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This document relates to the MNS iS System Release 7.0.

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General

Target Group

This document describes communication and control interfaces used in MNS iS. The manual is primarily intended for those requiring information on accessing information and data provided from MNS iS. Furthermore the document provides information for integration of MNS iS as fieldbus component into PLC or higher level Process Control Systems to control system and application engineers.

It is assumed that the reader of this manual is familiar with basic terms of fieldbus and control communication (e.g. basic knowledge about PROFIBUS, Modbus etc.).

Use of Warning, Caution, Information and Tip icon

This publication includes Warning, Caution, and Information icons where appropriate to point out safety related or other important information. It also includes Tip icons to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:

⚠️ The electrical warning icon indicates the presence of a hazard that could result in electrical shock.

⚠️ The warning icon indicates the presence of a hazard that could result in personal injury.

⚠️ The caution icon indicates important information or warnings related to the concept discussed in the text. It might indicate the presence of a hazard that could result in corruption of software or damage to equipment/property.

ℹ️ The information icon alerts the reader to pertinent facts and conditions.

💡 The tip icon indicates advice on, for example, how to design your project or how to use a certain function.

Although Warning notices are related to personal injury, and Caution notices are associated with equipment or property damage, it should be understood that the operation of damaged equipment could, under certain operational conditions, result in impaired process performance leading to personal injury or death. It is, therefore, imperative that you comply fully with all Warning and Caution notices.
### Terminology

List of the terms, acronyms, abbreviations and definitions that the document uses.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspect Object</td>
<td>ABB technology. An Aspect Object is a computer representation of a real object such as a pump, a valve, an order or a virtual object such as a service or an object type. An Aspect Object is described by its aspects and is organized in structures.</td>
<td></td>
</tr>
<tr>
<td>Alarm</td>
<td>Alarm is defined as status transition from any state to abnormal state. Status transition to abnormal state can be data crossing over the pre-defined alarm limit.</td>
<td></td>
</tr>
<tr>
<td>Bus Local</td>
<td>A Control Access term describing that the MControl accepts its commands from a device on the switchgear control network, e.g. the Web Interface, MView.</td>
<td></td>
</tr>
<tr>
<td>COTS</td>
<td>Commercial off the shelf product, term to describe products available on the market, ready to use</td>
<td></td>
</tr>
<tr>
<td>DCS</td>
<td>Distributed Control System See also PCS</td>
<td></td>
</tr>
<tr>
<td>DTM</td>
<td>Software module used to manage devices via Fieldbus (e.g. PROFIBUS) using frame application environment (e.g. PactWare, ABB Fieldbus Builder etc.)</td>
<td></td>
</tr>
<tr>
<td>Eth.</td>
<td>Ethernet is a local area network (LAN) technology. The Ethernet standard specifies the physical medium, access control rules and the message frames.</td>
<td></td>
</tr>
<tr>
<td>Event</td>
<td>An event is a status transition from one state to another. It can be defined as alarm, if the state is defined as abnormal or as warning as a pre-alarm state.</td>
<td></td>
</tr>
<tr>
<td>FD</td>
<td>Term for devices connected to the Fieldbus (e.g. motor control units or circuit breaker protection)</td>
<td></td>
</tr>
<tr>
<td>GSD file</td>
<td>A hardware description file for a PROFIBUS-DP or PROFIBUS-DP/V1 slave type</td>
<td></td>
</tr>
<tr>
<td>GPS</td>
<td>System to detect local position, universal time and time zone, GPS technology provides accurate time to a system</td>
<td></td>
</tr>
<tr>
<td>Hardware Local</td>
<td>A Control Access term describing that the MControl accepts its commands from the Hardwired inputs, when the respective Local control input is set to true.</td>
<td></td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>HMI</td>
<td>Human Machine Interface</td>
<td>Generic expression</td>
</tr>
<tr>
<td>LVS</td>
<td>Low voltage switchgear</td>
<td>A factory built assembly built to conform with IEC 60439-1</td>
</tr>
<tr>
<td>MCC</td>
<td>Motor Control Centre</td>
<td>Common term for switchgear used for motor control and protection.</td>
</tr>
<tr>
<td>MNS</td>
<td>Modular Low Voltage Switchgear family from ABB</td>
<td></td>
</tr>
<tr>
<td>MNS iS</td>
<td>The integrated intelligent switchgear solution from ABB</td>
<td></td>
</tr>
<tr>
<td>MStart</td>
<td>MFeed</td>
<td>MNS iS components integrated in the switchgear, see the MNS iS System Guide for technical details</td>
</tr>
<tr>
<td></td>
<td>MControl</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MLink</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MView</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MNavigate</td>
<td></td>
</tr>
<tr>
<td>MODBUS</td>
<td>Fieldbus communication protocol</td>
<td></td>
</tr>
<tr>
<td>MODBUS RTU</td>
<td>Fieldbus communication protocol</td>
<td></td>
</tr>
<tr>
<td>Motor Starter</td>
<td>Consists of motor controller and electrical components to control and protect a motor, part of Motor Control Center</td>
<td></td>
</tr>
<tr>
<td>NLS</td>
<td>Native Language Support</td>
<td>Providing the ability to change the language of software tools in order to support native languages (English is basis, others are optional)</td>
</tr>
<tr>
<td>OPC</td>
<td>OLE for Process Control, an industrial standard for exchange of information between components and process control application</td>
<td></td>
</tr>
<tr>
<td>PCS</td>
<td>Process Control System</td>
<td>High level process control system</td>
</tr>
<tr>
<td>PLC</td>
<td>Programmable Local Controller</td>
<td>Low level control unit</td>
</tr>
<tr>
<td>PROFIBUS-DP</td>
<td>Fieldbus communication protocol with cyclic data transfer (V0).</td>
<td></td>
</tr>
<tr>
<td>PROFIBUS-DP/V1</td>
<td>Fieldbus communication protocol, extension of PROFIBUS-DP allowing acyclic data transfer and multi master (V1).</td>
<td></td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>PROFIBUS-DP/V2</td>
<td>Fieldbus communication protocol, extension of PROFIBUS-DP allowing time stamp and communication between master and slave (V2).</td>
<td></td>
</tr>
<tr>
<td>PROFINET</td>
<td>PROFINET is an open standard for Industrial Ethernet and standardized in IEC 61158 and IEC 61784.</td>
<td></td>
</tr>
<tr>
<td>PNIO</td>
<td>PROFINET IO</td>
<td>PROFINET for decentralized periphery and distributed automation</td>
</tr>
<tr>
<td>RCU</td>
<td>Remote Control Unit</td>
<td>Local control unit with pushbutton and indicator to operate a device (e.g. motor) from field level.</td>
</tr>
<tr>
<td>RS232</td>
<td>Standard No. 232 for PC communication, established by EIA (Electronics Industries Association, USA)</td>
<td></td>
</tr>
<tr>
<td>RS485</td>
<td>Communication interface standard from EIA (Electronics Industries Association, USA), operating on voltages between 0V and +5V. RS-485 is more noise resistant than RS-232C, handles data transmission over longer distances, and can drive more receivers.</td>
<td></td>
</tr>
<tr>
<td>RTC</td>
<td>Real Time Clock</td>
<td>Integrated clock function in devices used to generate time and date information if a remote clock system is not present</td>
</tr>
<tr>
<td>Software Local</td>
<td>A Control Access term describing that the MControl accepts its commands from the hardwired inputs as a result of either the DCS or MView passing the Control Access Authority to Soft-Local.</td>
<td></td>
</tr>
<tr>
<td>Note: Does not require the hardwired local input to be set to true.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNTP</td>
<td>Simple Network Time Protocol</td>
<td>a protocol used for time synchronization in Control Network through Ethernet</td>
</tr>
<tr>
<td>Switchgear Bus Network</td>
<td>Term used to describe the internal switchgear communication network, between MLink and MControl.</td>
<td></td>
</tr>
<tr>
<td>TCP/IP</td>
<td>Transmission Control Protocol / Internet Protocol</td>
<td>TCP/IP is a high-level connection oriented, reliable, full duplex communication protocol developed for integration of the heterogenous systems.</td>
</tr>
<tr>
<td>Trip</td>
<td>A consequence of an alarm activated or an external trip command from another device to stop the motor or trip the circuit breaker.</td>
<td></td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>UTC</td>
<td>Coordinated Universal Time</td>
<td>Coordinated Universal Time is the international time standard. It is the current term for what was commonly referred to as Greenwich Meridian Time (GMT). Zero (0) hours UTC is midnight in Greenwich England, which lies on the zero longitudinal meridian. Universal time is based on a 24 hour clock.</td>
</tr>
<tr>
<td></td>
<td>Warning</td>
<td>A warning is defined as status transition from any state to pre-alarm state to inform in advance before an alarm level is reached.</td>
</tr>
</tbody>
</table>
Related Documentation

MNS iS
1TGC910211 M0203 MNS iS Interface Manual MLink, Release 7.0
1TGC910111 M0201 MNS iS MLink Upgrade Kit Manual
1TGC910223 M0201 MNS iS Interface Manual Web Interface, Release 7.6
1TGC910232 M0201 MNS iS Interface Manual OPC Server, Release 7.7
1TGC910241 M0201 MNS iS Interface Manual Profibus, Release 7.0
1TGC910251 M0202 MNS iS Interface Manual Modbus, Release 7.0
1TGC910292 M0201 MNS iS Interface Manual PROFINET IO, Release 7.6
1TGC910283 M0201 MNS iS MControl Interface Manual Profibus Direct, Release 7.6
1TGC910272 M0201 MNS iS MConnect Interface Manual, Release 7.6
1TGC910001 B0204 MNS iS System Guide
1TGC910201 M0201 MNS iS Quick Guide Installation and System Setup, Release 7.0
1TGC910090 M0210 MNavigate Help file V7.7
1TGC910018 M0208 MNS iS ATEX – Enhancements for Safety

PROFIBUS
[1] Profibus Specification Slave Redundancy TC4-04-0001

Related System Version
The content of this document is related to MNS iS System Release 7.0.
The described functions are designed but may not be fully implemented in all details. Please refer to the current system guides and release notes regarding possible restrictions.

Document Revision History

<table>
<thead>
<tr>
<th>Rev.</th>
<th>Page</th>
<th>Chapter</th>
<th>Description of change</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>M0201</td>
<td></td>
<td></td>
<td>Initial document for Release V7.0</td>
<td>July 2012</td>
</tr>
<tr>
<td>M0202</td>
<td>11,13,15, 16,30</td>
<td>Slave Redundancy Requirements Redundancy Configuration LED – Status Information</td>
<td>Figure 1 modified Figure 2 modified Figure 3 modified Figure 4 modified Document ID changed</td>
<td>June 2015</td>
</tr>
</tbody>
</table>
Introduction

Redundancy

Redundancy in communication systems and Fieldbus technology allows data communication between a PLC or DCS master to slave devices on two independent communication links. This may be required if a higher availability of the communication link is required. The MLink device in MNS iS is a slave device on the Fieldbus to which the following types of redundancy are applicable:

Line Redundancy

In this case, the cable connection between a Fieldbus master and slave devices is doubled. Two independent cables are used and routed through the plant on different cable ways. This redundancy requires third party hardware. No additional components and configuration is required in MNS iS.

Slave Redundancy

In slave redundancy, two slave devices are used on separate cable connections to the Fieldbus master. MNS iS allows redundancy incorporated in a Fieldbus system as Slave Redundancy by using two MLink modules.

Fig. 1 MNS iS Redundancy

Redundant OPC Servers are not supported.
MNS iS Hardware Requirements
The redundancy is available for MLink Types:

<table>
<thead>
<tr>
<th>Hardware ID numbers</th>
<th>1TGE102019Rxxyy</th>
<th>1TGE120021R0x10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware available for</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MNS iS versions</td>
<td>up to V6.0</td>
<td>from V6.1 onwards</td>
</tr>
<tr>
<td>MLink Types</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Accessories for           | ---             | Switchgear bus connector |
| Redundancy                |                 | Redundancy 1TGE120016R0103 |

- Redundant link cables
  - 2 m -> 1TGE120109R0002
  - 3 m -> 1TGE120109R0003
  - 5 m -> 1TGE120109R0005
  - 10 m -> 1TGE120109R0010

- Ferrite Core for redundant link cables
  1TGB000197P0001

MNS iS Interface Manual
MLink
1TGC 91012x M020x
1TGC 910210 M020x

MNS iS Software Requirements
Redundancy requires MNS iS Release 2.0 or higher.
Basics

Redundancy Requirements

The primary MLink polls the MControls via Switchgear Bus and is responsible for writing the switching commands, as well as reading the information fed back from the MControls via the MLink. The Backup MLink reads the information only, and is inhibited from writing switching commands.

A redundant system does not tolerate single failure. Following theoretical failure situations are covered by a redundant MNS iS system.

On an active communication link:

1. Failure in a PLC Fieldbus master or failure in a Fieldbus cable connection between one master and slave
2. Failure in a MLink or failure at the switchgear bus connection to a single MLink.

Fig. 2 Theoretical failure situations in a redundant MNS iS system

If a failure is detected, from one of the 2 cases detailed above an integrated system mechanism in MNS iS ensures a bumpless changeover from the ‘Primary’ MLink to the ‘Backup’ MLink. All process data, alarms and events and the system status information is then available from the ‘Backup’ MLink.
Figures 2 show representations only of both the Switchgear Bus and Fieldbus connections to MLink. For more details on the Switchgear Bus please refer to the section later in this manual. For more details about MLink Fieldbus interfaces ref. to the respective Interface Manuals.

Fault detection and change over

If the Fieldbus communication between Primary MLink and Process Controller fails and Fieldbus connection between the Backup MLink and Process Controller is healthy, then the Primary MLink and the Backup MLink execute a ‘bumpless’ changeover.

The primary MLink polls the MControls via Switchgear Bus and is responsible for writing the switching commands, as well as reading the information fed back from the MControls via the MLink. The Backup MLink continuously reads the information only, and is inhibited from writing switching commands.

If we take Fig. 2 as an example, and the communication is lost between the ‘Master A’ controller and the ‘MLink Primary’, (case 1), and the communication between the ‘Master B’ controller and the ‘MLink Backup’ is healthy. Then the system will initialize the changeover, resulting in Process Controller ‘Master B’ now having read / write access.

What was the ‘MLink Backup’ now becomes the active MLink, responsible for sending Control commands towards the connected MControls.

Fault indication that there is a redundancy problem, is then given by the serial link, to the ‘Master B’ controller, it is also displayed via the Web Interface, and LED indication is given by the Backup MLink.

The same handling also applies for case 2 previously detailed.

The Fieldbus data values sent from the Backup MLink are frozen at the time of the changeover. This is to ensure that the Fieldbus communication is available at any time for another changeover.

When the communication is then restored between ‘Master A’ and the Primary MLink, the redundancy fault indication will be cleared. The system is then again running in the redundant mode, with the ‘Master B’ Process Controller having read / write access, and ‘Master A’ having read access only. There is no automatic switch back to previous communication channels.

It is possible to initiate a changeover of the Master Controllers, providing all communication links are healthy. For more details please refer to the respective Fieldbus Interface Manuals.
Redundancy Configuration

There are three options available to connect DCS or PLC to both MLink:

- One DCS / PLC connected to both MLink, as described in [1]
- One DCS / PLC with at least redundant (two) master interfaces
- Redundant (two) DCS / PLC (redundancy handled in DCS or PLC only)

Fig. 3 One DCS / PLC is connected to both MLinks

This redundancy is described in [1]. The DCS / PLC master device is capable to communicate to two redundant slave devices with different Fieldbus addresses.

Fig. 4 Two DCS - each is connected to one MLink
Primary and Backup MLink

Redundancy is provided by using two MLinks connected as shown below in figure 6. These are configured as Primary and Backup in the MNavigate parameterisation software (refer to the section ‘Redundancy Setup’ for more information). The Primary and Backup MLinks are connected together within the switchgear by a data synchronisation link, and also by the Switchgear Bus.

The primary MLink polls the MControls via Switchgear Bus and is responsible for writing the switching commands, as well as reading the information fed back from the MControls via the MLink. The Backup MLink reads the information only, and is inhibited from writing switching commands.

The MLinks synchronize information about:
- Status of PLC or DCS connection
- MLink
- Configuration settings for redundancy in MLink.

Fig. 5 MLink Primary and Backup data and information flow
**Interfaces**

**MLink connectors**

Refer to the MLink Interface Manuals for details.

<table>
<thead>
<tr>
<th>Hardware ID numbers</th>
<th>1TGE102019Rxxxx</th>
<th>1TGE120021R0x10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware available for MNS iS versions</td>
<td>up to V6.0</td>
<td>from V6.1 onwards</td>
</tr>
</tbody>
</table>

**MLink Types**

Both MLink must be connected together to enable data synchronization and device supervision via a RS232 Null Modem cable from serial port 1 to serial port 1 to ensure correct operation. ABB part numbers for these cables and the associated ferrite core are given in the section ‘MNS iS Hardware Requirements’.

**Fig. 6 Serial 1 to serial 1 Redundant link connections with ferrite core**

The length of this cable should not exceed 10 meters
Switchgear Bus connection

In a dual redundant configuration both MLink are connected to the Switchgear Bus for communication to MControl devices. The maximum numbers of MControl connected to both MLink is 60, the maximum allowable number of panels is 7, and the maximum switchgear bus cable length is 30m, not including backplanes.

The Switchgear Bus must be terminated at both ends of the line with the active bus termination. This differs from non-redundant systems where only one bus termination is required.

MLink with Modbus RTU in redundant configuration does not reply to Modbus requests (except FC08) if switchgear bus is not connected properly. Thus the DCS can easily detect a communication problem and use the redundant communication line.
Approved redundant topologies

Fig. 7 Redundant MLink topology - Example 1

Note: Redundant Bus topology requires two Bus termination resistors, one at each end of the bus.
Fig. 8 Redundant MLink topology - Example 2

Note: Redundant Bus topology requires two Bus termination resistors, one at each end of the bus.

The two MLink can be installed at any point on the Switchgear Bus network between the control condaptors fitted with the Switchgear Bus termination.

Note: The Switchgear Bus connectors for redundant and non-redundant configurations are different. That needs to be considered during installation as a wrong connector type might lead to an instable communication!
Ethernet network connections

The Ethernet network used in MNS iS (Switchgear Control Network) connects all MLink to MView and MNavigate and the OPC Server. It is connected to LAN2 port on the MLink.

⚠️ In a redundant configuration the pair of Primary and Backup MLink must be connected to the same network (via managed switches) to ensure correct redundancy handling in the MView devices and to be able to download settings from MNavigate parametrization tool!

Fig. 9 Switchgear Control Network

Switchgear Control Network Restrictions

In order to achieve maximum performance from the interfaces on the Ethernet Switchgear Control Network it is not recommended to exceed the following connections to one pair of redundant MLink:

- 2 x Web Interfaces (MView)
- 2 x OPC Server
Redundancy Setup

MNS iS dual redundancy requires following hardware setup and configuration parameters.

**Hardware Setup**

1. Connect both MLink by redundant link cable (RS232 Null Modem cable).
2. Connect Switchgear Bus to both MLink, all Control Conadapter and terminate Switchgear Bus at both end of the line.
3. Connect MView and MNavigate via Ethernet using network switches.
4. Connect PLC or DCS as required in the project.

**Parameter Setup**

Configuration of parameters is handled via MNavigate. These parameters must then be downloaded to both Primary and Backup MLink to take effect. The majority of these parameters for the MLink are identical; address settings could differ depending on project requirements.

1. Set the Ethernet IP address of LAN1 (in case of Ethernet based fieldbus like ModbusTCP / Profinet is used) and LAN2 for Primary and Backup MLink.

![Fig. 10 IP address setting of Primary and Backup MLink](image)

It is essential that the IP address setting for LAN 2 of Primary and Backup MLink is different. The same subnet mask is used because both Ethernet ports are connected to the same Ethernet network for MView and MNavigate communication. Refer to Fig 13 for more information.
2. Set the slave address for the selected Fieldbus / Field network interface (required in case ModbusRTU or Profibus interface is used).

Fig. 11  Configure field bus address of Primary and Backup

![Image of configuration interface]

### Initial Values

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Default Parameter</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Address (LAN 2)</td>
<td>192.168.200.100</td>
<td>Primary – Switchgear Control Network</td>
</tr>
<tr>
<td>IP Address (LAN 2)</td>
<td>192.168.200.101</td>
<td>Backup – Switchgear Control Network</td>
</tr>
<tr>
<td>IP Address (LAN 1)</td>
<td>192.168.100.100</td>
<td>Primary – ModbusTCP / Profinet</td>
</tr>
<tr>
<td>IP Address (LAN 1)</td>
<td>192.168.100.100.100</td>
<td>Backup – ModbusTCP / Profinet</td>
</tr>
<tr>
<td>MODBUS RTU / TCP Slave address</td>
<td>247</td>
<td>Primary and Backup</td>
</tr>
<tr>
<td>PROFIBUS Slave address</td>
<td>126</td>
<td>Primary and Backup</td>
</tr>
</tbody>
</table>

⚠️ LAN 1 & LAN 2 Subnet settings must be different.
Network addresses for LAN2 must be set for both Primary and Backup MLink. Please Note these addresses must be different as shown in the example above.
Redundancy Functions

Handling of redundancy faults

Both MLink supervise at all times the redundancy conditions, detecting faults and problems according following table.

<table>
<thead>
<tr>
<th>Event</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLC or DCS connection interrupted for more than 1 second to Primary MLink</td>
<td>Redundancy change over if backup MLink has an active PLC or DCS connection</td>
</tr>
<tr>
<td>Power loss or internal error of Primary MLink</td>
<td>Redundancy change over, Redundancy error indicated</td>
</tr>
<tr>
<td>Power loss of backup MLink</td>
<td>No change over, Redundancy error indicated</td>
</tr>
<tr>
<td>Redundancy link cable broken</td>
<td>Redundancy error indicated</td>
</tr>
<tr>
<td>Problems in redundancy setup</td>
<td>No change over possible, Redundancy error indicated</td>
</tr>
<tr>
<td>Switchgear Bus at Primary MLink disconnected</td>
<td>Redundancy change over</td>
</tr>
</tbody>
</table>

A change over from Primary to Backup MLink will only be performed if there is no redundancy error.

Failsafe

The MControls can be configured to switch into a safe state (failsafe parameter) if both PLC / DCS connections are disturbed longer than the parameterized “PLC Timeout” in MLink fieldbus setting.

Further details about Failsafe can be found in the MNS iS Interface Manuals and in the MNavigate Help file.
PLC / DCS Data Communication

Both Primary and Backup MLink are communicating to the PLC or DCS. The Primary MLink sends and receives data (commands) from PLC / DCS while the Backup MLink sends only data to the PLC / DCS. The PLC / DCS must interpret the data registers to detect which is the Primary and which is the Backup MLink.

MODBUS RTU and TCP

Default data mapping uses following registers:
- Register Number: 12001 – If register is set MLink is Primary
- Register Number: 12002 – If register is set MLink has Redundancy Error

PROFIBUS DP and DP-V1

Default data image uses the following bytes/bits:
- Byte number 243, Bit 0: If bit is set MLink is Primary
- Byte number 243, Bit 1: If bit is set MLink has Redundancy Error

Further details can be found in respective MNS iS Interface Manuals.

If user data mapping is used instead of default mapping, it is a basic requirement that this data is configured in the user mapping for redundancy handling in PLC / DCS.

PLC / DCS Handling of Redundant Configurations

The PLC or DCS must interpret the MLink redundancy status registers to determine which MLink is the Primary MLink, and in the event of a changeover being initiated by the MLinks the PLC or DCS should react accordingly.

PLC / DCS Command for MLink change over

The PLC application can also force the Primary MLink in a redundant system to change over to act as Backup MLink.

MODBUS RTU and TCP

Default data mapping uses following registers:
- Register Number: 44001 - Changeover command from PLC / DCS
  - A value 0x0001 must be send to that register to force the PLC / DCS MODBUS master to change over to the slave in order to communicate with the 'new' Primary MLink.

PROFIBUS DP and DP-V1

Default data image uses following bytes/bits to change over:
- Byte 124, Bit 0 – Setting to 1 initiates a redundancy change over

If user data mapping is used, it is a basic requirement that this data is provided therein.
**MView / Web Interface**

In a dual redundant configuration the MView is connected via the same Ethernet network to both Primary and Backup MLink. (See Fig. 9 Switchgear Control Network).

If a change over takes place, the MView is automatically redirected to the Primary MLink without user interaction. Prior to the re-direction the background in MView changes to yellow, this indicates that current Web Interface is connected to the Backup MLink. One it has redirected to the Primary the background returns to its usual colour as below.

![Fig. 13 MView redirecting to new primary MLink after redundancy switchover](image)

![Warning: It is not recommended to use more than two MView or web interfaces per redundant pair of MLink, as this may affect the performance on the Switchgear control network.](image)

![Fig. 14 Redundancy Error shown in MView by a red square](image)

If the Backup MLink fails, a change over to the other MLink would not be possible in case of an redundancy failure and the MView shows a red square on the text window to indicate such a Redundancy Error.

For more details please refer to the MNS iS Web Interface Manual.
Troubleshooting

**MView or MNavigate cannot communicate with both MLink:**
- Check Ethernet cabling, IP address settings and network switch functionality.

**Redundancy Difference Report**
In case of a Redundancy Error (also indicated by red LED on MLink front) the "Redundancy Difference Report" function inside MNavigate can be used to check if there is any difference in configuration settings between the Primary and Backup MLink.

If there are any differences indicated in the report those have to be rectified before the Redundancy Error is cleared (if there are no other issues pending) and MLink redundancy is functioning again!

**MView Redundancy Status**
It is possible to further check the redundancy status in MView (refer to the MNS iS Web Interface Manual for details).

<table>
<thead>
<tr>
<th>Redundancy status displayed in MView</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Redundancy 6.1a</strong></td>
</tr>
</tbody>
</table>

This information needs to be send to ABB Service for help with troubleshooting.
**LED - Status Information**

The *MLink* redundancy is indicated by status LEDs at *MLink* front.

For more detailed information on LED status please refer to the MNS *iS* Interface Manual *MLink* or MNavigate Help file.

Trouble Shooting examples:

<table>
<thead>
<tr>
<th>Hardware ID numbers</th>
<th>1TGE102019Rxxxx</th>
<th>1TGE120021R0110</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MLink Types</strong></td>
<td><img src="image1" alt="Image" /></td>
<td><img src="image2" alt="Image" /></td>
</tr>
<tr>
<td><strong>LED indication</strong></td>
<td>LED7 and LED11</td>
<td>LED2 and LED7</td>
</tr>
<tr>
<td><strong>Recommended actions</strong></td>
<td>Check the redundancy report in MNavigate and the following. In case no issue is indicated or all indicated issues have been resolved and Redundancy Error persists check:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Both <em>MLinks</em> are powered on and running.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Null Modem cable connection - redundancy link between both <em>MLinks</em>.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Switchgear Bus connectors and cables are properly attached in to both <em>MLinks</em>.</td>
<td></td>
</tr>
</tbody>
</table>

After a re-boot of *MLink* it can take up to 5 minutes depending on numbers of connected *MControl* and size of user data mapping table until the *MLink* PLC / DCS communication is re-established and red LED is off.
<table>
<thead>
<tr>
<th><strong>Recommended actions</strong></th>
<th><strong>LED indication</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- LED8 is indicating which of the MLink is the current active Primary one.</td>
<td>- LED8 blinking</td>
</tr>
<tr>
<td>- The MLinks are continuously monitoring the MControl connection. If no MControl is connected to the MLink, a changeover between both MLink is executed every 2 seconds, because neither MLink receives responses from a single MControl. In this case check Switchgear Bus connections and termination.</td>
<td></td>
</tr>
<tr>
<td>- This indication also occurs if only one MControl is connected on the Switchgear Bus and this MControl is rebooting after an Application Download. The switchover is stopped after MControl reboot is finished.</td>
<td></td>
</tr>
<tr>
<td>- This indication also occurs if multiple MControl are connected on the Switchgear Bus and after an Application Group download all MControl are in reboot state. The switchover is stopped after first MControl has finished its reboot.</td>
<td></td>
</tr>
</tbody>
</table>