8-2 Troubleshooting using the IO Controller indicators

8-2-1 Determining Operating Status from the Indicators

This section presents a number of easy to use procedures to troubleshoot possible errors using the LED indicators on the front of the Unit (see figure below).

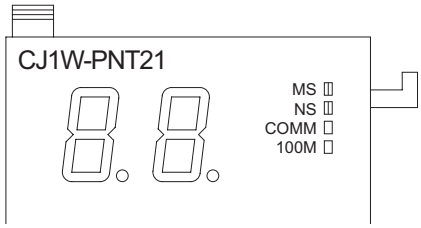

Figure 8.1: Indicators

The LEDs on the Communication Unit (1) have the following functions:

LED	Indicates the
MS	PROFINET IO Controllers Module Status
NS	PROFINET IO Controllers Network Status
COMM	PROFINET IO Controllers Communication Status
100	PROFINET IO Controllers IO Data Exchange Status

The LED indicators can be used to determine the following categories of errors:

- Normal operation
  This is the normal startup procedure and operation of the PROFINET IO Controller. Any other indication means the Unit is an abnormal state.
- Start-up errors
  These include errors in the PLC CPU, as well as errors in the Unit, which prevents the combination from starting up correctly.
- Operational errors
  These include PLC errors, PLC Bus errors, and error log problems, all during operations.
- Configuration problems
  These include errors during or after downloading a new configuration as well as errors in the configuration after startup.
- PROFINET IO errors
  These include errors in the PROFINET IO interface or on the network.

8-2-2 Normal Operating Status

The following table shows the status of the MS, NS, COMM and 100M indicators and the 7-segment display during normal operation

Indicator status				Network/Unit status	Comments
MS	**NS**	**100M**	**7-segment**		
OFF	OFF	OFF	- -	Booting and initializing with the PLC	Bootup and initialization with the PLC in progress. Restart the PROFINET IO Controller unit if this status continues for an extended period of time. Replace the CPU Unit and/or PROFINET IO Controller Unit if the problem is not corrected by restarting.
ON (green)	OFF	OFF	r dot flashing	Valid configuration detected	The PROFINET IO Configuration downloaded from the configuration tool is evaluated during startup of the unit.
ON (green)	Flashing (green)	OFF	r dot flashing	PROFINET IO core software started	The PROFNET IO Controller has started its core communication software and is ready to start communication with PROFINET IO Devices.
ON (green)	Flashing (green)	OFF	r dot ON	Relations to PROFINET IO Devices are set up	Before PROFINET IO Communication is fully running a relation between each IO Device and the IO Controller is established.
ON (green)	Flashing (green)	ON (yellow)	r dot ON	Data Exchange with at least one IO Device	At least one IO Device is exchanging IO Data with the IO Controller
ON (green)	ON (green)	ON (yellow)	r dot ON	Data Exchange with at all configured IO Devices	All configured IO Devices are detected by the IO Controller and to all IO Data Exchange is esthablised.

The COMM indicator turns ON during any communication at the Ethernet port. It functions independently from the operation mode of the Unit.

On smaller PROFINET IO Networks the sequence from starting the PROFINET IO core software to being in full Data Exchange with all the IO Devices can be very fast that the individual steps can not be distinguished.

8-2-3 Troubleshooting Errors Occurring in the IO Controller Unit

Unit errors are errors which occur at starting or normal operation of the system and which prevent the Unit from functioning correctly in the PLC system. Usually these errors also cause the CS/CJ PLC CPU ERR/ALM indicator to be lit or flashing. For more information on error indications in the PLC, refer to the CS1 Series CPU Unit Operation Manual (W339) or the CJ Series CPU Unit Operation Manual (W393) for more details.

Unit errors

Error category	Error	Indicators			Error log (Hex)
		7-segment	MS	NS	
Unit errors	Startup errors	1 to 6	ON (red)	OFF	--
IO Controller function	PROFINET configuration set invalid	C7	ON (green)	Flashing (red)	0202
PROFINET Network errors	Ethernet failure	E3	ON (red)	OFF	020C
	Bus hardware error	E5			0219
Memory access errors	Special Unit error	--	Flashing (green)	Flashing (red)	0601
	Memory access error	E9			0602
CPU Unit Exchange	Backplane bus error	H0	Flashing (red)	OFF	000E
	Unit number duplication	H1			--
	CPU Unit faulty	H6			--
	I/O table not registered	H7			--
	CPU Unit service monitoring error	HE			0001
	CPU Unit watchdog timer error	HF			0002

Note If Module Status is Red lit or flashing then refer to the displayed error code on the 7-segment display for further information.

8-2-3-1 Unit errors

Startup errors

7-segment	MS indicator	NS indicator	Error log (Hex)
1 to 6	ON (red)	OFF	--

Likely cause
During startup of the IO Controller it encountered a problem and can not continue

IO Controller Unit response
The Unit will stop processing. There will be no error logged in the error log.

CIO Area Flags allocated to the IO Controller Unit
None of the bits is set.

Correction
Restart the IO Controller. Replace the IO-Controller if the error recurs.

8-2-3-2 IO Controller Functions

PROFINET configuration set invalid

7-segment	MS indicator	NS indicator	Error log (Hex)
C7	ON (green)	Flashing (red)	0202

Likely cause
During startup of the IO Controller encountered a problem interpreting the PROFINET IO Configuration file. This could be because the Unit started for the first time and does not contain a configuration file yet. Also the Configuration file could be damaged.

IO Controller Unit response
The Unit is started and is capable to receive a PROFINET Configuration. It will not initiate PROFINET IO Communication. Records the error in the error log.

CIO Area Flags allocated to the IO Controller Unit
IO Controller status 1 (word n+5) bit 07 will be OFF

Correction
Use CX-ConfiguratorFDT to download a valid PROFINET IO Configuration in the IO Controller. Or restore the Configuration from a Compact Flash memory card. Replace the IO-Controller if the error recurs.

8-2-3-3 PROFINET Network errors

Ethernet failure

7-segment	MS indicator	NS indicator	Error log (Hex)
E3	ON (red)	OFF	020C

Likely cause
The PROFINET IO controller could not establish a Ethernet link to the connected switch or IO Device.

IO Controller Unit response
The Unit is not capable to communicate on the PROFINET network and therefore control to the IO Devices will be lost. The Unit will stop processing. Records the error in the error log.

CIO Area Flags allocated to the IO Controller Unit
IO Controller status 2 (word n+6) bit 03 will be ON

Correction
Check the Ethernet cable and switch or IO Device Restart the IO Controller.

Bus hardware error

7-segment	MS indicator	NS indicator	Error log (Hex)
E5	ON (red)	OFF	0219

Likely cause
Disturbance on the Ethernet network causes the Ethernet interface to fail.

IO Controller Unit response
The Unit is not capable to communicate on the PROFINET network and therefore control to the IO Devices will be lost. he Unit will stop processing. Records the error in the error log.

CIO Area Flags allocated to the IO Controller Unit
IO Controller status 2 (word n+6) bit 03 will be ON

Correction
Check the ethernet network for possible causes of disturbance. This can be EMC influences, broken or shorted Ethernet cable, faulty connectors, defective Ethernet switches or IO Devices and grounding problems to name a few. This will result in interrupted data streams or broken messages.

8-2-3-4 Memory access errors

Special Unit error

7-segment	MS indicator	NS indicator	Error log (Hex)
--	ON (red)	OFF	0601

Likely cause
The PROFINET IO controller encountered an internal error and can not continue.

IO Controller Unit response
The Unit will stop processing. Records the error in the error log.

CIO Area Flags allocated to the IO Controller Unit
None of the bits is set.

Correction
Restart the IO Controller. Replace the IO-Controller if the error recurs.

Memory access error

7-segment	MS indicator	NS indicator	Error log (Hex)
E9	Flashing (green)	Flashing (red)	0602

Likely cause
During startup the IO Controller encountered a problem reading the PROFINET IO Configuration file. This could be because the Unit started for the first time and does not contain a configuration file yet.

IO Controller Unit response
The Unit is started and is capable to receive a PROFINET Configuration. It will not initiate PROFINET IO Communication. Records the error in the error log.

CIO Area Flags allocated to the IO Controller Unit
IO Controller status 1 (word n+5) bit 07 will be OFF.

Correction
Use CX-ConfiguratorFDT to download a valid PROFINET IO Configuration in the IO Controller. Or restore the Configuration from a Compact Flash memory card. Replace the IO-Controller if the error recurs.

8-2-3-5 CPU Unit exchange

Backplane Bus error

7-segment	MS indicator	NS indicator	Error log (Hex)
H0	Flashing (red)	OFF	000E

Likely cause
The PROFINET IO controller encountered an error while assessing the backplane bus of the PLC.

IO Controller Unit response
The Unit will stop processing. Records the error in the error log.

CIO Area Flags allocated to the IO Controller Unit
None of the bits is set.

Correction
Restart the PLC. Check the PLC for faults in the backplane bus. Replace the IO-Controller or other Units if the error recurs.

Unit number duplication

7-segment	MS indicator	NS indicator	Error log (Hex)
H1	Flashing (red)	OFF	--

Likely cause
At startup the PROFINET IO Controller detected that there is another Unit having the same Unit number set.

IO Controller Unit response
The Unit will stop processing.

CIO Area Flags allocated to the IO Controller Unit
None of the bits is set.

Correction
Correct the Unit number of the IO Controller or the other Unit. Restart the PLC.

CPU Unit fault

7-segment	MS indicator	NS indicator	Error log (Hex)
H6	Flashing (red)	OFF	--

Likely cause
The PROFINET IO Controller detected that PLC CPU Unit is faulty.

IO Controller Unit response
The Unit will stop processing.

CIO Area Flags allocated to the IO Controller Unit
None of the bits is set.

Correction
Replace the CPU Unit if the error recurs when the CPU Unit is restarted.

Backplane bus error

7-segment	MS indicator	NS indicator	Error log (Hex)
H7	Flashing (red)	OFF	--

Likely cause
The PROFINET IO Controller detected that an error on the backplane bus.

IO Controller Unit response
The Unit will stop processing. Records the error in the error log. (The time information is set to all zeroes.)

CIO Area Flags allocated to the IO Controller Unit
None of the bits is set.

Correction
Replace the CPU Unit if the error recurs when the CPU Unit is restarted.

Cyclic refresh monitor timeout

7-segment	MS indicator	NS indicator	Error log (Hex)
HE	Flashing (red)	OFF	0001

Likely cause
During normal operation the cyclic refresh to the PLC CPU timed out.

IO Controller Unit response
The Unit will stop processing. Records the error in the error log.

CIO Area Flags allocated to the IO Controller Unit
None of the bits is set.

Correction
Replace the CPU Unit if the error recurs when the CPU Unit is restarted.

Watchdog timer error

7-segment	MS indicator	NS indicator	Error log (Hex)
H7	Flashing (red)	OFF	0002

Likely cause
The PROFINET IO Controller detected a watchdog timer error with the PLC CPU unit.

IO Controller Unit response
The Unit will stop processing. Records the error in the error log.

CIO Area Flags allocated to the IO Controller Unit
None of the bits is set.

Correction
Replace the CPU Unit if the error recurs when the CPU Unit is restarted.

8-3 Troubleshooting the Network

8-3-1 Troubleshooting Parameter Download

The PROFINET IO Controller DTM provides clear error messages if downloading of the parameters to the PROFINET IO Controller Unit fails. Failure can be due to either

- Errors or inconsistencies in the slave parameter sets, which are checked prior to download.
- The IO Controller DTM being unable to establish communication with the CJ1W-PNT21 PROFINET IO Controller Unit.
- A communication interruption of the process during download.

Errors in Slave Parameter Sets

The error messages displayed will provide a clear indication of the problem.
A download initiated by the user, starts with a check on the IO Device parameter sets. The IO Controller DTM will check

- The total number of IO Devices assigned, which must be at least one slave device.
- The total number of I/O modules per IO Device, which must be at least one I/O module per IO Device.
- The maximum size of the I/O data size, which must not exceed 7168 words.
- Any existing overlap in the I/O Areas configured.
- Any existing overlap in the allocated PLC memory areas.
- Availability of EM banks should any of the I/O Areas be mapped to one of the EM Banks. Availability of the EM banks depends on the PLC CPU type.

Any of these errors will abort the download process without consequences for the CJ1W-PNT21 PROFINET IO Controller Unit.

Errors when Establishing Communication

If no errors occurred during the checking phase, the IO Controller DTM will try to establish communication with the CJ1W-PNT21 PROFINET IO Controller Unit through CX-Server. If this fails, an error message will be displayed, indicating a communication problem. A failure to establish communication prior to download will have no consequences for the CJ1W-PNT21 PROFINET IO Controller Unit.

Errors During Download

If none of the first two processes result in a failure, downloading will commence. As soon as downloading has started, the configuration data in the CJ1W-PNT21 PROFINET IO Controller Unit will be over written.

Recovery After Failing Download

If a failure occurs during the download process, which prevents the IO Controller DTM from completing the process, the user must restart the Unit manually. Restarting the IO Controller Unit will abort the download process in the Master Unit and recover the previous configuration from its memory.

8-3-2 Troubleshooting the Network using CX-ConfiguratorFDT

CX-ConfiguratorFDT provides several means to troubleshoot either the CJ1W-PNT21 PROFINET IO Controller Unit, the IO Devices or the network. The means all rely on features discussed in the previous section.

Troubleshooting the IO Controller Unit

To troubleshoot the IO Controller Unit or the network, the IO Controller DTM Diagnosis User Interface provides a help in determining problems. The figure below shows the Diagnosis - IO Controller Status item of the IO Controller DTM Diagnosis User Interface.

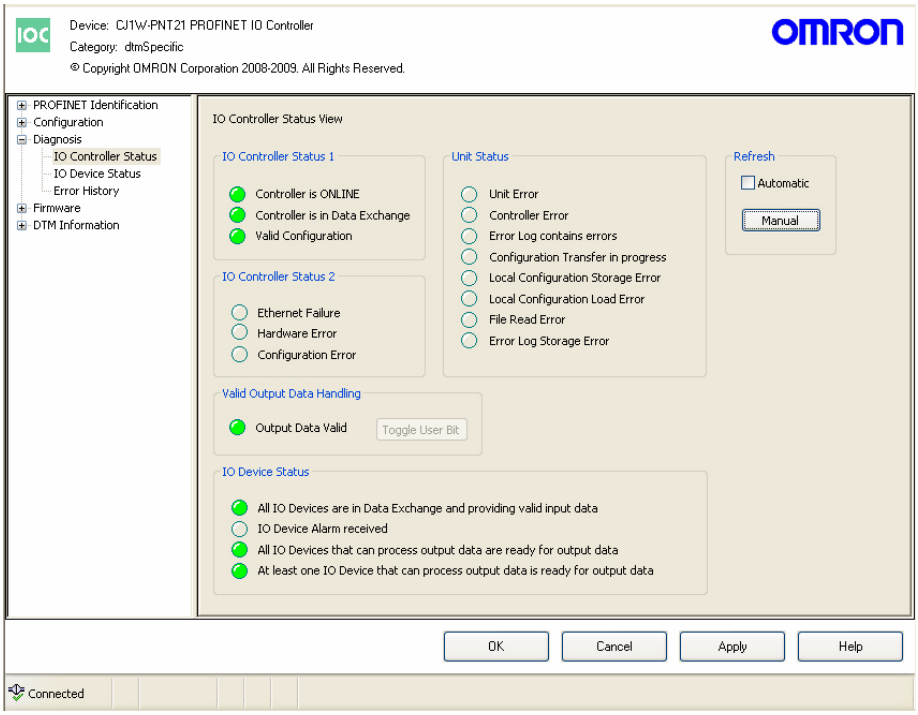

Figure 8.2: IO Controller status view

The LED indicators shown in the (example) figure above are all related to bit flags in the Unit Status Word, the IO Controller Status Word 1 and Word 2, and the IO Device Status Word.

Unit Status

The table below lists combinations of LED indicators with information on possible problems. They are derived from the Unit Status word. If one of the errors occur then there is a problem with the IO Controller itself. Probably the Unit needs to be replaced.

LED Indicators	Description/Correction
Unit Error	The Unit Error flag is ON if the unit has an error. That is if one of the other error flags in the Unit Status is ON.
Controller Error	The Controller Error Flag is On if one of the IO Controller Status 2 error flags is ON.
Error Log contains errors	When a new error is logged in the Error Log then this flag is ON. After reading or clearing the Error Log this flag is OFF. Reading or Clearing the Error Log can be done or by the Diagnosis Error History of the IO Controller DTM or by using the appropriate FINS commands.
Configuration Transfer in progress	During download of a new configuration from the IO Controller DTM to the IO controller this flag is ON

LED Indicators	Description/Correction
Local Configuration Storage Error	After the download of a new configuration or a restore from the Compact Flash card in the PLC CPU the IO Controller will store the configuration in its memory. If it does not succeed then this flag is ON. Try to download the configuration again. If the problem persists the replace the IO Controller.
Local Configuration Load Error	During startup of the IO Controller loads the configuration from memory. If it does not succeed then this flag is ON. Try to download the configuration again. If the problem persists the replace the IO Controller.
File Read Error	If the IO Controller restores a configuration from Compact Flash card in the PLC CPU and it can not access the configuration file on the Compact Flash card then this flag is ON.
Error Log Storage Error	If a new error needs to be written to the Error Log and the IO Controller does not succeed in storing this error in the Error Log then this flag is ON.

IO Controller Status 1

The IO Controller Status 1word displays the state of the Unit. It shows if the IO Controller can go on the network and communicate with the current configuration with the IO devices.

LED Indicators	Description/Correction
Controller is ONLINE	Normally the IO Controller is always Online. If the IO Controller has gone Offline then a severe error has occurred. Check the Unit Status and the Error History to see the cause. Eventually replace the Unit.
Controller is in Data Exchange	The IO Controller is in Data Exchange when it can reach at least one of the configured IO devices. This shows that the network connection to the IO Devices works. If some of the IO Devices can not be reached it is a network issue and not an issue of the IO controller. If the IO Controller is out of Data Exchange it means that their is something wrong with the network connection from the IO Controller to the IO Devices.

LED Indicators	Description/Correction
Valid Configuration	At startup the IO Controller checks if the stored configuration is valid. A new IO Controller contains no configuration yet so therefore it will show it has no valid configuration. If a configuration is not valid it means that means the file could be damaged. It is possible to download the configuration again with CX-ConfiguratorFDT. If downloading the configuration to the Unit does not solve the issue then replace the unit.

IO Controller Status 2

The IO Controller Status 2 word displays the state of the Unit's network interface. It shows if the Ethernet cable is correctly inserted in the IO Controller and an Ethernet Link could be established to the connected switch or IO Device. Or that the Ethernet interface of the Unit itself encountered a problem.

LED Indicators	Description/Correction
Link Status	The Unit could not establish an ethernet link at 100Mbps, Full Duplex to the connected switch or IO device. It could be that the Ethernet cable is damaged or not correctly inserted. Or that the connected device has a fault.
Hardware Error	The Ethernet controller of the Unit encountered a problem. It could be because of faulty access or there where broken messages or interrupted data streams from the network. This could be caused by external influences on the network.
Configuration Error	At startup the IO Controller checks if the stored configuration is valid. A new IO Controller contains no configuration yet so therefore it will show it has no valid configuration. If a configuration is not valid it could be that the file is damaged. It is possible to download the configuration again with CX-ConfiguratorFDT. If downloading the configuration to the Unit does not solve the issue then replace the unit.

IO Device Status

The IO Device Status word displays the state of the Unit's communication to its assigned IO Devices. Whether all or at least one IO Device that can process output data are connected. And if all IO Devices configured are supplying valid input data.
If one or more IO Devices have an Alarm then this will also be signalled.

LED Indicators	Description/Correction
All IO Devices are in Data Exchange and providing valid input data.	The Unit could establish an connection to all configured IO devices. All these IO Devices are now in Data Exchange and are providing valid input data. If one of the IO Devices sets it input data to be invalid then there could be something wrong with that IO Device. For more information refer to the IO Device Status item or to the IO Device DTM itself for further information. Also when an IO Device is simply turned off it is signalled here also.
IO Device Alarm received.	One of the IO Devices signalled it has a alarm available. Refer to the IO Device status item or the IO Device DTM to retrieve further.
All IO Devices that can process output data are ready for output data.	The IO Controller has found all configured IO Devices with output data and successfully created a connection to them. Now the output data must be activated by setting the state of the output data to valid. Output data is set valid by the IO Controller depending on the setting Valid Output Data Handling in the IO Controller Setup item. It could be or PLC Mode Dependent or User Bit Controlled.
At least one IO Device that can process output data is ready for output data.	The IO Controller has found at least one configured IO Devices with output data and successfully created a connection to it. If the IO Controller can reach at least one but not all IO Devices this could mean that something is wrong with the network connection to that part of the network. To see which IO devices can not be reached refer to the IO Device Status item.

Valid Output Data Handling

The IO Controller signals to the IO Devices that the output data it is sends is valid or not. The IO Devices use the state of the output data to active their outputs. If the output data is set to invalid it is up to the settings of the IO Device what will happen.Normally the IO Device will go to an fail-safe state. the PROFINET IO connection between the IO Controller and IO Device will stay intact.

The Toggle User Bit button will be accessible if the setting in the IO Controller Setup item for the Valid Output Data Handling is set to User Bit Controlled. Now it is possible to manipulate the Set Output Data Valid in Software Switches 1 (word N bit 12). Normally this bit would be controlled by the PLC program.

LED Indicators	Description/Correction
Output Data Valid.	If set the IO Controller sends valid output data to the IO Devices. The IO Devices should normally operate their outputs. If not set the IO Devices will set their outputs to a safe state. The IO Controller handles the state of the output data depending on the setting if it is: • PLC Mode Dependent • User Bit Controlled If IO Devices do not operate their outputs please check the setting of the Valid Output Data Handling and the according handling in the PLC program.

Troubleshooting IO Devices

The IO Device Status item gives an overview which IO Devices are in Data Exchange and which of them have reported new errors. By selecting a IO Device or in the New Alarm & Data Exchange Active Flags Area or by the Selected IO Device menu more information about the alarm is displayed.

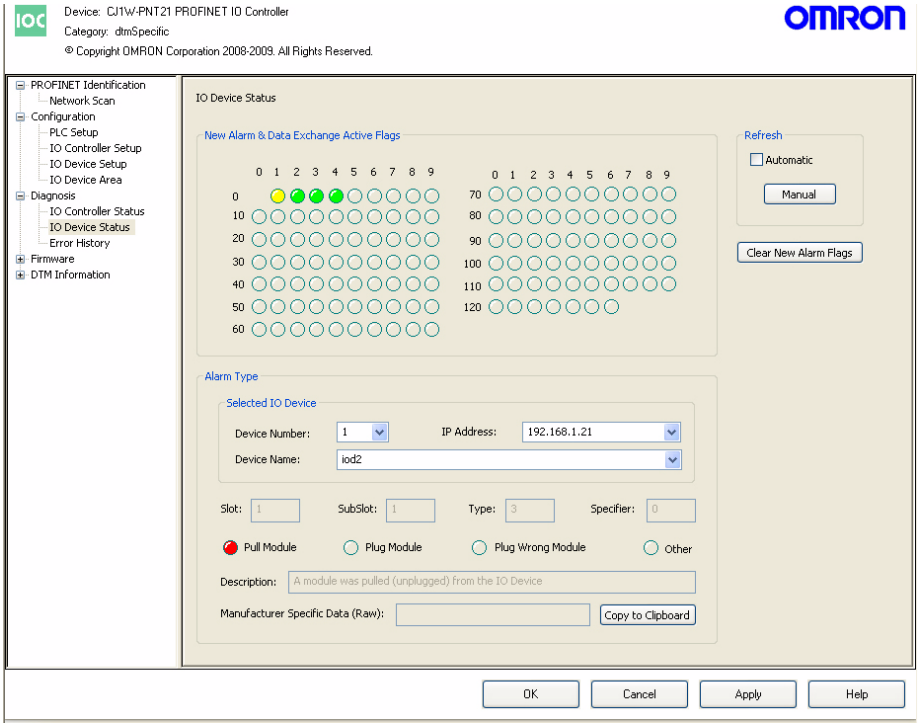

Figure 8.3: IO Device status

Missing IO Devices will be marked will be marked Red.
IO Devices that signalled an alarm will be Yellow.
The standard PROFINET alarms are implemented:

- Pull Module
- Plug Module
- Plug Wrong Module
- Other

When the type of Alarm is Other then additional information can be found in the Description and the Manufacturer Specific Data (Raw) fields.
The additional information can be copied to the Clipboard for further analysis.
When selecting an IO Device either in the New Alarms & data Exchange Active Flags or the Selected IO Device area will show the last known alarm of the IO Device. It does not necessarily mean that the alarm is still active. If a IO Device has an active alarm that this will be displayed in the colour of the IO Device (Yellow).
Alarms can be acknowledged with the Clear new Alarm Flags button.

Error History

The Error History item is reading the Error Log in the IO Controller. The IO Controller stores up to 30 errors in its Error Log. Information on the errors logged can be found in the list of errors.
Below the Error Log View is displayed.

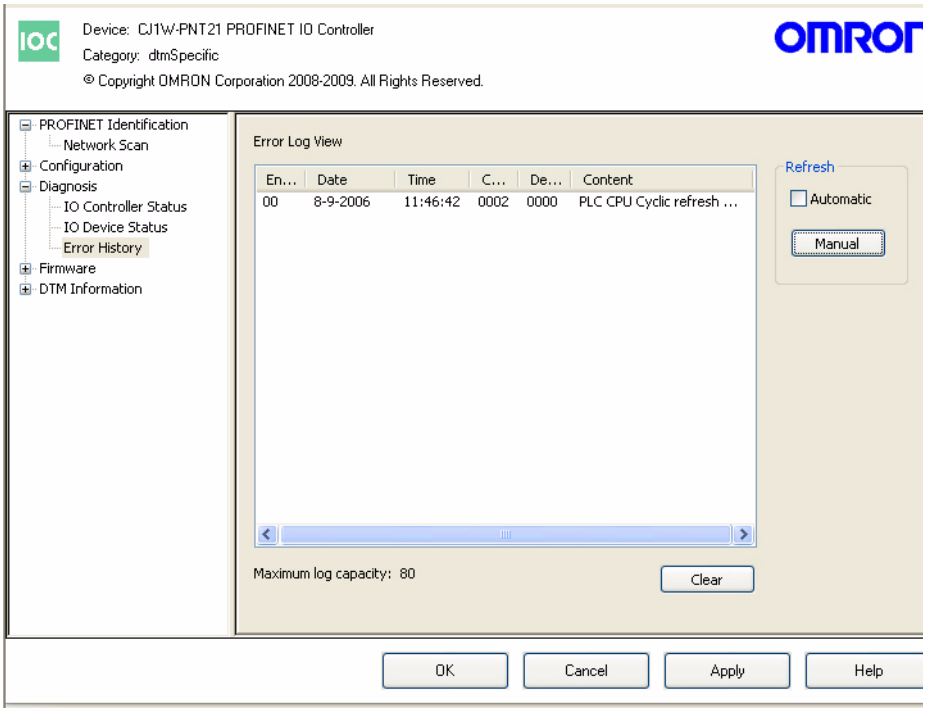

Figure 8.4: Error history