Westinghouse

numa·logic

# MULTIPLEXED REGISTER OUTPUT MODULE

## Catalog No. NL-754

PERFORMANCE DATA

| | |
|---|---|
| Circuits per Module | 8 or 16 (switch selectable) |
| I/O Rack Positions Req'd. | 2 |
| Data Outputs | TTL compatible high/true logic |
| Fan out | 26 standard TTL loads |
| Output Voltage Range (max.) | -0.5 to +5.5 VDC |
| Output OFF Voltage | 0 to +0.4 VDC<br>41.6 mA sink |
| Output ON Voltage | Open collector with 1K pull up to +5.0 VDC |
| Select Outputs | TTL compatible low/true logic |
| Fan out | 10 standard TTL loads |
| Select Voltage Range (max.) | -0.5 to +5.5 VDC |
| Select OFF Voltage | +2.4 to +5.0 VDC<br>400 $\mu$A source |
| Select ON Voltage | 0 to +0.5 VDC<br>16 mA sink |
| Power Requirement | 1 unit, Output Power Supply<br>185 units (max.), Logic Power Supply (120 units typical)<br>1 external power supply |
| Opto Isolation | 2500 VDC |
| Temperature Rating | 0° to 60°C<br>32° to 140°F |
| Humidity Rating | 0 to 95% noncondensing |
| Keying Slots | Between pins:<br>11 and 13<br>27 and 29 |

INTRODUCTION

The 16-bit Multiplexed Register Output Module is a microprocessor-based, multiplexing, 4-digit BCD device capable of driving up to 16 TTL-compatible field devices such as LED displays. The Module outputs 16 lines, or "bits," of data to each device over a single data bus. In addition, the Module converts into BCD format the binary data supplied from individual output registers by the Processor. It then outputs the data to up to 8 or up to 16 field devices.

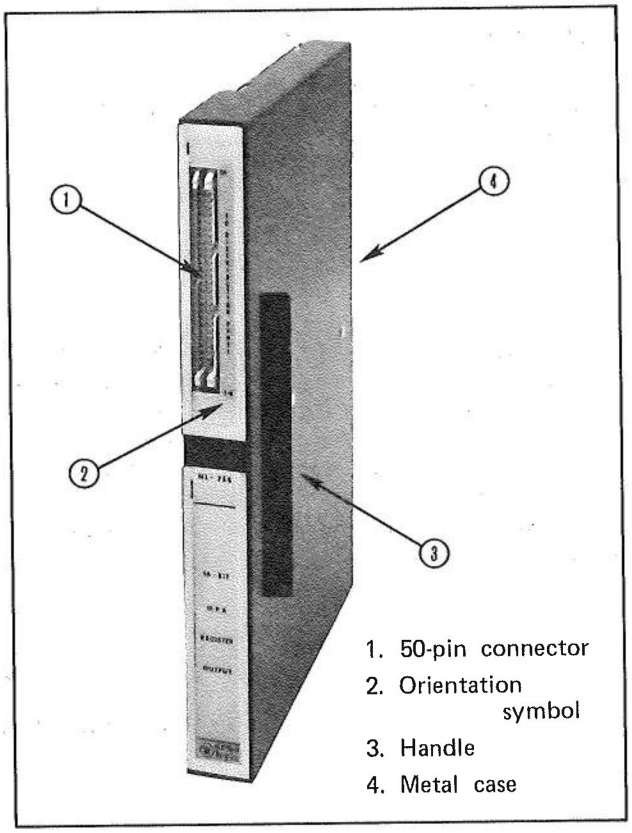



**Figure 1 — Multiplexed Register Output Module**

The 16 data outputs are TTL-compatible, high/true, fan out of 26. Together they form a 16-bit data input bus that carries the BCD data.

The Module also provides selection output signals that determine which of the field devices is to transmit on the data bus at a given time. The 16 select outputs (SEL1 thru 16) are TTL-compatible, low/true, fan out of 10.

All outputs are optically isolated from the Processor.

The Module is a "double height" type. Recommended field wiring to it is by means of a cable/connector assembly available from Westinghouse. Also available are LED Readouts, a quick-connect Distribution Panel and an external power supply. Together, these units offer fast installation without labor-intensive procedures. See Table A for more information and refer to Figure 2 where all of these devices are shown in relation to each other. (Alternately, users may wire to the Module, but proper procedures must be followed and restrictions must be observed.)

For proper operation of the Module, an external power supply is required. (See Application Note 2.)

Since connection is made directly on the Module, no Terminal Identification Strips are supplied. The Module's Lenses are supplied without symbols.

## INSTALLATION

**Proper Sequence** – This installation procedure is divided into two distinct parts. First, install, connect or wire all external field devices, but do not make any connection at the Module's 50-pin male connector. Second, after AC power can safely be applied to the entire system, voltage measurements must be taken before connecting to the Multiplexed Output Module. (This phase can be part of the start-up procedure.)

CAUTION

Make connections with the Multiplexed Output Module **only** after the electrical measurements, described later, have been made. Equipment damage can result if this sequence is not followed.

**Wiring** – These procedures assume that all the items available from Westinghouse and listed in Table A are being used in conjunction with the Module. If users choose to select other devices, they are responsible for making up their own installation procedures. Use the steps listed here when and if they apply. Refer also to Direct Connections later in this publication.

Note that the following installation steps assume that all other devices that make up the multiplexing system are already installed. Follow procedures detailed in Instruction Leaflets supplied with each Westinghouse device.

**Step 1** – Refer to the system drawings and determine the exact I/O Rack Positions in which the Module will be placed. (See Figure 4 for an explanation of "position.") Use a screwdriver to remove the terminal block adjacent to the top half of the Module. (It cannot be installed if the block remains in place. See Figure 3.)

**Step 2** – Confirm the exact Positions the Module will occupy in the I/O Rack. (Although the Module can be placed in either the upper 2 Positions or the lower 2 Positions, it may not straddle Positions B and C. See Figure 4.) It is important that it be placed according to the user program Reference Number scheme.

**Table A**

**OPTIONAL RELATED DEVICES ①**

| Device | Catalog No. | Length (ft/m) | Publication ② |
|---|---|---|---|
| 4-digit LED Readout (with storage latch) | NLR-714 | - | 15715 |
| Readout Interface Board/Cable | NLRB-718A<br>NLRB-718B | 5/1.5<br>10/3 | 15716 |
| Distribution Panel | NLDP-708<br>NLDP-716 | - | 15658 |
| Distribution Panel Cable ③ | NLC-10DP<br>NLC-20DP<br>NLC-30DP | 10/3<br>20/6<br>30/9 | 15717 |

① This listing represents all optional items Westinghouse offers to complete a multiplexing input system.

② These numbers identify Instruction Leaflets that explain each device.

③ Do not use NLC-40DP Cable for this application since its length causes excessive voltage drops.

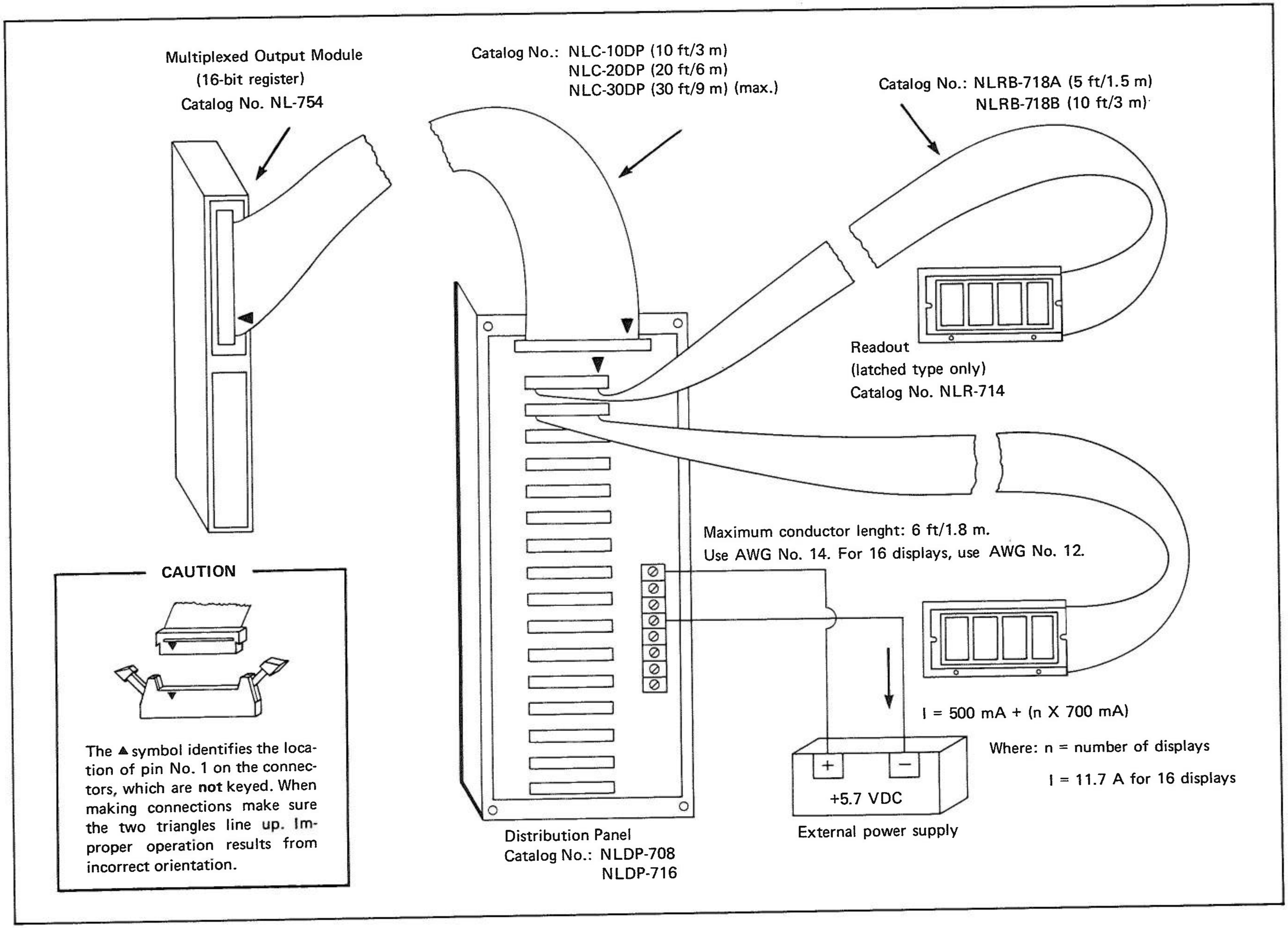



**Figure 2 – Overall Relations of Devices**

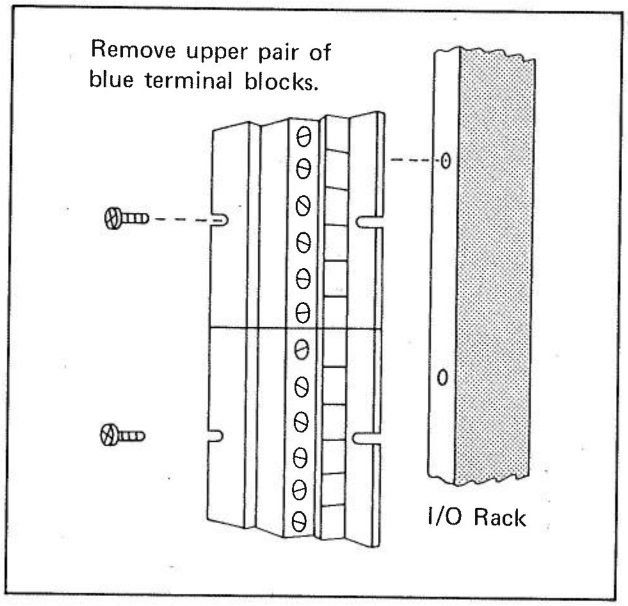



**Figure 3 — Terminal Block Removal**

**Step 3** — Move the Locking Bar on the I/O Rack's built-in terminal block to the left to uncover the guide slots on the block. (See Figure 5.)

**Step 4** — Align all of the Module's guide pins with corresponding slots on the I/O Rack. Gently press the Module into the edge connector on the Rack. Make sure the edge pins on the Module align and mate with the Rack connector.

**Step 5** — When the Module is properly seated, snap the Rack's Locking Bar over the Module's guide pins in order to hold it in place.

**Switch Settings** — In order to complete the installation of the Module, it is necessary to physically set individual rocker switches on the I/O Rack and the Module. Their combined function is to electronically identify each field device's input with a Reference Number required for programming. This explanation is detailed only to the level required by the installation team. (For further details, see the PC-700 and PC-900 Application Manuals and, also, Instruction Leaflet 15718.)

**Step 6** — On the I/O Rack in which the Module is placed, locate the Rack Switch assembly. It is located at the top right-hand side. (See Figure 4.)

**Step 7** — Place all 12 of the rocker switches on the assembly in the OFF position. (This setting assumes that **only** Multiplexed Modules are in the Rack. If other types of Modules are used in the remaining positions, see Application Note 1.)

**Step 8** — Another rocker switch assembly is located near the rear edge of the Module. (See Figure 6.) It may be necessary to remove the Module from the Rack to see it.

It is necessary to set these switches according to output registers associated with this Module. Note that the Module can be set to accept up to 8 or up to 16 field device inputs.

**Step 9** — Locate a list that relates field devices with directly corresponding Reference Numbers. The system drawings should show them. If not, contact the design engineer or programmer. The switches cannot be set without the list.

**Step 10** — Identify all the Reference Numbers used with the Module. Relate these to Table B. Determine which switches are to be set to the OPEN/OFF position.

**Step 11** — Set the Module Switches as indicated in the Table.

Note that the Module Switch assembly is not marked ON/OFF. The OFF position is marked OPEN on the top of the assembly. The CLOSED/ON position is nearer the printed circuit board.

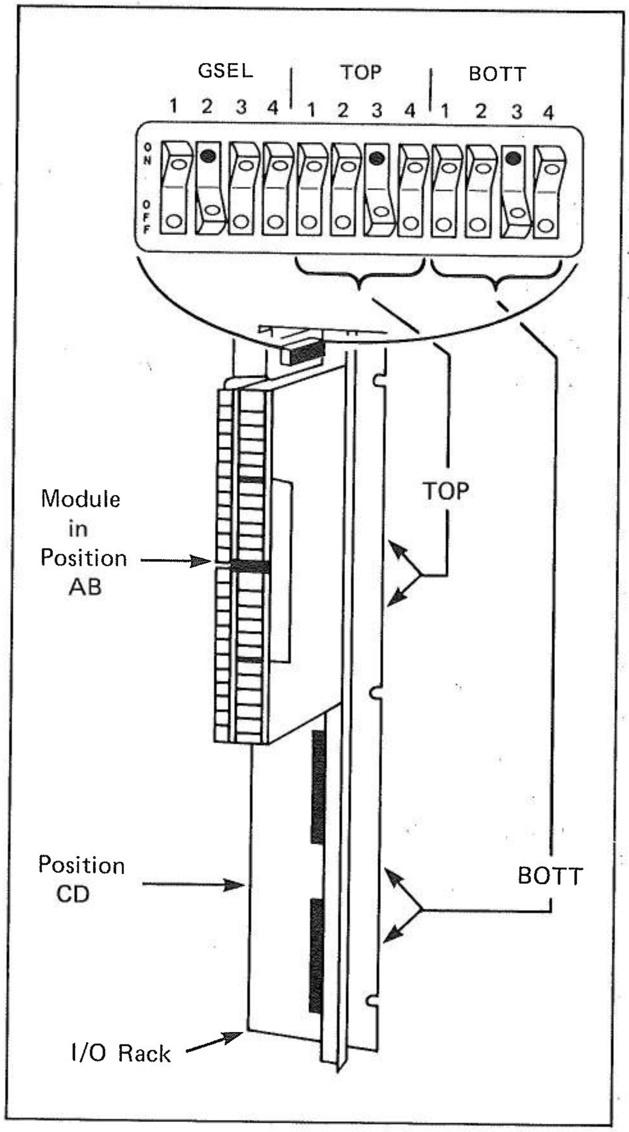



**Figure 4 — Rack Switch Location**

Example: output registers OR0009 thru 0016 are assigned to a given Multiplexed Output Module. What switch or switches should be set? Answer: put switch 2 in the OPEN/up position. (All other switches are to be in the CLOSED/down position.)

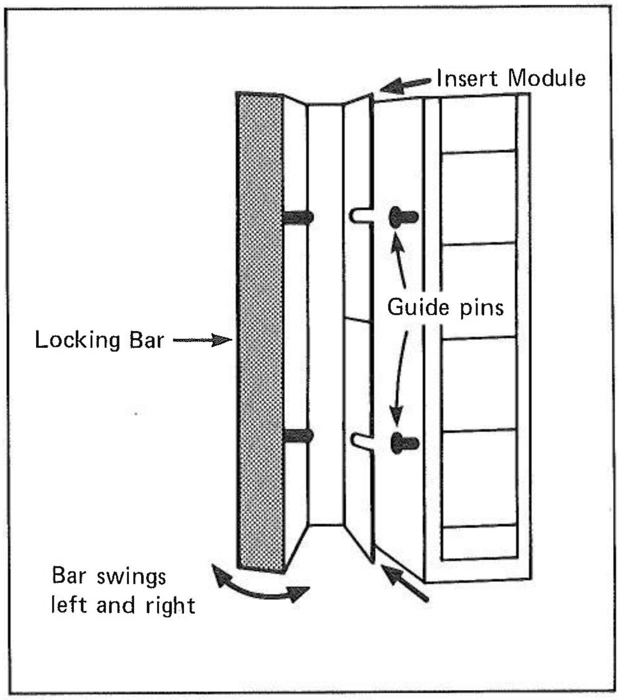



**Figure 5 – Guide Slots**

**Voltage Measurements** – Once the AC line power can be safely applied to the system, a number of voltage measurements must be taken to assure that the external power supply is outputting within a range that is acceptable to the Module. A digital voltmeter is required.

**CAUTION**

Do not connect the Distribution Panel Cable to the Module at this time. Damage could occur due to improper voltage levels.

**Step 12** – Locate pin 2 (+5.7 VDC) and pin 16 (COM) on the connector of the Distribution Panel Cable. (See Figure 7.) Use a digital voltmeter to adjust the external power supply output voltage for +5.7 VDC (±0.05 V).

**Step 13** – De-energize the system, including the external power supply.

**Step 14** – Connect the Distribution Panel Cable with the 50-pin male connector on the Module. Orientation is important! Be sure the molded plastic triangles on the connector and on the Module's Lens line up. (See Figure 8.)

**Step 15** – Energize the system and measure the voltage between terminals 1 (Vcc) and 4 (GND) on TB1 of the Distribution Panel. (See Figure 9.) Terminal 1 should be positive with respect to terminal 4.

**Table B**

**MODULE SWITCH ASSEMBLY SETTINGS**

| Use: | If the Reference Numbers are: | Press OPEN ① Module Switch(es) ② |
|---|---|---|
| For up to 8 field devices | OR0001 thru 0008<br>OR0009 thru 0016<br>OR0017 thru 0024<br>OR0025 thru 0032 | 1<br>2<br>3<br>4 |
| For up to 16 field devices | OR0001 thru 0016<br>OR0017 thru 0032 | 1,2<br>3,4 |

① Switch assembly is marked CLOSED; opposite position is OPEN = OFF.

② Any other settings are illegal. If such are used, the Module sends out BCD 0000; all data outputs are low.

**Step 16** – Adjust the output voltage to +6.06 VDC (±0.02 V). This level is sufficient to compensate for the voltage drop in the circuit, but it will not damage the Module, assuming the circuit uses the items noted in Table A.

## DIRECT CONNECTIONS

It is possible to use the Multiplexed Output Module without the optional devices listed in Table A. However, the user assumes the responsibility for proper choice of equipment, wiring practices and overall caution. To assist with this process, a number of very general guidelines are listed here.

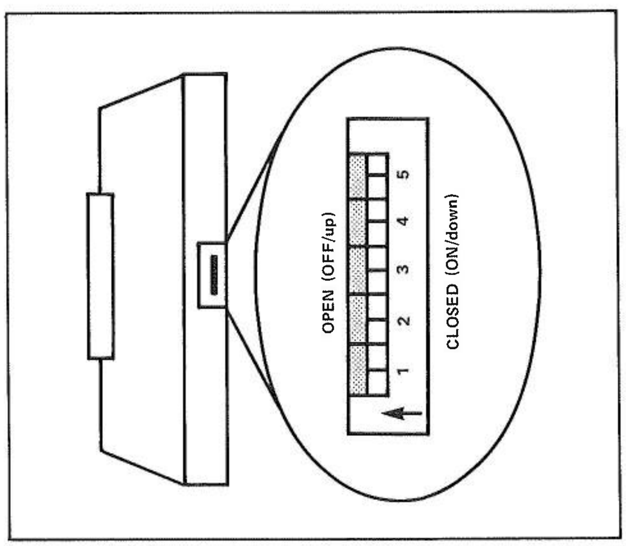



**Figure 6 – Module Switches**

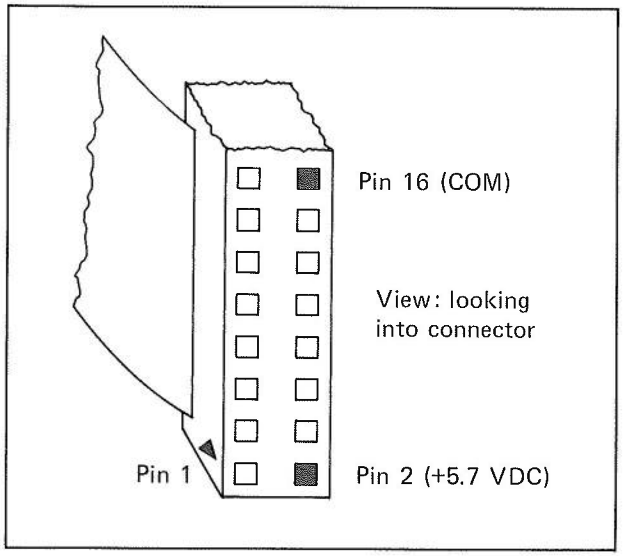



**Figure 7 — 50-pin Female Connector on Cable**

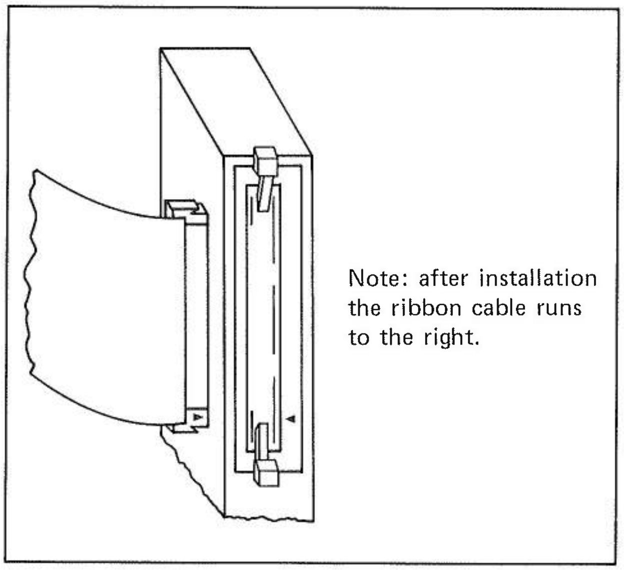



**Figure 8 — Proper Connector Orientation**

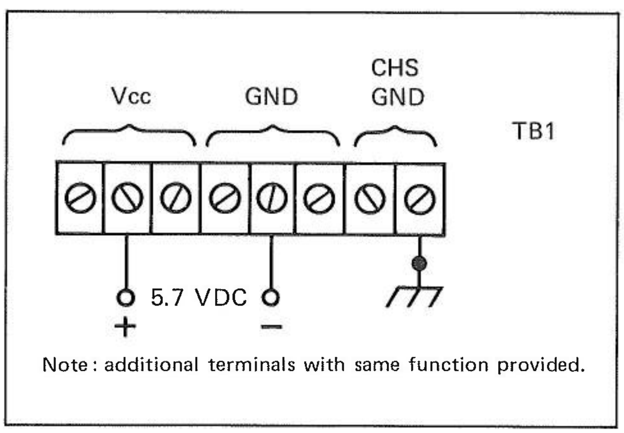



**Figure 9 — Distribution Panel, TB1**

**Guideline 1** — Read the installation steps listed earlier in this publication and use them as the basis of new procedures.

**Guideline 2** — Although the 50-pin male connector could be used for direct connection, it is strongly recommended that the proper socket (connector) be purchased to make a trouble-free connection. The proper 50-conductor shielded cable is also recommended. (See Table C.)

**Table C**

**PARTS LIST**

| Item Used: | Manufacturer | Part No. |
|---|---|---|
| Connector ("header") on Module | 3M | 3433-1002 |
| Connector ("socket") on Cable | 3M | 3425-6000 |
| 50-conductor ribbon Cable | 3M | 3476/50 |

**Guideline 3** — If a Westinghouse Readout assembly is to be used without other optional equipment listed in Table A, it is necessary to order a Catalog No. NLR-714 Readout. (Its built-in storage latch is required for multiplexing.)

**Guideline 4** — Follow the typical connection diagram shown in Figure 10. Also follow Figure 11 for connection at the Module end.

**Guideline 5** — The signal conductors must be shielded. Connect the shield to pin 50 of the male connector on the Module. (See Figure 11.)

**Guideline 6** — See Application Note 2 for power supply requirements. Observe Application Notes 2 thru 6 when selecting non-Westinghouse devices.

## APPLICATION NOTES

1. Switch settings noted in the Installation section of this publication are simplified because they assume only Multiplexing Modules are being used in an I/O Rack. However, it may be that other types of Modules—discrete or register—are also installed in the remaining Positions. If so, set the Rack Switches according to the needs of these Modules. (The Multiplexed Module continues to operate regardless of any—legal—settings.)

2. An external DC power supply is required to operate the Multiplexed Output Module. The Catalog No. NLPS-315, rated at 1.5 amperes, is acceptable and able to power 3 Modules. (For larger loads the -330 and -360 Supplies provide 3 and 6 amperes, respectively.)

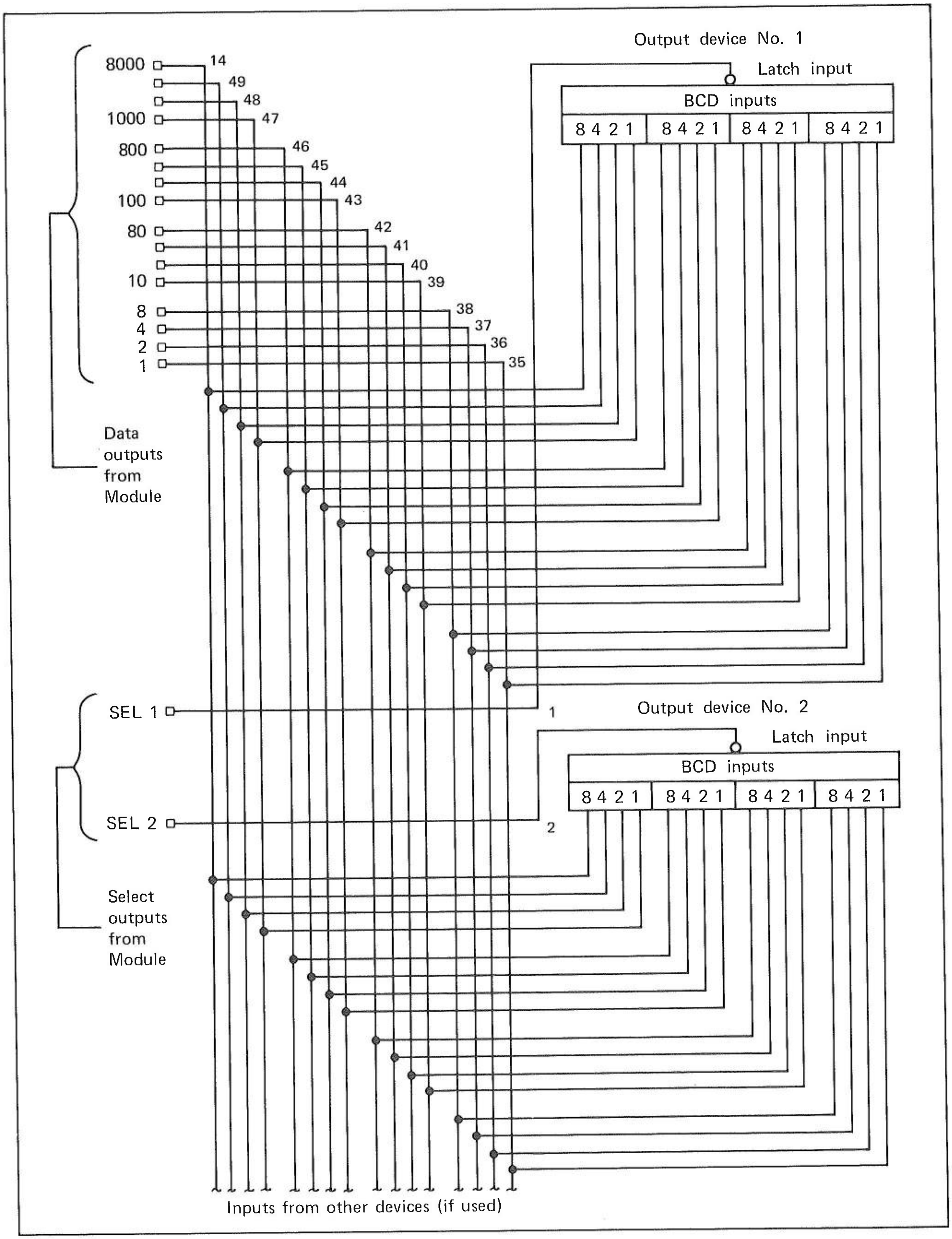



**Figure 10 – Typical Output Device Connections**

| Signal | Pin | Pin | Signal |
|---|---|---|---|
| Shield | 50 ① | 49 | BCD 4000 input (HI) |
| BCD 2000 input (HI) | 48 | 47 | BCD 1000 " " |
| BCD 800 " " | 46 | 45 | BCD 400 " " |
| BCD 200 " " | 44 | 43 | BCD 100 " " |
| BCD 80 " " | 42 | 41 | BCD 40 " " |
| BCD 20 " " | 40 | 39 | BCD 10 " " |
| BCD 8 " " | 38 | 37 | BCD 4 " " |
| BCD 2 " " | 36 | 35 | BCD 1 " " |
| Extend SEL (LO) | 34 | 33 | Not used |
| DC common – side of external 5.7 VDC power supply | 32 | 31 | SEL16 output (LO) |
| | 30 | 29 | SEL15 " " |
| | 28 | 27 | SEL14 " " |
| | 26 | 25 | SEL13 " " |
| | 24 | 23 | SEL12 " " |
| | 22 | 21 | SEL11 " " |
| | 20 | 19 | SEL10 " " |
| | 18 | 17 | SEL9 " " |
| | 16 | 15 | SEL8 " " |
| BCD 8000 input (HI) | 14 | 13 | SEL7 " " |
| +5.7 VDC + side of external 5.7 VDC power supply | 12 | 11 | SEL6 " " |
| | 10 | 9 | SEL5 " " |
| | 8 | 7 | SEL4 " " |
| | 6 | 5 | SEL3 " " |
| | 4 | 3 | SEL2 " " |
| | 2 | 1 ▲ | SEL1 " " |

▲ Pin No. 1 identifier

① Pin/conductor 50 is the shield, which is connected internally to DC common within the Module. No additional connection is required.

**Figure 11 — 50-pin Male Socket on Module**

The DC supply must be capable of providing +6.0 VDC (±0.25 V) and a current of 500 mA.

3. The external power supply must be connected to the **same** AC power line as the Processor. (This assures coordinated power-up and -down cycles. See Programming Notes 4 and 5.)

4. The Module outputs high/true data signals only. (That is, +2.4 to +5.0 VDC is a Logic "1.") If the field output device requires a low/true input, it is necessary to invert the outputs after they leave the Module. (This function cannot be performed in the Processor since the Module carries out the binary-to-BCD conversion.)

5. The Module's select (SEL) output signals to the field devices are low/true. (That is, 0 to 0.8 VDC is a Logic "1.") If the field device requires a high-level strobe or latch signal, the select line must be inverted after it leaves the Module.

6. The field device chosen must be capable of waiting until receiving a low SEL signal from the Module, at which time it can read the data signals on the bus. This is usually accomplished by means of a latched input on the device. (The Catalog No. NLR-714 Readout contains a storage latch that meets this requirement.)

7. The Module's inputs and outputs are not designed to meet the IEEE Surge Withstand Circuitry Standard.

## PROGRAMMING NOTES

1. The Multiplexed Output Module is not designed to be used with an I/O Update Immediate (UI) instruction.

2. Due to the required settings on the Module Switch assembly, it is necessary to assign input registers and Reference Numbers according to the groups listed in Table B. In other words, it would be unacceptable to use Reference Numbers OR0016 and OR0017 for individual field devices connected to a single Module. (Remember: 1 output register controls the 16 lines, or "bits," to 1 field device, and its signals are given unique Reference Numbers to identify it for the Processor.)

3. The relationships of output register numbers and select lines are shown in Table D.

4. If external power to the Module is lost, yet the Processor continues to operate, the outputs of the Module will be indeterminate—that is, unknown—even while

power is decaying. After power is restored, the outputs remain indeterminate until the Module has transmitted 1 complete data word of 16 bits. The time involved here is a range of 7.65 ms to 7.65 ms **plus** 1 Processor scan time.

5. If AC power to the Processor is lost, yet the external supply continues to power the Module, the Module stops normal operation. The outputs maintain valid voltage levels, but their data will be indeterminate.

6. Data contained in the output registers assigned to this Module must be in binary form since a binary-to-BCD function is performed on the Module. Normally this is the case; however, in certain circumstances user programs may call for BCD data in a register. If so, use the DB Conversion instruction before outputting to the Module.

7. The data in the output registers assigned to the Module must be within the range that can be represented by a 4-digit BCD number: 0000 thru 9999.

Normally an out-of-range condition does not occur since the Processor's arithmetic functions are limited to this range. However, it may occur if bit 15 or 16 happened to be set by a Bit Set (BS) instruction.

Should this nonlegal situation occur, the Module converts the 16-bit binary number from the output register to its equivalent BCD number and goes on to form a 4-digit output in which display segments contain incorrectly shifted digits. (If a Catalog No. NLR-715 Readout, with storage latch, is used, the letter E will show as a prefix.)

8. When AC power is applied to the Processor, the Module's outputs will be at an indeterminate state throughout the period when both of these units complete their power-up cycles. This requires between 1 and 2 seconds. The state continues until 1 I/O scan after the Processor completes its power-up cycle. This requires between 4.1 and 80 ms, depending on the size of the system.

9. The system response time is, to a certain extent, a variable. (System response is defined as the amount of time required, after a change of data in the output register, for a corresponding change to be transmitted from the Module's outputs.) It can be computed as a best-case minimum or as a worst-case maximum.

minimum time =

| | |
|---|---|
| output circuit response: | 0.1 ms |
| I/O update time (min.): | 3.0 ms |
| binary-to-BCD time (min.): | 4.0 ms |
| total: | 7.1 ms |

maximum time @

| | |
|---|---|
| output circuit response: | 0.1 ms |
| 1 Processor scan time: | 10.0 ms/1K |
| I/O update time (max.) | 12.5 ms |
| 1 Module scan (max.): | 630.0 ms |
| total: | 652.6 ms |

Note: this may be greater with a larger memory. Also, see Programming Note 12.

10. Since the Module transmits data to the field devices one at a time, a 16-output cycle may not meet the needs of the application. It is possible to use 2 Modules, each connected to up to 8 devices in order to decrease the time.

Alternately, in cases where high-speed outputting is required, the Catalog No. NL-753 Register Output Module may be used.

Table D

DEVICE-REGISTER ASSIGNMENT RELATIONS

| Groups ① | Select Outputs in Relation to Output Register Assignments | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Output Registers: | SEL1 | SEL2 | SEL3 | SEL4 | SEL5 | SEL6 | SEL7 | SEL8 | SEL9 | SEL10 | SEL11 | SEL12 | SEL13 | SEL14 | SEL15 | SEL16 |
| OR0001 - 0008: | 0001 | 0002 | 0003 | 0004 | 0005 | 0006 | 0007 | 0008 | | | | | | | | |
| OR0009 - 0016: | 0009 | 0010 | 0011 | 0012 | 0013 | 0014 | 0015 | 0016 | | | | | | | | |
| OR0017 - 0024: | 0017 | 0018 | 0019 | 0020 | 0021 | 0022 | 0023 | 0024 | | | | | | | | |
| OR0025 - 0032: | 0025 | 0026 | 0027 | 0028 | 0029 | 0030 | 0031 | 0032 | | | | | | | | |
| OR0001 - 0016: | 0001 | 0002 | 0003 | 0004 | 0005 | 0006 | 0007 | 0008 | 0009 | 0010 | 0011 | 0012 | 0013 | 0014 | 0015 | 0016 |
| OR0017 - 0032: | 0017 | 0018 | 0019 | 0020 | 0021 | 0022 | 0023 | 0024 | 0025 | 0026 | 0027 | 0028 | 0029 | 0030 | 0031 | 0032 |

① These groups correspond to Table B.

11. It is possible that output register data that changes before the maximum response time has elapsed may not be output from the Module.

12. Data is valid for 2 ms before the SEL line goes low and for 2 ms after it changes to high. This allows for direct connection to most positive-edge sensitive, negative-edge sensitive, or low-level sensitive strobe or latch inputs.

13. The Module transmits data, along with select signals, in a fixed numerical order until it has addressed all fixed devices connected to it. (This could be up to 8 or up to 16.) The Module then waits for the Processor's next I/O update, when it reads new data, if any. At that time it again transmits to the field devices. (See Figure 13.)

14. The SEL signal is normally on the data bus for 2.6 ms. There may be some field devices which require extended select signal times for proper reading. This is possible. Contact Westinghouse's Numa-Logic Applications Engineering Group.

## FUNCTIONAL THEORY

**Power Requirements** — Regardless of whether the PC-700 or PC-900 Processor is used, the Module's "processor" circuitry uses 185 units (maximum) of power from the Logic Power Supply. (The power used for the field side of the Module originates in the +5.7 VDC external power supply.)

To achieve coordinated operation during power-up and -down phases, both the external power supply and the Processor should be connected to the same AC line.

**Power Up, Down** — During the Processor's power-up cycle, the outputs of the Module are indeterminate—that is, unknown—because they are optically isolated from the Processor. After about 1 to 2 sec. the power-up cycle is complete, and the Output Power Supply is energized, thereby enabling the opto isolators and, in sequence, the Module's outputs. Even then the outputs remain indeterminate until the Module has transmitted 16 bits of data which is about 4 to 80 ms after the Processor enters the Run mode.

When power is removed from the Processor, it detects it and stops its scan of the user program before incorrect operation can occur.

As the power to the Module decays, the outputs pass through an indeterminate period until the voltage drops to zero.

## MAJOR CIRCUIT COMPONENTS

**General** — This discussion, and those that follow, need not be read in order to install the Module. Because of the critical-time element frequently involved in process control, the information may assist the programmer.

Multiplexing, or the sharing of a single data bus in order to output data to a number of field devices, is a process that repeatedly transmits signals in a cyclical manner. The process may be thought of as a "scan time," or "cycle time" factor which is 630 ms, maximum, for this Module with 16 devices. There are 3 major components, as shown in Figure 12. These are:

- Data buffer
- Data converter
- Output multiplexer

**Data Buffer** — The data buffer is an on-board memory that has 2 functions:

- To read only the data from the output registers that are actually assigned to the individual Module, as set on the Module Switch
- To serve as a buffer memory between the Processor and the output multiplexer

The Processor and output multiplexer operate at different rates. During the Processor's I/O update cycle, new output status is sent to the Multiplexed Output Module in quick bursts that are too rapid for the multiplexer. The time varies from 3 to 12 ms, depending on the number of I/O points in the system and the number of output registers assigned to the Module. The buffer memory allows the temporary storage of data while transmission to the field devices is completed. (Depending on Module Switch settings, either 8 or 16 16-bit lines are sent to the Module.)

**Data Converter** — The data converter changes the 16-bit binary data stored in the I/O buffer memory (that is, on-board memory) to 4-digit BCD data. As each group of 16 bits is transferred into it, the converter determines whether it can be represented by a decimal number within the range of 0000 thru 9999. If the data is within range, the conversion to BCD occurs and is output. (For more information, see Programming Note 7.)

**Output Multiplexer** — The output multiplexer controls device selection and output signal transmission. Specifically, it commands, in progressive order, data to be sent to each connected field device. Since up to 16 field output devices are connected to a 16-line data output bus, it is necessary to output to individual devices in an orderly fashion. To effect this arrangement, the Module also outputs 16 separate select signals (SEL1 thru 16) to command a specific device to accept new data. The order is a numerical progression from 1 thru 16, and all 16 devices are selected each cycle, unless 8 are switch selected.

The time required for this function is between 75 and 156 ms, depending on the number of output registers assigned to the Module. (See Figure 12 for an end-of-cycle variable.)

Note that there may be a waiting period between the output multiplexer completing its transmission and the beginning of the next I/O update cycle. This may be as

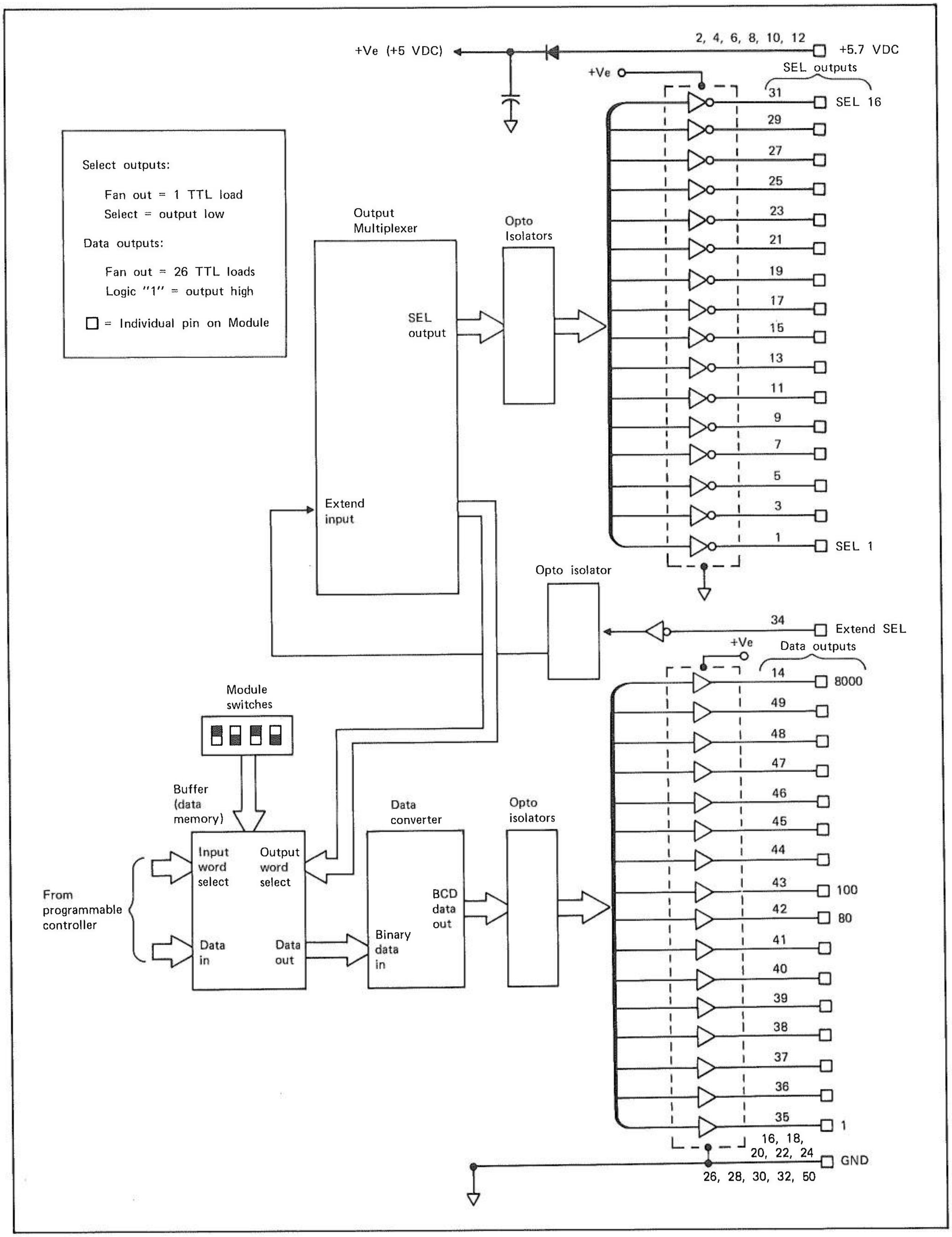



**Figure 12 — Output Circuit (simplified)**

little as no time under ideal conditions to as long as 1 Processor scan time, or 10 ms for each 1K of memory. (Typically it is 10 to 60 ms.)

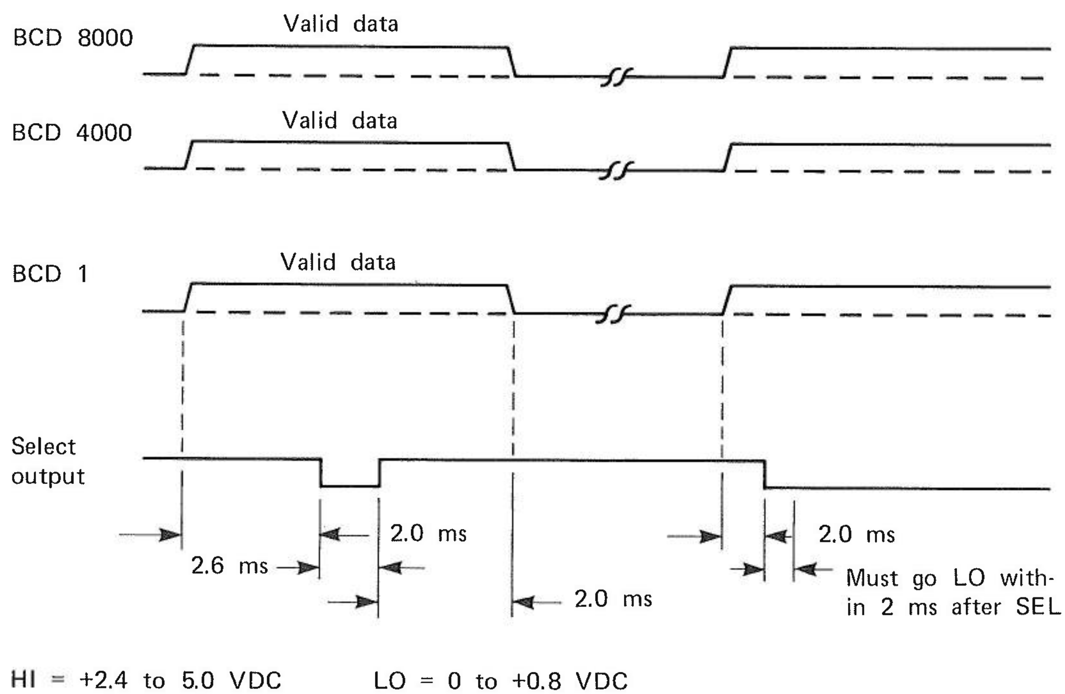
All times noted in this discussion can vary ±10%.

## TIMING

A timing diagram for output data is shown in Figure 13(a). Note that data is valid for 2 ms before and after the SEL signal for a given device goes low. It remains low for 2.6 ms. Thus data is assumed valid for 6.6 ms.

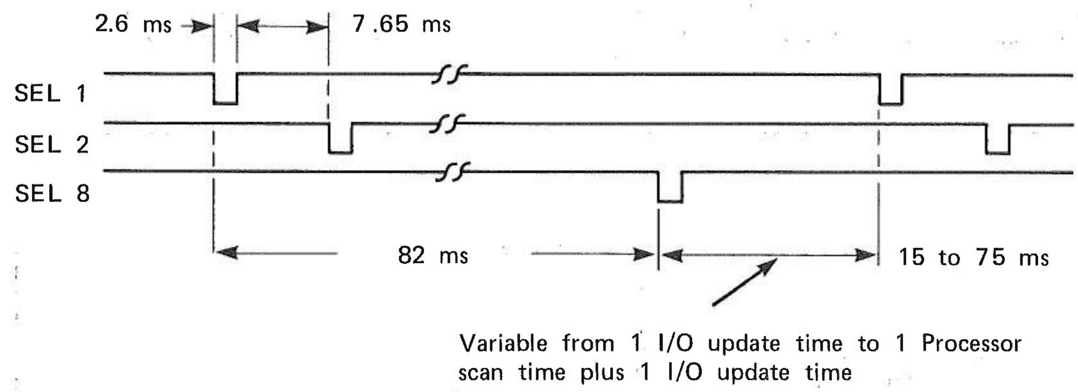
Timing diagrams for both 8 and 16 SEL signals are shown in Figure 13(b) and (c), respectively. Because of the I/O update times and the Processor scan time, there is a variable among complete cycles.

All times vary ±10%.

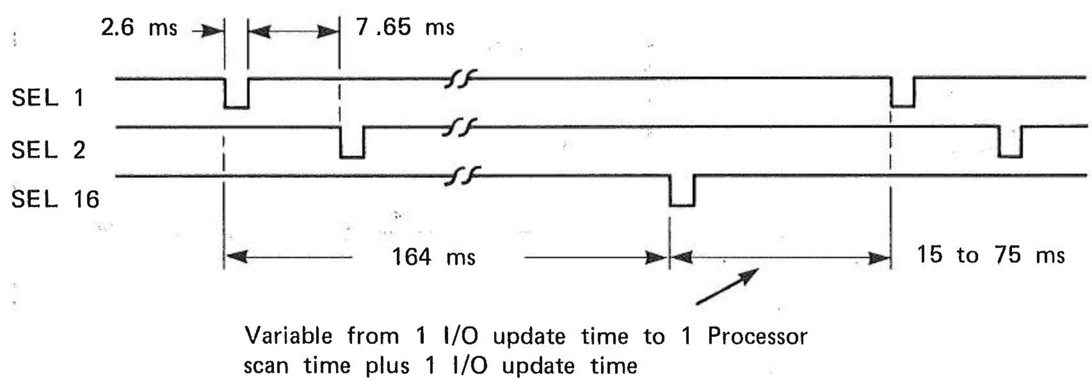



a) data outputs

**Figure 13 – Module Timing Diagram**




b) 8 select outputs




c) 16 select outputs

**Figure 13 – (cont'd.)**

## CIRCUIT DESCRIPTION

A simplified schematic of a typical BCD data output circuit is shown in Figure 14(a). Note that the outputs are high/true and are directly TTL-compatible and 5 VDC CMOS compatible. The driver output rating is: low = 0 to +0.4 at 32 mA sink.

A highly simplified select output circuit is shown in Figure 14(b). It is directly TTL-compatible and CMOS compatible. The output is low/true logic; low = 0 to +0.5 VDC; high = +2.4 to +5.0 VDC.

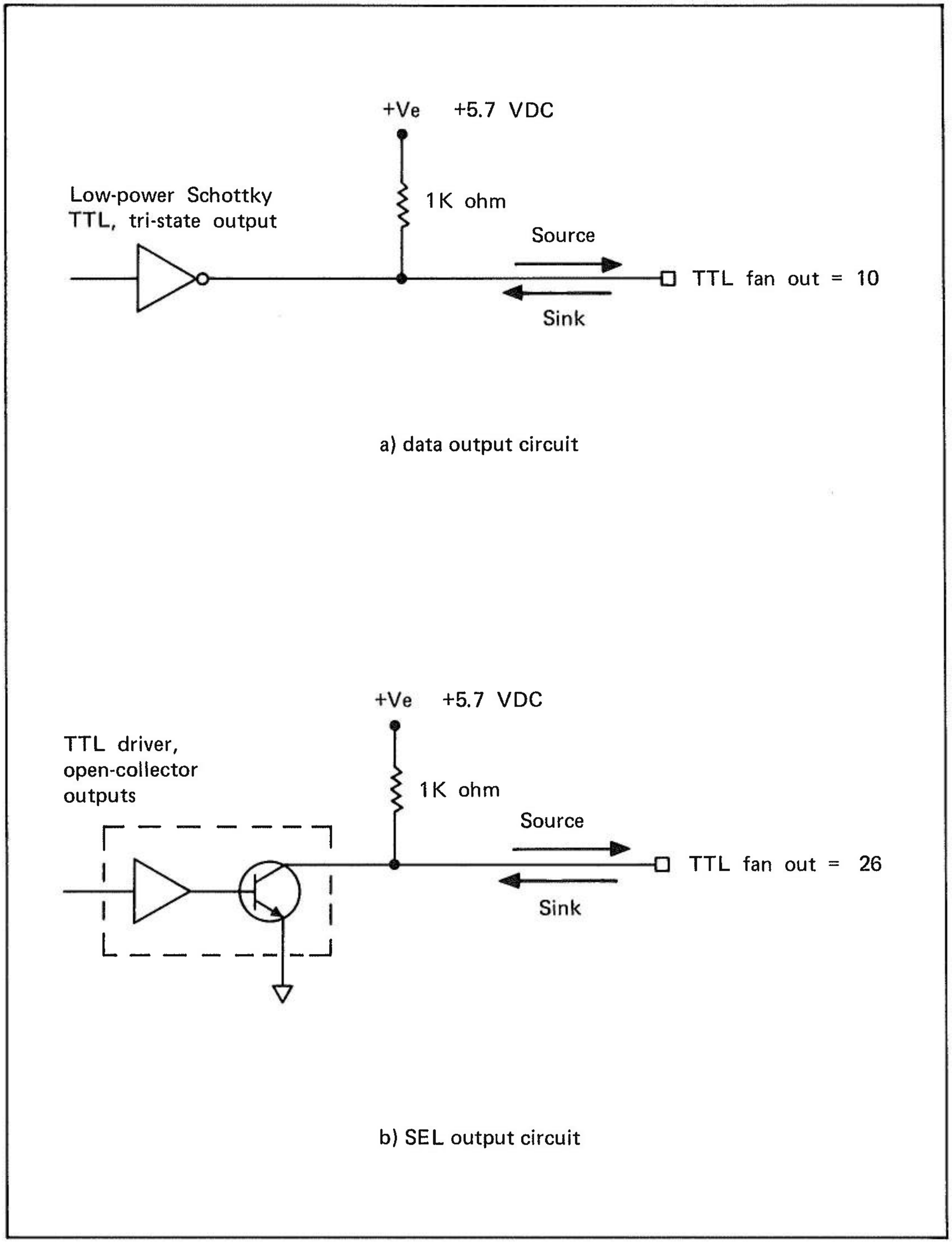



**Figure 14 — Schematic Diagram (simplified)**

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