CIO-777-PR Programming Guide

Configuring the CIO-PR with a GSD file
Most profibus configuration tools use a GSD file to configure the data exchanged between a profibus master device (such as a PLC or a scanner) and the slave CIO-PR module. The GSD file describes the output and input assembly numbers and the size of each assembly, but does not give any detail about what the data represents. This document describes in detail the configuration data for the CIO-PR and the data contained within the output and input assemblies.

At the very least, the profibus master device must send the output and input assembly numbers and the size of the output and input data (in bytes or words) to each CIO-PR on the network every time the network is powered up. This information is stored in the master device, but it is initially selected by the user interacting with the profibus configuration tool.

Most configuration tools are used on a live network so that the type of slave device can be determined and all of the configuration choices can be verified by the slave device. However, this usually requires the slave devices to be addressed before the configuration tool can be used. As shipped from the factory, the CIO-PR is set for Flex addressing. This allows the user to connect the CIO-PR to a 777-P, power them both up and use the 777-P to indirectly set the address of the CIO-PR module. See the section “Flex Addressing Mode” near the end of this document for more information on setting the address.

Once the configuration tool has established communication with the CIO-PR, the GSD file defines several choices for the configuration tool to present to the user. These choices are defined within the GSD file as “modules”.

Each module contains a piece of configuration information and the resulting size of output and/or input data associated with that module. The type of data that the module contains is communicated to the CIO-PR by the “Slot” number, which is the third byte of information defined within the module. To simplify things, the GSD file has been created with a description of the slot number as the first part of each user-readable module name. This way, the descriptive name lets the user what type of configuration data the module contains.

Slot Number
The Slot number defines the type of configuration data being sent:

Slot 1:	Power Up Configuration byte, Output Assembly number, Input Assembly number
Slot 0:	Power Up Configuration byte, Watchdog Enable byte, Watchdog Time Out byte.
Slot 2:	Output Assembly number
Slot 3:	Input Assembly number

Note that the term “input” assembly refers to the point of view of the profibus master device. The data sent from the CIO-PR to the master is treated as “input” to the profibus master device. The “output” assembly is the control data that the master device sends to the CIO-PR to turn the output relays on or off.

The first group of modules that are listed in the GSD file contain commonly used Slot 1 configurations. These Slot 1 configurations are convenient since only 1 module needs to be selected and it defines the addressing mode as well as the output assembly and one input assembly.

However, the CIO-PR allows up to 8 input assemblies, so the user has a great deal of flexibility in configuring the input data that will be sent to the profibus master device. The CIO-PR only allows one output assembly.

The CIO-PR allows many different ways to define the data for a particular application. One configuration approach is to use one Slot 1 definition to set the desired output assembly and the first input assembly, then use up to 7 more Slot 3 input assemblies to define all of the input data.

For example, the user can include input assembly 11 (4 voltage values), input assembly 12 (4 current values) and input assembly 16 (last 4 faults) for a total of 20 bytes sent to the master. Or a user could reduce the data and just select input assembly 201 (average voltage and average current) and input assembly 16 (last 4 faults) for a total of only 8 bytes sent to the master.

Slot 1 configuration not required

The CIO-PR does not require a Slot 1 module to define the output and input assemblies. The CIO-PR saves the power-up configuration and watchdog information internally, so once the CIO-PR has been configured with the desired configuration settings (or if the factory defaults are acceptable) the user does not have to include a Slot 1 or a Slot 0 module to re-define it every time.

Instead of a Slot 1 module, the CIO-PR can be configured using one Slot 2 output assembly and one or more Slot 3 input assemblies.

Power-up configuration and watchdog configuration (Slot 1 & Slot 0)

Note: A Slot 1 request can only include byte 0 (Power-up configuration).
A Slot 0 request can include byte 0, bytes 0 & 1, or bytes 0 & 1 & 2.

The profibus module allows multiple Power-up configuration bytes and multiple Watchdog configuration bytes to be defined, but only the last definition of each byte will be saved.

The profibus module stores the Power-up configuration byte, the Watchdog Enable byte and the Watchdog Time Out byte in non-volatile memory, so this data does not need to be re-configured once it has been set to the desired values.

Power Up Configuration

Byte	Bit	Name	Description
(0)		Puc	Power-up configuration
0	2	Fixed addressing	Address is fixed when this Puc bit is configured.
"	1	SSA addressing	Address is set by profibus master device.
"	0	Flex addressing	If the modbus address from the attached 777 is less than 99, that address is used as the profibus address. If the modbus address is 99 or greater, the profibus address can be set by the profibus master device.

Note: only 1 bit can be set. If a conflict exists, unit will default to Bit 0 (Flex) mode.

Watchdog Enable Configuration

Byte	Bit	Name	Description
(1)		WdEnable	Watchdog Enable Configuration
0	2	Relay A	Relay A will be deactivated if Watchdog/Idle occurs.
"	1	Relay B	Relay B will be deactivated if Watchdog/Idle occurs.
"	0	Slave Fault Relay	Fault relay of the attached 777 will be forced off if a Watchdog/Idle occurs.

Watchdog Time Out (in Seconds)

Byte	Bit	Name	Description
(2)		WdTimeOut	Watchdog Time Out value (in seconds), 0 thru 255

Multiple Power Up Configuration definitions
Since the profibus module only saves the last definition of each byte, it is permissible to include a Slot 1 configuration and to include an additional Slot 0 configuration to overwrite the Slot 1 power up configuration. This approach can also be used to define the watchdog control even though the Slot 1 definition does not include the watchdog configuration bytes.

CIO-PR MEMORY MAP

Output Assembly (Slot 1 & Slot 2)

Note: The CIO-PR only allows one output assembly. If additional output assemblies are included, the configuration bytes will result in either too many output bytes being defined or an invalid configuration.

Output Assembly 100 No control information

Byte	Bit	Name	Description
0		---	Dummy byte – no control from profibus master

Output Assembly 101 Standard control
If all zeros, Relay A & B are deactivated

Byte.	Bit	Name	Description
0	0	Relay B	
"	1	Off for Relay A & B	Off over-ride for A & B
"	2	Relay A	
"	4	Force Faulted state in slave 777	
"	6	Reset slave 777	

Output Assembly 102 No Off over-ride control – 2 bytes
If all zeros, Relay A & B are deactivated

Byte	Bit	Name	Description
0	0	Trip request for 'Remote Host Watchdog/Idle' state	
"	1	Clear 'Remote Host Watchdog/Idle' state	
1	0	Relay B	
"	1	-unused-	
"	2	Relay A	
"	4	Force Faulted state in slave 777	
"	6	Reset slave 777	

Output Assembly 103 Forward/Reverse control logic
If all zeros, no change in Relay A & B state

Byte	Bit	Name	Description
0	0	Relay B	
"	1	Off for Relay A & B	Off over-ride for A & B
"	2	Relay A	
"	4	Force Faulted state in slave 777	
"	6	Reset slave 777	

Output Assembly 110 (Same as 100) No control information

Byte	Bit	Name	Description
0		---	Dummy byte – no control from profibus master

Output Assembly 111 (Same as 101) Standard control
If all zeros, Relay A & B are deactivated

Byte.	Bit	Name	Description
0	0	Relay B	
"	1	Off for Relay A & B	Off over-ride for A & B
"	2	Relay A	

“	4	Force Faulted state in slave 777
“	6	Reset slave 777

Output Assembly 112 No Off over-ride control
If all zeros, Relay A & B are deactivated

Byte	Bit	Name	Description
0	0	Relay B	
“	1	-unused-	
“	2	Relay A	
“	4	Force Faulted state in slave 777	
“	6	Reset slave 777	

Output Assembly 113 (Same as 103) Forward/Reverse control logic
If all zeros, no change in Relay A & B state

Byte	Bit	Name	Description
0	0	Relay B	
“	1	Off for Relay A & B	Off over-ride for A & B
“	2	Relay A	
“	4	Force Faulted state in slave 777	
“	6	Reset slave 777	

Output Assembly 120 No control information – 2 bytes

Byte	Bit	Name	Description
0		---	Dummy byte – no control from profibus master
1		---	Dummy byte – no control from profibus master

Output Assembly 121 Standard control – 2 bytes
If all zeros, Relay A & B are deactivated

Byte.	Bit	Name	Description
0	0	Trip request for ‘Remote Host Watchdog/Idle’ state	
“	1	Clear ‘Remote Host Watchdog/Idle’ state	
1	0	Relay B	
“	1	Off for Relay A & B	Off over-ride for A & B
“	2	Relay A	
“	4	Force Faulted state in slave 777	
“	6	Reset slave 777	

Output Assembly 122 No Off over-ride control – 2 bytes
If all zeros, Relay A & B are deactivated

Byte	Bit	Name	Description
0	0	Trip request for ‘Remote Host Watchdog/Idle’ state	
“	1	Clear ‘Remote Host Watchdog/Idle’ state	
1	0	Relay B	
“	1	-unused-	
“	2	Relay A	
“	4	Force Faulted state in slave 777	
“	6	Reset slave 777	

Output Assembly 123 Forward/Reverse control logic – 2 bytes
If all zeros, no change in Relay A & B state

Byte	Bit	Name	Description
0	0	Trip request for 'Remote Host Watchdog/Idle' state	
"	1	Clear 'Remote Host Watchdog/Idle' state	
1	0	Relay B	
"	1	Off for Relay A & B	Off over-ride for A & B
"	2	Relay A	
"	4	Force Faulted state in slave 777	
"	6	Reset slave 777	

Note: The total size of all the input data cannot exceed 32 bytes.

See the notes on scaling current and ground fault values at the end of this section.

Input Assembly 11 Voltage Information

Byte	Bit	Name	Description
0-1		Vavg	Average voltage
2-3		Voltage Phase 3	
4-5		Voltage Phase 2	
6-7		Voltage Phase 1	

Input Assembly 12 Current Information

Byte	Bit	Name	Description
0-1		Iavg	Average Current x Scale Factor
2-3		IC	
4-5		IB	
6-7		IA	

Input Assembly 13 Unbalance and Ground Fault

Byte	Bit	Name	Description
0		VUB1	Voltage unbalance (1 byte)
1		CUB1	Current unbalance (1 byte)
2-3		GF	Ground fault current x 10 x Scale Factor

Input Assembly 14 Power and Run Hours

Byte	Bit	Name	Description
0-1		Power Factor Angle	
2-3		Power	Kilowatts
4-5		Run Hours	

Input Assembly 15 Restart Delays

Byte	Bit	Name	Description
0-1		RD1	Rapid cycling delay
2-3		RD2	Under current restart delay
4-5		RD3	Other fault restart delay

Input Assembly 16 Fault History

Byte	Bit	Name	Description
0		Last Fault 1	Most recent fault
1		Last Fault 2	2nd oldest fault
2		Last Fault 3	3rd oldest fault
3		Last Fault 4	4th oldest fault

Input Assembly 201

Byte	Bit	Name	Description
0-1		Iavg	Average Current x Scale Factor
2-3		Vavg	Average Voltage

Input Assembly 202

Byte	Bit	Name	Description
0-1		Vavg	Average voltage
2-3		Voltage Phase 3	
4-5		Voltage Phase 2	
6-7		Voltage Phase 1	
8-9		VUB	Voltage unbalance (2 bytes)
10-11		Average Current %	Average current as percent of FLA
12-13		Iavg	Average Current x Scale Factor
14-15		IC	
16-17		IB	
18-19		IA	
20-21		CUB	Current unbalance (2 bytes)
22-23		GF	Ground Fault current x 10 x Scale Factor
24-25		Power Factor Angle	
26-27		Power	Kilowatts
28-29		Run Hours	
30-31		CurrSF	current Scale Factor

Input Assembly 203

Byte	Bit	Name	Description
0-1		Vavg	Average voltage
2-3		VUB	Voltage unbalance (2 bytes)
4-5		Iavg	Average Current x Scale Factor
6-7		IC	
8-9		IB	
10-11		IA	
12-13		CUB	Current unbalance (2 bytes)
14-15		GF	Ground Fault current x 10 x Scale Factor
16-17		Power	Kilowatts

Input Assembly 204

Byte	Bit	Name	Description
0-1		Iavg	Average current x Scale Factor
(2-3)		PbOprStat	Profibus module operating status
2	6	PTC trip	
“	4	Input 4	
“	3	Input 3	
“	2	Input 2	
“	1	Input 1	
“	0	Slave Relay closed	
3	6	Ground Fault trip	
“	5	Over current fault	
“	4	Faulted	
“	3	Modbus comm. Loss	
“	2	Current flowing	
“	1	Relay B	
“	0	Relay A	

Input Assembly 205 CIO inputs and outputs

Byte	Bit	Name	Description
(0)		CIO-PR Inputs	CIO-PR Inputs 1-4
0	3	Input 4	
“	2	Input 3	
“	1	Input 2	
“	0	Input 1	

(1)		CIO-PR Outputs	CIO-PR Relay A & B
1	2	Relay A	
“	1	Off (both Relay A & Relay B are off)	
“	0	Relay B	

Input Assembly 210 Profibus configuration and diagnostics

Byte	Bit	Name	Description
(0)		UserDiag1	Diagnostic byte 1
0	2	Initial comm. w/777 not established	
“	1	Real Time data not valid (zeroed)	
“	0	Communications w/777 established	
(1)		UserDiag2	Diagnostic byte 2
1	7	Parameterization telegram exceeded internal buffer	
“	6	Invalid input assembly in parameterization telegram	
“	5	Invalid output assembly in parameterization telegram	
“	4	Parameterization data caused a new configuration	
“	2	Parameterization telegram not yet received	
“	1	Parameterization telegram did not contain enough data	
“	0	Parameterization telegram successfully processed	
(2)		UserDiag3	Diagnostic byte 3
3	7	Set Station Address (SSA) telegram contains errors	
“	6	SSA telegram received but not enabled	
“	5	SSA telegram caused a new address	
“	4	SSA telegram received	
“	2	Configuration telegram not yet received	
“	1	Configuration telegram data is not correct	
“	0	Configuration telegram successfully processed	
(3)		UserDiag4	Diagnostic byte 4
3	6	Internal Error - Invalid SSA pointer in SPC3 chip	
“	5	Internal Error – Null parameter pointer in SPC3 chip	
“	4	Internal Error – Invalid parameter pointer in SPC3 chip	
“	3	Internal Error – Invalid diagnostic pointer in SPC3 chip	
3	2	Internal Error – ROM checksum invalid during power up	
“	1	Internal Error – EEPROM check sum invalid during power up	
“	0	Internal Error – EEPROM check sum error	
(4)		Puc	Power Up Configuration
4	2	Fixed addressing	
“	1	SSA addressing	
“	0	Flex addressing	
5		DxOA	Output Assembly
6		DxIA	1st Input Assembly
7		CIO-PR Major Rev	Major firmware revision of CIO-PR
8		CIO-PR Minor Rev	Minor firmware revision of CIO-PR

Input Assembly 211 **(CIO-PR firmware revision 1.10 and newer)**

Byte	Bit	Name	Description
0-2		Identifier	3 byte identifier (ASCII ‘SMI’)
3		Sep1	Separator #1 (ASCII ‘-‘)
4		CIO-PR Major Rev	Major firmware revision of CIO-PR
5		CIO-PR Minor Rev	Minor firmware revision of CIO-PR
6		CIO-PR SubMinor Rev	Sub-Minor firmware revision of CIO-PR
7		Sep2	Separator #2 (ASCII ‘-‘)
8-9		777 Software Rev	2 byte major / minor software revision of 777P
10-11		777 Product Id	2 byte Product Id of 777P
12-13		777 Model Code	2 byte Model Code of 777P
14-17		filler	4 bytes filler (ASCII ‘ ‘)

Input Assembly 232

Byte	Bit	Name	Description
0-1		Average Current %	Average current as percent of FLA
2-3		Iavg	Average Current
4-5		IC	
6-7		IB	
8-9		IA	
10-11		CUB	Current unbalance (2 bytes)
12-13		ThermalCap	Thermal Capacity
14-15		GF	Ground Fault
16-17		RD1	Rapid cycling delay
18-19		RD2	Under current restart delay
20-21		RD3	Other fault restart delay
(22-23)		PbOprStat	Profibus module operating status
22	6	PTC trip	
“	4	Input 4	
“	3	Input 3	
“	2	Input 2	
“	1	Input 1	
“	0	Slave Relay closed	
23	6	Ground Fault trip	
“	5	Over current fault	
“	4	Faulted	
“	3	Modbus comm. Loss	
“	2	Current flowing	
“	1	Relay B	
“	0	Relay A	
24		Last Fault 1	Most recent fault
25		Last Fault 2	2nd oldest fault
(26-27)		Fault Status	
26	7	Single Phase (current) fault	
“	6	Current unbalance fault	
“	5	Ground Fault trip	
“	4	Over current fault	
“	3	Under current fault	
“	1	PTC overtemp fault	
“	0	Reverse Phase	
(28-29)		HoldOff	
29	5	OFF command received	
“	0	Reverse Phase	

Input Assembly 250

Byte	Bit	Name	Description
0-1		Average Current %	Average current as percent of FLA
2-3		Iavg	Average Current
4-5		IC	
6-7		IB	
8-9		IA	
10-11		CUB	Current unbalance (2 bytes)
12-13		ThermalCap	Thermal Capacity
14-15		GF	Ground Fault
(16-17)		PbOprStat	Profibus module operating status
16	6	PTC trip	
“	4	Input 4	
“	3	Input 3	
“	2	Input 2	
16	1	Input 1	
“	0	Slave Relay closed	
17	6	Ground Fault trip	
“	5	Over current fault	
“	4	Faulted	
“	3	Modbus comm. Loss	
“	2	Current flowing	
“	1	Relay B	
“	0	Relay A	
18		Last Fault 1	Most recent fault
19		Last Fault 2	2nd oldest fault

Big-Endian data format
The input assemblies return data in a “big-endian” format. In other words, the first byte of a two byte value will be the most significant data and the second byte will be the least significant byte. As an example, if the average voltage is (decimal) 480 volts, the value would be 0x01E0 in hexadecimal. The Average Voltage value, designated as Vavg, will be returned with a (hexadecimal) 0x01 in byte 0 and a (hexadecimal) 0xE0 in byte 1 for Input Assembly 11.

Scaling Current and Ground Fault Current values
Current values will be scaled by 10.
Note that Input Assembly 202 contains the actual scaling factor in bytes 30 & 31.

Current Scaling Example:
As an example, if the Average Current is 34.1 amps, and the scaling factor is 10. For Input Assembly 12, byte 0 & 1 will return the Average Current value, designated as Iavg, with a (decimal) value of 341. Byte 0 will contain (hexadecimal) 0x01 and byte 1 will contain (hexadecimal) 0x55.

FLEX ADDRESSING MODE

The Flex addressing mode allows the Profibus address to be set by the 777's modbus address. Since the modbus address can be manually set before the Profibus network is commissioned, this allows a user to indirectly set the Profibus address using the 777.

The reason this is called Flex addressing is that the profibus address can be set to 1 through 98 by setting the 777's modbus address to A01 through A98. **OR** the 777 can be set to address A99 which causes the CIO-PR to leave the Profibus address alone. This makes the A99 setting act as a "Don't use the 777 modbus address" setting. Therefore, the user has the flexibility to either set the profibus address with the 777 or to allow the profibus master to set the address.

If the Profibus master device has the ability to send a "Set Station Address" command, it can change the Profibus address in the CIO-PR to any valid setting of 0 through 125. Note that the "Set Station Address" command must be sent after the CIO-PR is powered up but before the CIO-PR is brought on-line.

Displaying the current 777 modbus address
To display and set the modbus address in the 777 overload, the 777 must first be powered up. If three-phase voltage is not available, the 777 can be powered up with single-phase voltage if sufficient voltage is available. For example, if the 777 is rated for 200 to 480 VAC (volts AC), there should be at least 180 VAC present at terminals L1 and L2 of the 777. The 777'S mode select switch can then be turned to the #RU/ADDR set point (straight up or at the 12 o'clock position).

Since the "Number of Restarts after an Undercurrent trip" (#RU) and the "modbus address" (ADDR) share the same position on mode select switch, make a note of the existing #RU setting before changing the modbus address in case the #RU setting is accidently changed. To read the #RU setting, turn the DISPLAY/PROGRAM knob (on the right side of the 777) fully counter-clockwise. The display should show '000' through '004' or just a single 'A' (with 2 blanks before the 'A' character).

To display the modbus address, turn the DISPLAY/PROGRAM knob fully clock-wise. The modbus address is displayed with a leading 'A' followed by 2 numeric digits, so the leading 'A' display lets you know that the modbus address is being displayed instead of the #RU setting.

For example, if the #RU setting is 3 and the current modbus address is 3, the #RU setting would be displayed as "003", whereas the modbus address would be displayed as "A03".

Setting the 777 modbus address
Each 777 overload will need to have its modbus address set to the desired profibus address for that location. To set the modbus address, you must have mode select switch turned to the #RU/ADDR position. Then press the RESET/PROGRAM button on the lower left side of the 777 and simultaneously turn the DISPLAY/PROGRAM knob until the desired address (with the A in front) is showing, then release the RESET/PROGRAM button.

EXAMPLE – Set the 777 modbus address to A03

> To set address 3, you must press the RESET/PROGRAM button and turn the DISPLAY/PROGRAM knob until the display reads 'A03'. If the display reads '003' then the knob has been turned too far counter-clockwise and you are changing the #RU setting instead of the ADDR setting. When the display shows 'A03', you may release the RESET/PROGRAM button.

After you release the RESET/PROGRAM button, you should verify that the display continues to read the correct modbus address, such as 'A03' in the example above, since the 777 may have the display lock enabled (the display lock prevents changes from the front panel). It is also a good idea to re-check the #RU setting to make sure it reads the same value that it had before you changed the modbus address.

After verifying the #RU setting and the modbus address setting, turn the mode select switch from #RU/ADDR back to the RUN position.

Getting the address into the CIO-PR
Flex addressing is only checked as the CIO-PR is being powered up. After the address is set in the 777, you will have to power down the CIO-PR. Then power up the CIO-PR and the 777 and wait for the CIO-PR's lower LED (labeled OLC) to go to solid green. Wait for 2 or 3 additional seconds and once again power down the CIO-PR. When you power up the CIO-PR a second time, it should have the new address.

If there are communication problems, it may be necessary to cycle power to the CIO-PR an additional time in order for the CIO-PR to accept the new modbus address of the 777.

Stand-alone CIO-PR modules
Even if you intend to use the CIO-PR without an attached 777, you can still use this method to set the Profibus address. You will have to attach the CIO-PR to a 777 to set the address, but after the CIO-PR has the address you want, you can remove it from the 777 and install it in the Profibus network without the 777.

NETWORK WATCHDOG CONTROL

Profibus defines its own watchdog enable and watchdog timeout control. The profibus defined watchdog features are configured within the profibus master device. The main control mechanism for the profibus watchdog seems to be that the profibus slave goes out of data exchange (DX) mode and the control registers are set to zero.

In addition, the 777 contains a network watchdog feature (see NETST, bit 0) that can be enabled to deactivate the overload's fault relay if there is a loss of communications with the CIO-PR module.

These two features are independent of the CIO-PR's watchdog enable configuration (WdEnable) and watchdog time out (WdTimeOut), but the overall effect of all three watchdog controls can be seen in the action of the CIO-PR's output relay A and output relay B and the action of the 777's fault relay.

The effects caused by a watchdog/idle condition are somewhat complex due to power issues and the fact that the control registers for the output assemblies are usually set to zero when the profibus master device (i.e. a PLC) is no longer communicating with the CIO-PR or if the profibus master device goes offline. Since the control registers are set to zero, certain output assemblies (see the first list below) will cause both output relay A and output relay B will be forced to an OFF state as soon as the profibus master device leaves the data exchange mode. This happens whether the CIO-PR watchdog enable configuration (WdEnable) calls for the relays to be deactivated or not.

CIO-PR Output Relay A and Output Relay B control with Output Assemblies:
101, 102, 111, 112, 121, 122
In the current firmware version of the CIO-PR, if the output assembly indicates that a zero value will cause output relay A and output relay B to be deactivated (see the list of output assemblies above), then the CIO-PR's watchdog enable configuration (WdEnable) will have less effect on the CIO-PR's output relay's behavior when the profibus master device goes offline. When the master goes offline, the control registers will be set to zero and output relays A & B will be deactivated regardless of the WdEnable configuration.

The CIO-PR's watchdog enable configuration (WdEnable) will still affect the output relays if there are certain types of communications failure (such as a broken or disconnected comm. wire) with the profibus master device. However the profibus watchdog feature will often zero the control registers before the WdTimeOut period expires, so the output relays will often be deactivated regardless of the WdEnable configuration.

CIO-PR Output Relay A and Output Relay B control with Output Assemblies:
103, 113, 123
If the output assembly chosen to control the 3 relays indicates that a zero value will not cause a change in relay A & B state (see the list of output assemblies above), then a watchdog enable configuration

(WdEnable) can be configured to determine whether or not the relays turn off with a watchdog/idle condition.

If the desired control scheme is to absolutely ***not*** have one or both of the relays change state during a watchdog/idle state or when the profibus master device goes offline, it will be necessary to use output assembly 103, 113 or 123. Note that this requires the profibus master device to set a bit (bit 1) in order to turn off both output relay A and output relay B.

If the desired control scheme is to cause the relays to be deactivated when a watchdog/idle state is detected or when the profibus master device goes offline, both the profibus watchdog should be enabled and the CIO-PR's watchdog enable (WdEnable) bits set. The only question is how much time will elapse before the relays are deactivated. If output assembly 103, 113 or 123 is chosen, the designated relay(s) will be forced off after the watchdog timeout value (i.e. 10 seconds). If one of the other output assemblies is chosen, the output relays will usually be deactivated immediately or by the profibus watchdog after it times out.

777 Fault Relay
The CIO-PR will be able to control the state of the 777 overload's fault relay regardless of the output assembly as long as the profibus 24 volt power is maintained.

In other words, if the watchdog enable configuration (WdEnable) is set to enable the watchdog feature for the slave fault relay (bit 0) and the profibus master device goes offline, the CIO-PR can send an OFF command to the 777 to cause the fault relay to go to the OFF state after the watchdog timeout period (WdTimeOut).

Loss of 24 volt power
If, for example, the profibus communication cable is accidentally cut the CIO-PR will lose power. Since both output relay A and output relay B are powered by the 24 volt power from the profibus communications cable, both relays will immediately be deactivated.

In addition, the CIO-PR module will no longer be able to send an OFF command to the 777. Unless the 777's network watchdog has been enabled, the 777 overload would continue to operate in a stand-alone manner without changing the state of the fault relay.

If the desired control scheme is to force the 777 fault relay to be deactivated if the profibus master device is no longer in control of the CIO-PR and the 777, even in the event of loss of 24 volt power, it will be necessary to both set the CIO-PR watchdog enable configuration (WdEnable) bit for the slave fault relay (bit 0) and enable the 777's network watchdog feature.

Refer to the 777-P's modbus memory map documentation, variable NETST at address 40125 or hexadecimal address 0x7C. Bit 0 of variable NETST must be set to enable the 777 modbus watchdog feature. If the feature is enabled, the 777 watchdog timeout period is fixed at 10 seconds.

In the current firmware version of the CIO-PR module, the 777 watchdog setting cannot be configured via profibus. It must be configured with a modbus configuration tool or software. Note that this will most likely require replacing the CIO-PR module with a modbus RS485MS converter module long enough to enable the 777 watchdog feature. Once the feature is enabled, the CIO-PR module can be re-installed.