5 V - 24 VDC Output Module

M/N 57C420

Instruction Manual J-3633-2

RELIANCE ELECTRIC

The information in this user's manual is subject to change without notice.

WARNING

THIS UNIT AND ITS ASSOCIATED EQUIPMENT MUST BE INSTALLED, ADJUSTED AND MAINTAINED BY QUALIFIED PERSONNEL WHO ARE FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF ALL EQUIPMENT IN THE SYSTEM AND THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

WARNING

UNEXPECTED MACHINE MOVEMENT MAY BE THE RESULT OF INSERTING OR REMOVING THIS MODULE OR ITS CONNECTING CABLES. POWER SHOULD BE REMOVED FROM THE MACHINE BEFORE INSERTING OR REMOVING THE MODULE OR ITS CONNECTING CABLES. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

CAUTION

THIS MODULE CONTAINS STATIC-SENSITIVE COMPONENTS. CARELESS HANDLING CAN CAUSE SEVERE DAMAGE.

DO NOT TOUCH THE CONNECTORS ON THE BACK OF THE MODULE. WHEN NOT IN USE, THE MODULE SHOULD BE STORED IN AN ANTI-STATIC BAG. THE PLASTIC COVER SHOULD NOT BE REMOVED. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT.

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1.0 INTRODUCTION

The products described in this instruction manual are manufactured or distributed by Reliance Electric Company or its subsidiaries.

This 5 V - 24 VDC Output Module will drive a maximum of 32 low level DC output signals. The output signal voltage ranges from 5 volts through 24 volts. An individual output may drive as much as 750 mA. Output signals have 5000 volt isolation to logic common. The module contains 8 isolated commons, each having 4 outputs.

Typically, this module is used to output on/off signals to devices such as LED displays, pilot lights, and DC relays.

This manual describes the functions and specifications of the module. It also includes a detailed overview of installation and servicing procedures, as well as examples of programming methods.

Related publications that may be of interest:

- J-2611 DCS 5000 Product Summary
- J-3600 DCS 5000 Enhanced BASIC Language Instruction Manual
- J-3601 DCS 5000 Control Block Language Instruction Manual
- J-3602 DCS 5000 Ladder Logic Language Instruction Manual
- J-3629 DCS 5000 Remote I/O Instruction Manual
- J-3630 ReSource AutoMax Programming Executive Instruction Manual Version 1.0
- J-3635 DCS 5000 Processor Module Instruction Manual
- J-3649 AutoMax Configuration Task Manual
- J-3650 AutoMax Processor Module Instruction Manual
- J-3675 AutoMax Enhanced BASIC Language Instruction Manual
- J-3676 AutoMax Control Block Language Instruction Manual
- J-3677 AutoMax Ladder Logic Language Instruction Manual
- J-3684 ReSource AutoMax Programming Executive Instruction Manual Version 2.0
- J-3750 ReSource AutoMax Programming Executive Instruction Manual Version 3.0
- IEEE 518 Guide For The Installation Of Electrical Equipment To Minimize Electrical Noise Inputs To Controllers From External Sources

2.0 MECHANICAL/ELECTRICAL DESCRIPTION

The following is a description of the faceplate LEDs, field termination connectors, and electrical characteristics of the field connections.

2.1 Mechanical Description

The output module is a printed circuit board assembly that plugs into the backplane of the DCS 5000/AutoMax rack. It consists of a printed circuit board, a faceplate, and a protective enclosure. The faceplate contains tabs at the top and bottom to simplify removing the module from the rack. Module dimensions are listed in Appendix A.

The faceplate of the module contains two female connector sockets and 32 LED indicators that show the status of the outputs. Output signals leave the module via two multi-conductor cables (M/N 57C376; see Appendix D). One end of each cable attaches to a faceplate connector, while the other end has a stake-on connector that attaches to two 16 point terminal strips for easy field wiring.

On the back of the module are two edge connectors that attach to the system backplane.

2.2 Electrical Description

The output module contains 32 output circuits for 5-24 volt logic signals. A single output may drive up to 750 mA. Each group of four circuits shares a single isolated common. Output signals have 5000 volt isolation to logic common. Refer to the block diagram in Appendix B.

Each output circuit consists of an optical coupler and an open collector NPN transistor with diode reverse voltage protection. The outputs are powered by an external power supply. A circuit diagram is shown in figure 2.1.

Note that this module should not be used to drive TTL type loads.

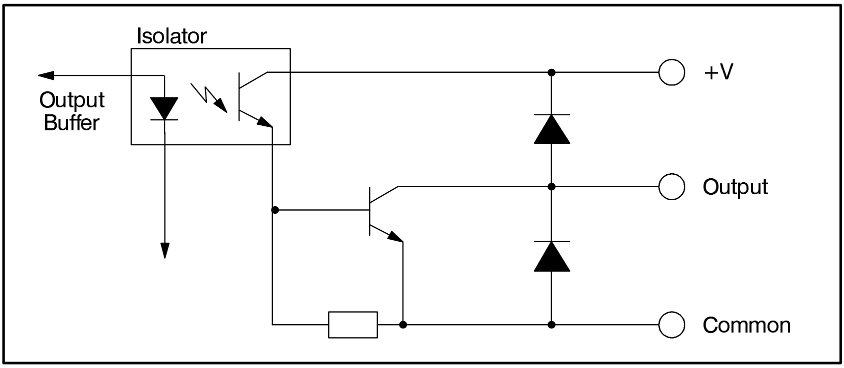


Figure 2.1 - Typical Output Circuit

There are 32 LEDs on the faceplate of the module. The LED indicators display the status of the logic level circuitry. A lit LED indicates that data has been written to the output.

The LEDs are arranged as four groups of eight and are numbered from 0-31. See figure 2.2. LEDs numbered from 0-15 correspond to the outputs in register 0. LEDs numbered from 16-31 correspond to the outputs in register 1. Refer to Appendix C for field connections.

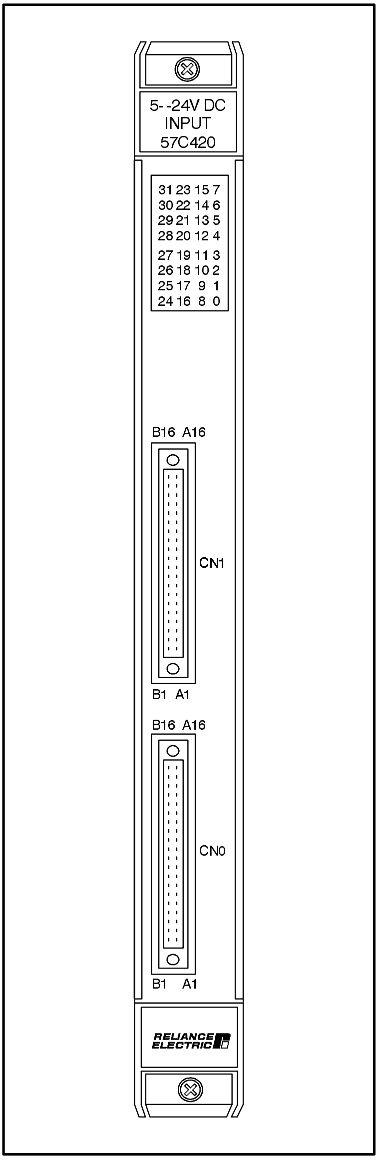


Figure 2.2 - Module Faceplate

3.0 INSTALLATION

This section describes how to install and remove the module and its cable assembly.

3.1 Wiring

The installation of wiring should conform to all applicable codes.

To reduce the possibility of electrical noise interfering with the proper operation of the control system, exercise care when installing the wiring from the system to the external devices. For detailed recommendations refer to IEEE 518.

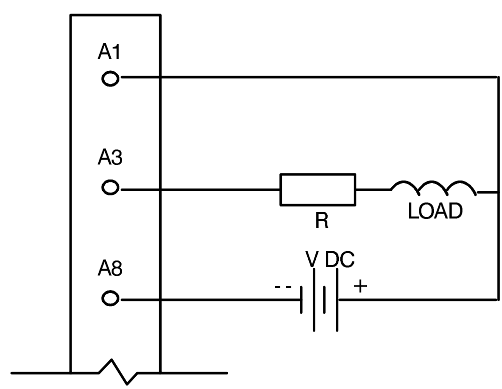
3.2 Initial Installation

Use the following procedure to install the module:

Step 1. Turn off power to the system. All power to the rack as well as all power to the wiring leading to the module should be off.

Step 2. Mount the terminal strips (M/N 57C376) on a panel. The terminal strips should be mounted to permit easy access to the screw terminals. Make certain that the terminal strips are close enough to the rack so that the cable will reach between the terminal strips and the module.

Step 3. Fasten field wires to the terminal strips. Refer to Appendix C for the arrangement of terminal strip connections. If the external device contains an inductive load or has a large inrush current, it may be necessary to add a current limiting resistor to the output. In these cases, refer to figure 3.1 for the proper arrangement of terminal strip connections. Make certain that all field wires are securely fastened.



$$R = \frac{\text{Supply Voltage}}{.75}$$

Figure 3.1 - Typical External Current Limit Resistor

Step 4. Take the module out of its shipping container. Take it out of the anti-static bag, being careful not to touch the connectors on the back of the module.

Step 5. Insert the module into the desired slot in the rack. Use a screwdriver to secure the module into the slot. Refer to figure 3.2.

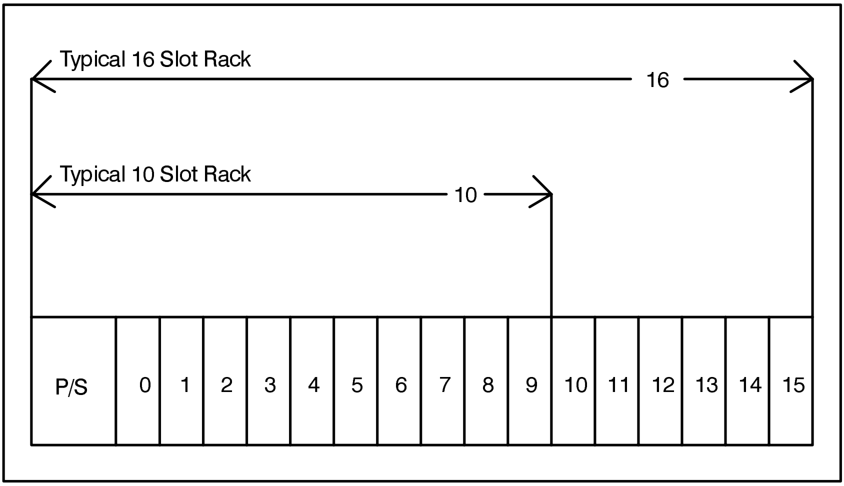


Figure 3.2 - Rack Slot Numbers

Step 6. Attach each of the two field terminal connectors (M/N 57C376) to a mating half on the module. Make certain that the connectors are the proper ones for this module. Use a screwdriver to secure the connectors to the module.

Step 7. Turn on power to the system.

Step 8. Verify the installation by connecting the programming terminal to the system and running the ReSource software. Use the I/O MONITOR function.

Stop all programs that may be running.

If the module is in a local rack, enter the module slot number and register (0 or 1).

If the module is in a remote rack, enter the slot number of the master remote I/O module, remote I/O drop number (also called the remote rack number), output module slot number, and register (0 or 1).

One at a time, toggle each of the bits that have been wired to output devices to verify that the installation has been completed correctly.

WARNING

BE CAREFUL WHEN WRITING TO THE OUTPUTS TO INSURE THAT NO UNEXPECTED MACHINE MOTION WILL RESULT. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY OR DAMAGE TO EQUIPMENT.

3.3 Module Replacement

Use the following procedure to replace a module:

Step 1. Turn off power to the rack and all connections.

Step 2. Use a screwdriver to loosen the screws holding the connectors to the module. Remove the connectors.

Step 3. Loosen the screws holding the module to the rack. Remove the module from the slot in the rack.

Step 4. Place the module in the anti-static bag it came in, being careful not to touch the connectors on the back of the module. Place the module in the cardboard shipping container.

Step 5. Take the new module out of the anti-static bag, being careful not to touch the connectors on the back of the module.

Step 6. Insert the module into the desired slot in the rack. Use a screwdriver to secure the module into the slot.

Step 7. Attach a field terminal connector (M/N 57C376) to each mating half on the module. Make certain that the connector is the proper one for this module. Use a screwdriver to secure the connector to the module.

Step 8. Turn on power to the rack.

4.0 PROGRAMMING

This section describes how the data is organized in the module and provides examples of how the module is accessed by the application software. For more detailed information, refer to the DCS 5000 Enhanced BASIC Language Instruction Manual (J-3600) or AutoMax Enhanced BASIC Language Instruction Manual (J-3675).

4.1 Register Organization

The data in the module is organized as two 16 bit registers. The software allows you to define the module as a single register (up to 32 bits) by referencing the entire module as a unit, as two 16 bit registers, or as up to 32 individual bits by referencing each of the bits separately. Refer to figure 4.1.

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
register 0	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW
register 1	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW	RW

Figure 4.1 - Organization of Register Bits

4.2 Configuration

Before any application programs can be written, it is necessary to configure, or set, the definitions of system-wide variables, i.e. those that must be globally accessible to all tasks.

For DCS 5000 and AutoMax Version 2.1 and earlier, you define system-wide variables by writing a Configuration task. For AutoMax Version 3.0 and later, you define system-wide variables using the AutoMax programming executive. After these variables are defined, you can generate the configuration file automatically, which eliminates the requirement to write a configuration task for the rack. If you are using AutoMax Version 2.1 or earlier, refer to Appendix E for examples that show how to define variables in the configuration task. If you are using AutoMax Version 3.0 or later, see the AutoMax Programming Executive (J-3750) for information about configuring variables.

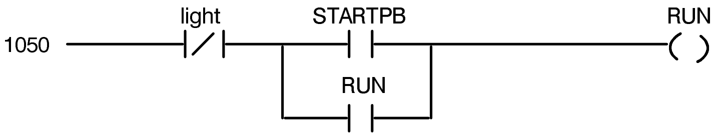
4.3 Reading And Writing Data In Application Tasks

In order for an output module to be referenced by application software, it is first necessary to assign symbolic names to the physical hardware. In AutoMax Version 2.1 and earlier, this is accomplished by either IODEF or RIODEF statements in the configuration task. In AutoMax Version 3.0 and later, you assign symbolic names using the Programming Executive.

Each application program that references the symbolic names assigned to the module must declare those names COMMON.

The frequency with which tasks, or application programs, read their inputs and write their outputs depends on the language being used. Ladder logic and control block tasks read inputs once at the beginning of each scan and write outputs once at the end of each scan. BASIC tasks read an input and write an output for each reference throughout the scan.

4.3.1 Ladder Logic Task Example



The symbolic names RUN and STARTPB reference the output modules. The trailing at symbol “@” is not used in ladder logic tasks. The symbolic name “light” is local to the ladder logic task and does not have I/O associated with it.

4.3.2 BASIC Task Example

```
1000   LOCAL  LIGHT@                              \!Fault light
1010   COMMON  STARTPB@                           \!Start Command
2000   COMMON  RUN@                               \!Line run
3000   !
4000   !
5000   RUN@ = NOT LIGHT@ AND (STARTPB@ OR RUN@)
5500   !
6000   END
```

The symbolic names RUN@ and STARTPB@ reference the output modules. The symbolic name LIGHT@ is local to the BASIC task and does not have I/O associated with it.

4.3.3 Control Block Task Example

```
2400   COMMON  STARTPB@                           \!Start Command
2500   LOCAL MOMENTARY@                           \!Momentary output
3000   !
4000   !
5000   CALL TRANSITION( INPUT=MOMENTARY@, OUTPUT=STARTPB@)
5500   !
6000   END
```

The symbolic name STARTPB@ references the output module. The symbolic name MOMENTARY@ is local to the control block task and does not have I/O associated with it.

4.4 Restrictions

32 Bit Register Reference

32 bit register references should not be used when this module is placed in a remote rack. The remote I/O system does not always transfer registers greater than 16 bits as a unit. As a result, it is possible for the most significant 16 bits of a previous value and the least significant 16 bits of a new value to be transmitted in the same I/O update as if they were a 32 bit register reference.

5.0 DIAGNOSTICS AND TROUBLESHOOTING

This section explains how to troubleshoot the module and field connections.

5.1 Incorrect Data

Problem: The device connected to the output is either always off, always on, or acting different than expected. The possible causes of this error are a module in the wrong slot, a malfunctioning module, or a programming error. It is also possible that the output is either not wired or wired to the wrong device. Use the following procedure to isolate the problem:

Step 1. Verify that the output module is in the correct slot and that the I/O definitions are correct.

Refer to figure 3.2. Verify that the slot number being referenced agrees with the slot number defined in the configuration task. Verify that the register number is 0 or 1. Verify that the bit number refers to the proper bit.

For remote I/O installations, also verify that the master slot and drop number are defined correctly.

Step 2. Verify that the power supply is functional.

Confirm that all connections at the terminal strips are tight. Connect a voltmeter to the power supply connections on the terminal strips. If the voltage is not correct, there is a problem with the power supply or the wiring to the terminal strip in question.

Check the cable for continuity between the faceplate connectors and the terminal strips.

Step 3. Verify that the module can be accessed.

Connect the programming terminal to the system and run the ReSource Software.

Stop all programs that may be running.

Use the I/O MONITOR function. Toggle the output device to determine whether the bit is changing state by observing the condition of the LED on the module. If the LED does not change state, the hardware is malfunctioning.

WARNING

BE CAREFUL WHEN WRITING TO THE OUTPUTS TO INSURE THAT NO UNEXPECTED MACHINE MOTION WILL RESULT. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY OR DAMAGE TO EQUIPMENT.

Step 4. Verify that the hardware is working correctly.

Connect a voltmeter to the proper points on the terminal strip and toggle the output device from the I/O MONITOR. The voltmeter should alternate between 0 and the line voltage.

If the output does switch correctly, check the field wiring and the external device. If it does not switch correctly, verify the hardware functionality by systematically swapping out modules. After each swap, if the problem is not corrected, replace the original module before swapping out the next module.

- To test local I/O, first replace the output module. Next, replace the processor module(s). If the problem persists, take all of the modules out of the backplane except one processor module and the output module. If the problem is now corrected, one of the other modules in the rack is malfunctioning. Reconnect the other modules one at a time until the problem reappears. If none of these tests reveals the problem, replace the backplane.
- To test remote I/O, first verify that the remote I/O system is communicating with the drop that contains the output module being tested. Next, by systematically swapping out modules, determine whether the output module is the only module that is not working. If more than one module is not working correctly, the problem most likely lies in the remote I/O system. If the problem does not lie in the system, it probably involves the remote rack.
- To test the remote rack, first replace the output module. Next, replace the slave remote I/O module. If the problem persists, take all of the modules out of the remote backplane except the slave remote I/O module and the output module. If the problem is now corrected, one of the other modules in the rack is malfunctioning. Reconnect the other modules one at a time until the problem reappears. If the problem proves to be neither in the remote I/O system nor the remote rack, try replacing the backplane.

Step 5. Verify that the user application program is correct.

Verify that the application program that references the symbolic names associated with the module has declared those names COMMON.

Confirm that the symbolic name in question is being referenced in the application program. This can be done indirectly by monitoring the variable with the VARIABLE MONITOR function in the programmer.

5.2 Bus Error

Problem: A “31” or “51” through “58” appears on the processor module’s LED. This error message indicates that there was a bus error when the system attempted to access the module. The possible causes of this error are a missing module, a module in the wrong slot, or a malfunctioning module. Refer to the DCS 5000 Processor Module Instruction Manual (J-3635) or AutoMax Processor Module Instruction Manual (J-3650) for more information. Use the following procedure to isolate a bus error:

Step 1. Verify that the output module is in the correct slot and that the I/O definitions are correct.

Refer to figure 3.2. Verify that the slot number being referenced agrees with the slot number defined in the configuration task. Verify that the register number is in the range 0 or 1. Verify that the bit number refers to the proper bit.

For remote I/O installations, also verify that the master slot and drop number are defined correctly.

Step 2. Verify that the module can be accessed.

Connect the programming terminal to the system and run the ReSource Software.

Stop all programs that may be running.

Use the I/O MONITOR function. If the programmer is able to monitor the outputs, then attempt to write to the outputs.

WARNING

BE CAREFUL WHEN WRITING TO THE OUTPUTS TO INSURE THAT NO UNEXPECTED MACHINE MOTION WILL RESULT. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY OR DAMAGE TO EQUIPMENT.

If the programmer is able to read and write to the output module, the problem lies in the application software and you need to refer to step 1 again. If the programmer cannot read and write to the outputs, the problem lies in the hardware (refer to step 3).

Step 3. Verify that the hardware is working correctly.

Verify the hardware functionality by systematically swapping out the output module, the processor module(s), and the backplane. After each swap, if the problem is not corrected, replace the original item before swapping out the next item.

For remote I/O installations, systematically swap out the output module, the slave remote module, and the backplane. After each swap, if the problem is not corrected, replace the original item before swapping out the next item.

Appendix A

Technical Specifications

Ambient Conditions

- Storage temperature: - -40C - 85C
- Operating temperature: 0C - 60C
- Humidity: 5-90% non-condensing

Maximum Module Power Dissipation

- 5.5 Watts + 1.1 watts/active output

Dimensions

- Height : 11.75 inches
- Width: 1.25 inches
- Depth: 7.375 inches

System Power Requirements

- +5 volts: 850 mA

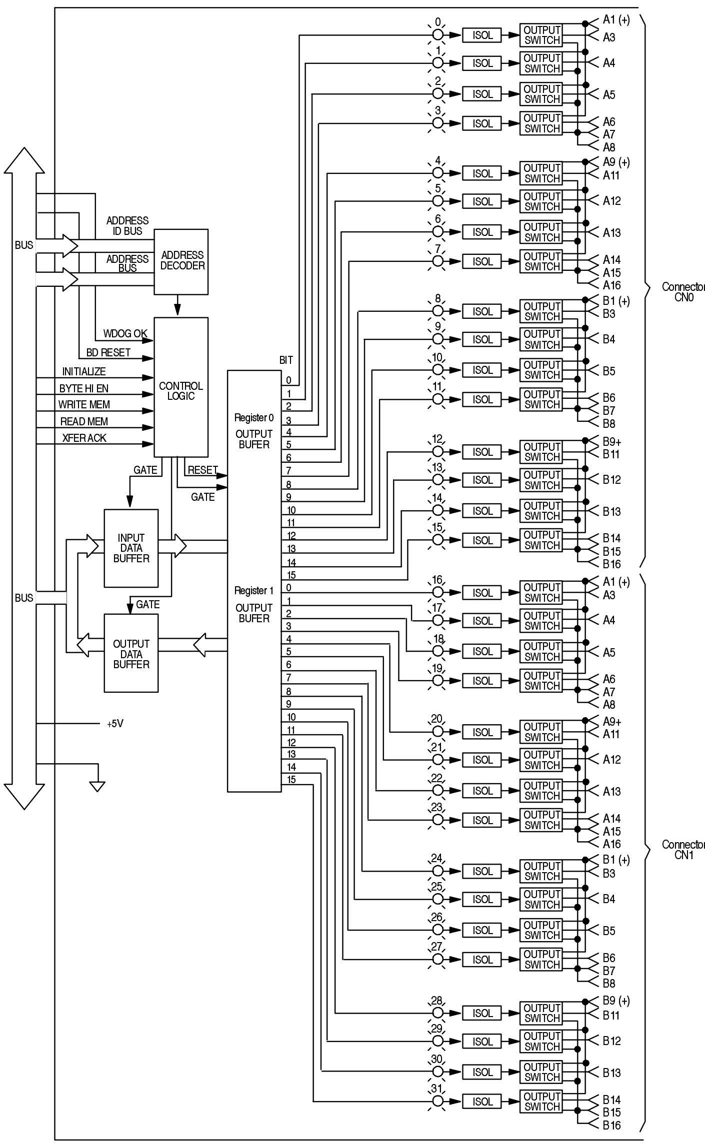
Output Circuit

- Number of outputs: 32
- Maximum current: 750 mA per output
1800 mA per common
- Maximum operating voltage: 30 volts D-C
- Maximum saturated voltage drop: 1.5 volts
- Four outputs per isolated common
- 5000 volt isolation between logic common and outputs

Appendix B

Module Block Diagram

5-24 VDC Output Module (57C420)



Appendix C

Field Connections

Register 0				
Conn Pin No.	Wire Color Code	Bit No.	LED No.	Term No.
A1(+)	black			1
A2	n.c.			
A3	white	0	0	2
A4	red	1	1	3
A5	green	2	2	4
A6	orange	3	3	5
A7(—)	blue			6
A8(—)	white/black			6
A9(+)	red/black			7
A10	n.c.			
A11	green/black	4	4	8
A12	orange/black	5	5	9
A13	blue/black	6	6	10
A14	black/white	7	7	11
A15(—)	red/white			12
A16(—)	green/white			12

Register 0				
Conn Pin No.	Wire Color Code	Bit No.	LED No.	Term No.
B1(+)	blue/white			13
B2	n.c.			
B3	black/red	8	8	14
B4	white/red	9	9	15
B5	orange/red	10	10	16
B6	blue/red	11	11	17
B7(—)	red/green			18
B8(—)	orange/green			18
B9(+)	black/white/red			19
B10	n.c.			
B11	white/black/red	12	12	20
B12	red/black/white	13	13	21
B13	green/black/white	14	14	22
B14	orange/black/white	15	15	23
B15(—)	blue/black/white			24
B16(—)	black/red/green			24

n.c. = no connection b.s. = black stripe w.s. = white stripe

Appendix C

(Continued)

Register 1				
Conn Pin No.	**Wire Color Code**	**Bit No.**	**LED No.**	**Term No.**
A1(+)	black			1
A2	n.c.			
A3	white	0	16	2
A4	red	1	17	3
A5	green	2	18	4
A6	orange	3	19	5
A7(—)	blue			6
A8(—)	white/black			6
A9(+)	red/black			7
A10	n.c.			
A11	green/black	4	20	8
A12	orange/black	5	21	9
A13	blue/black	6	22	10
A14	black/white	7	23	11
A15(—)	red/white			12
A16(—)	green/white			12

Register 1				
Conn Pin No.	**Wire Color Code**	**Bit No.**	**LED No.**	**Term No.**
B1(+)	blue/white			13
B2	n.c.			
B3	black/red	8	24	14
B4	white/red	9	25	15
B5	orange/red	10	26	16
B6	blue/red	11	27	17
B7(—)	red/green			18
B8(—)	orange/green			18
B9(+)	black/white/red			19
B10	n.c.			
B11	white/black/red	12	28	20
B12	red/black/white	13	29	21
B13	green/black/white	14	30	22
B14	orange/black/white	15	31	23
B15(—)	blue/black/white			24
B16(—)	black/red/green			24

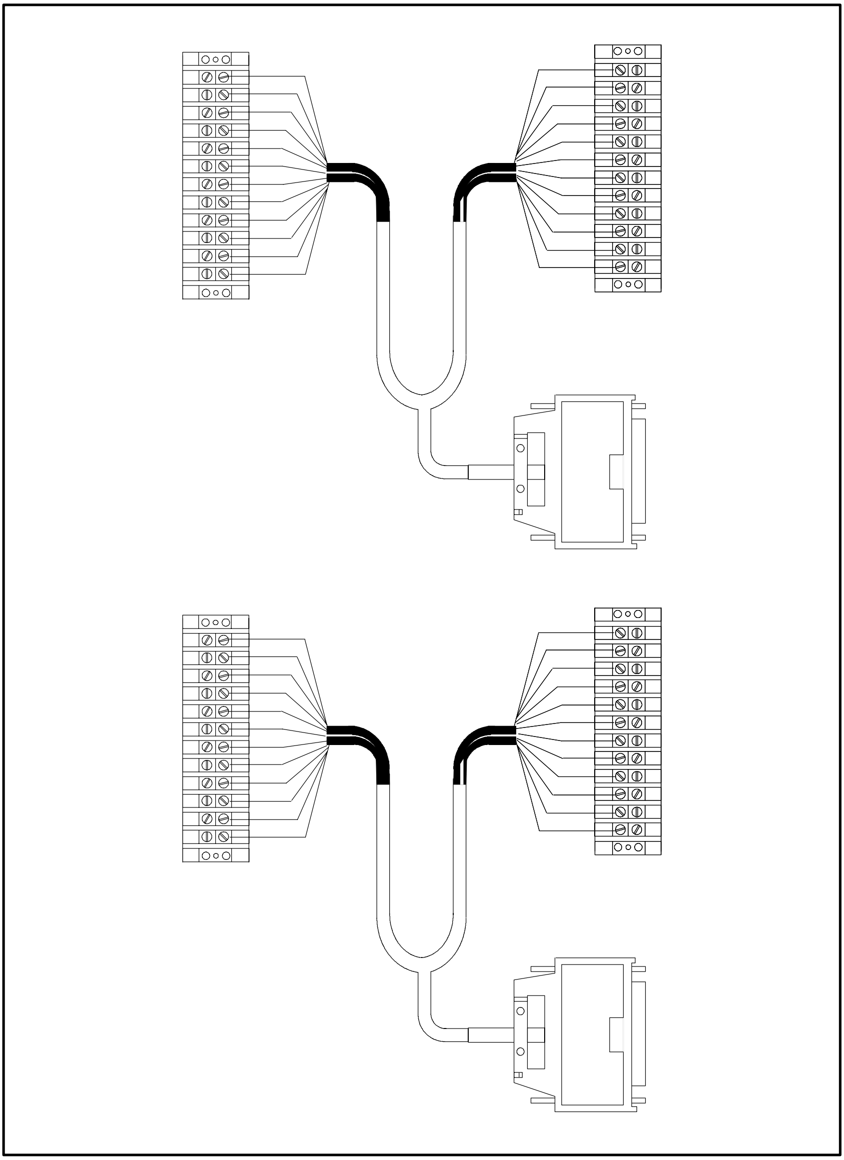
n.c. = no connection   b.s. = black stripe   w.s. = white stripe

Appendix D

Related Components

57C376 - - Terminal Strip/Cable Assembly

This model number includes two assemblies, each consisting of 2 terminal strips, a cable, and a mating connector. The assemblies are used to connect field signals to the faceplate of the output module.

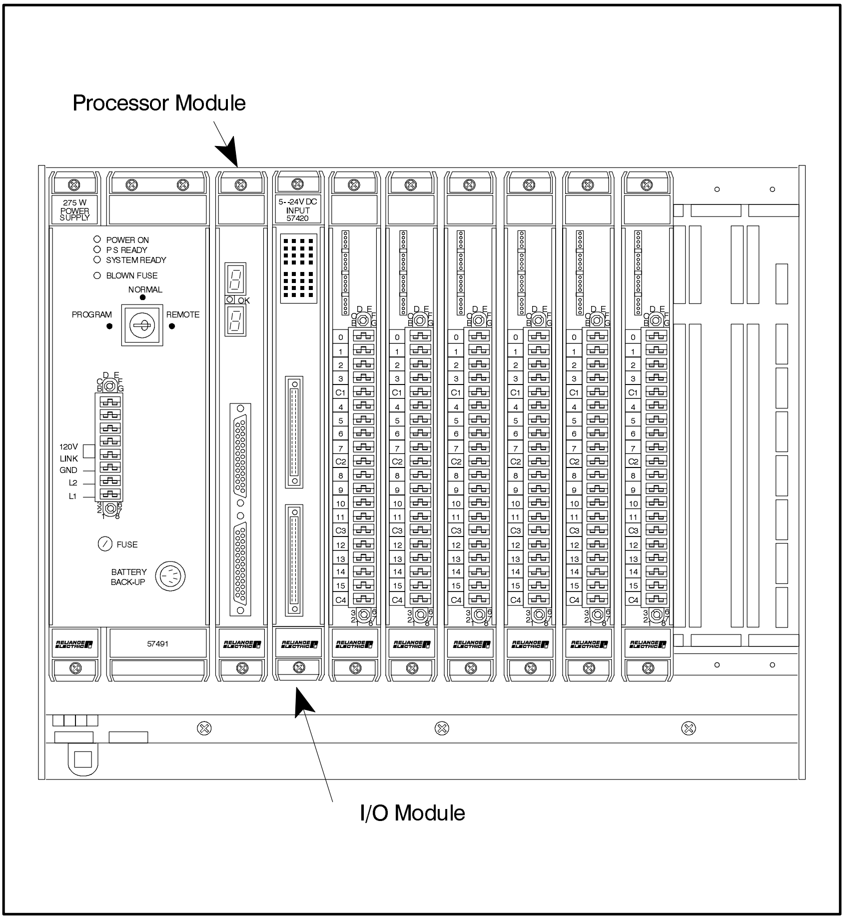


Appendix E

Defining Variables in the Configuration Task

Local I/O Definition

This section describes how to configure the output module when it is located in the same rack as the processor module that is referencing it. Refer to the figure below. Note that this procedure is used only if you are using the AutoMax Programming Executive software version 2.1 or earlier.



Module in a Local Rack

Appendix E

(Continued)

32 Bit Register Reference

Use the following method to reference all 32 outputs as a single register. Only one statement is necessary. The symbolic name of the register should be as meaningful as possible:

nnnnn IODEF SYMBOLIC_NAME![SLOT=s, REGISTER=0]

When referenced as a long register of 32 bits, register 0 becomes the high order 16 bits.

16 Bit Reference

Use the following method to reference a 16 bit register as a single output. For the entire mdoule, a maximum of two statements can be included in the configuration task (one for each register). The symbolic name of each register should be as meaningful as possible:

nnnnn IODEF SYMBOLIC_NAME%[SLOT=s, REGISTER=r]

Bit Reference

Use the following method to reference individual outputs on the module. For the entire module, a maximum of 32 statements can be included in the configuration task (one for each bit). The symbolic name of each bit should be as meaningful as possible:

nnnnn IODEF SYMBOLIC_NAME@[SLOT=s, REGISTER=r, BIT=b]

where:

nnnnn - - BASIC statement number. This number may range from 1-32767.

SYMBOLIC_NAME! - - A symbolic name chosen by the user and ending with (!). This indicates a long integer data type and all references will access the entire module.

SYMBOLIC_NAME% - - A symbolic name chosen by the user and ending with (%). This indicates an integer data type and all references will access register "r".

SYMBOLIC_NAME@ - - A symbolic name chosen by the user and ending with (@). This indicates a boolean data type and all references will access bit number "b" in register "r".

SLOT - - Slot number that the module is plugged into. This number may range from 0-15.

REGISTER - - Specifies the register that is being referenced. For long integers this number must be zero. For all other references this number may be 0 or 1.

BIT - - Used with boolean data types only. Specifies the bit in the register that is being referenced. This number may range from 0-15.

Appendix E

(Continued)

Examples of Local I/O Definitions

The following statement assigns the symbolic name WINDOW! to the output module located in slot 11:

1000 IODEF WINDOW![SLOT=11, REGISTER=0]

The following statement assigns the symbolic name DISPLAY% to the output module located in slot 4:

1020 IODEF DISPLAY%[SLOT=4, REGISTER=0]

The following statement assigns the symbolic name RUN@ to bit 9 on the output module located in slot 7:

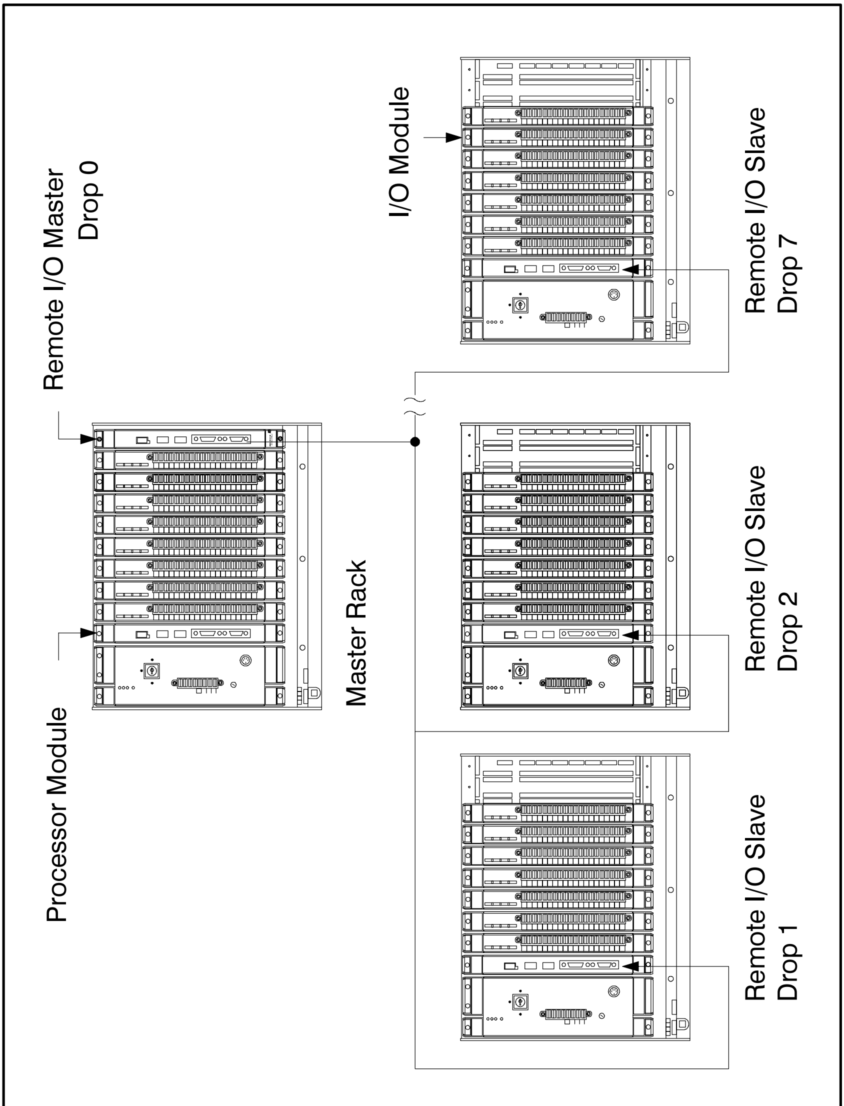
2050 IODEF RUN@[SLOT=7, REGISTER=0, BIT=9]

Appendix E

(Continued)

Remote I/O Definition

This section describes how to configure the output module when it is located in a rack that is remote from the processor module referencing it. Refer to the figure below.



Module in a Remote Rack

Appendix E

(Continued)

32 Bit Register Reference

Use the following method to reference all 32 outputs as a single register. Only one statement is necessary. The symbolic name of the register should be as meaningful as possible:

nnnnn RIODEF SYMBOLIC_NAME![MASTER_SLOT=m, &
DROP=d, SLOT=s, REGISTER=0]

When referenced as a long register of 32 bits, register 0 becomes the high order 16 bits. A 32 bit register reference over remote I/O should be used with care since the remote I/O system cannot guarantee that the entire 32 bit value will be moved in a single operation.

16 Bit Register Reference

Use the following method to reference a 16 bit register as a single output. For the entire module, a maximum of two statements can be included in the configuration task (one for each register). The symbolic name of each register should be as meaningful as possible:

nnnnn RIODEF SYMBOLIC_NAME%[MASTER_SLOT=m, &
DROP=d,SLOT=s,REGISTER=r]

Bit Reference

Use the following method to reference individual outputs on the module. For the entire module, a maximum of 32 statements can be included in the configuration task (one for each bit). The symbolic name of each bit should be as meaningful as possible:

nnnnn RIODEF SYMBOLIC_NAME@[MASTER_SLOT=m, &
DROP=d, SLOT=s, REGISTER=r, BIT=b]]

where:

nnnnn - - BASIC statement number. This number may range from 1-32767.

SYMBOLIC_NAME! - - A symbolic name chosen by the user and ending with (!). This indicates a long integer data type and all references will access the entire module.

SYMBOLIC_NAME% - - A symbolic name chosen by the user and ending with (%). This indicates an integer data type and all references will access register "r".

SYMBOLIC_NAME@ - - A symbolic name chosen by the user and ending with (@). This indicates a boolean data type and all references will access bit number "b" in register "r".

MASTER_SLOT - - Slot number that the master remote I/O module is plugged into. This number may range from 0-15.

DROP - - Drop number of the slave remote I/O module that is in the same rack as the output module. This number may range from 1-7.

SLOT - - Slot number that the module is plugged into. This number may range from 0-15.

Appendix E

(Continued)

REGISTER - - Specifies the register that is being referenced. For long integers this number must be zero. For all other references this number may be 0 or 1.

BIT - - Used with boolean data types only. Specifies the bit in the register that is being referenced. This number may range from 0-15.

Examples of Remote I/O Definitions

The following statement assigns the symbolic name UPPER_LIMIT! to the output module located in slot 10 of remote I/O drop 7. This remote drop is connected to the remote I/O system whose master is located in slot 9 in the master rack:

```
1000  RIODEF  UPPER_LIMIT![ MASTER_SLOT=9, DROP=7,                &
SLOT=10, REGISTER=0]
```

The following statement assigns the symbolic name LEVEL% to the output module located in slot 4 of remote I/O drop 3. This remote drop is connected to the remote I/O system whose master is located in slot 15 in the master rack:

```
1020   RIODEF  LEVEL%[ MASTER_SLOT=15, DROP=3,                    &
SLOT=4, REGISTER=0]
```

The following statement assigns the symbolic name STARTPB@ to bit 9 on the output module located in slot 7 of remote I/O drop 2. This remote drop is connected to the remote I/O system whose master is located in slot 6 in the master rack:

```
2050  IODEF  STARTPB@[ MASTER_SLOT=6, DROP=2,                     &
SLOT=7, REGISTER=0, BIT=9]
```

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Publication J-3633-2 - June 1999