Business Unit Naval Projects

Imtech Marine & Offshore B.V.
Sluisjesdijk 155
P.O. Box 5054
3008 AB Rotterdam
The Netherlands
Harbour number 2137
Tel. +31 (0)10 487 19 11
Fax. +31 (0)10 487 17 02

Maintenance Manual

Integrated Platform Management System

Volume -

Project:	TNI-AL
Projectnumber:	190134
Main title:	Maintenance Manual
Sub title:	Integrated Platform Management System
Special remark:	
Issue:	V2.0
Date:	25 January 2007
Total number of pages:	96
Registration code:	190134-4380-MM

	Name	**Signature**
Author:	R. Langeveld	
Quality control:	E.J. Middeldorp	
Acknowledge:	R. van Treuren	

Table of contents

Figures

Tables

References

[1] **Title:** **Technical Specification**
Description: Technical Specification between Schelde Naval Shipbuilding and IMTECH Marine & Offshore
Ref.: I 1005
From: Schelde Naval Shipbuilding
Issue: D
Date: 23 September 2004

[2] **Title:** **Documentation Plan**
Description: TNI-AL Documentation Plan
Ref.: 190134-DCL-001
From: R. v. Treuren
Issue: 1.1
Date: 31 January 2005

[3] **Title:** **System Specification IAS**
Description: Overall System specification of the Integrated Automation System
Ref.: 190134-4000-IAS-SSC
From: E.J. Middeldorp
Issue: V1.0
Date: 9 May 2005

[4] **Title:** **Functional Specification IPMS**
Description: Functional specification of the Integrated Platform Management System.
Ref.: 190134-4380-FSC
From: R. Langeveld
Issue: V1.0
Date: 9 May 2005

[5] **Title:** **Technical Specification IPMS HMI**
Description: Technical Specification of the Human Machine Interface of the IPMS
Ref.: 190134-4380-HMI-TSC
From: R. Langeveld
Issue: V1.0
Date: 9 May 2005

[6] **Title:** **Technical Specification IPMS ELP**
Remark: Non-deliverable
Description: Technical Specification of the Element Processing of the IPMS
Ref.: 190134-4380-ELP-TSC
From: R. Langeveld
Issue: V1.0
Date: <>

[7] **Title:** **Functional Specification PMS**
Description: Functional Specification of the Power Management System.
Ref.: 190134-3900-FSC
From: C. Schouten
Issue: V1.0
Date: <>

[8] **Title:** **Functional Specification PCS**
Description: Functional specification of the Propulsion Control System.
Ref.: 190134-2520-FSC
From: R. Bipat
Issue: V1.0
Date: <>

[9] **Title:** **Network Architecture CSN and PDN**
Description: Network architecture of the IAS, Client Server Network (CSN) and Platform Data Network (PDN)
Ref.: 190134-4000-CFS-001
From: A.H. de Groot
Issue: V2.0
Date: 9 May 2005

[10] **Title:** **Navigation System Interface Specification**
Description: Interface Specification for all external interfaces of the navigation functions
Ref.: 190134-ISC-001
From: H.J. Tigchelaar
Issue: 2.0
Date: 9 May 2005

[11] **Title:** **IO List**
Description: List with Input/Ouput signals of the IPMS
Ref.: 190134-4380-IOL
From: E.J. Middeldorp
Issue: V1.0
Date: <>

[12] **Title:** **Item Survey List**
Description: States the defined items and their characteristics, such as dimensions, weight, and allocation on board
Ref.: 190134-4000-ISL
From: E.J. Middeldorp
Issue: V1.0
Date: <>

[13] **Title:** **IPMS User Manual**
Description: An operator guide that describes the entire user scoped IPMS functions.
Ref.: 190134-4380-UM
From: R. Langeveld
Issue: V1.4
Date: 1 Dec 2005

[14] **Title:** **GENSYS Technical documentation**
Description: All technical issues regarding the GENSYS modules.
Ref.: A40Z090004
From: DSF Technologies
Issue: h
Date: March 2003

[15] **Title:** **CCU2/C-MXMB**
Description: Installation and Configuration Manual
Ref.: CCU2/C-MXMB
From: Tyco Safety Product
Issue: Z
Date: 1 Feb 2004

[16] **Title:** **Local Control Panel Communication Modbus Definition**
Description: Modbus communication interface description with Pielstick main engines
Ref.: 17249S400372
From: SEMT Pielstick
Issue: A
Date: 31 Jan 2005

[17] **Title:** **IPMS Maintenance Manual**
Description: A guide for IPMS maintainers
Ref.: 190134-4380-MM
From: R. Langeveld
Issue: V1.6
Date: 1 Dec 2005

[18] **Title:** **ControlNet NetChecker**
Remark: Non-deliverable
Description: User manual for ControlNet NetChecker device
Ref.: 1788-UM001A-US-P
From: Allen Bradley
Issue: -
Date: November 1999

Abbreviations

AVH	Alarm Value High
AVL	Alarm Value Low
CNET	ControlNet
CPU	Central Processing Unit
HMI	Human Machine Interface
IAS	Integrated Automation System
IPMS	Integrated Platform Management System
IMO	Imtech Marine & Offshore
IO	Input/Output
LED	Light Emitting Diode
LOP	Local Operator Panel
LPU	Local Processing Unit
MCR	Machine Control Room
NBCD	Nuclear Biological Chemical Damage
NIC	Network Interface Card
OOH	Out Of Range High
OOL	Out Of Range Low
OPC	OLE for Process Control
OS	Operating System
PLC	Programmable Logic Controller
SCADA	Supervisory Control And Data Acquisition
TNI-AL	Tentara Nasional Indonesia – Angkatan Laut

Preface

Since this document intends to describe all IPMS' user aspects in a generic way, not all items described herein may apply to the project for which it is implemented. The exact scope of functions, features and facilities is specified by project specific specifications.

Besides this, applicable user dialogs, screen dumps or file paths may comprise generic terms or may not look exactly the same as shown for your application. It is assumed you are able to interpret the differences.

Generic project identification is represented by <<PROJECT-ID>>. For the TNI-AL project, the PROJECT-ID ='TNI-AL'. This means that in case a reference is made to <<*PROJECT-ID*>>, that you should read TNI-AL or - abbreviated - TNIAL.

Some tables intentionally might be left blank inside this document. A user can fill in the applicable data, which is specific for his project. These sections are superseded by the note: *"Project specific data"*

Project specific data might be stated by attachments as well.

Note: This document intends to describe all IPMS' user aspects in a generic way. It must be clear that no rights can be derived from differences found between this document and the final IPMS implementation onboard. For example: this document describes the use of Local Operator Panels. For the TNI-AL project however there are no Local Operator Panels foreseen.

Updates

The next table summarizes the updates that have been carried out on this document concerning previous releases.

Issue:	Date:	Change:	Reason:
1.0	20 Apr 04	Initial version	
1.1	19 May 04	Section 2.3 and sub-sections.	Enhancement
1.2	21 March 05	Several changes	Update
1.3	22 June 05	Minor changes	Update
1.4	1 Aug 05	Ethernet switch config. topics added	Not described by other end-user documents.
1.5	Nov 2005	PC restore instructions improved Air filter X945 type id was added	Clarification
1.6	Dec 2005	Project specific issues abstracted.	Obtaining a generic document.
1.7	18 April 2006	Manual HMI start/stop clarified. DeviceNet issues explained.	Enhancements
1.8	11 Oct. 2006	Sections 3.6.9.X added Sections 3.2.X added Section 3.3 several enhancements	Improvement
1.9	14 Dec. 2006	PLC arrangement plans added. Minor changes	Improvement
2.0	25 Jan. 2007	Configuration issues D16U16B(L)	New module type.

1. Introduction

1.1 Purpose of this manual

This manual is intended to support the maintenance engineers being responsible for the Integrated Automation Systems (IAS) while they are up to their job on the Integrated Platform & Monitoring System (IPMS). The IPMS includes the HMI SCADA System (Chapter 2) and PLC's (Chapter 3).

Section 1 of this document highlights a brief description of the IPMS architecture and its technical aspects;
Section 2 covers maintainer information related to the Human Machine Interface (HMI) system;
Section 3 describes the PLC related maintenance issues regarding the IPMS;
Section 4 describes data-logger maintenance and export issues;
Section 5 summarizes how data on a PC hard disk can be restored to initial settings;
Section 6 gives a description how to restore an Ethernet switch to its original settings;
Section 7 guides you to a solution in case you are experiencing a problem concerning the IPMS.

Along with this manual the User Manual ref [13] comprises some more information the maintainer/operator may need.

Note: The IPMS is part of the Integrated Automation System (IAS). This means that besides the IPMS other information systems are integrated with the IAS also. However, as this document intends to focus on the IPMS only, maintenance actions on systems other than the IPMS are excluded from this document.

Note: Throughout this document, it is presumed that the reader is familiar with basics concerning PLC's, PC's and the Windows 2000 Operating System.

1.2 Relationship to other documents

As illustrated in Figure 1-1, this document is part of the documentation set for the Integrated Automation System (IAS).

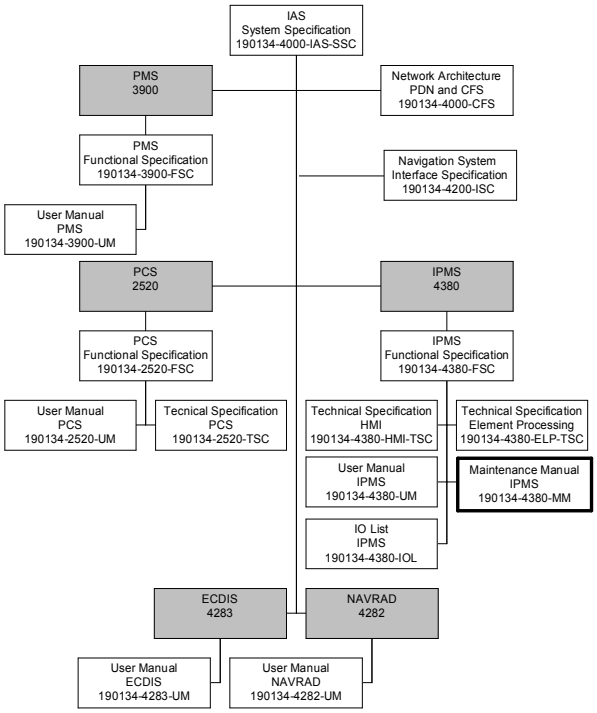


Figure 1-1 Documentation set

1.3 Brief system overview

Note: First, take a look at the IAS network architecture, Ref. [9] for a quick understanding how it is build, since references made herein will be used throughout this document also!

The IPMS comprises a number of IO-controller cabinets (LPU's) that interface the platform equipment (by using PLC's, sensors and actuators) and a Human Machine Interface (HMI / SCADA system). The HMI / SCADA system is primarily mend to interact with the remote operators but is also used for data-logging purposes. Both the PLC's and the HMI-servers communicate with each other by using the ControlNet network. Platform statuses like sensor values, alarm statuses etc. etc. are being monitored by PLC's. These units are able to react on a certain platform state based on their software. The HMI-servers poll the PLC's on regular intervals to achieve the latest alarm and monitoring information. Besides monitoring and alarm functions, operators are able to control the platform and to change settings from remote by using their workstation provided that these actions are granted to them.

1.4 ControlNet

The network used in between PLC's, remote IO-racks and the HMI-servers is ControlNet (CNET). Although originated by Allen Bradley, ControlNet is an open network standard that enables fast deterministic data transfers by using a token passing strategy.

ControlNet fault tolerance is achieved by using redundant cabling and redundant CNET bridge modules. That is, there are actually two coaxial RG6 type cables (identification: A and B) for each ControlNet network on the drawing. Although port A is the preferred port, the system will switch to the backup port (B) immediately in case of communication failure. Initially, the system may even use both ports when their quality is good. The quality of both ports can be monitored using HMI diagnostic screens but also by two LED's on front of each of the attached CNET interface modules. These LED's will light steady green in case the network is healthy. Besides these status information, a CNET NetChecker tool, type 1788-CNCHKR, make Allen Bradley makes it possible to do more detailed network tests.

Note:	The CNET NetChecker tool is not in the scope of supply. It can be purchased from Allen Bradley. See ref[C]

Important:	The ControlNet has proved to be reliable under industrial conditions, however care must be taken during maintenance actions concerning the network cabling in case some parts must be repaired or replaced. Improper repair actions may lead to spurious IPMS behavior!

1.5 Ethernet

Ethernet is used by the IAS to realize a fast link in-between workstations and servers. Ethernet switches interconnected by fiber-optic cables provide a 1 Gbit ring shaped redundant network backbone. In case an Ethernet connection times out, the Ethernet switches will attempt to reroute and re-establish the connections. (See IAS diagnostic mimic for applicable status indicators)

Note that most PC's have a dual network connection with the Ethernet ring. For this purpose two network interface cards (NIC) are installed in a PC. Dedicated network software manages both NIC's in such a way that just one of the NIC's is activated while the other one is in standby mode. Each NIC is connected to one of the Ethernet switches. So, in case of a faulted switch, the workstations are still connected to the network by the other NIC.

1.6 PLC architecture

Sensors and actuators are installed throughout the vessel to monitor and control the vessel equipment and its related processes. Wiring connects the platform to PLC IO modules. For example a level switch may be connected to a digital input board or a speed setpoint may interface a motor control unit via an analogue output board. Each of these boards interfaces at least one PLC processor somewhere on the ControlNet.

From the network architecture, Ref. [9] it can be seen that several IO-boards may reside in so called remote I/O racks. Besides IO-boards a remote I/O-rack comprises at least one ControlNet interface module and a power supply. Notice that no PLC processor module is installed within a remote IO-rack. Though each IO-board can be managed by just one PLC processor module anywhere on the ControlNet, all processor modules have read access considering IO board data.

2. HMI

2.1 General

The HMI is achieved by using Cimplicity Plant Edition HMI software. The Cimplicity HMI architecture is based on a client/server configuration. That is, HMI viewer software is installed on all IPMS workstations. It provides a client role on HMI server software that is installed on both platform servers.

The IPMS server gathers all information requested and displayed by the IPMS viewers. The other way round, a command given by a remote operator via one of the IPMS workstations must pass the IPMS server, before it is forwarded to the relevant PLC. Since an IPMS server failure would blind all viewers, the IPMS server is redundantly installed. That is, a secondary IPMS server will take over primary IPMS server roles in case it fails, provided that the HMI project was running in the redundant mode.

Note: Normally IPMS server switchover is fully automatic. However some failures, especially those considering the OPC server task, won't cause an automatic server switchover since all HMI processes are still healthy. In these cases system administrator intervention is needed to switch over server roles. For a complete understanding about server redundancy and its limitations, see the 'Server Redundancy Operation section which is available from the Cimplicity workbench help menu.

To achieve HMI project synchronization on both secondary - and primary servers drive mapping is being used. I.e. a project directory that physically exists on the secondary server hard drive is accessible from the primary server as it is shared over the Ethernet. The primary server will attempt to reconnect this remote drive whenever it boots. Drive letter 'F:\' is reserved for this purpose.

Note: On the primary server: check if disk F:\ is connected and whether it represents the remote project directory "<<*PROJECT_ID*>> on <*Secondary IPMS Server_Name*>". If not then redundant project synchronization will not be possible!

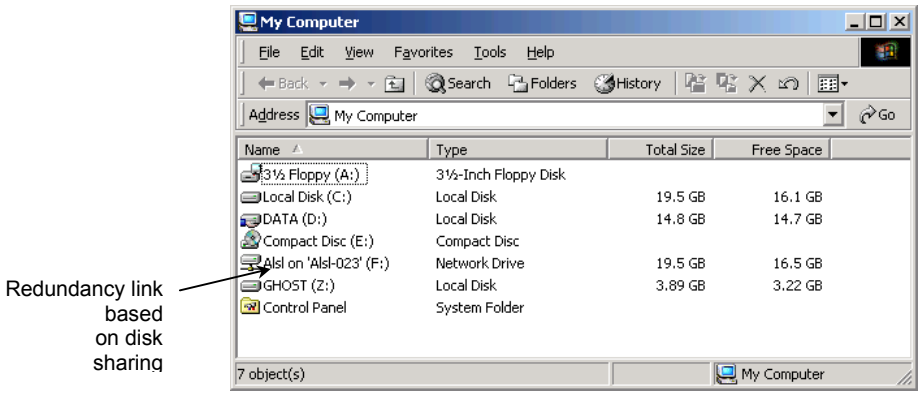


Figure 2-1 Folders available on the primary server

2.2 Starting / Stopping the SCADA project

2.2.1 Automatic start-up

The SCADA project will start automatically right after the OS on both server PCs has been started. However as the IPMS is configured as a redundant project we've to consider some issues regarding redundancy. To avoid racing conditions the secondary server is deliberately delayed. Confusingly it is preferred to power up the secondary server slightly first and just then the primary server within the next minute. This might be achieved by a delayed start of the OS on the primary server as well. This is because the primary server will attempt to achieve an automatic reconnection of a remote drive that physically resides inside the secondary server. A mapped drive is needed for IPMS project synchronization. The primary server won't be able to establish the reconnection once the OS is not already running on the secondary server yet. The redundant IPMS project assumes disk letter F:\ to be reserved for the remote project directory. (See also section 2.1)

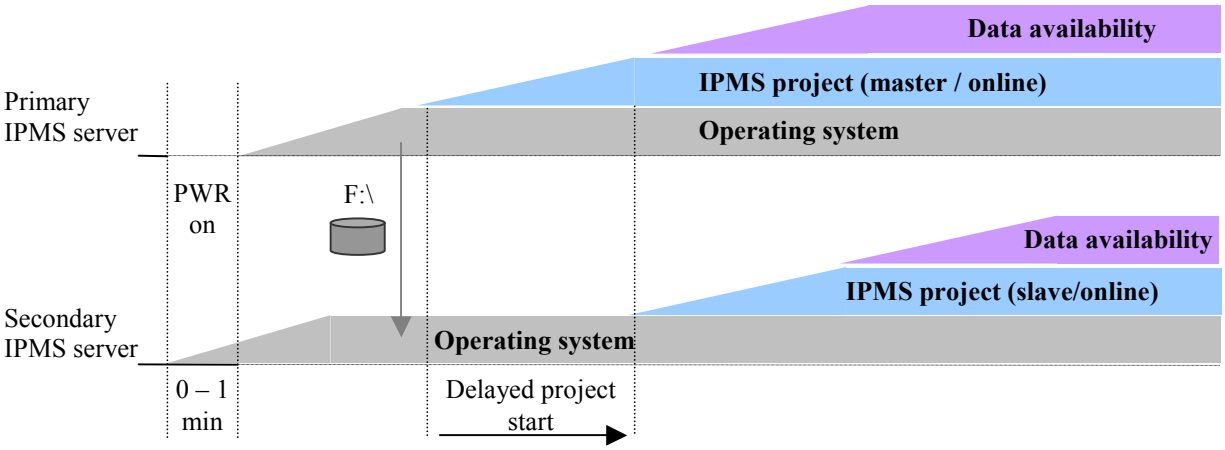


Figure 2-2 Representation of IPMS server boot process

Considering Figure 2-2 it can be seen that besides an IPMS project start there is also a data availability process involved. The data provider is responsible for interfacing both IPMS servers with the PLC processor on the platform.

When the primary server starts while the secondary computer is already acting as a master then the primary IPMS server automatically discovers that it should start as a slave. (provided that it is able to sense the current project status) In case for any reason the primary IPMS server is not able to detect that the secondary computer is already running as an IPMS master then it will attempt to start as a master also! Since a dual master mode is not supported, the system will attempt to recover from this once server interconnection has been re-established. The IPMS servers will start a negotiation about their role. Finally all involved HMI clients will have to switchover to the master server.

Note: A dual master recovery might not be bumpless. Even automatic recovery might not be possible. That is, screen animations may turn pink on and off for about 10-20 seconds and alarm summaries may be temporarily cleared. Once in dual master mode restarting both IMPS servers is the best way to recover.

Note: A server handshaking mechanism checks the status of the partner server. Whenever the Ethernet connection in between both HMI-servers is disturbed for a certain period of time the slave server assumes the master server is offline. This causes the secondary server to start his master roles also.

2.2.2 Manual start/stop

Several ways exist to achieve a manual start/stop. Though automatic start/stop is still preferred the following sub-sections will describe how a manual start and stop of IPMS servers can be achieved best.

Note: An automatic HMI project start is preferably to be achieved by rebooting the applicable server(s). If you still prefer a manual project start then use follow the procedures as described next.

2.2.2.1 Starting or stopping the project by using the Cimplicity workbench

Note: The workbench start/stop feature is only available on the primary HMI server. In case a manual start of secondary HMI server is required then use one of the procedures described in section 2.2.2.4

Note: It is advised to reboot the server PC whenever you want to start the HMI project again. This will not only start an automatic project startup sequence but causes automatic alarm setup synchronization also. If you still prefer a manual startup then trigger the alarm setup synchronization utility manually (See the applicable icon for this feature on the desktop) **BEFORE** you start the HMI project using the Cimplicity workbench

The SCADA project can be started/stopped manually using the Cimplicity workbench window on the primary server. The workbench software can be activated as follows:

1. By double left-clicking at the <<*PROJECT-ID*>> workbench icon which should be available on the primary server's desktop.

Figure 2-3 Typical workbench icon

The project workbench opens automatically or,

2. By selecting the following path from the windows start menu:

Start → Programs → CIMPLICITY → HMI → Workbench

Once the workbench has been opened click file and browse for project file: 'HMI.gef' that is located in folder:

C:\Cimplicity\HMI\Projects\<<*PROJECT-ID*>>

This will open the workbench window relevant for the current project at your desktop:

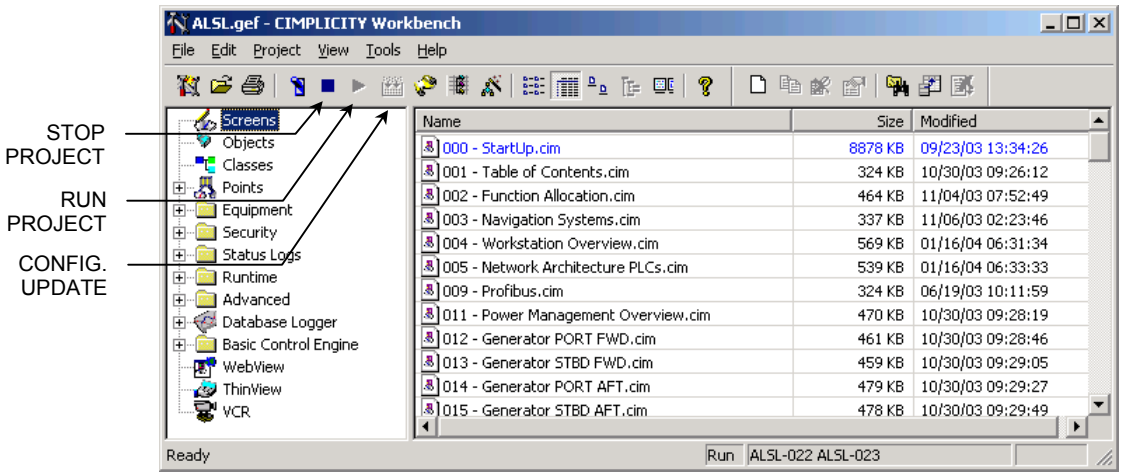


Figure 2-4 Typical Cimplicity workbench window

2.2.2.2 Starting the project from the workbench

A manual project start can be achieved by a click on the 'RUN' icon from the workbench (Figure 2-4) or select 'Run' from the 'Project' pulldown menu. (If the run feature is not available then the project is probably already running/starting)

The following typical 'Start project' dialog will appear:

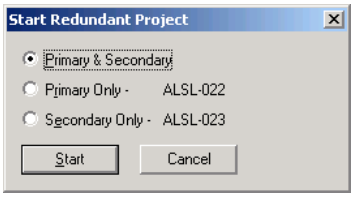


Figure 2-5 Typical 'Start project' dialog

Press the 'Start'-button after you've made a selection which server(s) must be started.

Since Cimplicity uses two databases (Master database for design, and run-time database for project run), changes made in the master database must be forwarded to the run-time database on both the primary and the secondary server as well. Pressing the configuration update button (See Figure 2-4) can do this provided that the project on both servers has been stopped.

In case master and runtime databases don't match, Cimplicity will remind you to do a configuration update first. (See Figure 2-6) Changes made in the master database are copied to the run-time databases after you've pressed the 'Yes' button.

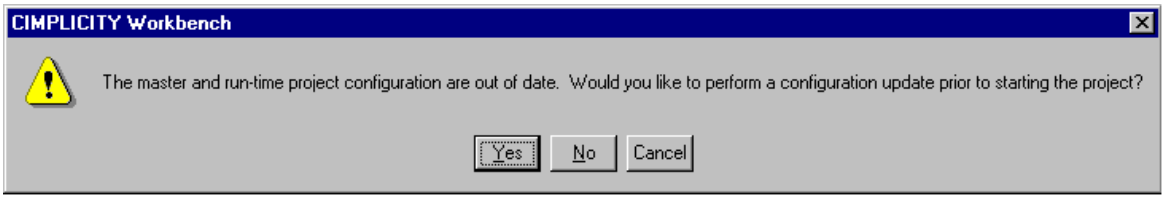


Figure 2-6 Configuration update request dialog

Note: The remote disk needed for synchronization (F:\) must be linked to the secondary server otherwise the primary server won't be able to do the update. In that case an error message will appear on the primary server screen.

As soon as the project starts a list of Cimplicity processes along with their statuses will be listed on the primary server screen. A project start may take about 4-5 minutes. After this, the primary server will be online provided that it was able to start all relevant Cimplicity processes. Next to this, the secondary server will start its Cimplicity processes also. The secondary server start-up lasts about another 4-5 minutes.

Note: Once Cimplicity processes have been started it may last about another 3-4 minutes to establish data transfers with the LPU's. This is because both HMI servers need to provide a link with all PLC processors to obtain platform data.

2.2.2.3 Stopping the project from the workbench

If a project stop is required then press the 'STOP' icon or select 'Stop' from the 'Project' pulldown menu ' The 'Stop project' dialog window will appear:

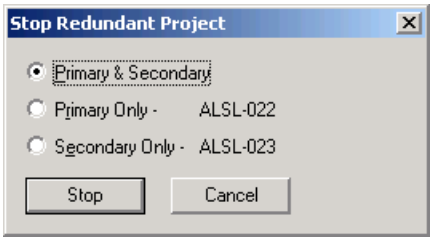


Figure 2-7 Typical 'Stop project' dialog

Tick one of the option buttons applicable to the server(s) you want to stop. In case you want to stop just one server whilst it is currently acting as master, it is advised to switchover server roles first. This is described in section 2.5

Important: If the IPMS project has been stopped it is advised to force a stop of the OPC Server (RSLinx) as well unless you plan to reboot the relevant server after all.

Forcing RSLinx to stop can be done by right-clicking at the RSLinx icon which is located at the lower right corner of the server screen. (See
Figure 2-8) Select 'Shutdown RSLinx'. Please verify that the RSI Directory server stops as well. If not then stop it the same way you've stopped RSLinx. You may also use the RSLinx Launch Control panel that is accessible from the Windows start menu.

Communication errors may occur if an OPC server stop is omitted.

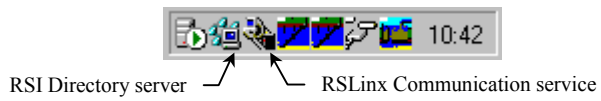


Figure 2-8 Active windows services on the SCADA server

2.2.2.4 Alternative ways to start and stop an HMI server.

As already described a server PC reboot is the best way to achieve a proper IPMS server start-up. If you still require a manual start/stop then the workbench is the best way to do it. However in rare occasions when the primary server is not available it is not possible to access the workbench as it is not available on the secondary server. Still it is possible to start/stop the SCADA project manually.

1. By using the 'Cimplicity Options' dialog
2. By using the 'Process Control' dialog.

2.2.2.4.1 Cimplicity Options dialog

On either the primary – or the secondary server:

Open the Cimplicity Options dialog from the Windows start menu select path:

Start → Programs → CIMPLICITY → HMI → Cimplicity Options

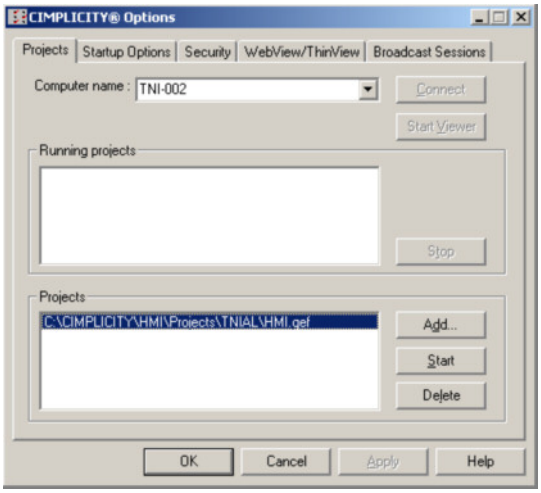


Figure 2-9 Cimplicity Options dialog

From the 'Projects' tab click the 'Add…' button and browse for the project file 'HMI.gef ' in path:

C:\Cimplicity\HMI\Projects\<<*PROJECT-ID*>>

Finally highlight the project entry and click at the 'Start' button.

2.2.2.4.2 Process Control dialog

Process Control is an interactive process that lets you start, stop, and display the current state of CIMPLICITY HMI processes. This section describes the functions available in Program Control and procedures for running it.

From the Windows start menu select path:

Start → Programs → CIMPLICITY → HMI → Process Control

In case the system detects **no** project currently running then the following dialog will appear:

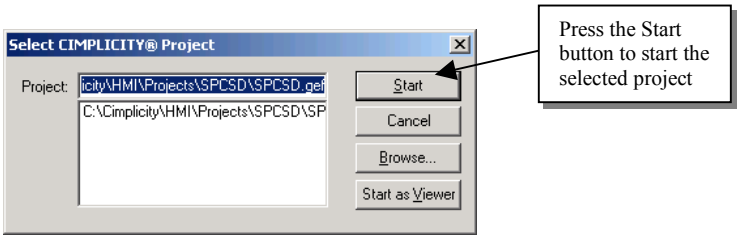


Figure 2-10 Typical Project Start dialog

Select the project icon and press the 'Start' button to start all processes necessary to start the project.

When the HMI project appears to be running already then the CIMPLICITY Process Control dialog box like the one shown in Figure 2-11 opens instead of the one shown in Figure 2-10. Click the drop-down list button to the right of the 'Project' field to select the project icon and then click the 'Connect' button.

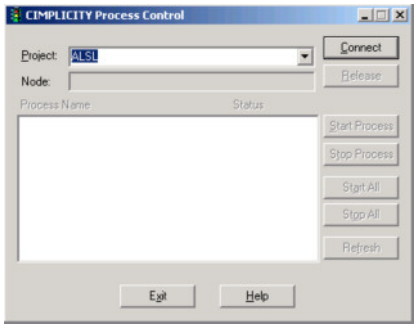


Figure 2-11 Typical Process Control dialog

A dialog box like the one shown in Figure 2-12 requests you to select a server node in case the project runs in a redundant mode. Select the required server node.

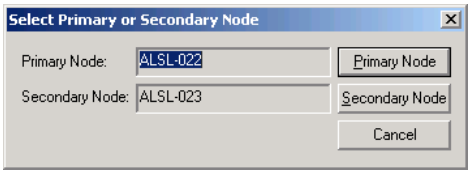


Figure 2-12 Typical project selection dialog

Once you are connected to a server node then all process names and their statuses are displayed like shown in Figure 2-13

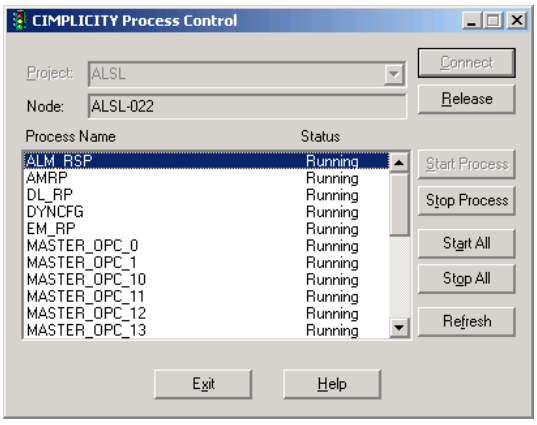


Figure 2-13 Process Control dialog while connected to a running project.

From this dialog you can:

- Start a halted process.
- Stop a running process.
- Start all halted processes.
- Stop all running processes.
- Refresh the process list.
- Release the connection to the project.
- Exit the 'Process Control' dialog box.

Important**:** This is not the recommended way to start or stop CIMPLICITY HMI software. You should only use CIMPLICITY Program Control to start and stop processes if you have been instructed to do so!

2.3 HMI to PLC interfacing

As described before, both HMI servers (even the one that performs a slave role) are gathering platform data from the PLC processor modules (seated in each LPU) which is needed to visualize and log platform statuses. However only data obtained from the master HMI server will be used to serve the HMI workstations (clients). Besides this, only the master HMI server will forward remote operator commands to the relevant PLC processor module.

The interface being used for HMI to PLC interfacing is based on the OPC communication protocol. OPC (=Embedded Object Linking for Process Control) is an open communication standard nowadays supported by most process automation equipment.

To achieve an OPC communication link an OPC server program ('RSLinx'), which has been installed on each HMI server PC, provides a communication interface in between the PLC processor modules and any other program that is able to act as an OPC client. In this case, the Cimplicity HMI server software incorporates OPC-Client software as well. So by using this OPC Client software the HMI server is able to interface the PLC processor modules via the RSLinx OPC server software.

The HMI server requests RSLinx to provide the data that is needed for visualization and logging and – if an operator issues a platform command – it requests RSLinx to forward data to a certain PLC processor module. This is illustrated by Figure 2-14.

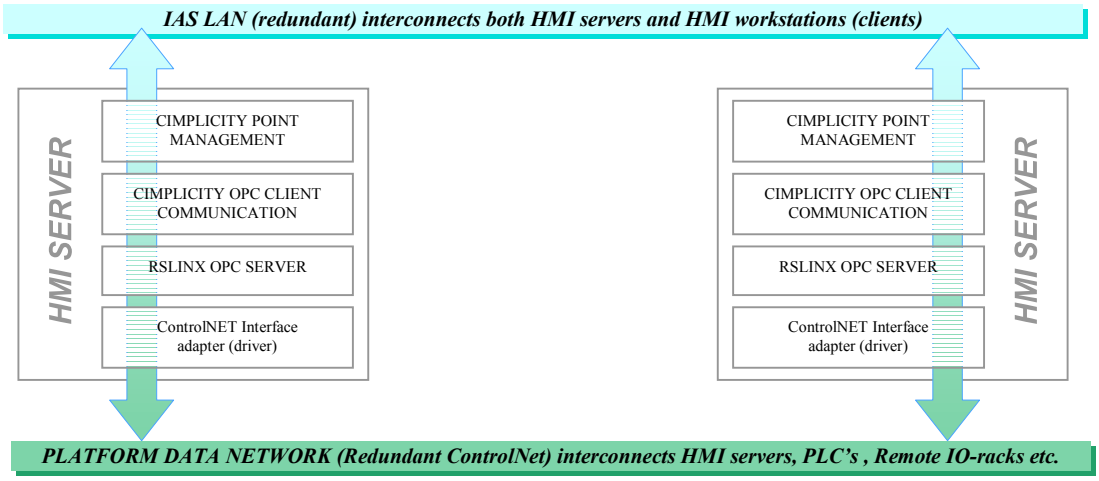


Figure 2-14 Data flow from the Platform Data Network to the Client Server Network

A suitable interface adapter inside each HMI server node interfaces the Platform Data Network (PDN). ControlNet is used to achieve deterministic (=scheduled) data transfers in between IO-boards and the relevant PLC processors. Besides this ControlNet supports unscheduled data-transfers as well. Unscheduled data-transfer methods are used to interface both HMI and PLC processor modules.

To gain insight into these unscheduled platform data transfers, open the RSLinx icon by a left-click on the 'RSLinx Communication service' icon. (see also
Figure 2-8 of this manual). The RSLinx program dialog will be opened.

2.3.1 Checking the ControlNet interface on an HMI server node

To check if the ControlNet driver is running select 'Configure Drivers' from the 'Communications' pull down menu. (See Figure 2-15) on each HMI server.

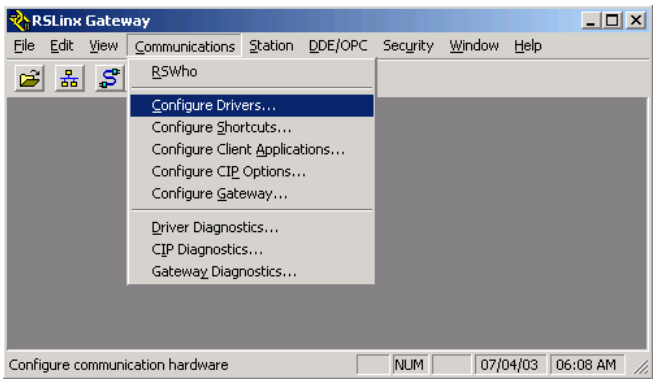


Figure 2-15 RSLinx: 'Configure Drivers' selection

The following dialog will open:

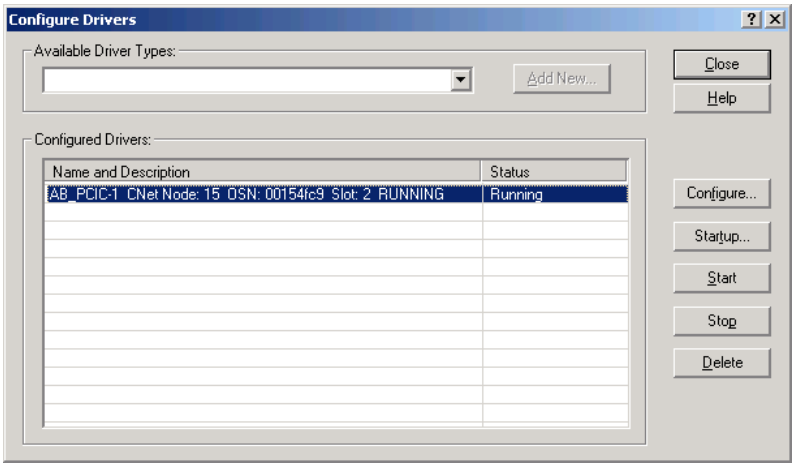


Figure 2-16 RSLinx: 'Configure Drivers' dialog

Check if the status of the ControlNet driver is 'Running'. If not press the 'Configure' button and check the node address. In case you've replaced the ControlNet interface board (1784-PCIC) then the driver won't start because of its unique serial number within the 1784-PCIC interface board. Select the right interface from the list and initialise its ControlNet node address according to the node number as listed for the project. (Node number can be obtained from the PDN/CSN architecture drawings, ref [9])

Important:	In case the ControlNet interface adapter card is replaced, the adapter card serial number won't match the current driver configuration anymore. You have to reconfigure the driver by pressing the 'Configure' button. A list of interface adapters formerly seen by this RSLinx instance will be displayed. Select the new adapter with its new serial number from the list (Probably the one listed at the bottom or the one that has node number 99 currently assigned). Also, verify the ControlNet node number stated for this project and change the node number of the new board accordingly.

If the adapter serial number you've selected matches the one of the interface adapter actually installed, the driver should be running now!

2.3.2 Checking the availability of all ControlNet nodes from an HMI server node

Once the ControlNet driver is running (see section 2.3.1), select 'RSWho' from the 'Communications' pull down menu to make sure if the ControlNet is accessible. (See Figure 2-17) Tick the 'Autobrowse' checkbox if it isn't already checked and left-click the '+' sign next to the 'AB_PCIC-1, ControlNet' item displayed in the left pane. RSLinx starts to browse the ControlNet now and will display all the ControlNet bridge nodes on the network. Note the node number displayed in fornt of each item on the list. Your screen should look like the one displayed in Figure 2-17. If any red crosses appear then this means that RSLinx saw that node before but it can't detect it anymore.

Expand one of the ControlNet nodes, identified by '1756-CNBR' or '1756-CNB', by again clicking on the + sign next to it to unfold the item. You're now "stepping" into the PLC-rack via a ControlNet Bridge "entrance" and you're facing the backplane. Clicking at the + sign of a backplane item shows all the IO-boards installed in a particular PLC-rack. The number shown in front of each item now matches the location of the board relative to the PLC-rack. Notice that the board location number starts counting at zero from left to right!

Figure 2-17 shows the situation after unfolding a PLC rack on ControlNet node address: 11.

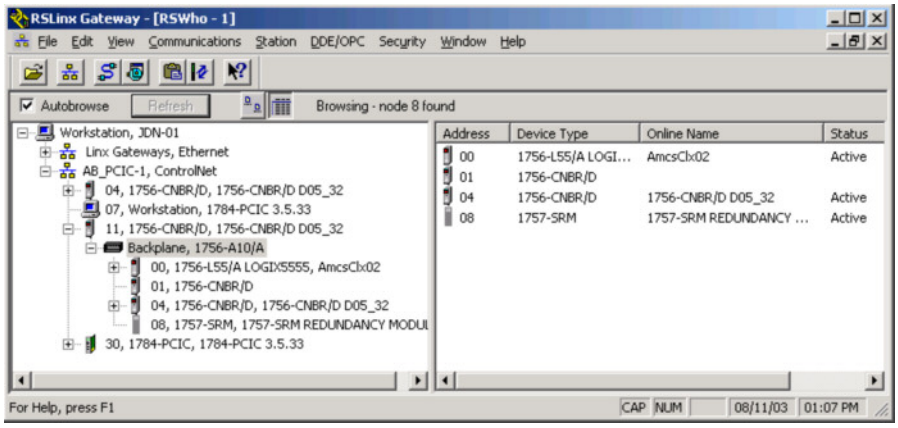


Figure 2-17 Typical 'RSWho' dialog opened on the primary server

2.3.3 Checking the ControlNet communication

Assumed that the RSLinx ControlNet interface is running (see section 2.3.1) and all ControlNet nodes seem to be available (see section 2.3.2) it is possible to check the RSLinx communication status.

Select 'Communication Events …'from the DDE/OPC pull down menu. (See Figure 2-18)

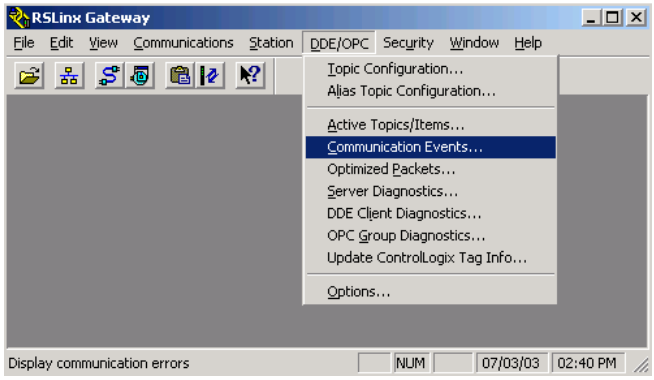


Figure 2-18 RSLinx program dialog

The OPC Communication Event Log like the one displayed in Figure 2-19 appears on the screen.

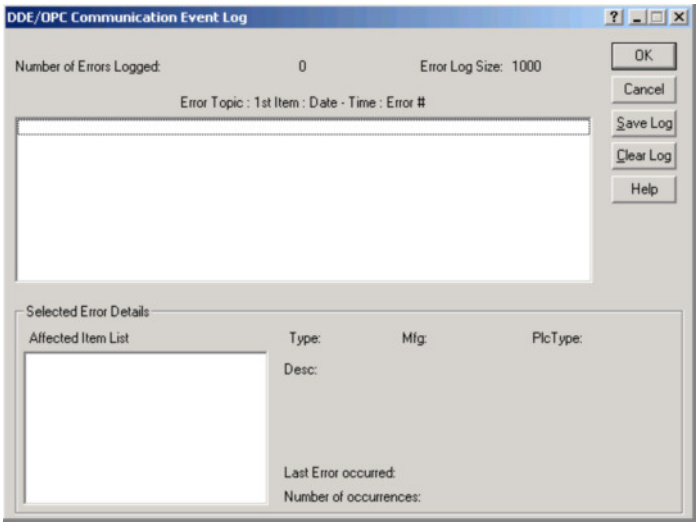


Figure 2-19 OPC Communication Event log

Check for log messages that may point at communication problems between RSLinx OPC Server and the PLC processors.

Note: A clean message log points at successful PLC communication. However in case the OPC Communication Event Log shows some messages this might not be a problem. Especially at project start messages may be generated due to a timeout. In case messages reappear after the 'Clear Log' button is pressed then there is a problem communicating with certain PLC devices.

2.4 Showing the HMI log files

Most of the HMI events, whether they succeeded or not, are logged by the local SCADA system. Although more log-files exist, this manual describes the most important ones. Two distinct log-files, unique for every workstation or server exist, i.e. a 'Project Status Log' file and a 'System Status Log' file. These log files are stored on the PC hard disk:

Project Status Log file (applies to servers only) is stored at:

C:\CIMPLICITY\HMI\Projects\<<*PROJECT_ID*>>\log\cor_recstat.clg.

System Status Log file is stored at:

C:\CIMPLICITY\HMI\log\cor_recstat.clg

The log can be opened from the Windows 'Start' menu by the following path:

Start → Programs →CIMPLICITY → HMI → Status Log

The Cimplicity log viewer like the one shown in Figure 2-20 appears on the screen and opens the "Project Status Log' file. If you want to view the 'System Status Log' file it can be selected from the 'Log' pull down menu.

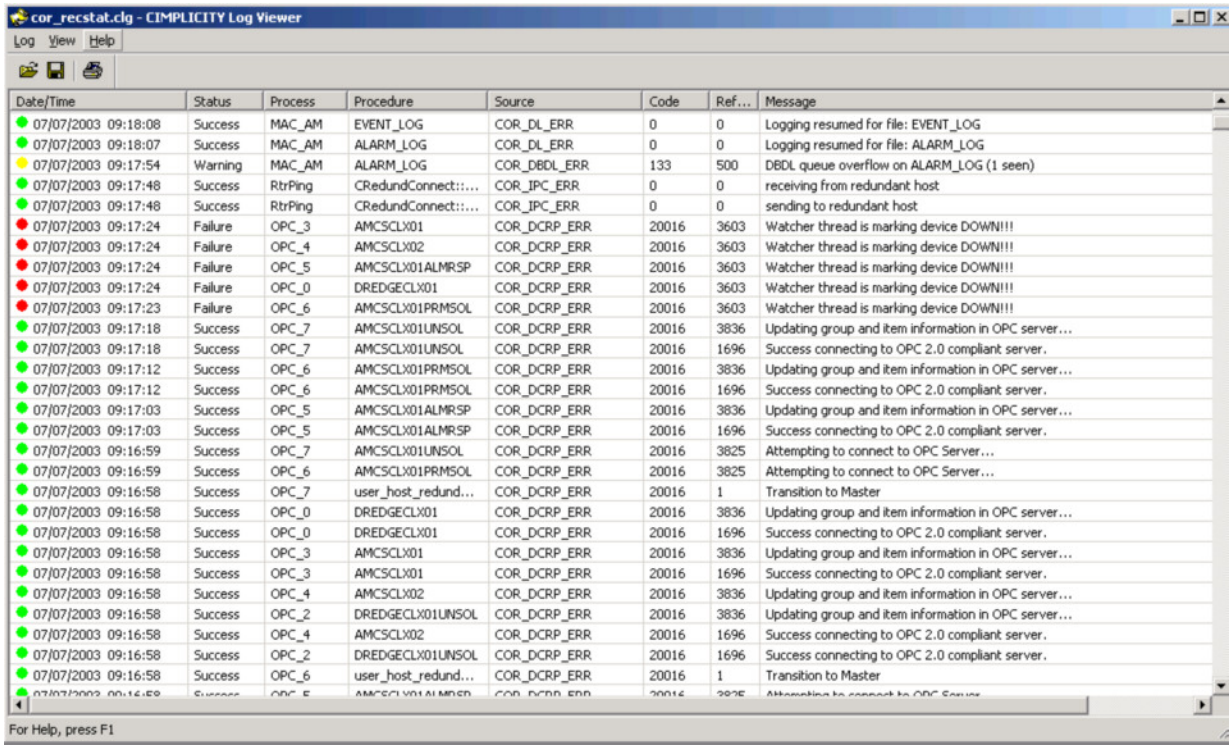


Figure 2-20 Typical Cimplicity log file

The CIMPLICITY Log Viewer screen displays the following information for each record that it finds in the status log file:

Date/Time The date and time the message was logged.
Status The type of message. This can be "Failure", "Warning" or "Success".
Process The name of the process that generated the log message.
Procedure The name of the procedure that generated the log message.
Source A symbolic name for the error class.
Code The primary value used by software for expressing the type of error.
Reference A number (shown as a decimal integer) that can be used to determine the location of the condition that caused the error.
Message An explanation of the condition that caused the log message

Each entry in the list is preceded by a colour-coded dot that corresponds to the **Status** field entry.
The correlations are:

Red	Failure
Yellow	Warning
Green	Success

A detailed description of the event log capabilities can be found in de Cimplicity help file: “System Management”, section: “Resolving Problems”

2.5 Master/slave switchover

In case server switchover is needed, the system operator may use the ServerSwitch mimic on condition that both servers are online. If not, start the other server by rebooting that PC. A shortcut that calls the server switchover mimic is provided on the primary server desktop.

Figure 2-21 Server switch shortcut

The following screen (or a comparable one) appears:

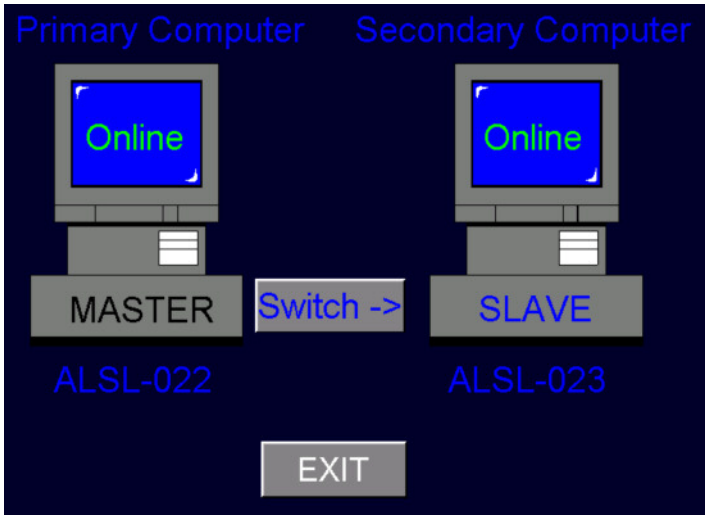


Figure 2-22 Typical IPMS server switchover mimic

Simply pressing the switch button will cause a switchover between both servers. A 90 seconds period is necessary for system stabilization. IPMS workstations may show unavailable platform data during the switchover for about 5 seconds. The actual server status is displayed on all IPMS clients showing the IAS diagnostic mimic.

2.6 Modifying parameters

It is possible to alter IPMS platform settings in order to meet platform object specifications. I.e. valve- or pump control pulses must have their specified duration, alarm thresholds must be set to their appropriate values etc. etc. In case adjustment of those settings is needed, parameters attached to that object can be altered using the assist page.

To access the assist page you left click the relevant object (pump, sensor etc.) on your screen. Pressing the F8 key will show you the assist page that displays all the information of any selected element. (See Figure 2-23 below for a typical assist page layout) Parameters applicable to the selected element are shown at the lower left side of the screen. Although accessing the assist page is possible from every workstation, changing element parameters is restricted to prevent unauthorised operation of machinery.

To alter element parameters the following conditions must be met:

- Be sure that the installation group concerning the focussed element is assigned to your workstation. This will enable the 'Authorize' button (F7) on the assist page

- You must know the assist page authorization password.

While the assist page is shown press the F7 key to authorize. A password dialog box pops up. Typing in the password does the authorizing. The 'authorized' status is reset automatically whenever the assist page is closed.

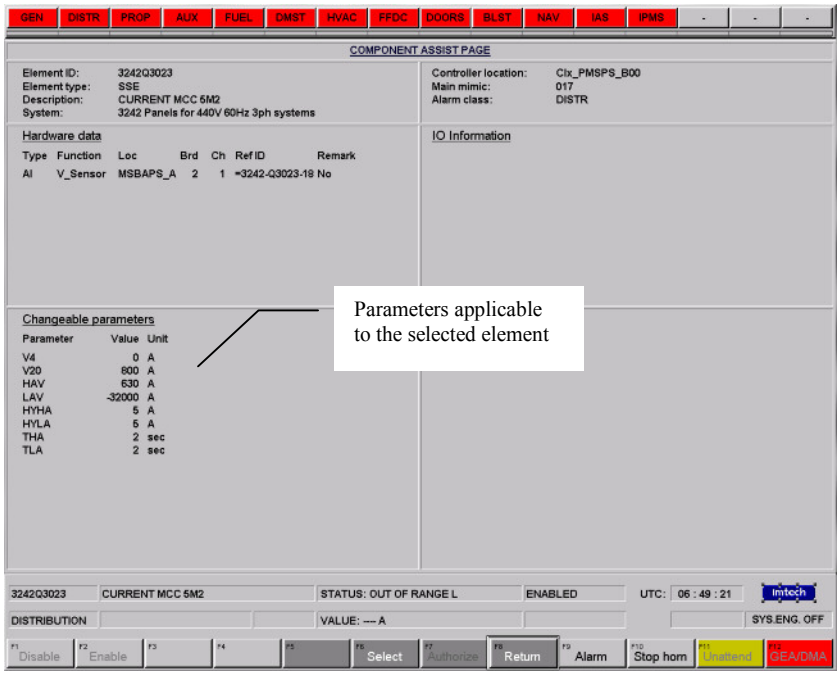


Figure 2-23 Typical Assist page

Once you are authorized to change parameters, you must stop the PLC processing of the element first. Disabling the element can do this. Press F1 to disable the element. The CIP status field shows 'STATUS: DISABLED'. Now you are able to select a parameter value. Left click the parameter value you want to alter. A textbox dialog appears. Type the new parameter value and press the OK button. If the new value is accepted, it will appear in the parameter list. This may take about 5 seconds.

If all parameters values are OK, do not forget to enable the element by pressing the F2 key. If enabled, the element will be inserted in the PLC processing sequence again.

Note: The functional design specification Element Processing, ref [6] describes the parameter set applicable for each element type.

2.7 Changing a password

Several IPMS features like modifying element parameters via the 'Assist' page are blocked unless you can authorize yourself by typing in a password. This password is not unique for each user but is related to the applicable IPMS function. I.e. the same password is used for parameter alterations on every workstation. Once you're authorized to use a restricted IPMS function you are able to change the password also by typing a 'C' on your keyboard. The following dialog will appear:

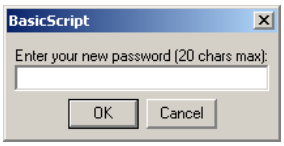


Figure 2-24 Change password dialog

After entering your new password and re-entering it for confirmation purpose the password is saved by both IPMS servers.

2.8 Report generation

User defined reports are automatically generated on both servers (provided that they're online) on a pre-defined time schedule. Besides this, report generation can be started manually also by pressing the 'MAKE' button in the 'REPORTS' section which is displayed on the function allocation mimic, provided that the IPMS installation group is attached to your workstation.

As soon as the report generation mechanism is started both HMI servers will search for their report template files (file extension 'ltf') that are supposed to be located in the following folder path:

C:\Cimplicity\HMI\Projects\<<*PROJECT_ID*>>\Screens\info\ForStorageOnly

'Notepad.exe', which is a standard text editor available on the Windows Operating System, can be used to open a report-template file. Figure 2-25 shows an example of the 'Engine Room Report' template.

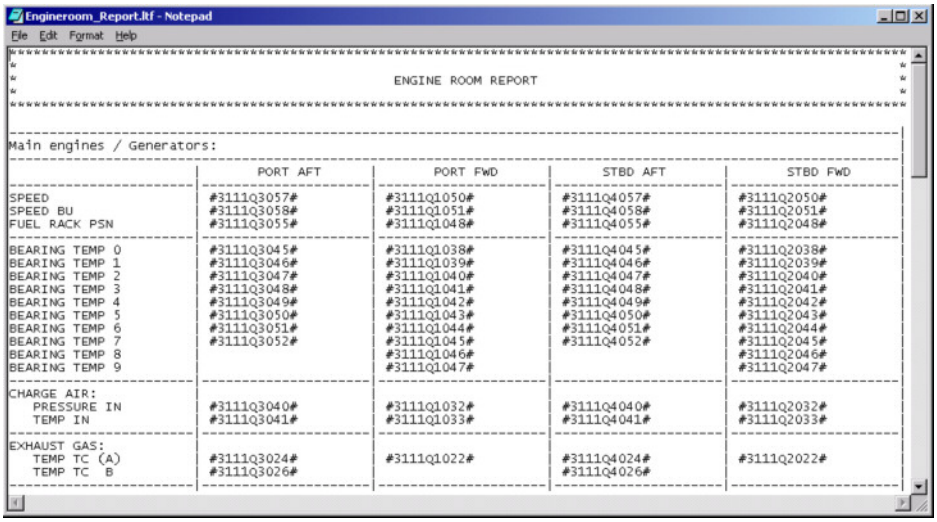


Figure 2-25 Report template file example

The layout of the template file is user-defined as long as the following rules are kept in mind:

1. The use of the '#' character is prohibited. It is a reserved character that may be used ONLY for embracing element names;
2. Type in the element id embraced by '#' characters at the cursor location where you want the element value/status to be pasted. You can get the element from the mimic where the element is displayed. Look for the element id shown in the CIP after you've left-clicked the applicable symbol. (See the User Manual, ref.[13] for a detailed description of the CIP functions)
3. Including many element id's in your reports may degrade server performance at report generation momentarily. It is advised to include only those elements required for your report to minimize server disturbance.

Other aspects regarding report generation:

1. Each report will contain specific header information like 'time of generation' and server state which is automatically added to each report.

2. You may include any existing element id in your report template. If the element id is analogue then the actual analogue value including its engineering unit will be pasted (Same precision as defined in your mimic). If the element id is digital (I.e. a motor, circuit breaker etc) then its actual status is pasted.

3. In case an alarm status high or low is activated for an analogue element at the time the report is generated a '-H' respectively a '-L' postfix string will be added to the sensor value.

4. In case the string length to be pasted exceeds the element id itself then the string will be truncated to the length defined by '#ELEMENT_ID#'. To solve this problem you may stretch the '#ELEMENT_ID#' string in your template using space characters so that the string in your template looks like '#ELEMENT_ID #'.

5. Reports stored in de <<*PROJECT-ID*>>\log\Er_Reports folder are checked for their 'time last changed' timestamp each time the report generator is triggered. Files older than 30 days are automatically removed. Archive your reports or print them by using the 'VIEW' button in the 'REPORTS' dialog.

6. Be sure to have a matching pair of '#' characters on each line of the report template. In case of an error the report generator will skip that line.

7. Errors that occur while the report template is interpreted will be logged in the project log directory. (See section 2.4)

3. PLC System

3.1 General

Considering the network architecture, Ref [9], several IO-racks in the vessel contain interface cards for monitoring and control of the platform. All PLC equipment being used is part of the ControlLogix PLC series make Allen Bradley. The PLC processors are able to access all the ControlLogix IO modules via the ControlNet and the ControlNet interface modules. PLC processors are installed at the following locations:

<TNI-AL specific data>

Location	PLC	CNET node	Function	Program name
	LPU-01	1	IPMS + PCS	CLX_LPU01_A00.ACD
	LPU-02	2	IPMS + PCS	CLX_LPU02_A00.ACD
Main Engine Room	LPU-03	3	IPMS	CLX_LPU03_A00.ACD
	LPU-04	4	IPMS	CLX_LPU04_A00.ACD
Bridge Console	LPU-05	5	IPMS	CLX_LPU05_A00.ACD

Table 3-1 PLC Program to CPU Link table

3.2 Hardware configuration

All of the PLC cabinets have at least one PLC rack installed inside them. Several rack sizes may apply dependent on your system configuration. At the left there is a power supply module. Several primary power options (AC & DC) apply for this type of module. Open the front door to check the power option actually being used for your system. A typical rack configuration is shown by Figure 3-1

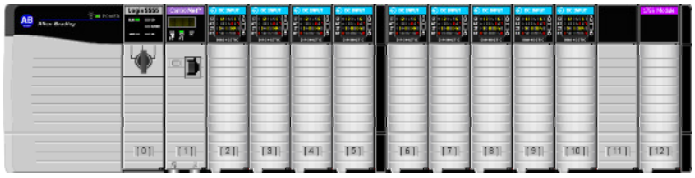


Figure 3-1 Typical PLC rack configuration

Next to the power supply starting from slot nr. 0 (zero!) several PLC modules may be seated. All ControlLogix PLC modules are hot swappable meaning you can extract/insert them from/into the relevant slot while power is still applied to the backplane. The actual rack arrangement is made at system design and is consequently project specific. Hence, you cannot interchange, add or remove modules in respect to the original configuration without consequences. See Appendix A for details concerning the project specific arrangements of each PLC-rack.

If a CPU module is installed then the first digital IO-module from the left has a number of hardwired inputs reserved for a program id-code. This binary id-code should match the code being stored in the CPU program otherwise the program won't start. This prevents you from starting a software release that is not intended to run on a certain node. In case the id-code doesn't match the code being stored in the program then the PLC program is stopped deliberately. A program fault will occur. See Figure 3-2. Once the PLC has been started you may extract the applicable digital input board from the rack if this is required.

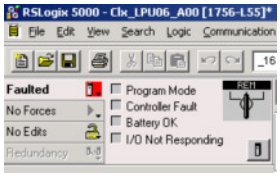


Figure 3-2 Processor fault

Program faults may also occur whenever hardware or software failures appear. You can try to reset a processor fault condition by using the key switch at the front of the processor module in the following sequence:

1. PROG
2. RUN
3. PROG

Put the processor back to RUN again now. This will restart the program in the processor. A better, more illustrative method however is to clear the fault from a maintenance PC. Link the maintenance PC to your PLC system. Section 3.3.3 describes how this can be achieved. Once the 'online' connection has been made call the 'Controller Properties' dialog and then select tab 'Major Faults'. (See Figure 3-3)The reason for the fault is shown up here as well. Click 'Clear Majors' to reset the fault status. Now the PLC can be set to mode 'RUN' again.

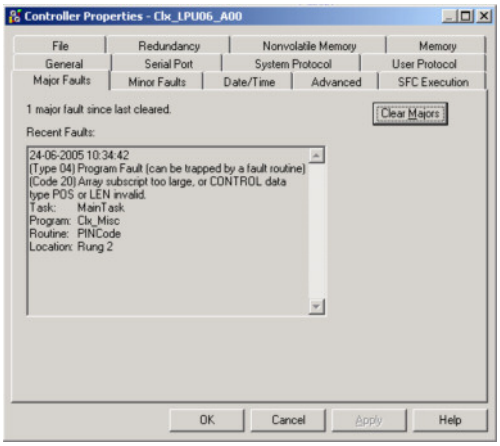


Figure 3-3 Major Fault in processor

The next sub sections describe hardware issues relevant for most (not all) of the PLC modules commonly used by the system.

3.2.1 Processor Module

PLC processors are used in all applications. Several processor modules types and hardware series exist within the ControlLogix scope. The actual type being used for your system depends on the application. Beside this several hardware series may exist due to a progressing hardware development of the ControlLogix platform.

A battery and possibly a CompactFlash slot is visible when you open the front door of a processor module. How to install the battery is illustrated by Figure 3-4. The next upcoming sections describe all issues related to replacing, downloading and the optional non-volatile memory of this module type.

Normally the indicators 'RUN', 'I/O' and 'OK' on this module should be steady green.
Indicators 'BAT', 'FORCE' and 'RS232' should be off.

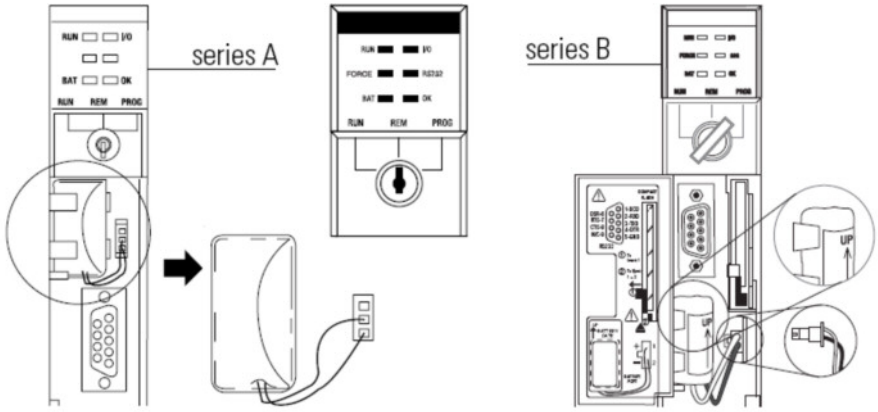


Figure 3-4 Battery connection processor module

3.2.2 ControlNet Bridge Module 1756-CNB(R)

A ControlNet bridge module interfaces the rack in which it is seated to the ControlNet . The 1756-CNB module provides one (not redundant) coaxial (BNC) link while the 1756-CNBR is used for redundant coaxial media.

Rotary switches at the top (inside) are used to set the network node address of this module. See also section 0.

Normally the indicators 'OK' 'A' (on a 1756-CNB) and 'B' (on a 1756-CNBR) are steady green.
Several messages may scroll along the alphanumeric display visible at the front of this module.

- OK — Normal Operation.
- %C## — ## indicates the modules CPU utilization percentage.
- Kp## — Keeper status, ## equals:
  - Ov = Offline with valid keeper information
  - Oi = Offline with invalid keeper information
  - Av = An active keeper
  - Ai = An active invalid keeper
  - Iv = An inactive valid keeper
  - Ii = An inactive invalid keeper
- nC## — ## indicates the total number of open connections (max. 64).
- nU## — ## indicates the total number of unconnected buffer usage (max. 20).
- A## — ## indicates the network address of the module.

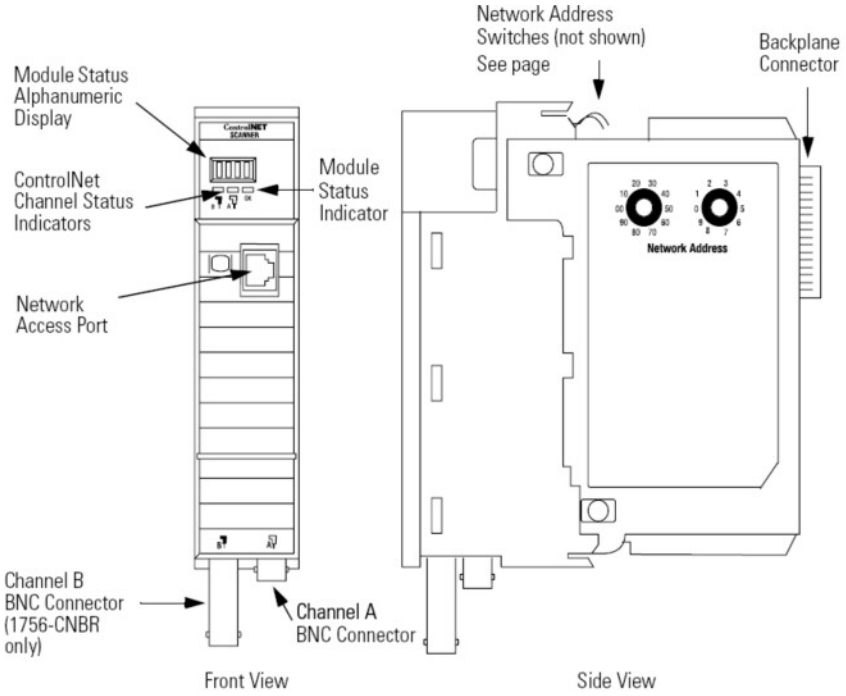
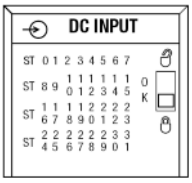


Figure 3-5 ControlNet 1756- CNB(R) module

3.2.3 Digital Input Module 1756-IB32



This type of module features two groups of each 16 digital inputs. Inputs within each group have a common ground. The LED indicators on the front show their individual input status (yellow = active input). Moreover a bi-coloured 'OK' LED should be steady green meaning that a PLC processor somewhere (in the local rack or on the network) is in control of this module. Figure 3-6 shows the connection diagram of this module.

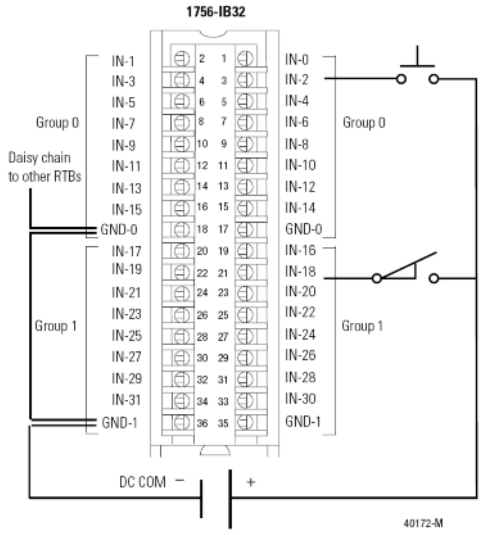
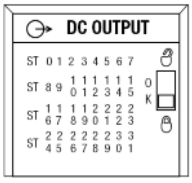


Figure 3-6 Wiring Example Digital Input Module 1756-IB32

3.2.4 Digital Output Module 1756-OB32



This type of module features two groups of each 16 digital sinking outputs. The LED indicators on the front show their individual output status (yellow = active output). Moreover a bi-coloured LED marked 'OK' should be steady green meaning that a PLC processor somewhere (in the local rack or on the network) is in control of this module. Figure 3-7 shows the connection diagram of the 1756-OB32.

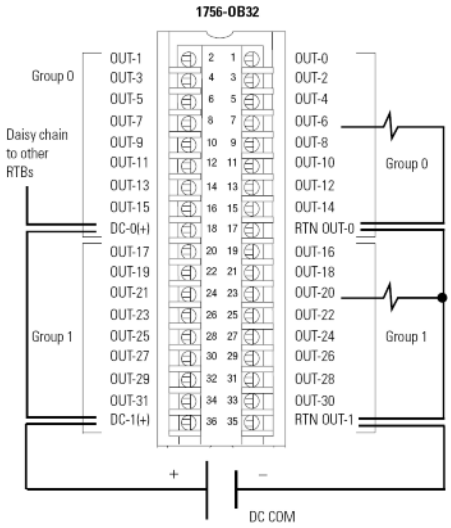
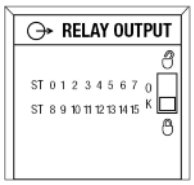


Figure 3-7 Wiring Example Digital Output Module 1756-OB32

3.2.5 Digital Relay Output Module 1756-OW16I



This type of module offers 16 digital relay outputs. The LED indicators on the front show their individual output status (yellow = activate output). Moreover a bi-coloured LED marked 'OK' should be steady green meaning that a PLC processor (somewhere in the local rack or on the network) is in control of this module. Figure 3-8 shows the connection diagram of the 1756-OW16I

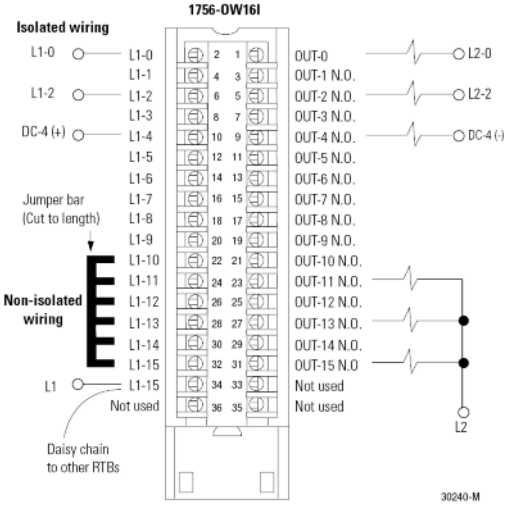
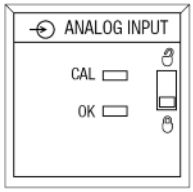


Figure 3-8 Wiring Example Relay Output Module 1756-OW16I

3.2.6 Analogue Input Module 1756-IF16



This type of module features either 16 single-ended or 8 differential analogue inputs configured as 0-20 mA / 0-10V. Normally this module is configured as a 16 single-ended 4-20 mA 16 bit D/A converter. It has a 'CAL' and an 'OK' LED at the front. The 'CAL' indicator is used while calibrating this module. Normally this indicator should be dimmed. The 'OK' LED should be steady green meaning that a PLC processor somewhere (in the local rack or on the network) is in control of this module. Figure 3-9 shows the connection diagram of the 1756-IF16

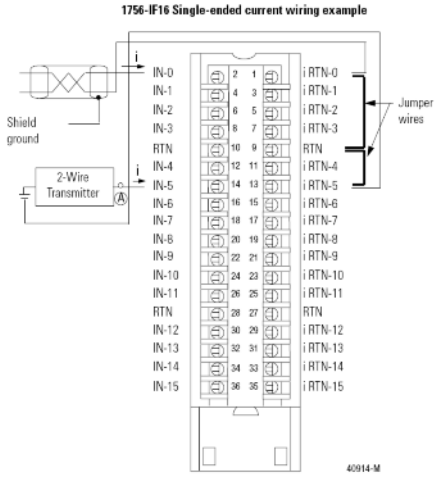


Figure 3-9 Wiring Example Analogue Input Module 1756-IF16

3.2.7 Current Loop Output Module 1756-OF6CI

This type of module features 6 isolated current outputs. The load has to be between 0 and 1000 Ω. It has a 'CAL' and an 'OK' LED at the front. The 'CAL' indicator is used while calibrating this module. Normally this indicator should be dimmed. The 'OK' LED should be steady green meaning that a PLC processor somewhere (in the local rack or on the network) is in control of this module. Figure 3-10 shows the connection diagram of the 1756-OF6CI.

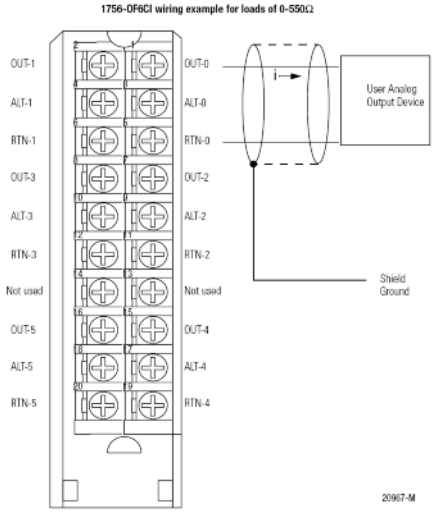
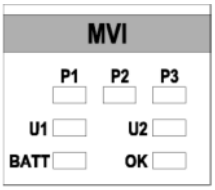


Figure 3-10 Wiring Example Current Loop Output Module 1756-OF6CI

3.2.8 Multi Vendor Interface module 1756-MVI56



The 1756-MVI module, is a serial communication module, that features two serial application ports and one maintenance port. Port 1 is reserved for maintenance. Jumper 1 in 'SETUP' position causes the module to boot with console port PRT1 enabled at 19200 baud, no parity, 8 data bits and 1 stop bit. Both Port 2 and Port 3 have a jumper located on the PCB which determines the electrical serial interface to be used (RS232, RS422, RS485), see Figure 3-11. The P1, P2 and P3 status leds are green if there is serial activity detected, otherwise these LEDs are dimmed. U1 and U2 are user defined LEDs, the BATT LED should be off and the OK led should be steady green.

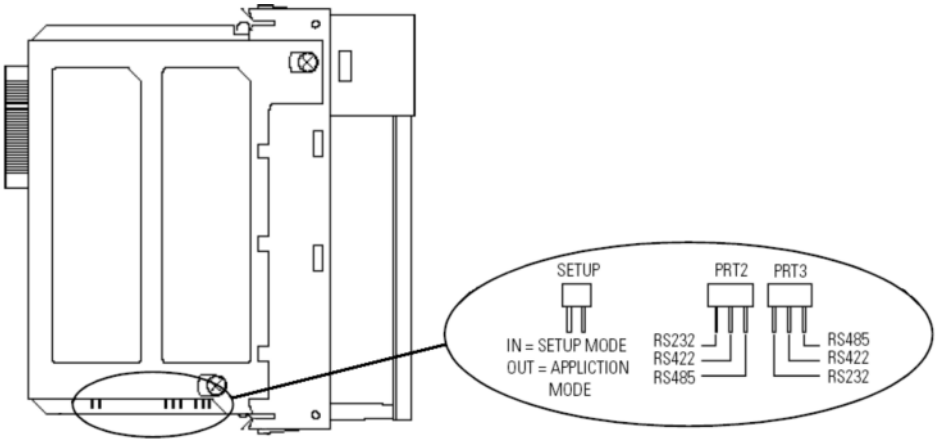


Figure 3-11 Jumper settings MVI56 card

PRT2, PRT3 Signals

DB-9M Pin	Jumper Set to RS-232 Signal	Jumper Set to RS-422 Signal	Jumper Set to RS-485 Signal
1	DCD	TxD+	TxD/RxD+
2	RxD	RxD+	--
3	TxD	--	--
4	DTR	--	--
5	COM/GND	COM/GND	COM/GND
6	DSR	RxD–	--
7	RTS	--	--
8	CTS	TxD–	TxD/RxD–
9	--	--	--
Metal Shell	Shield	Shield	Shield

Figure 3-12 MVI-Connector wiring

3.2.9 Removable Terminal Block

All of the IO cards are connected with a removable terminal block (RTB). On the IO card there is a locking tab on top, this to prevent the RTB from a undesignated disconnection. Make sure before removing the RTB that this locking tab is in the unlock position. Also make sure to put this in the lock position when placing the RTB back on the IO card. RTB's are the in 20 pins and 36 pins. Only the AO card will use the 20 pins RTB, all others use the 36 pins RTB. In Figure 3-13 is shown how to operate and connect the terminal block.

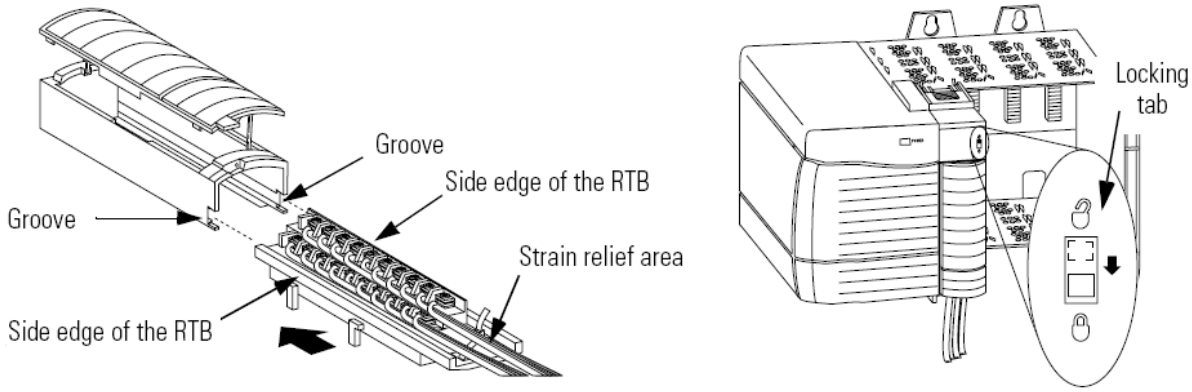


Figure 3-13 Removable Terminal Block and Locking Tab

3.3 Download plc software

Important: If not absolutely necessary, the vessel must be in an idle state before starting maintenance actions that may cause the PLC program to stop. Danger of the vessel and its crew may be the consequence!

Normally, download of PLC program into a processor module isn't necessary, however in case of a long time of power down while battery back-up condition is poor then the CPU may loose its program especially when the applicable CPU does not feature a non-volatile memory type. Moreover, in case a processor module is replaced then the application software has to be downloaded to the new module anyway.

Note:	You will need PLC development software - compatible with your project configuration - running on a suitable PC to be able to maintain the system. It is advised to arrange a portable PC reserved for maintaining the system with all relevant software already installed on its drive.

Preparations for program download:

1. If you've replaced the processor module: **First verify if the firmware version!** (See section 3.4.1) is compatible with your system! If not then upgrade/downgrade firmware first !
2. You mostly may skip this step but in case you experience any download problems or if PLC redundancy applies it might be needed to make sure to clear any undesirable history from the module:
   - Switch-off the PLC-rack power supply in case it is still powered on or extract the module from the rack;
   - Disconnect the back-up battery of the PLC processor.
   - Switch-on rack power again or insert the module into the relevant slot.
   - Reconnect the back-up battery cord again.
3. Identify the PLC-rack for the processor you want to download. (See Table 3-1) and open the relevant PLC project file on the maintenance PC. (Section 3.3.3 may help you with this);

3.3.1 How to link a maintenance PC to the Platform Data Network

Presumed your maintenance PC is a laptop computer, establish a link either of three ways:

1. If an Ethernet adapter (for example 1756-ENBT) is available in the PLC configuration then you are able to achieve a connection in between the maintenance PC and the PLC's via Ethernet. Once the maintenance PC is connected to the Ethernet LAN (=CSN) then it is possible to establish a link via an Ethernet switch nearby and the 1756-ENBT Ethernet module. Note that specific ports on the CSN Ethernet switches might be reserved for interfacing a maintenance PC while other switch ports might have been disabled for this purpose. This is illustrated by Figure 3-14, option 1.
2. If the 1756-ENBT is not connected to a nearby Ethernet switch then it is possibly installed for maintenance purposes only. The MDI/MDX feature on the 1756-ENBT Ethernet module enables you to create a 'Point-to-Point' link while using a straight UTP cable. This is another simple but very effective way to achieve a link. This is illustrated by Figure 3-14, option 2.
3. If the maintenance PC has a ControlNet adapter (e.g. a 1784-PCC PCMCIA board) installed then make a connection with the ControlNet using a maintenance port available at the front of any CNET adapter. The ControlNet node address reserved for the maintenance PC ControlNet adapter is node #30. This is illustrated by Figure 3-14, option 3.

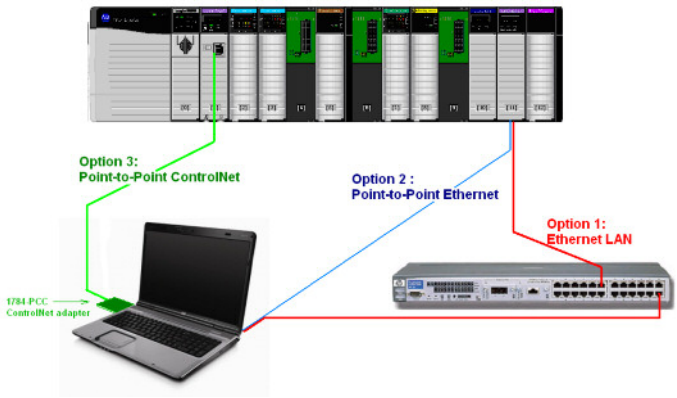


Figure 3-14 Maintenance PC link options

Once a connection to the PLC has been achieved either by using option 1, 2 or 3 then you're able to connect to all other ControlLogix modules in the system. By using 'RSWho' simply click on the '+' signs displayed at the front of the relevant items to browse through all the network members.

3.3.2 Test your PC < > PLC link

You may test your connection by opening the RSLinx communication program that can be started from de windows start menu by:

Start→Programs→Rockwell Software→RSLinx→RSLinx

Or when RSLinx is already running you may call its user dialog from the icon tray at the bottom-right of you screen by a single left-click.

Figure 3-15 RSLinx icon from which you can open its user dialog

From the RSLinx window select 'RSWho' from the Communications pull down menu. A window comparable with the one shown in Figure 3-17 should appear. If your laptop interfaces the ControlNet press the + sign next to the 'AB-PCIC-1, ControlNet' entry. (See highlighted section in left pane of Figure 3-17) Otherwise, if your laptop is connected by Ethernet press the 'AB-ETH-1, Ethernet' entry. A list of equipment attached to your laptop should appear as soon as the browsing process is started.

If nothing happens, check the following:

- If the 'Autobrowse' checkbox is ticked.
- If the PC interfaces the PLC by a ControlNet interface adapter, check your node address, by right-clicking the "AB-PCIC-1, ControlNet" item in the left pane of the RSWho window. Choose 'Configure driver' from the pop-up menu that appears check the driver status 'running' and the ControlNet node address. Also check the physical cabling in between the ControlNet interface
- If Ethernet is the medium that connects your PC and you are still unable to browse the PLC network then check the scrolling message at the front display of the 1756-ENBT Ethernet module to debug your connection. The node's IP-Address should be scrolling along the display once in a while. If instead of an IP-Address a 'BOOTP' message scrolls along then your Ethernet module is not yet configured with a proper IP-Address. Follow the configuration protocol of this module as described by section 3.6.9.2
- Of course the PC's IP-address and subnet mask as well as the IP-address and subnet-mask of the Ethernet module should be compatible. So verify the PC's IP-Address as well. You may try to 'ping' the PLC Ethernet module by its IP-Address to verify the connection by opening a command prompt window from the maintenance PC and typing:

  Ping <*IP-Address*>

  The PLC's IP-Address for your system is stated in Table 3-7.
- If you can ping the module and still you're not able to use 'RSWho' for browsing then check the RSLinx Ethernet driver configuration. From RSLinx open menu: 'Communication/Configure drivers …'. Double click the Ethernet driver icon. Your screen should be comparable with the one shown in Figure 3-16

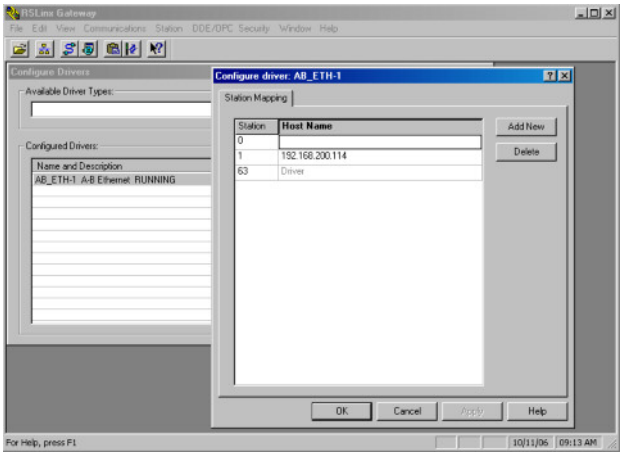


Figure 3-16 RSLinx Ethernet driver configuration

Check if there is a 'Station' with a 'Host Name' listed that shows the same IP-Address that matches the IP-Address of the PLC's Ethernet module to which you're attached. If there is a mismatch then alter your settings. It is also possible to click the 'Add New' button. Subsequently, the correct IP-Address can be typed in.

- If there is no point-to-point connection with the Ethernet PLC module i.e. both the maintenance PC and the Ethernet module are connected to an Ethernet switch then it might be that your maintenance PC is connected to a disabled or secured UTP port of the Ethernet switch. Try to establish a 'Point-to-Point' connection with the PLC Ethernet module to exclude this issue.

Once a connection has been established your screen should typically look like the one displayed in Figure 3-17. The left pane shows all devices currently available on the ControlNet. The digit that is shown as a prefix represents the ControlNet node number of the applicable device. Most of them apply to a 1756-CNB(R) device. This is the type ID of a (redundant) ControlNet bridge. That is because a ControlNet bridge is needed to interface a PLC rack with the ControlNet.

Furthermore you might see other device identifications shown in this section. For instance, a PanelView points to a local monitor, which is probably used as a Local Operator Panel. A 1784-PCIC device represents a PCI ControlNet adapter installed in a PC that interfaces ControlNet as well.

When you click on one of the '+' signs you actually enter the node (rack) via the relevant module. Mostly this will apply to a ControlNet bridge module but other modules, like an Ethernet bridge node, support the same way of browsing. When you 'enter' a rack by 'virtually stepping into' a bridge module then a branch will appear underneath the bridge module icon showing you the rack's backplane. Note that this item can be entered as well by again clicking at the '+' sign next to it. Now you're facing all the boards installed on the backplane. Note that the numbers listed underneath a backplane branch point to a slot number instead of rack node number.

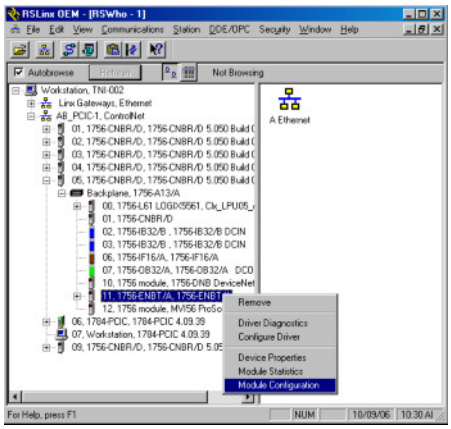


Figure 3-17 Typical RSWho communication dialog

Once a connection in between the maintenance PC and the ControlNet has been verified you are able to start the PLC development program called RSLogix5000.

3.3.3 Download a PLC program

From the maintenance laptop: Start the PLC development software RSLogix5000 via

Start→Programs→Rockwell Software→RSLogix 5000 Enterprise series→RSLogix 5000

Once RSLogix5000 has been started:

Open the project file of the PLC you need to access (See Table 3-1). To do this, left click the 'File' pull down menu and select 'Open'. Browse to the PLC project software, which is located at partition 'D:' of your hard disk in de following directory:

D:\User\Project<<*PROJECT_ID*>>**\Software\PLC**

Look for the file name as listed in Table 3-1. You may use a shortcut icon of each relevant PLC project as well if it is available on your desktop. This will open RSLogix5000 and the applicable project at once.

After opening the project your screen should look like the one shown by Figure 3-18 (or one that is comparable).

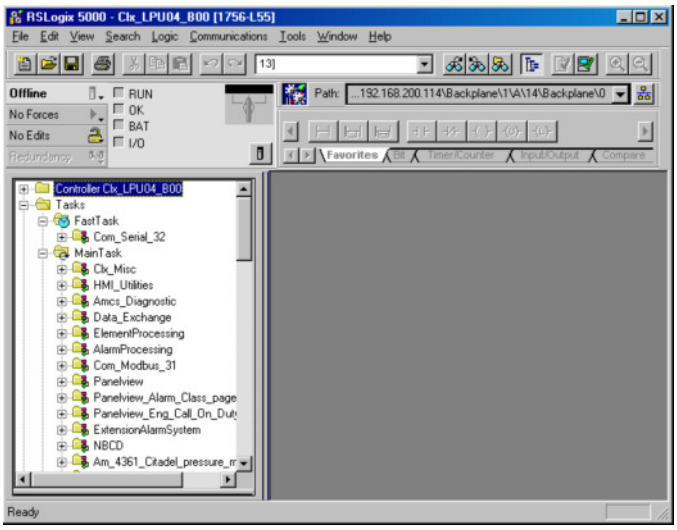


Figure 3-18 Typical RSLogix 5000 PLC Development window

Select 'Who Active' from the 'Communications' pull down menu. The following window appears. If not, please check if the 'Autobrowse' checkbox shown at the top is ticked.

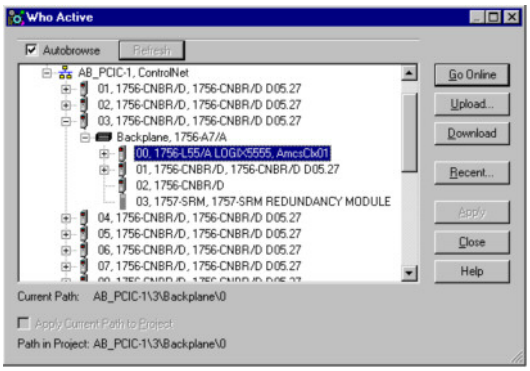


Figure 3-19 Dialog to select the PLC download path

Select a path for the relevant PLC CPU and confirm the connection either clicking at the 'Go Online' button of by clicking at the 'Download' button if a program download is required. Of course, if the application installed on your maintenance PC already matches the one in the PLC memory then you can click at the 'Go Online' button. RSLogix5000 will verify the configuration of the project and the relevant PLC processor. If there is a match then an online link with the PLC processor will be established. On the other hand if there is no match then the software will notify you about this. It won't be able to establish the link unless you download (from maintenance PC to PLC processor) or upload (from PLC processor to maintenance PC) the application software to realize a match.

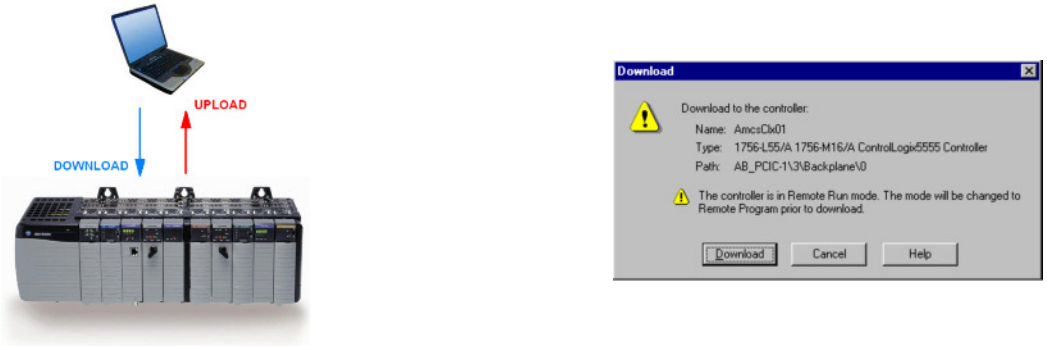


Figure 3-20 PLC program 'Download' or 'Upload' ?

Important: Of course **if there is no match you must be aware why** !!! Are you accessing the correct PLC processor ? Check your path !!!

In Figure 3-19 the PLC processor module of a ControlLogix rack at ControlNet node-address #03 is highlighted. The PC will ask you to confirm the download. (A dialog comparable to the one shown in Figure 3-20 wills pop-up).

Note: The key switch at the front of each PLC processor must be in state 'REMOTE' to be able to control it from the maintenance PC.

Note: Before the download actually starts the PLC CPU will be stopped by RSLogix 5000. Subsequently, all outputs being controlled from that CPU will be deactivated. Moreover, all SCADA data that is obtained from that PLC will be unavailable during the download. As a result applicable screen objects will turn pink on HMI workstations! It may be desirable to restart the HMI project as described by section 2.2.2 afterwards.

As soon as the download has ended successfully then toggle the key switch at the front plate of the processor to 'RUN' mode and back to 'REMOTE' again or change the processor mode to run from remote. (The key-switch must be in state 'REMOTE' to be able to change the processor state from remote.) Verify that both LED's being marked 'RUN' and 'OK' light steady green.

3.3.4 Program memory battery backup

Most processor modules feature a backup battery to keep the program stored in the CPU memory whenever PLC power is turned off. The CPU module itself monitors the backup battery condition. Whenever battery condition is poor the LED-indicator marked 'BAT' at the front of the CPU module will be lit. Replace the backup battery immediately without switching off main CPU power to prevent program loss.

3.3.5 Non-Volatile program memory

Although a backup battery is provided some PLC processors feature an extra Non-Volatile Program storage. When this option is installed then it is possible to copy the program from the storage memory to the program memory either automatically or on a user initiated action.

Important: Whenever the CPU module is replaced or whenever program changes or IMCS parameter settings have been made, the Non-Volatile memory (flashcard) should be updated as well to provide an up-to-date backup

The easiest way to store the program into the Non-Volatile memory is to establish an online connection from the maintenance laptop to the applicable CPU module first. See section **Error! Reference source not found.** How this can be done.

Once the connection has been established you're sure that the program on your harddisk matches the program in the PLC processor module. In the upper left corner of the RSLogix 5000 dialog a GREEN icon and '**Rem Run'** should be visible.

Click at the icon to pop-up a menu. Select 'Controller Properties' from the pop-up menu. The 'Controller Properties' dialog appears which is comparable to the one shown in Figure 3-21. From this dialog select TAB 'Nonvolatile Memory'

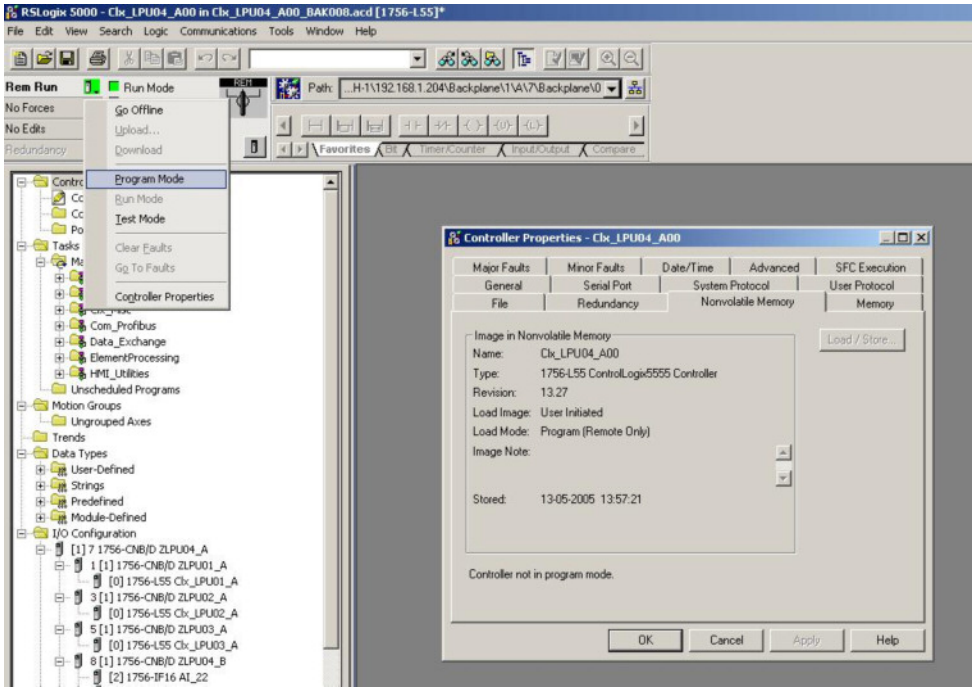


Figure 3-21 Controller Properties

From this dialog you can select the 'Load/Store…' button provided that the PLC program is stopped. A 'greyed-out' button appears otherwise. To stop the processor it should be brought to 'Program' mode. Again, click at the green icon next to '**Rem Run'.** From the pop-up menu select 'Program mode' The icon colour turns blue to indicate that there is an 'online' connection and that the program has been stopped.

When in Program Mode the message 'Controller not in program mode' in the controller properties dialog will disappear. Consequently the Load / Store… button will be enabled, see Figure 3-22.

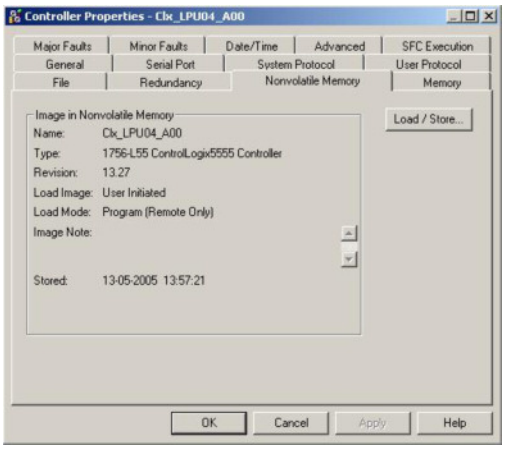


Figure 3-22 Load / Store Non-volatile Memory

When the 'Load / Store…' button is selected, a dialog window like the one shown in Figure 3-23 appears

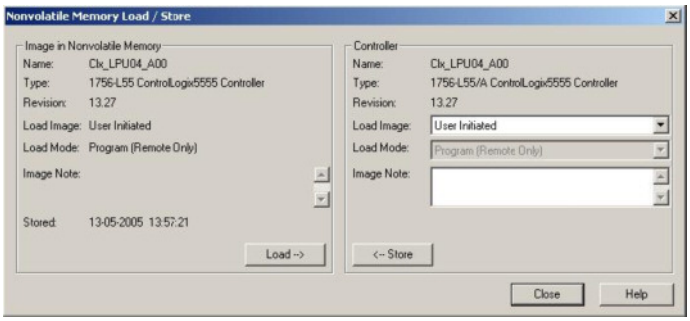


Figure 3-23 Non-volatile Memory Load/Store dialog

The 'Load Image' drop down box shows whenever this CPU module should copy its program from the non-volatile memory to its program memory. The following options are available:

- On Corrupt Memory: This option will cause a program load whenever there is no project in the controller and you turn on or cycle power on the chassis. If you are using a backup battery then selecting this option performs a load only if the battery has failed to maintain the project during a loss of power.
- On Power Up: This option will cause a program load whenever you turn on or cycle power on the chassis. If you are using a battery on the controller, selecting this option performs a load even if the battery has maintained the project during loss of power.
- User Initiated: Use this option if a program load is to be required only on a user initiated action.

"The actual option being used is to be determined by project settings."

3.3.5.1 Store the processor memory into Non-volatile memory

From the dialog shown in Figure 3-23:

- Push the '←**Store**' button to copy the program from the processor memory into the Non-Volatile memory.

After pressing the Store button a confirmation menu will pop up as shown in Figure 3-24.

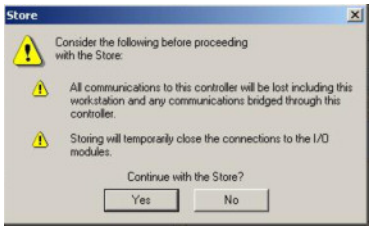


Figure 3-24 Store program into Non-volatile Memory

If you proceed (by clicking 'Yes') then a dialog appears to notify you that the store is in progress. Once the store has been completed, click 'OK'. At this point, if you require an online connection, you must select the 'Go Online' option manually.

Important:	**All data in the processor will be stored! That includes not only the program itself but also all parameter changes and all disabled elements that apply to this processor!** **I.e. if the processor memory is to be restored in the future from the contents being stored in the Non-Volatile memory then consequently the parameters and disabled elements will be restored at their state at the moment of storage as well!**

3.3.5.2 Load the Nonvolatile Memory

From the dialog shown in Figure 3-23:

- Push the '**Load →**' button to copy the program from the Non-Volatile memory into the processor memory.
  - The Load dialog appears, prompting you to confirm the load.
  - Click 'Yes'.
  - While loading: the 'OK' LED at the front of the controller toggles red < > green
  - RSLogix 5000 software disconnects from the controller
  - Once the store has been completed, click 'OK'.
  - At this point, if you require an online connection, you must select the 'Go Online' option manually.

Important:	**All parameters being changed after the backup was made will be lost!**

3.4 Module replacement

Most ControlLogix I/O modules, except for some modules that concern communication tasks, do not need specific settings before they can be used as a spare part. Hot swappable replacement of modules is supported. However special attention should be paid to:

- The firmware of a spare module **must be** compatible with the versions already used by the system. (See section 3.4.1) before it can be used as a replacement.

- Due to design changes and availability of hardware components the hardware revision of a spare ControlLogix module may differ from the module that has to be replaced. The consequences of using a module that has a deviating hardware revision is unpredictable and might even impact the firmware and application software!
- Miscellaneous module settings, like jumpers, module parameters etc. See the relevant parts being described in section 3.6 for any details.

Note: ControlLogix modules – especially Processor modules, ControlNet bridges and Serial interface modules may need firmware upgrade/downgrade before they are useable. Check firmware compatibility issues regarding your environment. They should match the revisions listed by

Table 3-2

Note: Besides checking the firmware version some modules, like a CNET interface module (1756-CNBR), need special settings regarding software configuration and hardware settings as well. (See section 3.6)

Note: A new 'out of the box' ControlLogix CPU will **ALWAYS** need a firmware upgrade as the manufacturer provides it with download support firmware only.

3.4.1 Verify / load firmware of a ControlLogix module.

Every ControlLogix module contains firmware. If you need to replace a ControlLogix module you may need to update/downgrade the modules firmware before it is compatible with the hardware/firmware environment.

Module description	Module type	Hardware Revision	Firmware Revision	Note
Processor module	1756-L61	A	13.36	Or 13.44
		B	13.44	
ControlNet Bridge Redundant	1756-CNB(R)	D	5.50	
		E	11.2	
DeviceNet Bridge	1756-DNB	A	7.1	
		B	7.1	
Analogue input module	1756-IF16	A	1.5	
		B		
Analogue current loop output module	1756-OF6CI	A	1.12	
		B		
Digital input module	1756-IB32	A		
		B	3.5	
Digital output module	1756-OB32	A	3.2	
		B		
Ethernet interface module 100 Mit	1756-ENBT	A	3.9	
		B		
Modbus serial interface module	1756-MVI-MCM	<all>	1.2	
		-		
Generic serial interface module	1756-MVI-GSC	<all>	1.2	
		-		
Profibus serial interface module	SST-PFB-CLX	<all>	4.6	
		-		
PCI ControlNet adapter	1784-PCIC	A		
		B	4.9	

Table 3-2 ControlLogix firmware compatibility list

3.4.1.1 Verifying a firmware version

The actual firmware version installed on the board can be verified by using RSLinx. Start RSLinx as described in section 3.3. Open the RSWho diagnostic and browse to the module you like to verify. A browser dialog like the one shown in Figure 2-17 appears. By clicking at a '+' sign next to some bridge modules you're able to step into the relevant rack where the module is located. Once you've reached the module of your choice you can right click the module icon from the left pane. Select 'Device Properties' from the pop-up window. A window comparable to that show by Figure 3-25 will appear.

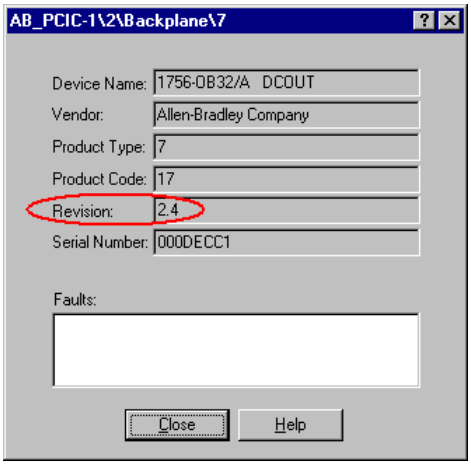


Figure 3-25 Typical device properties

The firmware version of the module is displayed in the 'Revision' textbox.

3.4.1.2 Loading a firmware version

The program to load firmware into a ControlLogix module is called ControlFlash. Except when your ControlLogix module is a Modbus, NMEA or a Profibus interface you will need ControlFlash to upgrade/downgrade a module's firmware. To access these latter serial interface boards you will need special software which is described in the sub-sections hereafter.

Flash software and firmware are to be installed on the maintenance PC. If installed, you may start ControlFlash from the following path:

Start→Programs→Flash Programming Tools→ControlFLASH

After clicking the '**Next**' button on the splash screen, a window comparable to the one shown in Figure 3-26 will appear. Select the module type you want to load firmware into and subsequently click at the '**Next**' button.

A dialog comparable to the one shown in Figure 3-17 will appear. Select a path that leads to the module you like to access and click the OK button.

The program will verify the firmware version currently present in the module. Besides this it will show you a list of firmware versions available on the maintenance PC that apply for the relevant module. You may have to click at the 'Show all' button if a firmware downgrade is needed. Once the current firmware version in de module doesn't match your application (See
Table 3-2) you will have to upgrade/downgrade the module's firmware. Select a firmware release that matches the IPMS configuration. Subsequently, click the OK button to start the flash session.

After upgrade/downgrade confirmation, the download process will be started. Wait for the program to end. In any way **do not interrupt** the download process.

Important:	**Any disturbance of the flash session process may cause the module to become unusable! An unusable module must be returned to the manufacturer for repair!**

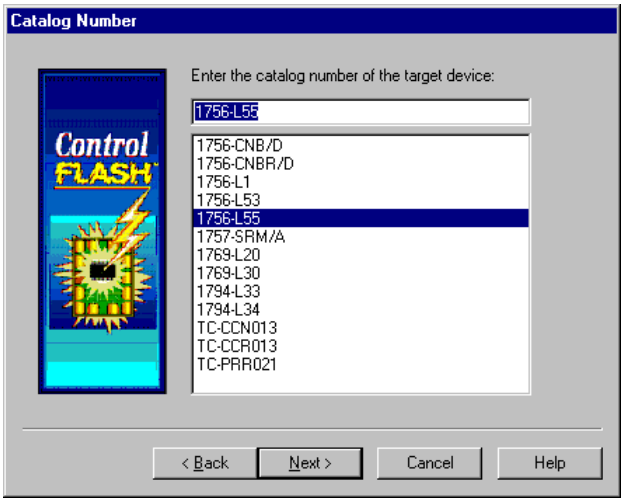


Figure 3-26 Firmware loading dialog

3.4.1.2.1 Modbus or Generic Serial Interface Firmware download procedure

The firmware download procedure for a Modbus (1756-MVI-MCM) – or NMEA (1756-MVI-GSC) interface module differs from the standard procedure. Follow the next steps to achieve a firmware change for these modules.

1. Power Down ControlLogix Rack wherein the MVI module resides.
2. Remove the module from the rack and install Setup jumper on MVI module
3. Connect the serial port of the maintenance PC to the 'Debug' port of MVI module using a null-modem cable.
4. Start the MVI Flash Update program from Windows start menu path:

   Start→Programs→Flash Programming Tools→MVI Flash Update→MVI Flash Update

5. Select Com 1, then click Connect
6. Power Up the applicable ControlLogix Rack. An attempt is made to establish a serial connection …
7. Once connected, browse to find the * .ima file that contains the suitable firmware for the serial interface

   For Modbus use path: **D:\User\Project\<<*PROJECT-ID*>>\Software\Flash_Specials\ModBus**
   For NMEA use path: **D:\User\Project\<<*PROJECT-ID*>>\Software\Flash_Specials\NMEA**

8. Click download.
9. Once the download has been completed, reboot the serial interface module from the download tool.
10. Extract the module from the rack, remove the Setup jumper.

After the firmware flash you may have to alter the jumper settings for the MVI module. See section 3.6.6 (Modbus) or section 3.6.8 (NMEA) for relevant jumper settings.

3.4.1.2.2 Profibus firmware download procedure

The firmware download procedure for a Profibus (SST-PFB-CLX) interface module differs from the standard. Link your maintenance PC to the Profi-bus module by using an available COM-port and the port marked "CONFIG" on the Profi-bus scanner with a suitable null modem cable.

Start the HyperTerminal software (Access path: Start →Programs → Accessories → HyperTerminal) on your PC and make a new connection, select the COM-port the Profibus scanner is connected to and enter the port-settings as described by Figure 3-34, (the scanner serial port supports any baud rate from 9600 to 115200 Baud, the scanner automatically detects the baud rate being used):

Cycle power on the ControlLogix-rack. When the module is powering up, the SYS LED starts flashing green for 2 seconds. While the SYS LED is flashing, hit the **exclamation mark (!)** in HyperTerminal to notify the scanner to enter maintenance mode. You may need to press the exclamation mark several times to let the scanner auto-detect the baud rate. Once the scanner is in maintenance mode, the COM and SYS LED's alternately flash red.

The following commands are available in maintenance mode:

Command	Description
Ver	To display the current firmware revision number
Help	To display available commands
LoadFlash	To load new firmware into flash
Run	To exit maintenance mode
Run aux	Reserved, DO NOT USE

- Type: LoadFlash
- Select 'Send file' from the 'Transfer' pull-down menu.
- Select the firmware file to send

  Path: (D:\User\Project\<<***PROJECT-ID***>>\Software\Flash_Specials\Profibus\clxprofi.ssf

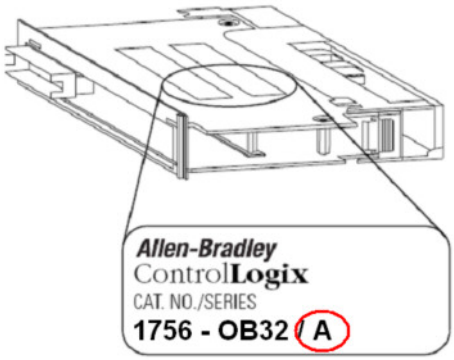
- Select the X-Modem Protocol
- Click on the Send button.

When the download is complete the scanner notifies you if you to program the new module into flash.
Type a 'y ' to confirm.

Once the module has been flashed, type command: Ver to check that the version number matches your application. Type 'Run' to exit maintenance mode and resume normal operation. The scanner will dim both the COM and SYS LED.

Besides a firmware flash your module needs a configuration file as well before it can be used as an IPMS spare part. See section 3.6.7 for download procedures concerning the IPMS configuration.

3.5 PLC Module Hardware revision mark



Due to advancing developments the hardware revision of a newly purchased ControlLogix module may differ from the one to be replaced. You can verify a module's hardware revision by looking at its left side plate.

At the left top corner look for 'CAT. NO./SERIES'. The letter being stated after the forward slash refers to the hardware revision of the module.

It is also possible to verify a module's hardware revision by browsing to the relevant module from the RSLinx\ RSWho dialog. See Figure 3-17 for details concerning the RSWho browsing process.

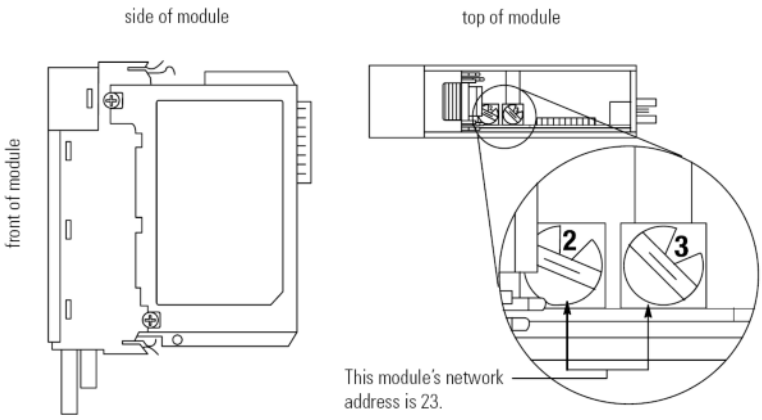
3.6 ControlLogix special settings

Besides firmware and hardware compatibility issues that may arise when replacing ControlLogix modules, some of these modules may need some attention concerning extra hardware- and or software configurations before they can be used as a spare part. This especially applies to the following module types:

- 1756-CNB(R) ControlNet Bridge Module (Redundant)
- 1756-DNB DeviceNet Bridge Module
- 1756-MVI-MCM Modbus interface module
- 1756-PFB-CLX Profibus interface module
- 1756-MVI-GSC Serial ASCII interface
- 1756-ENBT Ethernet module UTP/100 Mbit

3.6.1 1756-CNB(R) ControlNet bridge special settings

- First of all the ControlNet node number must be set to a unique ControlNet Address. Refer to the Network architecture PLC's, Ref [9] and look for the #XY notation next to each CNET tap to find out the node address. (The network address of each ControlNet module can also be obtained from Appendix A) Of course if you're able to have a look at the '***#A xx'*** message that scrolls along the CNB(R) front display of the old module you can use this value as well. Rotary switches located at the topside of the 1756-CNB(R) module are provided to adjust the module node address.



- Once the node address has been set, special settings considering ControlNet network scheduling parameters must be downloaded into the new module. This is also known as keeper information. The software tool required to download ControlNet keeper information into the new ControlNet bridge module is "RSNetworx for ControlNet". By default a shortcut is provided on the maintenance laptop by the following Windows Start menu path:

Start → Programs → Rockwell Software → RSNetworx → RSNetworx for ControlNet

- Connect the maintenance PC to the ControlNet either by means of the PC's Ethernet port and the 1756-ENBT Ethernet module (It is presumed that the network settings of both the 1756-ENBT and the maintenance PC are already set properly)

- Once "RSNetworx for ControlNet" has started, load the applicable network settings (see Table 3-3) by using menu: 'File'\'Open'

  Browse for the relevant file to:

D:\User\Project\<<*PROJECT-ID*>>\Software\RSNetworx

"Project specific data"

File name	Target
ControlNet.xc	Redundant ControlNet

Table 3-3 ControlNet configuration files

- Once you've opened the correct network configuration file check if the online path configuration matches the one you're actually using by menu: 'Network' \ 'Properties'. Select tab: 'General'
- If the online path matches your current path: go online by using the menu: 'Network ' \ 'Online'. (See Figure 3-27)

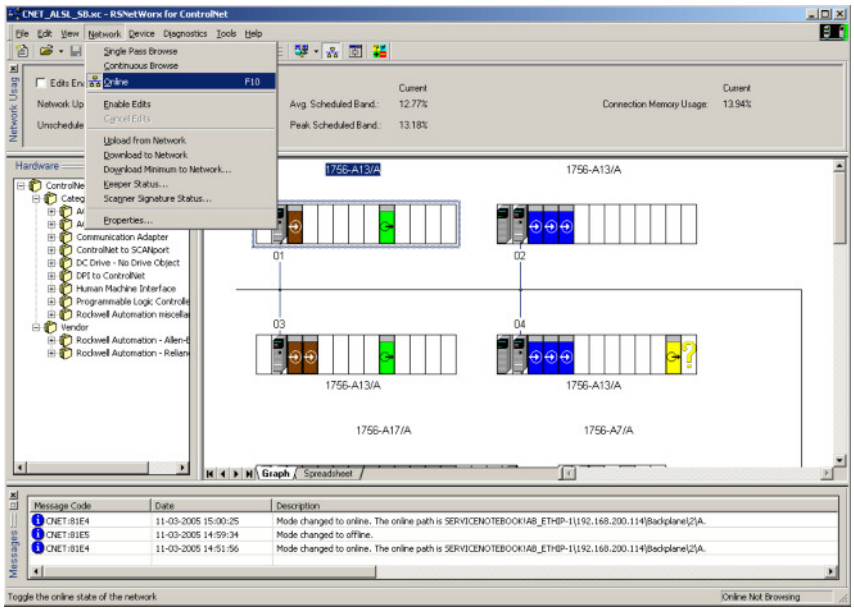


Figure 3-27 RSNetworx for ControlNet online

- RSNetworx will start browsing the network to check the device statuses.

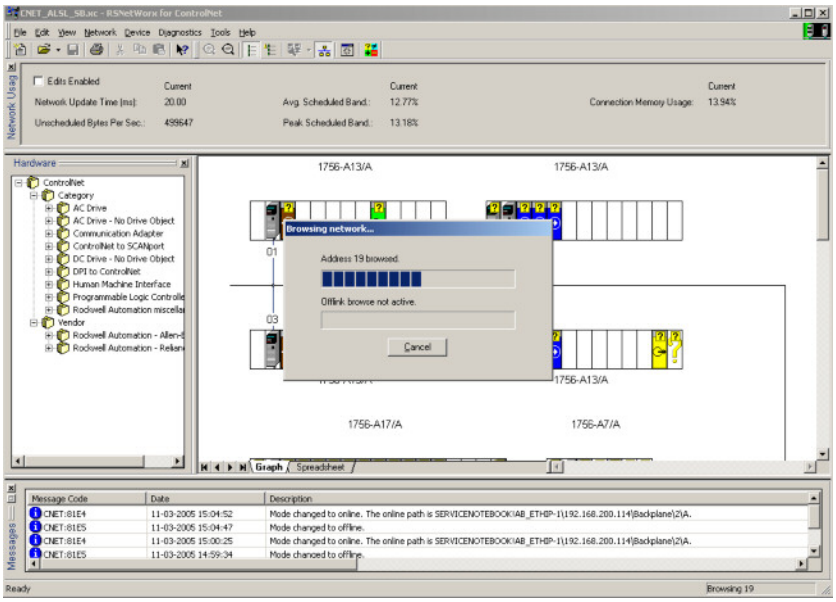


Figure 3-28 RSNetworx browses the ControlNet network

- Once RSNetworx has gathered all network statuses it is possible to check keeper statuses by menu: 'Network' \ 'Keeper status …'. Select the ControlNet node that applies to the 1756-CNBR module you've just replaced. Subsequently click at the button being marked 'Update Keeper' to load the applicable settings into the ControlNet bridge module.

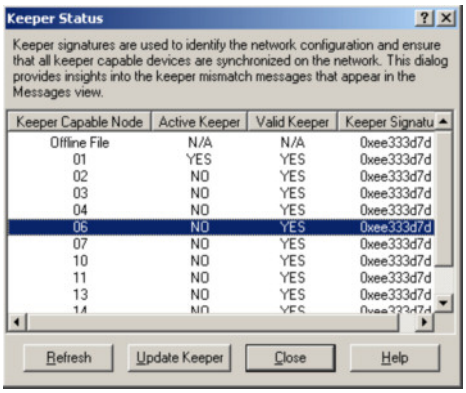


Figure 3-29 RSNetworx update keeper

- Close the dialog and exit the RSNetworx application.

3.6.2 1756-DNB DeviceNet bridge special settings

- The DeviceNet bridge module (1756-DNB) needs configuration before it can be used as a spare part. Consider Figure 3-30. As soon as power is applied, the alphanumeric display will cycle through the following information:

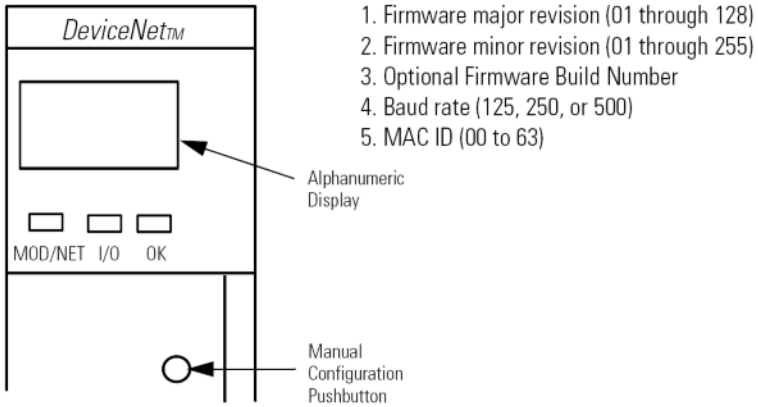


Figure 3-30 1756-DNB front

- The 1756-DNB is equipped with a manual pushbutton for setting DeviceNet's baudrate and node address. (MAC ID).

  Without the network connection it allows the maintainer to select the DeviceNet baud rate.
  Select baud rate '125 k' by pushing and holding the switch. Release the switch as soon as the proper setting is displayed.

  With the network connection it displays the DeviceNet node address for this module. Select the DeviceNet node address by pushing and holding the switch. Release the switch as soon as the proper setting is displayed.
  Refer to the Network architecture PLC's, Ref [9] and look for the #XY notation next to the DNET link.

- Once the node address and baud rate are set, special settings considering DeviceNet network parameters are to be downloaded into the DeviceNet bridge module. The software tool needed to store this information into the

module is “RSNetworx for DeviceNet”. It is installed on the maintenance PC. A shortcut is provided by the following path:

Start → Programs → Rockwell Software → RSNetworx → RSNetworx for DeviceNet

- Connect the maintenance PC. (see also section 3.3.1) It is assumed that the maintenance PC Ethernet interface will be used for this purpose. At least one port on any Client Server Network Ethernet switch is assumed to be available for connecting the maintenance PC. Either a PLC Ethernet interface card or a PC with both an Ethernet card and a ControlNet card installed that is able to act as a gateway may realize the connection in between the Client Server Network and the Platform Data Network.

- Once “RSNetworx for DeviceNet” has started, load the applicable network file (see Table 3-4) by using menu: ‘File’\‘Open’

  Browse for the relevant file to:

  D:\User\Project\<<*PROJECT-ID*>>\Software\RSNetworx

  “Project specific data”

File name	Target
DeviceNetLpu3.dnt	DeviceNet in Main Switchboard room AFT
DeviceNetLpu5.dnt	DeviceNet in Bridge Console

Table 3-4 DeviceNet configuration files

- Once you’ve opened the correct network configuration file then RSNetworx for DeviceNet will open.
- **The processor that owns this module should be stopped first**. Otherwise it won’t be possible to access the DeviceNet bridge module. Change processor mode to ‘Program mode’ before the download to the 1756-DNB actually starts. (You may use the key switch at the front of the PLC module)
- Then right click the 1756-DNB icon (see also Figure 3-31) and select ‘Download to Device’ to download the configuration data into the module.

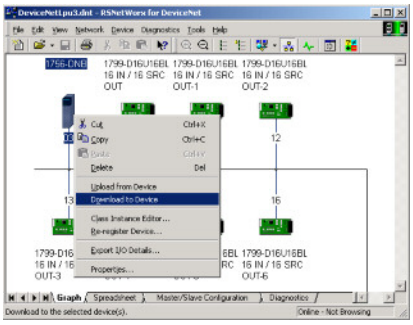


Figure 3-31 RSNetworx for DeviceNet dialog

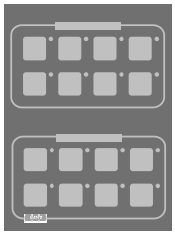
- Once the download has ended successfully you may close RSNetworx for DeviceNet.
- Change the processor mode to ‘Run’ again.

3.6.3 Configuring a DeviceNet Module

Devices that interface the IPMS by DeviceNet may need special settings. At least each module's DeviceNet address should be properly configured! Other settings may apply as well. The following devices are recognized.

3.6.3.1 Universal Monitoring & Control Panel (388-1020)

This module has been built on a sandwich-layered assembly. The upper PCB contains the indicator- and backlight LEDs, pushbuttons and dimming circuitry. The lower PCB contains the DeviceNet interface and relevant inputs/outputs that interface the upper PCB. A 50-core ribbon cable interconnects both PCBs. Text strips slide in from the side to assign relevant functions to each button/indicator.



The 388-1020 requires the DeviceNet address to be set before you can use it as a replacement.

- **WARNING: These modules appear to be extremely vulnerable for electrostatic discharges (ESD).** At least use a wristband that is properly grounded **before** touching the electrical parts of this module to prevent the module from being damaged!
- Disassemble the unit by unscrewing the bolts on each of the module's corner backside.
- Carefully open the assembly. Mind the ribbon cable that is still in between both PCBs! It is NOT necessary to disconnect the ribbon cable.

- If you've opened the module's assembly then on the second PCB look for two rotary switches. One rotary switch assigns the DeviceNet address decades (MSD = Most Significant Digit) while the other one assigns the DeviceNet address unit counts. (LSD = Least Significant Digit). See also Figure 3-32. The rotary switch settings displayed as an example point out on a DeviceNet address #63

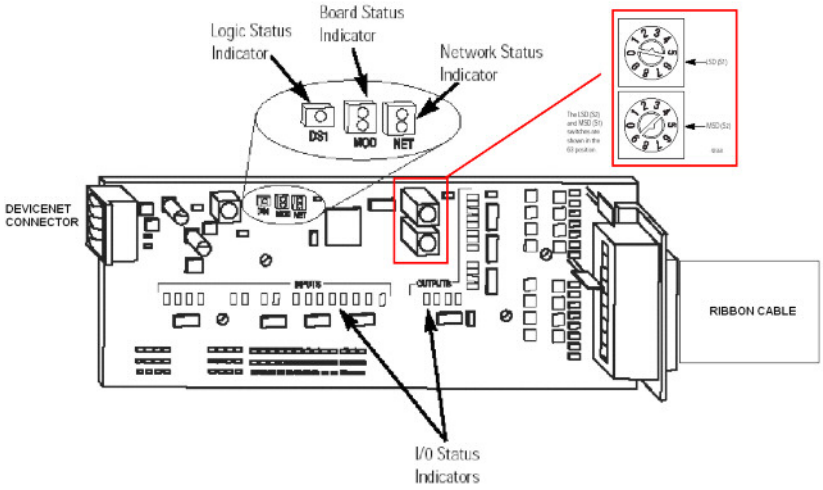


Figure 3-32 DeviceNet interface board

- Verify the current settings and change the rotary switch settings according to Table 3-5
- Reassemble the module and tighten the bolts.

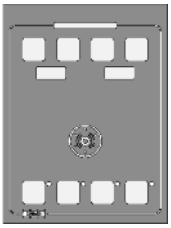
"Project specific data"

Module description	DeviceNet address
GENERAL / DIMMER	*#10*
CNTRL POSITION / MODES	*#11*
ALARMS SB / GB SB	*#12*
ME SB / CPP SB	*#13*
ME PS / CPP PS	*#14*
ALARMS PS / GB PS	*#15*
SETPOINT LEVER	*#16*
RELAY BOX CONTROLLER	*#21*

Table 3-5 DeviceNet node address settings

3.6.3.2 Dim Controller Panel (388-1021)

This module has been built on a sandwich-layered assembly. The upper PCB contains some indicator- and backlight LEDs, pushbuttons, dim circuitry and a buzzer. The lower PCB contains the DeviceNet interface and relevant digital inputs/outputs that interface the upper PCB. A 50-core ribbon cable interconnects both PCBs. Text strips slide in from the side to assign relevant functions to each button/indicator.

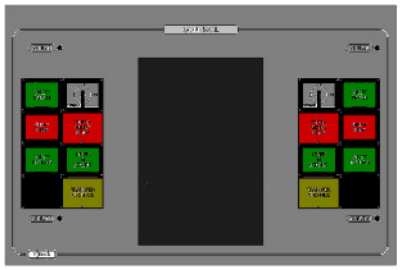


The 388-1021 requires the DeviceNet address to be set before you can use it as a replacement.

- **WARNING: These modules appear to be extremely vulnerable for electrostatic discharges (ESD).** At least use a wristband that is properly grounded **before** touching the electrical parts of this module to prevent the module from being damaged!
- The configuration of this module's DeviceNet address is described in section 3.6.3.1
- Verify the current settings and change the rotary switch settings according to Table 3-5
- Reassemble the module and tighten the bolts.

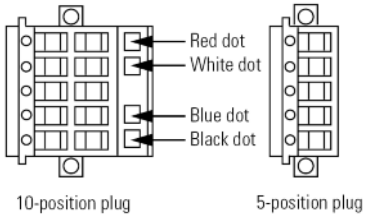
3.6.3.3 Lever panel (388-1022)

The lever panel comprises the propulsion lever as well as some relevant buttons and indicators. The DeviceNet module being used to interface the lever panel is identical to the one being used for the dimming control panel (388-1021) and the Universal Monitoring and Control Panel (388-1020). Due to mechanical properties the DeviceNet interface for the lever panel is not mounted on the lever panel itself. A multi-core cable interconnects both PCB's. The DeviceNet address has to be set exactly the same manner as already described in section 3.6.3.1.



3.6.4 DeviceNet Troubleshooting issues

DeviceNet is a simple field bus system mainly used to provide a low cost robust interface in between industrial devices and higher-level equipment such as computers and programmable controllers. It uses just a dual twisted pair trunk cable (and a ground shield) to interconnect up to 64 network nodes. The trunk cable should be terminated on both ends with a 120-Ohm resistor. Though several baud rates are supported the current network setup uses the slowest speed i.e. 125 kbps. Each device connected to the DeviceNet network has unique node address settings.



Two types of network connectors (a 5-pin and a 10-pin version) may have been used to interconnect all DeviceNet modules to the network. The 10-pin version is actually a 2 x 5-pin version, which is suitable to realize a chained cable along all DeviceNet members.

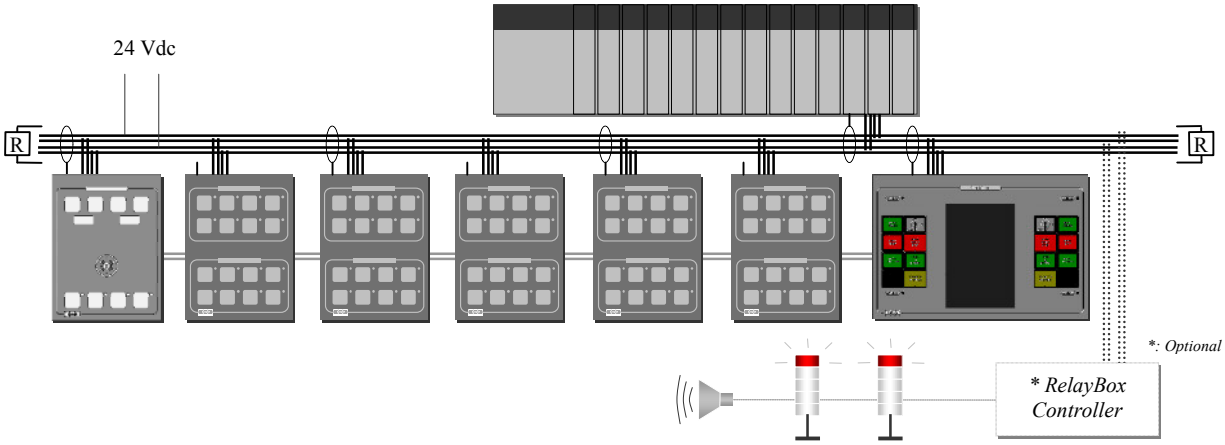


Figure 3-33 Typical DeviceNet configuration

Though DeviceNet has proven to be reliable and robust some typical problems might occur whenever the DeviceNet wiring is improperly terminated, short-circuited etc. or whenever at least one of the DeviceNet network members hasn't been configured or was not correctly connected. Table 3-6 summarizes some problems that might occur. Please have a look at the 1756-DNB installation manual for a full summary of messages and LED behaviours whenever problems are experienced with the DeviceNet network.

Problem description	Action / Cause
DeviceNet seems not to be active at all. PCS buttons are not detected and LED indicators - but not the backlight – are off. LED-TEST button doesn't work.	Check if the DeviceNet bridge module responsible for controlling the relevant network section is powered. If so, check for any error message being displayed on the front panel.
On the DeviceNet bridge (1756-DNB) module appears the following message: ***"No Network Power"***	There is no power applied to the DeviceNet network. Check if 24Vdc is available at the DeviceNet connector (Red dot = +24V / Black Dot= 0V)
On the DeviceNet bridge (1756-DNB) module appears the following message: ***"Bus Off Detected"***	Verify network wiring. Disconnect DeviceNet modules and subsequently reset the DeviceNet bridge. Connect each of the DeviceNet modules one by one to see which module causes the problem.
On the DeviceNet bridge (1756-DNB) module the following messages alternately appear: ***"A#03"*** and ***"IDLE"***	The DeviceNet bridge with node A#03 is in IDLE mode meaning that it is not accessed by a controller module probably because it is not running. Put the relevant controller in 'RUN' mode.
On the DeviceNet bridge (1756-DNB) module appears the following message: ***"NoRX"***	The scanlist being stored in the DeviceNet bridge module is empty probably because it has been replaced lately. You will need to download the proper DeviceNet configuration into the module. See also section 3.6.2 .

Problem description	Action / Cause
On the DeviceNet bridge (1756-DNB) module the following messages alternately appear: ***"A#03"*** and ***"RUN"***	This is the normal behaviour of the module. 'A#xx' points out on the device's current network address. 'RUN' means that it is currently working properly.
On the DeviceNet bridge (1756-DNB) module the following messages alternately appear: ***"N#xx"*** and ***"E#yy"*** where xx and yy actually represent a number	There is a problem detected that applies to a network device which has node number 'xx' assigned to it. The problem is identified by error code 'yy'. (The 1756-DNB module installation manual summarizes a list of error codes).

Table 3-6 DeviceNet troubleshooting list

3.6.5 Relaybox controller

A relaybox may be installed to activate a flashlight, signal columns and a local horn in the Main Engine Room (MER) and/or the Diesel Generator Room (DGR) in case of:

- CO2 Alarm occurrence;
- a General Alarm occurrence;
- a Fire Alarm occurrence;
- any Unacknowledged IPMS Alarm;
- the emergency telegraph states on both the bridge and MER do not match for more than 10 seconds;
- a telephone call for either MER or DGR

… to inform the ship's crew about the event.

Besides some digital in- and output relays the relaybox comprises a logical controller unit as well. This controller PCB includes a priority encoder, some timer circuits and controls the local horns, flashlights and signal lamps in both the MER and DGR in case any of the events listed above will be activated.

The controller PCB is exactly the same as it is used for each Universal Monitoring and Control panel (388-1020) or Dim Controller Panel (388-1021). Though the relaybox controller is a standalone unit (i.e. it needs no external controller to function) a DeviceNet network interface has been installed for maintenance purposes only. By using the DeviceNet network a maintainer is able to download a DeviceLogix configuration into the relaybox controller flash memory in case it has been replaced or changes have been made to the logic configuration. See section 3.6.5.1.

When the relaybox controller is to be replaced, verify the correct node number (See Table 3-5)

3.6.5.1 Downloading a DeviceLogix configuration

Preparations:

- It is assumed that a maintenance PC has already been physically connected to either the CSN or PDN. (See also section 3.3.1). The PC used for maintaining the IPMS has been started and works OK

DeviceLogix download procedure

- Start RSNetworx for DeviceNet or double-click at the relevant "*.dnt" file icon. (Details how to start RSNetworx for DeviceNet have been described in section 3.6.2) Wait for the RSNetworx splash screen. Whenever it disappears then you may proceed.
- From the RSNetworx for DeviceNet pulldown menu **'Network'/'Properties'** : Verify if the online path settings comply with your current network connection.
- From the RSNetworx for DeviceNet pulldown menu **'Network'/'Online'** you may now activate a browser process that investigates the availability of devices on the DeviceNet. Once the browser has ended then it summarizes all the nodes it has found in respect to the nodes its expect. When a minus appears on any of the

icons then this means that the module is expected to be there but currently it seems not to be available on the network. Likewise, when a plus sign appears then a module has been found on the network although it isn't in the Networx configuration file yet

- **Stop the Processor module** (=Program Mode) that owns the DeviceNet Bridge module otherwise you won't be able to proceed the DeviceLogix download sequence. You may use the key-switch at the front of the controller. When the key-switch is in 'Remote' you may also use RSLogix5000 to stop the processor.
- From RSNetworx: **Right-click** on the icon that matches the node number to be downloaded. Subsequently select **'Download to Device'** from the pop-up menu. RSNetworx may notify you about a DeviceLogix configuration that is currently running. This logic has to be stopped first!
- Once the logic has been stopped then the download of the new DeviceLogix configuration will start automatically. You may restart the logic again after the download has ended successfully.
- You may now close RSNetworx for DeviceNet.

3.6.6 1756-MVI-MCM configuration issues

Besides a firmware upgrade/downgrade (See section 3.4.1.2.1) you have to check for the jumper settings of this module as well. Extract the module from the ControlLogix rack. The module comprises a set of jumpers at the bottom side that apply to the electrical interface (RS232/RS422 or RS485). You might need to alter the jumper setting. Copying the jumper settings from the old module is probably the best.

3.6.7 SST-PFB-CLX configuration issues

Whenever this module is replaced it needs reconfiguration regarding its Profibus application after it has been flashed with the correct firmware version. See section 3.4.1.2.2 regarding firmware flash issues.

Note:	You will need a PC with a free COM-Port and with SST Profibus Configuration software installed!

Preparations:

- Locate the PLC-rack for the Profibus scanner you want to configure.
- Take out the Profibus Scanner and set the 'enable reconfiguration' jumper.
- Re-install the Profibus scanner in the PLC rack.

Link your maintenance laptop to the Profi-bus module by using an available COM-port and the port marked "CONFIG" on the Profi-bus scanner with a suitable null modem cable.

Two configuration methods apply to this module type. One uses 'HyperTerminal' while the other one uses dedicated profibus configuration software. This manual describes the 'HyperTerminal'method but you may use the other tool as well. (Access path dedicated tool: Start → Programs → SST Profibus → SST Profibus Configuration)

Open the HyperTerminal program (Start → Programs → Accessories → Communications→HyperTerminal) on your PC and make a new connection. Configure the applicable COM-port according to following port-settings:

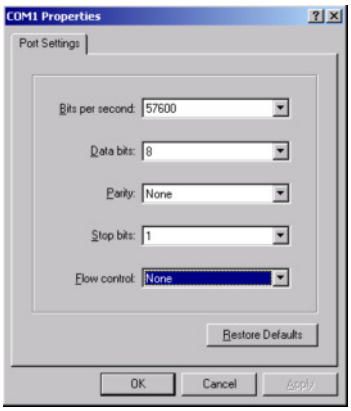


Figure 3-34 COM port settings suitable for interfacing a Profi-bus scanner module

Take out the Profi-bus scanner module and put it back in to reset the module. Type **an asterisk (*)** to get the scanner's attention. You may need to type several asterisks to let the scanner detect the baud rate automatically. The scanner should react by showing the message:

```
;Copyright (c) 1995-2000 SST/Woodhead Canada Ltd.
;For SST-PFB-CLX Card
;Version 3.12 BUILD 1
Reading Configuration from FLASH...

;>
```

Type ***help*** into the HyperTerminal window to show the command overview.

Sending the configuration file to the scanner:

1. Type ***RecBssXmodem*** <return>
2. Select 'Send file' from the Transfer pull-down menu.
3. Select the file to send (See project specific documentation for a summary of Profibus files that apply.
4. Select the X-Modem Protocol
5. Click on the Send button.

The Profibus scanner displays message:

```
;>recbssxmodem
Start Your XMODEM Send, Ctrl-X to Cancel
XMODEM Receive Successful
Parsing *.bss File...Successful
```

Next to this:

- Type ***UpdFlash*** <*return*> to update the module flash memory.
- Type ***end***<*return*> to end the Serial communication session.

Don't forget to remove the jumper:

1. Take out the Profi-bus Scanner again and remove the jumper to ensure that the configuration will not be lost;
2. Disconnect the link in-between the module and the maintenance laptop;
3. Re-install the Profi-bus scanner in the PLC rack.

3.6.8 1756-MVI-GSC

Besides a firmware upgrade/downgrade (See section 3.4.1.2.1) you have to check the jumper settings of this module as well. Extract the module from the ControlLogix rack. The module comprises a set of jumpers at the bottom side that apply to the electrical interface (RS232/RS422 or RS485). You might need to alter the jumper setting regarding the IPMS application. Copying the jumper settings from the old module is probably the best.

3.6.9 1756-ENBT special settings

A new 'Out of the box' Ethernet module is not yet configured at the IAS-system IP-address range so you can't access it from any PC by default. Unfortunately you will first need access to this module before you can configure it. To solve this problem you can:

1. Configure the 1756-ENBT via a ControlNet input of the rack where the Ethernet module is installed;
2. Configure the 1756-ENBT via its MAC-Address.

3.6.9.1 Configure the 1756-ENBT via ControlNet

By using RSLinx being installed on a PC with ControlNet access (For example either one out of both IMCS servers) you can browse to the rack where the applicable 1756-ENBT module is installed. (See section 2.3.2 how to access the 'RSWho' dialog and how you can start the browser.)

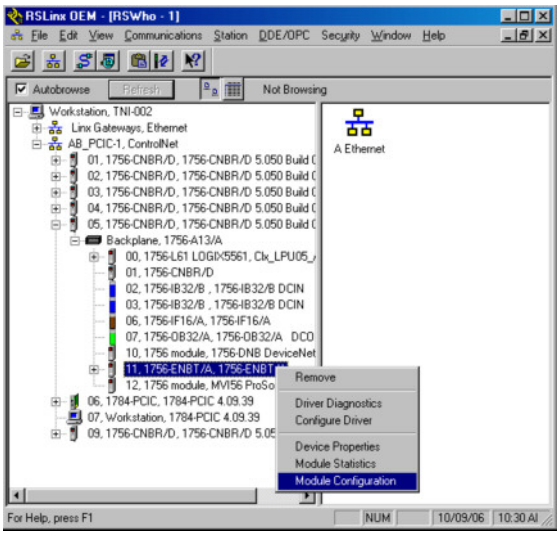


Figure 3-35 'RSWho' browser to access the 1756-ENBT card

Right click the 1756-ENBT entry and select 'Module Configuration' from the pop-up menu. The following dialog appears:

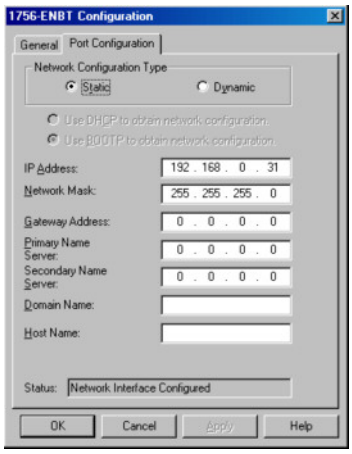


Figure 3-36 Configuring the 1756-ENBT module

Select the 'Port Configuration' tab. Fill an IP-Address and Network sub-net mask that is compatible with your system. Be sure that the 'Static' option is selected. Click OK and check if your IP-Address settings are reflected on the front display of the 1756-ENBT Ethernet module.

3.6.9.2 Configure the 1756-ENBT via its MAC-Address.

It is possible to access the 1756-ENBT via the network interface's MAC-Address. As the 1756-ENBT features MDI-MDX you may connect the maintenance laptop 'point-to-point' using a straight UTP Ethernet Cable for accessing the PLC environment.

Start a BOOTP server from the maintenance laptop Windows start menu path:

Start \ Programs \ Rockwell Software \ BOOTP-DHCP Server\ BOOTP-DHCP Server

If your RSLinx Ethernet driver is configured then the following dialog will appear:

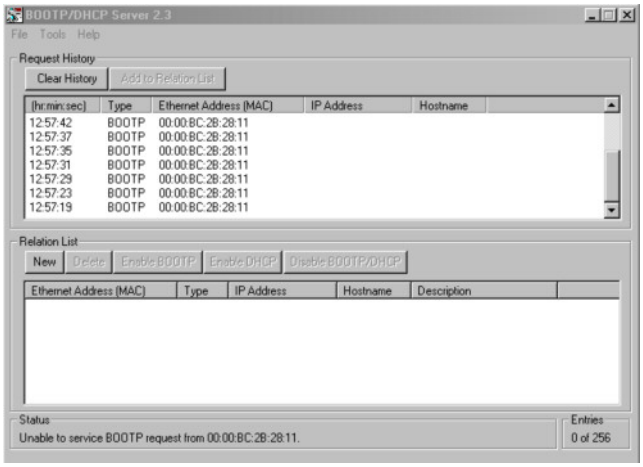
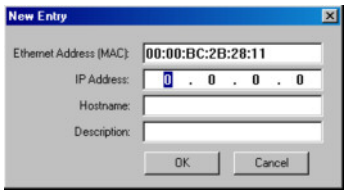


Figure 3-37 BOOTP server dialog

In the upper pane the BOOTP-Server lists all MAC addresses that haven't been assigned to a certain IP Address. As we're currently using a 'Point-to-Point' connection we're pretty sure that the MAC-address we're currently facing applies to the 1756-ENBT module.

A double-click at one of the MAC-Address entries being listed in the upper pane will show a dialog like shown below:



Fill in the IP Address of the 1756-ENBT module that matches your IP Address range.

"Project specific data"

IAS LAN IP range	*192.168.0.X*
Subnet Mask	*255.255.255.0*
PLC Ethernet bridge reserved IP-Address	*192.168.0.31*

Table 3-7 Project specific IP-Address settings

Other fields may be left blank. Click the OK button. The dialog will look like Figure 3-38.

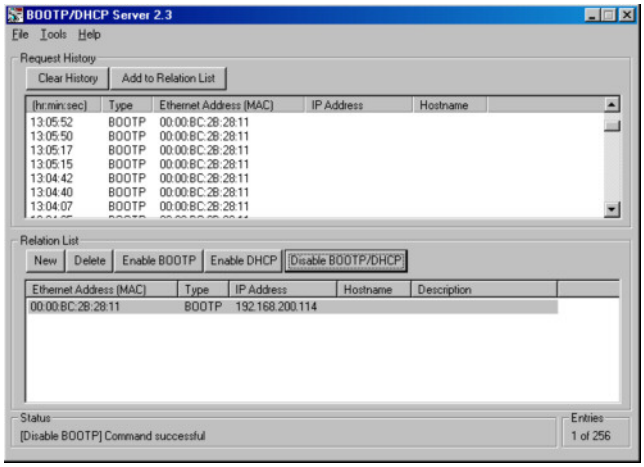


Figure 3-38 Assigning an IP-address to the 1756-ENBT module

At last click the 'Disable BOOTP/DHCP' button! This will assign the IP-Address as 'static' to the 1756-ENBT. I.e. a DHCP or BOOTP server will not be necessary anymore to configure this module. From now one you can access this module just by using its IP Address.

3.7 Downloading a Local Operator Panel (LOP)

If Local Operator Panels (LOPs) apply to the current IPMS project then they are probably installed in some cabins and common spaces. The ControlNet connects them to the IPMS. Screen configuration is done by software within

the LOP flash memory. Since flash memory is non-volatile downloading of LOP software isn't necessary when power has been switched off. However in case of LOP replacement, downloading will be necessary.

Connect the maintenance PC that has LOP development software installed to the network as described in section 3.3. Start the LOP development software via the Start menu path:

Start → Programs → Panelbuilder32 → Panelbuilder32

The PanelBuilder software will start. A dialog window as shown in Figure 3-39 appears. Check the checkbox 'Download an application to a PanelView terminal'. And click the OK button. A dialog window as shown in Figure 3-40 will appear.

Each LOP has a unique download file. So, it should be verified at which network your LOP is connected (PS or SB) and which network node address gives access to the LOP. Table 3-8 gives you this information.

By clicking the 'Browse'button you may select the file to be downloaded in the LOP. All downloadable files are located in the folder 'PVDownload' which is located in directory:

D:\User\Project\<<*PROJECT-ID*>>\Software\PanelView

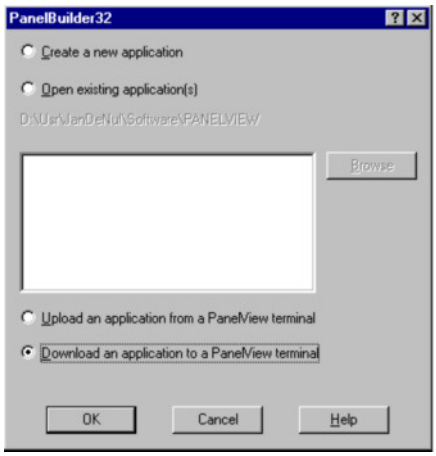


Figure 3-39 Panelview start dialog

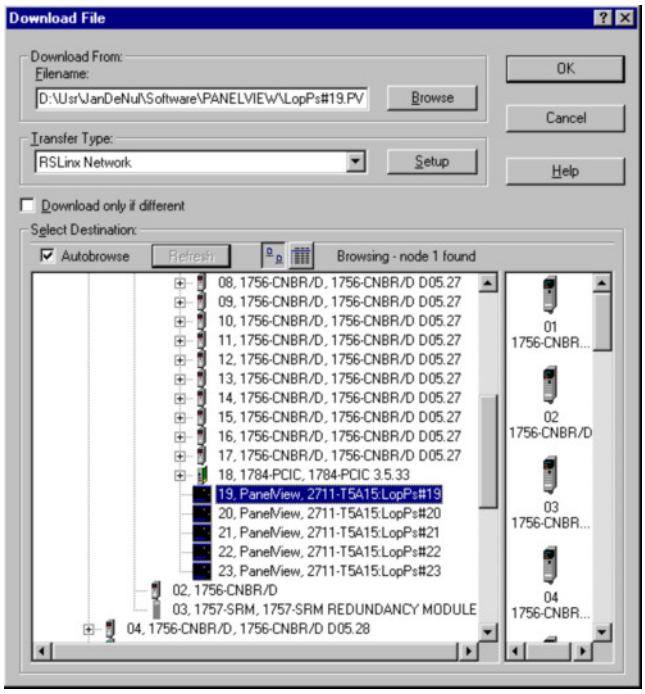


Figure 3-40 Selecting source and destination for LOP download

"Project specific data"

LOP location	Network side	Node address	File name to download

Table 3-8 LOP download file table

After selecting the source file, choose the destination from the access-tree displayed in the left pane of the dialog shown in Figure 3-40.

Note: The 'Autobrowse' checkbox should be checked to display all the devices presently connected to the network.

At last press the OK button to start the download process. After the download the LOP will restart automatically.

4. Data logger maintenance

4.1 Introduction

To enable the technical monitoring of platform installation groups, both IMCS servers record the condition of certain parts of the installation regularly. These data is stored into an SQL formatted database either locally (on each IMCS server) or on a remote disk depending on project configuration. Dedicated IMCS mimics are provided to access most of these data to get insight in the historical IMCS behaviour. See also ref. [13], IMCS User Manual how to get access to historical data.

4.2 Maintaining the data-logger database

As both IMCS servers continuously store relevant data into the logger, database maintenance will be needed to prevent the logger from running out of disk space. Both IMCS servers periodically achieve this type of maintenance. I.e. database records older than a certain time will be removed from the database automatically. Consequently it won't be possible to obtain historical data beyond the storage time being configured for it. See also ref. [13], IMCS User Manual for details concerning the storage time of historical data.

If an end-user still requires access to historical data then he/she should export this data from the data-logger before storage time expires. See section 4.3 how to export data from the logger.

4.2.1 Data-logger special care

Internal database processing algorithms require a proper start and stop. Especially in data-logger configurations special care is to be required if normal data-logger PC operation was interrupted for example because of a sudden power loss or a network disconnection. At all times prevent a data-logger from such a sudden interrupt, as the database is likely to fail afterwards. Database corruption might occur in case the data-logger is improperly stopped.

Precautions

- Backup the relevant databases regularly. See section 4.2.2 how this can be done.
- Never switch off a PC running a data-logger function by toggling the power switch or pulling the power chord. Please follow the proper shutdown procedures.
- If a standard shutdown procedure is not possible, press the power switch for about 1-2 seconds and wait for the PC to shutdown.
- **Never** use the 'reset' button – if available – unless all other options don't seem to work!

4.2.2 Database Simple Recovery Model

The backing up and restoring databases and transaction logs is a way that SQL Server provides to protect from data loss. The backup operation creates a copy of a database. This copy can be used to restore the database if the media failure occurs or if the database is somehow damaged. Despite of several database repair strategies (see also section 4.2.3) it is to be doubted that these repair actions succeed to repair all types of damages.

Note: It is advised to backup the relevant database – and transaction log files regularly and to store the backup either on a local (but physically separated) disk drive or on a remote network drive.

The graphical front-end being used for accessing SQL2000 and MSDE differs. However the OSQL command line works for both of them.

4.2.2.1 Log on to the OSQL console

From the data-logger PC:

- Get access to the Windows 'Start' button
- Use Windows start menu path: Start > Run. Type: cmd and then click the OK button. A command prompt window should open on your desktop.
- Log on to SQL server by typing:

  osql –E –S <*pc-name*>\CIMPLICITY <*Enter*>

  where <*pc-name*> should be replaced by the data-logger PC-name. If the log-on succeeds then the prompt will change to '1>' like shown in Figure 4-1

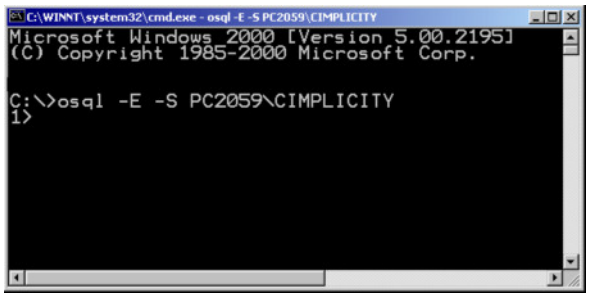


Figure 4-1 Typical OSQL log-on procedure

- You may exit the console again by typing: EXIT <*Enter*>

4.2.2.2 MSDE Simple backup procedure

Note: This backup procedure should also work for an SQL2000 oriented database

- Log on to the OSQL console as described by section 4.2.2.1
- In the console window type:

  BACKUP DATABASE <*DB_NAME*> TO DISK = '<*BACKUP PATH\FILENAME.BAK*>' <*Enter*>

  - Where <DB_NAME> is your database name: for example: CIMPLICITY
  - Where '<*BACKUP PATH\FILENAME.BAK*>' refers to your back up path & file name: for example: 'D:\DBBU\CIMPLICITY.BAK'

- Once the back up has ended you may exit the console by typing: EXIT <*Enter*>

Note: It is advised to copy the backup file to another, physically separated disk, drive, CD or DVD.

4.2.2.3 MSDE Simple restore procedure

Note: This restore procedure should also work for an SQL2000 oriented database

Note: The restore **requires exclusive access** to the database. You will need to stop the relevant IMCS server first before starting the restore of the database.

- Log on to the OSQL console as described by section 4.2.2.1
- In the console window type:

  RESTORE DATABASE <*DB_NAME*> FROM DISK = '<*RESTORE PATH\FILENAME.BAK*>' <*Enter*>

  - Where <DB_NAME> is your database name: for example: CIMPLICITY
  - Where '<*BACKUP PATH\FILENAME.BAK*>' refers to your back up path & file name: for example: 'D:\DBBU\CIMPLICITY.BAK'

- Once the restore has ended you may exit the console by typing: EXIT <*Enter*>

4.2.3 What if a database seems to have been damaged?

If historical data is not available or odd data is obtained from the logger then this may point to a database problem. If the project data logger is based on SQL or MSDE then you may attempt to repair the database by using a set of console commands.

- Log on to the OSQL console as described by section 4.2.2.1
- After the '>' prompt please type:

  EXEC sp_resetstatus '*DB_NAME*' <*Enter*>
  GO <*Enter*>
  DBCC checkdb ('*DB_NAME*', REPAIR_REBUILD) <*Enter*>
  GO <*Enter*>

  Where *DB_NAME* should be replaced by the database name in concern. (Do not remove the single quotes !!!)

- If the repair doesn't succeed then probably it is best to restore the database from a recent backup as described by section 4.2.2.3.

4.3 How to export data from the data-logger

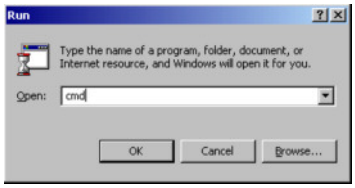
It is considered best to export relevant data-logger tables into a commonly used file format, such as MsAccess or MsExcel. Both MsExcel 2000 and MsExcel 2003 feature a query wizard that enables you to build, save and run data queries. Once your data query has been build and saved then you're able to load and execute the query at any time. The query wizard will prompt you to connect and modify filter parameters etc. The exported data will be loaded in an empty spreadsheet. Then save the MsExcel spreadsheet and store the file(s) on CD/DVD media for later use.

4.3.1 Preparations

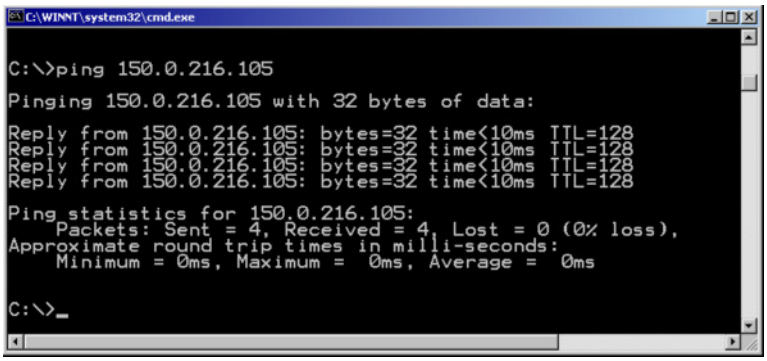
An optional maintenance PC (e.g. a laptop) is required for this purpose. A suitable version of MsExcel (i.e Excel 2000 or Excel 2003) is assumed to be installed on this PC.

1. Connect your maintenance PC to a suitable IAS network port using a straight UTP network cable.
2. Assuming the maintenance PC has been started already, you may check the link by pinging the logger PC. From the Windows start button select: 'Run'. Type 'cmd' in the Open drop down box. And click the OK

button.



3. In the command prompt window type: ping 192.168.X.Y <*enter*>
where X and Y point to project specific settings. The ping should succeed like shown below.

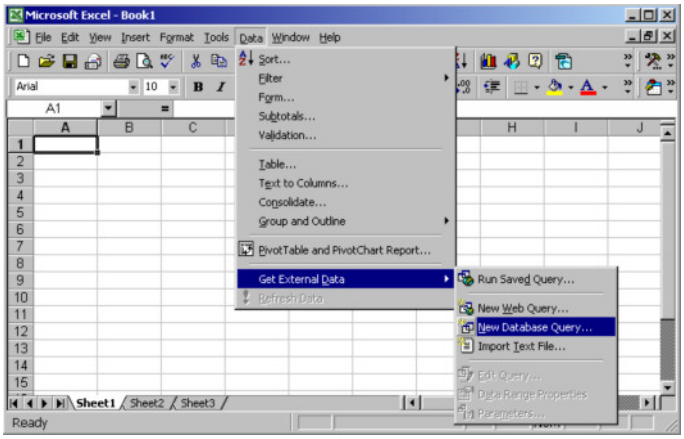


If this test fails then check your PC's IP-range and/or the relevant Ethernet switch port parameters.

4.3.2 Build/Save a data query

From MsExcel it is possible to build/save data import queries that access the data logger SQL-formatted database. This section describes how you can build your query.

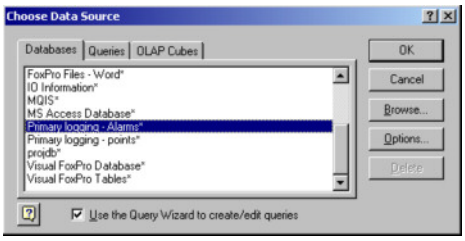
1. Open a blank MsExcel workbook.
2. From the 'Data' pulldown menu select: 'Get External Data'\'New Database Query …'



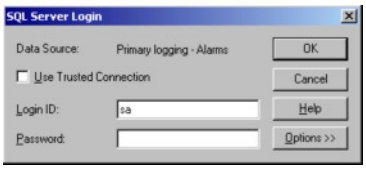
3. MsExcel will prompt you to select a database link from a list of ODBC connections already being configured on your maintenance PC. Select one of the 'Primary logging – XXXX' data sources to connect

to the primary database logger. You may also decide to select one of the 'Secondary logging – XXXX' links. However these sources point to the secondary database logger instead.

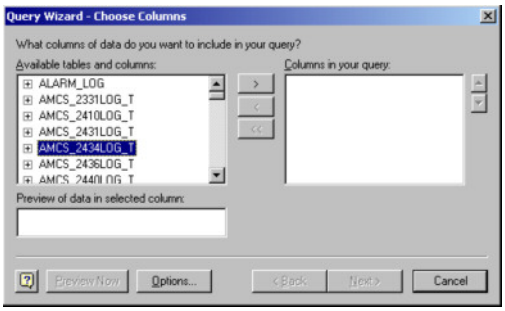
Note: Each IMCS server features a data-logger task that will be running if the IMCS server is 'online'. Even the server that performs a slave role will be logging its data into the relevant data-logger. As a result both databases will comprise the same data. However both databases will differ in respect to each other in case one out of both servers was stopped at the time span you're interested in.



Once you've selected the proper database source MsExcel will prompt you to log on the database. By default the login ID is 'sa'. No password required.

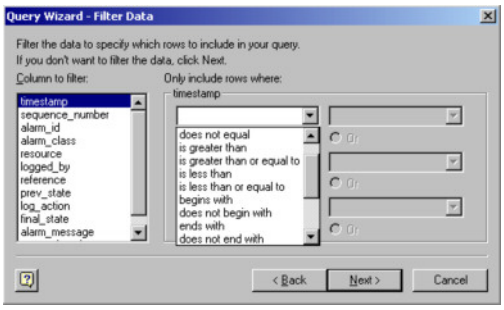


4. Once the log-on is successful a list of tables available from the database source will be listed like shown below.



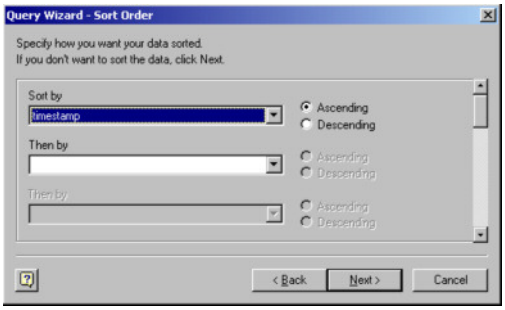
You may add tables (or part of these tables) available from the left pane to your query (right pane). First highlight the relevant table name (or columns) in the left pane and then click at the '>' button. Likewise, you may decide to remove columns from the right pane by clicking at the '<' button.
Click the 'Next >' button if all required columns have been added to your query.

5. Subsequently you can define filter algorithms on the columns included in your query.

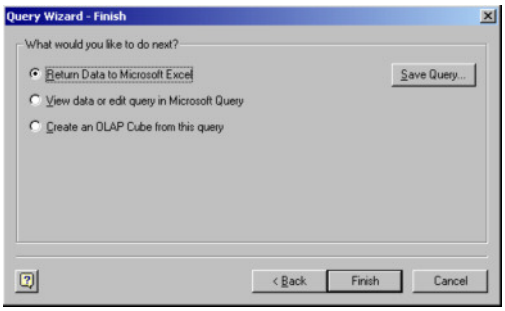


If you're interested in certain sensor values search for the <*ELEMENT_ID*>VAL_VAL0 column in the left pane where <*ELEMENT_ID*> is the sensor's element id listed in the CIP. Besides this you may use the filter feature to filter on a certain time span provided that this span is within the data-logger storage time. Click 'Next' after the required filter settings have been made.

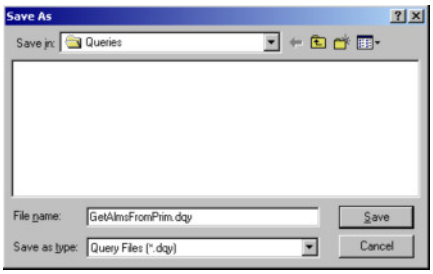
6. How should the records be ordered in the workbook? Select the column(s) to sort on, click 'Ascending' / 'Descending' and then click 'Next'



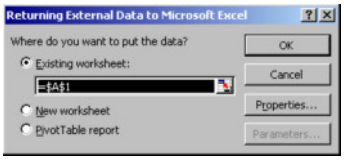
7. Assuming you would like to have the query result in a MsExcel format (the default option) you may save your query now.



Click 'Save Query …'



8. From the 'Query Wizard –Finish' dialog, click the 'Finish' button. You will be prompted where to insert the data from the query.



9. Make your choice and click 'OK'. The data from the query will appear in your workbook.

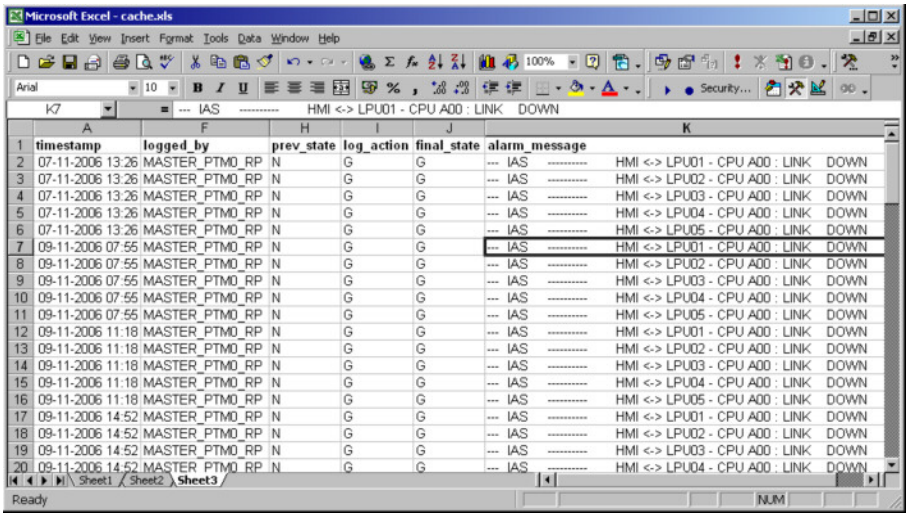
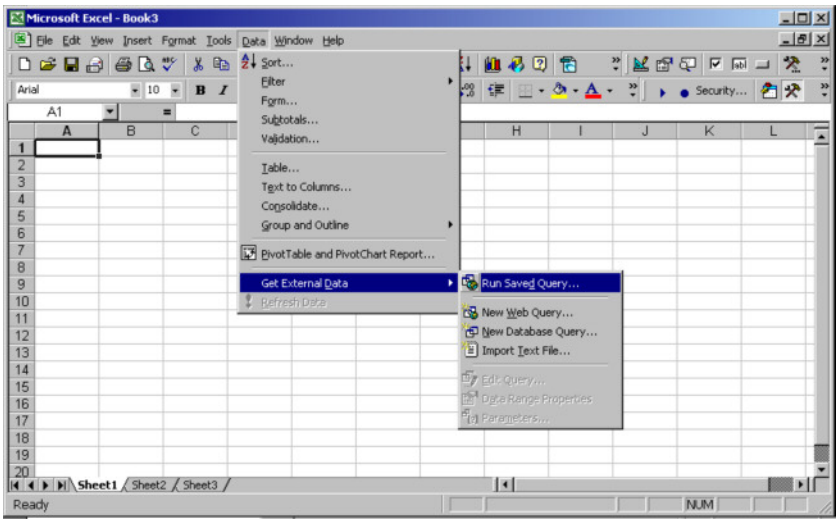


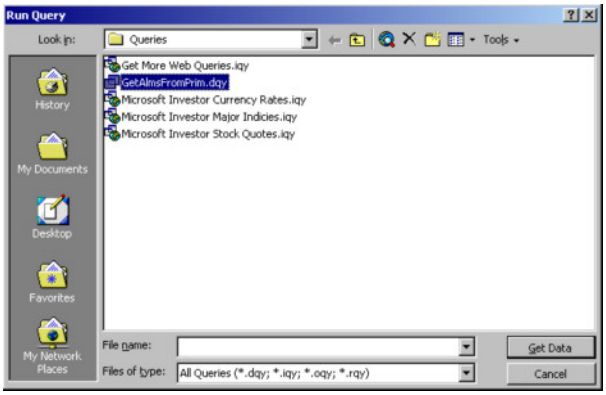
Figure 4-2 Example of data-logger export to MsExcel.

4.3.3 Run a data query

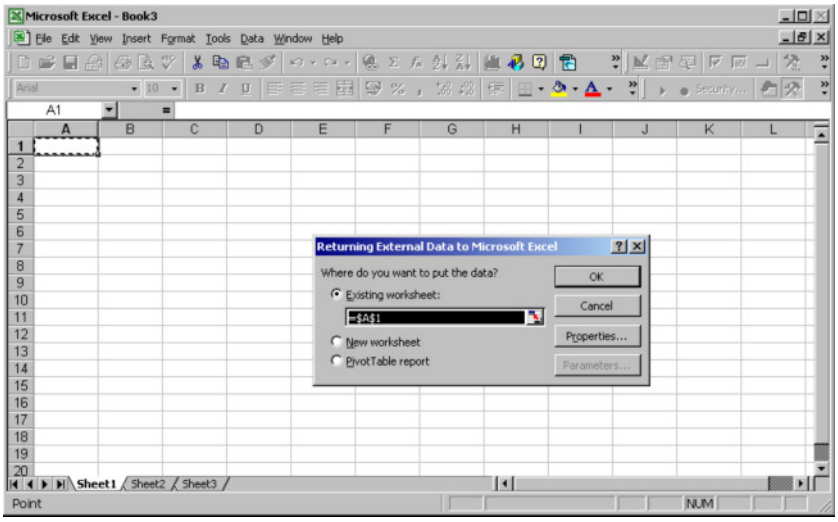
1. You can use a saved data query again after you've made the proper preparations (see section 4.3.1). Open a new MsExcel workbook. From the Data pull down menu select 'Get External Data' / 'Run Saved Query…'



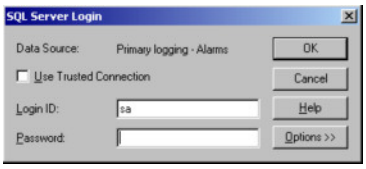
Select your query from the dialog that appears on the screen and click the 'Get Data' button.



2. Again, you will be prompted where to put the data from the query.



3. Log on the database by using login ID: ‘sa’ . The ‘Password’ field should be left blank.



4. Once the database connection has been established then the relevant data will be shown in your workbook.

Note: If your query includes filter settings that involve the ‘Timestamp’ field than you may have to alter these filter settings to get the data from the required time span.

5. Restoring a PC to original settings

5.1 General

In case a PC's harddisk is in such a state that a PC is not able to start/work properly then probably it is necessary to restore all software. This can be done by using a software restore tool, named 'GHOST', make Norton Symantec.

GHOST enables to make an exact copy (= disk image) of the PC harddisk (or a drive's partition). When a hard disk restore is required you will need GHOST and the hard disk's image. In case the PC's hard disk needs to be replaced you can use GHOST and the hard disk's image to restore all data on the new hard drive, provided that the drive capacity matches. (At least, the drive's capacity should be equal or greater than the former one)

Note: Disk images are used as a backup and contain unique data for every PC. Be sure they are up to date. Moreover, keep the restore media in a safe place. However it may be convenient that it is easily accessible when needed.

Note: GHOST will NOT restore BIOS settings on your PC. On the other hand, normally there is no need to change the PC BIOS settings.

Note: The GHOST image is suitable for restoring a PC harddisk but only if the PC hardware (Motherboard, adapter cards etc.) matches the original configuration when the disk image was made. A hard disk restore procedure being executed on deviating PC hardware will fail most likely.

5.2 Restore process

GHOST is a DOS executable program that can be loaded from a bootable floppy disk or a bootable Compact Disc. Due to the disk image file size your PC disk image will be stored on one of more CD-ROM's or DVD's , on a reserved restore partition on the local hard disk or on a remote hard disk.

Starting GHOST:

1. Open the CD-ROM/DVD tray of the PC that you have to restore. Insert the first CD-ROM/DVD and then reboot.
2. Once the PC has finished self-test procedures successfully it will start its boot process from the CD-ROM/DVD. It is assumed that the device boot order supports a start-up from CD/DVD. Otherwise you may have to force the boor order on start-up.

The GHOST program will be executed automatically. After a while, The GHOST splash screen appears. Click OK and select the path as shown in Figure 5-1 from the GHOST options menu.

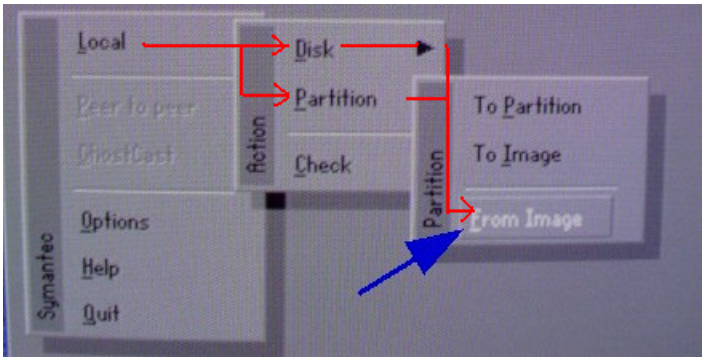


Figure 5-1 Begin image restore

Once you've selected the 'Local\Partition\From Image' path a browse dialog will appear. Browse for the image file (*.GHO) to restore. Select the image **source** file that is assumed to be available on your local hard disk or on your CD-ROM/DVD-ROM. GHOST will show you a list of drive partitions currently available within the image source file. Ghost will prompt you to select a source partition from the list.

Subsequently you will have to assign a **destination** partition currently available on your hard disk.
Please pay attention to this as the primary partition on your disk needs to be restored with the primary partition source file. Likewise, each logical partition needs to be restored with its applicable backup image obtained from the image source file. Check the disk label as shown in the 'Select source partition' and 'Select destination partition' to be sure that partitions are restored with the correct data.

Also check the partition 'SIZE' parameter especially when your destination drive is a new un-partitioned hard drive as GHOST may allocate more space on your destination drive than it really needs to restore the partition. Click on the size value to alter its value. It is preferable that you reserve an extra 4 Gbytes on your destination drive to store an additional disk image file in the future.

At last, click the 'OK' button to start the restore process.

Note: Mind that your Ghost image may comprise a primary NTFS partition ('C') and a logical NTFS partition ('D') only. Although these are the only partitions strictly needed to recover your PC, each drive has an extra 'Z' partition reserved for restore purposes. Note that you will lose this Z-partition once you restore the image as a whole or when it is used to restore a new un-partitioned hard disk.

If the hard drive was replaced then probably you've to change the size-parameter in GHOST's destination dialog especially when the disk image incorporates the 'C'- and 'D'- partitions only and when the new hard drive's capacity exceeds the capacity of the old hard drive. Once you've aligned the destination space with the amount of space being notified in the source dialog then as a result there will be a unused part on you're hard disk left after the restore has been done. You can check this by using Windows Disk Management. Format the unused space with a FAT16-, FAT32- or NTFS format type. Assign drive-letter 'Z' to this partition afterwards.

Normally the restore process of both a primary – and a logical partition will take about 15 minutes to complete.

After the image has been restored, quit the GHOST program. Remove GHOST media from the drives and then reboot the PC. The PC will start with its original settings and should be ready for use now.

Important:	After the GHOST image has been restored Windows might notify you that it has detected new hardware and that it a restart is required.

Important:	Check Windows drive letter assignments after Windows startup has been achieved. Especially drive letters being assigned to logical partitions may have been changed by Windows. ‘D’ should be your first logical drive. ‘E’ will be your CD/DVD ROM drive. ‘F’ is reserved for IPMS server drive mapping (for servers only). ‘Z’ is reserved for a restore partition. You may have to login with the administrator account to alter drive letter assignments. Press and hold the ‘SHIFT’ key while Windows starts to interrupt the auto logon procedure. A login dialog wills pop-up that enables the maintainer to logon with administrator privileges. Then right click ‘My Computer’ and select ‘Manage’ from the popup menu. Use ‘Disk Management’ from the left pane of the dialog to achieve a correct drive letter assignment for all partitions being involved.

Important:	When either one of both IPMS servers is involved with the disk restore then be sure to run the ‘Configuration update’ (as described by section 2.2.2.2) to synchronize both servers again.

6. Ethernet switch configuration topics

6.1 General

Though CSN Ethernet switches are not strictly part of the IPMS, the switch configuration procedure is described by this document for now.

Ethernet switches HP Procurve 2524 need special settings before they can be used as a Client Server Network node. The easiest way to achieve proper settings is to download a unique configuration file into the switch by using your maintenance PC and a serial link cable. (A suitable cable is provided). You will need to configure an Ethernet switch whenever you replace it.

6.2 Initialization procedure

It is assumed that both your maintenance PC and the applicable HP Procurve switch are switched on.
Connect the serial link cable in-between the maintenance PC COM-port and the sub-D connector on the left front corner of the switch.

Open the HyperTerminal program via the Windows start menu.

Path:

Start→Programs→Accesoires→Communications→HyperTerminal

Or open a suitable HyperTerminal application already stored on the maintenance PC.

Once you start a new HyperTerminal session you will meet the following user dialogs:

Figure 6-1 Hyperterminal Splash screen

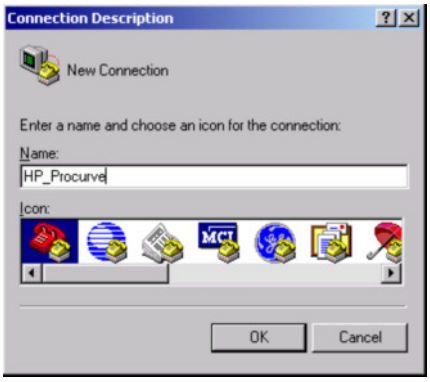


Figure 6-2 Make a new connection

Figure 6-3 Select COM port

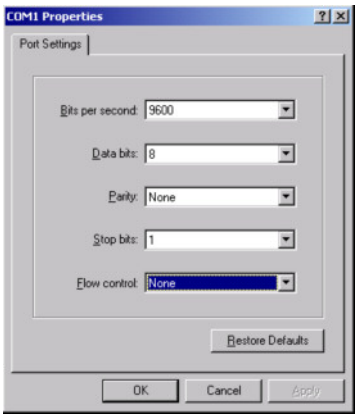


Figure 6-4 Initialize your COM-port

Wake up the serial link by pressing the <Enter> key on your maintenance PC twice. The HP Procurve switch should response now. Your HyperTerminal window should look like the screen shown by Figure 6-5

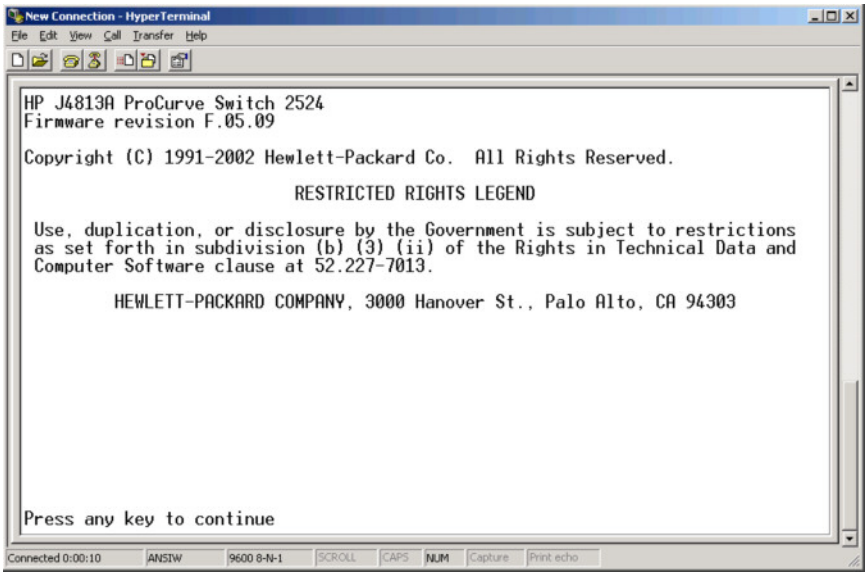


Figure 6-5 HP Procurve wake up screen

You will need to initialise the Xmodem protocol on both the Ethernet switch and the maintenance PC to establish a link that suits the configuration file transfer.

In your HyperTerminal screen:
Type:

copy xmodem startup-config pc <Enter>

Acknowledge the reboot and press <Enter> to start Xmodem on the Ethernet switch. (See also next dialog)

```
DCSF# copy xmodem startup-config pc
Device may be rebooted, do you want to continue [y/n]?  y
Press 'Enter' and start XMODEM on your host...
```

Now start the Xmodem protocol on your maintenance PC also by selecting ‘Send File…’ from the ‘Transfer’ pull down menu. (See Figure 6-6). Browse for the applicable HP Procurve configuration file and then select the ‘Xmodem’ protocol from the ‘pull down’ list.

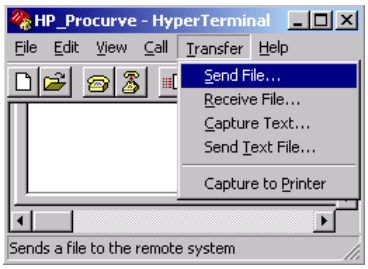


Figure 6-6 HyperTerminal Start Send File …

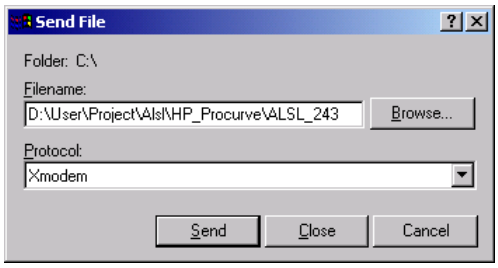


Figure 6-7 Transfer HP Procurve configuration

The configuration file will be transferred. Several messages will appear on the HyperTerminal screen. Once transfer has been succeeded the Ethernet switch will restart automatically. The HyperTerminal screen should look like shown by Figure 6-8.

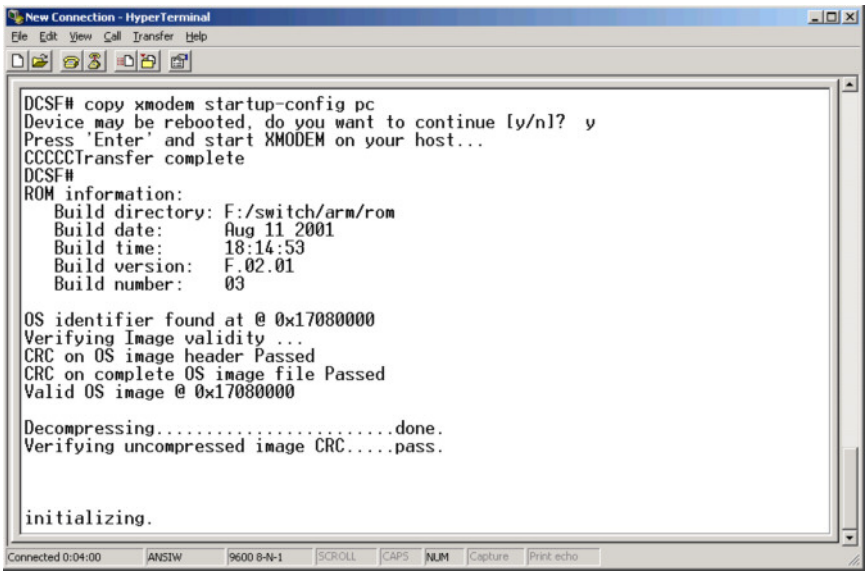


Figure 6-8 HP Procurve configuration file transfer completed

7. IPMS Maintenance issues

7.1 Maintenance schedule

Periodic maintainer's attention is needed to prevent system failures.

Item	What to do:
PLC Battery backup	• Replace each PLC module battery regardless their battery status indicator at least every year to prevent loss of PLC software whenever the PLC rack power is lost. This applies to all PLC processor modules. • Battery replacement part: 1756-BA1 or 1756-BA2 (dependent of your CPU module type), Allen Bradley. Just in time ordering is advised as aging process proceeds while at stock: Use a 'First in – First out' strategy for these parts ! • Worst case battery life for powerless modules ≈ 1 month @ Tamb=25 ºC
PC fan filters	• Replace PC fan filters regularly whenever needed. (Depends on environmental conditions) • Supplier. Jakob Hatteland Display,

Table 7-1 Periodic maintenance issues

7.2 IPMS troubleshooting list

This section will guide you to solve system failures. Table 7-2 may help you to find the cause and solve the problem.

Problem description:	Probable cause:	What to do:
When starting the server from the workbench the following message appears: "*The master and run-time project configuration are out of date. Would you like to perform a configuration update?"*	• A project change has been detected that was not forwarded to the runtime configuration yet	• Though you might not be aware of any change it is considered best to click 'Yes' when this message appears.
When starting the server from the workbench the following message appears: "*Unable to connect to remote computer"*	• The primary IPMS server is not able to connect to the secondary IPMS server	• From the Primary server explorer window, check availability of the secondary IPMS server by opening disk F:\. Restore the link and retry.
When starting the server from the workbench the following message appears: "*Remote Start is supported only for projects located on the remote nodes disk"*		
When performing a configuration update from the workbench the following message appears: "*failed copying data to slave computer"*		

Problem description:	Probable cause:	What to do:
A continuous beep can be heard around one of the HMI server PCs	One out of both power supplies has no primary power attached	• Check both the HMI server power chords • Check the power switch at the back site of each power supply unit.
	There is a problem with the power supply fan.	• Shutdown the server and check the fans.
All objects on **all** HMI screens **including the Alarm Group Bar** are pink	• IPMS Server broke down while project was NOT in redundant mode.	• Check server 'online' status either calling the relevant mimic or by the HMI workbench.
All objects on **all** HMI screens are pink **except for the Alarm Group Bar**	• OPC Server breakdown	• Check OPC server status (See sections 2.3.2 and 2.3.3) • Switchover server role (Section 2.5) • If solved then restart failing server else check ControlNet status.
All objects (**Alarm Group Bar included**) on **some** (not all) IPMS screens are pink while other workstations behave normally	• IPMS client has lost communication with SCADA master server	• Check Ethernet network cabling and switches; • Restart workstation
Same objects on **all** IPMS screens turn pink while other object animations (sensors, motors etc.) are normal	• When clicking at such a pink object the CIP shows: STATUS: DISABLED	• Check object status on the platform and enable the object via ASSIST if possible
	• When clicking at such a pink object the CIP shows: STATUS: INVALID	• If object is monitored via a serial interface, a Comm.. Failure with this link may be the problem. Check availability of serial link.
	• When clicking at such a pink object the CIP shows: STATUS: UNAVAILABLE	• It seems that the link with the relevant PLC CPU is lost. Switchover server roles and check if the other IPMS server is able to obtain the applicable data. • If solved: restart slave server, wait for the system to stabilize, restore server role and see if connections are re-established. • If not: Check PLC CPU 'RUN' status and/or applicable ControlNet cabling. • If problem persists, Reset the applicable LPU cabinet by toggling PLC processor rack power. • If problem still persists, reload the PLC software as described in section 3.3.
The alarm list summarizes alarm messages in pink.	• Alarm statuses derived from the relevant PLC suddenly became unavailable.	• Check relevant PLC status. • Check ControlNet status.

Problem description:	Probable cause:	What to do:
The alarm list is cleared for just a short time (5-10 s).	• Server switchover occurrence. • Recovery from Dual Master mode	• Check Cimplicity system log to get a clue about what caused the server switchover. • Check for Ethernet disturbances.
Although some active alarms where in an acknowledged state they suddenly appear to be unacknowledged again.	• SCADA Server temporarily lost communication with PLC CPU's, and performs a synchronisation.	• This may occur at project start when alarms that are appearing on the alarm screen are acknowledged to soon. • If a project start doesn't apply see if any actions took place what could have initiated a communication error.
Analogue sensor object shows '----' or '++++' signs.	• Sensor defect • Wire break	• Call assist page of relevant element to obtain sensor input board info. • Check wiring of relevant input.
Analogue sensor object shows '****' while status field is pink.	• Sensor element is disabled. • Sensor value is unavailable.	• Check CIP status field. If status is 'DISABLED' find out why. Enable the element if possible. • Check CIP status field. If status is 'INVALID' the element value is probably derived from a serial link. Check link status.
ControlNet switchover to redundant link. A (OR B) LED at front of CNB(R) module flashes (red/off)	• Poor ControlNet network quality	• Check network cabling and availability of all attached racks using the ControlNet Checker 1788-CNCHKR, Make: Allen Bradley. See ref. [C]
A (OR B) LED at front of CNB(R) module is steady red	• 1756-CNB(R) module faulted	• Reset unit • Replace unit if problem persists
A (OR B) LED at front of CNB(R) module alternating red/green	• 1756-CNB(R) is in self-test mode.	• No failure. Wait till self-test has ended.
A (OR B) LED at front of CNB(R) module flashing green/off	• Temporary error. Unit will self correct.	• Wait for recovery.
OK LED at front of CNB(R) module is steady red. Display shows: 'DUPL NODE'	• A duplicate node address has been detected.	• Validate module node address.
OK LED at front of CNB(R) module is steady red. Display shows: 'RACK ERR'	• Rack has faulted.	• Replace rack
OK LED at front of CNB(R) module is steady red.. Display shows a message other than 'DUPL NODE' or 'RACK ERR'	• 1756-CNB(R) fault.	• Replace module
I/O LED at front of PLC processor module flashes green	• At least one IO module within the processor configuration is not responding.	• Check availability of all IO modules being involved with the Controller software.
I/O LED at front of PLC processor module flashes red OK LED at front of PLC processor module steady red	• Processor module (minor) fault.	• Reset processor module. • If problem persists, replace module.

Problem description:	Probable cause:	What to do:
OK LED at front of PLC processor module flashes red	• The IPMS software loaded into the processor module doesn't match its physical location.	• Check if you've downloaded the correct IPMS software into the applicable controller.
OK LED at front of an IO-module flashes green or yellow	• The IO-module is IDLE. There is no controller accessing this IO-module.	• Check controller availability involved with processing this IO-module • This might be caused by a ControlNet network error since the processor is not able to access the IO-module.
Availability alarm of PLC rack	• Connection with the relevant IO-rack has been lost.	• Check if rack power is applied. • Check CNB(R) module status in the relevant rack.
A LED indicator marked 'BAT' at the front of one of the PLC processor modules is lit.	• Battery quality is poor. Program loss may occur if rack power is switched off.	• Replace the battery while power is applied to the module! • If PLC program has been lost download the PLC software again as described in section 3.3 • To prevent this problem, replace the battery at least every year.

Table 7-2 IPMS Troubleshooting List

Appendix A LPU arrangement plan

LPU01 arrangement plan

- Each LPU cabinet comprises a 13-slot PLC-rack.
- Each PLC-rack has a standardized hardware arrangement. I.e. the wiring for common IO type modules is available at the LPU termination blocks whether the board is actually installed into the PLC rack or not.
- The ControlNet node address for this PLC is: #01

Power supply 24V
DC input.
Type: 1756-PB72

Processor :
Type: 1756-L61

ControlNet Bridge :
Type: 1756-CNBR

Digital Input (2 x 16)
Type: 1756-IB32

Digital Input (2 x 16)
Type: 1756-IB32

Spare Slot reserved for
Digital Input (2 x 16)
Type: 1756-IB32

Analogue Input (2 x 8)
Type: 1756-IF16

Analogue Input (2 x 8)
Type: 1756-IF16

Digital output (2 x 16)
Type: 1756-OB32

Analogue Current Loop
Output (6 x 1)
Type: 1756-OF6CI

Spare Slot reserved for
Special IO

ModBus interface
Type: 1756-MCM

LPU02 arrangement plan

- Each LPU cabinet comprises a 13-slot PLC-rack.
- Each PLC-rack has a standardized hardware arrangement. I.e. the wiring for common IO type modules is available at the LPU termination blocks whether the board is actually installed into the PLC rack or not.
- The ControlNet node address for this PLC is: #02

Power supply 24V
DC input.
Type: 1756-PB72

Processor :
Type: 1756-L61

ControlNet Bridge :
Type: 1756-CNBR

Digital Input (2 x 16)
Type: 1756-IB32

Digital Input (2 x 16)
Type: 1756-IB32

Spare Slot reserved for
Digital Input (2 x 16)
Type: 1756-IB32

Analogue Input (2 x 8)
Type: 1756-IF16

Analogue Input (2 x 8)
Type: 1756-IF16

Digital output (2 x 16)
Type: 1756-OB32

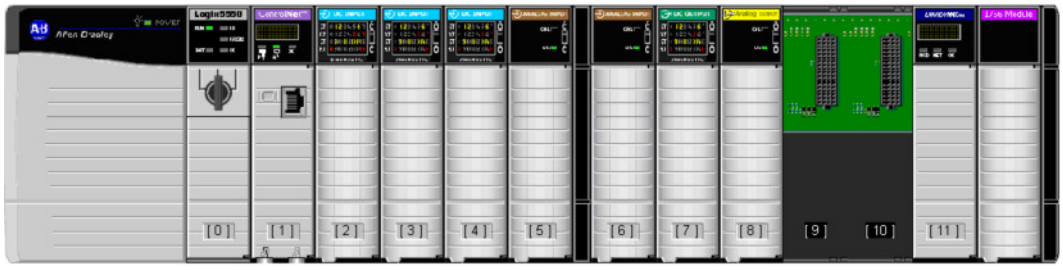
Analogue Current Loop
Output (6 x 1)
Type: 1756-OF6CI

Spare Slot reserved for
Special IO

ModBus interface
Type: 1756-MCM

LPU03 arrangement plan

- Each LPU cabinet comprises a 13-slot PLC-rack.
- Each PLC-rack has a standardized hardware arrangement. I.e. the wiring for common IO type modules is available at the LPU termination blocks whether the board is actually installed into the PLC rack or not.
- The ControlNet node address for this PLC is: #03



Power supply 24V
DC input.
Type: 1756-PB72

Processor :
Type: 1756-L61

ControlNet Bridge :
Type: 1756-CNBR

Digital Input (2 x 16)
Type: 1756-IB32

Digital Input (2 x 16)
Type: 1756-IB32

Digital Input (2 x 16)
Type: 1756-IB32

Analogue Input (2 x 8)
Type: 1756-IF16

Analogue Input (2 x 8)
Type: 1756-IF16

Digital output (2 x 16)
Type: 1756-OB32

Analogue Current Loop
Output (6 x 1)
Type: 1756-OF6CI

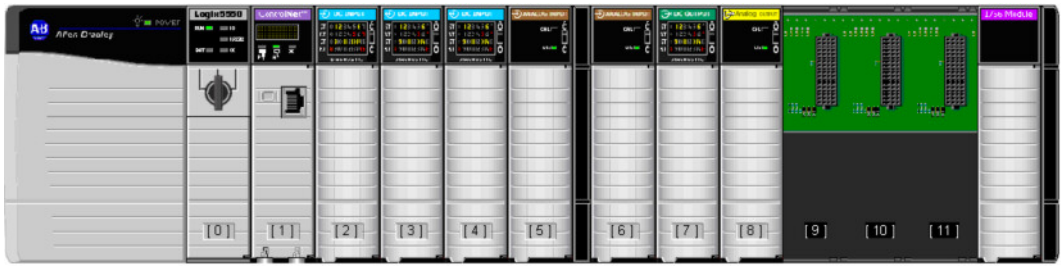
Spare Slot reserved for
Special IO

DeviceNet Bridge:
Type: 1756-DNB

ModBus interface
Type: 1756-MCM

LPU04 arrangement plan

- Each LPU cabinet comprises a 13-slot PLC-rack.
- Each PLC-rack has a standardized hardware arrangement. I.e. the wiring for common IO type modules is available at the LPU termination blocks whether the board is actually installed into the PLC rack or not.
- The ControlNet node address for this PLC is: #04



Power supply 24V
DC input.
Type: 1756-PB72

Processor :
Type: 1756-L61

ControlNet Bridge :
Type: 1756-CNBR

Digital Input (2 x 16)
Type: 1756-IB32

Digital Input (2 x 16)
Type: 1756-IB32

Digital Input (2 x 16)
Type: 1756-IB32

Analogue Input (2 x 8)
Type: 1756-IF16

Analogue Input (2 x 8)
Type: 1756-IF16

Digital output (2 x 16)
Type: 1756-OB32

Analogue Current Loop
Output (6 x 1)
Type: 1756-OF6CI

Spare Slot reserved for
Special IO

ModBus interface
Type: 1756-MCM

LPU05 arrangement plan

- Each LPU cabinet comprises a 13-slot PLC-rack.
- Each PLC-rack has a standardized hardware arrangement. I.e. the wiring for common IO type modules is available at the LPU termination blocks whether the board is actually installed into the PLC rack or not.
- The ControlNet node address for this PLC is: #05

Power supply 24V
DC input.
Type: 1756-PB72

Processor :
Type: 1756-L61

ControlNet Bridge :
Type: 1756-CNBR

Digital Input (2 x 16)
Type: 1756-IB32

Digital Input (2 x 16)
Type: 1756-IB32

Spare Slot reserved for
Digital Input (2 x 16)
Type: 1756-IB32

Analogue Input (2 x 8)
Type: 1756-IF16

Spare Slot reserved for
Analogue Input (2 x 8)
Type: 1756-IF16

Digital output (2 x 16)
Type: 1756-OB32

Analogue Current Loop
Output (6 x 1)
Type: 1756-OF6CI

Spare Slot reserved for
Special IO

DeviceNet Bridge
Type: 1756-DNB

Ethernet Bridge (100Mbit)
Type: 1756-ENBT

ModBus interface
Type: 1756-MCM