

SECTION 1

SPECIFICATIONS

Introduction

This addendum to the Type 7B71 Instruction Manual describes the changes in characteristics, operation, circuit description, maintenance, calibration, parts list, and schematics due to Mod 515C. Except for subjects affected by Mod 515C, the 7B71 basic manual remains applicable.

The 7B71 Mod 515C is a Tektronix 7B71 Delaying Time Base Plug-in Unit equipped with facilities for remote analog input for control of Triggering Level, Position and Delay Time Multiplier voltages, and an 8-bit serial digital input controlling the magnifier and various trigger and sweep modes. Inputs are via interface connectors C1-C4, with a front-panel LOCAL/RMT switch for restoring manual control. The instrument is intended for use in the 7704A Mod 515C or similarly modified oscilloscope. Except as noted herein, performance characteristics are the same as for the standard 7B71.

Mod 515C consists of the following specific changes:

LOCAL/RMT Switch. The front panel DELAY MODE pushbuttons are removed, and a two-position LOCAL/RMT switch added, selecting normal front-panel manual operation (Local) or control of selected functions by remote inputs as described below.

B Delay Mode. Delay mode selection for Sweep B is moved to an interior jumper set, normally wired for **Starts After Delay**. When sold in a DPO system using two 7B71 Mod 515C Time Base units, the one installed in the Sweep B compartment is set to **Independent**.

Remote Control Inputs. Interface coaxial connector positions C1-C4 (numbered left-to-right as seen from the front panel) are wired for remote control inputs as follows:

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Connector	Function	Input
C1	Trigger Level	Analog, 0 to +5.0 volts
C2	Delay Time Mult.	Analog, 0 to +5.0 volts
C3	Position	Analog, 0 to +5.0 volts
C4	Trigger & Mag	Digital, 8-bit serial, TTL-Compatible

The analog input voltage range of 0 to +5.0 volts corresponds to the entire range of the corresponding front-panel control; an input level of +2.50 volts corresponds to the center of the front-panel control range.

The digital input accepts serial data input in asynchronous teletype format at logic levels of 0 to +1 volts = "0", +2.7 to +5 volts = "1", at a rate of 1000 baud (10 milliseconds/word). A single 8-bit word performs all programmed functions, including Trigger Source, Coupling, Mode and Slope, and Magnifier.

Cable Extenders. Two ribbon-cable extenders are added to the accessories complement for instrument servicing with added circuit boards partially removed.

Analog Inputs

Input Impedance. Each analog input appears as a voltage of +2.5 volt behind a resistance of 10 kilohm $\pm 10\%$. An open input line will result in the associated function being set to mid range.

Normalization. Each input is normalized to provide full normal control range for an input voltage range of 0 volts to +5.0 volts (for Position input, the external input corresponds to the COARSE range only. An internal adjustment permits setting the total range from ± 5 to ± 10 division for 0 to 5 volt external input).

Input Protection. Input circuits are protected against transients of +50 volts or sustained input levels up to 15 volts. Inputs appear as a resistance of 2 kilohms when driven beyond -1 volt or +6 volts (or when oscilloscope power is off).

Noise Level (Delay Time Multiplier). To meet normal delay jitter requirements, noise level in the Delay Time Multiplier circuit must be not more than 100 microvolts peak-to-peak. The 1:50,000 jitter figure is obtainable in LOCAL mode; between 1:25,000 and 1:50,000 is obtainable with quiet external sources in REMOTE mode.

Response Time. Settling time for all analog inputs is 5 milliseconds or less.

POSITION Input. The FINE POSITION control remains active during remote operation and may be used to obtain display/graticule/remote position input alignment (range ± 0.5 division).

Serial Digital Input

Input Characteristics. With the front-panel switch set to REMOTE, the serial data input appears as a voltage of +5 volts behind 73 kilohm. An active pull-up driver (TTL or CMOS) is recommended.

Input Protection. Input circuits are protected against transients up to ± 50 volts or sustained inputs up to ± 35 volts. The input appears as an impedance of 5 kilohm when driven beyond the nominal 0 volt and +5 volt logic levels (or when the oscilloscope power is off).

Data Format. The serial input is designed to accept an 8-bit word in asynchronous teletype format at 1000 baud, as follows:

Idle	Logic high (+2.7 to 5.0 volt)
Start Bit	Transition to Logic low, 1 millisecond
Data bits 1 through 8	1 millisecond each
Stop bit	Logic high, 1 millisecond duration.

Clock timing is adjustable $\pm 10\%$ to match incoming signals. The start bit and stop bit are each tested approximately 600 microseconds after the leading edge. If the start bit shows a high state, the receiver is reset to wait for another start bit. If the stop bit shows a low state, the entire instruction is ignored.

Implementation Time. Instructions are implemented in the plug-in unit within 5 milliseconds of the point at which the stop bit is tested. The data bits are latched, and implementation of instructions is not disturbed during assembly of a new word: the same word may be sent

repetitively without interfering with plug-in functions. However, where the instructions change, appropriate time must be allowed for implementation and use of the instruction before a new instruction is sent.

The peak memories of the P-P Auto system may require up to 700 milliseconds to respond to a reduction in peak value, or to recover from a source change involving a DC level shift (false peak). Special programming techniques will be required in using this mode.

Remote/Local Switching. When the plug-in is switched from RMT to LOCAL, functions revert directly to front-panel switch settings. When it is switched to RMT, the instrument implements the last received instruction. There is no turn-on initialization: if the instrument is turned on in the RMT mode, it will implement a random instruction. The serial data line should be idle (high) during turn-on.

Programming. Remotely-controlled functions are programmed bit-wise as follows:

Bit 8	Bit 7	Bits 6-5	Bits 4-3	Bits 2-1
Mag	Trig Slope	Trig Coupling	Trig Mode	Trig Source
0 X1	0 +	00 AC	00 P-P Auto	00 Int
1 X10	1 -	01 AC-LFR	01 Auto	01 Line
		10 AC-HFR	10 Single	10 Ext
		11 DC	11 Normal	11 Ext + 10

Bit 1 (LSB) is the first data bit transmitted;
 Bit 2 (MSB) is the last data bit transmitted.

P-P Auto. The peak-to-peak automatic triggering circuit function has been modified to accommodate remote programming. The center-seeking feature has been retained, but the triggering level range is not reduced for small signals. As a result, it will be possible, both by remote control and manually, to select Triggering Level settings beyond the peak values of small-amplitude triggering signals.

Compatibility. The 7B71 Mod 515C is normally compatible with all 7000-Series Oscilloscopes. Remote programming, however, is possible only in Oscilloscopes providing remote interconnections to interface positions C1-C4: e.g., the Type 7704A Mod 515C Oscilloscope.

Panel Lights. The front-panel pushbutton-indicating lights are disabled during RMT operation. The status-indicating lights (TRIG'D, READY) function normally in all modes.

HF Stab Function. For stable triggering on signal repetition rates above 50 megahertz, use of the HF Stab circuit with operator/display interaction may be required. The HF STAB control -- ganged with the LEVEL control -- remains active in RMT operation.

Sweep Length. Sweep length is increased as required to allow a single POSITION setting which assures that both ends of the sweep are out of the graticule area for all sweep rates (SN B226411 and Up).

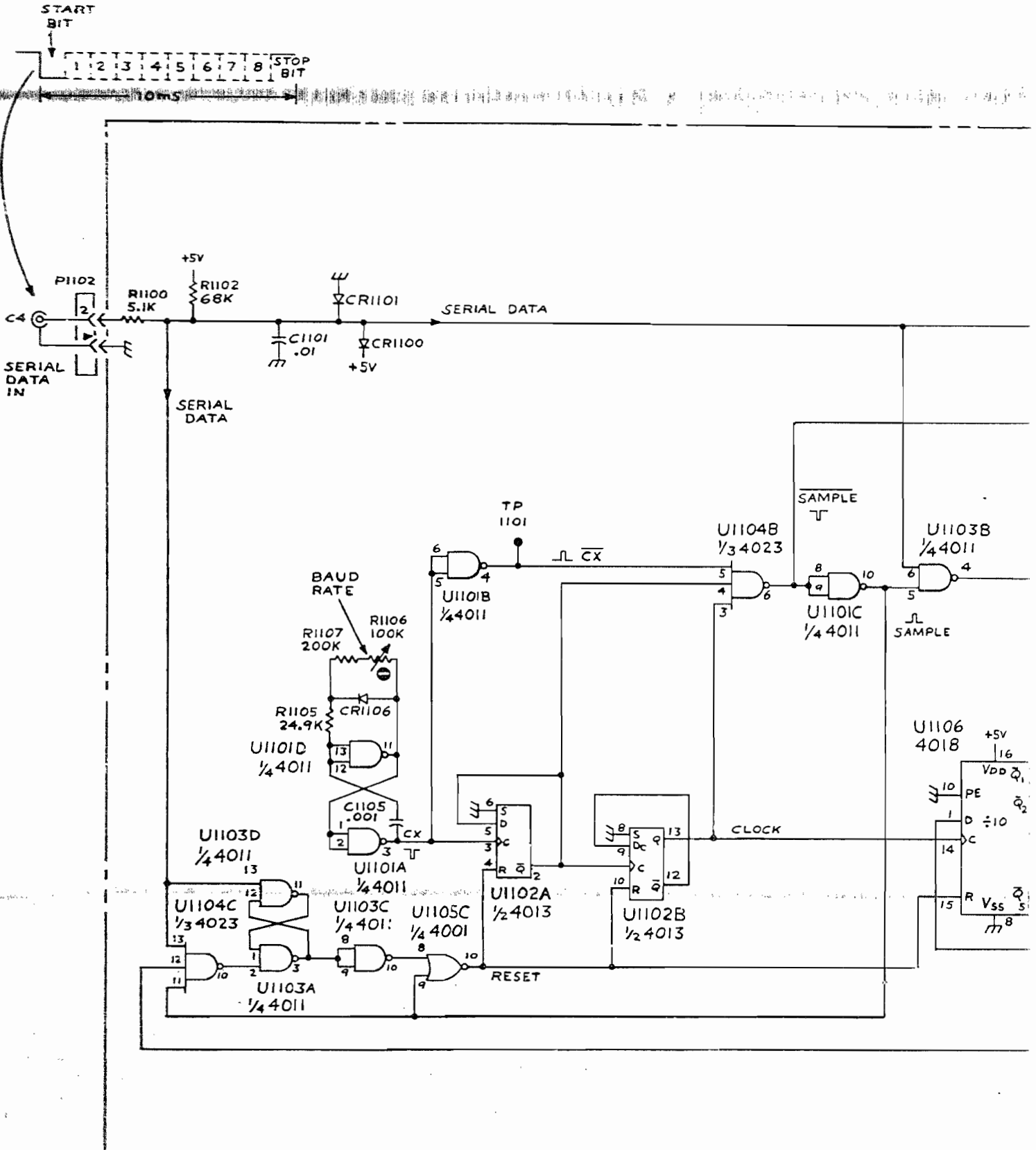
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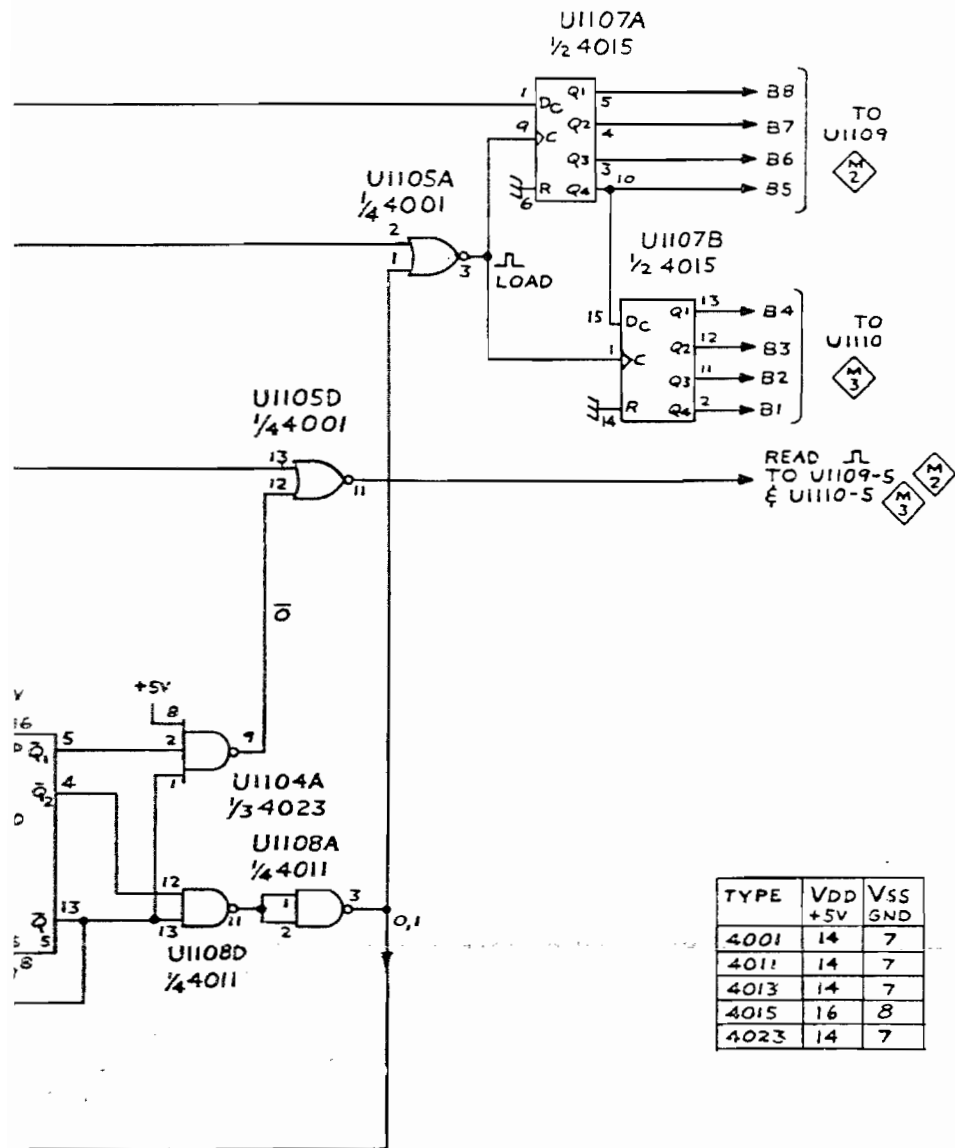
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SECTION 7**SCHEMATICS**

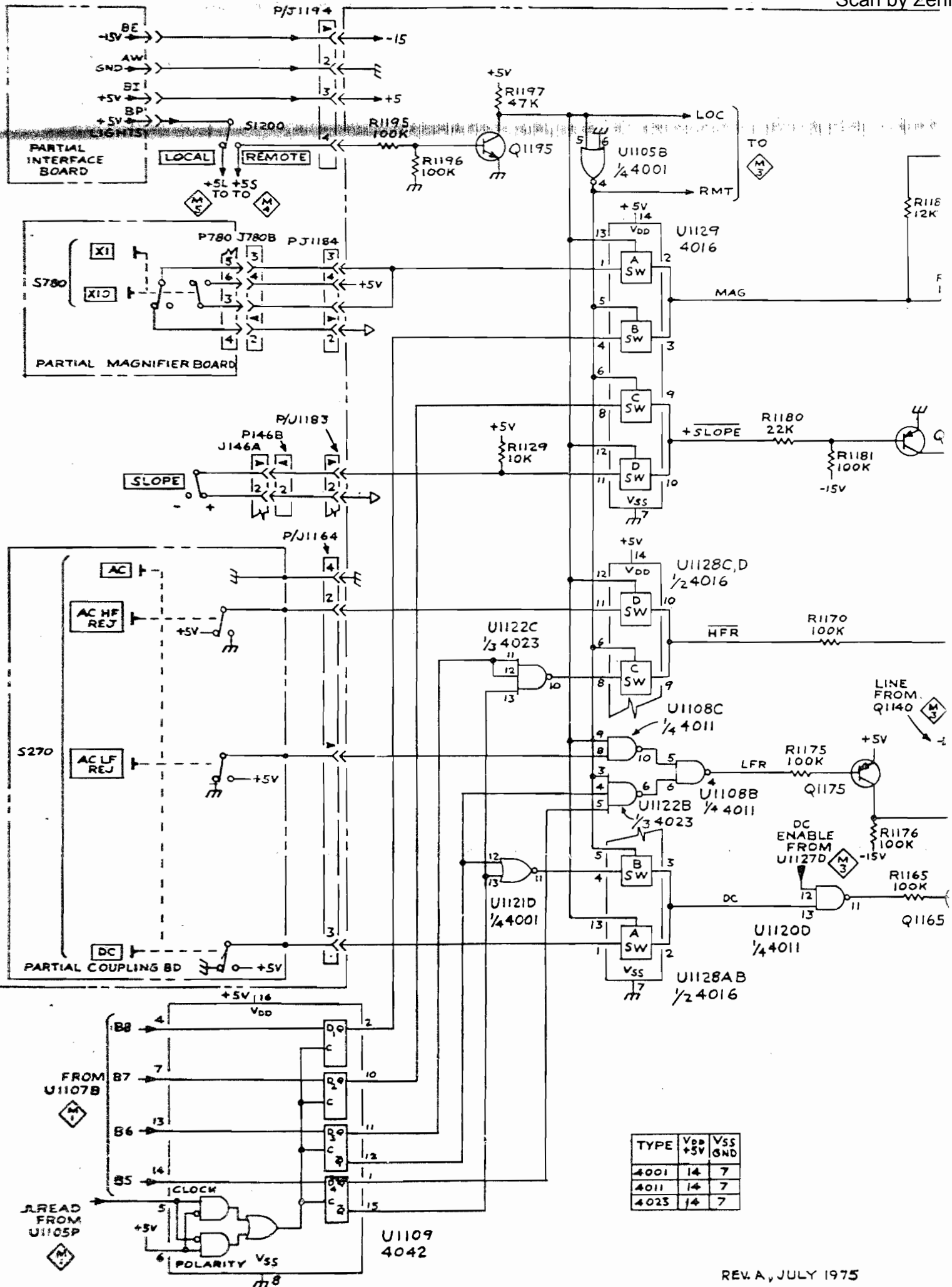
The following schematics show the modified circuitry only for the 7B71 Mod 515C. They should be used along with the schematics in the standard 7B71 Instruction Manual.



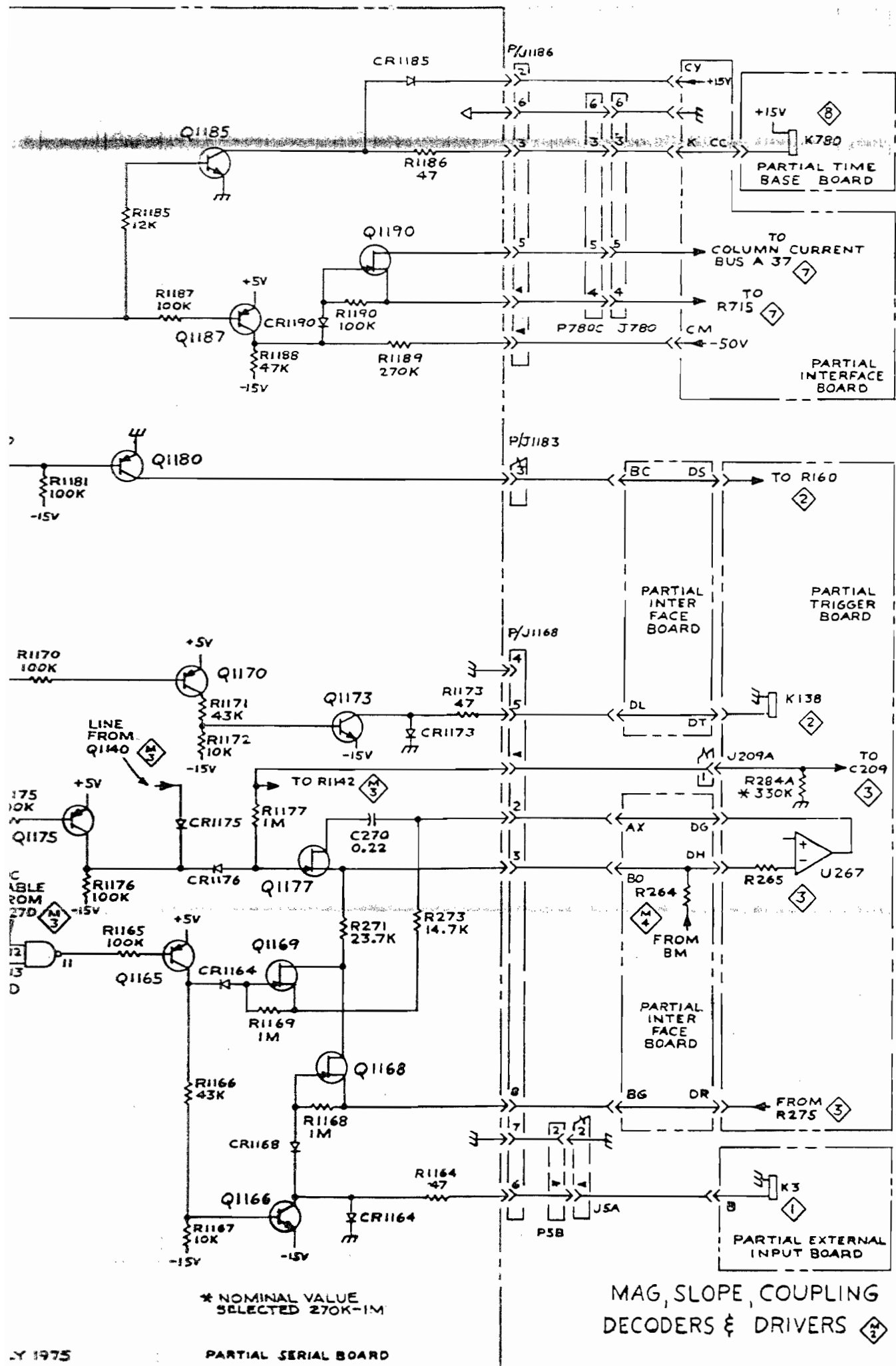


PARTIAL SERIAL BOARD

SERIAL DATA RECEIVER M1



REV. A, JULY 1975

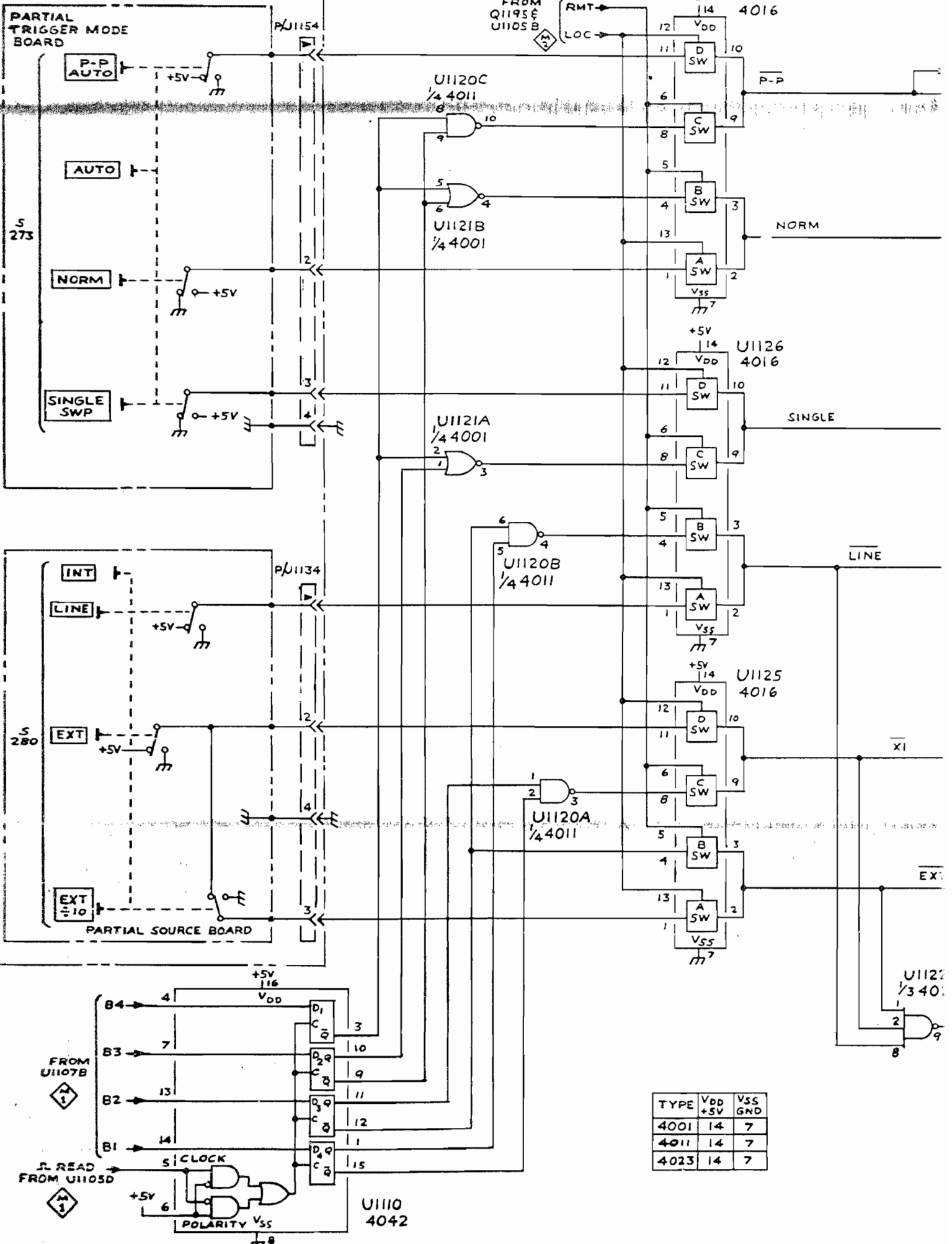


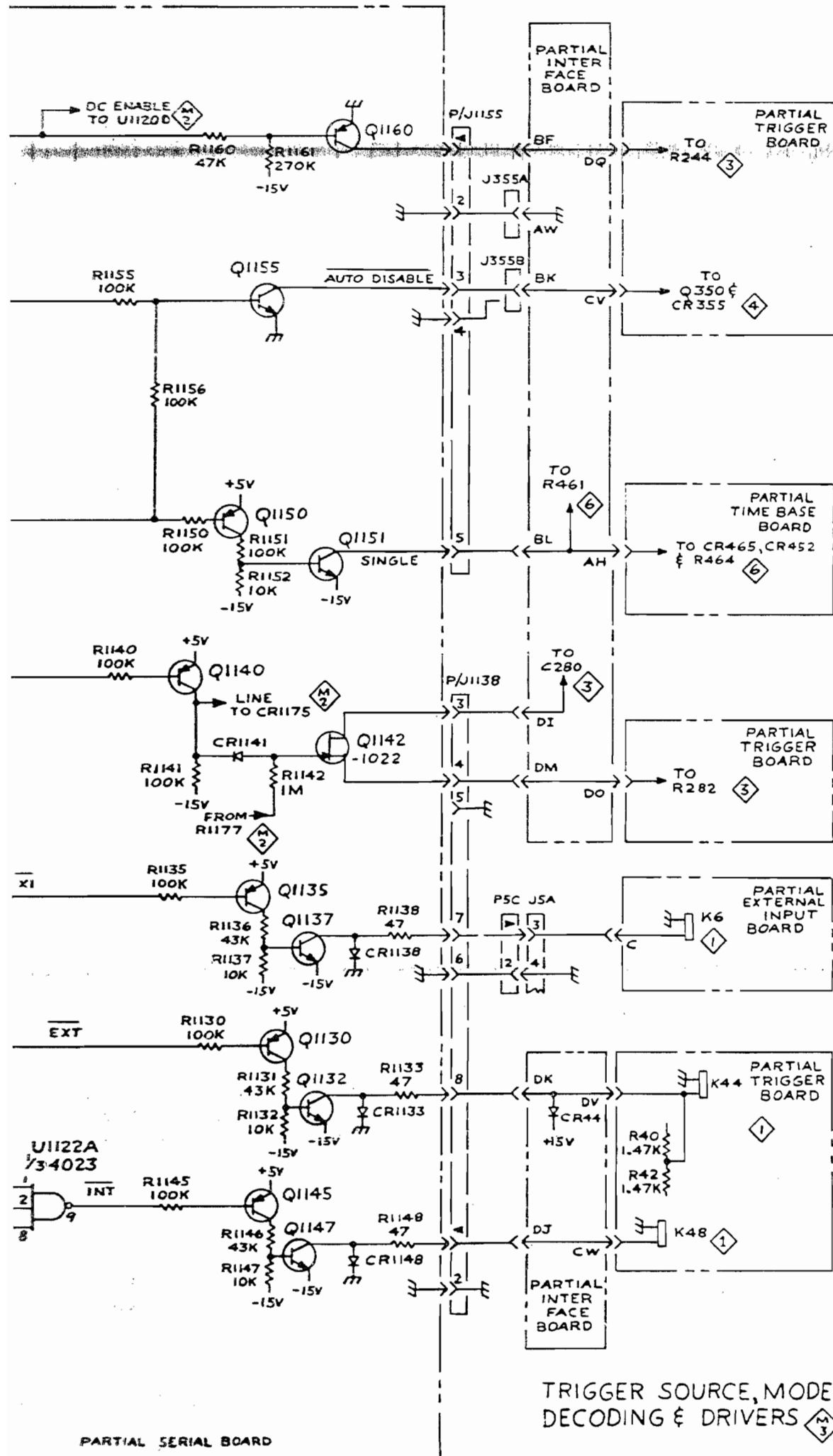
* NOMINAL VALUE SELECTED 270K-1M

MAG, SLOPE, COUPLING DECODERS & DRIVERS

PARTIAL SERIAL BOARD

1975





TRIGGER SOURCE, MODE DECODING & DRIVERS

PARTIAL SERIAL BOARD

PARTIAL INTER FACE BOARD

PARTIAL TRIGGER BOARD

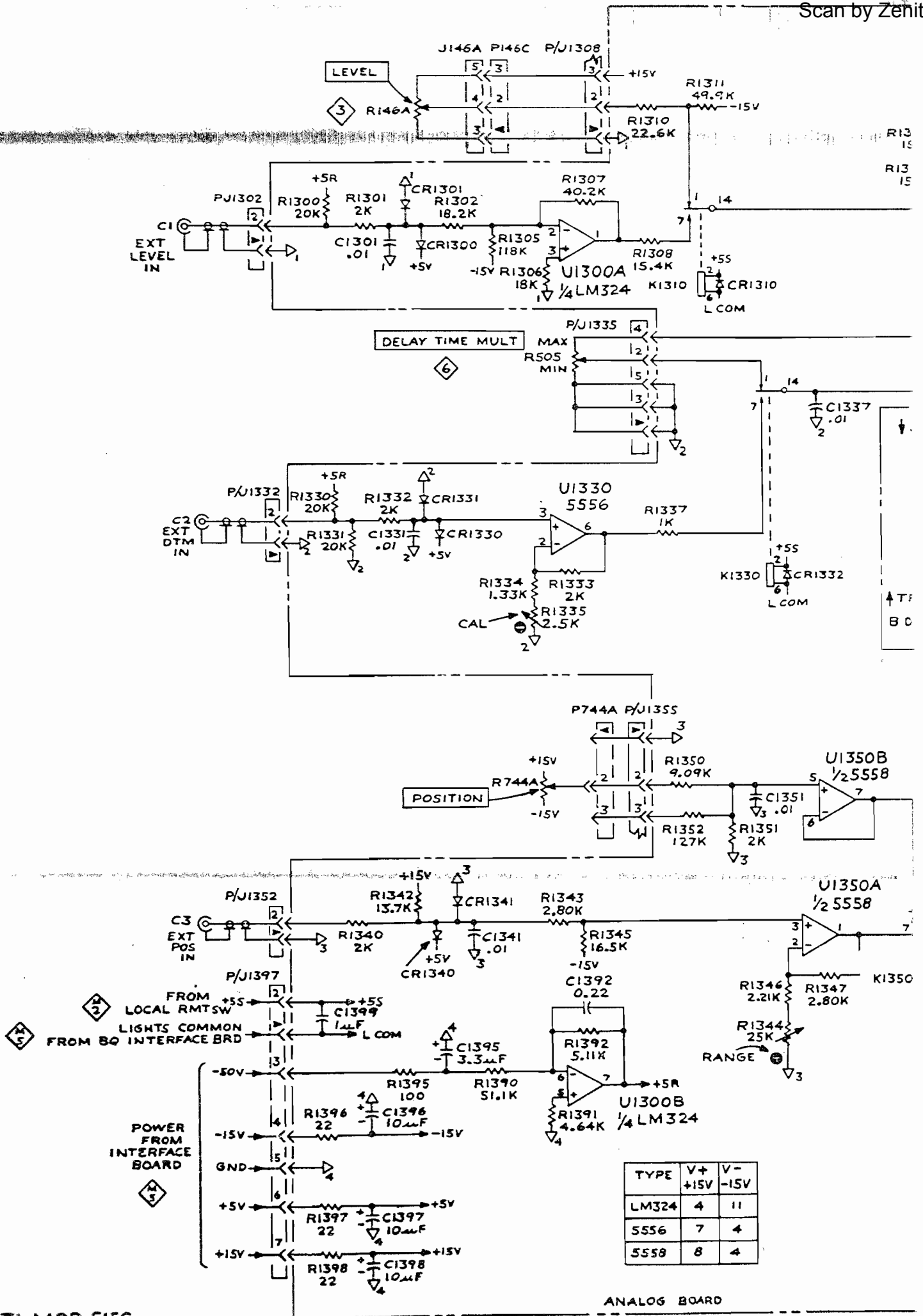
PARTIAL TIME BASE BOARD

PARTIAL TRIGGER BOARD

PARTIAL EXTERNAL INPUT BOARD

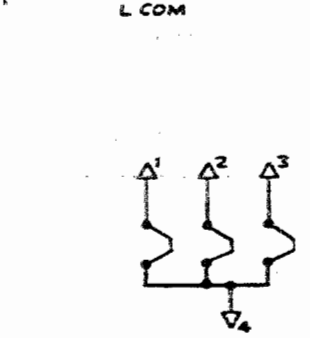
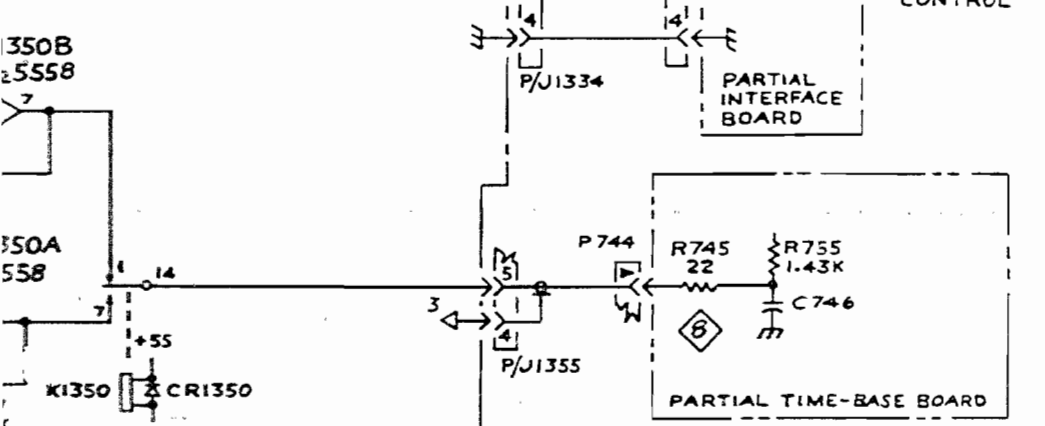
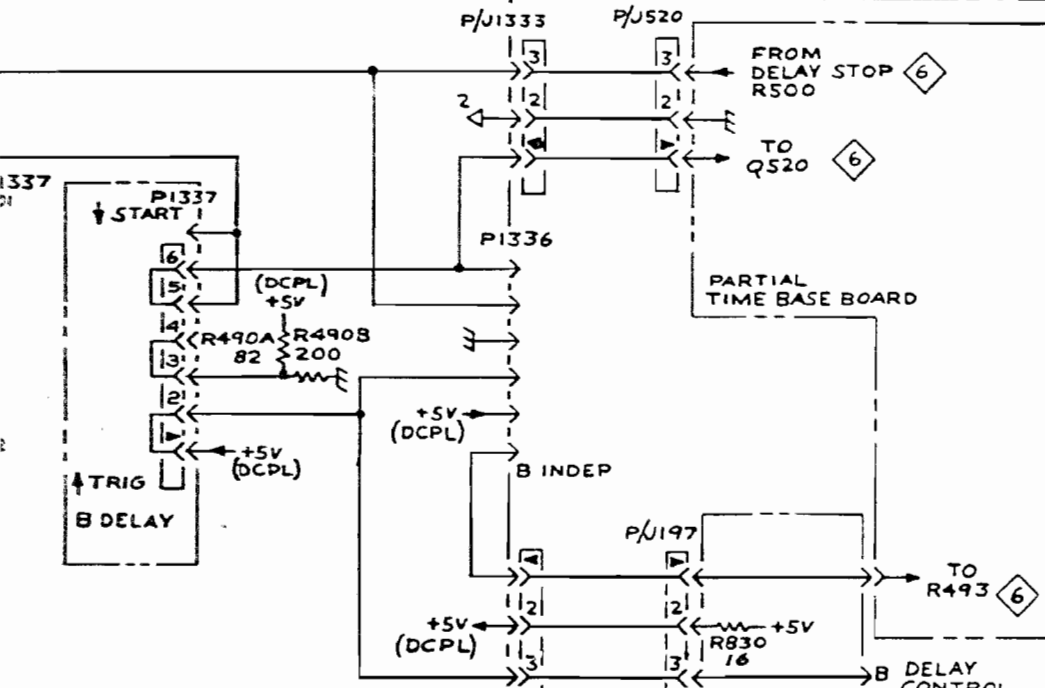
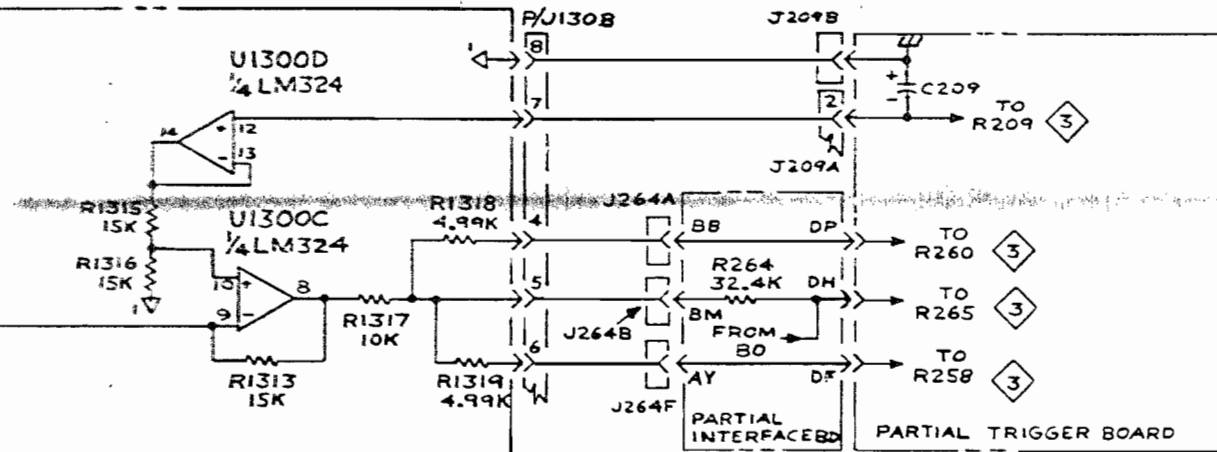
PARTIAL TRIGGER BOARD

PARTIAL INTER FACE BOARD

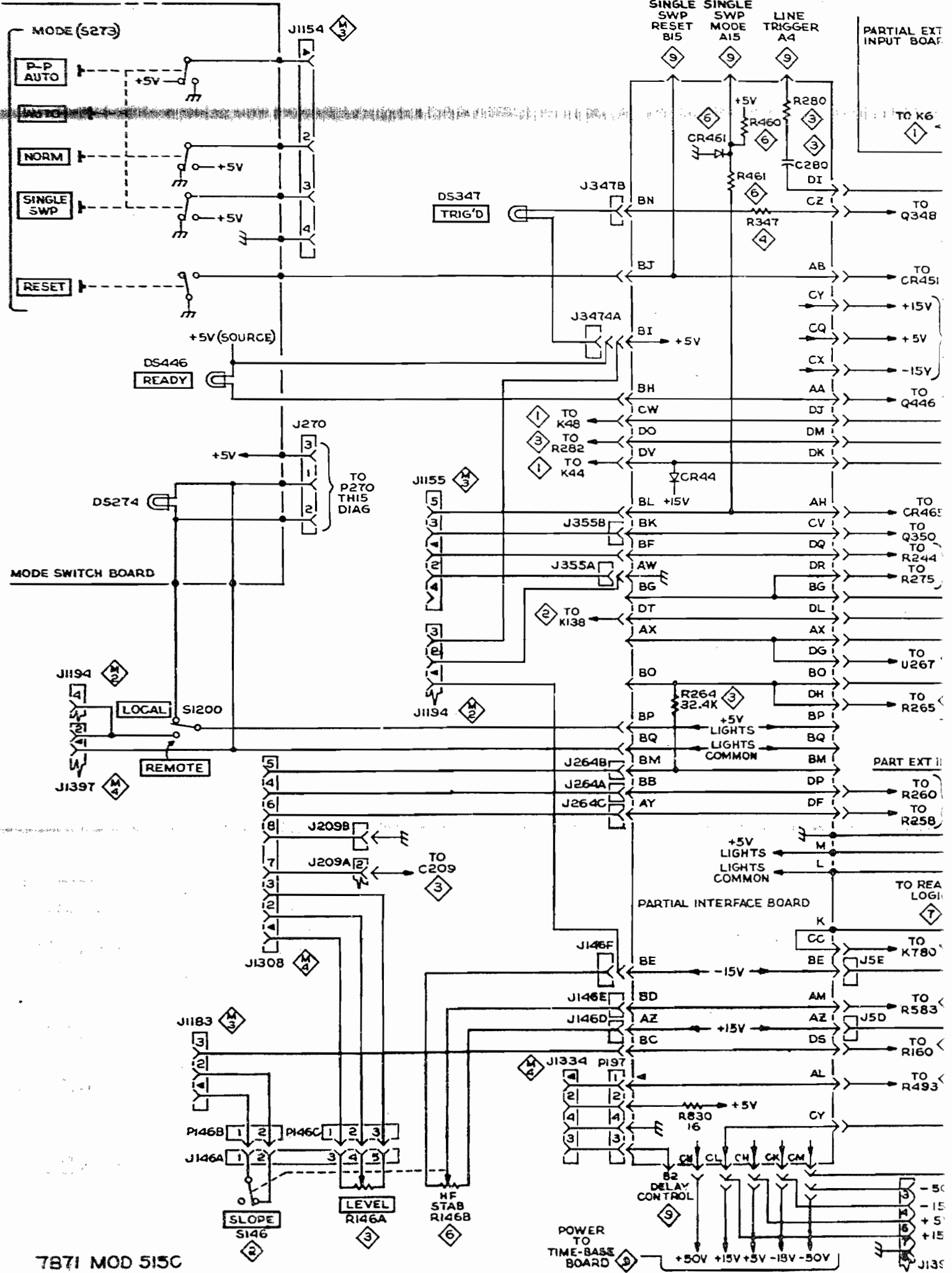


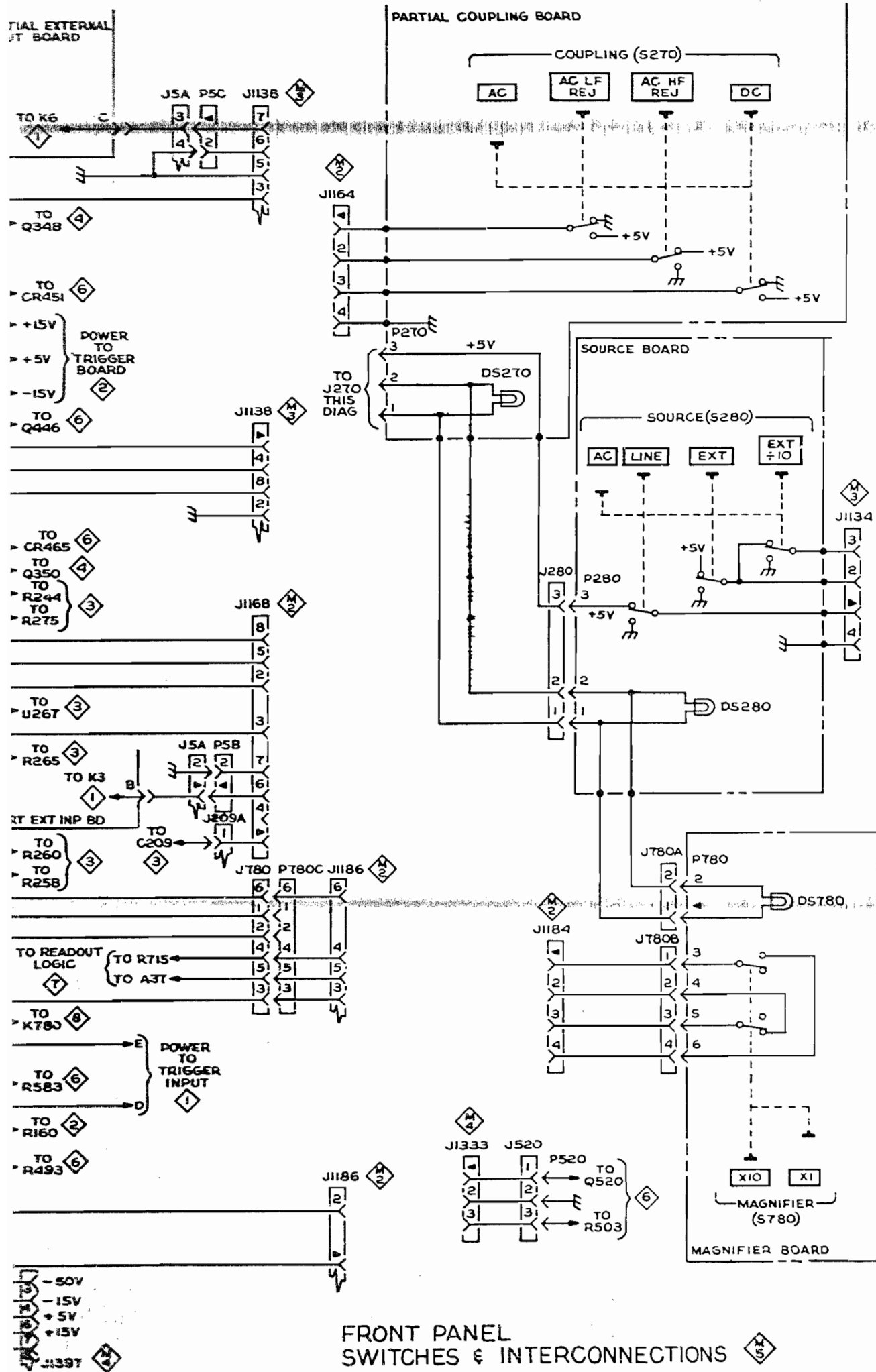
ANALOG BOARD

REV. A, JULY 1975



ANALOG INPUTS





FRONT PANEL SWITCHES & INTERCONNECTIONS