

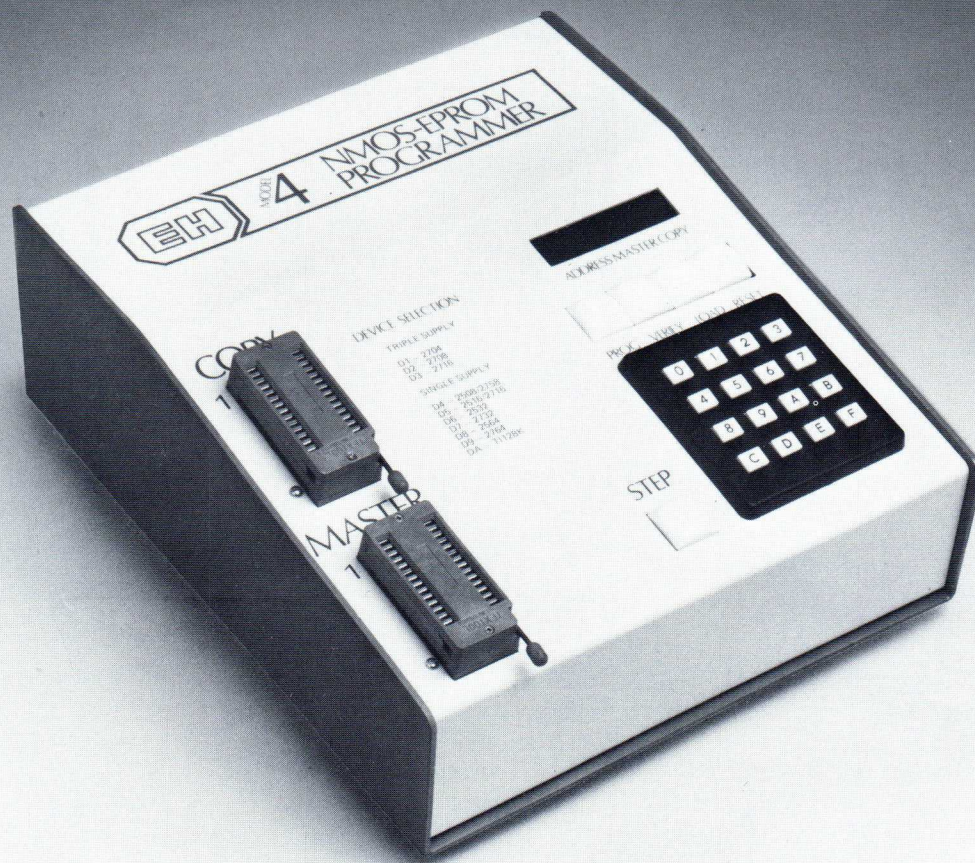
MODEL 4  
PROM PROGRAMMER  
SERVICE MANUAL

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**E-H International Inc.**

**EH****MODEL 4**

# NMOS-EPROM PROGRAMMER



## Features

- SOFTWARE PERSONALITY™ PROGRAMMING 2704 (4K) THROUGH TI 128K EPROM's
- NO MORE HARDWARE HASSLES
- 2K X 8 RAM BUFFER
- 2K X 8 PROM EMULATION
- INCLUDES RS232 & TTY SERIAL I/O INTERFACE
- PERFORMS CHECKSUM VERIFICATION
- EXECUTES MOVE & LIST COMMANDS
- FULLY BUFFERED & COLD SOCKETS
- HEX KEYPAD & HEX DISPLAY
- SMALL, LIGHT, & PORTABLE

The E-H MODEL 4 self-contained NMOS-EPROM PROGRAMMER is the most advanced programming system available. Utilizing *software personality*™ changes to select the device types is the programming method of the future. Simple keystroke entry will change the device type automatically from a 2704 (4K) through the TI 128K EPROM's. No more personality cards or hardware changes.

The beauty of the E-H Model 4 is that it can be easily run by any operator, but has an extensive software package to allow in-depth data manipulation using selected keyboard commands. This combined with the 2K X 8 RAM buffer, checksum verification, PROM emulation, and fully buffered and normally powered down sockets gives you the most complete, portable, and flexible EPROM programmer on the market today.

The **E-H MODEL 4** is a stand-alone, self-contained microprocessor-controller EPROM programmer.

## Device Select

When the unit is first powered on, the display shows a "d" in the window requesting the device type. By depressing a "D" and then a "1" through "A" on the keypad the following devices can be selected:

Device Selection:	
Triple Supply . . . . .	D1-2704
	D2-2708
	D3-2716
Single Supply . . . . .	D4-2508/2758
	D5-2516/2716
	D6-2532
	D7-2732
	D8-2564
	D9-2764
	DA-TI 128K

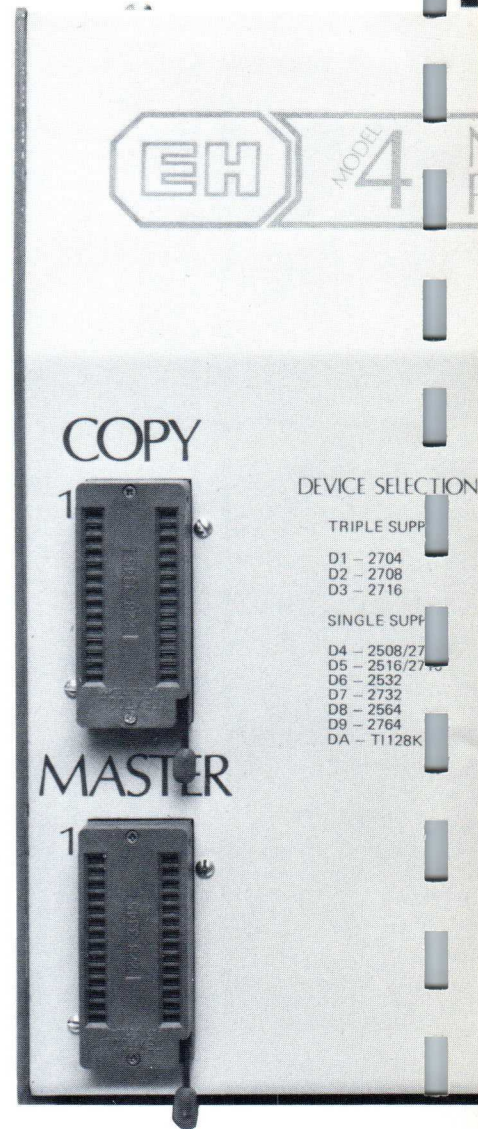
## Keys

<b>Reset</b> . . . . .	Initializes programmer to command mode.
<b>Load</b> . . . . .	Moves data from Master to RAM.
<b>Verify</b> . . . . .	Master to copy EPROM.
<b>Program</b> . . . . .	Blank checks/programs/verifies the Master to the copy EPROM.
<b>Step</b> . . . . .	Allows manual manipulation of programmer.
<b>Keypad</b> . . . . .	For data entry and software commands.

## Operating Modes

The letters in this section appear in the display as that operation is being executed:

<b>A</b> . . . . .	Load From Master
<b>B</b> . . . . .	Blank Check
<b>C</b> . . . . .	Program Operation
<b>D</b> . . . . .	Verify
<b>E</b> . . . . .	Emulate
<b>AA</b> . . . . .	Move Operation
<b>BB</b> . . . . .	Dump/List to Serial Port
<b>CC</b> . . . . .	Checksum
<b>FF</b> . . . . .	Receive From Serial Port
- . . . . .	Read/Alter Location
- . . . . .	Select Device
- . . . . .	Select Baud Rate

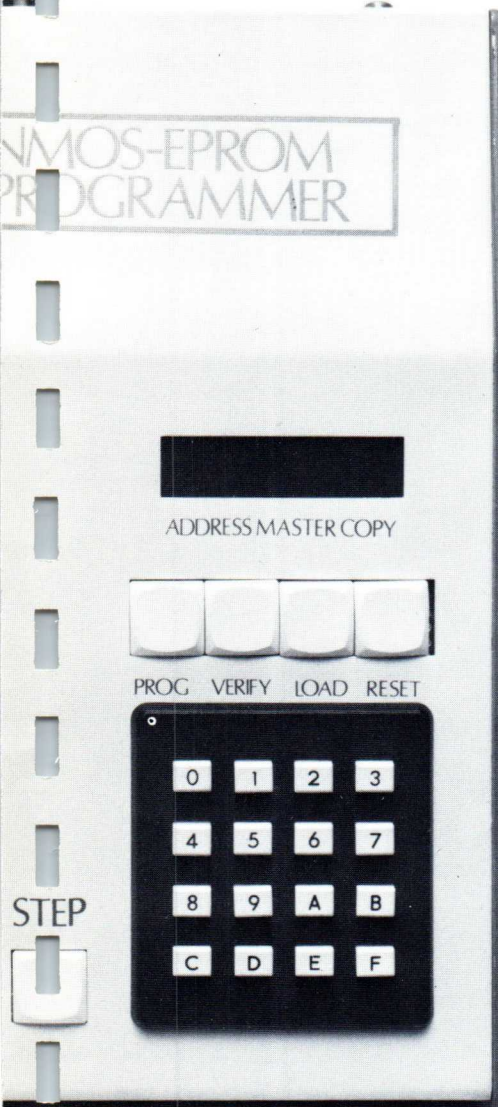


## Emulate

1. Select device 2704, 2708, 2716 triple power supply, 2758, 2516, 2716 single supply.
2. Depress "E" "STEP."
3. Connect master socket on programmer to in-circuit device socket using 24-pin cable.  
**Timing:** Data will be valid within 650 ns after all the address and CE are valid.  
**Inputs:** CMOS loading and levels.  
**Outputs:** Will drive 1 TTL load.

## Serial Data Interface

- 25 pin "D" connector set up for:
- Serial RS232C — Set up as an EIA modem using transmit data, receive data, clear to send, carrier detect, and data set ready; 300, 1200, 2400 bps.
  - TTY — 20 milliamp current loop signals supplies; send, receive, and reader control, 110 bps.
  - MODE — Asynchronous, half-duplex, 1 or 2 stop bits.



## Sockets

28-pin zero insertion force, mounted on mother sockets. Sockets are fully buffered from micro-processor. No power is applied to the devices in the sockets until an operation is started.

## LED Display

8-digit display that shows address, master data and copy data simultaneously. Normally displays the device type in operation or current operation mode.

## Checksum

The checksum is calculated and displayed after every verify operation over the memory space selected. This ensures a reliable data transfer. The checksum is an addition of the binary data and is displayed in a 2-byte sum. To calculate the checksum of RAM or copy:

1. Checksum of RAM—Depress "C" then "1."
2. Checksum of Copy—Depress "C" then "3."

# STEP-BY-STEP INSTRUCTIONS

## SELECT THE DEVICE

*A device must be selected before any operations can be performed.*

## DUPLICATE A MASTER

1. Load master and copy sockets.
2. Depress "program" key.

*The Model 4 will automatically blank check the copy PROM, pass a good device and continue into program. Once the manufacturer's programming time is complete the unit automatically verifies the copy to master.*

## VERIFY ONE PART AGAINST ANOTHER

1. Load master and copy sockets.
2. Depress "verify" key.

*Model 4 automatically compares the master PROM to the device to be tested. If the data does not compare the unit will display the address that failed, master data, and copy data. After a fail a simple press of the "step" key will continue verification.*

## ALTER DATA

1. Place master in master socket.
2. Depress "load." Master data is transferred to internal RAM.
3. Enter "A" and address to be altered on keypad. Unit will display address and RAM data.
4. Enter new data on keypad. As it is entered it will be displayed.
5. Depress "step." This enters the new data change and steps to next address.
6. Complete as many changes as needed.
7. RAM data can now be programmed into a copy PROM with a move routine or used in the Emulation mode. (See Emulate.)

## EDITING

*Move Routine: Block moves of data in RAM to copy device.*

1. Depress "A" then depress "Program." This sets the programmer into the editing software.
2. Depress "B" to initiate the software to a block move and then a number "1" through "8." A "1" moves the 2K X 8 of RAM into the lower 2K of data in the copy device. A "2" command moves the RAM data into the next 2nd 2K section of the copy PROM and "3" into the 3rd section of the copy PROM, etc., until the complete copy device selected is programmed.

1 = 0000 — 07FF	16K	5 = 2000 — 27FF	80K
2 = 0800 — 0FFF	32K	6 = 2800 — 2FFF	96K
3 = 1000 — 17FF	48K	7 = 3000 — 37FF	112K
4 = 1800 — 1FFF	64K	8 = 3800 — 3FFF	128K

*List Routine: When Model 4 is dumping to a CRT or etc., it will list the contents of RAM, master or copy data over a specified field utilizing same sequence as generalized move routine.*

**Generalized Moves:**

1. Any number of bytes can be moved from copy, master, or RAM.
2. Depress "A" then "Program." This sets the programmer into the move routine.
3. Enter beginning address of the block to be moved, XXXX.
4. Enter ending address of the block to be moved, YYYY.
5. Enter the beginning address of the destination, ZZZZ.
6. After the last Hex key is depressed, the instrument automatically transfers the defined block of data to the address designated.

If the block to be moved is in the master, add 2000 Hex to the address and enter that number. If the block is in the copy, add 4000 Hex to the address and enter that number.

**Example: Move address 0000 through 03FF of master into copy at address 0800.**

- (a) Depress "A" then "Program."
- (b) Enter beginning address 2000 (2000 + 0000).
- (c) Enter ending address 23FF (2000 + 03FF).
- (d) Enter destination 4800 (4000 + 0800).
- (e) After the last hex entry the block of data outlined was programmed into the copy starting at copy address 0800.

## Warranty

One year on parts and labor.

## Miscellaneous

**Transformer** . . . . . Shielded to safety ground.

**Power Cord & Receptacle** . . . . . International standard CEE-22.

**Fuseholder** . . . . . Shock-safe, meets IEC Pub No. 65.

**Operating Temperature** . . . . . 0°C to 55°C; (32°F to 131°F).

**Weight** . . . . . 5 lbs. (2.3 kg).

**Measurements:**

Length . . . . . 9 in. (22.86 cm).

Width . . . . . 8 in. (20.32 cm).

Height . . . . . 4 in. (10.16 cm).

**Power Requirements** . . . . . 100, 115, 230 VAC ±10%, 50–60 Hz, approximately 30 VA.

*SALES ORDER 3047*



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This procedure is for the check-out of the Model 4 EProm Programmer. It has been broken down into five sections. These sections cover testing the two main assemblies separately and together as a complete unit. A thorough understanding of the Model 4's Instruction Manual and the Model 4's use is necessary when using this procedure.

There are also two forms that must be completed before the unit can be considered ready to ship. One is the Logic Board check-list that should be completed while performing section II of the check-out procedure. The second is the revision record that must be completed for each box.

SECTION I - MODEL 4 LOGIC BOARD POWER-UP

Before beginning the technician should understand the operation of the keypad and the display format. You should also know the physical layout of the CPU board.

1. The following equipment is needed for this procedure:

- A. Real Time Scope
- B. Dmm or VOM
- C. Model 4P.S. - completely test

2. Logic Board Power-up - The board-set should be powered-up using a pre-checked Model 4 power supply. The CPU

X (A34), Proms-(A28-A30), Ram (A25-26 and A31-33) should not be installed.

- A. With power off check that none of the supplies are shorted together.
- B. Turn power on. Check that none of the supplies are shorted to ground or another supply.
- C. Adjust the clock to one MHZ. Turn-off the power.
- D. Install the CPU, Proms and Ram as listed below:

A25 - 2112 Ram  
A26 - 2114 Ram  
A27 - 2114 Ram  
A28 - TI2716 Prom #1 - operating system  
A29 - empty  
A30 - TI2716 Prom #2 - operating system  
A31 - 2114 Ram  
A32 - 2114 Ram  
A33 - 2112 Ram

E. Turn power on. A "d" should appear on the display and you should be able to enter a device code. If a "d" doesn't appear your CPU and/or operating system hardware isn't working. Before going on to section II, check the keyboard by pushing load and/or verify and check that the display gives the correct code.

## SECTION II LOGIC BOARD SET CHECKOUT

1. The following equipment is needed to check-out the board sets.

- A. Real time scope. Accurate to 0.5% on the 0.1 MICR SEC range in order to set the 1MHZ clock.
- B. DVM
- C. Teletype and special cable for Model 4.
- D. Model 4 test tool.
- E. RS232 cable or special teletype cable.
- F. 24 conductor cable with 24DIP connectors on both ends.
- G. TTY test tape
- H. Model 4 power supply.
- I. 1 each of PROMS 2708, TI2716, TI2516 or Intel 2716, TI2532.
- J. Model 4 Manual
- K. Test loads for testing pins under load.

Logic Board sets should be checked using a pre-tested Model 4 Power Supply.

2. Cpu Clock - Frequency adjustment is by 5K pot. Duty cycle is by selecting resistor to A24P7 frequency should be 1MHZ  $\pm 0.5\%$  measured at A34P38.

3. Pin test - All AC signals are TTL signals except for the 24V program pulse on Pin 20. Using Table II, the read signals can be seen on the master socket during program and the Pgm signal on the copy socket during program.

*Handwritten scribble*

A. ~~Using Table II~~ *In D2 and program*  
 test pins 26, 23, 22, 21 & 20. Also, ~~test~~ *with special prom,*  
 Test the add & data lines for proper levels.

Pin	Master	Copy
26	+5	+5
23	-5	-5
22	CE	+1 2
21	+12	+12
20	OV	+25V

(note 4, Table II-1)

In Verify mode check pins 22 & 20 of the copy socket.

Pin	Master	Copy
22	X	<del>OV</del> CE
20	X	<del>CE</del> OV

B. In D3 test pins 26,22 & 20

in program.

Pin	Master	Copy
26	X <del>10</del>	+12
22	X	A10
20	CE	X <del>25V PGM</del>

In verify mode check pin 20  
of the copy for CE.

C. In D5 test pin 23 and 20 of  
copy and master in program.

Pin	Master	Copy
23	+5	+25
20	X	<u>PGM</u>

(Note 5, Table II-1)

Test pins 21 and 23 of copy and  
master in verify.

Pin	Master	Copy
23	X <del>10</del>	+5
21	A10	A10

D. In D6 test pin 22 of master and  
copy in program.

Pin	Master	Copy
22	PD	PGM

(Note 5, Table II-1)

Test Pin 20 of master and copy in  
verify for All.

E. In D7 test pins 22 & 20 of copy  
in program.

Pin	Master	Copy
22	X	+25
20	X	PGM

(NOTE 5, Table II-1)

Test Pins 23, 22 & 20 of master  
and copy in verify.

Pin	Master	Copy
23	<u>A11</u>	<u>A11</u>
22	<u>OE</u>	<u>OE</u>
20	Note 6 Table II-1	

F. In D8 test pins 28, 27, 23, 2  
and 1 of master and copy in verify.

Pin	Master	Copy
28	+5	+5
27	OV	OV
23	A12	A12
2	OV	OV
1	+5	+5

Test pin 1 of copy in program for  
+25V.

G. In D9 test pins 23 and 2 of  
master and copy in the verify mode.

Pin	Master	Copy
23	A11	A11
2	A12	A12

H. In DA test pin 2 of master and copy, in verify, for A13. You will see only a TTL DC. level.

I. In DB test pin 27 of master and copy, in verify, for A13. You will see only a TTL DC level.

X 4. Checks CPU and most of logic not checked in ~~section 3~~<sup>Step</sup>. To perform this ~~section~~<sup>Step</sup> you must know how to load master to ram and verify ram to copy.

A. Load D3 test prom into ram. Make sure check sum is correct.

B. Using test prom that was loaded into ram, verify copy socket against ram.

5. The following explanation refers to a bit and not a byte of a prom. When a prom

is new or erased all inputs are high. During programming when a high is required, no change is required at the input for the output to be a high. When a low is required during programming the input is pulled low. Because of this it is possible to change the programmed data, after the first programming, depending on the bit pattern originally programmed. A high can be changed to a low, but a low cannot be altered. In data bytes FF is all bits high and 00 is all bits low.

A. Load a 2708, programmed with all FF, into ram. Change ram address 0000 to FE. Load ram to copy. This should be done by allowing the prom to be programmed for about 5 seconds and then pushing reset. Now verify the copy to ram. The displayed checksum should be FbFF. If the part doesn't verify program it for another 5-6 seconds.

B. Do the same operation as A using a TI 2716. The checksum should be F7FF.

C. Do the same operation as in B using an Intel 2716 or TI2516.

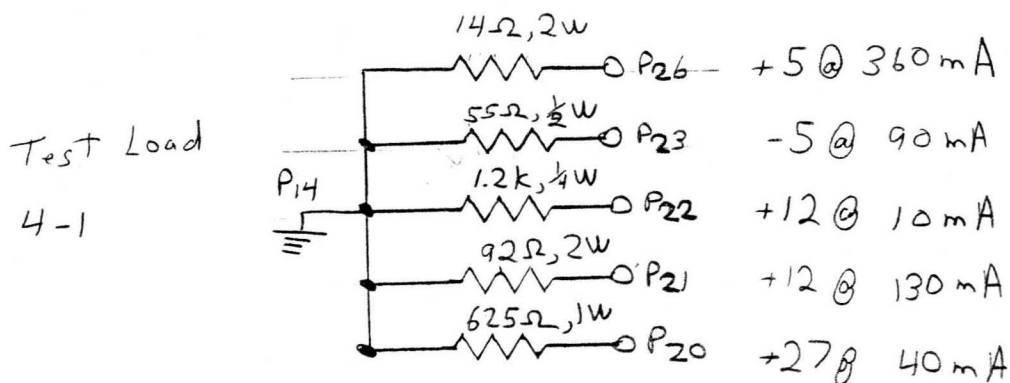
D. Follow the same procedure as in C using a TI2532. The checksum should read 7FFF.

For the next machine to be checked use the same procedure and proms.

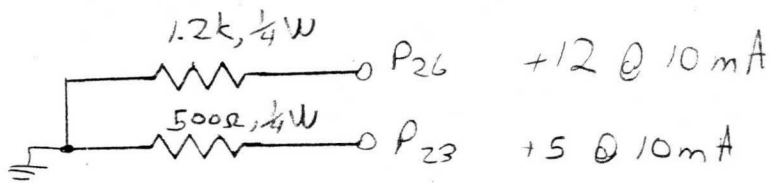
The only difference will be to add one to the address to be altered.

The checksum should also be reduced by one.

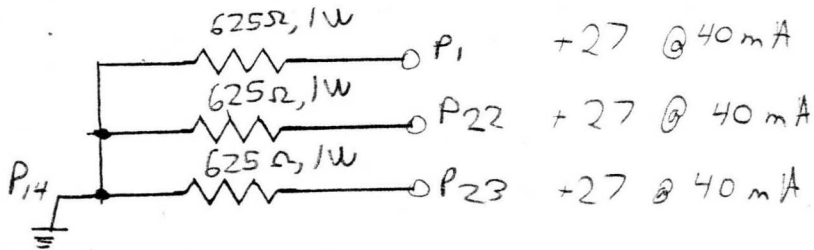
6. Loading pin drivers, use test loads below, with Model 4 P.S.



Test load  
4-2



Test Load  
4-3



- A. Use test load 4-1 with box in D2 and program. Test pin 26, 23, 22, 21 & 20 of copy for voltages listed in table. Also check TR and Tf of 25V pulse at pin 20 under load.
- B. Use test load 4-2 with box in D3 and program. Test P26 of copy for  $+12.6 \overset{T_0}{\rightarrow} +11.8$ .
- C. Use test load 4-2 with box in D5 and verify. Test pin 23 of master and copy for (Vcc-.6).
- D. Use test load 4-3 with box in D5 and program. Test pin 23 of copy for +24V-26V.
- E. Use test load 4-3 with box in D7 and program. Test pin 22 of copy

for +24-26V.

F. Use test load 4-3 with the box in D8 and program. Test pin 1 of the copy for +24-26V.

7. Display and keypad check. When checking display look for missing and weak segments as well as complete digits. The operator should understand the use of the Alter function and its display format. The box should be programmed to D3 or greater.

A. Enter -A078888, check all digits and segments, then hit step, then reset.

B. Enter - A0788, the data for this memory location should display 88.

C. Enter - D8, checking the 5 of the displayed 2564. Enter A0234, checking the 2.

8. Keypad check. Check for proper operation and positive feel and return of each key. Check that for each key entered the proper data is displayed in the correct location. Operator should understand the alter function and its display format.

A. Enter any device, A0123, 45, step, 6 7, step 8 9, step, A B, step, C D, step, EF

9. Teletype check. Use special cable built for TTY. Operator must understand the TTY as well as the I/O operation of the Model 4.

A. Select baud rate of 110.  
B. Program Model 4 to receive information from the TTY.  
C. Load test tap from teletype into Model 4.