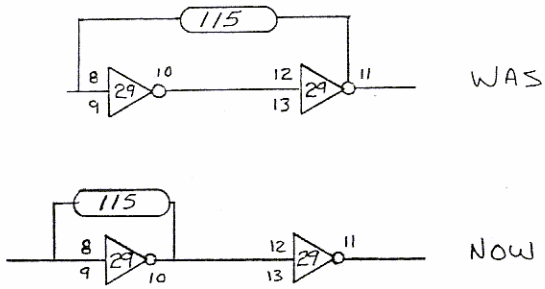
12. Replace the cover.

ERRATA

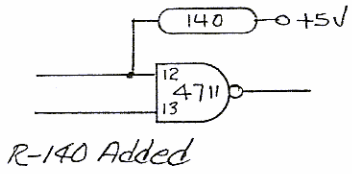
1.



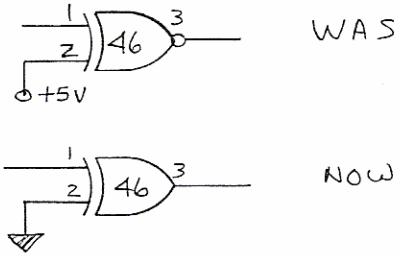
2.



3.



4.

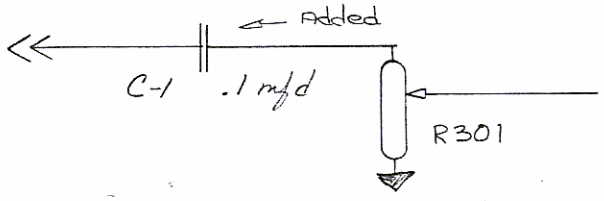


5. R7 and R 11 locations on I/O parts location drawing should read R 6 and R 10 respectively

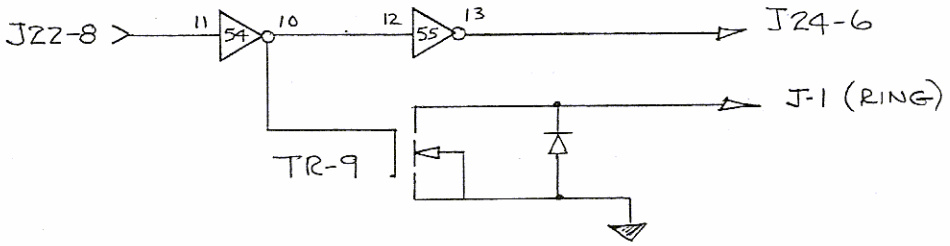
6. C-2 Not used.

7. Change C-1 to a resistor, 2000 ohms, ¼ watt, 5%.

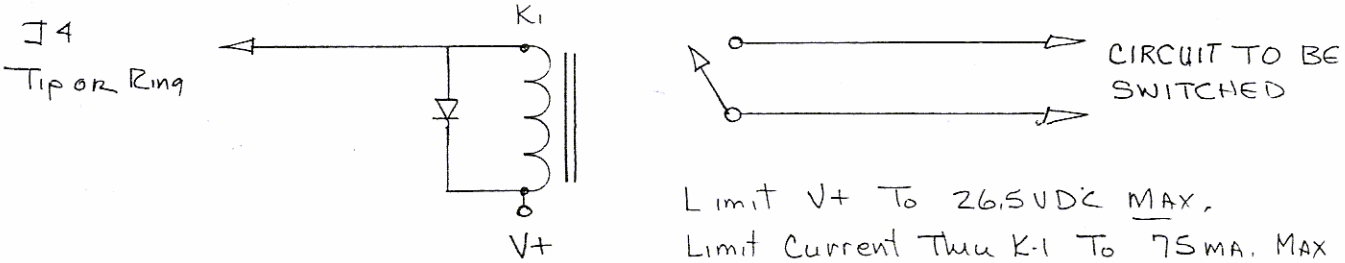
8. Add .1 Mfd disc. capacitor as shown.

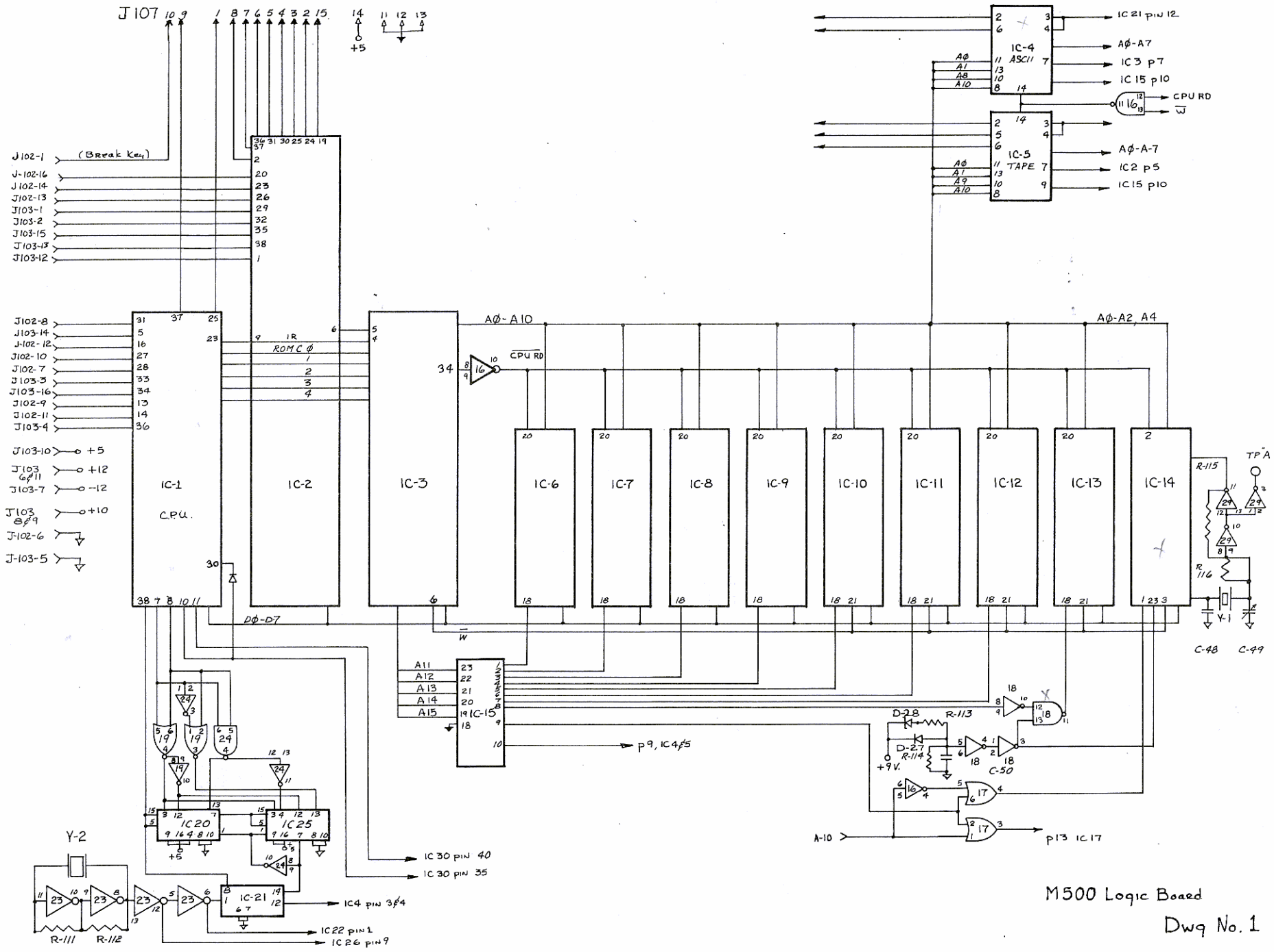


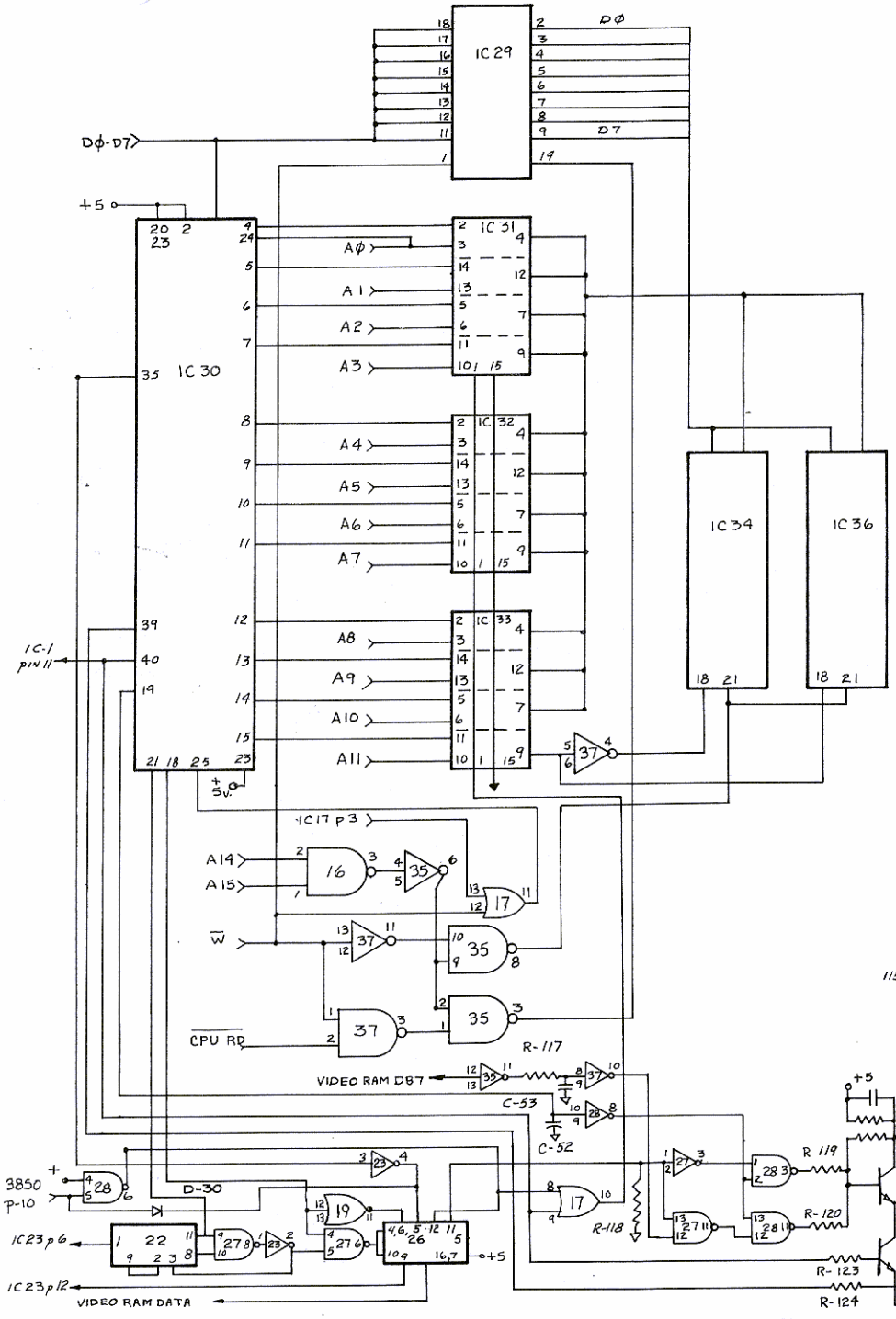
9. Schematic correction, Drawing No. 3, Autostart Driver and indicator

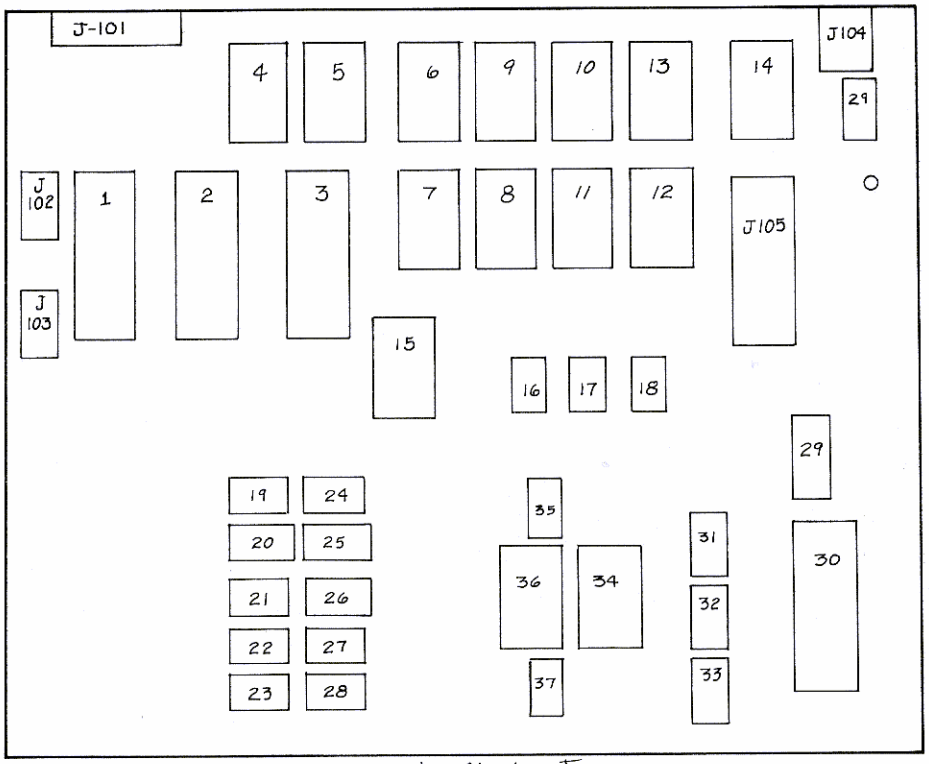


10. Suggested circuit for the utilization of AUX. 1 and 2..

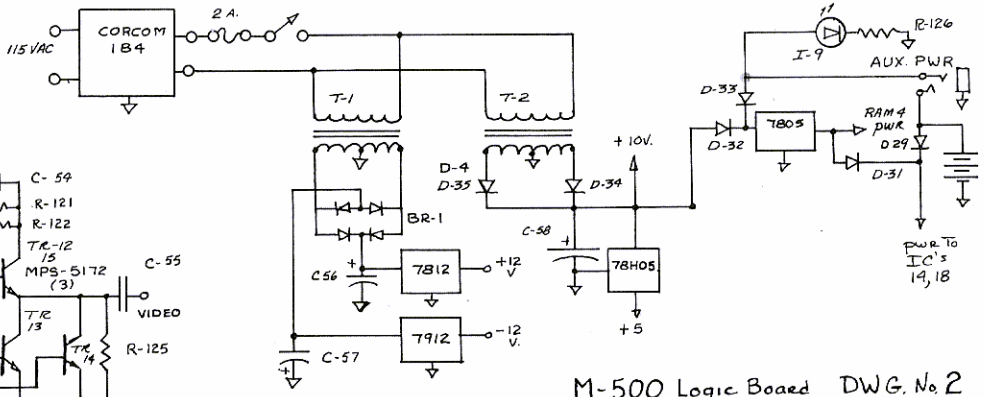



J107
(Break Key)
IC-1
C.P.U.
IC-2
IC-3
IC-4
ASCII
IC-5
TAPE
IC-6
IC-7
IC-8
IC-9
IC-10
IC-11
IC-12
IC-13
IC-14
IC-15
IC20
IC25
IC-21
A0-A10
A0-A2, A4
D0-D7
CPU RD
ROM C0
IC 21 pin 12
A0-A7
IC 3 p7
IC 15 p10
CPU RD
IC2 p5
IC15 p10
TP A
R-115
R 116
Y-1
C-48
C-49
D-28
R-113
D-27
R-114
+9 V.
C-50
A-10
p13 IC 17
p9, IC4 p5
Y-2
R-111
R-112
IC 30 pin 40
IC 30 pin 35
IC4 pin 3 & 4
IC22 pin 1
IC 26 pin 9
M500 Logic Board
Dwg No. 1

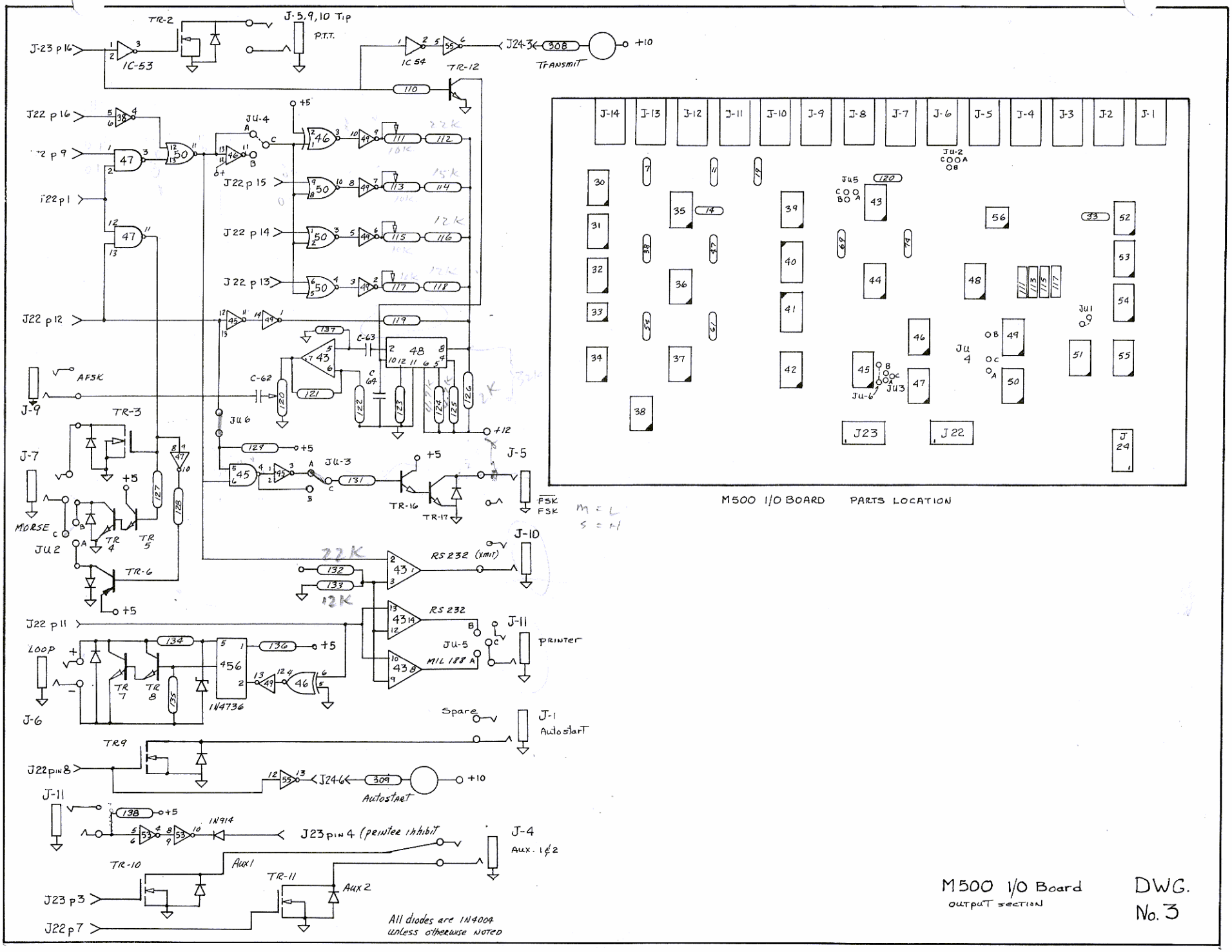




M500 Logic Board - Chip Layout



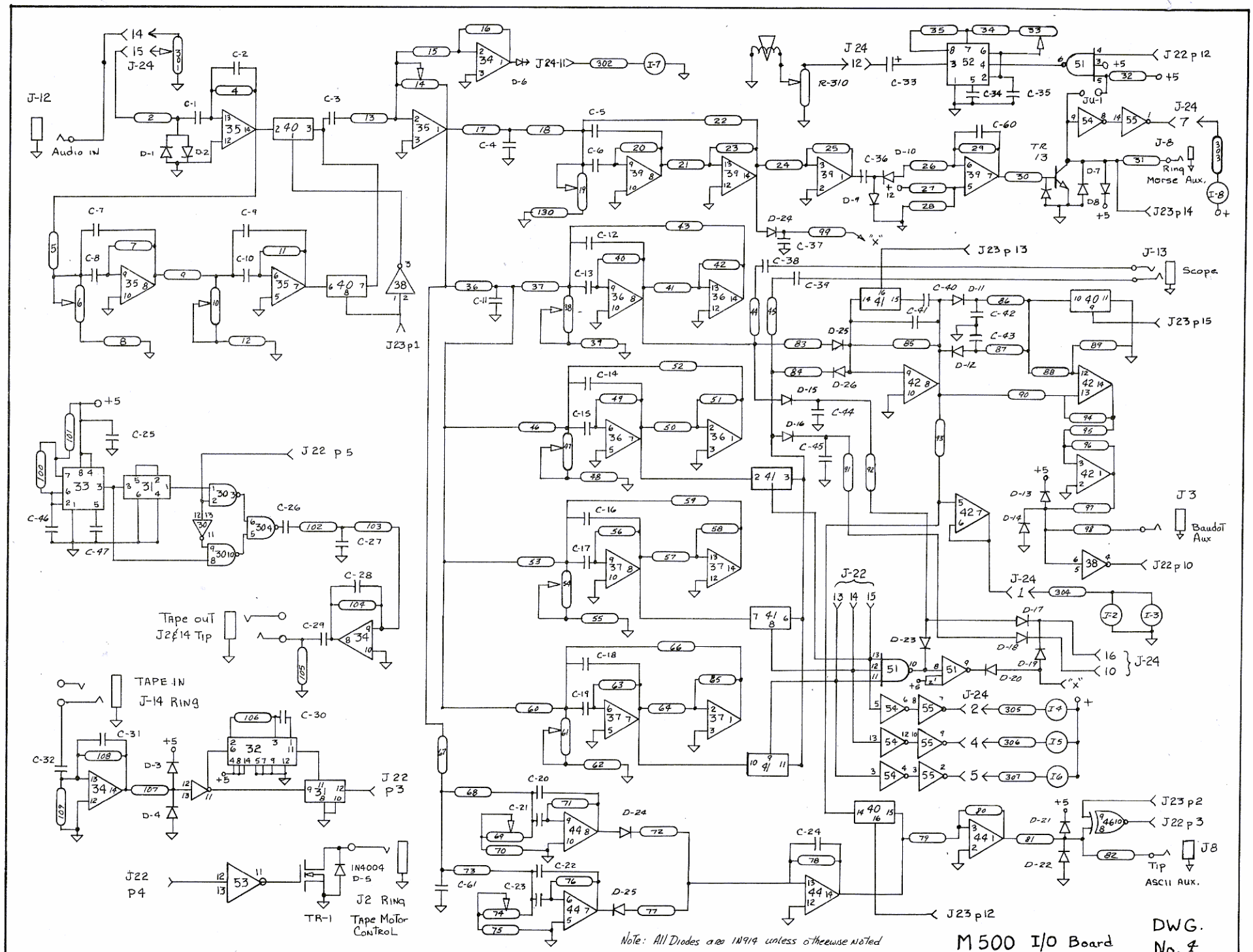
M-500 Logic Board DWG. No. 2

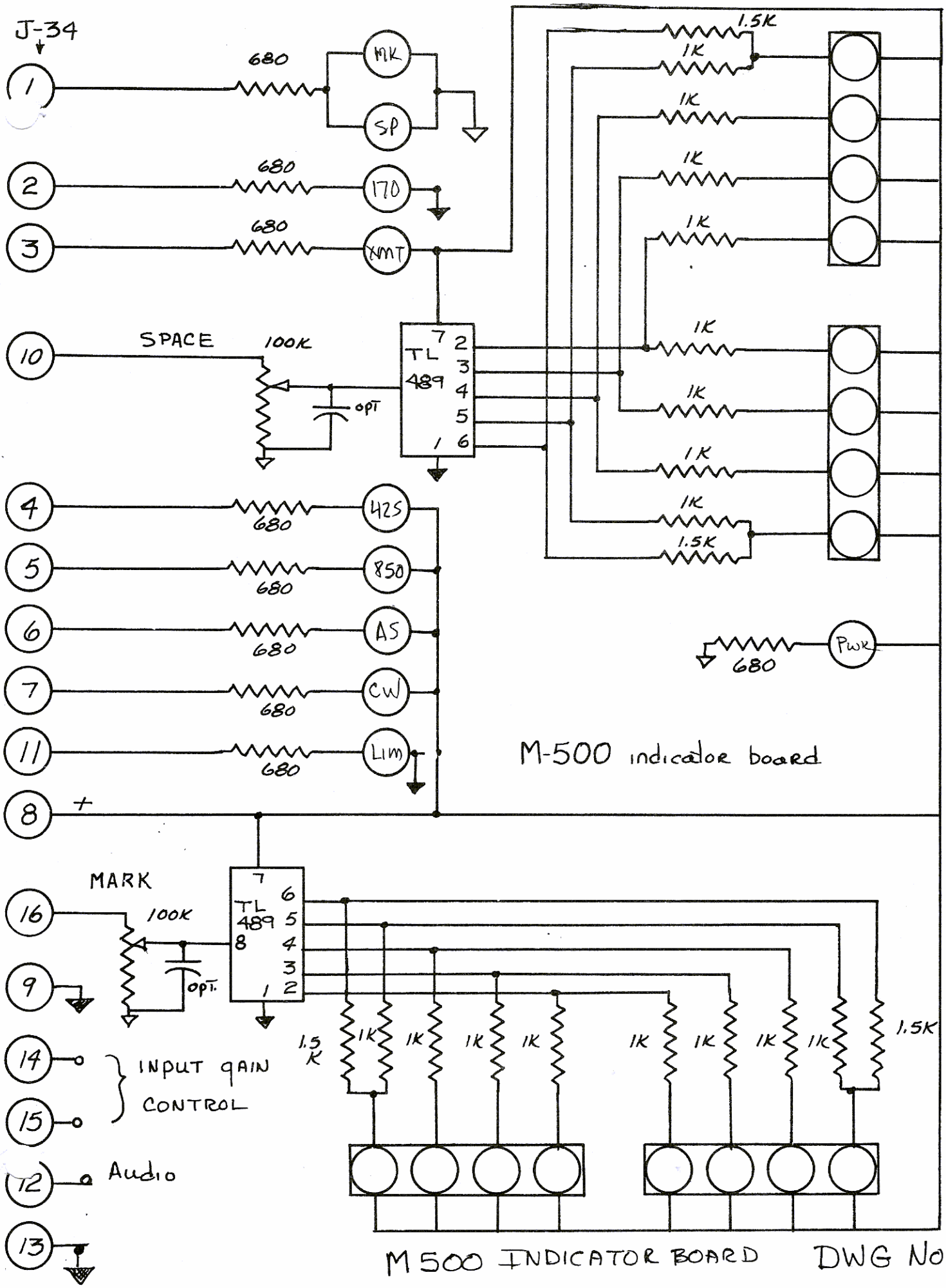


M500 I/O BOARD PARTS LOCATION

M500 I/O Board
OUTPUT SECTION

DWG. No. 3


J-12
Audio IN
J-24
C-1
C-2
C-3
C-4
C-5
C-6
C-7
C-8
C-9
C-10
C-11
C-12
C-13
C-14
C-15
C-16
C-17
C-18
C-19
C-20
C-21
C-22
C-23
C-24
C-25
C-26
C-27
C-28
C-29
C-30
C-31
C-32
C-33
C-34
C-35
C-36
C-37
C-38
C-39
C-40
C-41
C-42
C-43
C-44
C-45
C-46
C-47
C-60
C-61
D-1
D-2
D-3
D-4
D-5
D-6
D-7
D-8
D-9
D-10
D-11
D-12
D-13
D-14
D-15
D-16
D-17
D-18
D-19
D-20
D-21
D-22
D-23
D-24
D-25
D-26
R-310
TR 13
TR-1
IN4004
Tape Motor Control
J2 Ring
TAPE IN
J-14 Ring
Tape out
J2 & 14 Tip
J22 P4
J22 P3
J22 p 5
J22 p 10
J22 p 12
J23p1
J23 p 13
J23 p 14
J23 p 15
J23 p12
J23p2
J22 p 3
J-22
J-13
Scope
J3
Baudot Aux
J-8
Ring
Morse Aux.
Tip
ASCII Aux.
I-2
I-3
I-4
I-5
I-6
I-7
I-8
Ju-1
+5
"x"
Note: All Diodes are IN914 unless otherwise noted
M500 I/O Board
DWG. No. 4


J-34
1
680
MK
SP
2
680
170
3
680
XMT
1.5K
1K
1K
1K
1K
10
SPACE
100K
opt
7
TL
489
1
2
3
4
5
6
1K
1K
1K
1K
1.5K
4
680
425
5
680
850
6
680
AS
7
680
CW
11
680
LIM
8
+
680
PWR
M-500 indicator board
MARK
16
100K
9
opt.
7
TL
489
8
1
6
5
4
3
2
1.5K
1K
1K
1K
1K
1K
1K
1K
1K
1.5K
14
15
INPUT GAIN CONTROL
12
Audio
13
M500 INDICATOR BOARD
DWG No. 6

INFO-TECH M-500 MEMORY EXPANSION MODULE

INSTALLATION AND OPERATING INSTRUCTIONS

GENERAL

The M-500 Memory Expansion Module (MXM) is a plug-in assembly which provides an additional 10k bytes of memory to the M-500.

The MXM is user-installable by plugging the module into an emply 40 pin IC socket located on the processor (lower) circuit board of the M-500 main-frame.

When installed in an M-500 which has a safe (external) power supply for the battery-back-up RAM, the RAM on the MXM is also protected (saved) by the external supply. (Refer to page 8 in the M-500 manual).

The MXM will add a maximum of 300 MA to the battery supply drain.

INSTALLATION INSTRUCTIONS

1. Disconnect the power cord and any external (battery or other) power supplies. (All RAM data will be lost).
2. Remove the M-500 top cover after removing the 20 phillips head screws which hold the top cover in place.
3. Remove the 14 nuts securing J1 through J14.
4. Remove the 3 phillips head screws holding the upper circuit board in place.
5. Place the M-500 on a flat, level surface, with the right side of the cabinet toward you. The work area should have at least 12 inches of clear space to the left (front side) of the cabinet.
6. Lift up slightly on the upper circuit board while pulling toward the cabinet front panel until all 14 jacks are clear of the rear panel.
7. Turn the upper board over so that it will lay, inverted, to the left of the cabinet (resting on the top edge of the front panel and the work table.) This allows installation <u>without</u> disconnecting the ribbon cables.
8. Check the pins on the MXM plug to see that they are all straight, parallel and evenly spaced. (Adjust as required.) Note: Pin 28 will be cut off.
9. Orient the MXM so that pin one of all ICs are toward the front panel and insert the pins into the empty 40 pin IC socket on the lower board.
   Note: Due to the retention characteristics of this socket, a fair amount of pressure is required for installation. It is sometimes easier to start at one end of the socket and work to the other end.
10. Using a small mirror held at an angle, check the pins for proper insertion in the socket.
11. Replace the upper circuit board and top panel.
12. When installing the 14 nuts on J1-14 be sure that the nuts are not cross threaded and only lightly tightened as the plastic bushing on these jacks will cross thread easily and even a slight over torqueing will strip the threads.

MXM MAIL-BOX PACKAGE

The M-500 MXM with the Mail-Box software package provides a basic mail-box system using 2k bytes of ROM and 8k bytes of RAM for message storage.

Proper operation of the Mail-Box requires the use of special recallable message memories "J" and ",", which store the mail-box response messages. Each of these memories will store 72 characters (including EOM character). Normally, the only control codes or characters which may be included in these messages are:

"CONTROL I" or "CONTROL C" (if these messages do not contain "CONTROL T" or "CONTROL R" commands), OR "CONTROL Z"

The commands "CONTROL T" and "CONTROL R" must not be entered in the Mail-Box response messages. Transmit/Receive control is performed automatically by the Mail-Box program.

Memory "J" stores the message that will be sent in response to the Identification command, and at the start of most Mail-Box response operations.

Memory "," stores the message which is sent at the end of a Mail-Box response when required.

While nearly any message could be entered for the start and end messages typical examples would be:

J: "'RETURN' DE WBØGUX MAIL-BOX ON 146.70 'CONTROL Z' 'CONTROL C' 'RETURN' 'CONTROL .'".

,: "'RETURN' DE WBØGUX MAIL-BOX 'CONTROL Z' 'CONTROL C' SK SK SK 'RETURN' 'CONTROL.'".

Refer to the M-500 operating manual for instructions on loading recallable messages.

To allow users to access the mail-box functions they must send, to the mail-box station, a sequence of characters (sel-cal code) followed by MBX operation commands. The sel-cal code for MBX access is entered just as other sel-cal codes are (refer to M-500 operating manual). The code that is chosen should be one which would not be likely to occur in normal text, for example: WBØGUXMX, or W4ABCZMX. The mail-box access prefix code is stored in sel-cal "J".

In the remainder of this manual, the following abbreviations will be used:

(mbx)	will indicate the sel-cal code for mail-box access.
(start)	will indicate recallable message "J".
(end)	will indicate recallable message ",".
(c/r)	will indicate a 'carriage-return' / 'line-feed' sequence.
(T)	will indicate the M-500 switching to transmit mode.
(R)	will indicate the M-500 switching to receive mode.
(wait)	will indicate a delay after an input. The delay timer is reset every time a character is received by the M-500. Unless otherwise noted, if more than 30 characters are received after the beginning of a 'wait' time, the MBX command will be cancelled.

After recallable messages "J" and "," and the access code/command have been loaded, the M-500 should be set to the proper mode, speed, shift and sense for the mode of operation desired.

To enter the mail-box operating mode, enter "SHIFT CONTROL X". When this has been entered, the screen will be cleared except for the status line and "MAIL-BOX" above the status line. The cursors will disappear and the TX buffer will indicate "TX = ØØØØ". Also the output mode will be 'character', the transmit mode will be half-duplex, receive-manual, and 2 video lines will be assigned for transmit buffer (22 for receive).

After the Mail-Box mode has been entered, receive operation will continue normally, but transmitting will only occur from Mail-Box operations. The only Control entry which will be recognized from the keyboard will be the Mail-Box Exit command "SHIFT CONTROL E", which will return the M-500 to normal operation. Any other non-control input from the keyboard will appear as received data on the video screen and will have the same effect on the Mail-Box as if that character were received from another station. When the Mail-Box is operated locally in this fashion, it is important that the M-500 not be receiving any other signals that would inter-mix with the keyboard entries, and that any transmitter connected to the M-500 be disabled to prevent Mail-Box responses from being transmitted.

All Mail-Box responses will also be displayed on the received video as dim intensity characters.

When in the Mail-Box mode the following functions may be operated:

IDENTIFICATION: Mail-Box station identification

When the MBX system receives "(mbx) I (c/r)" (wait)
The M-500 will respond with (T) (start) (R)

Example: RX = ..."W4ABCZMXI (c/r)" (wait)
TX = (c/r) DE WBØGUX MAIL-BOX ON 146.70 (time & date)
(cwid) (c/r)

DIRECTORY:

Lists the messages in the mail-box.
When the MBX system receives "(mbx) D (c/r)" (wait)
The M-500 will respond with: (T) (start)
(message number) (message 'to' call) DE (message 'from' call)
(date and time message was left) (c/r)
This is repeated until all messages are listed, then: (end) (R)

Example: RX = ... "W4ABCZMXD (c/r)" (wait)

TX = (c/r) DE WBØGUX MAIL-BOX ON 146.70 (time & date)(cwid)(c/r)

ØØ1 W4ABC DE W4XYZ 12/15 14:31 (c/r)
ØØ2 W4XYZ DE W4ABC 12/15 18:Ø3 (c/r)
ØØ3 W4ABC DE K6RHH 12/16 Ø4:18 (c/r)
ØØ4 W4ABC DE WIAW 12/16 21:42 (c/r)
ØØ5 QST DE WBØWRK 12/17 11:28 (c/r)
.
.
Ø78 W4XYZ DE K7BQR 12/25 Ø7:34 (c/r)
(c/r) DE WBØGUX MAIL-BOX (time & date) (cwid) SK SK SK (c/r)

SELECTIVE DIRECTORY:

Lists only those messages in the mail-box addressed to a specific call.

When the MBX system receives "(mbx) S (c/r) (call) (c/r)" (wait)
The M-500 will respond with: (T) (start)
(message number) (message 'to'call) DE (message 'from' call)
(date and time message was left) (c/r)

This is repeated until all messages addressed to the specified call are listed, then:
(end) (R)

Example: RX = ..."W4ABCZMXS (c/r) W4ABC (c/r)" (wait)

TX = (c/r) DE WBØGUX MAIL-BOX ON 146.70 (time & date)(cwid)(c/r)

ØØ1 W4ABC DE W4XYZ 12/15 14:31 (c/r)
ØØ3 W4ABC DE K6RHH 12/16 Ø4:18 (c/r)
ØØ4 W4ABC DE WIAW 12/16 21:42 (c/r)
(c/r) DE WBØGUX MAIL-BOX (time & date)(cwid) SK SK SK (c/r)

READ A MESSAGE: Transmits the contents of a specified message number.

When the MBX system receives "(mbx) R (message number) (c/r)" (wait)
The M-500 will respond with: (T) (start) (c/r)
(message number) (message 'to' call) DE (message 'from' call)
(date and time message was left) (c/r) (text of message) (end) (R)

Example: RX = ..."W4ABCZMXR3 (c/r)" (wait)

TX = (c/r) DE WBØGUX MAIL-BOX ON 146.70 (time & date)(cwid)(c/r)

ØØ3 W4ABC DE K6RHH 12/16 Ø4:18 (c/r)
Hey Sam, this mail-box is really great. (c/r)
Don't forget to bring the roster to the meeting
Monday. (c/r) NNNN
(c/r) DE WBØGUX MAIL-BOX (time & date)(cwid) SK SK SK (c/r)

If the specified message number is not located in the mail-box the M-500 will respond with: (T) (start) (c/r).
MESSAGE # (message number) NOT FOUND (c/r)(end) (R)

ERASE A MESSAGE: Removes a specified message from the mail-box.

When the MBX system receives: "(mbx)E(message number)(c/r)"(wait)
The M-500 will erase the specified message number and respond with:

(T)(start)(c/r) MESSAGE # (erased message number) ERASED
(end) (R)

Example: RX = ..."W4ABCZMXE24 (c/r)" (wait)

TX = (c/r) DE WBØGUX MAIL-BOX ON 146.70 (time & date)(cwid)(c/r)
MESSAGE # Ø24 ERASED
(c/r) DE WBØGUX MAIL-BOX (time & date)(cwid) SK SK SK (c/r)

If there was no message #24 in the mail-box, the response would be:

(c/r) DE WBØGUX MAIL-BOX ON 146.70 (time & date)(cwid)(c/r)
MESSAGE #Ø24 NOT FOUND
(c/r) DE WBØGUX MAIL-BOX (time & date)(cwid) SK SK SK (c/r)

Note: When a message is erased, the number assigned to all messages of a higher number than the erased number is decreased by one.

Example:

ØØ1	ABC		ØØ1 ABC
ØØ2	DEF	after ØØ2 is erased	ØØ2 GHI
ØØ3	GHI	becomes	ØØ3 JKL
ØØ4	JKL		ØØ4 MNO
:			:
:			:
Ø59	XYZ		Ø58 XYZ

WRITE A MESSAGE: Leaves a message in the mail-box.

When the MBX system receives: "(mbx)W(c/r)('to' call)/('from' call) (c/r)" (wait)

The M-500 will respond with: (T) (start) ('from' call)
BEGIN MESSAGE TO ('to' call) WITH A (C/R), AND END WITH 4 N's. (c/r)
LIMIT MESSAGE TO (maximum message length) CHARACTERS (c/r)
K K K (c/r) (R)

The MBX system is now ready to accept the message. The text of the message must start with a (c/r) and end with 4 N's. The time and date will automatically be logged, along with the 'to' and 'from' calls, into the message identifying header. The total number of printing characters plus (c/r)'s and the 4 N's should not be greater than the number indicated in the response.

Whenever memory space allows, this number will be 250. When available memory space becomes limited, this number will be accordingly less.

If this number of characters is exceeded, the message will be recorded except that any input after the limit has been reached will be ignored, and not entered as part of the message.

After the message and 4 N's (wait) have been received, there is another (wait). During this (wait) any number of characters may be received without cancelling the command.

After this (wait) the M-500 will respond with : (T) ('from' call) MBX HAS RECORDED MESSAGE # (message number) FOR ('to' call) (note) (end) (R)

If the message was within the limit, the (note) will be OK.

If the message exceeded the maximum character length, the (note) will be OVER-WRITE ERROR.

If there is not enough memory space to leave a message, the first response will be: (T)(start)MBX FULL (end)(R)

Example: RX = ..."W4ABCZMXW (c/r) QST/WIAW (c/r)" (wait)

TX = (c/r) DE WBØGUX MAIL-BOX ON 146.70 (time & date) (cwid) (c/r)

WIAW BEGIN MESSAGE TO QST WITH A (C/R), AND END WITH 4 N's. (c/r)

LIMIT MESSAGE TO 250 CHARACTERS. (c/r) K K K (c/r)

RX = ..."(c/r) HOW NOW BROWN COW? (c/r) N N N N" (wait)

TX = WIAW MBX HAS RECORDED MESSAGE #Ø49 FOR QST OK

(c/r) DE WBØGUX MAIL-BOX (time & date)(cwid) SK SK SK (c/r)

CW MAIL-BOX OPERATION

The M-500 MXM Mail Box may be operated in the Morse mode for a CW mail-box with the following changes:

1. The (C/R) in the operating commands must be replaced with a period (. - . - . -). (There is no Morse code for carriage return or line feed.)

2. The equivalent of at least two word spaces (14 or more dots) must be left between segments of a command.

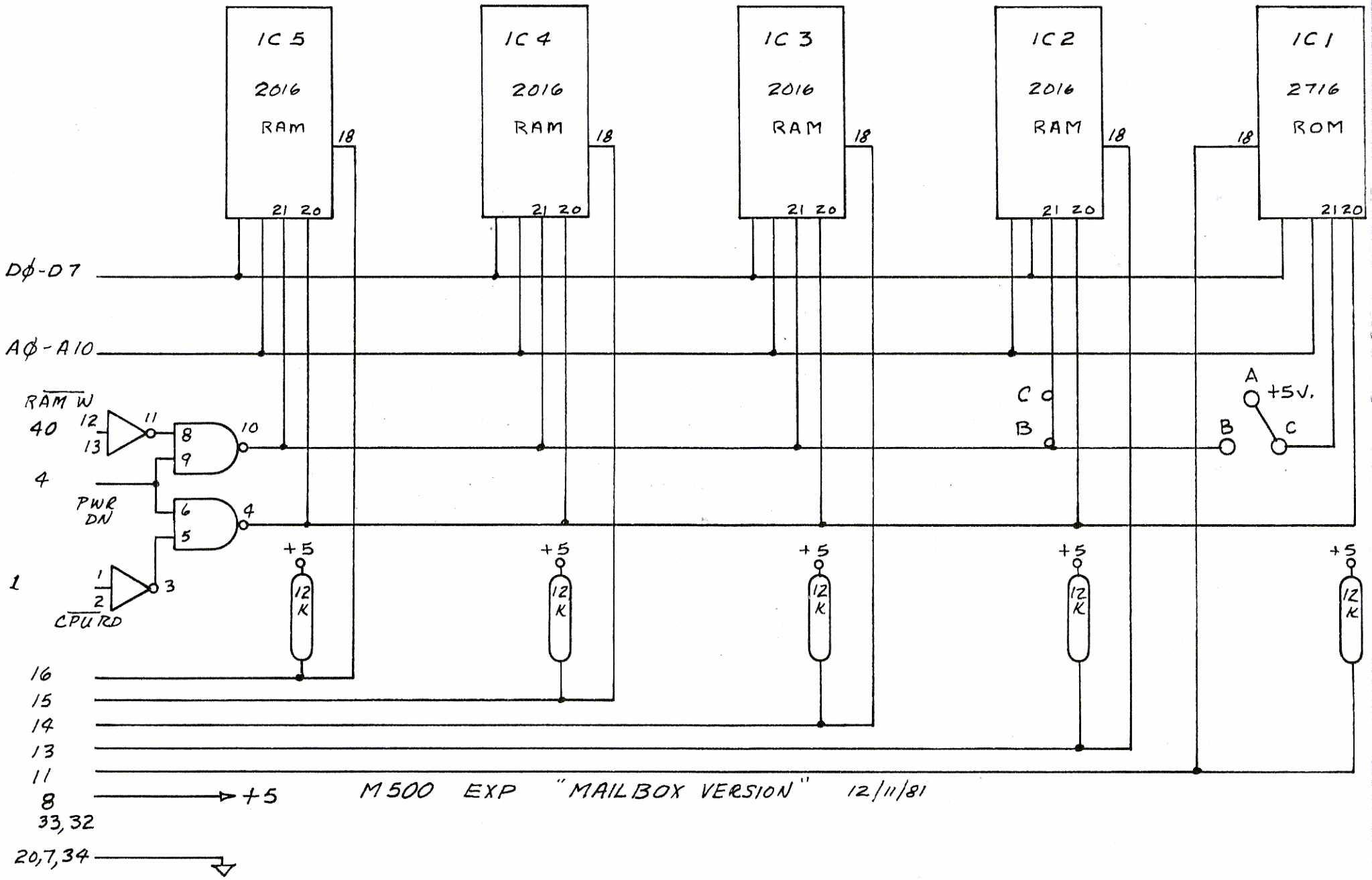
   Examples: (= indicates where spacing must occur)

   I.D. : (mbx) = I = .

   Erase: (mbx) = E = (message number) = .

   Write: (mbx) = W = (to call) / (from call) = .

3. Between the time that the access code (mbx) is received and the period is received or the command is cancelled, the 500 will ignore all word spaces so that precise timing and character spacing is not required for command entry.


IC 5
2016
RAM
IC 4
2016
RAM
IC 3
2016
RAM
IC 2
2016
RAM
IC 1
2716
ROM
18
21 20
Dϕ-D7
Aϕ-A10
RAM W
40
12
13
11
8
9
10
4
PWR
DN
6
5
4
1
1
2
3
CPU RD
+5
12
K
C
B
A
+5V.
16
15
14
13
11
8
33, 32
20, 7, 34
M500 EXP "MAILBOX VERSION" 12/11/81

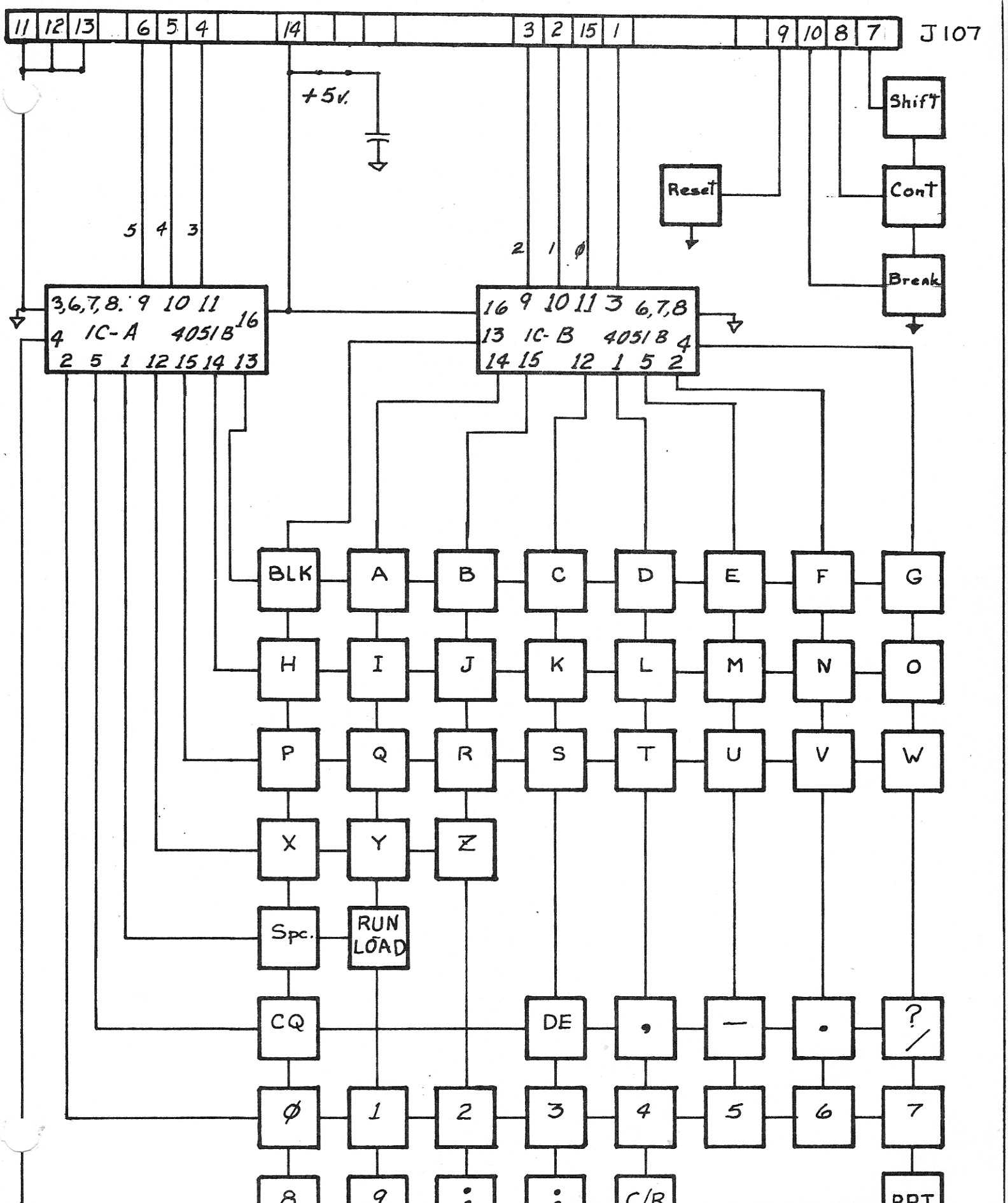
KEYBOARD CONTROL COMMANDS FIGURE 2.

"CONTROL" COMMANDS

A- ATC Toggle
B - BROWN FOX test message
C - CWID recallable message
D - Full/Half Duplex toggle
E - Exit from quick reply buffer
F - "FIGURES" (Baudot only)
G - Not assigned
H - HALT (switch to load)
I - ID recallable message
J - CARRIAGE RETURN (C/R)
K - Clocked Output value change
L - "LINE FEED" (LF)
M - MULTIPLE SCROLL INHIBIT(Toggle)
N - NORMAL/REVERSE Toggle
O - OUTPUT METHOD select
P - PARITY Select
Q - Enter QUICK REPLY BUFFER
R - RECEIVE
S - SHIFT select
T - TRANSMIT
U - UNSHIFT ON SPACE TOGGLE (UOS)
V - "LETTERS" (Baudot only)
W - WIDE toggle (170 pre-filter enable)
X - TRANSMIT MODE SELECT (Auto/Manual)
Y - RY's to end of line
Z - TIME AND DATE output
/ - Split recallable message (1-Ø)
. (Period)- End loading of recallable
1-Ø- Play recallable message 1-Ø
: (Colon)- Immediate action command
RESET- SPECIAL ENTRY COMMAND
BLANK- DIDDLE TOGGLE

SHIFT/CONTROL COMMANDS

A - ASCII Mode
B - BAUDOT Mode
C - CWID Load
D - Display RECALLABLES or SEL-CALS
E - Clear Transmit Buffer
F - Not assigned
G - "
H - Printer, Auto CR/LF toggle.
I - ID MESSAGE load
J - Mailbox message"A" load
K - Output, Auto CR/LF, Toggle.
L - Transmit data to printer(Toggle)
M - MORSE Mode
N - Receive data to printer (ON)
O - Receive data to printer (OFF)
P - PRINTER- MODE /SPEED SELECT (Scan)
Q - QUICK REPLY
R - Restore Received Screen
S - SEL-CAL Load
T - TAPE
U - Aux Output #1 "ON"
V - Aux Output #1 "OFF"
W - WEIGHT (Morse only)
X - MAILBOX MODE
Y - Aux Output #2 "ON"
Z - Aux Output #2 "OFF"
1-Ø - Load RECALLABLE MESSAGE 1-Ø
, (Comma) - MAILBOX Message "B" Load
: (Colon) - Immediate Action command
BLANK - Loads INITIALIZATION MEMORY


J107
11 12 13 6 5 4 14 3 2 15 1 9 10 8 7
+5v.
Shift
Cont
Break
Reset
5 4 3
2 1 ø
3,6,7,8,9 10 11
4 IC-A 4051B 16
2 5 1 12 15 14 13
16 9 10 11 3 6,7,8
13 IC-B 4051B 4
14 15 12 1 5 2
BLK A B C D E F G
H I J K L M N O
P Q R S T U V W
X Y Z
Spc. RUN LOAD
CQ DE • — • ? /
ø 1 2 3 4 5 6 7
8 9 : ; C/R RPT

J107 10 9 1 8 7 6 5 4 3 2 15 14 11 12 13

+5

J102-1 (Break Key)
J-102-16
J102-14
J102-13
J103-1
J103-2
J103-15
J103-13
J103-12

J102-8
J103-14
J-102-12
J102-10
J102-7
J103-3
J103-16
J102-9
J102-11
J103-4

J103-10 +5
J103 6 of 11 +12
J103-7 -12
J103 8 of 9 +10
J-102-6
J-103-5

IC-1 CPU.

IC-2

IC-3

ROM C Ø 1 2 3 4

A Ø - A 10

CPU RD

IC-6 IC-7 IC-8 IC-9 IC-10 IC-11 IC-12 IC-13 IC-14

A Ø - A2, A4

D Ø - D7

W

A11 A12 A13 A14 A15 IC-15

p9, IC4 p5

IC-4 ASCII
A Ø A1 A8 A10
IC 21 pin 12
A Ø - A7
IC 3 p7
IC 15 p10
CPU RD
W

IC-5 TAPE
A Ø A1 A9 A10
A Ø - A-7
IC2 p5
IC15 p10

IC20 IC25

IC-21

IC 30 pin 40
IC 30 pin 35
IC4 pin 3 & 4
IC22 pin 1
IC26 pin 9

Y-2
R-111 R-112

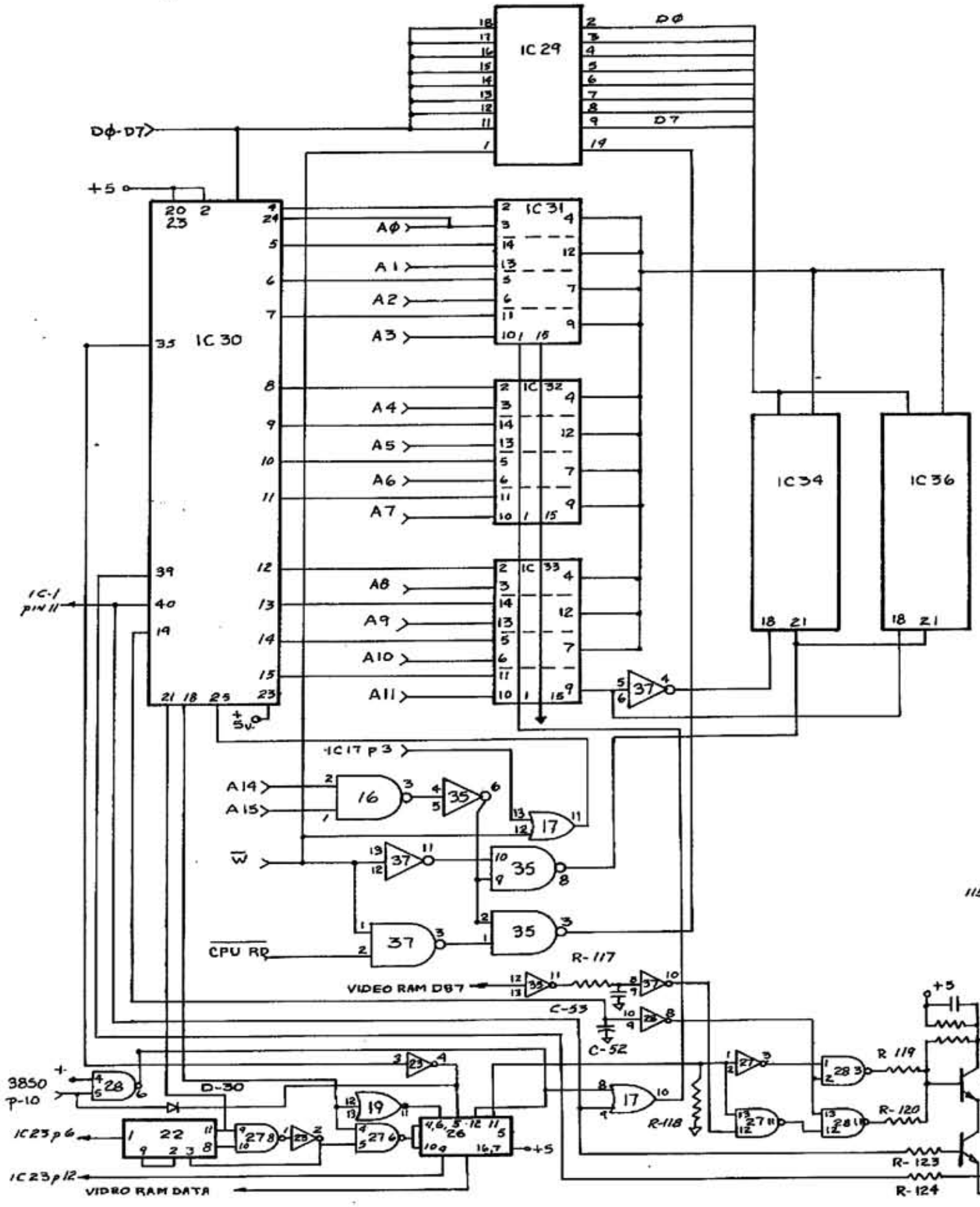
D-28 R-113
D-27 R-114
+9V.
C-50

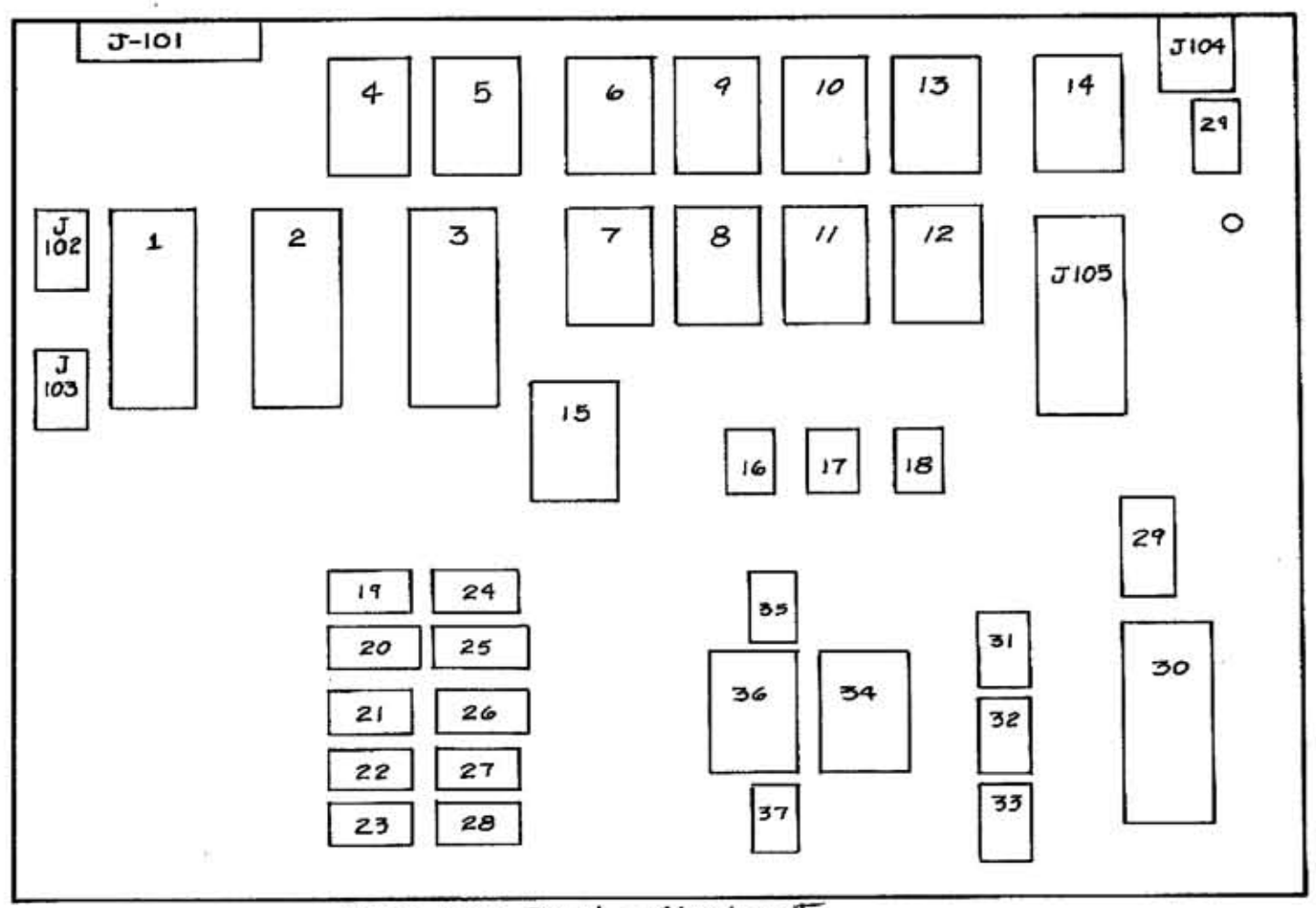
A-10
p13 IC17

R-115
R-116
Y-1
C-48 C-49
TP A

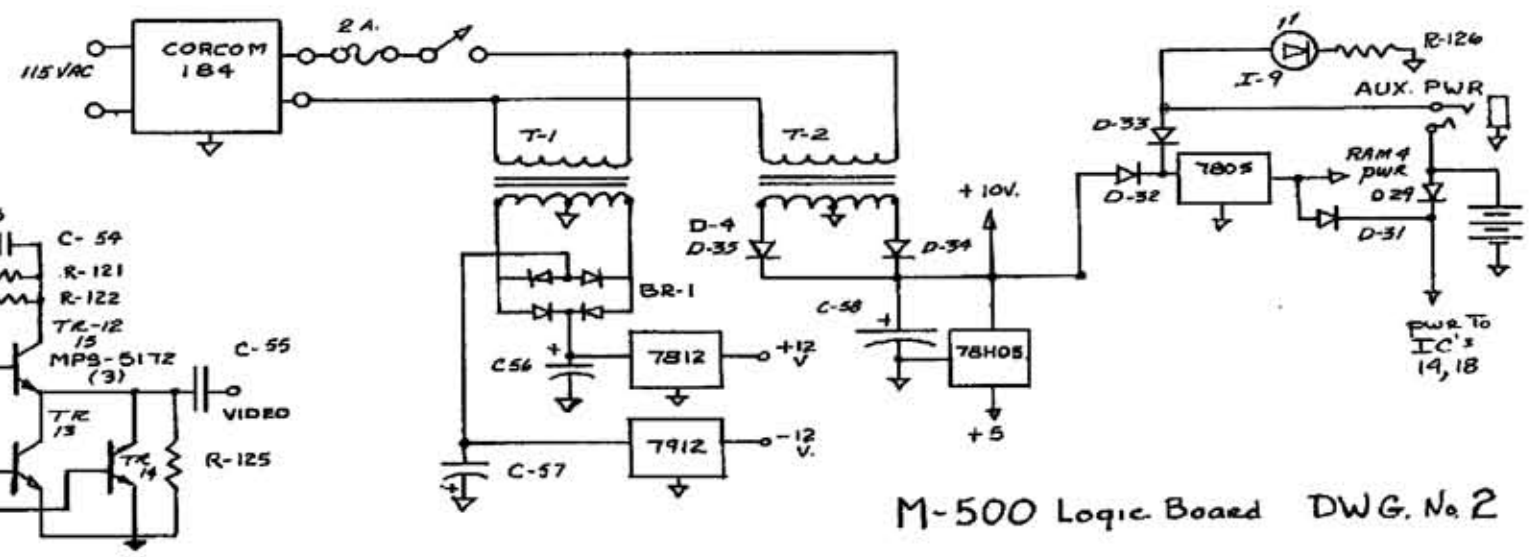
M500 Logic Board

Dwg No. 1

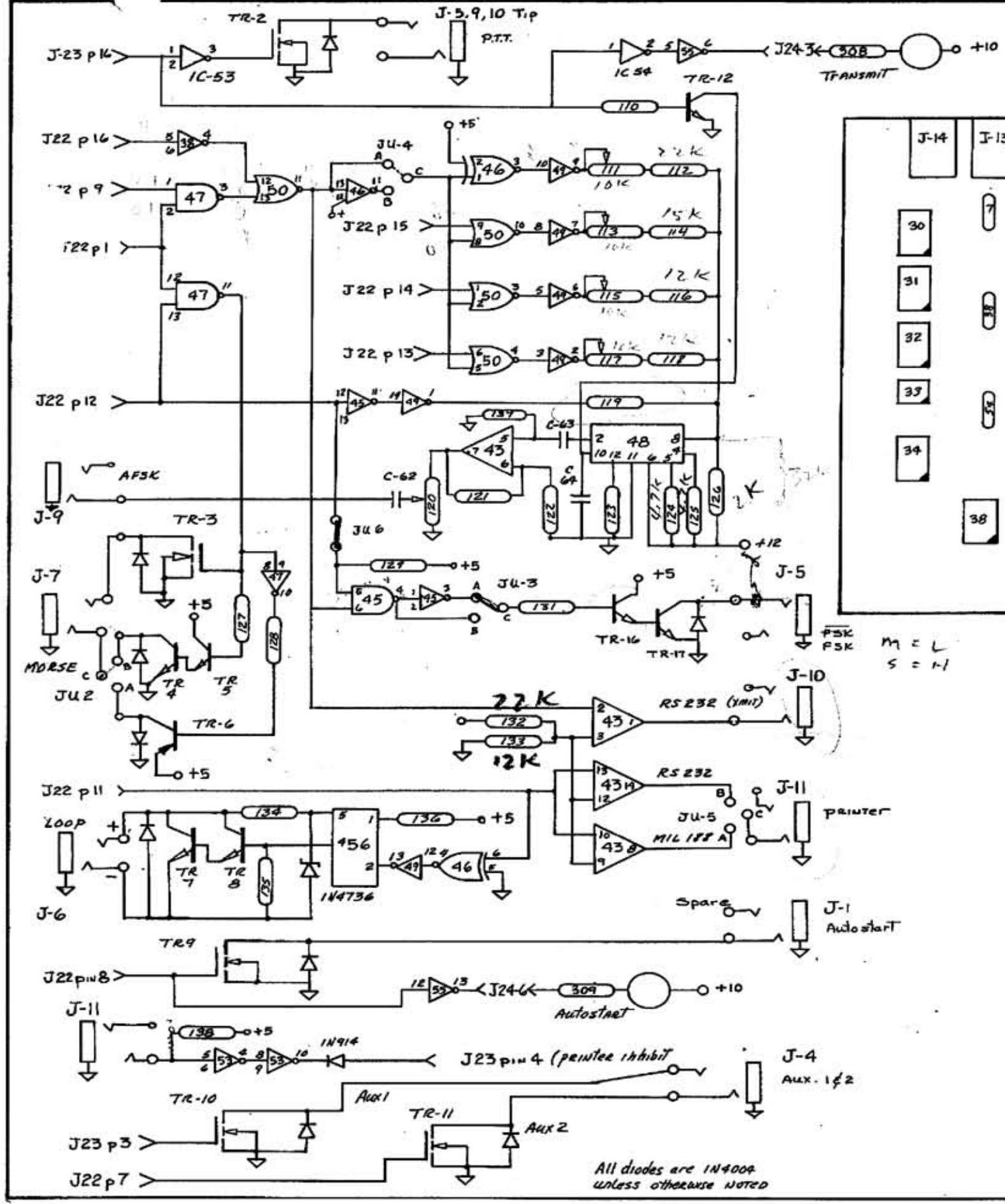


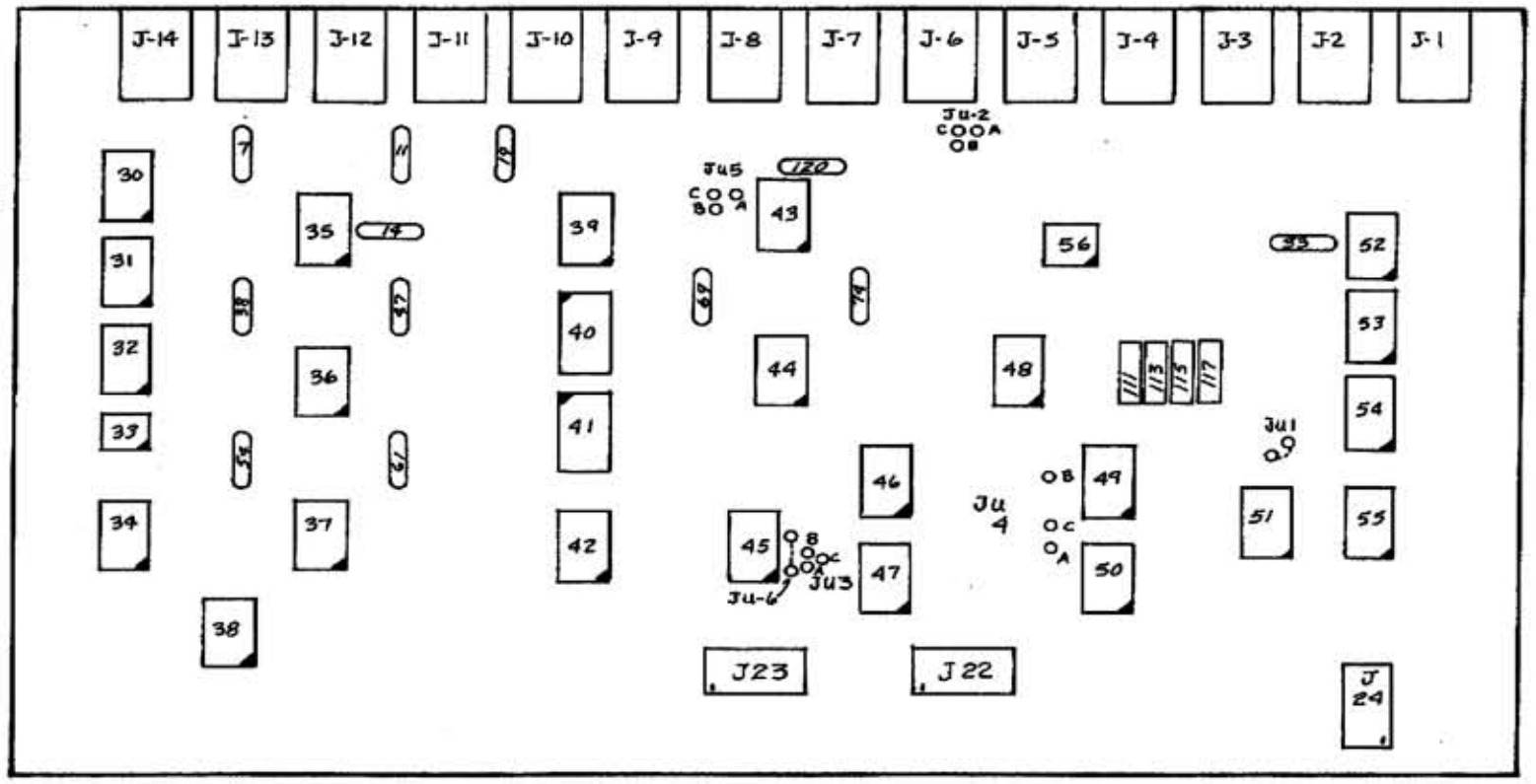


M500 Logic Board - Chip Layout



M-500 Logic Board DWG. No. 2





M500 I/O BOARD PARTS LOCATION

M500 I/O Board
OUTPUT SECTION

DWG.
No. 3

J-12
Audio in
J-24
C-1
C-2
C-3
C-4
C-5
C-6
C-7
C-8
C-9
C-10
C-11
C-12
C-13
C-14
C-15
C-16
C-17
C-18
C-19
C-20
C-21
C-22
C-23
C-24
C-25
C-26
C-27
C-28
C-29
C-30
C-31
C-32
C-33
C-34
C-35
C-36
C-37
C-38
C-39
C-40
C-41
C-42
C-43
C-44
C-45
C-46
C-47
C-60
C-61
D-1
D-2
D-3
D-4
D-5
D-6
D-7
D-8
D-9
D-10
D-11
D-12
D-13
D-14
D-15
D-16
D-17
D-18
D-19
D-20
D-21
D-22
D-23
D-24
D-25
D-26
R-310
J24-11
J23 p1
J22 p5
J22 p3
J22 p4
J22 p10
J22 p12
J23 p12
J23 p13
J23 p14
J23 p15
J23 p2
J22 p3
J24 12
J24 7
J24 1
J24 2
J24 4
J24 5
J24 16
J24 10
J-22
13 14 15
J-13
Scope
J3
Baudot Aux
J8
Tip
ASCII AUX.
Ring
Morse Aux.
TR 13
TR-1
Tape out
J2 ring tip
TAPE IN
J-14 Ring
J2 Ring
Tape Motor Control
IN4004
+5
+8
I-1
I-2
I-3
I-4
I-5
I-6
I-7
I-8
"X"
"Y"
Note: All Diodes are 1N914 unless otherwise noted

M 500 I/O Board

DWG. No. 4