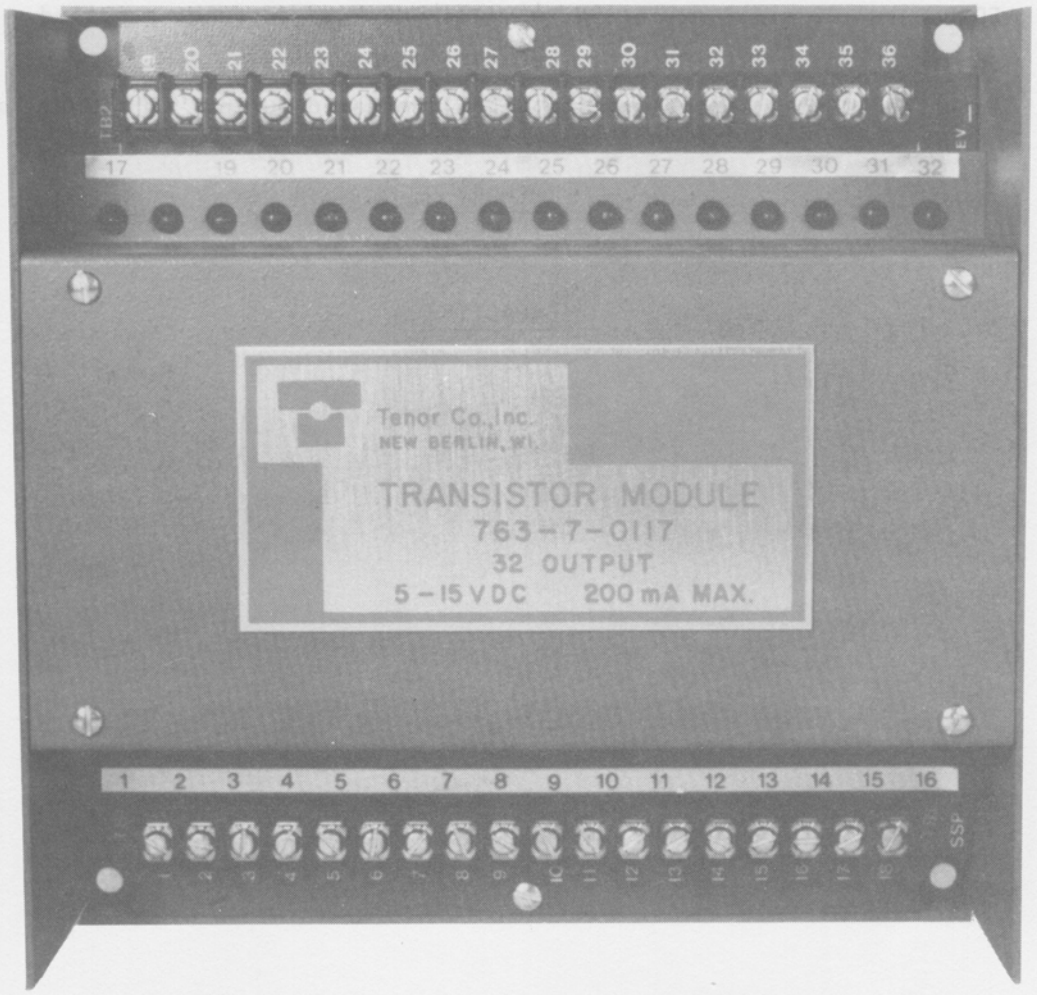
SECTION 9

DC TRANSISTOR OUTPUT MODULE

763-7-0117



9.1 DC TRANSISTOR OUTPUT MODULE MODEL 763-7-0117

GENERAL

Operating Temperature Range: 0^{o} - 60^{o} C

Main Power: Connected to power supply of Solid State Stepper or Multi-Program Stepper via ribbon cable.

OUTPUTS

Number: 32-Switchable each program step.

Operating Voltage: 5-15 VDC customer supplied

LED Power: 20 milli-AMP @ 15V, 4 milli-AMP @ 5V customer supplied

Transistorized Switch Output: 200 milli-AMP

Status Indicator: Corresponding LED illuminated during "ON" condition for each output.

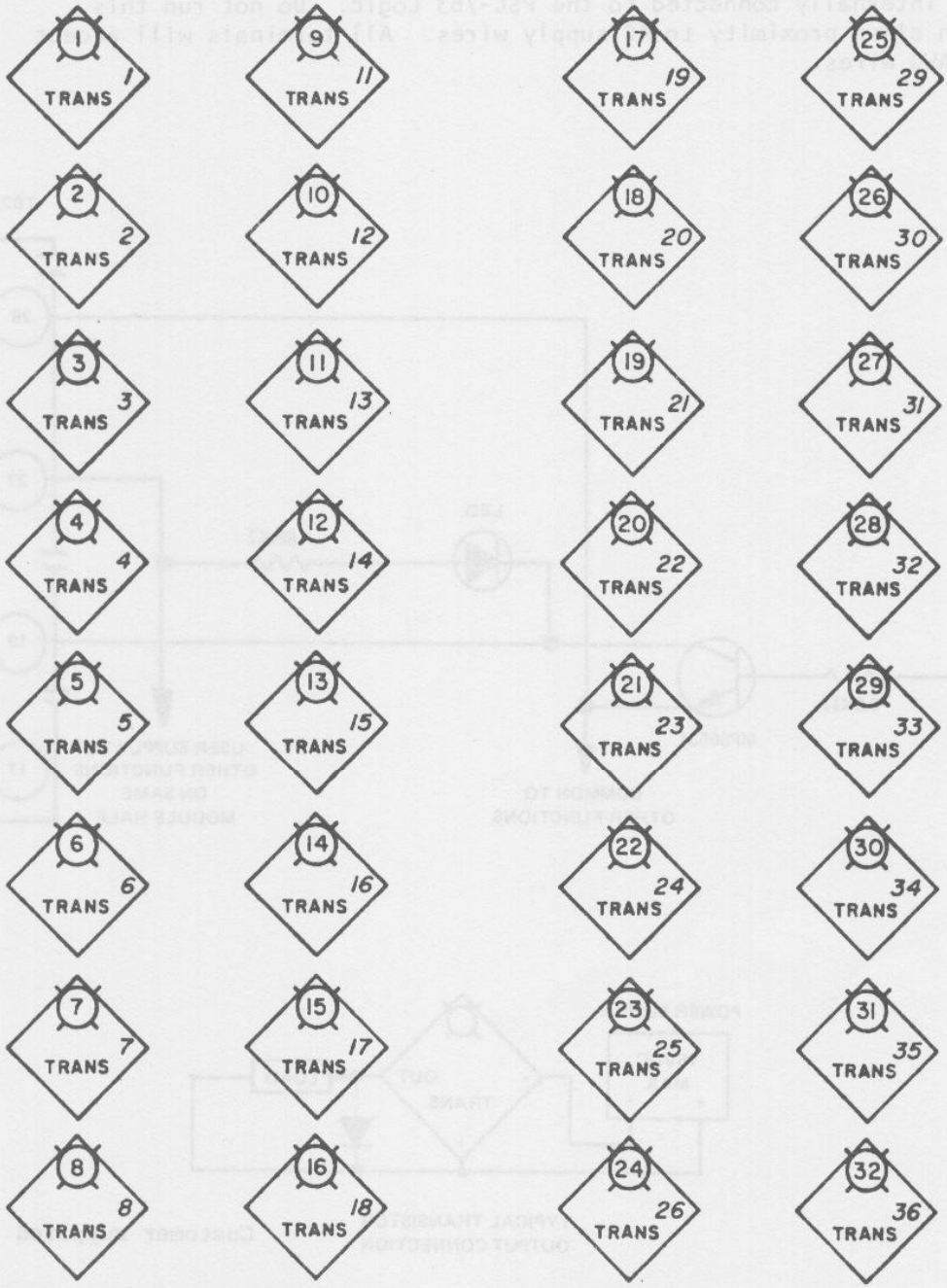
MEMORY

EPROM

CAPACITY

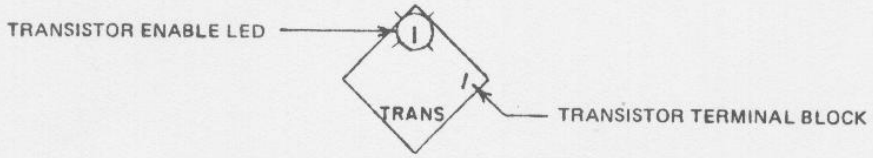
128 Steps (H-127)

9.2 DC TRANSISTOR OUTPUT MODULE FUNCTIONS



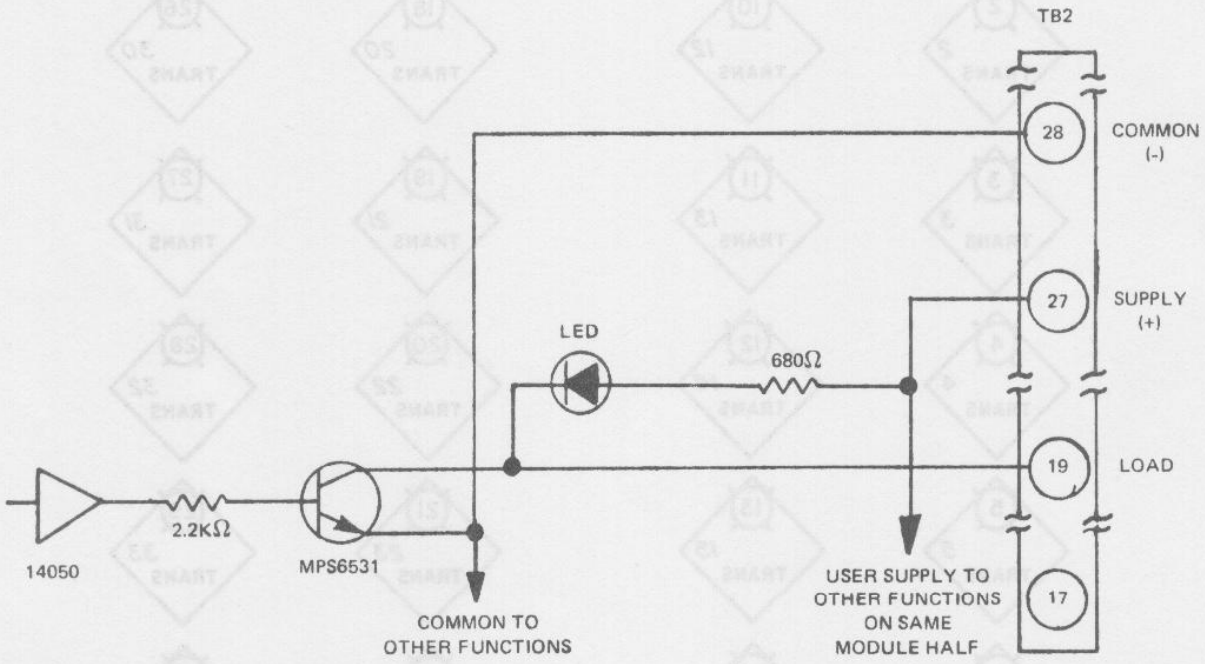
TERMINAL 9 = SUPPLY (+)
TERMINAL 10 = COMMON (0 VDC)

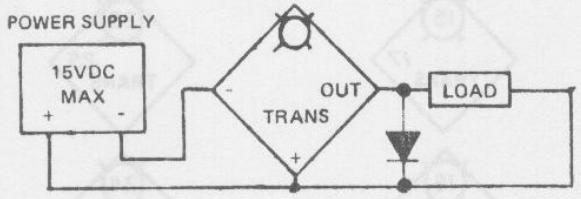
TERMINAL 27 = SUPPLY (+)
TERMINAL 28 = COMMON (0 VDC)



Transistor Module Schematic Symbols
and Terminal Block Connections

Below is a typical output stage of the transistor Module. The common Bus is internally connected to the PSC-763 Logic. Do not run this lead in close proximity to AC supply wires. All terminals will accept 2 #14 AWG wires.





TYPICAL TRANSISTOR
OUTPUT CONNECTION

Customer supplied IN4004

Figure 1.40

9.3 DC TRANSISTOR OUTPUT MODULE OPERATING INSTRUCTIONS

GENERAL DESCRIPTION

The DC Transistor Module contains 32 separate output drivers capable of operating at voltage levels from 5-15 Volts DC at a maximum current of 200 milli-AMPS. The step instructions from the output configuration are programmed according to the application requirements. At any given step the Solid State Stepper Module communicates with the Transistor Output Module via the Bus Ribbon Cable to syncronize the programming instructions. The EPROM in the Transistor Output Module reads the address on the Bus Cable and initiates the outputs programmed in the EPROM for that step and remains in that state until the Solid State Stepper Module advances to the next program step. At that point the Transistor Output Module reads the address on the Bus Cable and actuates the appropriate output functions. This process is continued throughout the program.

The output transistors are sensitive to either overvoltage or improper voltage polarity. When the output transistors are used to switch Inductive Loads such as Relay Coils, a "Free Wheeling" Diode must be connected across the load terminals. Be sure to observe the proper polarity of the "Free Wheeling" Diode. See Figure 1.40.

MEMORY CHIP HANDLING

The user memory device used in the output modules is a metal oxide semi-conductor (MOS) device which may be damaged by static electricity. Before removing the memory, disconnect 120 VAC power to the Stepper Module. When handling the MOS memory, do not touch the leads of the integrated circuit. Use the EPROM Removal Tool included with the 763 Stepper Module. Store the MOS devices with leads inserted in conductive foam or aluminum foil.

PROGRAMMING

It is best to prepare a program chart in advance to aid in loading the EPROM.

An example of a typical program chart and program are shown in Figure 1.41.

The charts are a grid on which up to 16 controlled items (working performing devices and feedback sensors) can be listed along the horizontal axis, and up to 64 program steps can be listed along the two (2) vertical axis. Notice that 2 separate sheets are required for operations having over 64 steps. One program chart set is required for each EPROM in the Transistor Output Module. It should be noted that each EPROM controls 16 outputs. Therefore, the PSC 763 Transistor Output Module requires 2 EPROMS to control its 32 outputs.

MODULE TYPE: Transistor NO.: 1		PROGRAM:	DATE

Tenor Co. Inc.
BULLETIN 800301

SET SW1 IN STEP MODULE
TO 19 = 16 + 2 + 1

EPROM #1

SEQUENCE OF EVENTS	STEP NO.	1 RETURN P.B.	2 STATION 1 LS1	3 " 2 LS2	4 " 3 LS3	5 " 4 LS4	6 " 5 LS5	7 " 6 LS6	8 " 7 LS7	9 HOIST UP LS8	10 HOIST DOWN LS9	11 1TR 10 MINUTES	12 2TR 15 MINUTES	13 3TR 3 MINUTES	14 CONVEYOR FWD. - 1MF	15 CONVEYOR REV. - 1MR	16
START AT STATION 1	H		X														
FORWARD TO STATION 2	1			X											X		
LOWER HOIST	2										X						
RAISE HOIST	3									X							
FORWARD TO STATION 3	4				X										X		
DWELL	5											X					
FORWARD TO STATION 4	6					X									X		
LOWER HOIST	7										X						
RAISE HOIST	8									X							
FORWARD TO STATION 5	9						X								X		
LOWER HOIST	10										X						
DWELL	11												X				
RAISE HOIST	12									X							
FORWARD TO STATION 6	13							X							X		
LOWER HOIST	14										X						
DWELL	15													X			
RAISE HOIST	16									X							
FORWARD TO STATION 7	17								X						X		
WAIT FOR RETURN P.B.	18	X															
REVERSE TO STATION 1	19		X														
	20																
	21																
	22																
	23																
	24																
	25																
	26																
	27																
	28																
	29																
	30																
	31																

SEQUENCE OF EVENTS	STEP NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	32																
	33																
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	35																
	36																
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Typical Program Chart

Figure 1.41

EPROM REMOVAL AND INSTALLATION

Included with the PSC 763 Stepper Module is an EPROM Removal Tool (Augat - Part No. T114-1)*. Power should be removed from the PSC 763 before any EPROM is removed or installed in its socket. To remove the EPROM, gently spread the fingers of the removal tool and place under EPROM as shown in Figure 1.42. While applying a slight clamping pressure on the fingers of the removal tool, gently rock the EPROM up and out of its socket.

CAUTION: Do not pull the EPROM out at an angle. This will almost always result in bending or breaking of the EPROM leads. Do NOT touch EPROM leads. Static electricity will damage this chip.

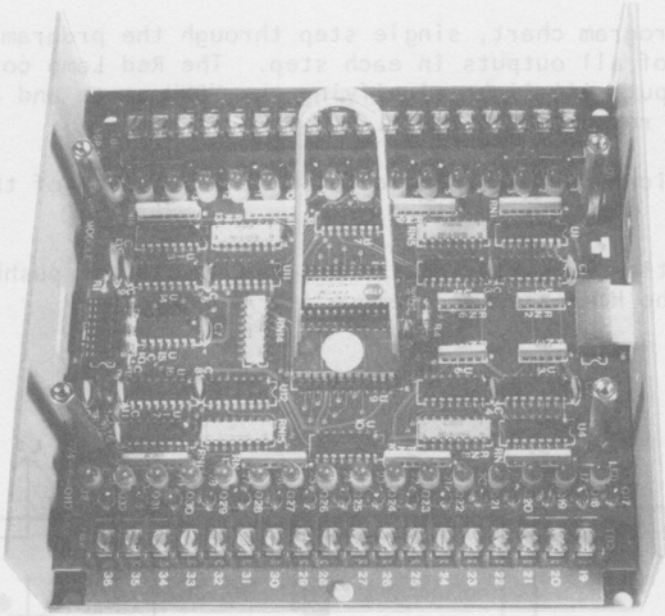

Figure 1.42

To reinstall the EPROM, align the EPROM over its socket with the notched end of the EPROM at the same end as the notched end of the socket. Be sure that the EPROM leads are aligned with the corresponding socket holes. Gently push the EPROM straight down into its socket, being careful not to bend the pins on the EPROM during insertion.

*AUGAT, INC., P. O. BOX 779, ATTLEBORA, MA 02703

INITIAL CHECK OUT

Static program check of the system is recommended at this time.

Figure 1.44 shows the correct wiring diagram for the 763 Solid State Programmer and 763 Multi-Program Stepper.

CAUTION: AC power must be disconnected from all output loads during this procedure to prevent accidental injury or damage.

1. Connect AC power (L1 and L2) to the appropriate terminals on the 763 Solid Sate Programmer or 763 Multi-Program Stepper.

2. Install a normally open pushbutton switch between L1 and the single step forward input.

3. Apply power to the circuit. If this is the first time the system has been energized since unpacking, it should start at the Home (H) step. If it does not, cycle the pushbutton switch until the readout is at the Home step.

4. Using the program chart, single step through the program verifying the status of all outputs in each step. The Red Lamp corresponding to each output will light signifying the "ON" state and ability to turn on the respective circuit.

   The Red indicating lamps should follow the sequence of the program chart.

5. Upon completion of verifying the program, cycle the pushbutton switch to the Home step and remove all AC power.

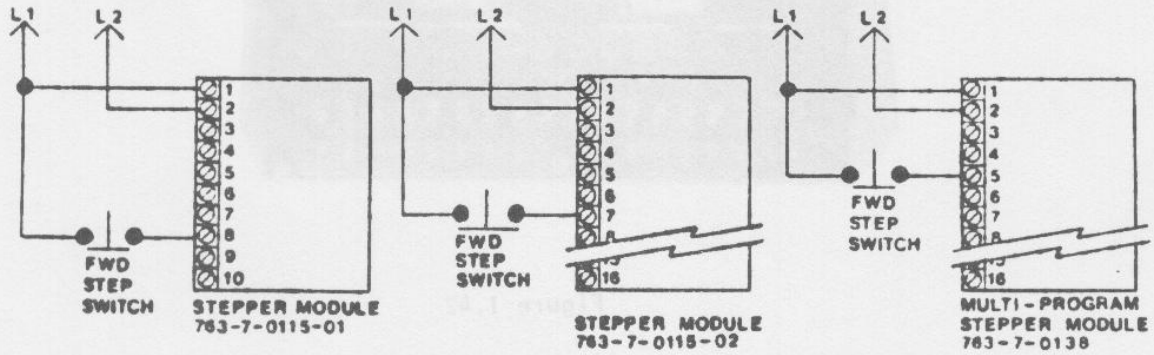

Figure 1.44

LOADING THE PROGRAM

To program a 1702A EPROM on the Tenor EPROM Loader (Catalog No. 763-7-0120) first plug the programmer into a 120 VAC 60 H_z grounded receptacle. After the loader is plugged in, install the EPROM into its socket.

WARNING: Do not connect or disconnect AC power from the loader with an EPROM in the socket.

The locking handle on the socket must be "up" to allow the EPROM to be inserted. The notched end of the EPROM must be at the locking handle end of the socket, see Figure 1.45. With the EPROM correctly inserted in the socket, push the locking handle down to secure the EPROM in its socket.

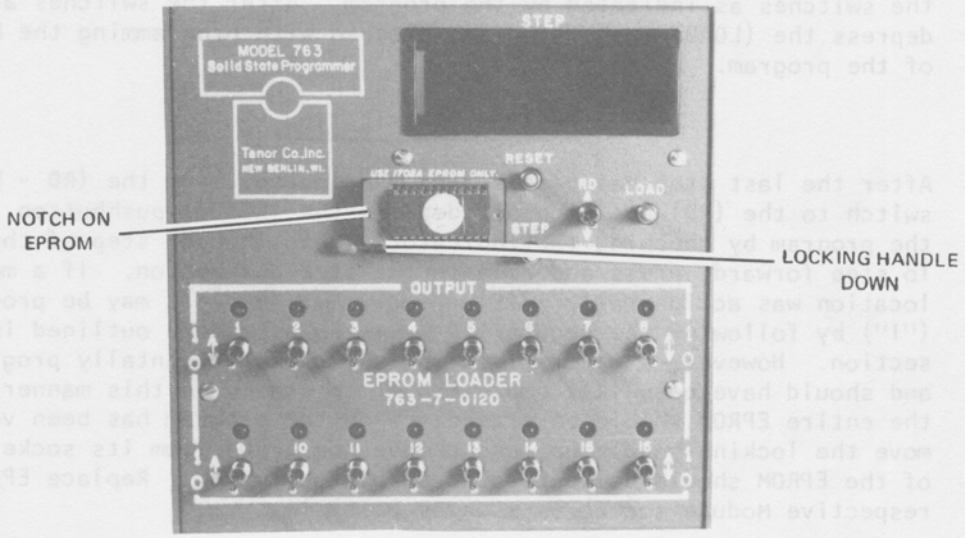

Figure 1.45

With the EPROM secured in its socket, move the read - write (RD - WR) toggle switch on the loader face to the (RD) position and depress the (RESET) push-button. The step readout should now indicate the Home (H) step and all (16) of the lights on the face of the loader panel should be off.

With the loader in the Read (RD) mode of operation it is now advisable to check the EPROM address locations to ensure that they are empty. By press-ing and releasing the STEP pushbutton the loader will now step to step number (1). All (16) lights on the face of the loader panel should be off. A quick check of the remaining memory locations should be made by cycling the (STEP) pushbutton, verifying that all lights are off for the balance of the program steps. When you arrive at the final step in your program you can push the (RESET) pushbutton and return to the Home (H) step.

Before programming, a piece of opaque tape must be placed across the window of the EPROM to prevent possible erasure of the light sensitive device. A marking should be made on the tape to aid in identifying the program about to be stored and its proper location.

Move the (RD - WR) toggle switch to the Write (WR) position. The loader is now in the programming mode. Refer to the program chart and look at the horizontal row adjacent the (H) (STEP NO.). Wherever an (X) occurs in the (H) row, the corresponding toggle switch on the programmer should be put in the "1" position.

After the switches are all set, the (LOAD) pushbutton should be depressed and released. The information is now stored on the EPROM. Notice that after depressing and releasing the pushbutton, the loader (STEP) readout moved to the number (1) step.

The loader is now ready to be set-up for step number (1). Move along the horizontal row adjacent step number (1) on the program chart and set-up the switches as indicated by the program. After the switches are set-up, depress the (LOAD) pushbutton and proceed with programming the balance of the program.

PROGRAM VERIFICATION

After the last step has been set-up and loaded, move the (RD - WR) toggle switch to the (RD) position and depress the (RESET) pushbutton. Verify the program by checking the indicator lights in each step of the program. To step forward, press and release the step pushbutton. If a memory location was accidentally left unprogrammed ("0") it may be programmed ("1") by following the regular programming procedure outlined in this section. However, a memory location that was accidentally programmed and should have been left empty cannot be erased in this manner. Instead the entire EPROM should be erased. When the program has been verified, move the locking handle up, and remove the EPROM from its socket. Handling of the EPROM should be kept to an absolute minimum. Replace EPROM in its respective Module socket as soon as possible.

ERASING THE EPROM

To erase or empty the data stored in the EPROM, a U-V (ultra-violet) Memory Chip Eraser is available (Catalog No. 763-3-0121). This device will erase up to 4 EPROMS at the same time. A picture of this device is shown in Figure 1.46. Instructions for the use of this device are included in its packaging. It is recommended that the 1702A EPROM be exposed to the short wave U-V lamp for a minimum of 45 minutes to ensure complete erasure.

WARNING: Never look directly into the lit U-V lamp because this may cause permanent eye damage.

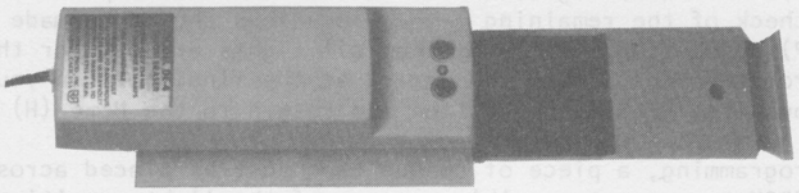

Figure 1.46

9.4 MAINTENANCE

Solid state control devices require a minimum of maintenance. A good preventive maintenance program should include the following:

1. Keep inside of enclosure free of dust and contaminents. (Do NOT steam or hose clean).

2. Keep enclosure doors closed except when servicing.

3. Do not store loose or unnecessary articles in the enclosure.

   WARNING: Keep personnel clear of machinery and equipment that can be hazardous if activated by the control system during maintenance of trouble-shooting. Use generally accepted safe practices for electrical equipment maintenance.

4. Check terminal block connections, plugs and sockets periodically for tightness. This is especially important after any trouble-shooting.

5. Do not insert or remove modules, module covers, IC's or fuses while power is on.

9.5 RECOMMENDED SPARE PARTS

Description	Tenor Part Number
EPROM (National or AMD 1702A)	700-3-0769
Flat Interconnection Cable Assembly	700-3-5059