NATIONAL RADIO ASTRONOMY OBSERVATORY
Green Bank, West Virginia

Electronics Division Internal Report No. 120

# NRAO STANDARD CALENDAR MODEL III

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# NRAO STANDARD CALENDAR MODEL III

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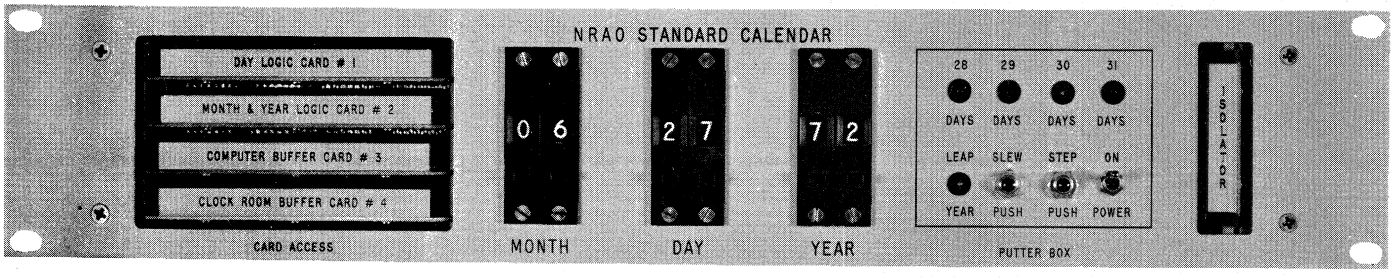
A new electronic calendar has been completed comprising 4 small circuit cards, 2 power supplies, 6 electromechanical decades, and chassis. The system keeps track of the day, month, and year to provide this data to the site computers. The calendar is passive at all times except at midnight when the date advance pulse from the Observatory clock room initiates a little programmed sequence that lasts less than 3 seconds to advance all counters to the next date.

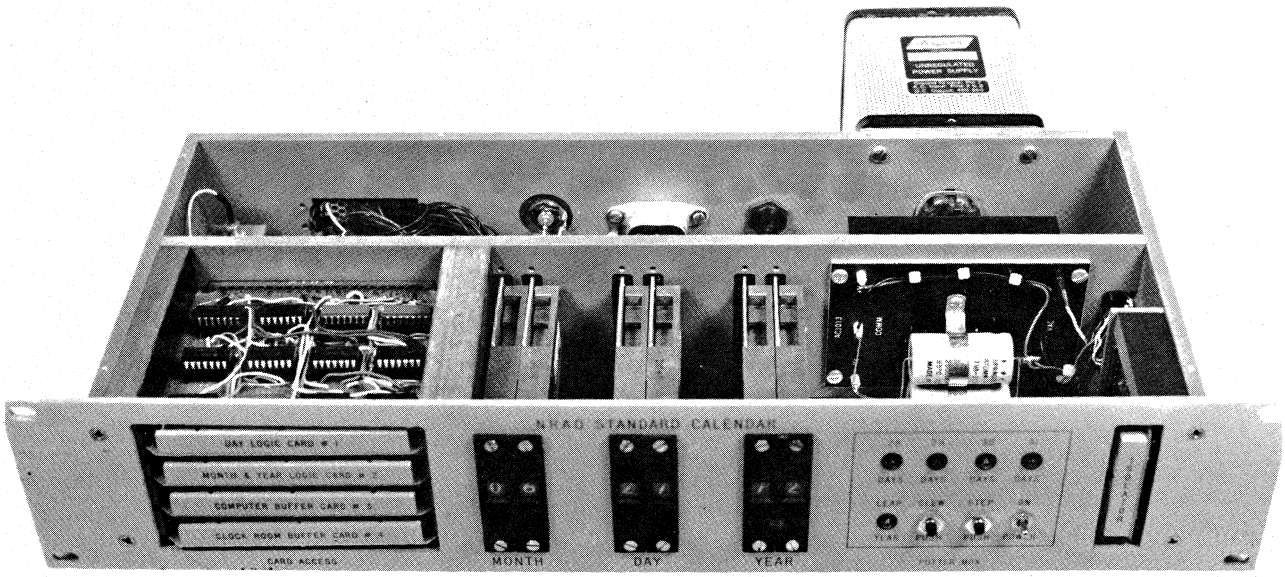
In previous calendar designs, Electronics Division Internal Report No. 69, redundant memories are employed that are difficult to synchronize and reset when the date gets out of step. In Model III, on the other hand, only one memory is employed (electromechanical Veeder Root decades) and since the system is passive nearly all of the time, the date setting procedure is quite simple. The system is compact and quite inexpensive.

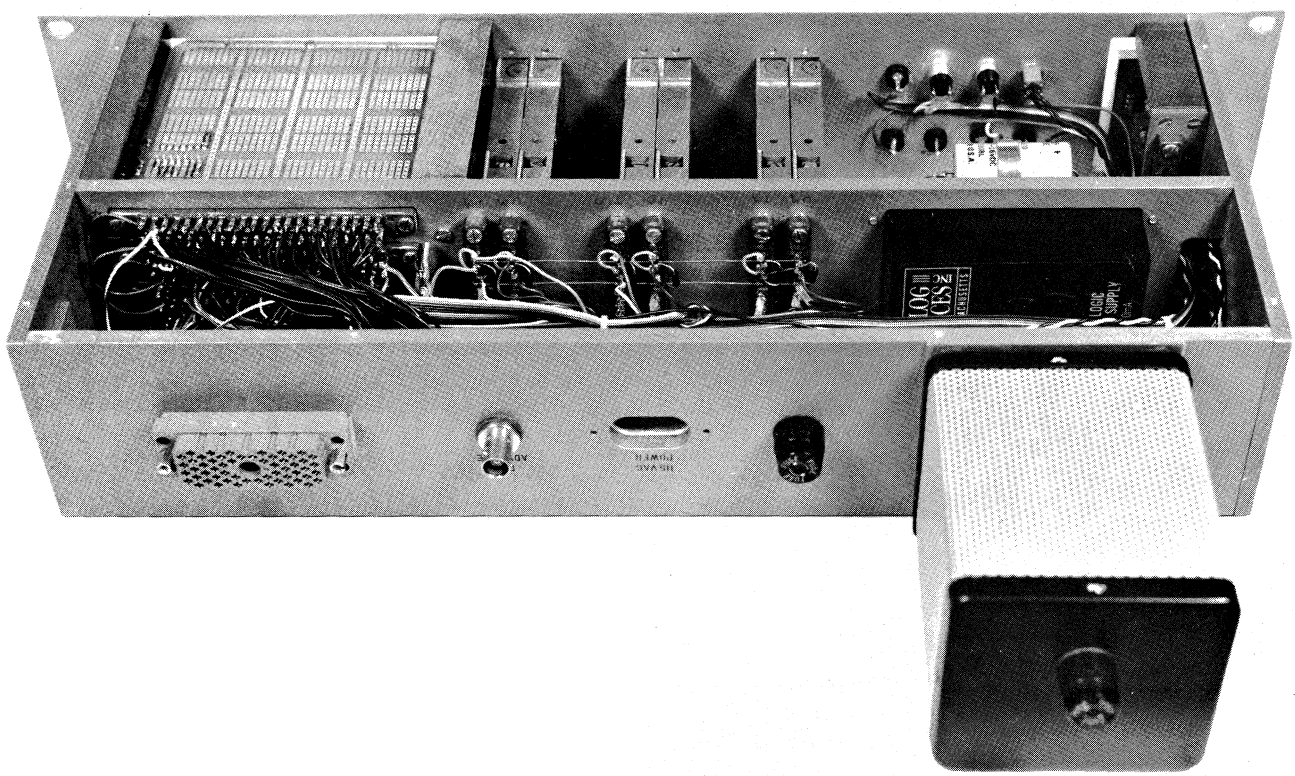
A picture of the front panel is presented showing the controls.



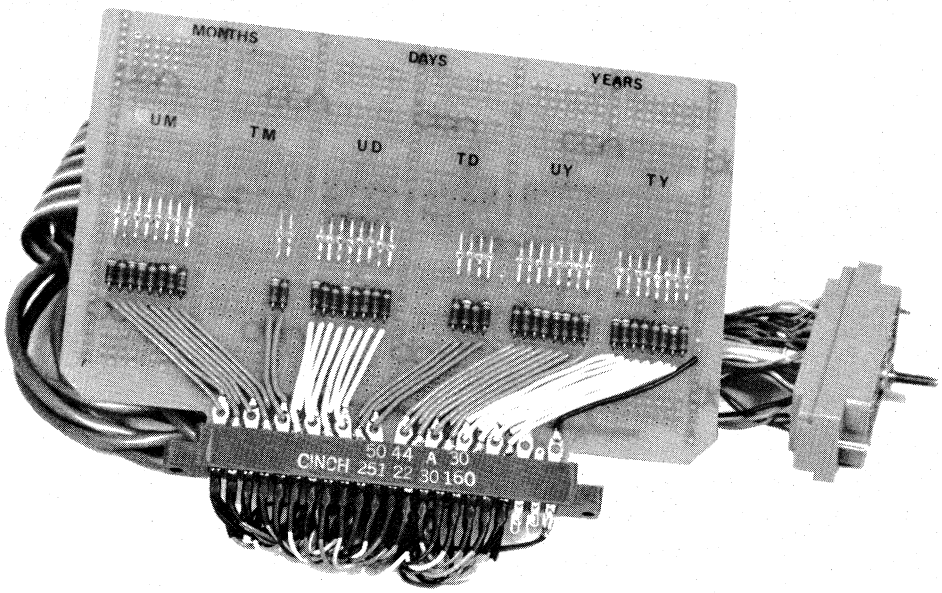

Decades provide a readout of the present date. The circuit cards are accessible from the front panel. Several controls and display LED lamps, not required for the actual function of the system but are useful for diagnostic tests, are located in the putter box.

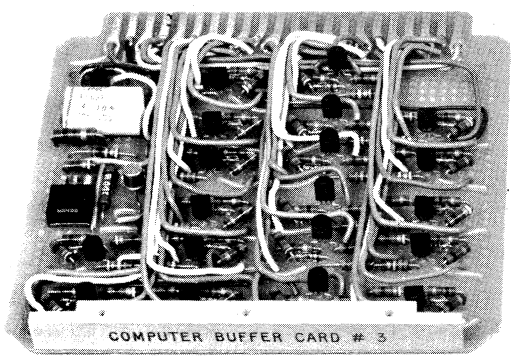
Two other pictures show the front view and back view showing the package in perspective.

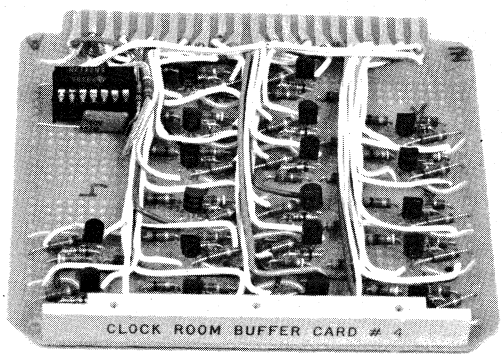


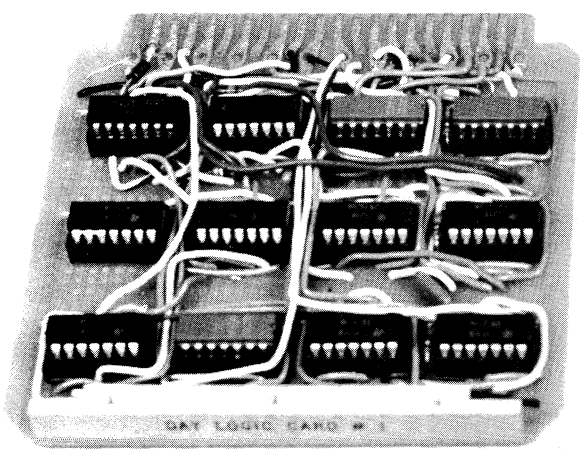



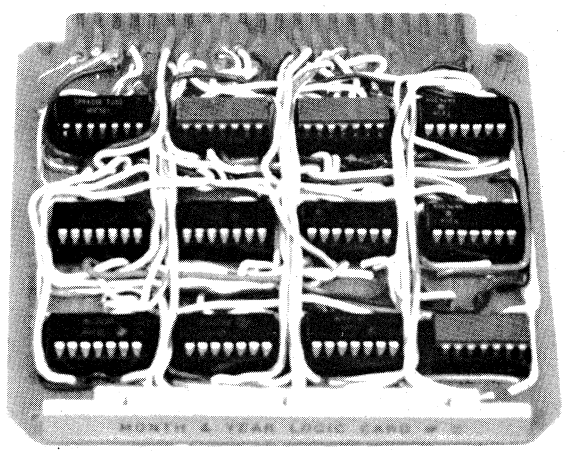
The four circuit cards are shown below. Also shown is a test card and cable that connects to the rear I/O Elco connector, providing a visual test of all data bits.



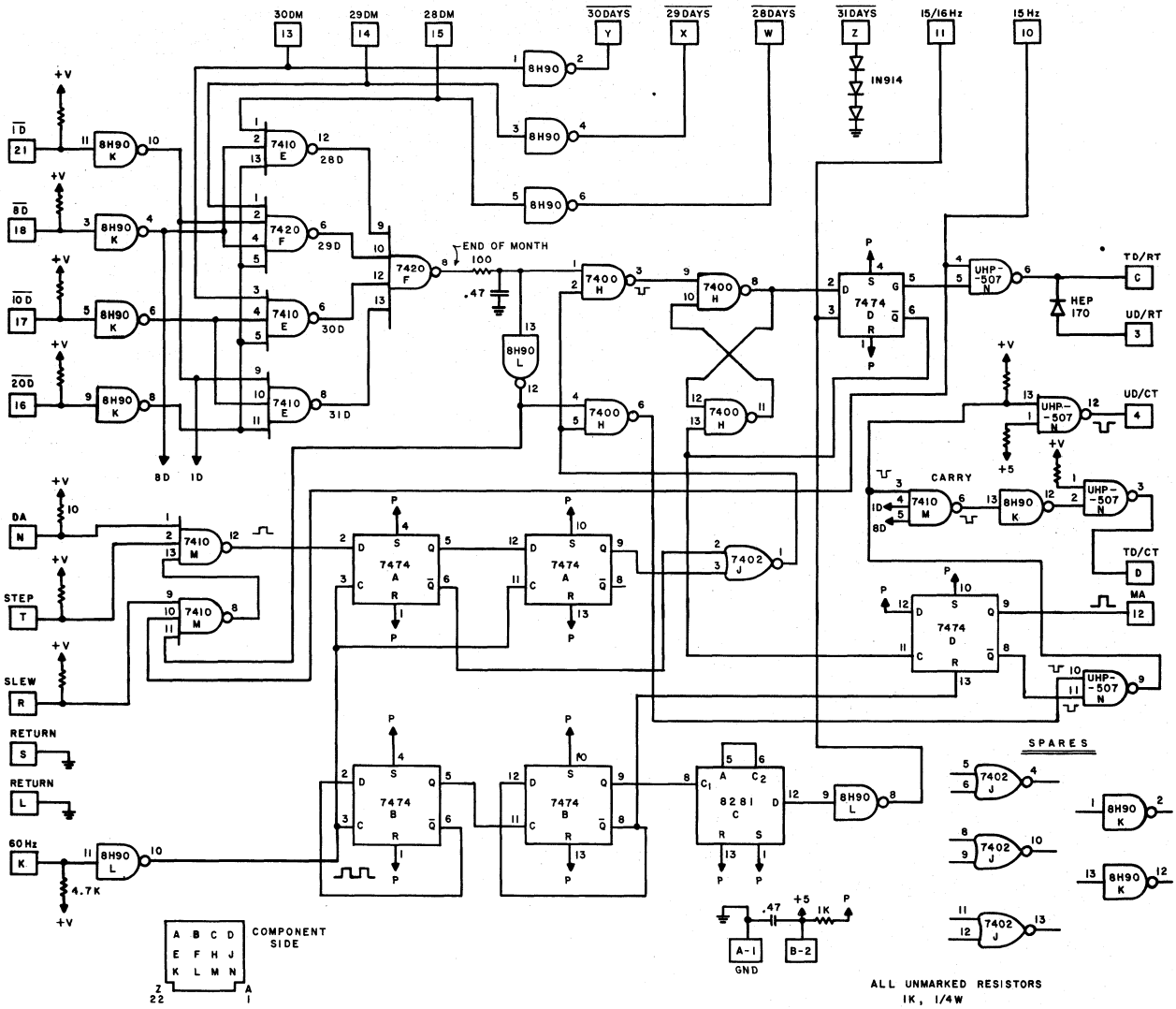



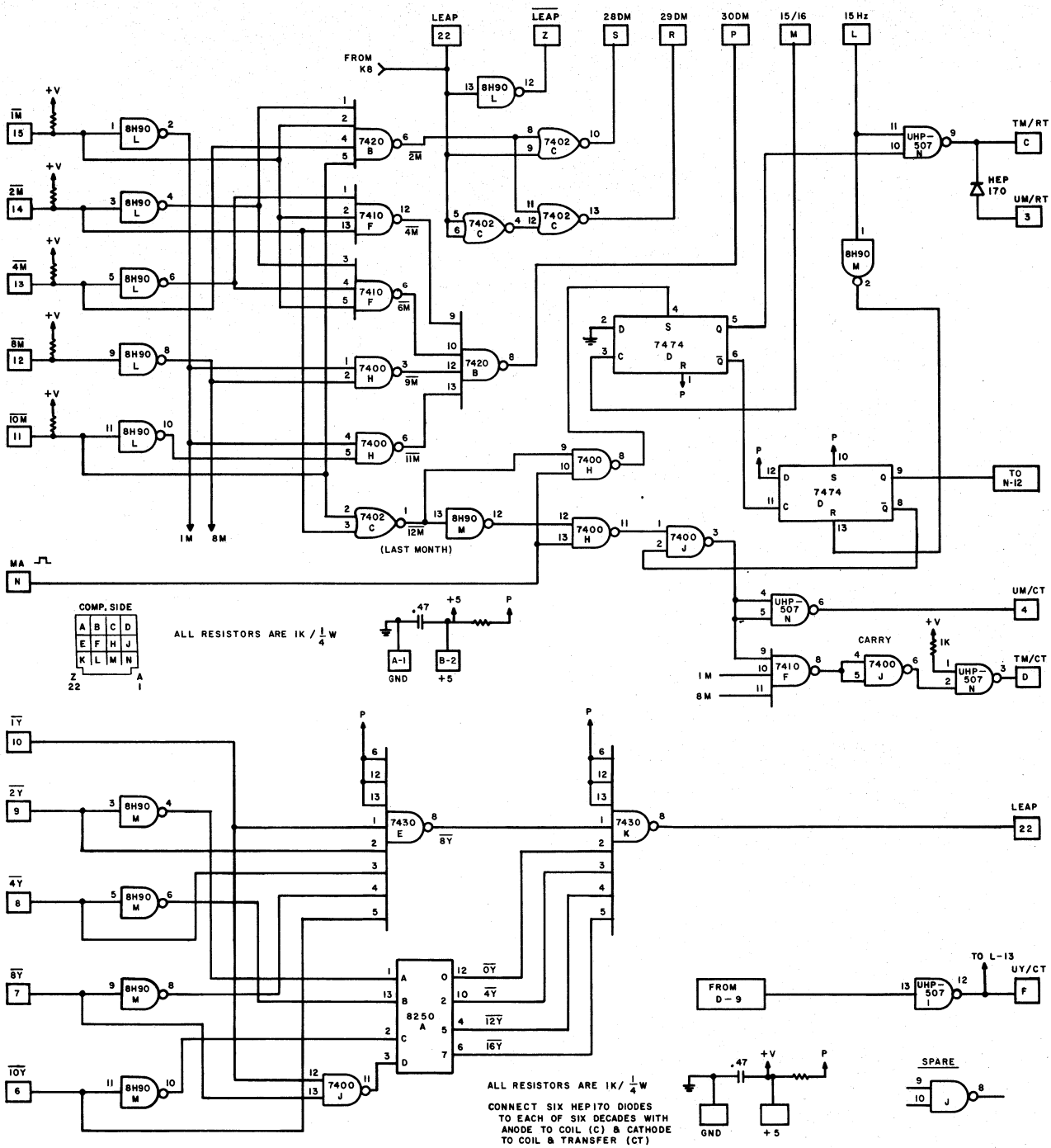
A schematic of the day counting decade logic and control is shown in Figure I.




NRAO STANDARD CALENDAR MODEL III
DAY LOGIC CARD I
FIG. I

Card I logic decodes the days decades (gates E and F) and sequences the decades (flip-flops A, D, and H) through solenoid drivers (chip N). The 60 Hz line is divided by flip-flops B and C providing a system timing generator.

The same functions are provided for the months and years counting decades by the logic of Card II shown in Figure II.



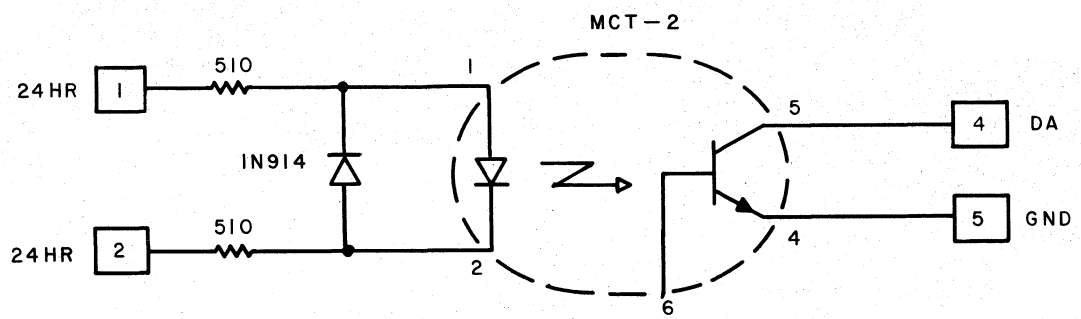

NRAO STANDARD CALENDAR MODEL III MONTH & YEAR LOGIC CARD II

FIG. 2

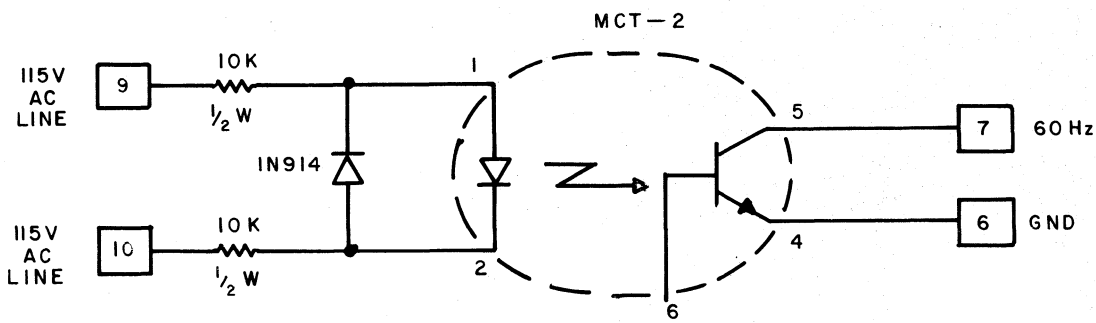
Months status is decoded by gates B, F, H, and C, providing an output to the day logic to provide the correct end of month indication. Red, yellow, and green LED's on the front panel indicate the proper operation of the month and year logic.

Flip-flops (D) control the sequence of the months and years decades. The years decoder logic (gates E and K and 1 of 8 decoder A) detect leap years providing an output to the months decoder logic used in determining the last day of February.

The isolator circuit card schematic is presented in Figure III, providing hi-pot isolation from the AC power line for 60 Hz timing and the date advance clock room cable providing some degree of lightening protection.



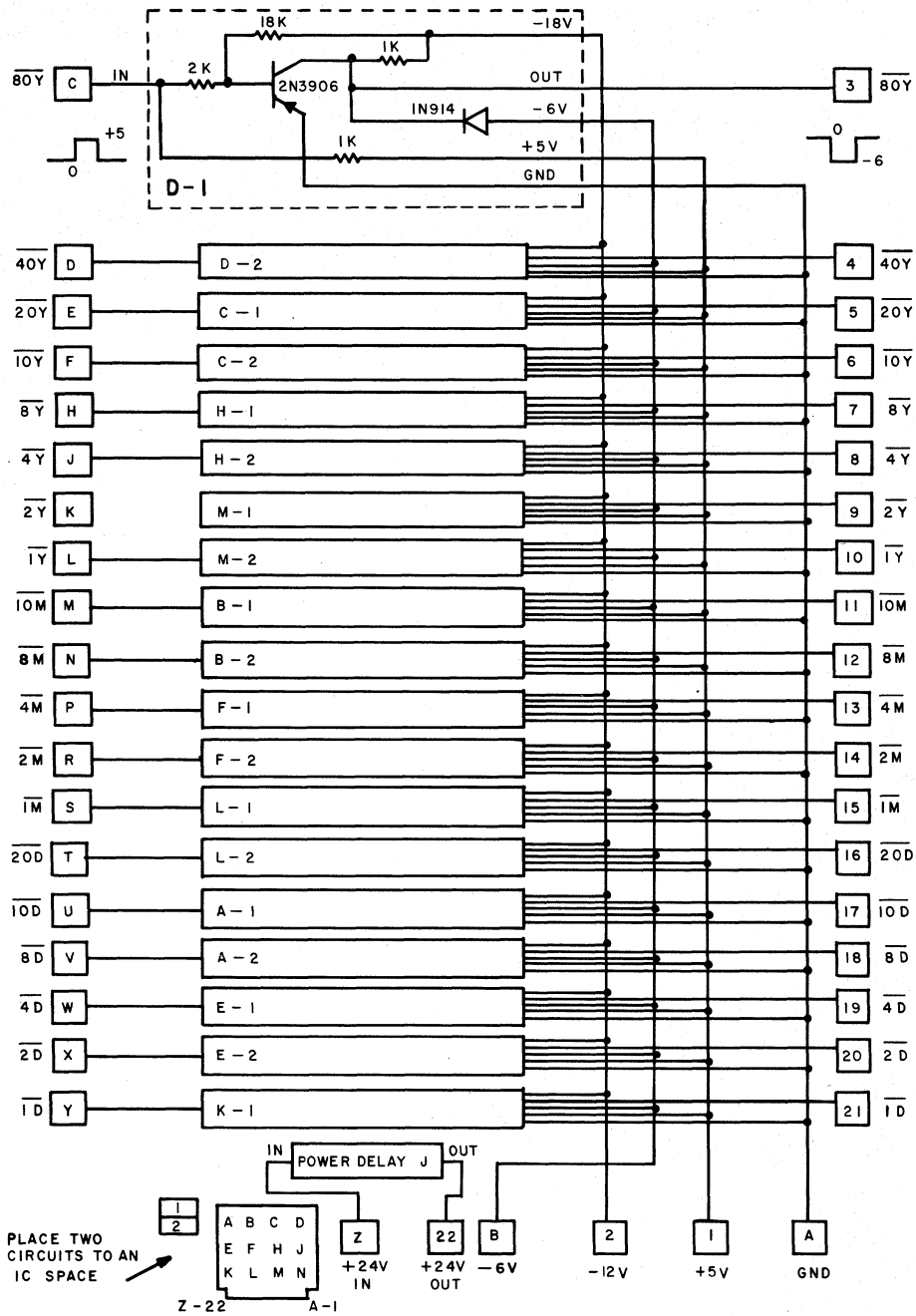

CLOCK ROOM CABLE ISOLATOR




115VAC/60Hz LINE ISOLATOR

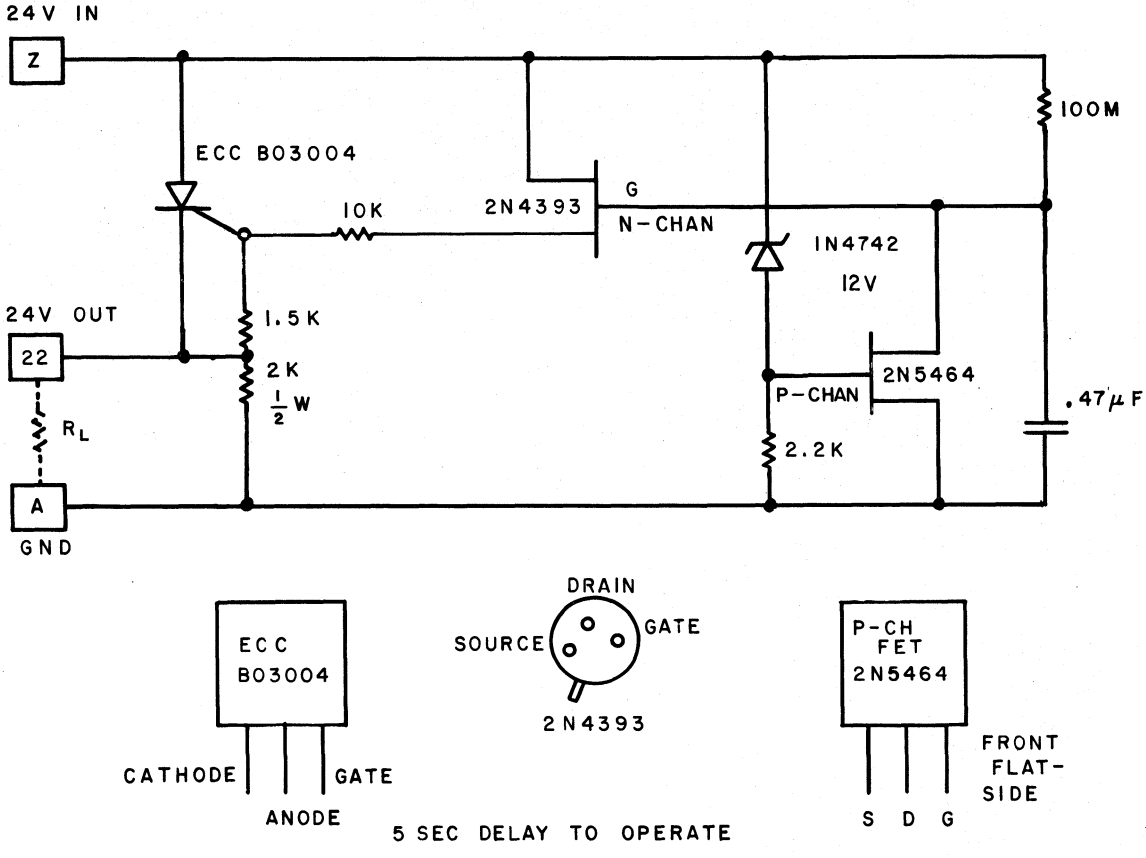
CARD # 0
ISOLATOR CIRCUITS
FIG. 3

Card 3 is a level shifting card interfacing the calendar to the site computer. Inputs to this card are provided directly from the decades. Figure IV is the schematic of this card.




NRAO STANDARD CALENDER MODEL III
COMPUTER BUFFER CARD # 3
FIG. 4

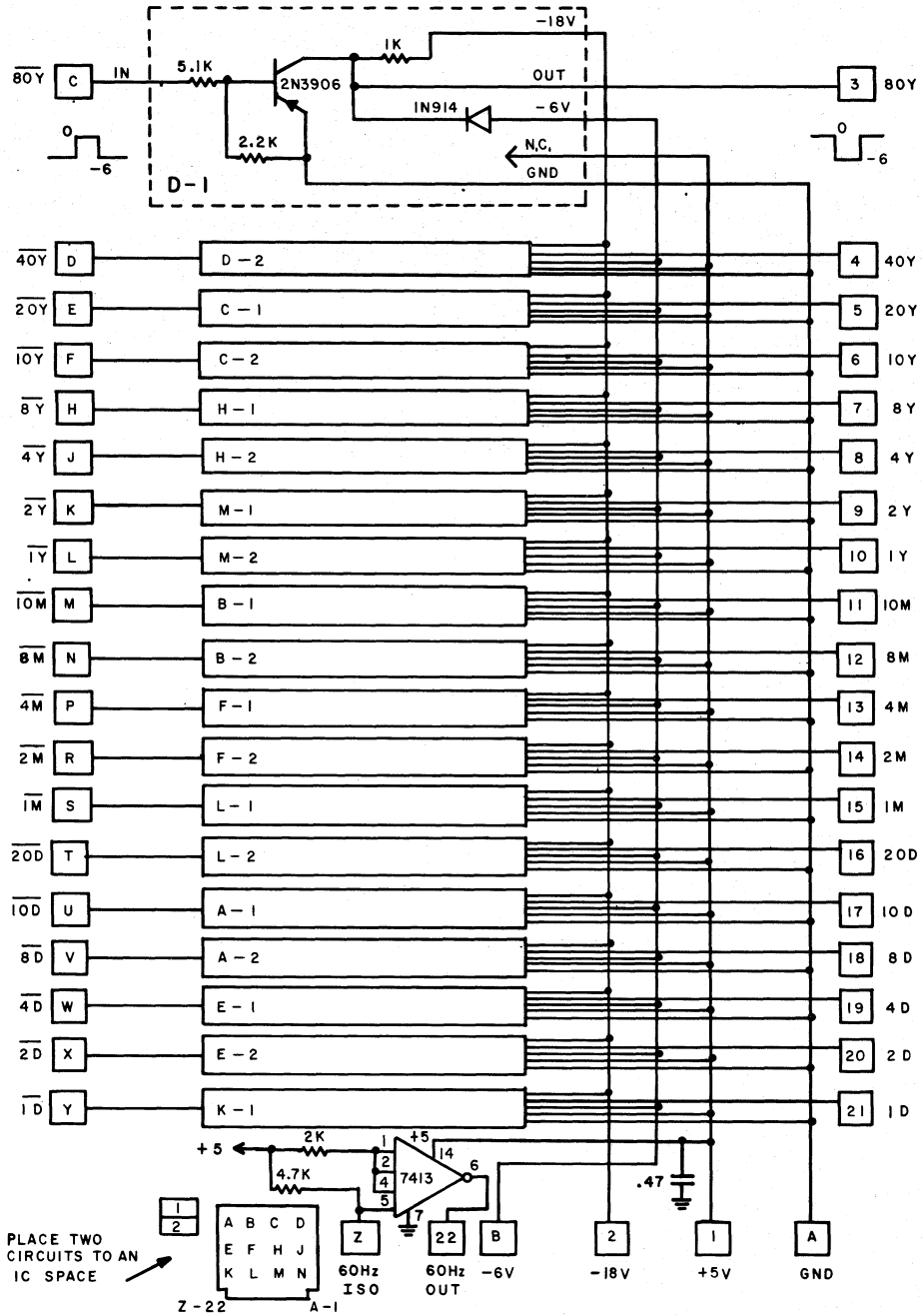
A power delay circuit that shuts down the solenoid 24 volt power supply in the event of power dips and transients is on card 3. A schematic is in Figure V.




**POWER SUPPLY DELAY CIRCUIT**
**(ON CARD 3 – SLOT J)**
**FIG. 5**

When power is initially applied, the SCR is off until turned on by the 2N 4393 N-channel FET when the .47 μF capacitor is charged to about 6 volts through the 100 meg ohm resistor. This turns on the 24 volt power to the Veeder Root counters. If a power dip occurs the 12 volt zener and 2N 5464 P-channel FET detect this and discharge the .47 μF capacitor and the SCR turns off,momentarily disconnecting the coil power to the counters.

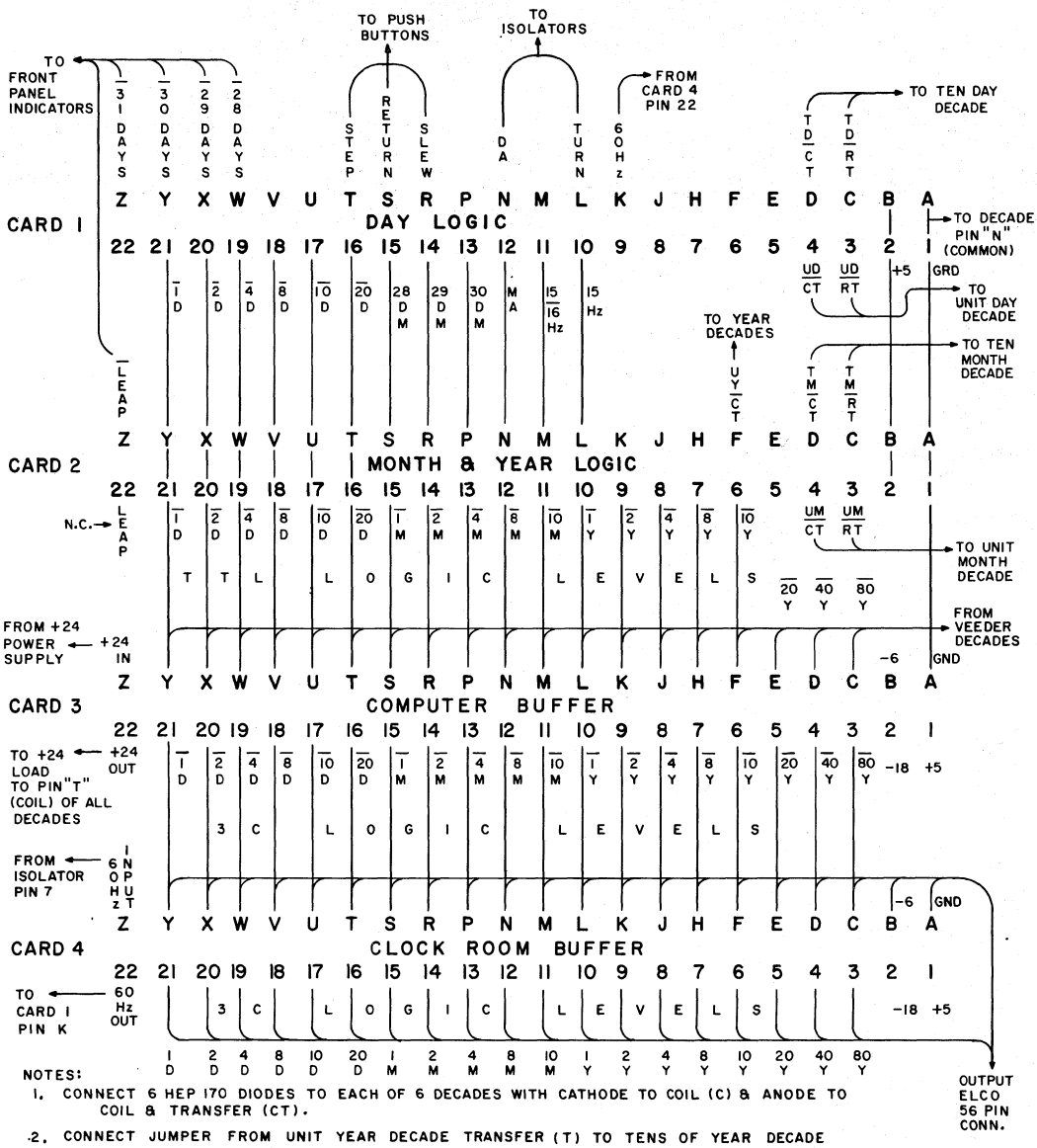
Figure VI is a schematic of the clock room interface card 4 which receives inputs directly from card 3.




NRAO STANDARD CALENDER MODEL III
CLOCK ROOM BUFFER CARD # 4
FIG. 6

Card 4 also contains a Schmitt trigger (7413) that "squares up" the 60 Hz clock from the line isolator. The interface function of this card is only required for the calendar in the clock room. All other sites require only the Schmitt circuit so that if a calendar is changed, the card 4 should be changed with the dummy card, thus keeping the spare clock room buffer card with the spare calendar in case it is needed in the clock room.

The interconnection of the circuit cards is shown in Figure VII.

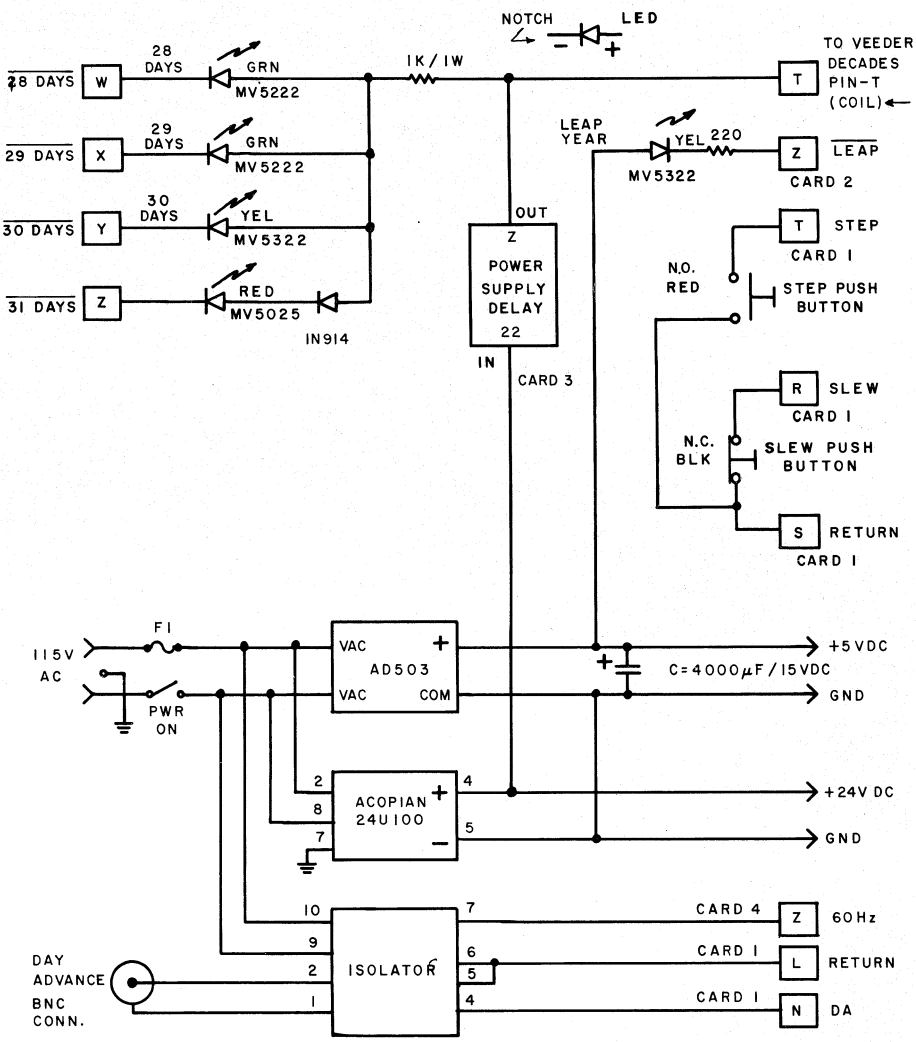



NOTES:
1. CONNECT 6 HEP 170 DIODES TO EACH OF 6 DECADES WITH CATHODE TO COIL (C) & ANODE TO COIL & TRANSFER (CT).
2. CONNECT JUMPER FROM UNIT YEAR DECADE TRANSFER (T) TO TENS OF YEAR DECADE COIL & TRANSFER (CT).

CALENDAR MODEL III CARD INTERCONNECTIONS

FIG. 7

The main chassis wiring connection schematic is shown in Figure VIII.




MAINFRAME CIRCUITS

FIG. 8

## Conclusion

The standard calendar logic will provide for proper date counting sequence until February 28, 2099 at which time the telescope operator will have to bend over and push the step button to advance the date again since the calendar will detect incorrectly that this is a leap year. Otherwise, it is hoped that everything has been designed in the system to end standard calendar designing for awhile.

## Acknowledgment

A fine electronic assembly job was done by Dick Skaggs as well as the mechanical chassis fabrication by Martin Barkley and group and installation by Jerry Turner.

# NRAO STANDARD CALENDAR OUTPUT CONNECTOR WIRING LIST (E2A02)

| Function | Elco | Card |
|---|---|---|
| $\overline{10\ M}$ | A | 3-11 |
| 10 M | B | 4-11 |
| $\overline{8\ M}$ | C | 3-12 |
| 8 M | D | 4-12 |
| $\overline{4\ M}$ | E | 3-13 |
| 4 M | F | 4-13 |
| $\overline{2\ M}$ | H | 3-14 |
| 2 M | J | 4-14 |
| $\overline{1\ M}$ | K | 3-15 |
| 1 M | L | 4-15 |
| $\overline{20\ D}$ | M | 3-16 |
| 20 D | N | 4-16 |
| $\overline{10\ D}$ | P | 3-17 |
| 10 D | R | 4-17 |
| $\overline{8\ D}$ | S | 3-18 |
| 8 D | T | 4-18 |
| $\overline{4\ D}$ | U | 3-19 |
| 4 D | V | 4-19 |
| $\overline{2\ D}$ | W | 3-20 |
| 2 D | X | 4-20 |
| $\overline{1\ D}$ | Y | 3-21 |
| 1 D | Z | 4-21 |

56 Pin Elco (E2A02)

Model III Calendar { Protected Pins on Panel / Exposed Pins on Cable

DDP-116 Computer { Protected Pins on Cable / Exposed Pins on Panel

| Function | Elco | Card |
|---|---|---|
| $\overline{80\ Y}$ | a | 3-03 |
| 80 Y | b | 4-03 |
| $\overline{40\ Y}$ | c | 3-04 |
| 40 Y | d | 4-04 |
| $\overline{20\ Y}$ | e | 3-05 |
| 20 Y | f | 4-05 |
| $\overline{10\ Y}$ | h | 3-06 |
| 10 Y | j | 4-06 |
| $\overline{8\ Y}$ | k | 3-07 |
| 8 Y | l | 4-07 |
| $\overline{4\ Y}$ | m | 3-08 |
| 4 Y | n | 4-08 |
| $\overline{2\ Y}$ | p | 3-09 |
| 2 Y | r | 4-09 |
| $\overline{1\ Y}$ | s | 3-10 |
| 1 Y | t | 4-10 |
| | u | |
| | v | |
| | w | |
| | x | |
| | y | |
| | z | |
| NC | AA | Not used |
| NC | BB | Not used |
| | CC | |
| | DD | |
| -6 V | EE | 4-B |
| | FF | |
| -18 V | HH | 4-2 |
| | JJ | |
| GND | KK | 4-A |
| GND | LL | 4-A |
| GND | MM | 3-A |
| GND | NN | 3-A |