INSTRUCTION MANUAL

Serial Number ____________________

16-Channel Programmable
Scanner

CM 015-0267-00

Tektronix, Inc. • P.O. Box 500 • Beaverton, Oregon 97077 • Phone 644-0161 • Cables: Tektronix
061-1317-00 Issued:375DG

16-Channel Programmable Scanner

(CM 015-0267-00)

Data acquisition and processing is made easier and more accurate with Tektronix TM 500-Series test and measurement systems, 31/53 Calculator Instrumentation Systems, or other measurement systems of similar nature by use of the Tektronix 16-Channel Programmable Scanner.

Designed to operate as a regular-width TM 500-Series plug-in, the Scanner takes measurements rapidly in sequence from as many as 16 different test points, and furnishes the results to the DM 501 or to a digital counter plug-in for further processing. If needed, several Scanners can be cascaded so that many more than 16 measurements can be taken and processed through the system very quickly. In this configuration, the first Scanner in the chain is designated as the Master Scanner, and the following units are connected in a Slave arrangement.

SCANNER FRONT PANEL INPUT AND OUTPUT SIGNALS

STEP IN

A Step command is required to advance the channel input signal sequence from one channel to the next. A Step In signal to accomplish this can be furnished from the 153 Interface Trigger outputs, from the Scanner's FLASH Output, or from some other trigger source. Where a single Scanner is used in the system, or where the Scanner is in the Master position, Step Pulses can also be provided from the manual STEP pushbutton on the Scanner front panel. In Slave Scanners, the STEP pushbutton is disabled.

STEP OUT

When Scanners are connected in cascade, Step Pulses are supplied to Slave scanners

STEP OUT (cont)	from the STEP OUT connector on the Master Scanner. If more than two Scanners are connected, succeeding Slave scanners receive their Step In pulses from the Step Out connector of the preceding Slave Scanner in each case.
RESET (Input & Output)	The Reset Pulse causes channel status to revert to its starting point. In a single Scanner arrangement the scanner automatically reverts to Channel 1 as soon as the 17th Step Pulse occurs. In a cascade hookup when a Reset Pulse is commanded from the Calculator the status of the system goes to Channel 1 of the Master Scanner, while all Slave Scanners are set to Channel Ø. On the Master Scanner, the front panel RESET Connector is both an Input and an Output. Reset Pulses are input from the 153 Trigger Output or other source on the Master Scanner, and are output to Slave unit resets from the same connector. Reset Pulses can also be supplied manually to the Master Scanner (or to a single Scanner) from the front panel RESET Pushbutton. This pushbutton is disabled on Slave Scanners. Finally, in a situation where less than 16 channels are used in a single Scanner, Reset Pulses can be hard-wired to occur after the last channel has cycled, by the use of special diodes. This system is described in a later section.
FLASH Output	This signal output is used to cause the 31 Calculator display to flash at a rate selected

FLASH Output (cont)	by the RATE control on the Scanner front panel. FLASH is connected from the Scanner front panel to the Flash Input on the 153 Interface plug-in. The Flash rate can be adjusted over the range from 10 pulses per second through 1 pulse each 10 seconds.
HI and LO Outputs	The HI and LO banana jack connectors on the Scanner front panel supply the high and low voltage information from the channel inputs to the DM 501 or digital counter plug-in.
POWER Output	The POWER connector on the Scanner front panel is a source of 12-volt DC for external transducers. It is a 3-pin connector similar to those used for the 16 channel inputs.

FRONT PANEL CONTROLS AND INDICATORS

STEP Pushbutton	A manual Step Pulse control. When the Scanner is the only one connected in the system, or is in the Master position in a cascade arrangement, this pushbutton generates a Step Pulse which advances the active channel to the next one in sequence each time it is pressed. Disabled when the Scanner is in a Slave position.
RESET Pushbutton.	Operates in a manner similar to the STEP Pushbutton. Generates a manual Reset Pulse when pressed in a Scanner connected alone in the system, or one connected in the Master position. Also disabled in a Slave Scanner.

RATE Control	A variable control which varies the Flash output interval from 10 per second to 1 each 10 seconds as it is rotated from Min to Max.
Channel Indicators	A series of 16 numbered indicator lamps, located on the front panel adjacent to the channel connectors. The lamps light in succession to indicate the active channel at any given moment.

INSTALLATION

The Programmable Scanner is constructed as a regular-width plug in for a TM 500-Series Power Module. It will fit in any plug-in compartment of the TM 500, and if several Scanners are used in a system, they can be mounted side by side in TM 500 modules. Details of interconnections for various system configurations are discussed later in this section.

Diode Connections for Reset Pulses

As noted previously, if a single Scanner is used in the system, and all 16 channels are connected, Reset to Channel 1 is automatic immediately after Channel 16 has cycled. However, if less than 16 channels are in use, or if several Scanners are cascaded and the final one in the series does not use the full complement of 16 channels, a Reset Pulse must be provided. The Reset Pulse can be commanded from the Calculator after the desired number of channels has cycled through. When single Scanners are used and you want to save calculator program memory, the Reset Pulse can be hard-wired in the Scanner by means of diodes inserted in clips provided for the purpose. (See Fig. 1). The diode clips are numbered 8, 4, 2, and 1, so that by a combination of diodes, any number of channels from 1 through 15 can be cycled prior to the Reset Pulse. Reset occurs following the channel number selected by diodes. For example, if diodes are inserted in the 4 and 1 clips, Reset will occur immediately after Channel 5 is active. Be sure to insert

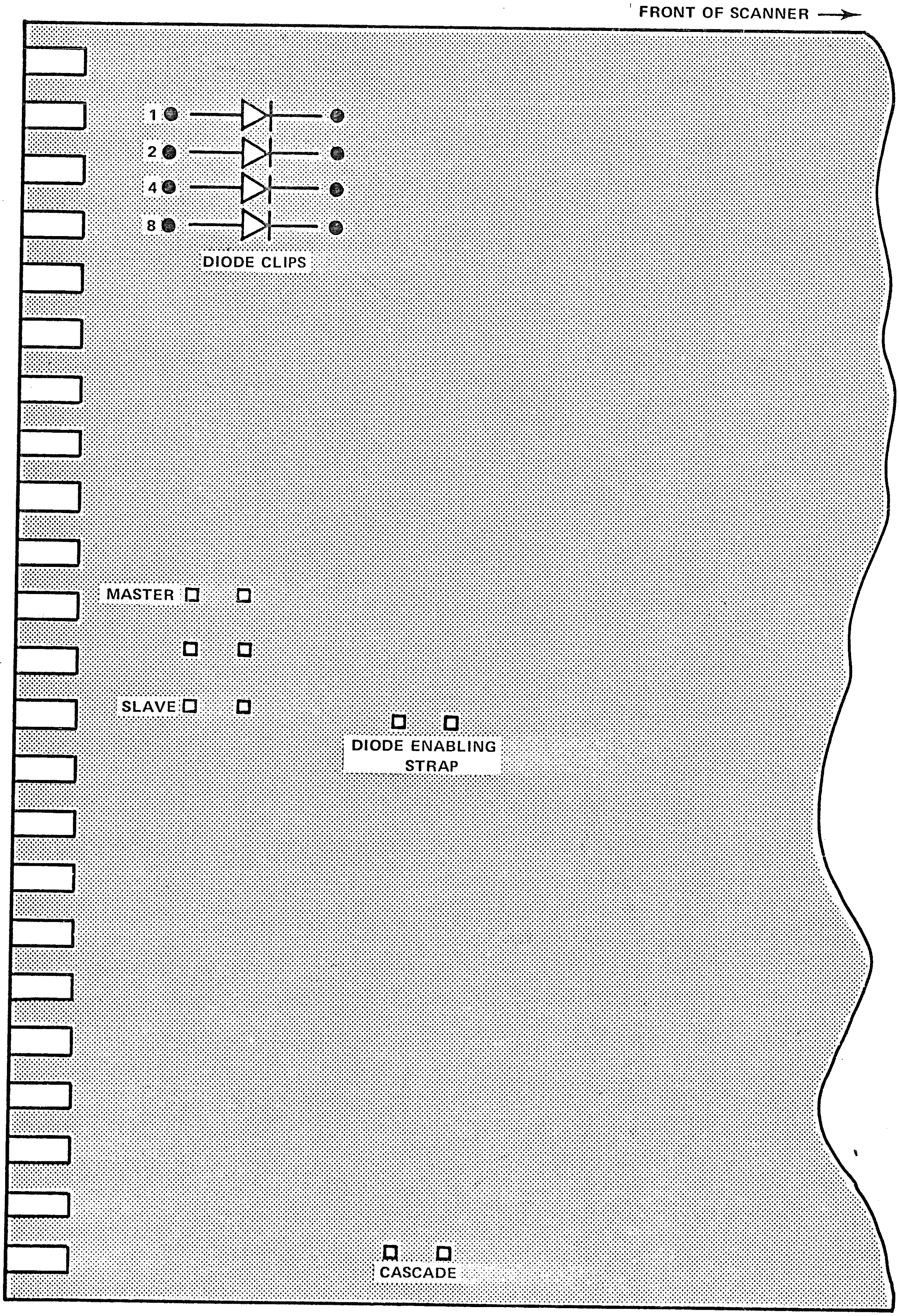


Fig. 1. Location of strap options and diode clips. (Left side view of scanner.)

diodes in accordance with the silk-screened polarity markings on the Scanner Board. When diodes are installed, Jumper Strap B (Fig. 1) must also be connected. Diodes for use in this arrangement are NOT provided with the Scanner. However, silicon diodes, type 1N4152 can be used. They can be ordered by Tektronix Part No. 152-0141-02.

SYSTEM CONNECTION OPTIONS

Several arrangements can be put together for system operation, utilizing different features of the scanner and the 31/53 System to best advantage for the particular application. The illustrations and descriptions to follow point out the major ones.

No. 1 Single Scanner with all channels active

Fig. 2 illustrates the interconnections required in this application, where a single Scanner is used in the system, and all 16 channels are utilized. The Step Pulse is taken from the front or rear panel Trigger output on the 153 Interface, and the connection is to the STEP IN connector on the Scanner front panel. When the system is first powered up, or whenever the Scanner front panel RESET pushbutton is pressed, the Scanner will go to Channel 1 active. With each trigger received at STEP IN, the Scanner will advance to the next channel in order. The signal input at each succeeding channel is presented in turn to the HI and LO outputs on the Scanner front Panel, and connected from there to the input of the DM 501 or DC Counter plug-in for further processing. As soon as Channel 16 has cycled, the next trigger received sets the Scanner back to Channel 1. No Reset Pulse is needed in this arrangement, unless one is applied manually from the front panel pushbutton.

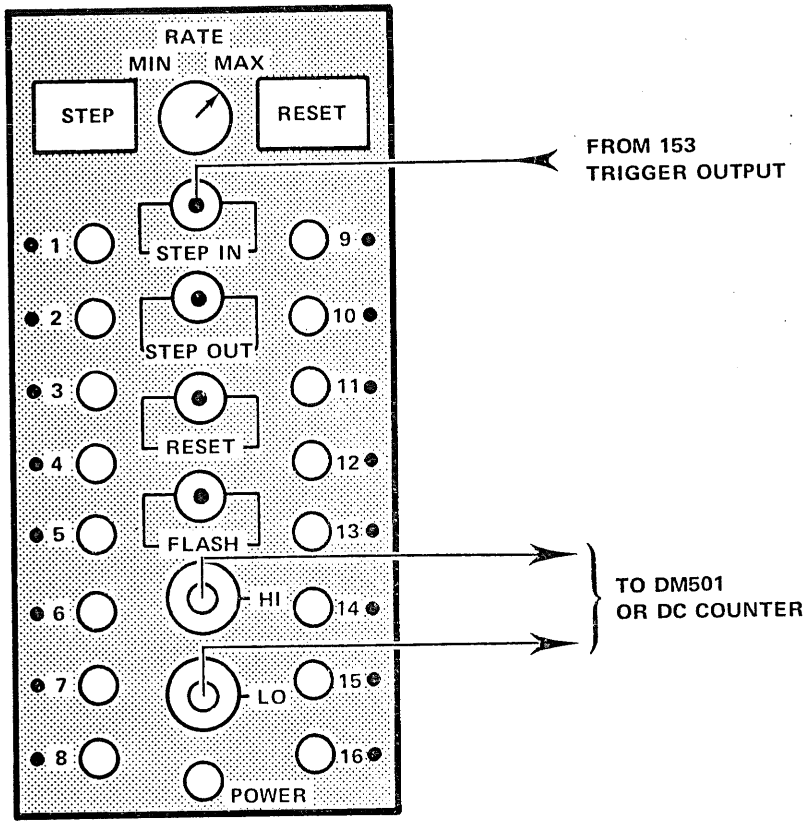


Fig. 2. Scanner connected as only scanner in system. Step pulses supplied from 153 trigger output.

No. 2 Single Scanner with less than 16 Channels active

Fig. 3 shows the required connections for this use of the Scanner. The connections are the same as those in Fig. 2, with the addition of a Reset Pulse from the front or rear panel trigger of the 153 Interface. The Step Pulse and Reset Pulse inputs can be taken from either of the 153 Trigger Outputs, and commanded from the Calculator by Remote commands. Remote 23 calls up the front panel trigger output, and Remote 24 commands the rear panel trigger. After the required number of Scanner channels (less than 16) has cycled through, the Reset Pulse sets the Scanner back to Channel 1. As pointed out earlier, the Reset Pulse can be hard-wired into the system by the use of diodes. This saves Calculator memory, and causes the Reset to occur automatically after the designated channel.

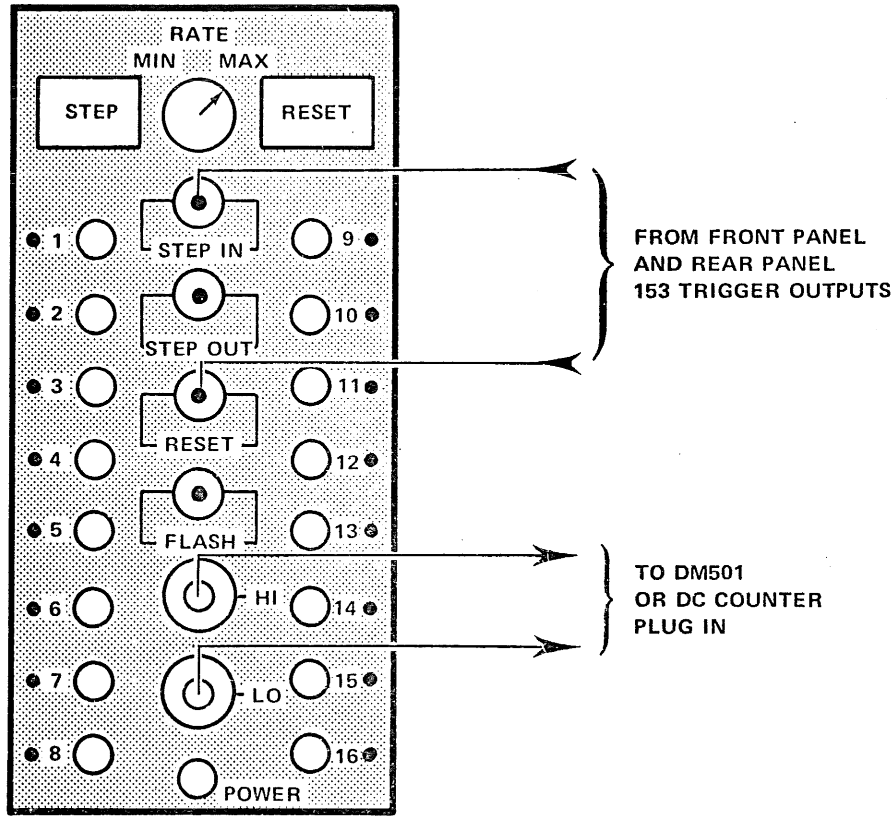


Fig. 3. Scanner connected as only scanner in system. Step and reset pulses supplied from 153 trigger outputs.

No. 3 Single Scanner with Reset and Flash pulses

Fig. 4 illustrates the interconnections needed for this application. It can easily be seen that this setup is similar to the one described above under No. 2, and illustrated in Fig. 3. However, in addition to the connections of Fig. 3, there is a connection between the FLASH output on the Scanner front panel, and the Flash Input on the 153. The Flash Pulse is a 3 microsecond negative-going signal which causes a flashing display on the Calculator. The repetition rate of the pulse can be adjusted over the range from 10 pulses per second to one pulse each 10 seconds, by the use of the RATE control on the Scanner front panel. The Flash Pulse amounts to a synthetic Interrupt of the Calculator Program, and can be used to control the system's sampling rate. In response to an IF FLASH statement in the Calculator program, Remote 23 or

Remote 24 can be called to command a Step Pulse or a Reset Pulse as the situation demands. The Flash Pulse may also be used for some purpose by some piece of equipment external to the system.

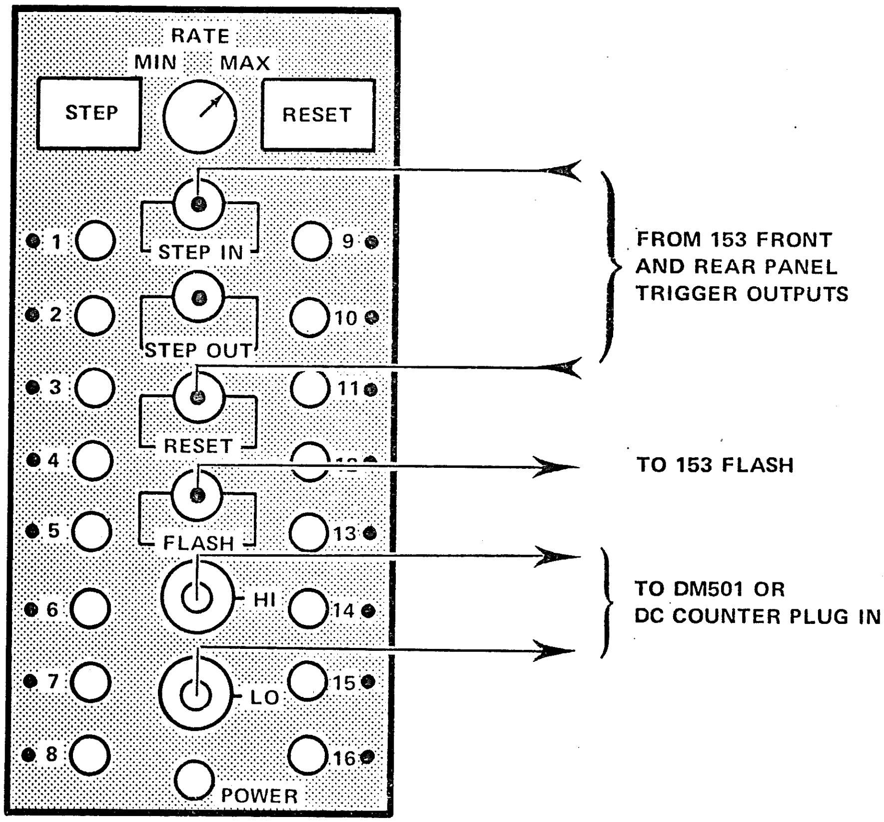


Fig. 4. Scanner connected as only scanner in system. Step and remote pulses furnished from 153 trigger outputs, flash pulse from scanner to 153 flash input.

No. 4 Single Scanner with Reset and Flash Pulses -- Flash supplies Step In

Fig. 5 shows the interconnections for this setup. This arrangement is similar to that described above and shown in Fig. 4, except for the addition of one more connection. In this case, the FLASH Output pulse from the Scanner is fed back into the Scanner's Step In input, so that the Flash Pulse, in addition to Flashing the Calculator display, also regulates the stepping of the channels in the Scanner. While this arrangement saves Calculator program memory, it effectively removes control of the channel stepping rate from the Calculator. (Flash Pulse repetition rate establishes the stepping rate). Thus, it is necessary to set the RATE control to the point that the Flash Pulses are far enough apart to permit all necessary processing, logging, or storage of information from a channel before the Flash occurs and steps the Scanner to the next channel.

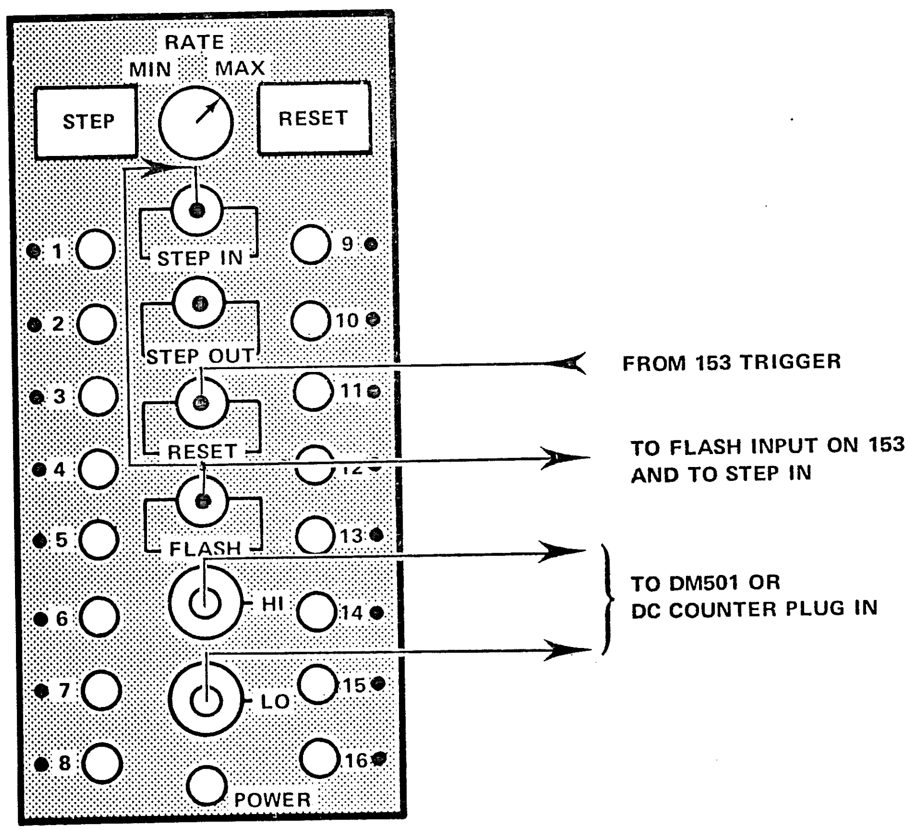


Fig. 5. Scanner connected as only scanner in system. Reset pulse furnished from 153 trigger. Flash output both furnishes step pulse and flashes calculator display.

No. 5 Master and Slave connections with Step and Reset Pulses

When more than 16 channels are needed for the measurements being taken, Scanners are cascaded. In this arrangement, the first Scanner in the series is designated the Master. The strap option settings and some of the connections are different for the Master unit than they are for the succeeding Scanners in the series, which are described as Slave units. Fig. 1 shows the strap positions and jumper connections. For the Master Scanner, the jumpers at the Master-Slave position, halfway between the top and bottom edges of the Scanner Board at the back, should be in Master position. Also for the Master Unit, the Cascade jumper at the bottom rear of the Scanner board, is removed. For the first (or only) Slave Unit, the Master-Slave jumpers will be in Slave position. If only one Slave Unit is used, the Cascade jumper is left connected. If more than one is in the circuit, the Cascade jumper must be removed on all Slave Units except the final one in series. When the Cascade jumper is removed, the Scanner goes to a zero channel state after Channel 16 has cycled, and the Step Pulses are passed directly from the Step In connector to Step Out, and thence to the Stop In connector on the next Scanner in the series.

Fig. 6 shows the interconnections for a Master-Slave configuration with Step and Reset pulses connected. Note that 153 Trigger Pulses are connected to the Master Scanner Step In connector and Reset connector in the same manner as for a single Scanner arrangement. Additionally, a connection is made between the Step Out connector on the Master and the Step In connector on the slave. This same connection applies between each pair of Slave Scanners in the system. The Reset Pulses are connected from the Master Reset connector to each successive Slave Reset connector. Finally, the HI and LO outputs from the Master front panel are connected to the DM 501 or DC Counter, and at the same time, to the HI and LO outputs of each of the Slave Scanners in series. This is because there is generally only a single DM 501 or DC counter plug in in the system, and with this connection, HIs and LOs can be fed from each Scanner to the DM 501 or counter. Because the HI and LO outputs are connected in parallel it is important to make sure the jumper straps for Master Slave operation are in the proper position to insure that only 1 channel is selected at any given time.

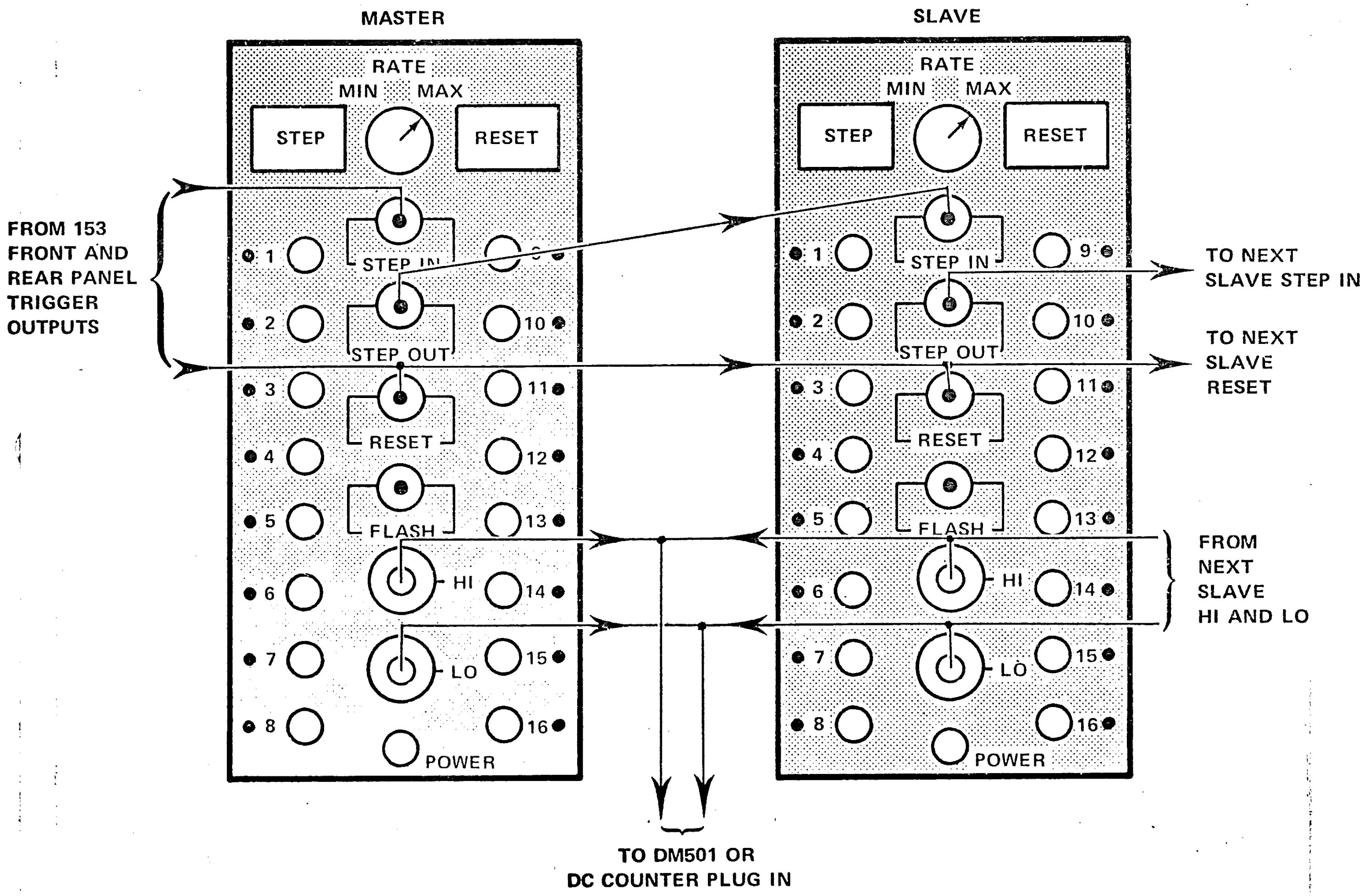


Fig. 6. Scanner connected as master and slave. Step pulses from 153 to master, from master step out to slave step in. Reset to master from 153 trigger, from master reset to slave reset.

No. 6 Master and Slave Scanners connected with Step, Reset, and Flash Pulses.

Fig. 7 illustrates the connections required for this arrangement. Strap option settings and interconnections are the same as those shown in Fig. 6 and described immediately above. The one addition is a FLASH output connection from the Master Unit back to the Flash Input on the 153. Note that no other Scanners have Flash connections, and the FLASH pulse is used from only the Master Scanner. If two or more Scanners are connected in the system and all channels are in use, the Reset Pulse will have to be generated by the Calculator under program control. The Reset Pulse will set the Master Scanner to Channel 1, and the Slave units to Channel Ø.

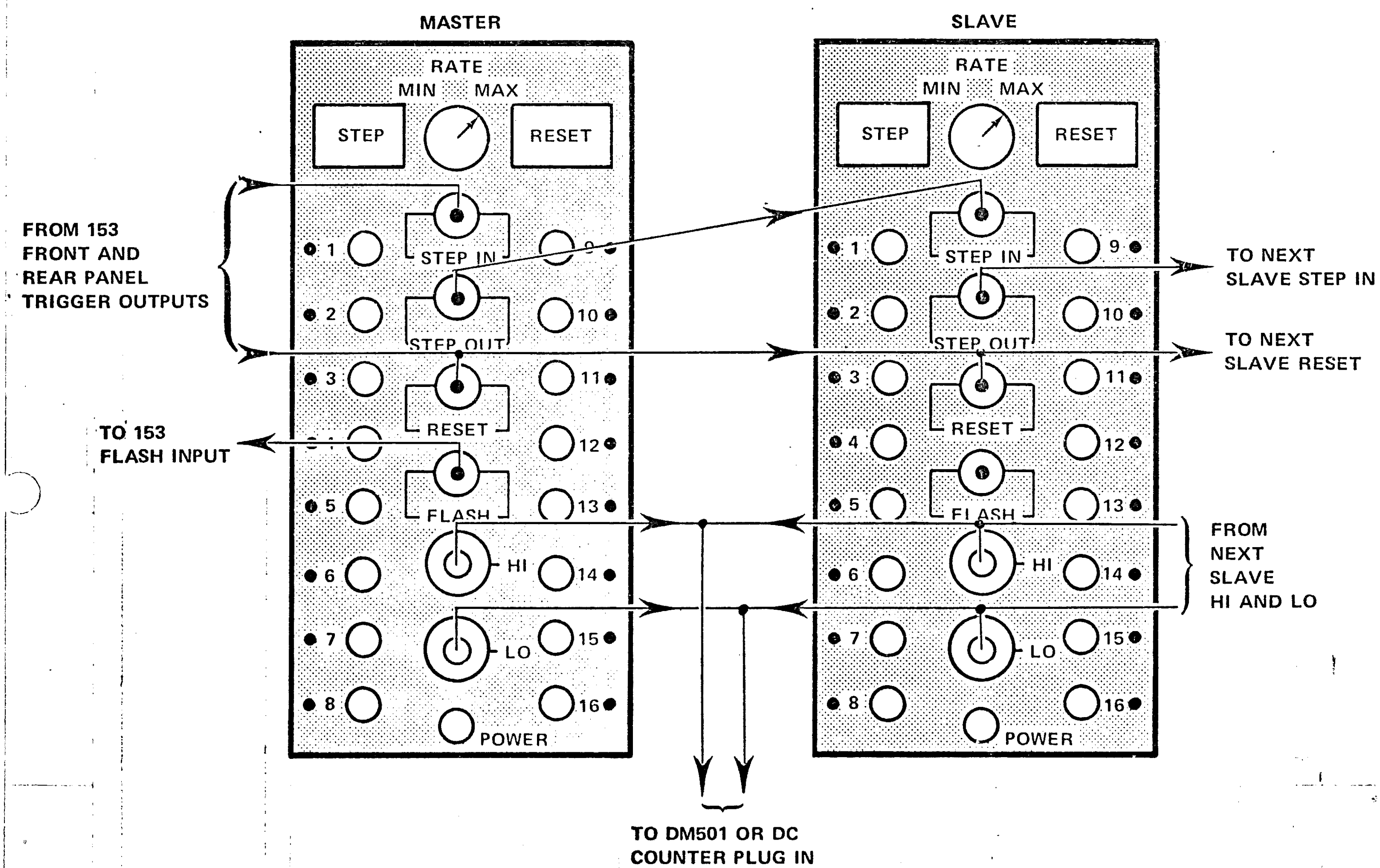


Fig. 7. Scanners connected as master and slave. Reset and flash are both used. Note that flash is connected to 153 from master scanner only.

SCANNER SPECIFICATIONS

Switching: Accomplished by 16 Reed switches

Reed Switch Operating Characteristics

Contact Ratings: 200 VDC maximum

0.5 Ampere maximum

10 watts maximum power consumption

Reed Switch Life expectancy approximately 10,000,000 cycles.

Flash Pulse Repetition Rate: Adjustable by RATE control from 10 pulses per second to 1 pulse per 10 seconds.

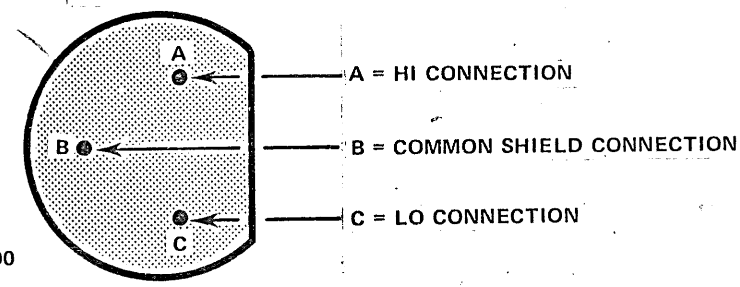
POWER Output: 12 volts DC at 250 mA.

Scanner Accessories:

One adapter - BNC female to BSM male - Part No. 103-0036-00

17 3-pin connectors, 16 for channel inputs, 1 for Power Output. (See Fig. 8)

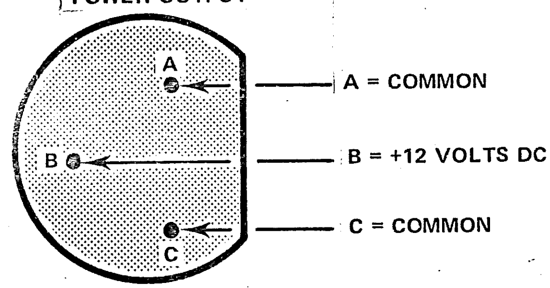
CHANNEL INPUT



MALE P/N 131-0716-00

*FEMALE P/N 131-0717-00

POWER OUTPUT



NOTE: FEMALE CONNECTORS FOR CHANNEL INPUT
OME WITHOUT COVERS. COVERS COME WITH MALE
ONNECTORS. FOR EXTRA INPUT CONNECTORS BOTH
ALE AND FEMALE MUST BE ORDERED AND COVERS
ROM MALE INSTALLED ON FEMALE.

B.N.C. FEMALE TO B.S.M. MALE P/N 103-0036-00

Fig. 8. Connector pin diagram.

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CIRCUIT DESCRIPTION

The 16-Channel Programmable Scanner is connected into the data acquisition system for the purpose of taking information samples from many different test points, and transmitting them to the TM-500 portion of the measurement system in a cyclical manner -- with each connected information channel successively acting as a data transmission channel. Switching from one channel to the next is under control of the Step Pulse. A series of Step Pulses is supplied to the Scanner from a Trigger Output of the 153 Interface, from the Scanner's own front panel FLASH connector, or (in the case of a Master or Single Scanner arrangement) may be generated manually at the Scanner's front panel STEP pushbutton. After all connected channels have, in turn, provided information to the TM-500 measurement system, a System Reset occurs to cause the operation to return to its starting point at Channel 1.

Scanning Rate

The rate at which the Scanner cycles through its channels is determined by several factors. Since the Step Pulses which cause channel cycling generally originate from the 153 Interface Trigger outputs, scanning rate may be determined by the scanning rate of the controlling calculator -- approximately 18 scans per second.

Flash Pulses

Through the use of Scanner-generated Flash Pulses, the scanning rate can be controlled by the RATE control on the Scanner front panel. Flash Pulses can be generated from this source over a range of rates from 10 pulses per second through one pulse per 10 seconds, as established by the RATE knob. Every time a Flash occurs, the calculator display is flashed, creating a pseudo-interrupt condition in the calculator. The Flash output can, at the same time, be connected to the STEP IN connector on the Scanner, to control the channel cycle rate.

Scanner Circuitry

Circuitry in the Scanner is of two kinds; the 16 information channels, and the control circuitry. The control circuitry supplies Step and Reset pulses at appropriate times, determines that only a single channel can be active at any given instant, and establishes which Scanner in a cascade arrangement is "on line" at any particular time.

Step and Reset Pulses

Step and Reset pulses, as mentioned above, are supplied to the Scanner from 153 Interface Trigger outputs, or can be generated at the Scanner by front-panel pushbuttons (in a Master or single Scanner configuration). The circuitry for Step and Reset pulse generation is basically the same. The Step or Reset pushbutton supplies an input to a debounce circuit consisting of flipflop U335A in the case of the Step Pulse, and U335B for the Reset. The output of the flipflop in each circuit is fed to a one-shot (U325A for Step Pulses, U325B for Reset). The one-shot establishes the length of the pulse -- so that a uniform-duration Step or Reset pulse is produced, no matter how long the pushbutton is held down.

From the Step one-shot U325A, pushbutton-generated Step pulses enter OR gate U121A at pin 2. Externally-generated Step Pulses are applied at pin 1 of U121A. Pushbutton-originated Reset pulses are applied from U325B to pin 10 of U121C. At the pin 6 output of U235C, a wired OR condition effectively exists. Reset pulses can be accepted either from the front-panel RESET pushbutton, or from the RESET connector -- and in either case, the resulting pulse activates the Reset inputs at pin 2 of U231A, and pin 6 of U231B.

Channel Cycling

When a Step Pulse from either the external source or the push-button enables U121A, its pin 3 output is applied to the Clock input, pin 2, of counter U25.

Single Scanner (Master) Operation. When only a single Scanner is connected in the system, or when the Scanner is to be used as the Master in a cascade arrangement, the Master-Slave jumper is in Master position. This blocks any input from U231A, and locks out the Channel Ø capability used in cascade operation. The Step Pulse at the Clock Input of U25 starts the divide-by-16 counter clocking and providing input signals to U125, the channel selector.

The negative level of the Step Pulse from U121A is inverted to a high state in U221E and applied to the pin 19 (G2) input of U125. This forces a high state on all 16 channels, effectively cutting off all channels by opening the reed relays. All channels are held in this closed state for the duration of the Step Pulse. As this occurs, an output from U25 is furnished to U125 to cause the indicated channel (selected by the binary code output of the 8-4-2-1 lines from U25) to be active. The low state of the channel outputs is the true state. As Step Pulses occur, the Scanner toggles sequentially through the 16 channels; and on the 17th Step Pulse, U25 automatically returns to Channel 1 output status. This is because U25 is, in effect, a ring counter. In single Scanner operation, no Reset Pulse is needed if all 16 channels are connected.

Cascade Scanner Operation

Master Scanner. In most respects, a Scanner used in the Master position in a cascade arrangement works as though it were a single Scanner. However, the one major difference is that after all 16 channels of the Master Scanner have cycled, the Master goes into a state of quiescence, and the next Step Pulse starts the channels of the first Slave Scanner through their sequence. This can occur because when the Scanner is in a Master position, the Cascade jumper between ground and pin 5 of U121B has been removed. Removal of the jumper allows pin 5 to go high so that whenever a high signal appears at pin 4 of U121B, the two high inputs cause a high output at pin 6. Pin 4 is moved high by the Carry Out Pulse from pin 15 of U25. This pulse only occurs after all 16 channels of the Master Scanner have cycled. When this has happened, the pin 6 output of

U121B is inverted through U221D, and applied as a low state to pin 4 of U225B. The signal then appears as a high level on pin 9 of U225C, enabling the next Step Pulse which appears as a high at pin 10 of U225C to be transferred out through the Step Out connector.

The timing diagram of Fig. 9 shows the sequence of events, starting with the positive excursion at the end of Step Pulse 15. Simultaneously, the Carry Out pulse from U25 pin 15 moves positive and holds a high level for one Step Pulse interval. Through U121B, inverter U221D, and pin 4 of U225B, U225B pin 6 is driven positive. This holds pin 9 of U225C high, so that the next Step Pulse which arrives at pin 10 of U225C via U221E is passed through U225C to the STEP OUT connector, and thence to the first Slave Scanner to start its channels through a cycle.

At the same time, the Carry Out pulse is caught by U231B at its pin 7 input. On the next (Step Ø) excursion, the pin 8 output of U231B drops low, and holds that level until a Reset Pulse is received at pin 6 (Reset input). This forces a high output at pin 6 of U225B, which allows Step Pulses to be passed on to the STEP OUT connector to toggle the Slave Scanner through its series of channel cycles. The low signal out of pin 8 of U231B is also applied to pin 2 of U225A. This forces a high level at G1 (pin 18) of U125, which produces highs at all outputs of U125, opening all relays and thereby effectively disconnecting all information channels in the Master Scanner until the next Reset Pulse is received.

Slave Scanner Operation

When the Scanner is in a Slave position in a cascade arrangement, the Cascade jumper is removed, if additional units are to follow, and the Master-Slave jumper is in Slave position. This jumper position creates three conditions. It applies a high state to pin 1 of U325A, which disables the Step one-shot, and consequently renders the STEP pushbutton ineffective. Simultaneously, through inverter U221F, a low is applied to pin 11 of U325B, disabling the Reset one-shot, and the RESET pushbutton. Finally, this high level enables U225D through pin 12, permitting U231A to play a part in Scanner operation.

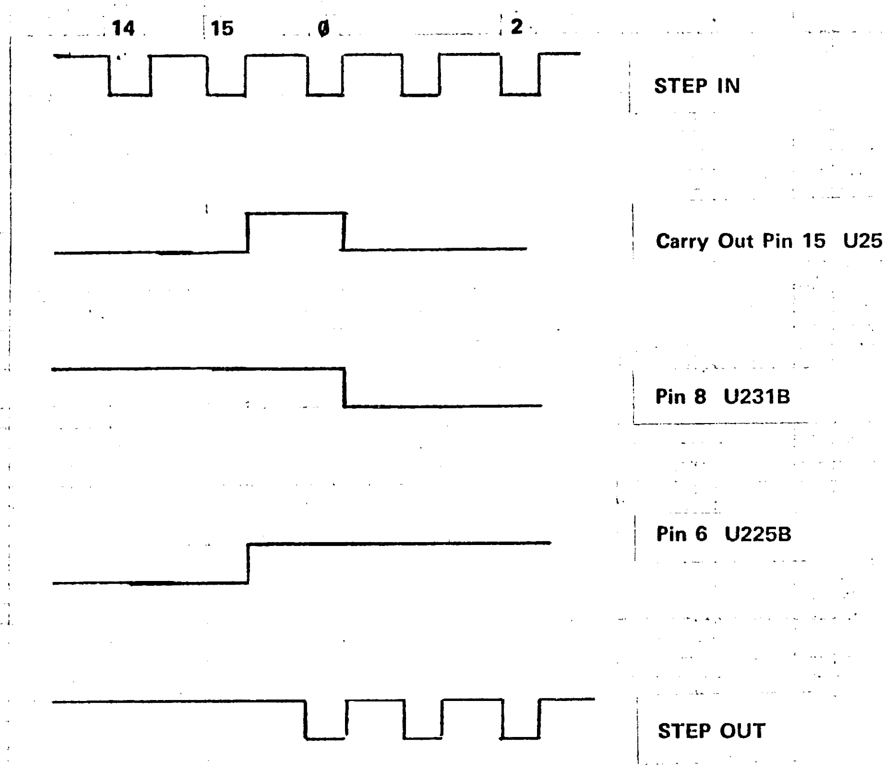


Fig. 9. Timing Diagram Scanner

When the Reset Pulse is first received from the Master Scanner, the $\overline{Q}$ output (pin 13) of U231A is high. The high at both inputs of U225D causes its output to be low. This low, applied to the parallel input (pin 7) of U25 disables the counter and prevents any counting until a high level is applied. Simultaneously, the low state from U225D is applied to pin 1 of U225A, creating a high at G1 (pin 18) of U125. This opens all channel relays and disables the channels.

This condition is changed by the arrival of the first Step Pulse from the Master Scanner via U121A. This Step Pulse becomes a Clock input to U231A, which toggles a low level to the pin 13 output. Through U225D, the low state occurs as a high on the parallel enable of U25, and a low at the pin 18 G1 input of U125.

This action permits the second Step Pulse arriving to initiate normal operation of the Slave Scanner. The arrival of the low state resulting from the first Step Pulse at G1 of U125 automatically turns on Channel 1 of the Slave Scanner, which then scans through the remaining channels under command of the succeeding Step Pulses.

Diode Resets

A special feature of the 16 Channel Programmable Scanner is useful in a single Scanner arrangement where less than the full 16-channel array is in use. This is the ability to configure the Scanner for an automatic Reset to Channel 1 after cycling through a selected number of channels, by the use of one or more diodes inserted into special clips.

These diode clips are connected off the four output lines of U25, and are labeled on the schematic as CR40, 41, 42, and 43. The lines from the diodes to the pin 1 input of U221A are labeled respectively 8, 4, 2, 1. Additionally, the Diode Enabling Strap between pin 2 of U221A and pin 9 of U25 (See Fig. 1) must be installed for diode operation.

To cause reset to occur after the desired number of channels have cycled, diodes are installed in the clips that are numbered to a total corresponding to the channel at which reset is desired, less one. Thus, if reset is desired after Channel 7 has cycled, diodes are installed in clips 4 and 2.

Operation of the circuit is as follows. With Channel 1 active, all output lines of U25 are low. With one or more diodes, plus the Diode Enabling Strap, installed, the low states at the diode cathodes appear as a low input to pin 1 of U221A, and a high input to the Load pin, pin 9 of U25. The high state is the inactive condition of the Load Pulse. This state continues until the cathodes of all installed diodes have been driven high by the output lines from U25. At this point, all diodes are back-biased, and pin 1 of U221A goes high, producing a low at pin 9 of U25. At the occurrence of the next Step Pulse, the ground state present on the parallel inputs of U25 (pins 3, 4, 5, and 6) is jam-transferred to the output lines. This forward-biases the diodes, sends the Load input high, and resets the Scanner to Channel 1.

The diode reset arrangement is a convenient means of conserving calculator memory in a Single Scanner setup with less than 16 channels active.

Channel Circuits

The foregoing description has dealt with the circuits which control channel cycling in the Scanner. Each of the channels is a means of carrying information from a test point to the measurement and evaluation sections of the data system. Each channel is operated by a reed relay under command of the above-described control circuitry. As the reed switch is closed at each channel, that channel presents its information to the system. At the same time, a front panel light-emitting diode on the Scanner is lighted to indicate the active channel at that moment.

FRONT PANEL BOARD PARTS LIST

QUANTITY	DESCRIPTION	PART NUMBER
68	Sq. Pin .025 x .365	131-0608-00
16	Connector, Recept., Electric Male	131-0716-00
1	Connector, Recept., Electric Female	131-0717-00
16	Lamp, LED, Red. 2.5V	150-1004-00

SCANNER BOARD

QUANTITY	DESCRIPTION	PART NUMBER
16	Coil, Reed Driver 11.5V DC	108-0340-00
3	Contact Set, Electric	131-0601-00
78	Sq. Pin .025 x .365	131-0608-00
4	Connector, Term.	131-0707-00
2	Link, Term. Conn.	131-0993-00
32	DIODE 1N4152	152-0141-02
1	I.C. SN7438N	156-0145-01
1	I.C. SN7473N	156-0039-01
1	I.C. SN7474N	156-0041-01
1	I.C. SN7404N	156-0058-01
1	I.C. SN74154N	156-0078-01
1	I.C. 9601	156-0081-01
1	I.C. SN74161N	156-0117-01
1	I.C. SN7408N	156-0129-01
3	I.C. SN7417N	156-0140-01
1	I.C. SN74123N	156-0172-01
1	I.C. 7805	156-0277-00
1	I.C. 7812	156-0285-00
1	I.C. NE5555	156-0402-01
3"	Wire, #26 AWG	175-0529-00
2	Cable, Special Purpose, Electric	175-1111-00
1	Washer, Cup, Transistor	210-0071-00

MECHANICAL PARTS LIST

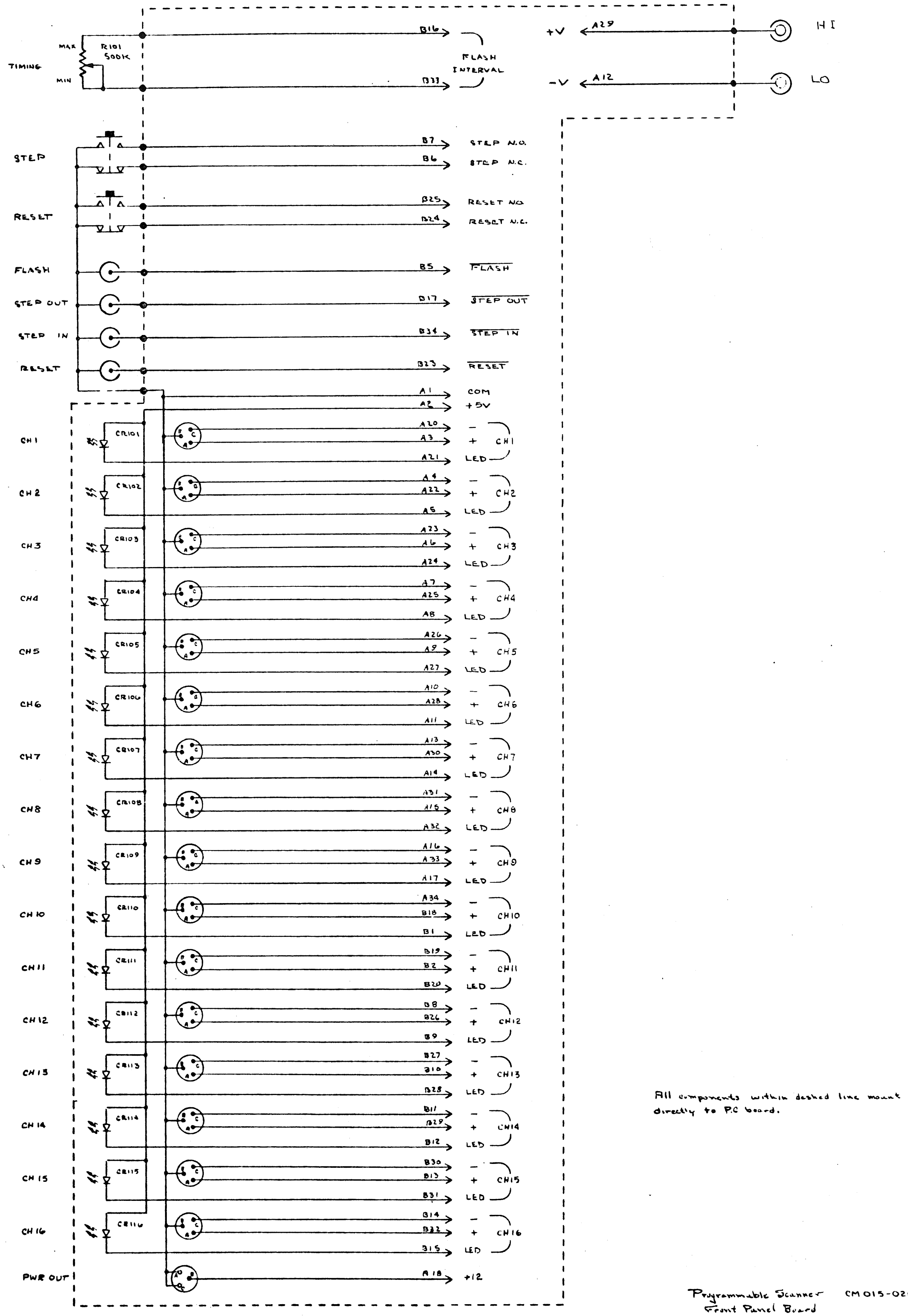
QUANTITY	DESCRIPTION	PART NUMBER
1	Post, Binding, (Charcoal)	129-0064-00
1	Post, Binding, (Red)	129-0064-01
4	Spacer, Post Hex 4-4 x .35L x .188	129-0353-00
4	Bulkhead, Receptacle w/hardware	131-0282-00
2	Wire #26 AWG 2" 0-N	175-0529-00
1	Wire #26 AWG 2" 1-N	175-0529-00
1	" 2-N	"
1	" 9-0	"
1	" 9-1	"
1	" 9-2	"
1	" 9-3	"
1	" 9-4	"
1	" 9-5	"
1	" 9-6	"
1	" 9-7	"
1	" 9-8	"
1	" 9-N	"
1	Washer, Lock, Internal #12	210-0020-00
4	Washer, Lock, Internal	210-0046-00
1	Lug, Solder	210-0261-00
2	Nut, Kep Hex 6-32 x .312	210-0457-00
1	Nut, Mini Pot Hex .25 x 32 x .312	210-0583-00
2	Washer, Shouldered, Fiber	210-0811-00
8	Washer, Fiber 1/8 ID x 1/4 OD	210-0823-00
2	Washer, Flat .147 ID x .312 OD	210-0870-00
1	Washer, Flat .250 ID x .375 OD	210-0940-00
4	Screw, 4-40 x .188 PH	211-0065-00
6	Screw, Circuit Board PH 6-32 x .312	211-0601-00
4	Screw, Self-tapping PH 6-32 x .312	213-0146-00

QUANTITY	DESCRIPTION	PART NUMBER
1	Nut, Plain, Hex 6-32 x .250	210-0407-00
1	Screw 6-32 x .375 PH	211-0510-00
32	Switch, Reed	260-0552-00
1	Capac. 470 pf	281-0525-00
1	Capac. .01 μf 150V	283-0003-00
2	Capac. .1 μf 50V	283-0111-00
5	Capac. 1 μf 25V	283-0177-00
1	Capac. 4.7 μf 50V	
1	Capac. Tan Dip 15μf 20V	290-0527-00
1	Capac. Tan Dip 15μf 50V	290-0528-00
1	Capac. Tan Dip 47μf 20V	290-0529-00
1	Capac. Tan Dip 100μf 10V	290-0531-00
1	Res. Pak. 4.7K	307-0383-00
1	Res. 60 ohm 2W W/W	308-0162-00
1	Res. 10 ohm 2W W/W	308-0574-00
1	Res. 1K 1/4W 5%	315-0102-00
2	Res. 10K 1/4W 5%	315-0103-00
1	Res. 20K 1/4W 5%	315-0203-00
16	Res. 220 ohm 1/4W 5%	315-0221-00
1	Res. 2.7K 1/4W 5%	315-0272-00
2	Res. 33K 1/4W 5%	315-0333-00
1	Res. 4.7K 1/4W 5%	315-0472-00
1	Res. 5.1K 1/4W 5%	315-0512-00
1	Insulator, Transistor	342-0202-00
1	Holder, Term. Conn.	352-0176-00

QUANTITY	DESCRIPTION	PART NUMBER
4	Screw, Self-tapping FH 6-20 x .375	213-0229-00
1	Screw, Self-tapping FH 2-32 x .25	213-0254-00
1	Spring, Ground Flat	214-1061-00
1	Latch, Plug-in, Retaining	214-1513-01
1	Pin, Knob, Securing	214-1840-00
2	Switch, Pushbutton	260-1665-00
1	Pot, Comp. 500K ±20%	311-0419-00
1	Panel, Front	CM 333-2070-00
2	Shield, Electric Side	337-1399-00
1	Knob	366-0494-00
2	Pushbutton .253 x .326 x .43	366-1328-00
1	Knob, Latch	366-1422-01
1	Sub-Panel, Front	CM 386-3415-00
1	Sub-Panel, Rear	CM 386-3416-00
2	Frame, Pushbuttons	426-0681-01
1	Frame, Section Bottom	426-0724-00
1	Frame, Section Top	426-0725-00

ACCESSORIES

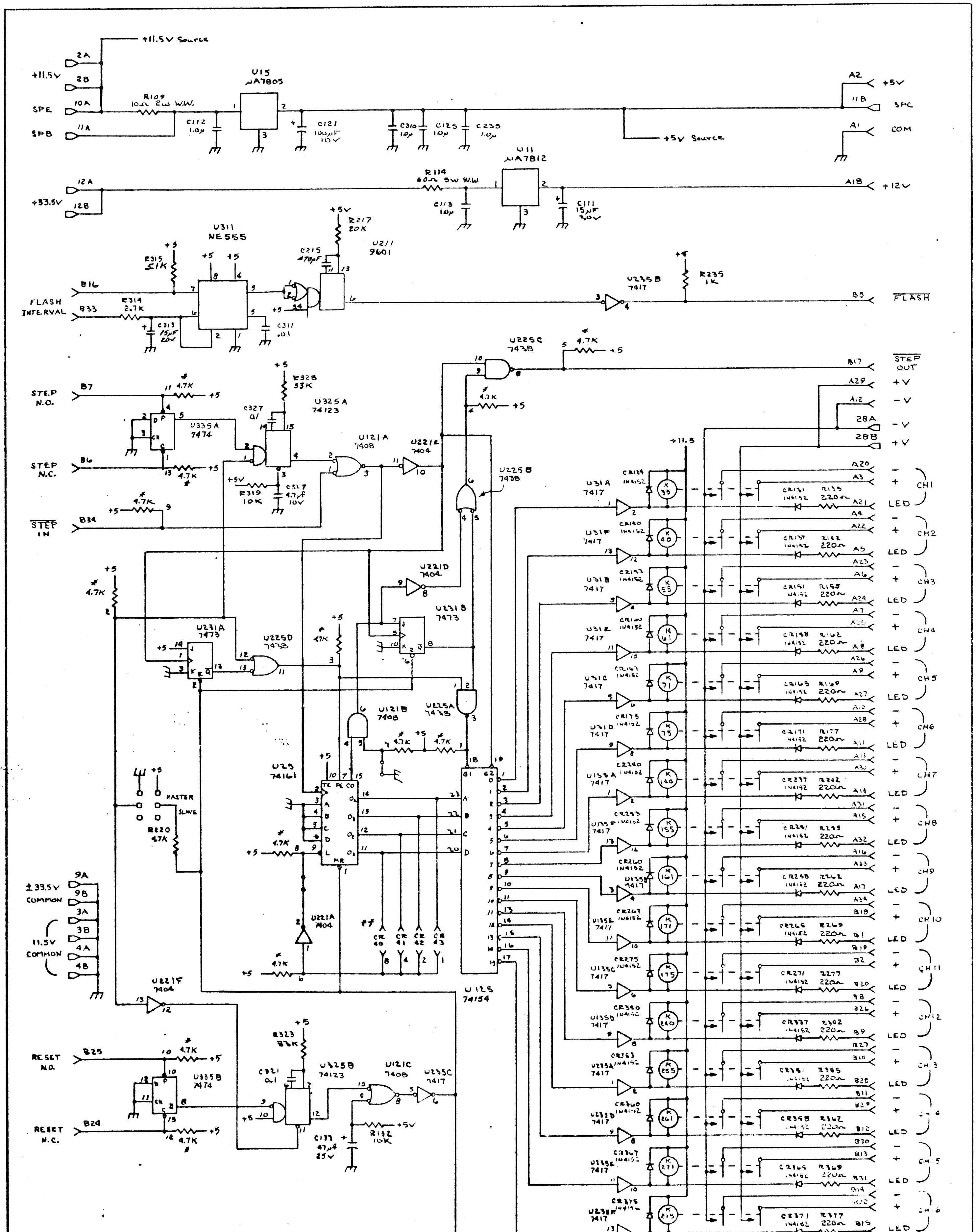
QUANTITY	DESCRIPTION	PART NUMBER
1	Connector, Recept., Elect., Male	131-0716-00
16	Connector, Recept., Elect., Female	131-0717-00
1	Adaptor	103-0036-00



All components within dashed line mount directly to P.C board.

Programmable Scanner CM 015-0267-00
Front Panel Board

EAC 10-15-74



JA-4873-00

Programmable Scanner

Rev 11-13-74

10-11-74

U331 Res. Pack

CM 015-0267-00