NUCLEAR COUNTER

MODEL 1775

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NUCLEAR COUNTER
MODEL 1775

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CANBERRA

NUCLEAR COUNTER
MODEL 1775

Instruction Manual
December, 1977

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CANBERRA INDUSTRIES, INC.
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Meriden, Connecticut 06450

Telephone: (203) 238-2351

BASIC WARRANTY

CANBERRA - MANUFACTURED EQUIPMENT

Equipment manufactured by Canberra Industries, Inc. is warranteed against defects in materials and workmanship for a period of twelve months from date of shipment, provided that the equipment has been used in a proper manner as detailed in the instruction manuals. During the warranty period, repairs or replacement will be made at Canberra's option on a return to factory basis. The transportation cost, including insurance, to and from Canberra, is the responsibility of the Customer. Except for defects discovered upon initial operation, shipping expense to Canberra is to be paid by the customer; shipping expense to return the repaired equipment will be paid by Canberra.

The customer must obtain shipping instructions, including an Authorized Return Number (ARN), before returning any equipment to the Canberra factory. *Compliance with this provision by the customer shall be a condition of this warranty.* In giving shipping instructions, Canberra shall not be deemed to have assumed any responsibility or liability in connection with the shipment. If, upon receipt of the equipment, Canberra determines that such equipment is not defective within the terms of this warranty, the customer shall pay to Canberra, upon invoice, the cost of diagnosis at the then prevailing Canberra repair rate and the cost of return transportation.

The Canberra Basic Warranty applies only to equipment manufactured by Canberra which is returned to the factory. If equipment must be repaired at the customer's site, the actual repair labor and parts will be provided at no charge during the warranty period. However, travel expenses to and from the customer's site, and living expenses while on site, shall be paid by the customer unless an On-Site Warranty Option has been purchased. This option may only be purchased prior to shipment of the equipment to the customer.

This warranty shall not apply to Canberra equipment that has been modified or serviced by other than Canberra Service Personnel, or to failures of Canberra equipment caused by defective equipment not manufactured by Canberra.

The Express warranties set forth herein are the only warranties with respect to the products, or any materials or components purchased from others and furnished by Canberra, and there are no other warranties, expressed or implied. The warranty of merchantibility is expressly limited as herein provided and all warranties of fitness are expressly disclaimed and excluded. Canberra shall have no liability for any special, indirect or consequential damages, whether from loss of production or otherwise, arising from any breach of warranty hereunder or defect or failure of any product or products sold hereunder.

EXCLUSIONS

Warranty service is contingent upon the proper use of all equipment and does not cover equipment which has been modified without Canberra's written approval or which has been subjected to unusual physical or electrical stress as determined by Canberra Service personnel. Canberra Industries shall be under no obligation to furnish warranty service (preventive or remedial): (1) if adjustment, repair or parts replacement is required because of accident, neglect, misuse, failure of electrical power, air conditioning, humidity control, transportation, or causes other than ordinary use: (2) if the equipment is maintained or repaired or if attempts to repair or service equipment are made by other than Canberra personnel without the prior approval of Canberra.

This warranty does not cover detector damage caused by warm-up or by neutrons or heavy charged particles. Damage from these causes is readily identifiable as described in the manual accompanying each detector.

EQUIPMENT NOT MANUFACTURED BY CANBERRA

Canberra's basic one-year warranty applies only to equipment manufactured by Canberra. Although Canberra may frequently supply, as part of systems, equipment manufactured by other companies, the only warranty that shall apply to such non-Canberra equipment is that warranty offered by the original manufacturer if any.

Canberra will, upon request, offer, as an option, warranty coverage for non-Canberra equipment such as computers and peripherals sold as part of a system supplied by Canberra. Quotations on this coverage may be obtained by contacting Canberra Nuclear Systems Division.

SOFTWARE

Canberra warrants proper system operation *only* with programs developed by Canberra using the operating system supplied to the customer. Canberra assumes no responsibility for user-written programs or programs published as part of information exchange in Canberra periodicals.

Engineering assistance for software development is available and can be contracted through the Canberra Nuclear Systems Division Sales Department.

INSTALLATION

Installation of equipment purchased from Canberra shall be the sole responsibility of the customer unless the installation is specifically contracted for at the prevailing Canberra field service rates. To insure timely installation after receipt of equipment, it is recommended that installation be contracted for at the time the equipment is ordered.

ON-SITE WARRANTY OPTION

The On-Site Warranty Option provides for free on-site warranty work (Canberra pays all travel and living expenses) within the first 90 days after delivery of equipment to the customer. If installation is ordered from Canberra, the 90 day period commences upon completion of the initial installation. After the 90 day period, labor and materials used on site will still be covered by the basic warranty, but the customer shall pay for all travel and living expenses incurred for any on-site service.

A maintenance contract may be purchased covering the period after the 90 days on-site warranty period, or after initial installation of the equipment. This is to be contracted through Canberra's Nuclear Systems Division.

REPAIRS

Any Canberra-manufactured instrument no longer in its warranty period may be returned, freight prepaid, to our factory for repair and realignment. When returning instruments for repair, contact the Customer Service Department for shipping instructions and an Authorized Return Number (ARN).

All correspondence concerning repairs should include Model Number and a description of the problem observed.

Once repaired, all equipment passes through our normal pre-shipment checkout procedure. Return shipping expense on out-of-warranty repairs will be charged to the customer.

For instruments out of warranty, the customer must supply a purchase order number for the repair before the item will be returned to him.

SHIPPING DAMAGE

Shipments should be carefully examined when received for evidence of damage caused by shipping. If damage is found, immediately notify Canberra and the carrier making delivery, as the carrier is normally responsible for damage caused in shipment. Carefully preserve all documentation to establish your claim. Canberra will provide all possible assistance in processing damage claims.

Due to the delicate nature of cooled detectors [Ge(Li) and Si(Li)] Canberra requires that delivery to and from air freight terminals be handled with special care. Do not ship such Detectors without first obtaining advice from our Traffic Department.

REVISION B
July 1, 1978

NUCLEAR COUNTER
Model 1775

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Section 1

INTRODUCTION

The Canberra Model 1775 Nuclear Counter combines, in a single dual-width module, a six digit 25 MHz scaler and a six decade (.01 second or .01 minute time-base) timer.

Either the scaler or the timer may be preset, thus serving as the master. The unit not preset is the slave; its accumulation is displayed on the front panel LED display. When the preset count (or time) is reached, both master and slave stop.

The Model 1775 may also serve as the master unit in a large counting system, replacing the timer and one scaler in a classical multiscaler preset time system. For example, a preset timer, four-scaler system would be reduced to a Nuclear Counter, three-scaler system.

The Model 1775 Nuclear Counter is gateable (either scaler, or timer, or both by jumper selection). The unit may be operated in Single (one cycle) or Recycle modes. The dead (display) time between cycles in recycle operation may be adjusted internally from 1 to 5 seconds. By internal jumper selection, an incoming reset signal will reset either scaler or timer, or both; by switch selection, both scaler and timer or the slave only can be printed out at the end of the preset cycle.

Independent thumbwheel switches select the preset limit. The N switch selects a multiplier (0-9) and the 10^M switch selects the power of ten (10^0-10^6) by which it is multiplied.

The scaler input accepts positive or negative pulses. The positive input is equipped with an integral discriminator covering an input voltage range of +0.5 to +10 volts by means of a front panel ten-turn potentiometer.

The six numeric indicators utilize seven-segment light-emitting diodes to provide solid state reliability and long life. Because this is a flat surface display, the viewing angle is far wider than that obtained with tube display. A circularly-polarized filter allows brilliant readout even in direct sunlight. Leading zeroes are suppressed for viewing ease.

SECTION 2
SPECIFICATIONS

2.1 INPUTS

SIGNAL POS.	Accepts +0.5 to +10 volt (+50 volts maximum) pulses. Rise time: any. Pulse width: 20 nanoseconds. Input impedance: greater than 1000 ohms; DC coupled; front and rear panel BNC connectors.
NEG.	Accepts - 0.6 to - 2.0 volt pulses. Pulse width: 20 nanoseconds minimum. Input impedance: 50 ohms; DC coupled; front and rear panel BNC connector.
GATE	+3 to +10 volt DC level or pulses (or open circuit) enables accumulation; less than 0.8 volt DC level or pulse (or short circuit) inhibits accumulation. Input impedance: greater than 1000 ohms DC coupled, front and rear panel BNC connector.
CONTROL IN	Accepts START, STOP, RESET, PRINT (5 volt negative-going pulses from +5 volt level). Rise time: 500 nanoseconds maximum. Width: 1.0 microsecond minimum. Also accepts HOLD commands (DC level change from +5 volts to +0.5 volts maximum during printout; rear panel Amphenol 17-10150 15-pin connector.

2.2 OUTPUTS

OVERFLOW	+5 volt pulses at overflow of sixth decade. Rise time: less than 200 nanoseconds. Width: .5 microseconds DC coupled; rear panel BNC connector.
GATE OUT	Provides +5 volt DC level during accumulation. +0.5 volt DC level when not accumulating (except when inhibited by Gate Input). Rise time: less than 200 nanoseconds; will gate up to 50 compatible scalers and timers. Current sinking: 150mA, DC coupled; rear panel BNC connector.
CONTROL OUT	Provides START, STOP, and RESET commands (5 volt negative-going pulses from +5 volt level, rise time 500 nanoseconds maximum, width 1.0 microsecond minimum); data output information in the form of decimal digit serial 1-2-4-8 BCD; logic 1 = +4 volts DC, logic 0 = 0 volts DC; connector also provides "next unit" PRINT command; eighth and successive PRINT command pulses are routed out via logic gate; all control lines except PRINT command are wired directly between Control Input-Control Output connectors; rear panel Amphenol 17-20150 15-pin connector.

2.3 FRONT PANEL CONTROLS

START	Manual pushbutton to renew or begin accumulation.
STOP	Manual pushbutton to terminate accumulation.
RESET	Manual pushbutton to reset all decades to zero; accumulation will continue unless the STOP pushbutton is first depressed.
TIME/COUNT	Toggle switch to select TIME or COUNT as MASTER.
MODE	Toggle switch to select SINGLE or RECYCLE mode of operation upon reaching a preset condition.
PRESET	Two digit thumbwheel switches; selectable preset limit is N x 10^M, N is the 0-9 digit multiplier and 10^M is the power of ten being multiplied; N = 0 is preset OFF, disabling the preset function.
NEG/POS	Front panel toggle switch to select input pulse polarity.
DISC	Front panel ten-turn potentiometer to inhibit counting of input pulses below selected level from +0.5 to 10 volts.

2.4 REAR PANEL CONTROLS

PRINT	Rear panel toggle switch to enable print of SLAVE or SLAVE and MASTER.

2.5 INTERNAL CONTROLS

EXTERNAL RESET DISABLE	A jumper plug may be removed to inhibit response of the module to reset commands received via the Model 1404 control cable. Thus, the slave or master may be reset only by front panel control for cumulative count.
GATE ENABLE	A jumper plug inserted to enable the GATE input to either MASTER or SLAVE channel.
TIMEBASE	Jumper selects timebase of .01 sec or .01 min.
RECYCLE TIME	Internal potentiometer allows Recycle time from 1-5 sec.

2.6 PERFORMANCE

CAPACITY	Two complete six decade scalers; each allows a full time range of 10^4-1 seconds or minutes, or full scale count range of 10^6-1 counts.

COUNT RATE	25MHz minimum, 30MHz typical.
PULSE PAIR RESOLVING TIME	Less than 40 nanoseconds.
CRYSTAL TIME BASE	0.005% stability over operating temperature range; 0.002% setting accuracy.
TEMPERATURE OPERATING RANGE	0° to 50°C.
PRINTOUT SEQUENCE	SLAVE or SLAVE/MASTER.
AUTOMATIC RESET	Initiated when power is first turned on or after power failed; resets all decade counters to zero.

2.7 INDICATORS

VISUAL DISPLAY	Six solid state numeric indicators; leading zeros are suppressed.
COUNT	Front panel light is illuminated during accumulation and extinguished when STOP command is given.

2.8 CONNECTORS

SIGNAL IN	Front and rear, BNC, UG-1094/U.
GATE IN	Front and rear, BNC, UG-1094/U.
OVERFLOW	Rear panel, BNC, UG-1094/U.
GATE OUT	Rear panel, BNC, UG-1094/U.
CONTROL IN	Rear panel, Amphenol, 17-10150.
CONTROL OUT	Rear panel, Amphenol, 17-20150.

2.9 POWER

+24V	0mA
+12V	50mA
-24V	0mA
-12V	250mA
115VAC	250mA

2.10 PHYSICAL

SIZE	Standard double width module (2.70 inches wide) per TID-20893 (rev.)
WEIGHT	4 lbs. (1.82 kgs)

2.11 ACCESSORIES

One Canberra Model 1404 Data/Control Cable 3 ft. in length is supplied for connection to other Canberra data acquisition series modules.

SECTION 3

CONTROLS/INDICATORS

3.1 FRONT PANEL

DATA DISPLAY
Provides visual readout of six decades; leading zeros are suppressed.

STOP PUSHBUTTON
When depressed, terminates data accumulation in the Model 1775.

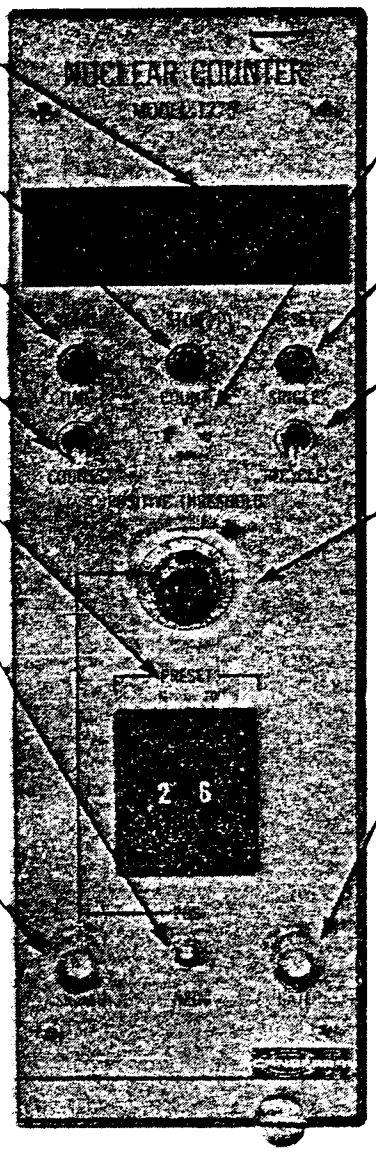
START PUSHBUTTON
When depressed, initiates data accumulation in the Model 1775. Scaler is not reset to zero.

COUNT/TIME SWITCH
Selects input for MASTER (Preset) Channel or SLAVE (Display) Channel.

PRESET SWITCH
Selects preset count (or time), in the form N x 10^{M}.

POS/NEG SWITCH
Selects polarity of input pulse to be discriminated. If in NEG position, the SIGNAL input is terminated in 51 ohms and the discriminator level is fixed at - 0.6 volts. If in POS position, input impedance is 1000 ohms, and a variable discriminator level is enabled.

SIGNAL INPUT
Accepts positive or negative pulses for accumulation.



COUNT LAMP
Illuminates while data accumulation is enabled (between START and STOP commands). The COUNT lamp is not inhibited by the GATE input.

RESET PUSHBUTTON
When depressed, resets scaler contents to zero. The RESET pushbutton does not terminate data accumulation.

SINGLE/RECYCLE SWITCH
When in RECYCLE position, enables repetitive count cycles, separated by an adjustable (1-5 second) delay.

DISC POTENTIOMETER
When enabled by POS/NEG switch, selects discriminator level for positive input pulses. Ten-turn pot gives variation from 0.5 to +10 volts.

GATE INPUT
When open (or at a HIGH logic level) enables accumulation of input pulses; when grounded (for receiving a LOW logic level) inhibits accumulation of input pulses.

Figure 3-1
Front Panel

3.2 REAR PANEL

SIGNAL INPUT	Identical to Front Panel inputs.
GATE INPUT	Identical to Front Panel inputs.
OVERFLOW OUTPUT	Transmits a .5μsec positive pulse on the overflow of the most significant decade.
PRINT SLAVE/BOTH	Inhibits or enables printout of Model 1775 when connected to Print Control module.
GATE OUTPUT	Transmits a +5 volt level while accumulation is enabled (the logical AND of the COUNT enable and the GATE input). Transmits a 0 volt current sink when not enabled to accumulate.
FUSE	1/2 amp Slo-Blo inserted in 110 VAC input line.
CONTROL INPUT/CONTROL OUTPUT CONNECTORS	Accept Model 1404 data cables for control and printout of Model 1775 via suitable Master or Print Control modules. The Model 1775 responds to and transmits START, STOP, RESET Commands (with functions identical to Front Panel pushbuttons). The RESET function may be internally inhibited. The Model 1775 also responds to HOLD and PRINT CLOCK commands, transmitting its data on the BCD DATA lines. Corresponding pins in the CONTROL IN and CONTROL OUT connectors are wired together in parallel, with the exception of PRINT CLOCK.

3.3 INTERNAL

Four options are programmable by jumper within the Model 1775: external reset inhibit, RECYCLE delay, GATE input enable, and timebase.

EXTERNAL RESET	When the jumpers shown in Figure 3.1 are in the "ER" position, a RESET command received via the CONTROL IN/CONTROL OUT connector will reset the respective counting channel. If the jumpers are in other positions, an external reset is inhibited.
RECYCLE DELAY	The potentiometer adjusts the time between counting operations in the RECYCLE mode from 1 to 5 seconds.
GATE INPUT	The jumpers labeled M and S are inserted to allow the GATE input to either MASTER or SLAVE channel.
TIMEBASE	The jumper labeled S and M selects appropriate timebase (0.01 seconds or 0.01 minutes).

SECTION 4

OPERATING INSTRUCTIONS

4.1 INSTALLATION

The Canberra Model 1400 Bin and Power Supply, or other bin and power supply systems conforming with the mechanical and electrical standards set by AEC Report TID-20893 (rev.), will accommodate the Model 1775. The right side cover of the double-width NIM module acts as a guide for insertion of the instrument. Secure the Module in place by turning the two front panel captive screws clockwise until finger tight. It is recommended that the NIM bin power switch be OFF whenever the module is installed or removed.

The Model 1775 can be safely operated where the ambient air temperature is between 0°C and +50°C (+120°F maximum). Perforations in the top and bottom sides permit cooling air to circulate through the module. When relay rack mounted, along with other "heat generating" equipment, adequate clearance should be provided to allow for sufficient air flow through both the perforated top and bottom covers of the NIM bin.

4.2 SINGLE UNIT OPERATION

4.2.1 MANUAL CONTROL

1. Set the Model 1775 front panel controls as follows:

   COUNT/TIME Switch . . . . . TIME
   OPERATION MODE Switch . . . . . SINGLE
   PRESET Thumbwheel Switches N=0 (Preset "off")
   POS/NEG Switch . . . . . NEG

2. Apply power to the Model 1775 by turning the NIM bin Power switch ON. Observe visual data displays show zero. This is the automatic reset feature which is initiated when power is first applied or after power has failed.

3. Connect a source of - 1 volt pulses (repetitive or random) so SIGNAL INPUT BNC connector (either front or rear panel).

   Interfacing fast rise time logic pulses to the Counter/Timer requires that the user terminate the receiving end of the coaxial cable with its characteristic impedance to eliminate reflections (pulse distortion). Improper termination (or none) may cause double counts, incorrect data. In Neg mode, this termination is internal.

4. Depress START pushbutton. Observe COUNT indicator light. Observe input count accumulation.

5. Depress STOP pushbutton. Observe that accumulation will cease and COUNTING indicator extinguish.

6. Depress RESET pushbutton. All decade counters will reset to zero. Counting can be renewed by depressing the START pushbutton.

   Momentarily depress the RESET pushbutton while the unit is accumulating data. Observe that all decade counters reset to zero, but the counting operation is not terminated.

4.2.2 GATING

The electronic gating capability permits simple coincidence experiments without the need for additional coincidence modules, and the capability of inhibiting the Counter/Timer by external command.

1. Depress START pushbutton to begin count accumulation again.

2. Ground (short-circuit) GATE INPUT BNC connector (front or rear panel). Observe counting stops. Remove short-circuit from GATE INPUT and observe the resumption of counting.

NOTE: COUNTING light remains on even though the Model 1775 is gated off. The rear panel GATE OUTPUT signal is a function of the GATE input.

4.2.3 PRESET COUNT

1. Enter a MASTER PRESET time of 2 sec (N=2 and M=2) with front panel controls set the same as Section 4.2.1, step 1.

2. Begin accumulation by depressing START pushbutton. Counting will cease upon Master Channel reaching its preset time of 2 sec.

4.2.4 AUTOMATIC OPERATION

Automatic data acquisition by the Model 1775 can free the researcher from time-consuming manual control of the many iterations that may be required in counting experiments.

1. Front panel controls should be set the same as Section 4.2.1, step 1.

2. Set PRESET time of 10 seconds (N=1 and M=3).

3. Set OPERATION MODE toggle switch to RECYCLE position.

4. Begin acquiring data by manually depressing START pushbutton. The Model 1775 will stop counting when the preset time of 10 seconds is reached. Observe that the Reset and Start functions will be performed automatically when the Display Time elapses (time between recycles is adjustable from 1 to 5 seconds via the internal DISPLAY TIME trim control).

   The automatic Recycle function will continuously repeat until manually terminated by setting the OPERATION MODE switch to SINGLE.

4.3 NON-PRINTING SYSTEM OPERATION

In a Canberra Data Acquisition System, a "master" unit can control system operation. The Model 1775 Nuclear Counter fulfills this master role; its START, STOP, and RESET functions can control (manually or automatically) up to 50 compatible scalers and timers.

All modules in the counting system are interconnected with Model 1404 System Print/Control cables as shown in Figure 4-1. The sequence of connection is not important because the system Start, System Stop, and System Reset control lines are common (presented in parallel) to all the modules.

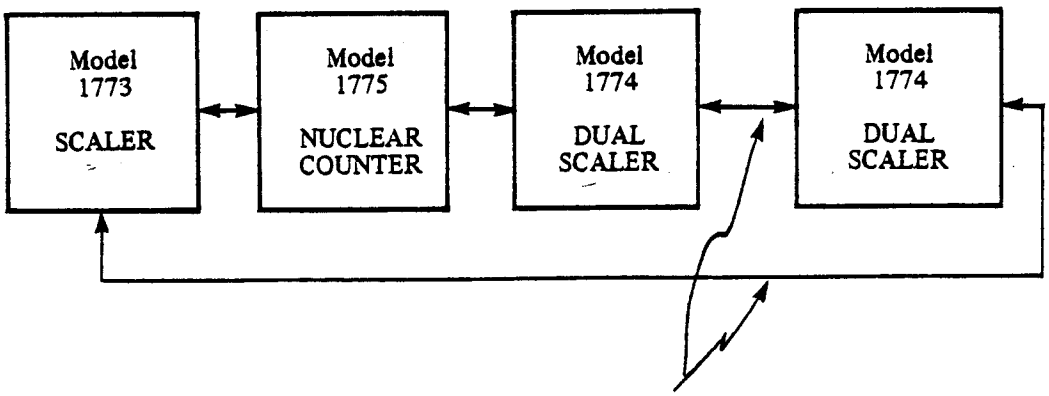


Figure 4-1. Interconnection of Modules for Non-printing System Operation

Operate the Model 1775 as a single unit according to the instructions in Section 4.2. All cable-connected system modules will be simultaneously affected by START, STOP, and RESET commands originating from the Nuclear Counter (and any other master unit in the counting system).

4.4 PRINTING SYSTEM OPERATION

4.4.1 GENERAL

Five alternatives are available for scanning and recording the data accumulated by a Canberra Data Acquisition System:

Model 1486	ASCII format incremental magnetic tape data scanner.
Model 1487	Computer compatible punched paper tape data scanner.
Model 1488	Punched tape and hard copy Teletype data scanner.
Model 1489	Data scanner/modular strip ("grocery tape") printer.
Model 1788	EIA Interface

The task of the Data Scanner is to interrogate each of the scalers and timers in the counting system, receive the incoming data, and prepare it in the proper format for the output recording device.

4.4.2 SYSTEM SETUP

Canberra Data Acquisition Series NIM modules are fully compatible with each other for system control and printout. Up to 50 units can be controlled, scanned, and printed out by a single Data Scanner NIM Module.

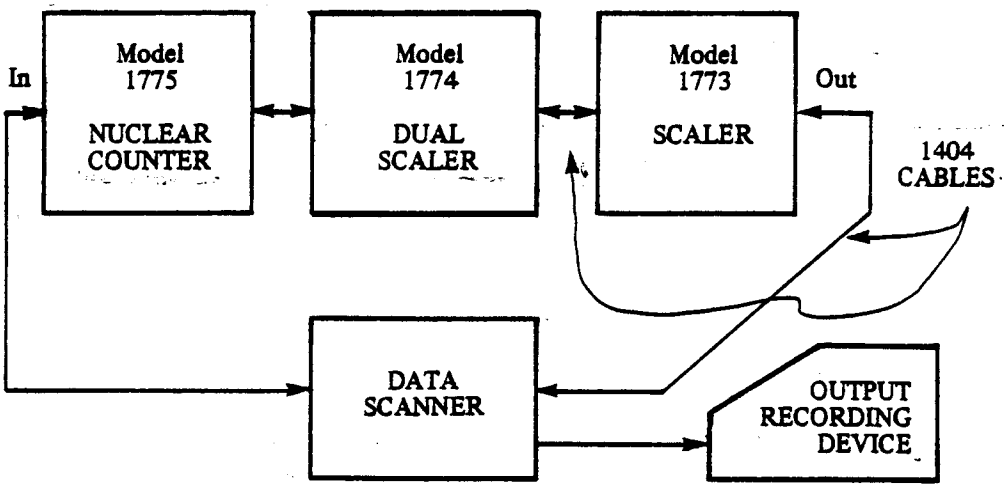


Figure 4-2. Interconnection of Modules for Printing System Operation

All Canberra printing system modules are interconnected by a closed loop "daisy chain" of Model 1404 System Print/Control cables as illustrated in Figure 4-2. Except for the Print Clock line, all control and data lines are directly wired from the CONTROL INPUT to CONTROL OUTPUT connectors on the rear panel of each printing module. A common data/control bus is thus formed, with system commands presented in parallel to all units in the system.

The desired printing sequence is a function of module position in the closed loop system. In Figure 4-2, the Model 1775 will be printed out first, the Model 1774 second, and the Model 1773 last.

Set the Data Scanner's MODE switch to SINGLE and its CONTROL switch to OFF before applying power to the system.

Establish a preset time of 10 seconds on the "master" unit (in this case, the Model 1775) in the system. Master is defined simply as any module in the system that fan start, stop or reset the other units in the system, and set the Model 1775 mode switch to SINGLE.

Set the Model 1775 and Model 1773 rear panel PRINT switches to enable printout of their data contents.

4.4.3 SYSTEM OPERATION

Refer to Figure 4-2 for the following typical printing system operation. In this system both the Model 1775 and Data Scanner function in the master roles, with the Model 1774 and Model 1773 being system slaves.

1. Apply power to the system by turning the NIM bin POWER switch ON.
2. At turn on, all scalers should be reset to 0, and should not be counting.
3. Set the Data Scanner's control switch to ON.

4. Start the system accumulating data by depressing the START pushbutton on the master unit. When the Model 1775 reaches its preset time of 10 seconds, the system will stop counting, and a printout cycle will commence. After printout, the system will await the next manual command.

5. The following sequence of events will help explain what happens during the printout cycle for the counting system in Figure 4-2.

   a. A System STOP command (pin 7) is initiated on the common Data/Control bus by the Model 1775 reaching its preset condition.

   b. The Data Scanner generates a System HOLD command (pin 6) followed by a PRINT CLOCK (interrogate) pulse train (pin 5).

   c. The System HOLD command gates off all visual displays in the printing system (Model 1775, Model 1774, and Model 1773) and removes any previous information from the common BCD Data lines (pins 1, 2, 3, 4).

   d. PRINT CLOCK pulses from the Data Scanner control the sequential steps for printout and continue at a predetermined rate until the printout cycle is completed. The data contents of the module (Model 1775) connected to the CONTROL OUTPUT connector of the Data Scanner is printed out first. Each of the scalers selected in the Model 1775 is printed out in succession, digit by digit, starting with the most significant data digit in each scaler. As each data digit is printed out, the numeric LED indicator for that digit is illuminated.

   e. After printout, the Model 1775 "enables" (via internal gate logic) succeeding PRINT CLOCK input pulses to be routed out for interrogating the next printing module (Model 1774).

   f. This system printout sequence continues until the last unit (Model 1773) has finished printing. The next PRINT CLOCK pulse passes completely around the closed loop "daisy chain" without finding a unit needing interrogation and returns to the Data Scanner, signalling the end of the printout cycle. All visual displays are then illuminated again.

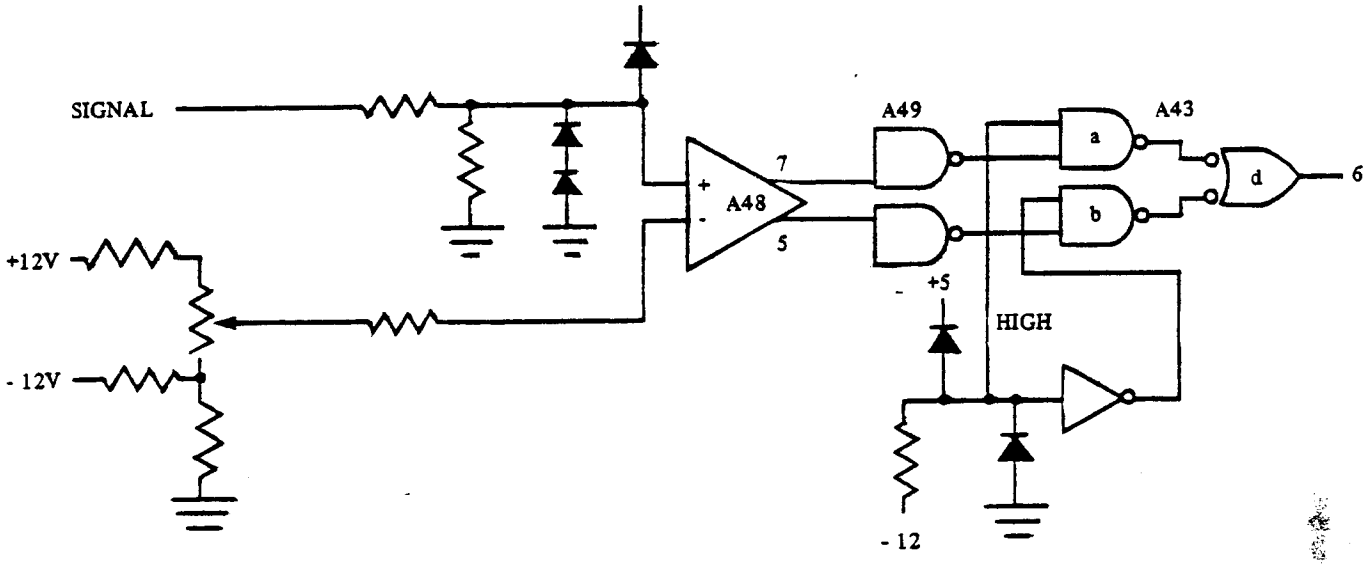
6. For automatic data acquisition and printout, set the MODE switch on the Data Scanner to RECYCLE. Repeat step 5 of Section 4.4.3. After printout the system will automatically reset, and another accumulate/printout/reset cycle will occur. To stop recycling, set the Data Scanner's MODE switch to SINGLE.

SECTION 5

THEORY OF OPERATION

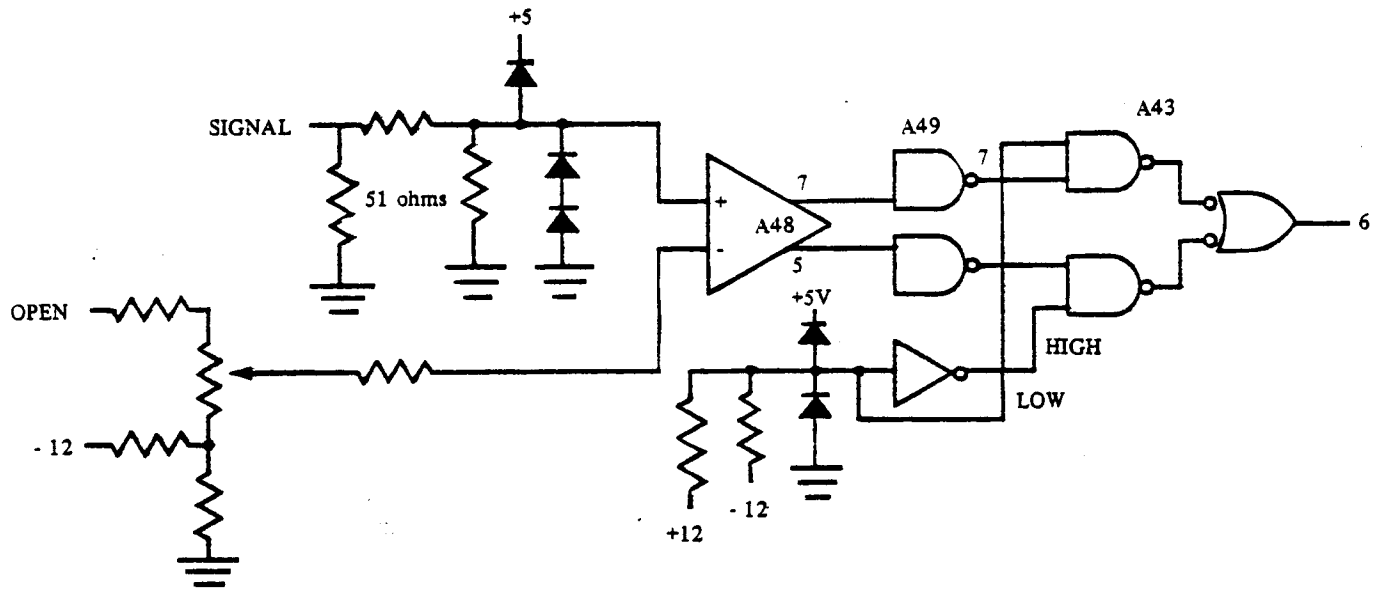
5.1 INPUT DISCRIMINATOR

Input discriminator A48 is an ECL device which detects negative or positive input pulses as a function of the POS/NEG front panel switch. When the switch is in the POS position, the circuit is configured:



In this configuration, the input pulses are discriminated against the potentiometer setting, and of the two complementary outputs of A48 the output from pin 8 is selected to pass through A49 and A43C; the output from A43, pin 6 is the pulse train to be counted.

If the switch is in the NEG position, the configuration is:



Now the discriminator level is essentially independent of potentiometer setting at approximately -0.5V: and the other output (from A49, pin 11) is selected to become the pulse train to be counted.

5.2 SCALER

To enable the Model 1775 to count at > 25MHz, the first counting stage is a high speed flip-flop (A45b).

The scaler is a standard six stage ensemble, multiplexed for display and readout.

5.3 DISPLAY, READOUT

Under non-readout conditions, oscillator Q18 drives decade counter A75, whose decoded outputs (A69) multiplex scaler data and drive both sets of LEDs. When the "7" count is reached, the counter is reset (via A74, pin 3) to 0.

Leading zero suppression is accomplished by A35a. On count 0, the flip-flop is cleared (giving a ripple blanking input). As each digit is strobed, the ripple blanking output is "stored" in A35a. The first non-zero digit sets the flip-flop, forcing the ripple blanking input low to allow display. The flip-flop is always set on the 6th count in any case.

When the HOLD line goes low, flip-flop A19b is set (if in the PRINT condition) and the input print clocks control data output via the Model 1404 connector.

The printing operation of the Model 1775 is controlled by the three flip-flops A81a, A81b, and A73a. If the PRINT switch is in the SLAVE position, flip-flop A81a is held in the RESET state.

Flip-flop A73a will be set on the leading edge of the HOLD signal (via A74b). The SLAVE PRINT line is always enabled.

The output A81 pin 5 gates the information from Channel A to the data lines: Then as the seventh PRINT CLOCK pulse is received, A81a is reset, and now A80, pin 4, goes HIGH to gate out the information in the B channel if enabled. At the seventh PRINT CLOCK pulse, A81b is reset, and A73, pin 6, goes LOW, resetting flip-flop A73a and terminating the readout operation of the Model 1775.

The front panel COUNTS/TIME switch routes either the discriminator output or a crystal controlled timebase to the master (preset) scaler with the other pulse train going to the slave (displayed) scaler. The master is denoted by Channel B, the slave by Channel A.

5.4 START/STOP/GATE

Flip-flop A70b/A70c receives the pushbutton outputs, as well as inputs from the Model 1404 connector. This flip-flop enables counting in both channels of the Model 1775, as well as illuminating the COUNT lamp.

Its output (A32, pin 8) is summed with the GATE inputs to enable the J and K inputs to the first counting stage of each channel.

5.5 TIMEBASE

The basic clock for the Model 1775 is derived from a 3.2768MHz crystal oscillator (A68). The 3.2768MHz waveform is passed through two JK flip-flops (inhibited by COUNT enable), then through 3 divide-by-16 counters. The resultant waveform is 200Hz, and is divided by 2 (A52) to give 100Hz (0.01 sec. period). The 100Hz signal is divided by 60 to give a waveform of 0.01 min.

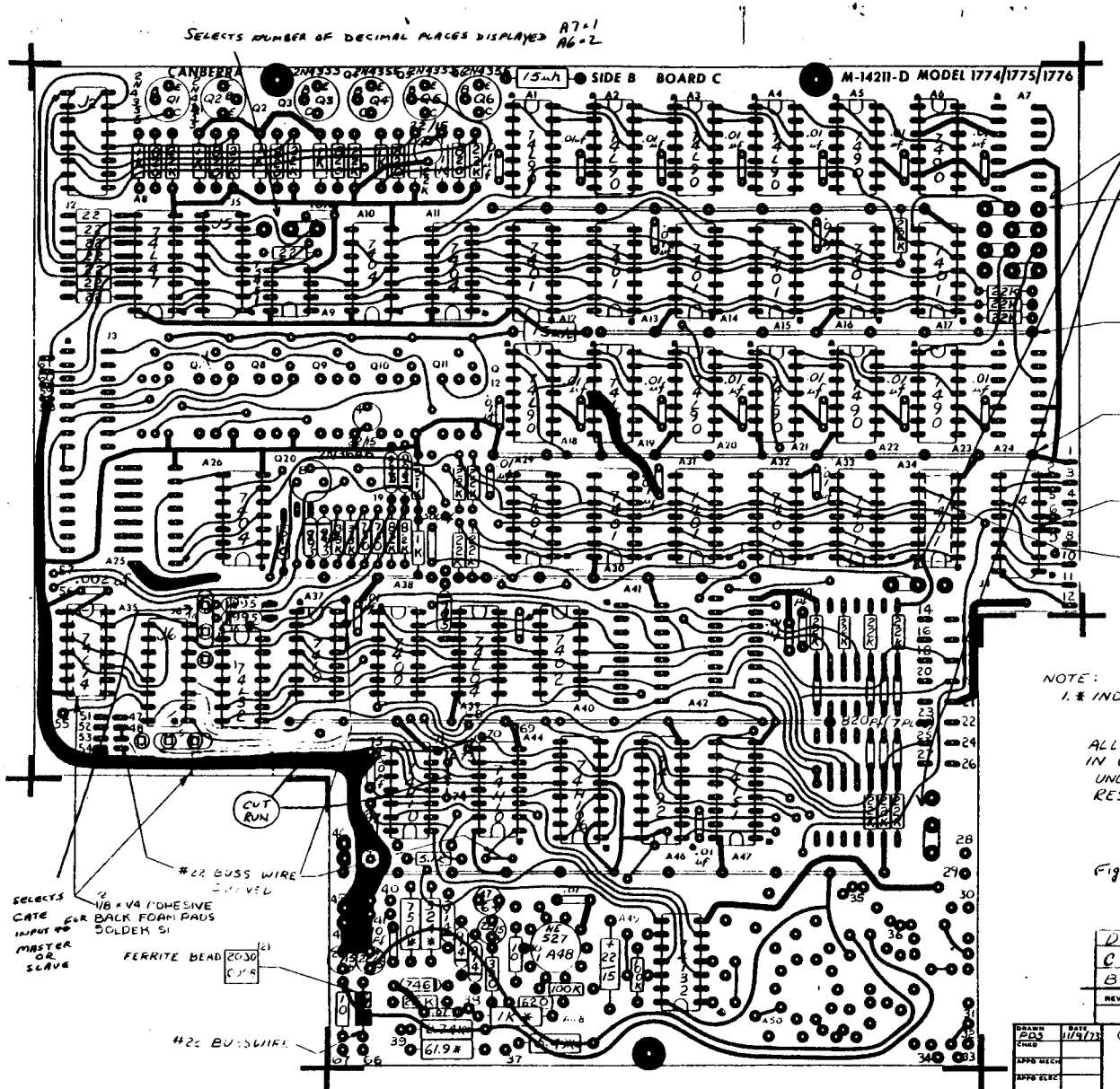
If the COUNTS/TIME switch is in either timebase position, the appropriate waveform is selected (A58), and an edge-triggered clock signal is input to the first counting stage. Additionally, an appropriate decimal point is displayed (via A9, pin 5), and the zero suppressing circuitry is modified to suppress all zeroes to the left of the first integral digit of time.

5.6 PRESET OPERATION

The input clock to the scaler, along with the overflow outputs of each stage, are input to an 8-to-1 line multiplexer (A42). The BCD information from the "M" thumbwheel switch on the front panel is used to select one of the multiplexer inputs. The selected input appears at A47, pin 5. When counting is not enabled, counter A46 is loaded with the contents of the "N" thumbwheel switch on the front panel. When counting is enabled, "count" goes HIGH, allowing the "down" clock to decrement the counter A46. When the counter underflows, PRSTB goes LOW, firing single-shot A64b to output a system STOP command. If the "N" value is 0, A38, pin 3, will be low, inhibiting the "down" clock from reaching A42 and blocking any preset operation.

5.7 RECYCLE OPERATION

When a STOP command is generated as a result of a preset being reached, A64b momentarily goes LOW, in turn firing the single shot A64a. A64a must be enabled (by the RECYCLE switch in the RECYCLE position). The single shot, A64a, will last for several seconds (as selected by RV1) and will then fire single shot A65b, delivering a RESET/START command to the system.



NOTE:
1. * INDICATES RN60C RESISTOR.

ALL UNMARKED RESISTOR VALUES ARE IN OHMS
UNLESS OTHERWISE NOTED ALL RESISTORS ARE 1/4W ±5%

Figure 3.1a

REV	CHANGE	ECN	BY	DATE	APPD
D	SEE ECN	1211	WMK	1/8/74	
C	SEE ECN	1162	WMK	1/8/74	
B	INITIAL RELEASE	1048	PDS	1/9/73	

DRAWN PDS	DATE 11/9/73	COMPONENT ASSY. 'C' BOARD SCALER MODEL 1775	CANBERRA MERIDEN CONN.
CHKD			
APPD MECH			DRAWING NO C-14715 REV D
APPD ELEC			
NEXT ASSY		SCALE 2/1 DO NOT TEMPLATE DRAWING	SHT 1 OF 1

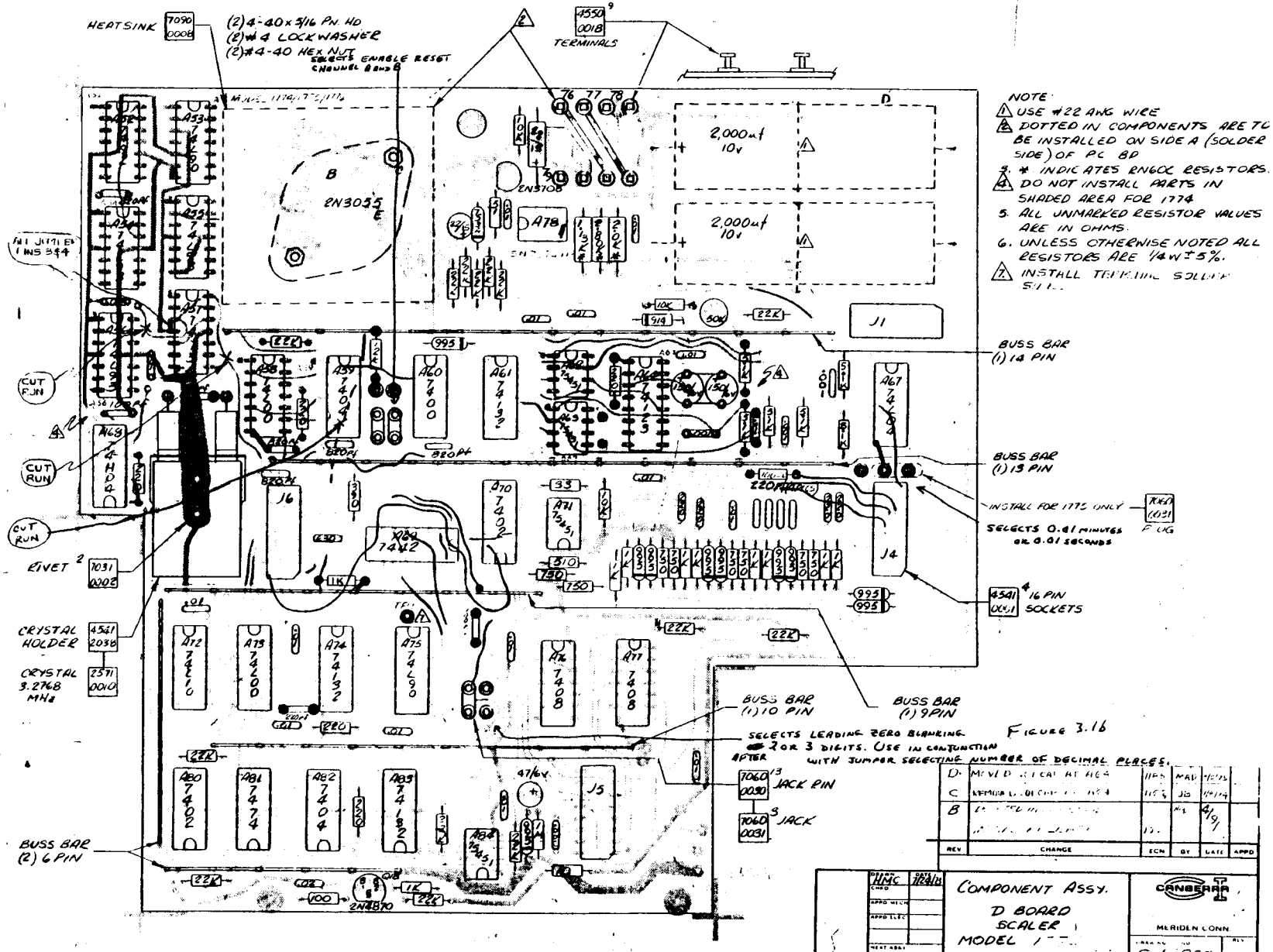
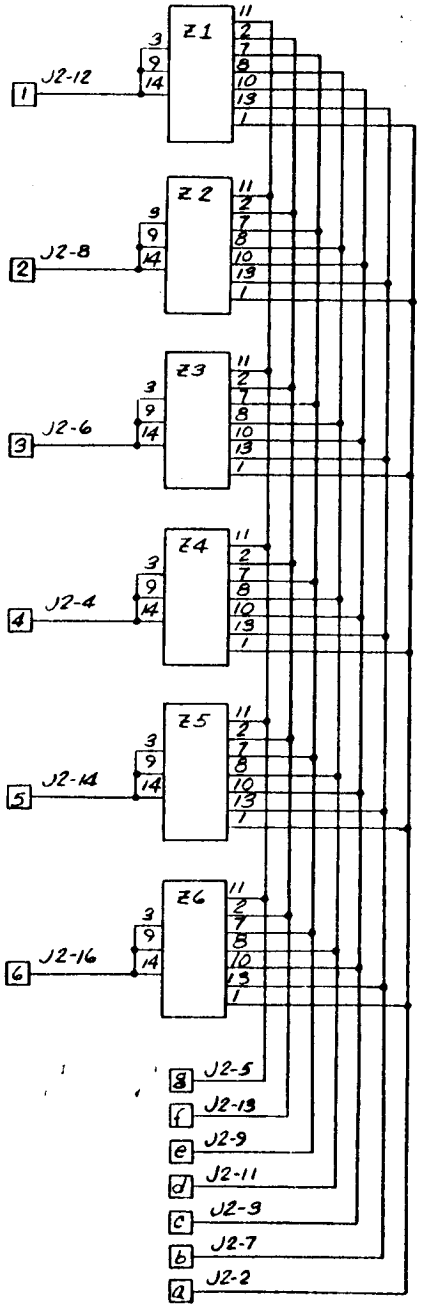


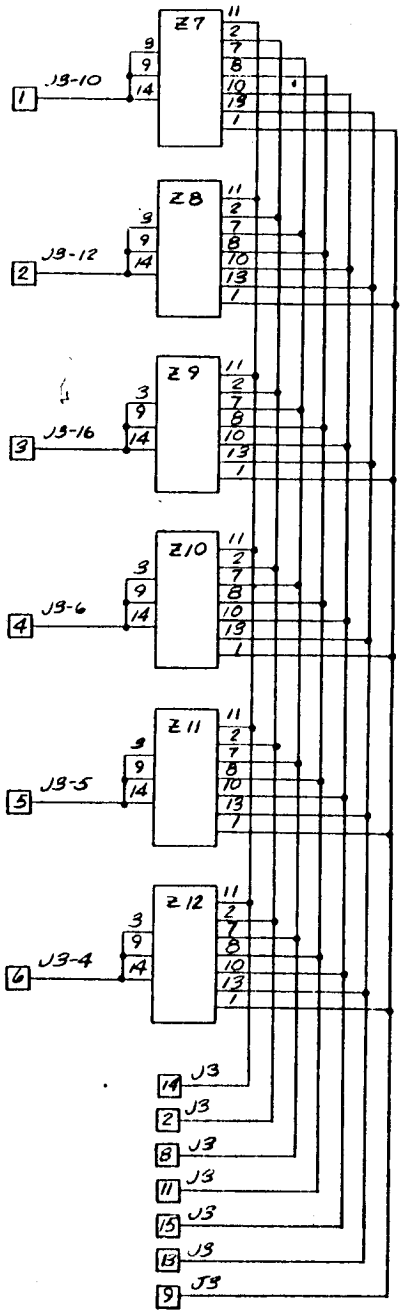
FIGURE 3.16

REV	CHANGE	ECN	BY	DATE	APPD
D	MOVED [illegible]	1155	MAD	4/6/71	
C	REMOVED [illegible]	1153	JB	4/9/71	
B	[illegible]	[illegible]	[illegible]	4/9/71	

DRAWN HMC 4/8/71	COMPONENT ASSY. D BOARD SCALER MODEL 1	CANBERRA	
CHKD		MERIDEN CONN	
APPD MECH		DRAWING NO. C-1-855	REV E
APPD ELEC		SHT 1 of 1	
NEXT ASSY		SCALE — DO NOT TEMPLATE DRAWING	
USED ON			

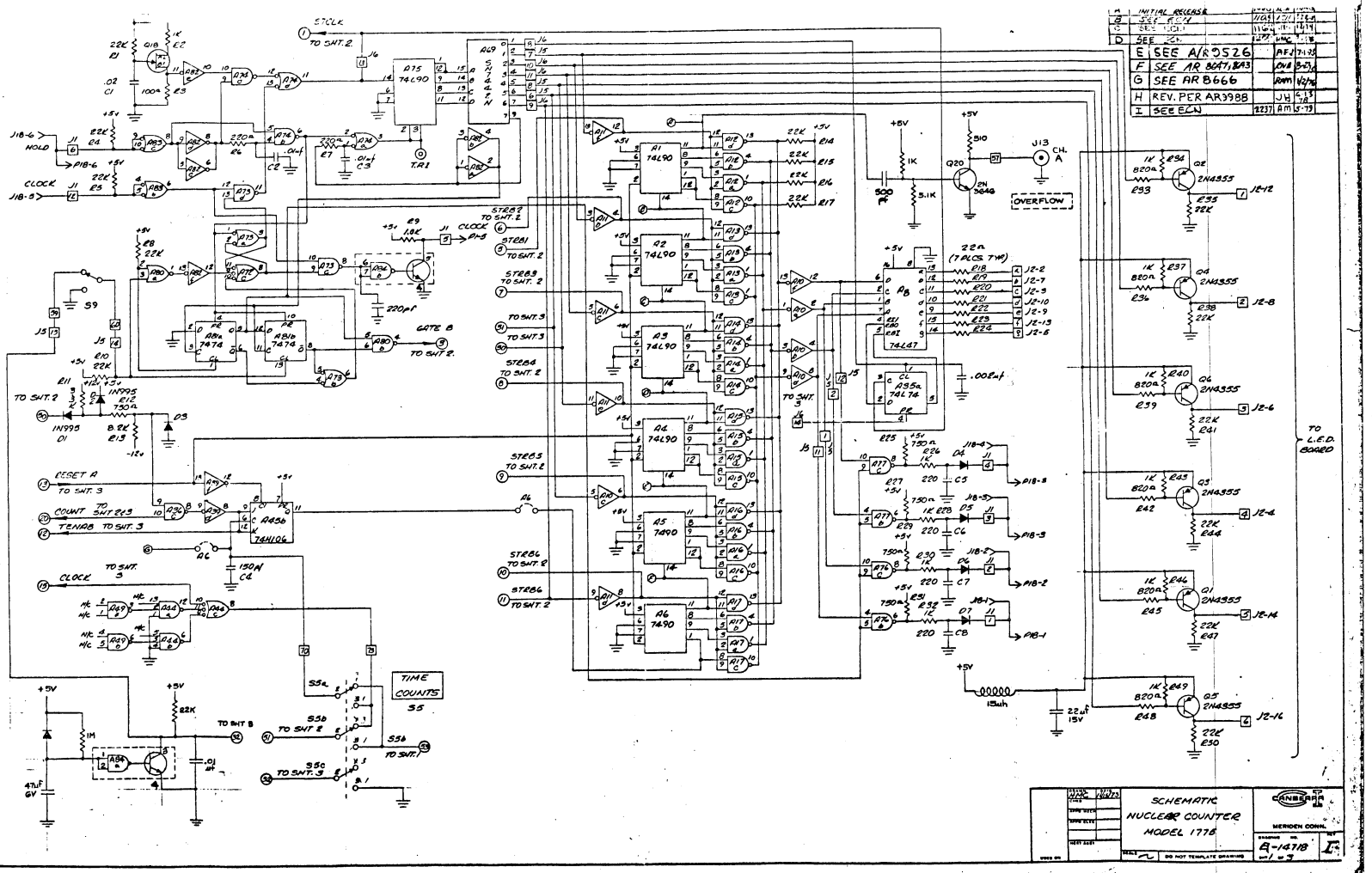
REV	CHANGE	CN	BY	DATE
	INITIAL REL	362	[illegible]	[illegible]





NOTE:
1. Z1 THRU Z12 ARE HP-LED (SELECTED)

DRAWN HMC 3/12/76	SCHEMATIC DUAL DISPLAY LED BOARD	CANBERRA	
CHKD		MERIDEN CONN.	
APPD MECH	MODEL 1774/1776	DRAWING NO A-14412	REV.
APPD ELEC		SHT 1 OF 1	
NEXT ASSY	SCALE — DO NOT TEMPLATE DRAWING		
USED ON			



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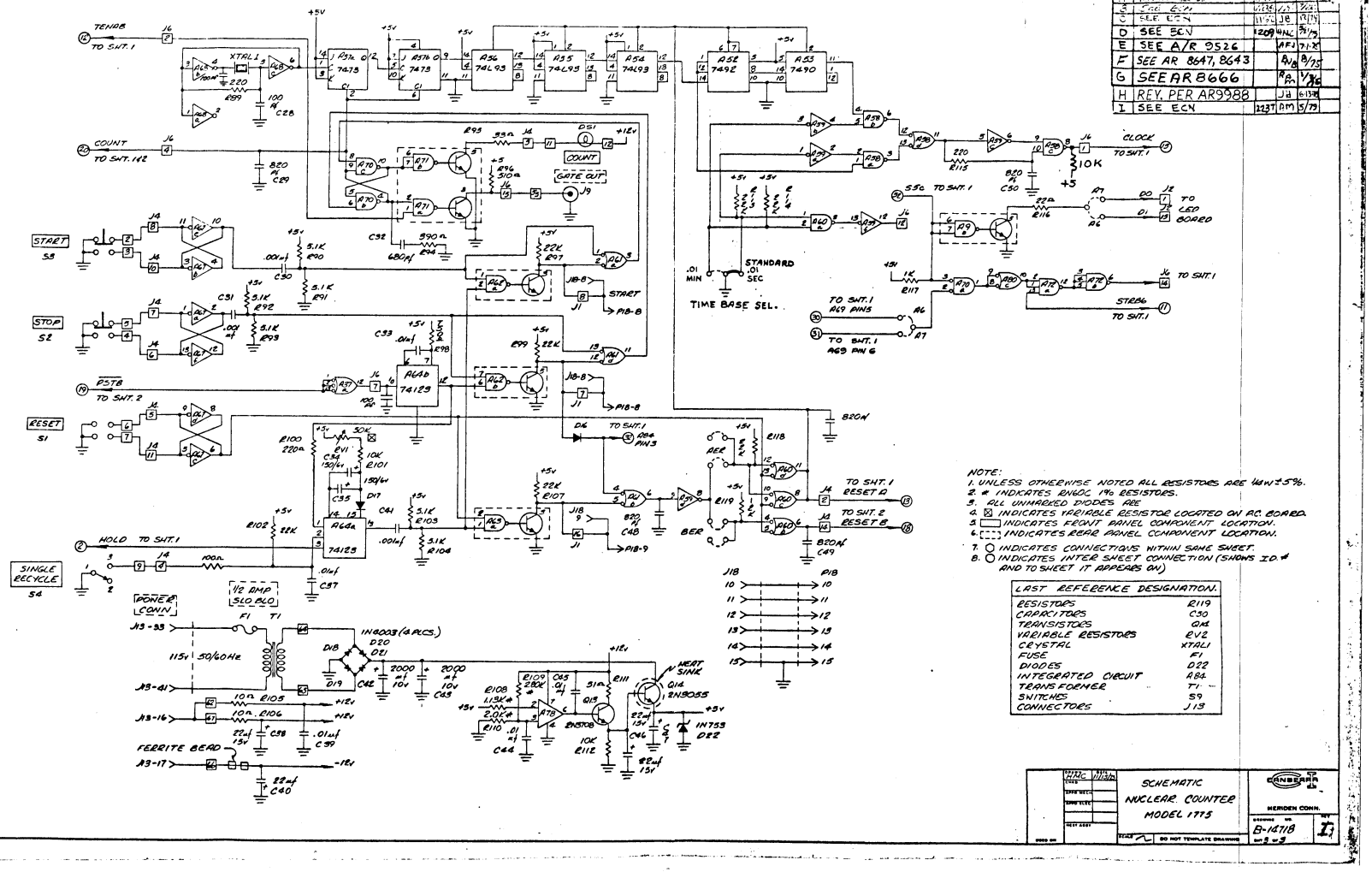
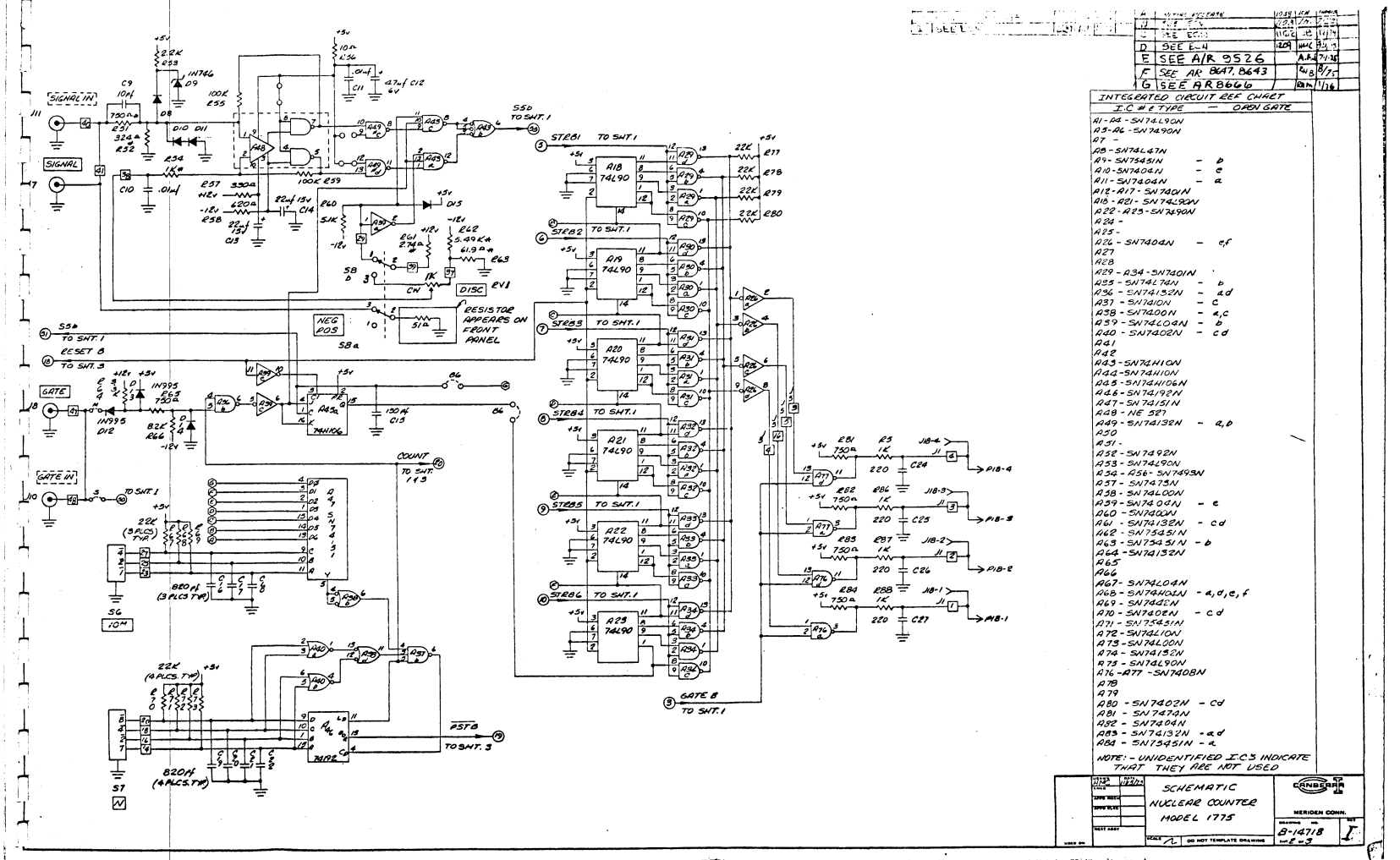
SHEET 1 OF 3



B	SEE ECN	11/26	JB 12/74
C	SEE ECN	11/74	JB 12/74
D	SEE ECN	1209	WNC 5/75
E	SEE A/R 9526		AFJ 7/1-X
F	SEE AR 8647, 8643		RA 8/75
G	SEE AR 8666		RA 1/76
H	REV. PER AR9988		JB 6/13/76
I	SEE ECN	1237	DM 5/79



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