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Start-up and troubleshooting

The Numa-Logic 300 Series concept

Numa-Logic 300 Series controls are designed to simplify start-up and troubleshooting, thereby reducing machine down-time.

Industrial history has shown that a large percentage of any machine's electrical problems are external to the control and are caused by a malfunction of one or more of the machine's input/-output pilot devices. With Numa-Logic's exclusive pictorial display, these malfunctions can be isolated in short order by simply observing the light-emitting diodes (LEDs) on the input and output modules.

Figure 5-1 shows a module pictorial display of a typical hydraulic unit. The LED behind each pictorial symbol will turn on as each machine function is performed. The absence of the proper LED (pilot devices) indicates where in the sequence the machine has stopped. Thus, the faulty pilot device is easily isolated and replaced.

When the problem is in the solid state portion of the control itself, troubleshooting is also simplified by using front mounted test points or optional LEDs on the logic modules. The corrective procedure is simply a matter of removing the defective module and plugging in an operative module. The suspect module then can be easily checked off-line, using the logic trainer/tester shown in Figure 5-4.

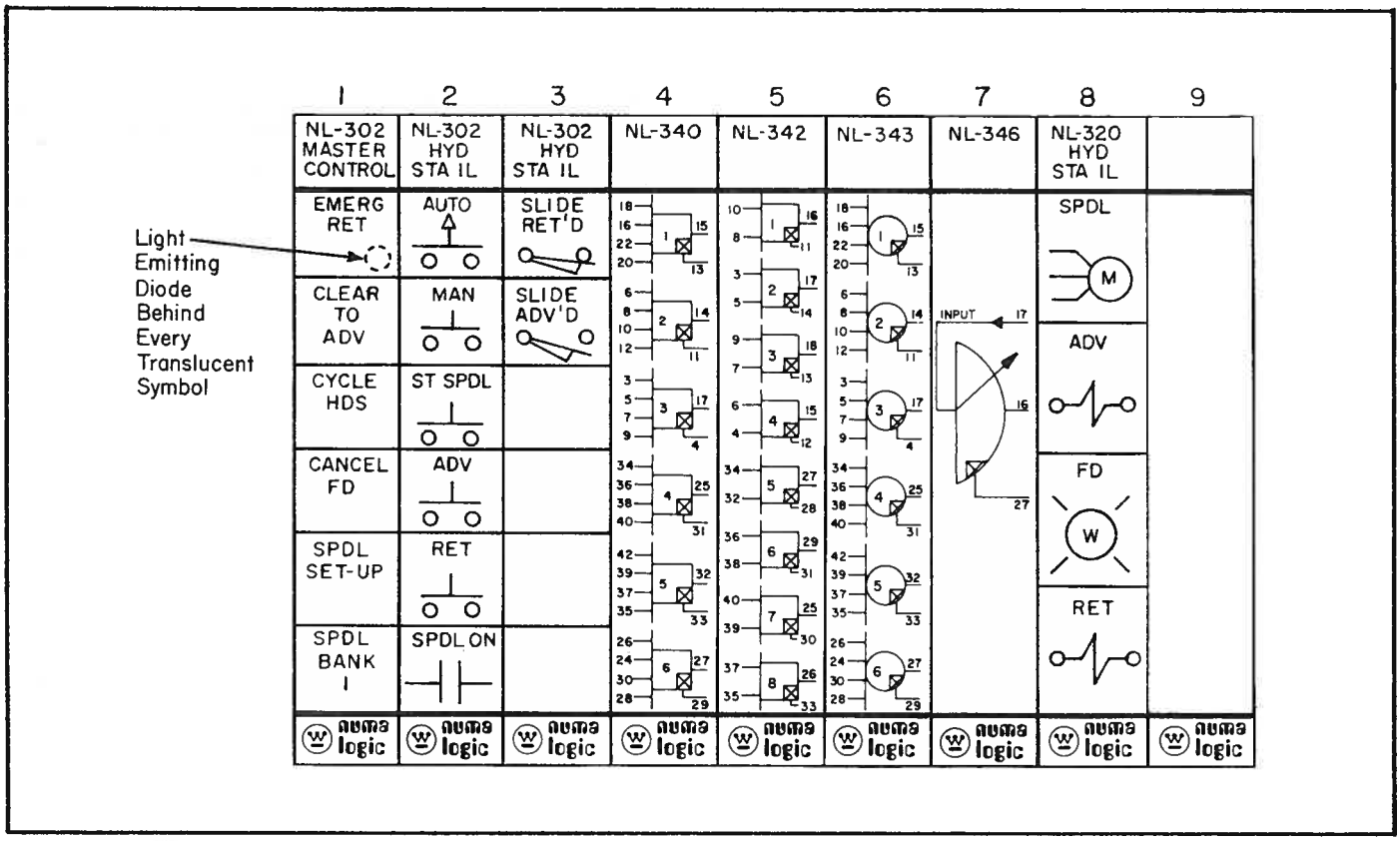

Figure 5-1: Module pictorial display for typical unit.

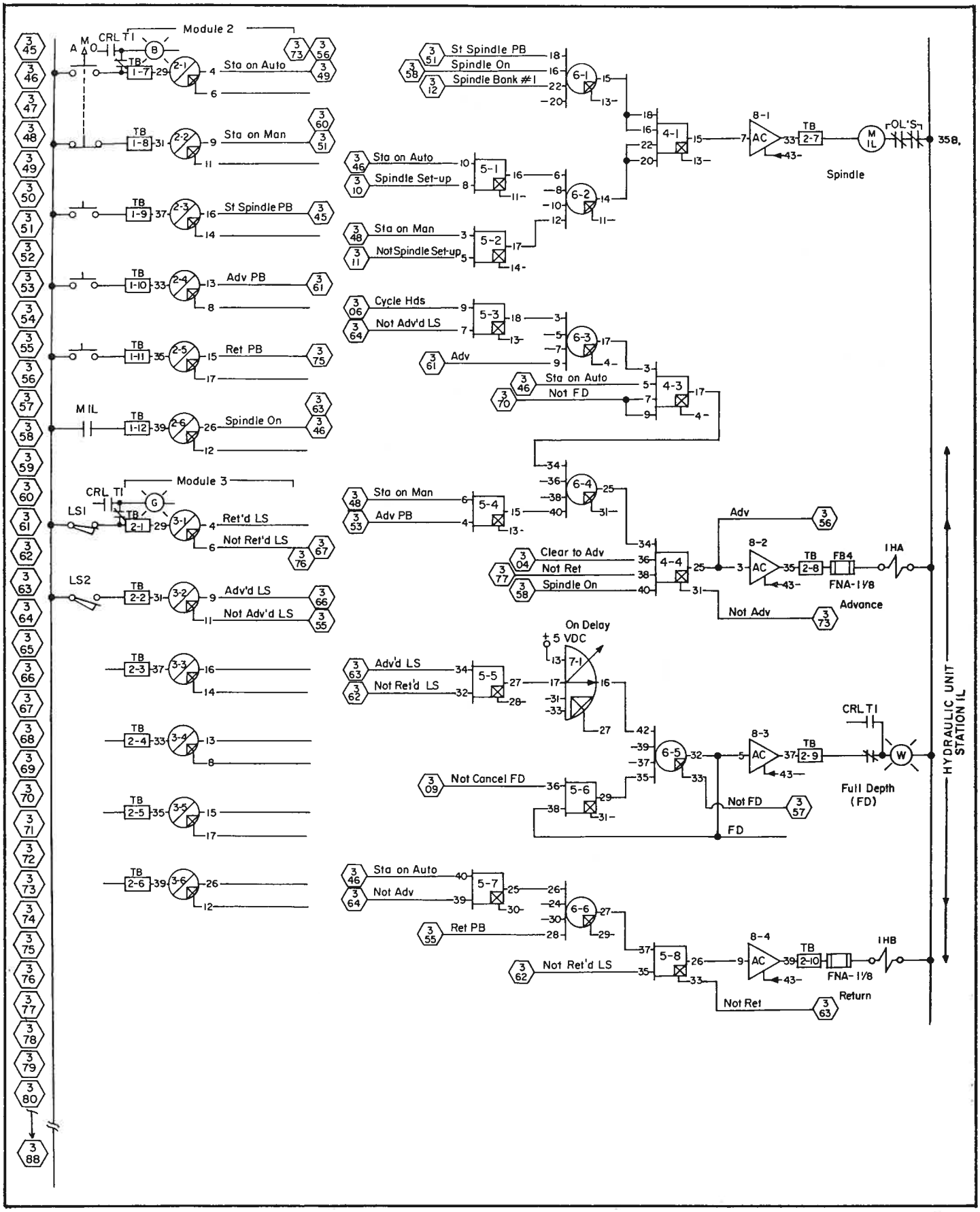

Figure 5-2: Solid state diagram for typical hydraulic unit.

There are many ways to use Numa-Logic's 300 Series troubleshooting features, but best results will be obtained if a specific sequence of steps is followed as described below. The same sequence can be used for initial machine start-up or on-line troubleshooting.

Troubleshooting Sequence

STEP 1. Examine the machine and determine which function is inoperative. Normally, this is the next function that is scheduled to be performed at the time the machine stops. Note the associated pilot device.

EXAMPLE: In the circuit shown in Figure 5-3, the Advance Unit solenoid should be energized. (Unit in Auto Mode).

STEP 2. Visually check the LED on the solid state AC output element that drives the inoperative pilot device.

EXAMPLE: LED on card 8-circuit 2 (8-2).

STEP 3. If the LED is on, check the output pilot device; in this case the Advance solenoid, for an open circuit failure and replace if faulty.

STEP 4. If the output device is okay, check for a defective panel fuse (FB4) and/or a connection problem between the rack terminal (2-8) and the pilot device (solenoid).

STEP 5. If the LED is off (from step 2), start on the right side of the schematic (shown below) at the AC output device (8-2) and trace the circuit backward toward the left. As you come to each solid state element in order, check to see if the LED is on or off depending on whether the true or NOT output qualifies the input.

When you find the first qualifying signal, stop. Discontinue following that path and return to the solid state element that it feeds. Select another input and trace back in the same manner to determine if that input is qualified. By proceeding in this way it is easy to isolate the inoperative input pilot device or faulty solid state element.

EXAMPLE: 4-4 LED is off, and element 6-4 LED is off. In following the procedure, the next element in line is 5-4 or 4-3. Since 5-4 is a manual function and the unit is in the Auto Mode, element 4-3 is the path to follow.

Element 4-3 LED is off and element 6-3 is off. In viewing the diagram, it is noted the input on pin 9 of element 6-3 is a seal path around the gate 5-4 and is not required until the Advance signal is present. Element 5-3 is then our next suspect.

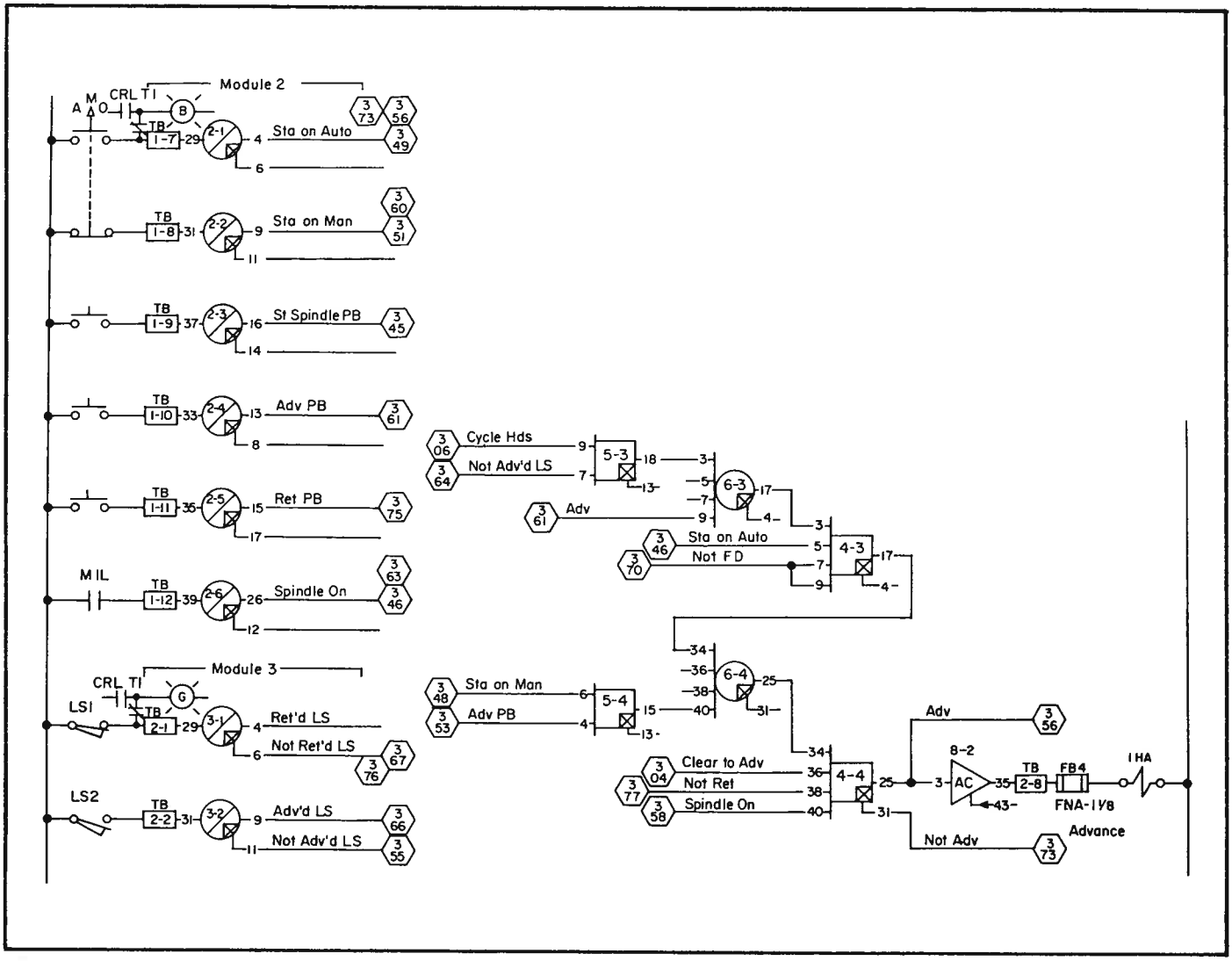

Figure 5-3: Solid state diagram for typical solenoid operation.

Element 5-3 LED is off. In order to qualify 5-3, both inputs must be present. LED on element 3-2 is on, indicating the input to pin 7 of element 5-3 is not qualified. Since the LED on 3-2 is on and a NOT output is required, the Advance limit switch should be checked. If a check of the limit switch indicates it to be defective, it should be repaired or replaced. In the event the limit switch checks out okay, power down and replace the AC input interface module (Module 3) with a good spare.

Logic Trainer/Tester (NLT-303)
This unit can be used for module testing, training, demonstrations nd circuit prototyping. It contains a nine module rack with five modules (NL-302L, NL-341L, NL-342L, NL-344L and NL-320L) and plug-in jumpers for programming. Each module has inputs and outputs brought out to the test jacks on the faceplate. Pins for blank slots are wired to the plate allowing any module to be inserted in those positions.

Programming is accomplished by inserting plug-in jumpers between jacks.

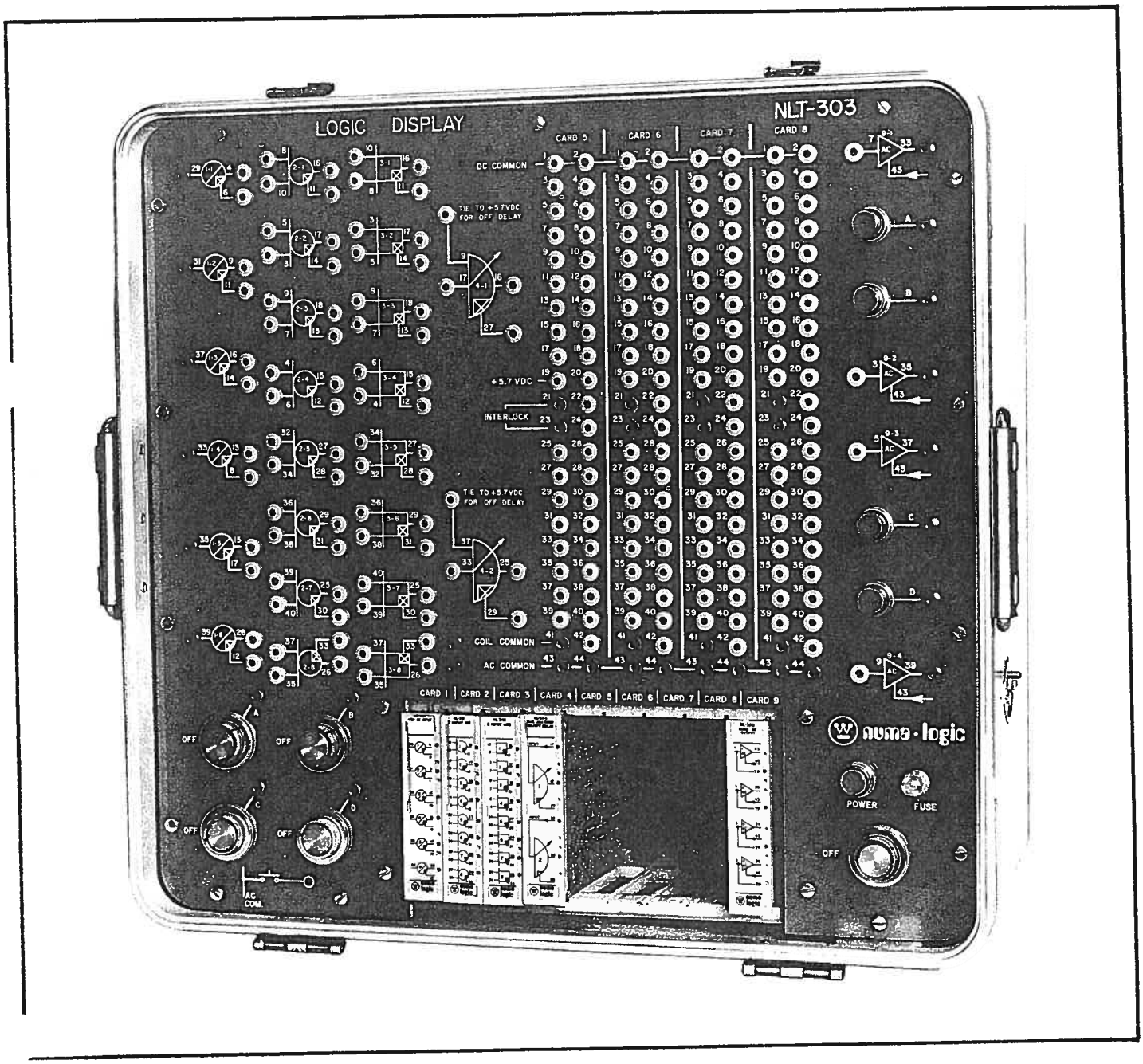

Figure 5-4: Logic trainer/tester.