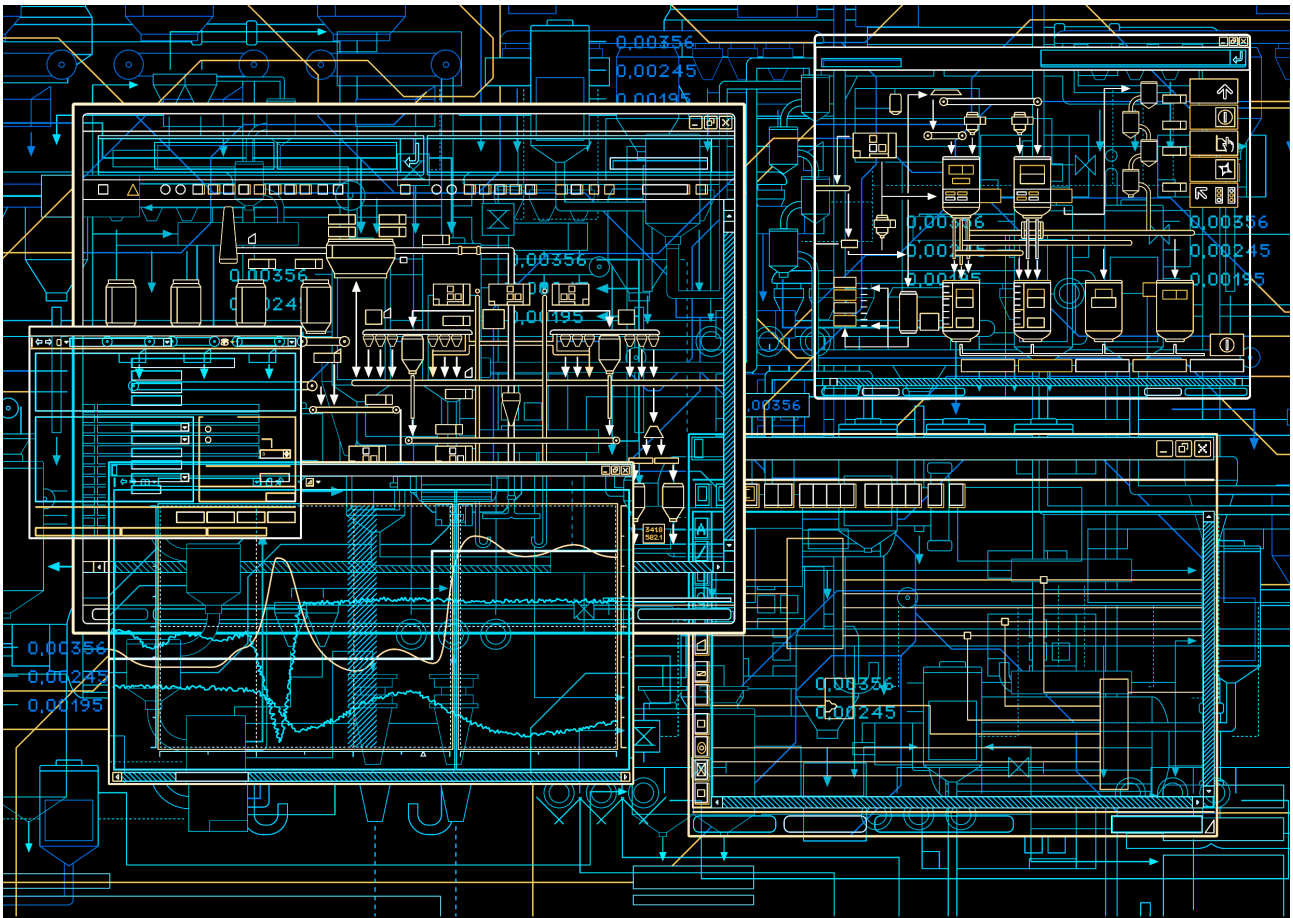

System 800xA

AC 800M PROFIBUS DP Configuration

System Version 6.0

System 800xA

AC 800M PROFIBUS DP Configuration

System Version 6.0

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1 About This User Manual

Any security measures described in this User Manual, for example, for user access, password security, network security, firewalls, virus protection, etc., represent possible steps that a user of an 800xA System may want to consider based on a risk assessment for a particular application and installation. This risk assessment, as well as the proper implementation, configuration, installation, operation, administration, and maintenance of all relevant security related equipment, software, and procedures, are the responsibility of the user of the 800xA System.

This user manual describes the configuration of the PROFIBUS DP-V1 in the 800xA control system using CI854 communication interface.

This manual does not provide any information about installing the PROFIBUS network. This information is provided in the *AC 800M PROFIBUS DP Installation (3BDS009029*)* Manual for PROFIBUS DP-V1.

The main areas covered in this user manual are:

- PROFIBUS functionalities available with CI854
  - Functionality and Feature of CI854 and CI854A firmware are same. However, CI854 does not support Module Redundancy.
  - Functionality and Feature of CI854A and CI854B are same. However, the Firmware for CI854 and CI854A is different from CI854B.
- Hardware configuration with the Control Builder M
- Supervision and status visualization of the PROFIBUS

The reader of this manual is expected to have good knowledge of the 800xA control system and the PROFIBUS in general

This user manual is not the only source of instruction for PROFIBUS. ABB offers training courses for those who use ABB control systems

1.1 Intended User

This manual is intended for application engineers and for engineers who are planning the design of a PROFIBUS system. The reader should be familiar with Control IT for AC 800M products and the programming tool, Control Builder M. Also the reader should be familiar with the hardware and software functionality of the 800xA system products. Apart from this, the user should have a good PROFIBUS knowledge.

1.2 How to Use this User Manual

Section 2 Introduction gives a brief overview of PROFIBUS and how it is integrated in the controllers.

Section 3 Functional Description provides detailed information on the PROFIBUS implementation.

Section 4 Configuration describes the configuration of PROFIBUS with the Control Builder M.

Section 5 Download and Online Mode describes the download procedure and the system behavior in case of an error.

Section 6 CI854 Web server describes how to get detailed diagnostic information from the system in case of a serious PROFIBUS error and how to set the slave address for PA devices.

For a list of documentation related to the products described in this user manual, see Released User Manuals and Release Notes on page 16.

In this document, the functionality that is relevant for all variants of CI854 (CI854 non-A plain, CI854A and CI854B) is referred to as CI854. Otherwise, it is mentioned explicitly which module is referred.

1.3 User Manual Conventions

Microsoft Windows conventions are normally used for the standard presentation of material when entering text, key sequences, prompts, messages, menu items, screen elements, etc.

1.3.1 Warning, Caution, Information, and Tip Icons

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

Electrical warning icon indicates the presence of a hazard that could result in *electrical shock.*

Warning icon indicates the presence of a hazard that could result in *personal injury*.

Caution icon indicates important information or warning 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.*

Information icon alerts the reader to pertinent facts and conditions.

Tip icon indicates advice on, for example, how to design your project or how to use a certain function

Although Warning hazards are related to personal injury, and Caution hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, fully comply with all Warning and Caution notices.

1.4 Terminology

A complete and comprehensive list of Terms is included in the Industrial^{IT} Extended Automation System 800xA, Engineering Concepts instruction (3BDS100972*). The listing includes terms and definitions that apply to the 800xA System where the usage is different from commonly accepted industry standard definitions and definitions

given in standard dictionaries such as Webster's Dictionary of Computer Terms. Terms that uniquely apply to this User Manual are listed in the following table.

Term/Acronym	Description
AC 800M	ABB Controller 800M series, general purpose process controller series by ABB.
AC 800M Controller	Any controller constructed from the units and units connected to the AC 800M hardware platform.
Control Builder M	The programming tool for AC 800M. Often referred to as Control Builder. Control Builder M Professional is integrated into System 800xA.
CEX-Bus	Communication Expansion Bus (for communication units).
Connector	A Connector is a coupling device used to connect the wire medium to a fieldbus device or to another segment of wire.
DIW	The Device Import Wizard is a tool provided with Control Builder M that converts GSD Files to HWD Files.
DL	The Device Library provides device object types to be installed with the Device Library Wizard.
DLW	The Device Library Wizard is a tool to install separately delivered device object types provided by the Device Library into an 800xA system.
DTM (Device Type Manager)	A DTM is a software module provided by the device vendor. It is used to establish communication and data access to the device. The DTM co-operates and exchanges data with the engineering tools via the FDT interfaces.
DPM1	DP Master Class 1. After configuring the slave the DPM1 gets into the cyclic data transmission with the slave via MS0(Master Slave Class 0) connection. The DPM1 can also have acyclic communication with the slave via MS1 (Master Slave Class 1) connection.
DPM2	DP Master Class 2. The DPM2 is mainly used for DP-V1 configuration of slave devices. The acyclic communication is setup via MS2 (Master Slave Class 2) connections.
Failover	In case of an error the primary module stops working and the backup module gets active.

Term/Acronym	Description
FCI	The Fieldbus Communication Interface (FCI) device contains the interface to the fieldbus.
FDT (Field Device Tool)	FDT defines a vendor-independent and protocol-independent interface for integrating field devices in the engineering tools of process control systems.
Fieldbus	A fieldbus is used to interconnect field devices, such as I/O modules, smart sensors and actuators, variable speed drives, PLCs, or small single loop devices, and to connect these devices to the 800xA system.
GSD File	Gerätestammdaten, device communication database file for PROFIBUS devices.
Highway Addressable Remote Transducer (HART)	The HART protocol is a widely-used open protocol for communication with Smart devices.
Hot Removal	Units with hot removal support can be removed online, without any disturbance to other units connected to the CEX-Bus. This includes that the unit can be removed online if it becomes faulty.
Hot Standby	Definition for the redundancy behavior for the backup module. The backup module is configured and ready to take over in case of a failure of the primary module.
Hot Swap	Units with hot swap (includes hot removal) support, can be replaced online, without any disturbance to other units connected to the CEX-Bus. In a redundant system, the backup unit can be replaced without any disturbances to the primary unit. This includes that the unit can be replaced online if it becomes faulty.
HWD File	Hardware Definition file, ASCII readable file describing the hardware unit. Used by Control Builder M.
IEC	International Electrotechnical Commission.
IS	Intrinsic Safety
ISP	Input Set as Predetermined. When the controller detects a communication failure with an input module, the application variables are set to predetermined values specified by ISP control.

Term/Acronym	Description
Linking Device	The linking device connects one or more PROFIBUS PA segments to PROFIBUS DP.
MBP	Transmission technology **M**anchester Coding and **B**us **P**owered. This term replaces the previously common terms for intrinsically safe transmission “Physics in accordance with IEC 61158-2, 1158-2, etc.
Module Termination Unit (MTU)	The Module Termination Unit is a passive base unit that contains the PROFIBUS and CEX-Bus connectors.
Node	A computer communicating on a network, for example the Internet, Plant, Control or IO network. Each node typically has a unique node address with a format depending on the network it is connected to.
OSP	(Output Set as Predetermined). When an I/O module locally detects communication failure with the controller it automatically sets its output to the values specified by OSP control.
PROFIBUS	**PRO**cess **FI**eld**BUS.** PROFIBUS is a manufacturer-independent fieldbus standard for applications in manufacturing, process and building automation. The PROFIBUS family is composed of three types of protocol, each of which is used for different tasks. The three types of protocols are: PROFIBUS FMS, DP and PA.
PROFIBUS DP	PROFIBUS DP is the communication protocol for Decentralized Peripherals. DP covers the versions DP-V0, DP-V1 and DP-V2.
PROFIBUS DP-V0	Version DP-V0 provides the basic functionality of DP, including cyclic data exchange, station, module and channel-specific diagnostics.

Term/Acronym	Description
PROFIBUS DP-V1	Version DP-V1 contains enhancements geared towards process automation, in particular acyclic data communication for parameter assignment, operation, visualization and interrupt control of intelligent field devices, parallel to cyclic user data communication. This permits online access to stations using engineering tools. In addition, DP-V1 defines alarms. Examples for different types of alarms are status alarm, update alarm and a manufacturer-specific alarm.
PROFIBUS DP-V2	Version DP-V2 contains further enhancements and is geared primarily towards the demands of drive technology. Due to additional functionalities, such as isochronous slave mode and lateral slave communication (DXB) etc., the DP-V2 can also be implemented as a drive bus for controlling fast movement sequences in drive axes.
PROFIBUS FMS	**F**ieldbus **M**essage **S**pecification. Is designed for communication at the cell level, where programmable controllers, such as PLCs and PCs primarily communicate with each other. It was the forerunner of PROFIBUS DP.
PROFIBUS PA	PROFIBUS for Process Automation
PROFIBUS International (PI)	The international umbrella organization for PROFIBUS founded in 1995.
PROFIBUS User Organization e.V. (PNO)	The PNO is the trade body of manufacturers and users for PROFIBUS founded in 1989.
Redundancy	The existence of more than one capability of an item (system, equipment or component) to perform its intended function.
Remote I/O	Input/Output units connected to a controller via a fieldbus.
RLM 01	**R**edundancy **L**ink **M**odule for PROFIBUS DP. The RLM 01 connects a non redundant PROFIBUS slave to the line redundant PROFIBUS.
RS485	A communication interface standard from EIA (Electronics Industries Association, USA), operating on voltages between 0V and +5V. RS485 is more noise resistant than RS-232C, handles data transmission over longer distances, and can drive more receivers

Term/Acronym	Description
Segment	A Segment is a section of a PROFIBUS DP fieldbus that is terminated in its characteristic impedance. Segments can be linked by Repeaters to form a longer PROFIBUS DP fieldbus. Each Segment can include up to 32 devices.
tbit	Time a bit needs to be transferred on PROFIBUS. This time depends on the baudrate. tbit = 1/baudrate.
TRS	Tool Routing Service, a service that allows the user to use Fieldbus Builder PROFIBUS/HART to configure HART devices, via AC 800M.
Unit	A hardware unit, with or without accommodated software.

1.5 Released User Manuals and Release Notes

A complete list of all User Manuals and Release Notes applicable to System 800xA is provided in *System 800xA Released User Manuals and Release Notes (3BUA000263*)*.

System 800xA Released User Manuals and Release Notes (3BUA000263)* is updated each time a document is updated or a new document is released. It is in pdf format and is provided in the following ways:

- Included on the documentation media provided with the system and published to ABB SolutionsBank when released as part of a major or minor release, Service Pack, Feature Pack, or System Revision.
- Published to ABB SolutionsBank when a User Manual or Release Note is updated in between any of the release cycles listed in the first bullet.

A product bulletin is published each time *System 800xA Released User Manuals and Release Notes (3BUA000263*)* is updated and published to ABB SolutionsBank.

For standards and commercially available PROFIBUS documentation please visit the PROFIBUS Web Site (http://www.profibus.com).

2 Introduction

PROFIBUS is a manufacturer-independent fieldbus standard for applications in manufacturing, process and building automation. PROFIBUS technology is described in fixed terms in DIN 19245 as a German standard and in EN 50170 / IEC 61158 as an international standard. The PROFIBUS standard is thus available to every provider of automation product.

The PROFIBUS family is composed of three types of protocol, each of which is used for different tasks. Of course, devices with all three protocols can communicate with each other in a complex system by means of a PROFIBUS network.

The three types of protocols are: PROFIBUS FMS, DP and PA.
Only the two protocol types DP and PA are important for process automation.

PROFIBUS DP: the bus for the **d**ecentralized **p**eriphery
The PROFIBUS DP (RS485) is responsible for communication between the Controller level of a process automation system and the decentralized periphery in the field, also intrinsic safety (RS485-IS) via DP-Ex barriers into hazardous area. One feature of PROFIBUS DP is its high speed of transmission up to 12 Mbit/s.

PROFIBUS PA: extension for **p**rocess **a**utomation
This PROFIBUS variant was developed for the process industry. Communication and power supply to Transmitter and Positioners are handled direct via one 2-line cable and correspond to IEC Standard 61158-2 (named also as MBP, MBP-LP). Intrinsic safety (EEx i) (MBP-IS) installations in Zone 1 / Div.1 are possible. Coupling components (Linking Devices) are used to integrate PA bus lines into the PROFIBUS DP network. This ensures that all information is available in a continuously connected network through the complete PROFIBUS system (DP and PA).

The PROFIBUS DP is interfaced to the IEC61131 controller AC 800M using the PROFIBUS DP-V1 module CI854 in the AC800M. For high availability redundancy is supported.

The configuration for the PROFIBUS is done with the Control Builder M. The configuration covers the planning of the hardware units in the hardware tree and the device specific configuration for the master and slave units as well. The device specific configuration data is described within the device specific GSD File provided by the manufacturer of the device. To allow the configuration of the device within the Control Builder M the GSD File has to be converted to a HWD File and inserted to the project. The conversion is done with the Device Import Wizard.

The following figure shows the redundant PROFIBUS connected to the redundant AC 800M controller.

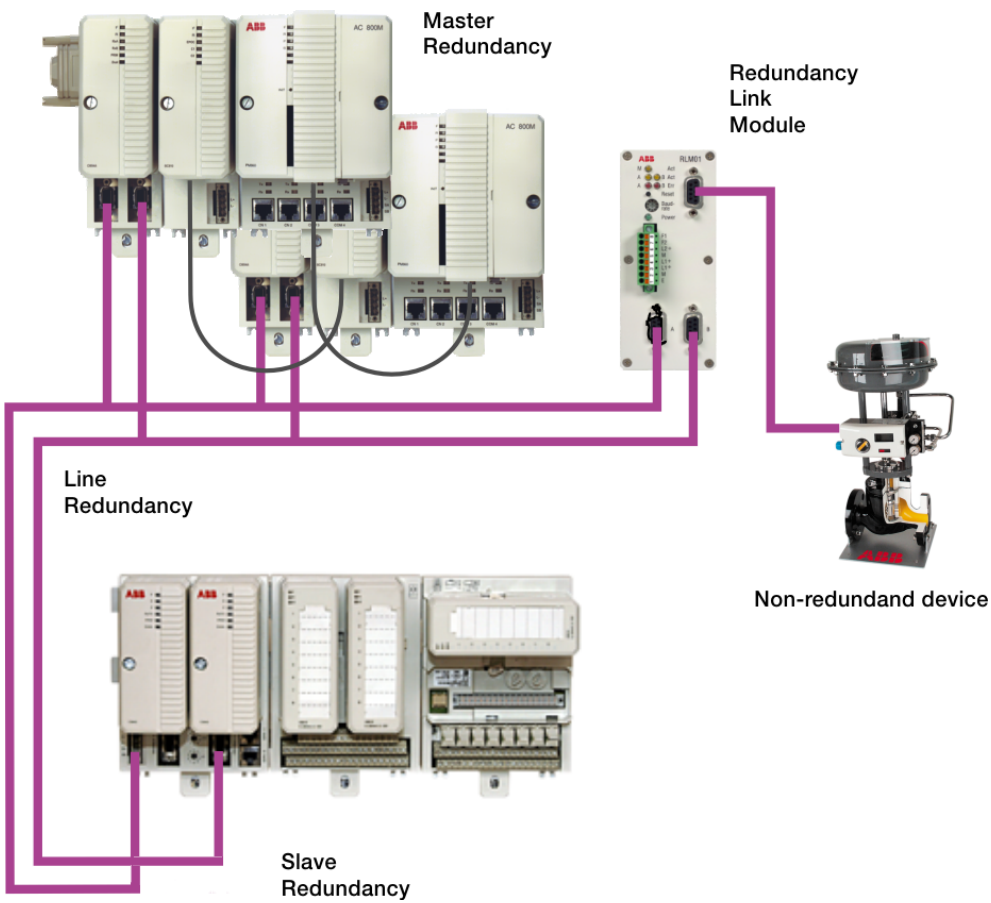


Figure 2.1: Redundant AC 800M with redundant PROFIBUS

3 Functional Description

3.1 PROFIBUS Basics

3.1.1 Basic Functions DP-V0

Cyclic Data Communication

The data communication between the DPM1 (DP Master Class 1) and its assigned slaves is automatically handled by the DPM1 in a defined, recurring sequence. With each user data transfer, the master can write up to 244 bytes of output data to the slave and read up to 244 bytes of input data from the slave. The Data is read and written synchronously in one procedure.

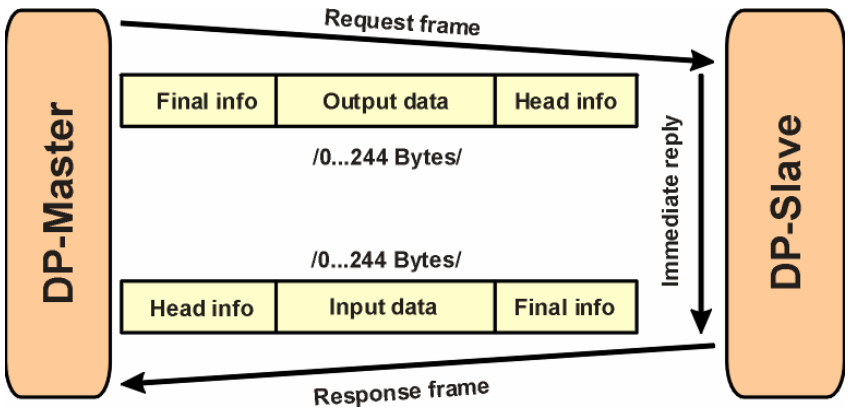


Figure 3.1: Cyclic User Data Transmission in DP

The assignment of the slaves to the DPM1, CI854 in this case, is done via the hardware configuration in Control Builder M.

The data communication between the DPM1 and the slaves is divided into three phases: parameterization, configuration and data transfer. Before the master includes

a DP slave in the data transfer phase, a check is run during the parameterization and configuration phase to ensure that the configured setpoint configuration matches the actual device configuration. During this check, the device type, format and length information and the number of inputs and outputs must also correspond. This provides you with reliable protection against parameterization errors.

Diagnostics

In addition to the cyclic data the PROFIBUS slave unit provides diagnostic data. With this diagnostic data the slave can indicate errors or warnings on the slave unit, the I/O-units or the I/O-channels. Some diagnostic data is generic and defined by the PNO. But most of the diagnostic data is manufacturer specific.

The following errors/warnings are examples for PROFIBUS diagnostics:

Channel related:

- Wire break
- Short circuit

Module related:

- Wrong module type
- Module missing

Slave related:

- Power supply 2 error
- Internal bus error

The CI854 supports the operation of PROFIBUS DP-V0 diagnostics. The diagnostic data transferred from the slave to the master is mapped by the CI854 to the unit status of the PROFIBUS slave unit or the related I/O-unit and is indicated as error or warning in the UnitStatus in Control Builder M for the specific unit.

Only that diagnostic data configured within the hardware definition file is operated by the system. The configuration includes

- Selection of diagnostic to be operated by the system.
- Mapping of the diagnostic information within the diagnostic frame on PROFIBUS to the specific hardware unit (slave or I/O unit). Some of the standard diagnostics bits like "Slave does not exist", "Parameter fault", "Configuration fault" etc. will be applied to the slave at the fixed bit position. So it is necessary to map the

standard diagnostics to the right bits of Error and Warnings and extended status. If not mapped, Device Bit X text will appear on the slave unit status.

- Definition of the corresponding bit in the unit status for the specific diagnostic information. Use of device specific codes in ErrorsAndWarnings and ExtendedStatus.
- Definition if the diagnostic information shall be indicated as error or warning.
- Definition of the presented text within unit status and alarm/event for the specific diagnostic information.
- Definition if in addition an alarm or event shall be generated for the specific diagnostic information. If yes also the severity has to be defined.

For S800 I/O and S900 I/O the configuration for the diagnostics is already specified in the hardware definition files that are provided with the system. For other slaves the configuration for PROFIBUS diagnostics can be done via the DeviceImport Wizard. The Device Import Wizard provides a dialog to pick up the diagnostic data from the GSD-file and map it to the DeviceSpecific and ExtendedStatus bits of the HwStatus for the related slave unit or I/O-unit. The dialog also supports mapping of PROFIBUS diagnostic bit to the system alarm/event severity. For more information please refer to the online help for the Device Import Wizard.

DP Master Class 1 (DPM1) and Class 2 (DPM2)

The DP master class 1 is the master that is in cyclic data transmission with the assigned slaves. To get into the cyclic communication the DPM1 has to configure the slave before.

The DP master class 2 is used for engineering and configuration. It does not have cyclic data transmission with the slave devices. Normally a DPM2 is only connected temporarily to the bus. A DPM2 can have class 2 communication to the slave devices before the slaves are configured via DPM1 and cyclic communication is active. It is also possible to connect MS2 Master to the slave devices for acyclic communication when the slave is actively in I/O communication with MS1 master.

The CI854 is of type DP master class 1 (DPM1) and class 2 (DPM2).

System Behavior

For a DPM1 master the following operating states are defined:

Stop

No data communication between the DPM1 and the slaves.

Clear

The DPM1 reads the input information of the slaves and keeps the outputs of the slavs in a fail-safe state (“0” output). The default value of the BP flag is disabled i.e. AutoClear is false.This means the master will never get into clear state on error of any configured slaves.

Operate

The DPM1 is in the data transfer phase. In cyclic data communication, inputs are read from the slaves and output information written to the slaves.

Sync and Freeze Mode

The CI854 does not support sync and freeze mode.

Monitoring the DP-V0 Communication

The cyclic communication between the DPM1 and the slaves is monitored by the master and the slaves itself.

If the CI854 master unit detects a failure in the communication with a slave, it will indicate the corresponding slave as disturbed. On CI854A/CI854B a special handling is implemented to support also redundancy for master and slave. In both cases the monitoring timings consider the failovers of master and slave.

On slave side the communication with the master is controlled via the watchdog. If no data communication with the master occurs within the watchdog interval, the slave automatically switches its outputs to the fail-safe state.

For details on special handling for connection error, refer Connection Error on page 69

Multi Master Systems

In a multi master system several masters are connected to one bus. They represent either independent subsystems, comprising one DPM1 (DP Master Class 1) and its

assigned slaves, or additional configuration and diagnosis devices. The CI854 master unit supports multi master systems.

The Control Builder M with the integrated PROFIBUS master calculation does not support multi master configurations. The calculation only covers one CI854 with its assigned slaves. If you connect several CI854 or additional configuration devices to the same bus you have to adapt the bus settings manually. But only the TTR has to be adapted. An overall TTR has to be calculated as the sum of all individual TTR for the CI854 master units connected to the same PROFIBUS. The resulting TTR has to be manually configured for all connected CI854 master units.

Example: you have three CI854 master units having the automatically calculated TTR times 20.000, 30.000 and 40.000, then you have to manually configure the TTR time 90.000 for all three units.

If a standalone tool is directly connected to the PROFIBUS as DPM2 (DP Master Class 2) master for some acyclic communication, then the TTR time of this master also has to be taken into account. Otherwise the standalone tool might get communication problems.

3.1.2 Version DP-V1

Acyclic Data Communication

The key feature of version DP-V1 is the extended function for acyclic data communication. The acyclic data communication is mainly used for configuration and parameterization purpose. With the acyclic DP-V1 read and write services the master can read or write any desired data to and from the slave. The data is addressed by slot, index and length. Each data block can be up to 244 bytes.

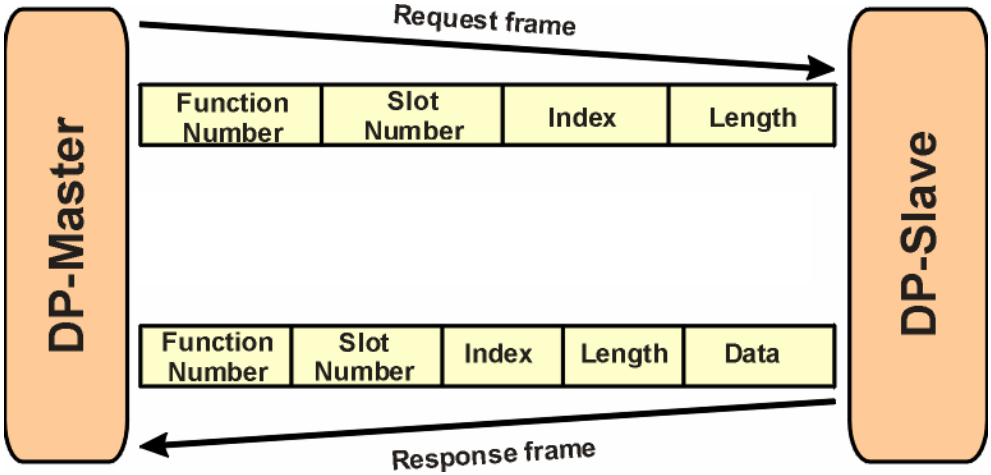


Figure 3.2: Acyclic Communication in DP-V1: Read Service

The transmission of acyclic data is executed in parallel to the cyclic data communication, but with lower priority. Acyclic services are operated in the remaining time at the end of the DP-V0 cycle.

The automatic master calculation for CI854 ensures that the gap on PROFIBUS is big enough for some acyclic communication. If there is a need to increase the gap for some additional acyclic communication this can be done via the TTR time. Please refer also to Settings Tab on page 52.

Alarms and Status Messages

The CI854 does not support the alarm and status message handling of DP-V1. Only DP-V0 diagnosis is supported.

3.2 Redundancy

PROFIBUS and CI854A/CI854B have a high scalability for redundancy. Following redundancy configurations are possible:

- PROFIBUS master unit CI854A/CI854B
- PROFIBUS slave unit
- PROFIBUS line.

Depending on your needs each type of redundancy can be configured independent of each other. Also mixed configurations are supported. You can configure for example a redundant PROFIBUS installation consisting of a redundant CI854A/CI854B master unit and redundant PROFIBUS lines and have connected redundant and non-redundant slave units in parallel.

A special mixture of redundancy is the so called combined slave and line redundancy. A slave provides two slave units supporting the PNO slave redundancy and each slave unit only provides one PROFIBUS interface. This is a one error tolerant solution. The slave unit will only have communication on one PROFIBUS line at a time and a single error on the PROFIBUS line will lead to a switchover of the slave units. But the big advantage of this solution are the reduced cost. Therefore it is a very popular solution. It is used for example for S800 I/O with CI840 and S900 I/O with CI920.

3.2.1 Master Redundancy

The CI854A/CI854B supports PROFIBUS master redundancy. Two CI854A/CI854B connected to one controller can be configured to work in a redundant configuration. The configuration for redundancy is done via configuring the CI854A/CI854B in the hardware tree of the Project Explorer. For configuration of redundancy please refer to Add Redundancy for Master Unit on page 40.

Primary and backup CI854A/CI854B need different node addresses on PROFIBUS. While the primary node address is configured via the settings in the hardware Configuration Editor the node address for the backup module is defined by the node address of primary module **-1**. If the node address for primary module is set to **1**, you cannot configure the node address 0 on PROFIBUS with CI854A/CI854B. This is reserved for redundancy.

During normal operation only the primary CI854A/CI854B has communication with the slave units. The backup unit is in hotstandby mode. It is configured by the controller and synchronized by the primary unit. If there is a failover because of for example a disturbed PROFIBUS communication, primary and backup module change the node addresses. During failover the former primary module will get reset.

After download and successful configuration the availability of the backup unit is monitored. This includes the balancing of current data and the communication links via PROFIBUS and CEX-Bus as well. In case of no error the DUAL LEDs on primary and backup unit will be lit.

Reasons to perform a switchover are for example that the primary unit has lost the communication to all connected slaves “All slaves failed” because of for example a cabling problems or a “Fatal error” on the primary CI854A/CI854B itself was detected.

The PROFIBUS master redundancy is only supported by CI854A/CI854B and not CI854 and also the AC 800M controller type used must support redundancy.

If the CI854A/CI854B is configured for redundancy and the configured watchdog time is less than the calculated watchdog time for the configured baud rate, the watchdog time will be increased automatically by 1000 ms.

CI854 module redundancy is supported for modules with the same module type. That is, if both the modules in the pair are CI854A or both are CI854B.

When the redundant CI854A modules are being replaced with CI854B modules, there can be a temporary phase when combination of CI854B and CI854A is allowed in a redundant configuration. This is only to ensure that the replacement process can be carried out without disturbance in the communication. However this combination should not be considered as a permanent combination for operation.

For details refer Replacing CI854A with CI854B

3.2.2 Slave Redundancy

CI854 supports the PROFIBUS slave redundancy specified by the PROFIBUS User Organization (PNO). The specification can be found at http://www.profibus.com.

A redundant slave has two PROFIBUS interfaces, one for the primary and one for the backup slave. If line redundancy is used, one of the interfaces is connected to line A and the other to line B. If not, both interfaces are connected to the same PROFIBUS cable. The PROFIBUS address of the backup slave is always the address of the primary slave plus 64. The configuration in the Control Builder M ensures, that both addresses are available when the slave is set redundant. If a redundancy switchover of a slave occurs, also the PROFIBUS addresses are switched. That means, the primary slave always has the assigned address and the backup slave always has the address + 64 regardless of who is the primary and who is the backup. This kind of redundancy is called “flying redundancy”.

Only the primary slave can transfer process data and diagnostic information on the PROFIBUS. Therefore the status of the primary slave also contains the information of the backup slave. Please refer to the slave documentation for the details.

Although the backup slave has no active data transmission with the master, the CI854 is able to monitor the backup slave. The backup slave is available in the Livelist and if redundancy is configured the monitoring will be activated. If the backup slave fails, the message regarding backup or redundant slave not available will be set in the Extended status of the primary slave. The actual message shown will be as per the GSD file of the device.

To allow the slave a failover in case of an error the CI854A has a special monitoring function. Refer to Connection Error on page 69 for details on this special monitoring. This special monitoring for redundant slave enables the slave to perform a switchover and proceed with the normal data exchange without interrupting the communication.

3.2.3 Line Redundancy

CI854 supports line redundancy for PROFIBUS DP. Therefore the two interfaces “PROFIBUS A” and “PROFIBUS B” are available on the baseplates TP854 of the modules. There is a Redundancy Link Module functionality implemented on the CI854 that handles the sending and receiving of data on the PROFIBUS. Independent of any configuration the RLM sends data on both lines and receives data only via one line. Regarding the receiving of data the RLM checks if the slave sent data on both lines and if the data is valid. The first received valid data on line A or B will be picked up and operated. It is possible that the slave sends data on both lines in parallel or only on one line.

The monitoring of the line redundancy can be enabled or disabled. The default is disabled. The enabling is done via the parameter “Line redundancy” in the settings for CI854. If the line redundancy is enabled, a warning “No activity on PROFIBUS” will be indicated for the specific line in case of a failure, for example if there is a fault on the PROFIBUS cable.

Enable the monitoring of line redundancy, if

- redundant slaves according to the PNO redundancy specification are used and/or
- non-redundant slaves provide a line redundant interface and/or
- non-redundant slaves with only one PROFIBUS interface are connected to the CI854 with a RLM01.

For CI854A, the disabling of parameter "Line redundancy" does not disable the communication on Line B. The monitoring for the line B would only be disabled. The RxA/RxB LED is always ON as long as it is able to communicate on PROFIBUS network even with one of the configured slaves in Control Builder.

For CI854B, the disabling of parameter "Line redundancy", disables the communication on Line B. The status of the RxA/RxB LED depends on the number of slaves physically connected (not the configured slaves) on the PROFIBUS network.

RxA/RxB LEDs flickers for less number of physically connected slaves.

RxA/RxB LEDs is always ON for more number of physically connected slaves.

3.3 Status Handling

3.3.1 Status Handling for DP-V1 Master Unit

Every status information for CI854 in terms of hardware and software errors is indicated via the unit status. The unit status is used to present the status of the hardware unit in Control Builder M while it is in online mode. In addition alarms/events are generated based on the unit status (refer also to Alarms and Events on page 35). For special reasons also the access to the unit status via the controller application is supported.

Table 3.1 represent all device specific ErrorsAndWarnings and Table 3.2 represent ExtendedStatus defined for CI854.

Table 3.1: Device Specific ErrorsAndWarnings for CI854

Bit	Code	Status Text	Status Type	Alarm/ Event	Severity	Description
22	16#00400000	Wrong pair of CIs used for Redundancy	Warning	Alarm	Medium	Valid for CI854B only. In CI854B Redundant configuration, if one of the CI854B module is hot swapped with CI854A, `Device Specific Error 10 ('Wrong pairs of CIs used for redundancy')` message in unit status appears and remains until it is replaced back with CI854B module.
23	16#00800000	Hardware watchdog on CI854 expired	Error	Alarm	Medium	The hardware watchdog on the primary CI854 was not triggered by the CI854 firmware within the timeout.
24	16#01000000	Error in PROFIBUS master configuration	Error	Alarm	Medium	A configuration error has been detected on the primary unit.
25	16#02000000	PROFIBUS com. failure between Primary and Backup	Warning	Alarm	Medium	The PROFIBUS connection between primary and backup unit failed.

Table 3.1: Device Specific ErrorsAndWarnings for CI854 (Continued)

Bit	Code	Status Text	Status Type	Alarm/ Event	Severity	Description
26	16#04000000	Communication memory obtained too long	Warning	Event	High	Overload of the communication memory access. There is too much access from the application tasks to the PROFIBUS I/O-data in the shared memory on the CI854 so that the CI854 cannot update the memory in time. The CI854 is not able to read/write process data in time. This status is set when IO copying lock obtained by controller is not released for longer time.
27	16#08000000	Duplicate address	Warning	Alarm	Medium	Two or more PROFIBUS nodes have the same address.
28	16#10000000	No activity on PROFIBUS line A	Warning	Alarm	Medium	This warning reflects the state of the RxA LED of the primary unit.
29	16#20000000	No activity on PROFIBUS line B	Warning	Alarm	Medium	If line redundancy is enabled, this warning reflects the state of the RxB LED of the primary unit.
30	16#40000000	Hardware fail of CI854 (A)	Error	Alarm	High	A hardware failure has been detected on the primary unit, for example RAM failure.
31	16#80000000	Firmware needs to be reloaded	Error	Alarm	Medium	The primary unit does not contain a valid firmware.

Table 3.2: Device Specific ExtendedStatus for CI854

Bit	Code	Status Text	Status Type	Alarm/ Event	Severity	Description
0	16#00000001	Timeout on bus, maybe duplicate slave address (TTO)	Warning	-	-	The lower layer of the PROFIBUS has detected a timeout. During a baudrate change this error may occur for a short time. This occurs when the master does not see any traffic in the network when it first enters into the network or when the token is missed. If it remains, the PROFIBUS connection and slave addresses must be checked.
1	16#00000002	Bus synchronization failure, check hardware (SYN)	Warning	-	-	The lower layer of the PROFIBUS has detected a synchronization error. During a baudrate change this error may occur for a short time. If it remains, check the PROFIBUS hardware (cables, connectors, slaves).
2	16#00000004	Taken out of ring by another master, check system conf.	Warning	Event	Low	Another master on the PROFIBUS has disabled the CI854. Check the system configuration.
3	16#00000008	Fatal medium access error	Warning	Event	Low	The lower layer of the PROFIBUS cannot access the medium. Check the connection of the CI854 (cable, connectors). This can also be a hardware failure on the CI854 itself.
4	16#00000010	Fatal hardware error	Warning	Event	Low	A fatal hardware error has been detected. Replace the CI854.

Table 3.2: Device Specific ExtendedStatus for CI854 (Continued)

Bit	Code	Status Text	Status Type	Alarm/ Event	Severity	Description
5	16#00000020	All slaves failed	Warning	Alarm	Medium	Check the PROFIBUS connections (cable, connector at the CI854). The reason can also be a hardware error of the CI854. If the CI854A/CI854B is used redundant, this error leads to a redundancy switchover. In case of CI854A, `All slaves failed` is displayed if the master CI854 is not able to reach any of the slaves configured. In case of CI854B, `All slaves failed` will be displayed if the PROFIBUS connector is disconnected from the master CI854B end. In case the connector is not disconnected, but the master is not able to reach to the slaves the slaves will be displayed with connection down status.
6	16#00000040	Hardware configuration error on backup	Warning	Event	Low	A configuration error has been detected for the backup unit.
7	16#00000080	Backup device not found	Warning	Event	Low	The backup unit was not found on the CEX-Bus.
8	16#00000100	I/O configuration error on backup	Warning	Alarm	Medium	The backup CI854A/CI854B has detected a configuration error for a slave unit.
9	16#00000200	I/O connection error on backup	Warning	Alarm	Medium	The backup CI854A/CI854B has detected a configuration error for a slave unit.

Table 3.2: Device Specific ExtendedStatus for CI854 (Continued)

Bit	Code	Status Text	Status Type	Alarm/ Event	Severity	Description
10	16#00000400	Hardware watchdog on Backup CI854(A) expired	Warning	Event	Low	The hardware watchdog on the backup CI854 was not triggered by the CI854 firmware within the timeout.
11	16#00000800	Error in PROFIBUS master configuration of Backup	Warning	Event	Low	A configuration error has been detected on the backup unit.
12	16#00001000	No activity on PROFIBUS line A of Backup	Warning	Alarm	Medium	If line redundancy is enabled, this warning reflects the state of the RxA LED of the backup unit.
13	16#00002000	No activity on PROFIBUS line B of Backup	Warning	Alarm	Medium	If line redundancy is enabled, this warning reflects the state of the RxB LED of the backup unit.
14	16#00004000	Hardware fail of CI854A Backup	Warning	Alarm	Medium	A hardware failure has been detected on the backup unit, for example RAM failure.
15	16#00008000	Firmware needs to be reloaded on Backup	Warning	Alarm	Medium	The backup unit does not contain a valid firmware.
16	16#00010000	CEX-Bus com. failure between Primary and Backup	Warning	Alarm	Medium	The CEX-Bus connection between primary and backup unit failed. This bits is applicable only for CI854A not for CI854B.
17	16#00020000	Fatal error on Primary detected	Error	Alarm	High	A general error has been detected on the primary unit and the CI854 stops the normal operation. If the CI854A is used redundant, this error leads to a redundancy switchover.

Table 3.2: Device Specific ExtendedStatus for CI854 (Continued)

Bit	Code	Status Text	Status Type	Alarm/ Event	Severity	Description
18	16#00040000	Fatal error on Backup detected	Warning	Alarm	Medium	A general error has been detected on the backup unit and the CI854 stops the normal operation. This error prohibits a redundancy switchover.
19	16#00080000	Bus disturbance detected	Warning	Alarm	Medium	This status is set when the bus disturbance is detected in the PROFIBUS network. All the slaves configured under the CI854 are marked with connection down error. This status is applicable for CI854B only.

3.3.2 Status Handling for Slave Units

CI854 also handles status information for the connected slave units. If there is a failure on the PROFIBUS slave, an indication for the FCI or the specific I/O-unit will appear.

There are several reasons to let the CI854 indicate some status information for the slave unit:

- No cyclic communication to the slave:
  Connection down will be indicated for the disturbed slave unit.
- Slave has active standard diagnosis:
  The slave indicates for example “Parameter data fault” or “Configuration data fault”. This errors will be indicated without any special configuration.
- Slave has active extended diagnosis:
  This is also called PROFIBUS Diagnostics. Depending on the configuration the diagnostic information is indicated for the FCI (Fieldbus Communication Interface) or the related I/O-unit. Please refer also to Diagnostics on page 20.
- A monitoring function has detected a failure:
  The CI854 checks status of backup slave (backup slave monitoring) to see if the backup slave is present on the PROFIBUS.

3.3.3 Alarms and Events

PROFIBUS DP-V1 uses the general alarm and event handling provided with the system. Alarms and events are generated only via the status interface. The CI854 influences the generation of alarms/events by setting/resetting the individual status bits. For every status bit in ErrorsAndWarnings and ExtendedStatus a fixed configuration information is available that defines if a change of a status bit shall generate an alarm or event. The generated alarms/events are of the type system alarm or system event. With the generation of the alarm/event the status interface also adds the severity and the time stamp.

3.4 Hot Swap

CI854 supports hot swap. It can be replaced without any disturbance to other units connected to the CEX-Bus. After hot removal and subsequent insertion, the unit is configured automatically.

Replacement of CI modules in Redundant and Non-redundant configuration is explained in the following topics:

3.4.1 Replacement of CI854 in Non Redundant Configuration

A non redundant CI854 can be replaced with another CI854 module by hot removing the existing module and hot inserting the new module in its position.

3.4.2 Replacement of CI854 in Redundant Configuration

Replacing CI854A with Same Module Type

For a redundant CI854A configuration,

- first remove backup CI854A.
- then, hot insert a new CI854A in its place.
- continue replacing the primary CI854A. This initiates a module switch-over.

Replacing CI854B with Same Module Type

For a redundant CI854B configuration,

- first remove backup CI854B.

- then, hot insert a new CI854B in its place.
- continue replacing the primary CI854B. This initiates a module switchover.

Replacing CI854A with CI854B

For a redundant CI854A configuration,

- first hot remove the backup CI854A.
- then, hot insert the CI854B in its place.
- at this stage, the module redundancy works even though one of the module in CI854A and the other is CI854B. The Profibus communication continues on the CI854A that is primary.

This feature, to continue to have redundancy with CI854A and CI854B as per the above step, should not be considered as a permanent combination for operation. This should be only for the replacement process.

At this stage if a switch-over occurs from the CI854A to the CI854B, the switch over would happen without any drop in profibus communication. But the CI854A module would go to fault mode.

- Now hot remove the CI854A module. This initiates a module switchover. Hot insert the CI854B in its place.

Replacing CI854B with CI854A

Replacement of CI854B with CI854A is not supported.

3.5 Hot Configuration in Run (HCIR)

Hot configuration in run a slave can be configured online without initializing the PROFIBUS communication. The new or changed configuration is downloaded to the slave while the cyclic communication keeps active.

If a slave supports HCIR, then I/O-units can be added or deleted online. During reconfiguration the cyclic data transmission between CI854 and the slave is stopped. The CI854 keeps the input values and the slave the output values. After completing the reconfiguration, the cyclic data transmission will proceed based on the new configuration data.

The reconfiguration is monitored by the CI854 with the HCIR timeout. By starting the reconfiguration the HCIR timeout is sent via a SetPrm telegram to the slave. This indicates the slave to increase the watchdog timeout to the value defined by the HCIR timeout until the reconfiguration is finished. The timeout for HCIR is defined on CI854 by:

$HCIR_{timeout}$ = 10 x TTR / (bit/sec) + 300 ms.

Configuration through HCIR is only possible for slaves that have implemented this feature such as S800 I/O and S900 I/O. To activate the HCIR sequence, a special entry in the hardware definition file is necessary.

3.6 Monitoring of Backup CI854 module for switchover

The backup CI854 module monitors if it is ready for switchover based on if it is able to reach any of the slaves.

- If the backup CI854 module is not able to reach any of the slaves during module startup on any of its lines, (for. e.g. after cable removal at the backup CI854 end), it is not ready for switchover. In this scenario, if the primary CI854 cables are removed or the primary module is removed, switchover will not happen to backup CI854.
- If the backup CI854 is able to reach any of the slaves at any time on any of its lines (for. e.g. after cable insertion at the backup CI854 end), it is ready for switchover. In this scenario if the primary CI854 cables are removed or the primary module is removed, switchover happens to the backup CI854.
- If the backup CI854 is able to reach any of the slaves at any time on any of its lines (for. e.g. after cable insertion at the backup CI854 end), it is ready for switchover. Now even if the backup cables are removed from the backup CI854, it is still ready for switchover. In this scenario if the primary CI854 cables are removed or the primary module is removed, switchover still happens to the backup CI854.

4 Configuration

4.1 Hardware Library

To configure hardware types for PROFIBUS master and slave units hardware libraries are used. How to handle hardware libraries, refer *System 800xA Control AC 800M Configuration (3BSE035980*)* and *Compact Control Builder AC 800M Configuration (3BSE040935*)* Manual.

4.2 Insert PROFIBUS Master Unit

To insert a new CI854 PROFIBUS DP-V1 master unit proceed as described.

1. Right-click on the controller you want to insert the CI854 and select **Insert Unit**. The Insert Unit dialog pops up.

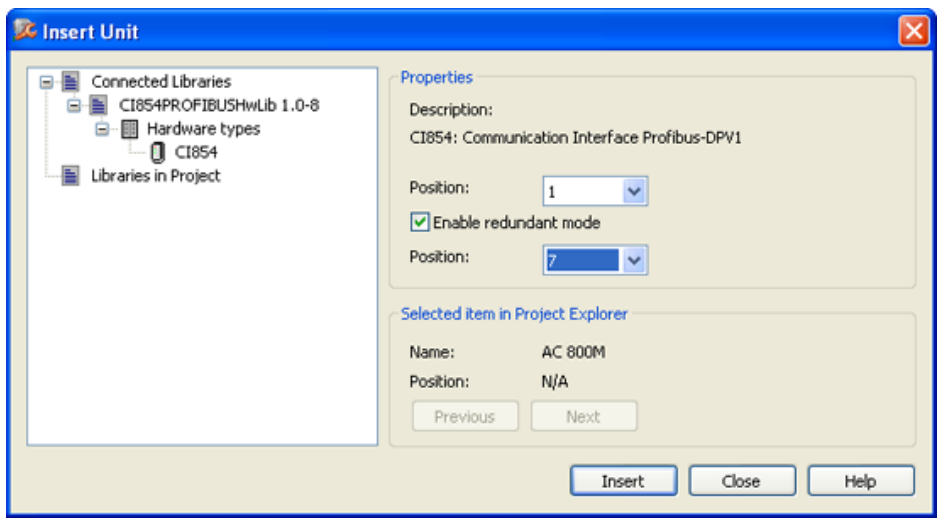


Figure 4.1: Dialog for inserting CI854

2. Expand the library for CI854 under Connected Libraries and select the CI854 hardware type.
3. Select a position for the hardware unit in the dialog box displayed. The first available position is chosen by default. If another position is desired, click the list box to display available positions and select the desired one.
4. If the module shall be set redundant check Enable redundant mode. This releases the dialog box for the position of the backup unit. Select a position for the backup unit.
5. Click **Insert** to apply the current changes.
6. Click **Close** or proceed inserting further units.
7. The hardware unit is now included in the tree. The icon shown in the tree depends on if redundancy is configured or not. For a redundant configured unit the position for the backup module is presented within parenthesis.

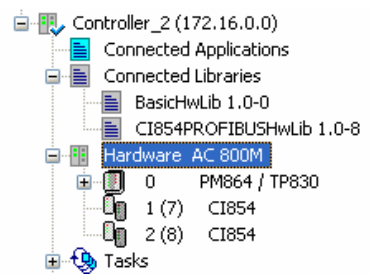


Figure 4.2: Redundant CI854 in hardware-Tree

4.3 Add Redundancy for Master Unit

If the CI854A/CI854B is already configured and running in single mode you can add redundancy.

1. Right-click on the unit you want to add the redundancy and select **Redundancy > Add Redundant Unit**.
2. Select a position for the backup unit in the dialog box displayed. The first available position is chosen by default. If another position is desired, click the list box to display available positions and select the desired one.

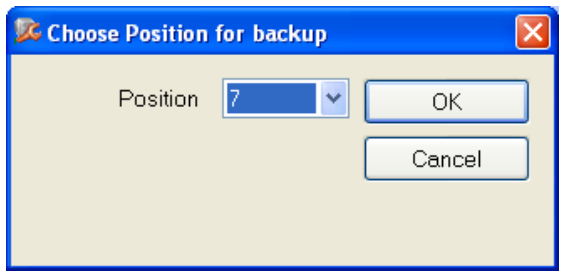


Figure 4.3: CEX-Bus Position for backup CI854A/CI854B

3. The icon changes to the redundancy icon and the text is updated with backup position within parenthesis (see Figure 4.2).

The inserted backup unit is called unit B. Unit B is fixed related to the configured position. Unit B starts as backup but acts as primary after failover.

4.4 Delete Redundancy for Master Unit

If the CI854A/CI854B is already configured and running in redundant mode you can delete redundancy.

1. Right-click on the CI854A/CI854B you want to delete redundancy for and select **Redundancy** > **Delete Backup**.
2. The icon changes to the single icon and the position for the backup is deleted in the text.

In the offline mode of Control Builder M unit B is always presented as the backup unit independent of the current state. Therefore always unit B will be deleted as backup. If you download and go online a failover may be performed by CI854A/CI854B if unit B acts as primary. Unit A gets primary and afterwards unit B will get deleted.

4.5 Firmware Upgrade

Firmware upgrade for the CI854 modules is performed by right clicking the controller in **Controller Builder** > **Remote System** > **Show Firmware Information** (see Figure 4.4.

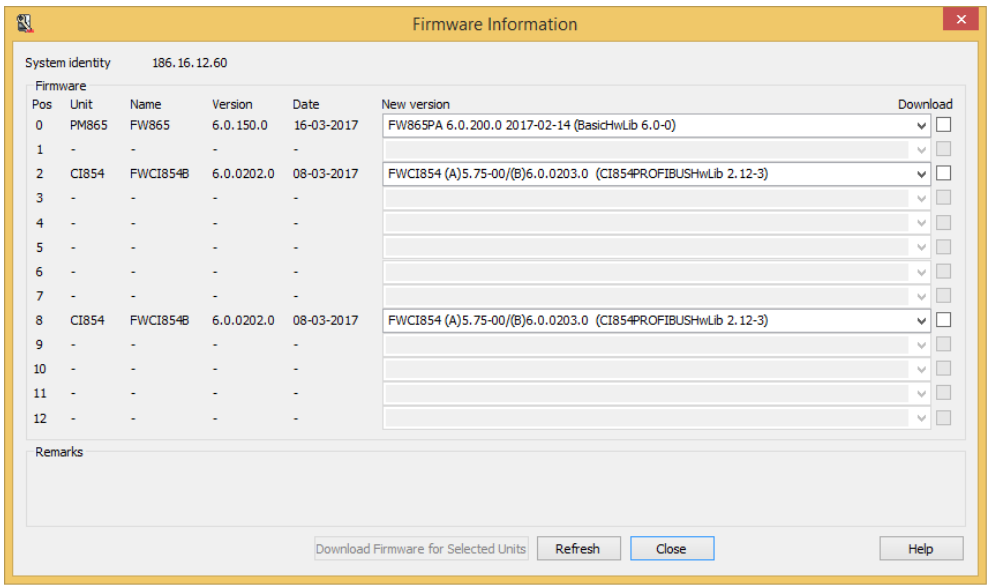


Figure 4.4: Control Builder MFirmware Information

- The module connected on the CEX bus with its firmware loaded is shown on the left hand side.
- The **Unit** field shows the module as CI854 (irrespective of the module connected in CI854.
- The **Name** field shows the firmware loaded for the module and indicates if the firmware is related to CI854A or CI854B.
- The version and date fields shows the details of the firmware loaded in the module.
- The **New** version field on the right side shows the firmware version to be loaded as available in the Control Builder M with the new versions of both CI854A and CI854B mentioned in the string.
- When the user selects this module for firmware upgrade, based on the module connected, the corresponding firmware is loaded.

The CI854B is restarted twice during the firmware upgrade. The first reset is after the CI854B firmware is loaded and the second reset is after the new stack is loaded. CI854B is reset only once, if the stack does not require an upgrade.

The CI854 PROFIBUS Hardware Library consists of single CI854 Hardware module type and this module type is same for both CI854A and CI854B firmware.

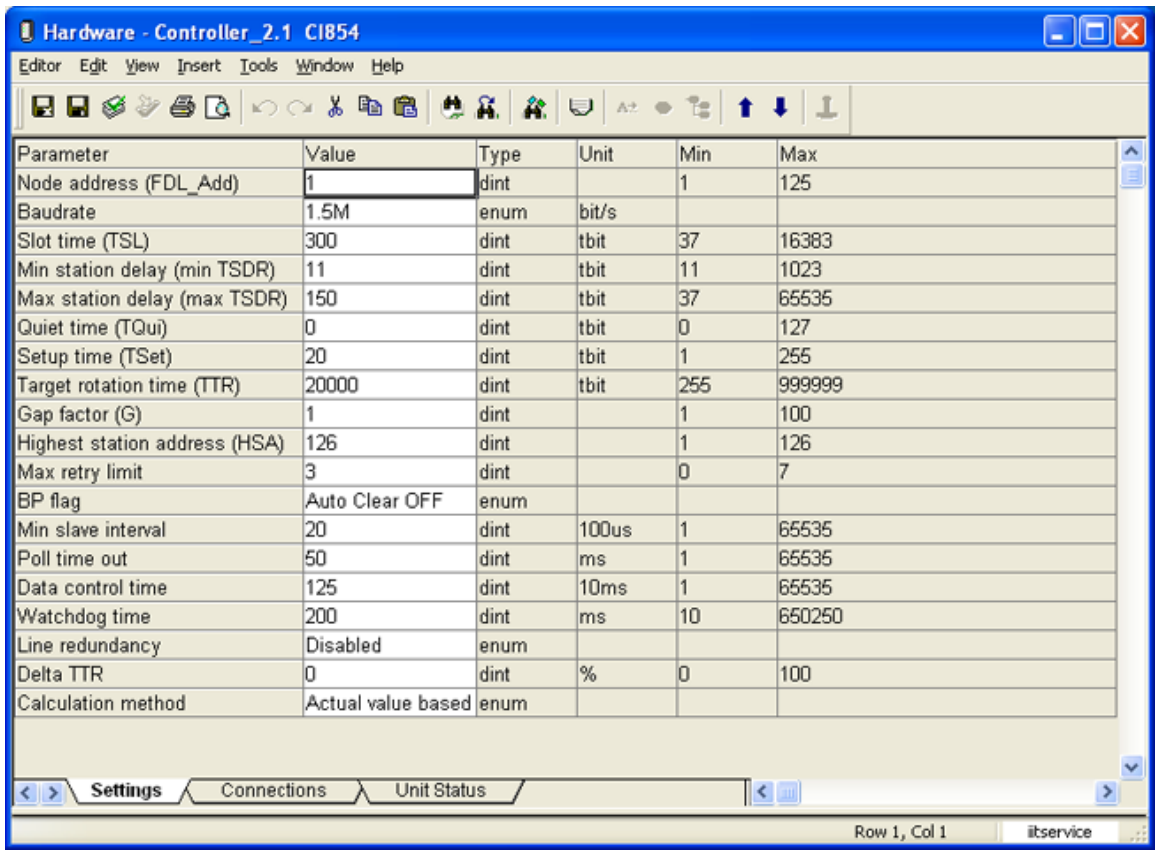
4.6 Configure the PROFIBUS Master Unit

4.6.1 Hardware Editor

Open the hardware editor via double-click on the hardware unit or choose Editor from the CI854 context menu. The hardware editor contains the following tabs: Settings, Connections and Unit Status.

Settings Tab

Figure 4.5 shows the list of default parameter values defined for CI854.



Parameter	Value	Type	Unit	Min	Max
Node address (FDL_Add)	1	dint		1	125
Baudrate	1.5M	enum	bit/s		
Slot time (TSL)	300	dint	tbit	37	16383
Min station delay (min TSDR)	11	dint	tbit	11	1023
Max station delay (max TSDR)	150	dint	tbit	37	65535
Quiet time (TQui)	0	dint	tbit	0	127
Setup time (TSet)	20	dint	tbit	1	255
Target rotation time (TTR)	20000	dint	tbit	255	999999
Gap factor (G)	1	dint		1	100
Highest station address (HSA)	126	dint		1	126
Max retry limit	3	dint		0	7
BP flag	Auto Clear OFF	enum			
Min slave interval	20	dint	100us	1	65535
Poll time out	50	dint	ms	1	65535
Data control time	125	dint	10ms	1	65535
Watchdog time	200	dint	ms	10	650250
Line redundancy	Disabled	enum			
Delta TTR	0	dint	%	0	100
Calculation method	Actual value based	enum			

Figure 4.5: Settings for CI854

These parameters are used to set up CI854. Normally, most of the parameters need not be changed. Parameters marked with a * will be calculated (during download) by the Control Builder, but may need to be adjusted due to special slaves, repeaters, or segment couplers used.

Table 4.1: Settings for CI854

Parameter	Description
Node address	This is the PROFIBUS address of the master which can be in the range 1-125. This address must differ from all other slave addresses, otherwise a compilation error is generated. Slaves are assigned their addresses according to the device numbering in the configuration. With multi-master systems ensure that there is no addressing conflict with the other masters and their slaves.
Baudrate	Supported baudrates are 9.6; 19.2; 93.75; 187.5; 500; 1500; 3000; 6000 and 12000 kbit/s. Not support are the baud rates 31.25 and 45.45 kbit/s. The default value is 1.5 Mbit/s. Higher values require careful consideration of correct cable installation. All slave devices must support baud rate setting. Some slaves require a manual reset after change of the baud rate. A compilation warning occurs if a slave does not support the selected baud rate. In this case the next lower supported baud rate will be selected automatically. If no one can be found, a compilation error will be generated. Changing the baud rate may also require changing of other bus parameters to ensure successful communication. The automatic calculation will determine the right settings. Default values of parameters at different baud rates can be found in Table 4.2.
*Watchdog time (TWD)	Each slave has a watchdog timer that is retriggered by requests from the master. If the watchdog time expires the slave outputs are set to the predetermined value. This control ensures a controlled predetermined value if there is a break in the master or the communication system. Set the watchdog time at least as long as the theoretical system reaction time (see Target Rotation Time, TTR, below). Watchdog time should be greater or equal than TTR * tbit * 10, where tbit = (1/baud rate[kbits/s]). For example, with TTR = 20000 tbit and baud rate = 9.6 kbit/s, the watchdog parameter should be greater than: 20000 * (1/9.6) * 10 = 2084 ms. For example, witch TTR = 20000 tbit and baud rate = 1.5 Mbit/s, the watchdog parameter should be greater than: 20000 * (1/1500) * 10 = 133 ms. The automatic calculation during the download prohibits a too short watchdog time and issues an appropriate warning or error message.
*Slot time	The slot time is the maximum time a master must wait for a transaction response. It must always be greater than (>)MaxTsdr + TQUI + 11 + 2 + SafetyMargin (see below for MaxTsdr and TQUI) or a compilation warning will be generated and the value will be set to the smallest one allowed. Setting it too high may slow down the performance.  PROFIBUS PA may require long settings for the slot time.

Table 4.1: Settings for CI854
(Continued)

Parameter	Description
*Min station delay (MinTsdr)	The period of time which elapses before the responder can send the response frame expressed in tbits. Slave implementation determines, however, the minimum response time. The default value is 11 tbits. Setting MinTsdr too high may slow down the performance. Settings below 11 will be overwritten with the defined minimum value 11 when closing the editor window.
*Max station delay (MaxTsdr)	The maximum time the slave is given to respond to a request message, expressed in tbits. At different baud rates it may have different values. The automatic calculation ensures that the value set in the master is higher or equal than the highest value for the connected slaves. If not, a warning or error message will be shown.
*Quiet time (TQUI)	The period of time a transmitting station must wait after the end of a frame before enabling its receiver. Its purpose is to take care of transmitter fall time after switching off the transmitter. It is significant when using self-controlled repeaters. The automatic calculation ensures that TQUI is less than MinTsdr or a compilation warning will be generated and the value will be set to the highest allowed value.
*Setup time	The time between the occurrence of an interrupt request (for example, SYN timer expired) and the necessary reaction (for example, enabling the receiver). The value depends on the baud rate.  PROFIBUS PA applications may require longer times than the default values at the different baud rates.
*Target rotation time (TTR)	The target rotation time is the anticipated time for one token rotation on the PROFIBUS network, including allowances for high- and low-priority transactions and GAP maintenance. For networks with one master it must be greater than the system reaction time. The automatic calculation for the CI854 ensures, that TTR is high enough for a single CI854 or a redundant CI854A/CI854B PROFIBUS master and all its slaves plus two acyclic communications used for toolrouting plus a safety margin according to the defined max retry limit. The calculated value may be increased to allow more acyclic traffic, if necessary.If there are other masters on the bus, the calculated value has to be increased for the time these other masters need for their cyclic and acyclic communication. Refer to the configuration of these masters.  In a multi-master system all masters must use the same value for TTR.

Table 4.1: Settings for CI854
(Continued)

Parameter	Description
GAP factor (GAP)	This parameter defines the number of token rotations between GAP maintenance cycles. The current version of the CI854 always uses a value of 1 independent of the value entered here.
Highest station address (HSA)	This parameter defines the highest station address on the PROFIBUS. Set the parameter to at least the highest number of node addresses configured for all masters and slaves present on the bus. Redundant slaves may use it for checks of the backup slave. Do not set it below the highest used (redundant) slave address. Optical link modules uses this parameter to manage the redundancy functionality. The HSA has to be at least one greater than the highest number of node addresses for masters and slaves present on the bus. It is highly recommended not to change the default of 126.
Max retry limit	This parameter indicates how often the FDL (Fieldbus Data Link Layer) must repeat the request frame when no response or acknowledge frame is received from the slave station within the slot time. PROFIBUS PA applications may require that you set the max retry limit to 3-7.
*Min slave interval	This parameter specifies the minimum time between two polling cycles for a slave to expire. The setting must be greater than the maximum value for all connected slaves, or a compilation warning will be generated and the value corrected. The value of this parameter should be set as low as possible. A large value will slow down performance on the bus
Poll timeout	In the case of master-to-master communication this parameter specifies the maximum amount of time the requester may take to fetch the response. The default for all baud rates are 50 ms.
BP Flag	This flag is disabled and cannot be edited by user. Default value for this flag is Auto-clear OFF.
*Data control time	The Data Control Time defines the time in which a master has to send his state (Stop, Clear, Operate) to the slaves. For CI854 the Data control time shall be >= 2 * Watchdog time.

Table 4.1: Settings for CI854
(Continued)

Parameter	Description
Line redundancy	If slaves are connected to both lines A and B of CI854, then set this parameter. For CI854A/ CI854 non-, if this parameter is enabled, the warning **No activity on PROFIBUS** is indicated for the specific line in case of a lost communication on that line. For CI854B, if this is disabled, line B is disabled, and no status will be updated for this line.
Delta TTR	Increases automatically the calculated TTR time (see Target Rotation Time (TTR), above). A change for Delta TTR is only needed if there is a high load of acyclic DP-V1 communication on the PROFIBUS used for toolrouting.
Calculation Method	With this parameter you can define if you want to make a calculation based on the actual entered values (Actual value based) or if the calculation shall determine the minimal possible values to achieve the fastest cycle time on PROFIBUS (Minimum value based).

Connection Tab

For CI854 a connection to the UnitStatus can be configured. For more information refer to Control Builder M online help.

Unit Status Tab

For information on the Unit Status tab, refer to Control Builder M online help.

4.6.2 Automatic Calculation of PROFIBUS Master Parameter

The easiest way to define the bus parameters is to let the system calculate them. You only have to set:

- the node address,
- the baudrate and
- the line redundancy mode

to the required values. All other parameters don't need to be changed. The Parameters marked with a * in Table 4.1 are calculated automatically during download depending on the actual configuration for the slave units.

The automatic calculation ensures that all calculated parameters will be on the safe side. This means also manual changes have to be considered. Therefore no changes of the actual settings in direction to faster but insecure values takes place.

To get the optimized values for the PROFIBUS master parameters set the parameter **Calculation method** to **Minimum value based**. The automatic calculation will now recalculate all parameters. The result is the fastest possible cycle time you can reach for the configured slaves.

If you have devices that need special settings then first proceed as described above. In a second run do the manual adjustments to the specific parameters, switch the parameter **Calculation method** to **Actual value based** and repeat automatic calculation.

4.6.3 Default Values

The following default values may be used as guidelines when setting up the PROFIBUS DP-V1 baudrate. The values are taken from the PROFIBUS standard and modified for the CI854 needs:

Table 4.2: Default Settings for different Baudrates

Parameter	Value	Value	Value	Value	Value	Value	Value	Value	Value
Baudrate	9.6k	19.2k	93.75k	187.5k	500k	1.5M	3M	6M	12M
Slot time (TSL)	100	100	100	100	200	300	400	600	1000
Min Station delay (min_TSDR)	11	11	11	11	11	11	11	11	11
Max Station delay (max_TSDR)	60	60	60	60	100	150	250	450	800
Quiet time (TQui)	0	0	0	0	0	0	3	6	9
Setup time (TSet)	20	20	20	20	20	20	24	32	48
GAP factor (G)	1	1	1	1	1	1	1	1	1
Max retry limit	1	1	1	1	2	3	3	3	4

Table 4.2: Default Settings for different Baudrates (Continued)

Parameter	Value	Value	Value	Value	Value	Value	Value	Value	Value
Min slave interval	20	20	20	20	20	20	20	20	20
Data control time	>= 2*TWD								

Some PROFIBUS slave units like CI830 and CI840 are not compatible with the parameter settings shown above. In such a case, none of the parameters above can be used. Please see also the documentation for the PROFIBUS slave type you are using.

The Control Builder M supports default values only for 1.5 Mbit/s. The default values are set by adding a new CI854 hardware unit. If you change the baudrate the current values for the other parameters will not be changed. If you also want to adapt these parameters to the new baudrate you have to do it manually.

4.6.4 Special Settings

For some devices special manual adjustments to the PROFIBUS master parameters are necessary.

Table 4.3: Adjustments to Master Parameters

Device	Parameter	Adjustment
RLM01, Repeater, Media-Converter		No adjustment is necessary if only one segment or a short optical connection is used. The automatic calculation of the PROFIBUS master parameters has taken this already into account. If the PROFIBUS consists of several segments or long optical connections are used then the settings have to be adapted to the values provided by the supplier.
Optical Media	Slot time (TSL)	Please refer to the values provided by the supplier.
Linking Device[1] LD 800P from ABB	Slot time (TSL)	Increase Slot time about 150...500[2]
	Watchdog time	The watchdog time on PA-side is fixed in the firmware of LD 800P to 5 seconds and independent from the DP-side.

Table 4.3: Adjustments to Master Parameters (Continued)

Device	Parameter	Adjustment
Linking Device[1] SK2 from P&F	Slot time (TSL)	Increase Slot time about 150...500[2]
	Watchdog time	The SK2 is working in a transparent mode. It passes through the calculated watchdog time from the DP-side to the PA-side. Because the PA-side is much slower than the DP-side, the watchdog time on DP-side has to be configured adequate to the timing constraints on PA-side. Therefore set the watchdog time to 5 seconds.
Linking Device[1] SK3 (PROFIBUS Power Hub	For more information see PROFIBUS Power Hub SK3 on page 58	
Linking Device SK1 from P&F	Baudrate	93.75k
	Slot time (TSL)	4095 / 7192[3]
	Min Station delay (min_TSDR)	22
	Max Station delay (max_TSDR)	1000
	Quiet time (TQui)	0
	Setup time (TSet)	150
	GAP factor	10

1. To get the 12 Mbit/s supported by the LD 800P, SK2 or SK3 enabled, an adaptation of the timing parameters for the slave device is necessary. This is automatically done by the Device Import Wizard during conversion of the GSD file to HWD file. If object types of the Device Library are used, they already have the timing parameters adapted for LD 800P, SK2 and SK3.
2. Increase the slot time if there is high traffic for acyclic DP-V1 communication.
3. Use this value if the total of input and output data for one PA device exceeds 253 bytes.

If necessary the watchdog time for LD 800P, SK2, and SK3 can be decreased. The exact value can be calculated based on the I/O data length, the number of PA-devices, length of PA-segments etc. For more information refer to the User Instructions for LD 800P, SK2, and SK3.

4.7 Insert a Slave Unit

To add a new PROFIBUS DP slave unit proceed as described.

1. Right-click on the CI854 you want to insert the slave unit and select **Insert Unit**. The Insert Unit dialog pops up.

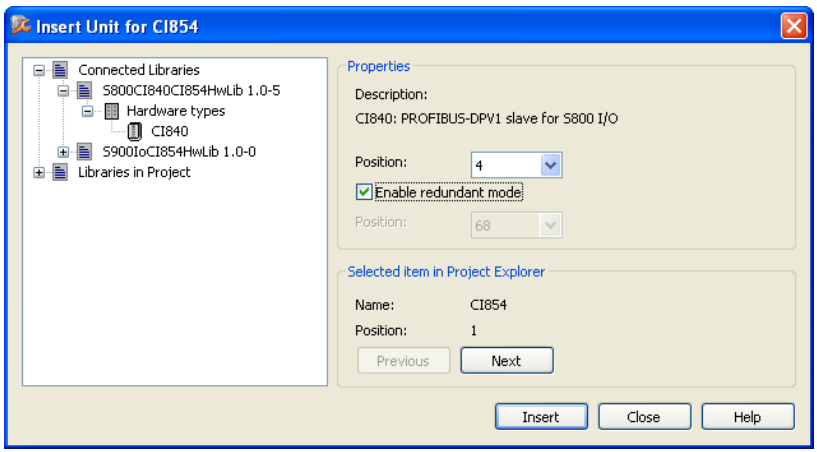


Figure 4.6: Dialog for inserting CI840

2. Expand the library for the slave device under Connected Libraries and select the slave hardware type like CI840 as shown in the example for S800. Select a position, the PROFIBUS slave address, for the hardware unit in the dialog box displayed. The first available position is chosen by default. If another position is desired, click the list box to display available positions and select the desired one.

The position configured with Control Builder M has to fit to the PROFIBUS address configured on the hardware unit itself. The configuration on the hardware unit is typically done via DIP switches. If the unit does not have a DIP switch like a PROFIBUS PA device it is possible to set its address via the PROFIBUS using the Web interface described in SetAddress on page 79.

3. If the module shall be set redundant check Enable redundant mode. The position for the backup slave will be calculated automatically and displayed (see also Slave Redundancy on page 26).

4. Click **Insert** button to apply the current changes.
5. Click **Close** to close the dialog or proceed inserting further units.
6. The hardware unit is now included in the tree. The icon shown in the tree depends on if redundancy is configured or not. For a redundant configured unit the position for the backup module is presented within parenthesis.

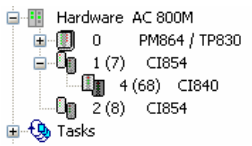


Figure 4.7: Redundant CI840 in hardware-Tree

If the FCI shall work in redundant mode, it is needed to configure redundancy in the settings tab of the hardware unit as described in Add Redundancy for Slave Unit on page 54.

7. If the slave is a modular one like S800 I/O and S900 I/O you have to add sub-units for the required functionality. Right-click on the slave unit you want to insert the I/O-modules and select **Insert Unit**. The Insert Unit dialog pops up. You can insert all sub-units before closing the dialog.

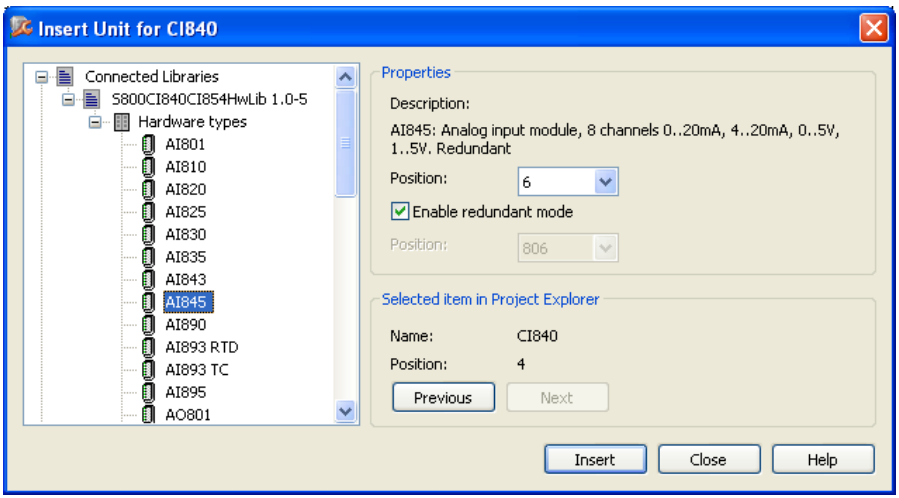


Figure 4.8: Insert Sub-Units for S800

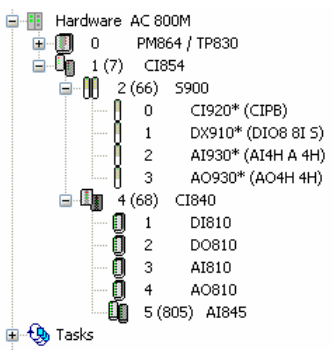


Figure 4.9: Redundant PROFIBUS with S800 I/O and S900 I/O in hardware Tree

4.8 Add Redundancy for Slave Unit

If the slave is already configured and running in single mode you can add redundancy.

1. Right-click on the unit you want to add the redundancy and select **Redundancy > Add Redundant Unit**.

2. The icon changes to the redundancy icon and the text is updated with backup position within parenthesis (see Figure 4.7). The position for the backup unit will be calculated automatically (see also Slave Redundancy on page 26). The position of the backup module is given by the fixed offset of +64 to the position of the primary module.
3. Open the hardware editor for the FCI unit and configure the parameter for redundancy in the settings tab.

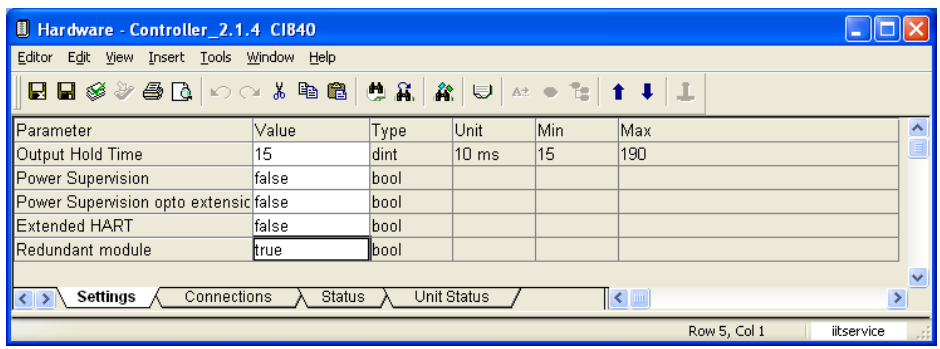


Figure 4.10: Configure Redundancy on Slave Unit

4.9 Delete Redundancy for Slave Unit

If the slave unit is already configured and running in redundant mode you can delete redundancy.

1. Right-click on the unit you want to delete redundancy for and select **Redundancy** > **Delete** .
2. The icon changes to the single icon and the position for the backup is deleted in the text.
3. Open the hardware editor for the FCI unit and configure the parameter for redundancy in the settings tab.

4.10 Insert a new Slave Type

To insert a new slave type that is not provided with the delivered hardware libraries, you have the following alternatives:

1. Use existing hardware definition file
   If you have a proven hardware definition file for the slave, you can create your own hardware library. Right-click **Hardware** and select **New Library** and define the name for your new hardware library. To insert the hardware types right-click on **Hardware types**, select **Insert/Replace Hardware Type(s)** and select the existing hardware definition file from the disk to be inserted by having the filetype set to HWD.(hwd). All hardware types defined in the hardware definition file will be available in the new hardware library.

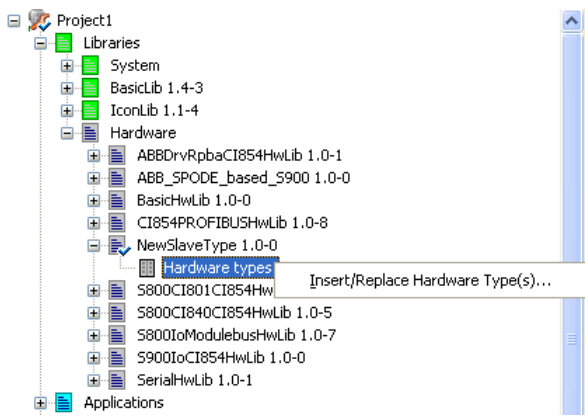


Figure 4.11: Insert Hardware Definition File for new Slave Type

2. Make GSD Import
   If you only have the GSD file for the device you have to make a GSD Import to create the hardware types. The GSD Import is done with the Device Import Wizard. First insert a new hardware library for the device. Right-click **Hardware** and select **New Library.** Start the Device Import Wizard. Right-click on **Hardware types**, select **Insert/Replace Hardware Type(s)** and select the GSD file from disk to be imported by having the filetype set to PROFIBUS (*.gs?). The Device Import Wizard will navigate you through the configuration. After finishing the Device Import Wizard the configured hardware types will be created in the hardware library.

3. Use Device Type Objects delivered with Device Library
   The Device Library provides already integrated and proven Device Type Objects for PROFIBUS DP and PA devices. You can download the Device Type Objects to your system. For more information about Device Type Objects see Device Management PROFIBUS & HART on page 60.

4.11 Configuration of PA-Devices

From Control Builder M point of view PROFIBUS PA-devices are seen like PROFIBUS DP-devices. Every PA-device needs to have a hardware definition file to get it configured on PROFIBUS. But additional configuration aspects have to be taken into account to get a proper engineering.

4.11.1 Connecting PA-Devices via Linking Device LD 800P and SK3

Due to the fact that PA is using a different transmission technology than DP, PA-devices cannot be connected directly to PROFIBUS DP. A linking device has to be used.

The Linking Device LD 800P and SK3 is the interface between PROFIBUS DP and PROFIBUS PA. The LD 800P and SK3 is a transparent gateway. PA devices are seen as DP devices on the PROFIBUS DP. The LD 800P and SK3 supports all defined baudrates for PROFIBUS DP from 9.6 kbit/s up to 12 Mbit/s.

The GSD file for PA devices normally do not support higher baudrates. At a maximum 93.75 kbit/s are entered that is used by SK1. To get the PA devices running in AC 800M also with higher baudrates, you have two alternatives:

1. Make GSD import with Device Import Wizard
   If the parameter Slave_Family is set to 12 in the GSD file, a PA device is defined. The Device Import Wizard checks this parameter and enters automatically the settings for the higher baudrates in the HWD files for these devices. For more information about Device Import Wizard see Insert a new Slave Type on page 56.
2. Use Device Type Object delivered with Device Library
   Device Type Objects delivered with the Device Library always have the higher baudrates enabled to be used with LD 800P and SK3. For more information about Device Type Objects see Device Management PROFIBUS & HART on page 60.

4.11.2 PROFIBUS Power Hub SK3

The PROFIBUS Power Hub is a Pepperl + Fuchs's new PROFIBUS DP/PA linking device, successor of the SK2 resp. The PROFIBUS Power Hub SK3, compared to SK2 and LD 800P, provides enhanced PROFIBUS functionalities. This can be configured as a DP-slave and it supports slave redundancy.

When configuring with AC 800M and CI854, only the PROFIBUS Power Hub is used with active slave functionality as non-redundant or redundant. In a full transparent mode (slave address on DIP-switch of PROFIBUS Power Hub configured > 126), the communication of CI854 with the connected PA-slaves might sporadically become faulty or it may not work. This is because in a full transparent mode, the SK3 behaves similar to the SK2, which has a transparent watchdog and a retry limit equal to 1 as a default setting. For more information see "Linking Device SK2 from P&F" in Table 4.3.

To use the PROFIBUS Power Hub as a slave device, an existing object type provided by Device Management is used. For more information about Device Type Objects see Device Management PROFIBUS & HART on page 60.

When configuring the PROFIBUS Power Hub as a slave device, the following settings for PA_Bus_Cfg_Diag module should be configured:

Table 4.4: PA_Bus_Cfg_Diag Module Settings

Watchdog Mode	Watchdog Time [100ms]	Retry Limit
Fixed	50	3 Retries

If the PROFIBUS Power Hub is configured as redundant on PROFIBUS DP, then the PROFIBUS Power Hub has to establish communication with the CI854, before communicating with the connected devices on PROFIBUS PA.

For more details about PROFIBUS Power Hub, *refer Device Management, Field IT - Linking Device Integration Pepperl+Fuchs Power Hub, 2PAA102122** manual.

4.11.3 Configuration of PROFIBUS Slave Address

PA devices have as default the position 126 configured. The position 126 can't be used for the normal cyclic communication. The position 126 is only used to identify new slaves on the PROFIBUS. You have to change the position to the correct value that is planned in the hardware tree in the Control Builder M. The configuration on the hardware unit is typically done via DIP switches. But PA devices typically do not

have a DIP switch. In this case you can set the address via the PROFIBUS using the Web interface as described in SetAddress on page 79.

4.11.4 Configuration via DP-V1

The configuration for PA-devices within the Control Builder M is only to get the device running on PROFIBUS with the cyclic DP-V0 communication. Only the I/O-communication can be configured. The internal behavior of the PA-device can only be configured acyclic via DP-V1 communication.

With the DP-V1 configuration you can change the operating mode of the device, define the fail-safe behavior, configure limit values, define filters and linearizations and adjust the calibration parameters. All this configurations may also affect the cyclic communication. If for example the operating mode is changed additional variables may be put on the PROFIBUS. As an example the temperature transmitter TF12 can be configured to provide only one temperature value, or two temperature values or also 3 temperature values. For the different operating modes specific sub-units are provided for TF12 within Control Builder M.

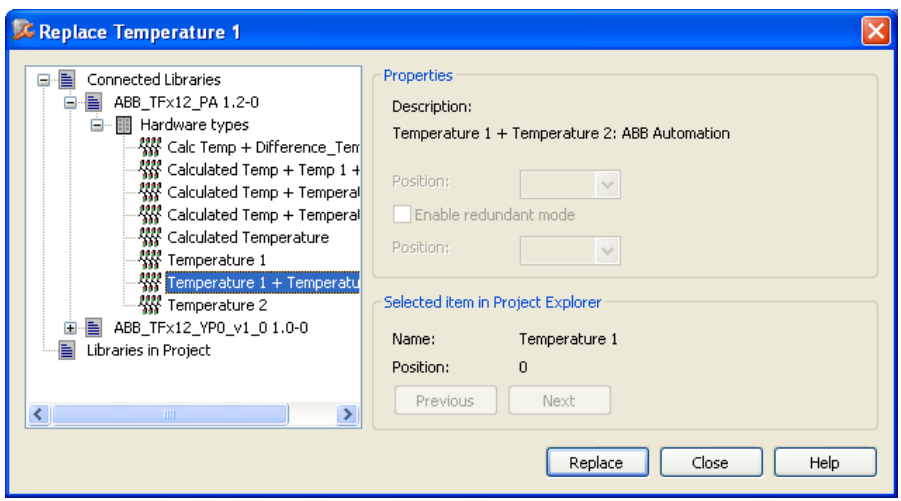


Figure 4.12: Select the Operating Mode for TF12

If you change the configuration of the PA device via DP-V1 you may also have to adapt the configuration within Control Builder M.

For DP-V1 configuration you can use a standalone tool directly connected to the PROFIBUS or the FDT/DTM concept that is directly integrated into the 800xA system. Support for FDT/DTM is given by use of the Device Type Objects delivered with the Device Library. For more information about Device Type Objects see Device Management PROFIBUS & HART on page 60.

4.11.5 Device Management PROFIBUS & HART

Device Management PROFIBUS & HART offers a large portfolio of engineering tools and Device Type Objects to be used in the 800xA system. While Control Builder Mis used for the DP-V0 configuration of the devices, Device Management is mainly used for the DP-V1 configuration.

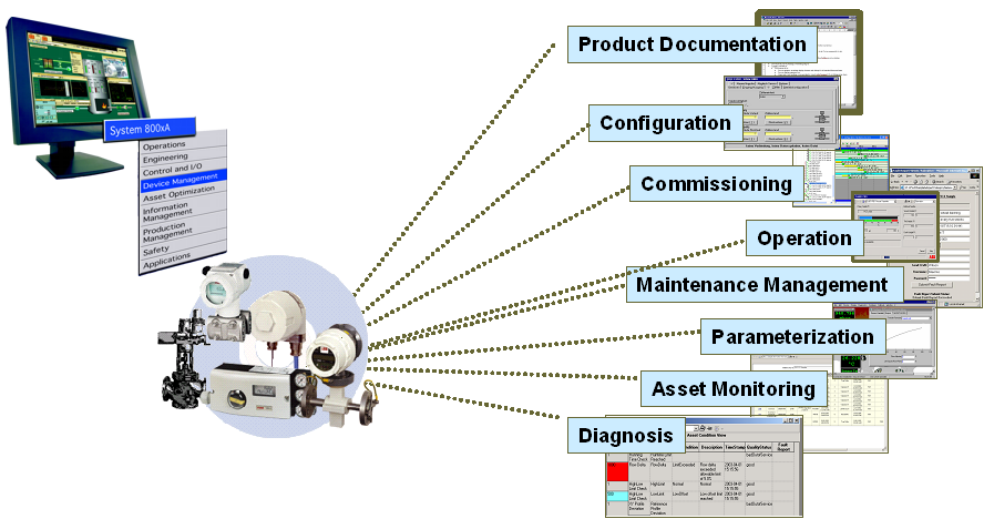


Figure 4.13: Components of the Device Management PROFIBUS & HART

The Device Type Objects are delivered with the Device Library. To get a new device integrated into your system just drag a device from the library, drop into the relevant structure, and use it in all its aspects. Device Libraries contain ABB and third party device types enhanced with the essential Aspects for

- Configuration
- Parameterization
- Commissioning/diagnosis

- Device documentation
- Asset monitoring
- Maintenance management (CMMS connectivity)
- DMS Calibration Integration.

The Device Type Object also includes a standardized and proven Hardware Definition file for the device packed in a hardware library. By use of the Device Type Object no individual import of the device with the Device Import Wizard is necessary. Furthermore you will benefit by generic solutions based on the standard Device Type Objects.

For more information, refer to *System_800xA Device Management PROFIBUS & HART, Configuration (3BDD011934*)*.

5 Download and Online Mode

This section describes how to download and go online with a project accessing PROFIBUS DP data.

5.1 Preconditions

Check the hardware configuration of the slave units and the PROFIBUS cabling especially the termination. Verify the DIP switches for setting the slave addresses. Verify that no duplicate addresses are configured.

Duplicate address of a slave station cannot be detected by a PROFIBUS master CI854A/CI854B.

Hence the effect of duplicate slave address on the PROFIBUS communication cannot be predicted. User should make sure to set unique PROFIBUS addresses for all slaves connected.

Before you can download the AC 800M controller ensure that the processor module as well as the CI854 contain the correct firmware. Refer to Control Builder M documentation and online help for further information.

5.2 Download

If you click on the download button all configuration changes will be downloaded to the system. This includes the configuration for the controller, the CI854 and the PROFIBUS slave units.

As per PROFIBUS standard implementation, the maximum length of parameter data per slave is limited to 243 bytes.

In case user adds a slave under CI854 in Control builder that has more than 243 bytes of parameter data, then the error: Too *many slave parameter during compilation*. is displayed during download.

5.2.1 Online Changes

Depending on the configuration change, Control Builder M indicates a warning in the Compilation Summary window that the communication will be lost temporarily for the listed hardware units if you proceed with the download like shown in the following figure.

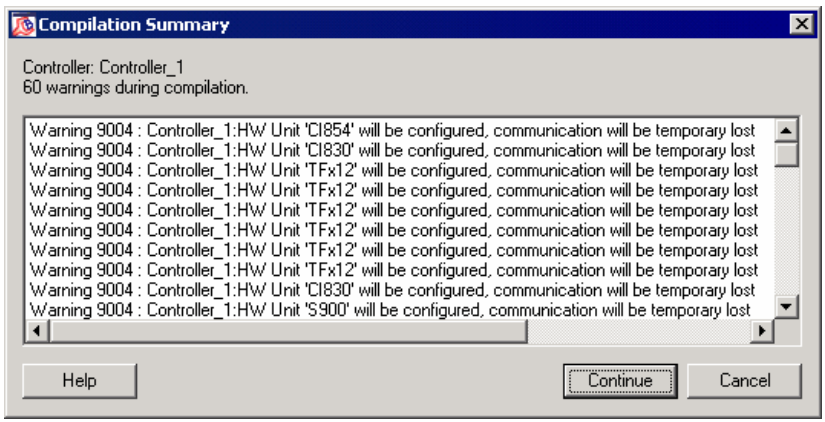


Figure 5.1: Warning: Loss of Communication during Download

With CI854 most changes can be downloaded without stopping the PROFIBUS communication. Slaves can be added, deleted or changed online. For CI854A, the would stop momentarily for change in master parameters namely, Baud rate, Node address, Minimum Slave Interval and Highest Station Address.

For CI854/CI854A, the complete PROFIBUS communication will be stopped only if one of the following bus parameters are changed:

- Baudrate
- Node Address for CI854/CI854A/CI854B
- HSA (Highest Station Address)
- Min Slave Interval

For CI854B, the complete PROFIBUS communication will be stopped if one of the following bus parameters are changed:

- Baudrate
- Node Address for CI854/CI854A
- Min Station delay
- Quiet time
- Gap factor
- BPFlag
- Poll timeout
- Data Control time

In addition a warning will be indicated if the Watchdog Time is changed. This is done because some slaves do not support the online change for the watchdog time although they should.

PROFIBUS slave unit also must support the online change of bus parameters. Otherwise the connection for the specific slave unit is disconnected for a short time.

For any master parameter change for CI854, there will be a temporary stop in communication and it will automatically resume communication with slave after the change is applied on the bus. This momentary stop in communication is because the CI854 would lock the slaves to parameterize the slaves with new bus parameters. After this, the data exchange will resume with the slaves.

For Baud rate reconfiguration to low baud rates (9.6 kB and 93.75 kB) on large PROFIBUS configuration (more number of slaves and large IO bytes per slaves), the response time from the slave is slow during download. In such reconfiguration scenarios there could be an impact of the slow response on the PROFIBUS communication.

In some cases Baud rate reconfiguration may lead to CI854A going to fault mode due to stack stop.
Workaround for the problem is to perform a hotswap of CI854A module to resume communication.
It should be anyway be known that change in baud rate would lead to momentary stop in PROFIBUS communication.

CI854A may reset for change in master parameters namely, Baud rate, Node address, Minimum Slave Interval and Highest Station Address. The communication would resume after the CI854A comes up after the reset.
In redundant CI854A, for the change in the above mentioned master parameters, both the redundant CI854A modules may reset one after the other and then the communication resumes.

5.2.2 Automatic Calculation of PROFIBUS Master Parameters

During download a calculation of the PROFIBUS master parameters takes place. Depending on the selected baudrate the settings will be recalculated. The calculation uses the actual values as an input. Based on the configured slaves with their input and output data it calculates the new values.

If the value of a parameter is changed it will be indicated in the message pane and the compilation summary window. The new calculated values are written back into the settings tab for CI854 and stored in the project as shown in Figure 5.2.

If a slave does not support the selected baudrate, the system automatically selects the next lower baudrate supported by all slaves and downloads this baudrate into the controller.

Figure 5.2 shows the different steps for the automatic PROFIBUS master parameter calculation.

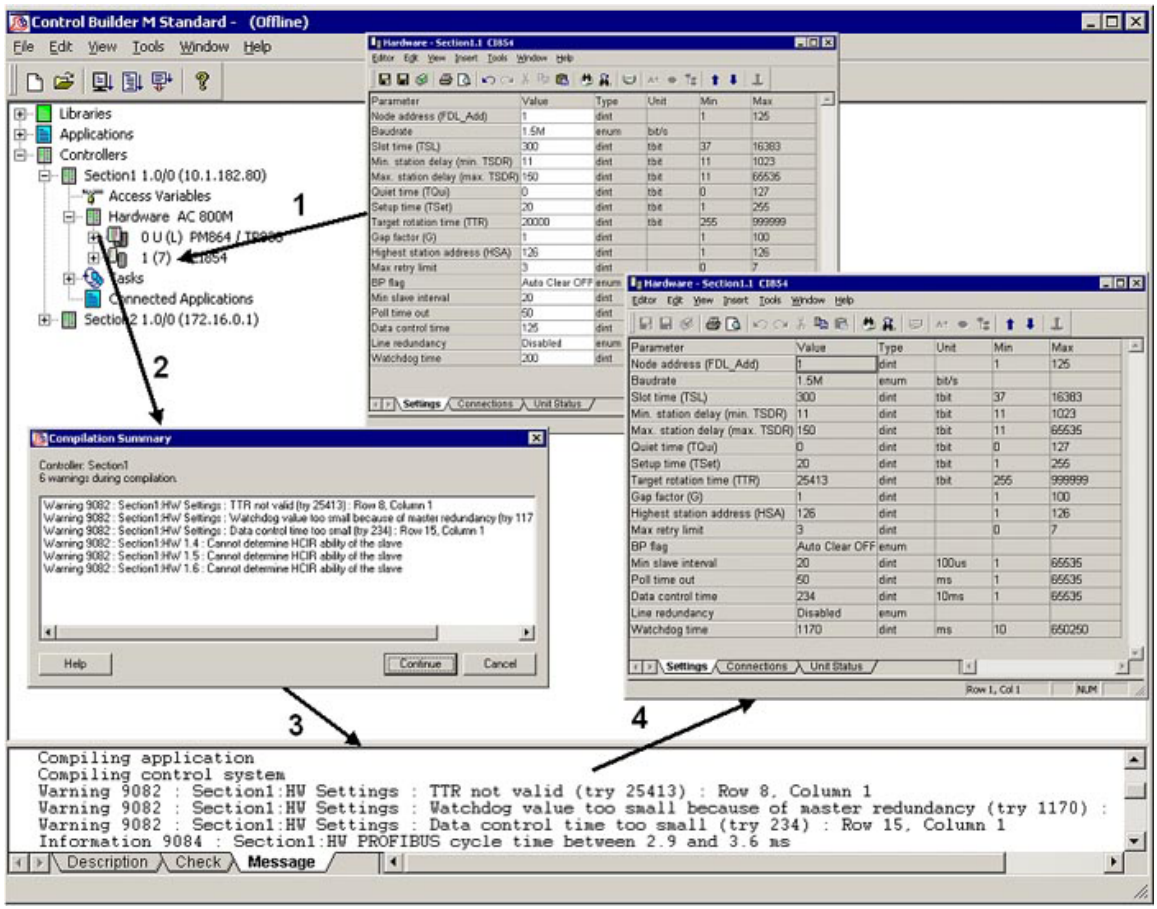


Figure 5.2: PROFIBUS Master Calculation during Download

5.2.3 Logfile

In addition to the write back of the calculated PROFIBUS parameters into the settings tab the calculation result with some extra information will be sent to a text file named Profibus_DPV1_Calculation.txt. This logfile is placed in the logfile directory, called LogFiles, of Control Builder M. The text file includes the current and previous

calculations up to a size of 1 Mbyte. The current calculation is placed at the end of the file.

If configuration or parameter data belonging to at least one slave or to the CI854 master unit is changed then the complete downloaded configuration and parameter data belonging to the CI854 master unit and all connected slaves will be written into this file.

The logfile contains also internal calculated data that are not available in Control Builder M. For the normal operation this logfile is not needed. It is mainly used for service purpose in the case of an error.

5.3 Online Data

Choose the Unit Status tab (see Figure 5.3) to get online information on the hardware status of the CI854 unit. For details refer to the Control Builder M documentation and Status Handling on page 28.

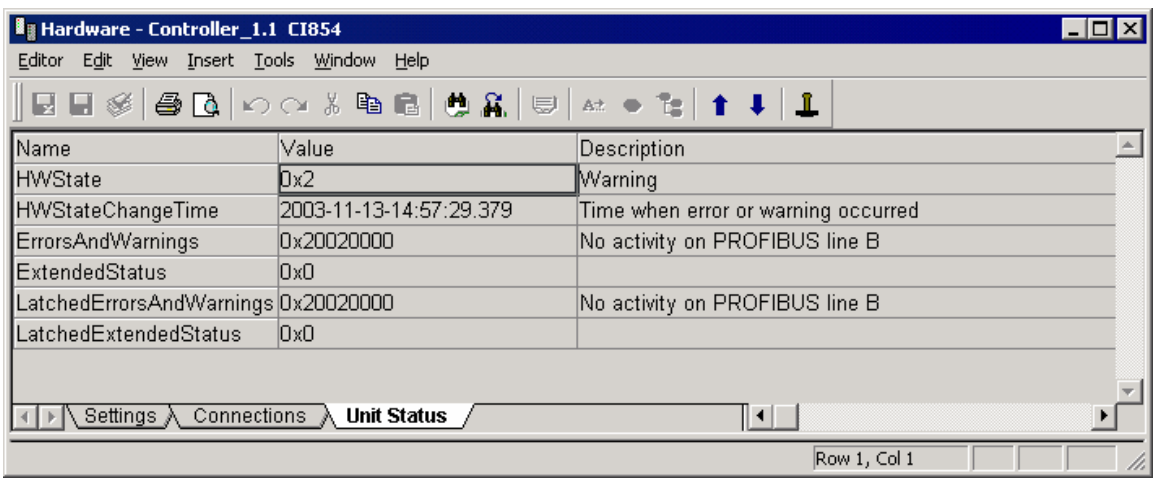


Figure 5.3: Unit Status Tab for CI854

5.4 Behavior of I/O and Communication

5.4.1 Insertion and deletion of I/O units

In case of insertion and deletion of I/O units the corresponding outputs are set to zero.

5.4.2 Connection Error

The communication between the CI854 master and the slave is monitored by both units, the master and the slave. In case of an error, specific reactions on the master and the slave side will take place.

If the CI854 master unit detects the loss of communication with the slave unit the error “Connection down” will be indicated for the specific slave. The AC 800M controller stops the copying of input data and activates ISP (Input Set as Predetermined) control for the related variables. During “Connection down” the status for Error/Warning and Alarm/Event will not change. If the connection gets re-established the status will be updated.

If the slave unit detects the loss of communication with the master unit it activates the OSP (Output Set as Predetermined) control for the related output channels.

A connection error can be caused by reconfiguration or a temporary error such as cable error. If a temporary error is corrected, the connection will be reestablished automatically.

In case of a connection error, for example due to a disconnected cable, the CI854 will keep the current values for all inputs belonging to the disturbed slave unit.

Special monitoring for Connection error for CI854

Following are the scenarios for Connection error for slaves with CI854A as master:

- For non redundant slave, the connection down is reported for the slave if the slave is not reachable for the configured watchdog time.
- For redundant slave, the connection down is reported for the slave if the slave is not reachable for (2 *configured watchdog time) +1 second.

Following are the scenarios for Connection error for slaves with CI854B as master:

- For non redundant slave and single CI854B, the connection down for the slave is reported immediately if the slave is not reachable.

- For non redundant slave and redundant CI854B, the connection down for the slave is reported if the slave is not reachable for 1 second.
- For redundant slave, the connection down for the slave is reported if the slave is not reachable for (2 *configured watchdog time).

6 CI854 Web server

The PROFIBUS web server interface provides additional feature through a web browser interface. These features are used during commissioning, maintenance or for service purpose in the case of an error.

6.1 CI854 Web Server Login Prerequisite

The web server interface can be accessed through web browsers such as Microsoft *Internet Explorer* or *Mozilla Firefox*. Before logging into web server, ensure that the following web browser settings are done in **Internet Options** > **Security** tab.

It is recommended to connect to web server from Windows 8 client machine. The browser setting changes in *Internet Options* > *Security tab* is only done to connect from a Windows 2012 R2 server.

Ensure that correct browser settings for the connection (for example, no proxy server for the controller address) are set, and the controller must be accessible from the system.

Ensure that TCP/IP forwarding is enabled on Connectivity Servers. For more information, refer to *System 800xA Network Configuration (3BSE034463*)*.

6.1.1 Web Server Login

It is recommended to connect to web server from Windows 8 client machine. The browser setting changes in *Internet Options* > *Security tab* is only done to connect from a Windows 2012 R2 server.

To overcome unsuccessful login attempt into web server, open **Internet Options** and in the **Security** tab, ensure that for all the three zones (Internet, Local Intranet, and Trusted Sites), **Enable Protected Mode (requires restarting Internet Explorer)** check box is cleared as shown in Figure 6.1**.**

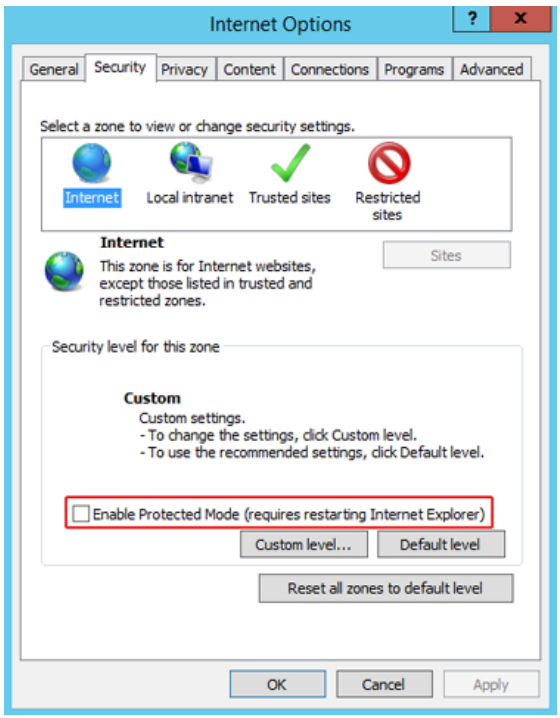


Figure 6.1: Internet Options - Security Tab, Zone Settings

6.1.2 Enable Javascript for Web Server

It is recommended to connect to web server from Windows 8 client machine. The browser setting changes in *Internet Options* > *Security tab* is only done to connect from a Windows 2012 R2 server.

To enable the javascript for using the web server, open **Internet Options** and click **Custom Level** in the **Security** tab, as shown in sample Figure 6.2.

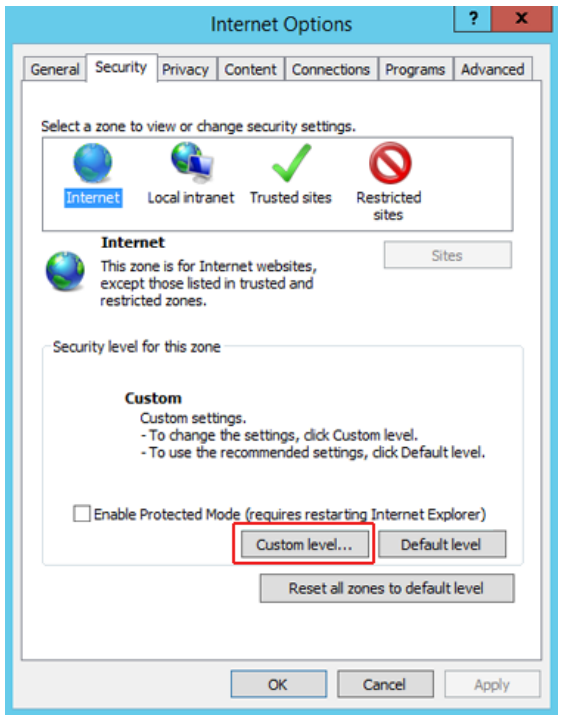


Figure 6.2: Internet Options - Security Tab

In the Security Settings, for **Scripting** and **Scripting of Java applets**, select the **Enable** option as shown in sample Figure 6.3.

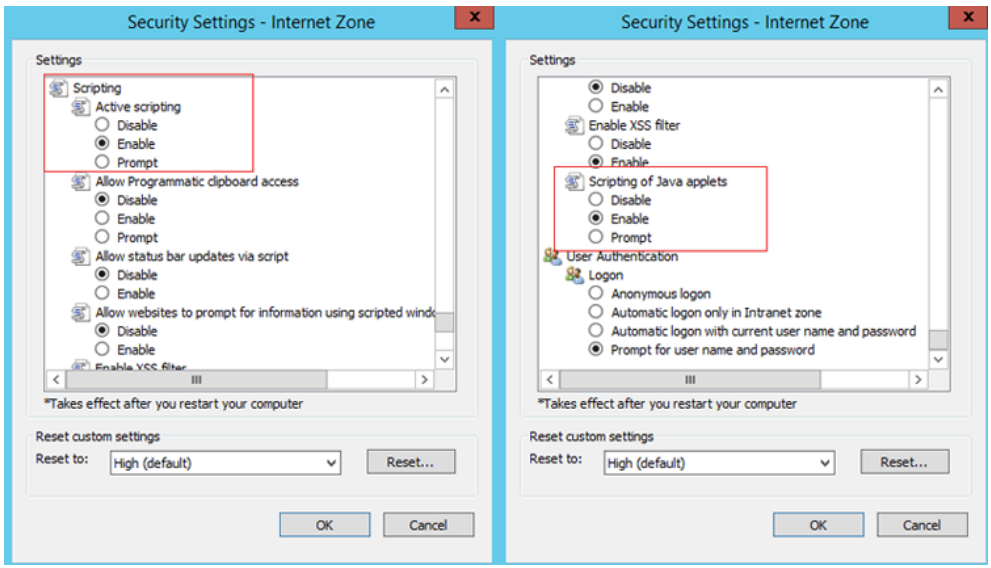


Figure 6.3: Custom Level Security Settings - Enable Javascript

Ensure that the same settings are done for all three zones (Internet, Local Intranet, and Trusted Sites).

6.1.3 Reset Web Browser Security settings for Web Server

The web browser settings mentioned in the Web Server Login on page 71 and Enable Javascript for Web Server on page 72 must be retained to its original settings after logging out of web server. This reset is done by manually changing the settings in all three zones (*Internet, Local Intranet,* and *Trusted Sites*).

6.2 CI854 Web Server Security

The web server is disabled by default. It can be enabled on request using the **Enable Web Server** option available in Control Builder. This option is visible only when the Control Builder is online and at least one of the modules CI854, CI860 and CI871 is configured

For more information on accessing the enable web server option in Control Builder and general handling of web server in controller, refer to the *System 800xA Control*

AC 800M Configuration (3BSE035980)* and *Compact Control Builder AC 800M Configuration (3BSE040935*)* Manual.

The login screen for authentication is displayed as shown in Figure 6.4. Enter the user name and password to login and access the homepage of the web server. The default user name is **service** and the default password is **ABB800xA**. To change the password please refer to Change Password on page 99.

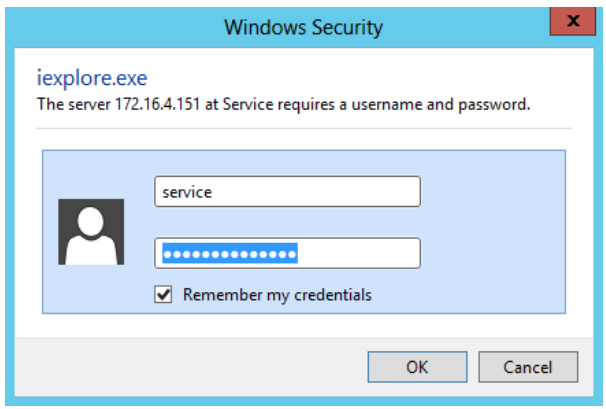


Figure 6.4: Login

The default password is **ABB800xA**. Replace this with a password that conforms with your organization's security policy at the first possible opportunity. Failure to replace the default password makes the system susceptible to unauthorized access.

Refer to the Password Security topic in *System 800xA Administration and Security (3BSE037410*)* for recommendations on establishing a password security scheme.

After firmware update to system version 6.0, the PM8xx controller password must be configured again, as the previously configured password is cleared and replaced with the new default password.

If three unsuccessful login attempts occur in a minute, the webserver is locked and can be logged in only after ten minutes.

After opening the web server interface, select the CI854 from the **Cex slot** drop-down list.

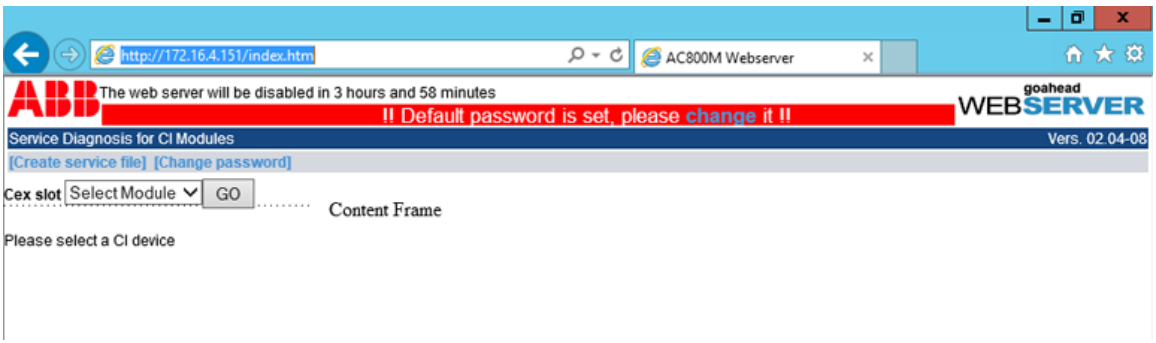


Figure 6.5: Web Interface for CI854 Service Diagnosis

The web server page is active only for 4 hours from the first login. A timer is set for 4 hours and during this limited session time, an information on the remaining time before the web server disables is shown in the browser.

When the limited activation time has expired and if the web server page is still open, a message *The web server is disabled, it can only be reenabled externally* is shown. To continue using the web server, enable it through Control Builder.

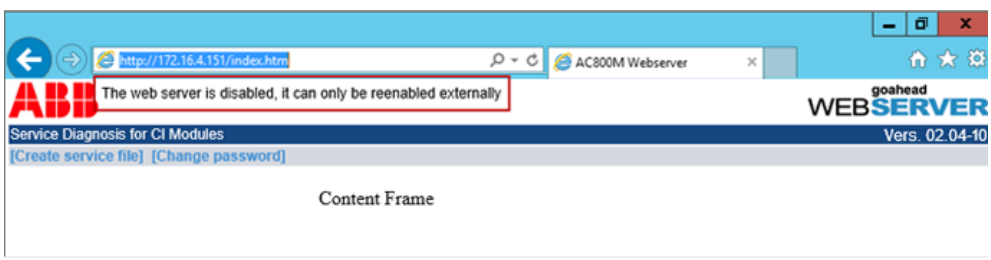


Figure 6.6: Web server Disable

Table 6.1 lists the Alarms, Events and Warnings recorded in web server. These are displayed in Plant Explorer and Hardware Status of Control Builder.

Table 6.1: Web server Alarms and Events

Message	Type	Severity
The web server is enabled, but the password has not been changed from default.	Alarm	Medium
The web server has been enabled.	Event	Low
The web server has been disabled.	Event	Low
The web server timer has been reset.	Event	Low
The controller password has been changed from.	Event	Low
Successful login to the controller from <IP>.	Event	Low
Unsuccessful login attempt to the controller from <IP>.	Event	Medium
Unsuccessful attempt for controller password change from <IP>.	Event	Medium
The web server has been enabled.	Audit Trail	N/A

6.3 CI854 Web Server Interface

The web server interface can be accessed through a web browser. To open the web server interface, enter the IP address of the controller in the address bar of the browser and press <Enter>.

The web server window has two frames. The left frame displays the menu items (Function List). Select the menu item on the left to display the respective contents in the content frame on the right.

The view of the content is function specific. For some functions only a simple printout of the available data is done. Some other functions need an additional input before the function can be operated. For those a specific input dialog opens at the upper area of the content frame.

For some specific functions that only read data an automatic refresh to update the data is supported. For those a timer can be activated. The timer is shown at the lower area of the content frame. The timer offers the possibility to change the update time.

The specific functions of the Web Interface are described in the following chapters.

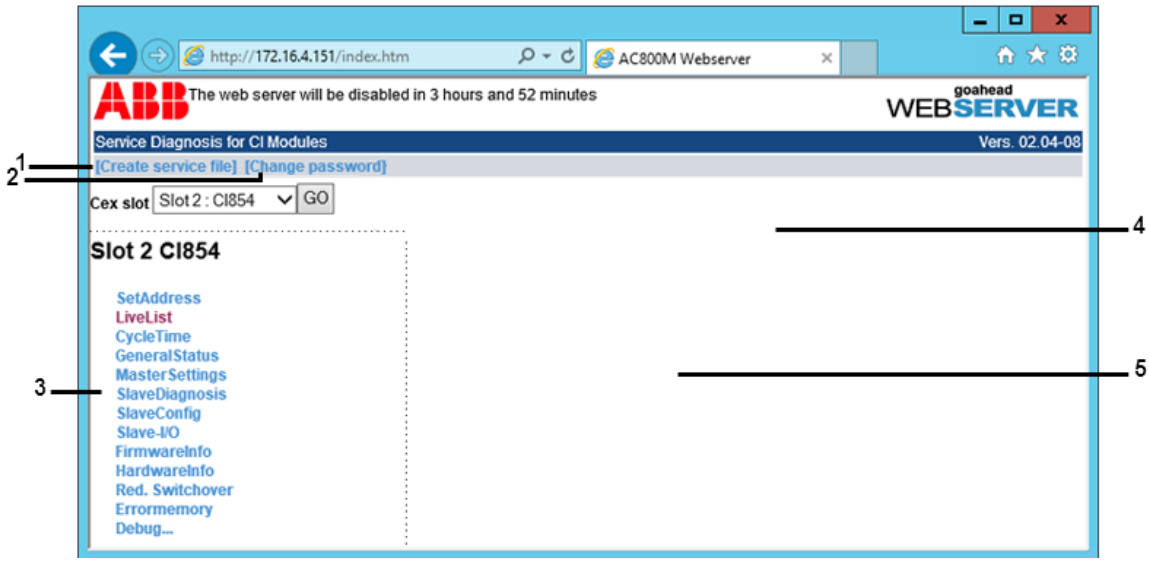


Figure 6.7: Functional overview of the Service Diagnosis

Legend	Description
1	Service File
2	Change Password
3	Function List
4	Input Dialog
5	Content Frame

6.4 CI854 web server Interface Menu Items

CI854 web server Interface displays the following menu items:

- SetAddress
- LiveList
- CycleTime
- GeneralStatus

- MasterSettings
- SlaveDiagnosis
- SlaveConfig
- Slave-I/O
- FirmwareInfo
- HardwareInfo
- Redundancy Switchover
- Errormemory *
- Debug--> DMJ Buffer *
- Service File
- Change Password
- Debug-->Set Log Filter **
- Debug-->Print Trace Buffer **
- Debug-->Reset Statistic **
- Debug-->Address Map **
- Debug-->Memory Dump **

* Valid for CI854A only.

** Valid for CI854B only

- All the Debug options mentioned above are only for debugging and used for troubleshooting.

6.4.1 SetAddress

Use this function to change the address of a connected PROFIBUS slave device.

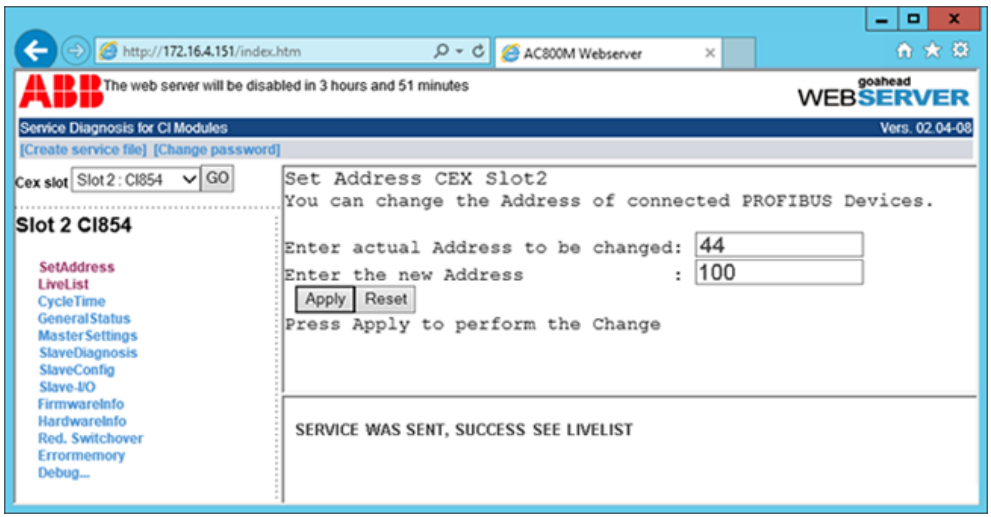


Figure 6.8: SetAddress

In the response you will get the result of the action. The result in case of an error or a successful operation will be indicated as follows:

Successful operation:	SERVICE WAS SENT, SUCCESS SEE LIVELIST
Error:	ERROR CHANGING SLAVE ADDRESS

In case of a successful operation please check that the slave is now entered with the new address in the livelist. Use the function **LiveList** to verify this.

The Reset button only resets the content of the input field.

In the case of an error please check that the slave is connected to the PROFIBUS and that it supports this service.

Check that only one slave with address 126 is connected at a time. If you have several new PA devices from the shelf all with the default address 126, then connect them one after the other to the PROFIBUS and change the address before connecting the next device.

6.4.2 LiveList

Use this function to see which devices are connected to the PROFIBUS.

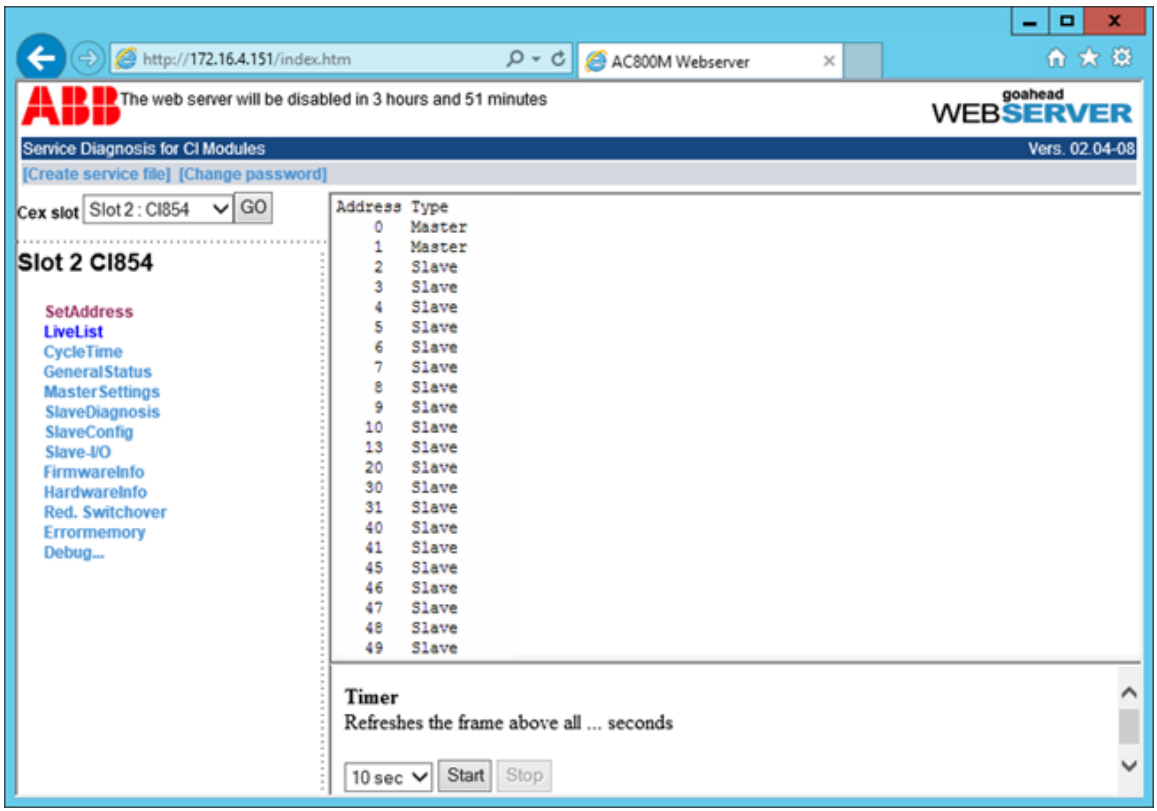


Figure 6.9: LiveList

The devices are listed together with the type information telling if it is a master or slave device sorted by the current node address found on the PROFIBUS. By activating the Refresh Timer the Live List can be updated automatically.

All devices, masters and slaves, connected to the PROFIBUS are shown, independently of it whether they are configured and in data exchange or not.

6.4.3 CycleTime

Use this function to read the current measured cycle time for the running PROFIBUS.

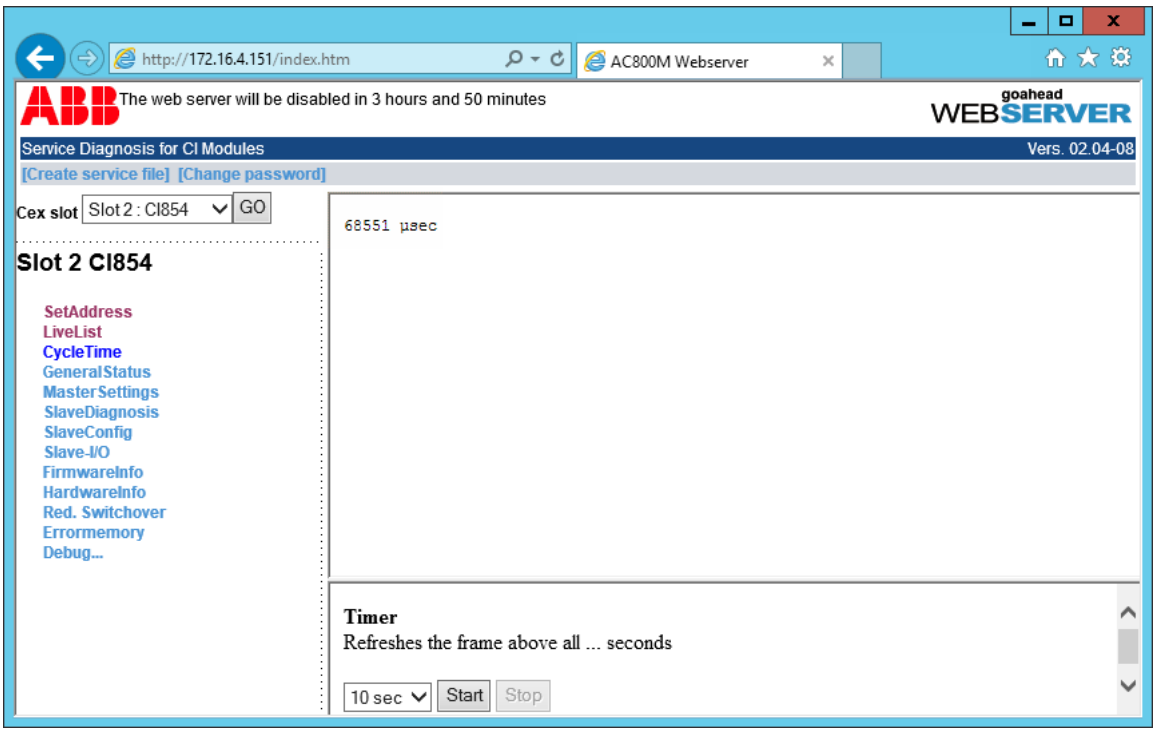


Figure 6.10: CycleTime for CI854A

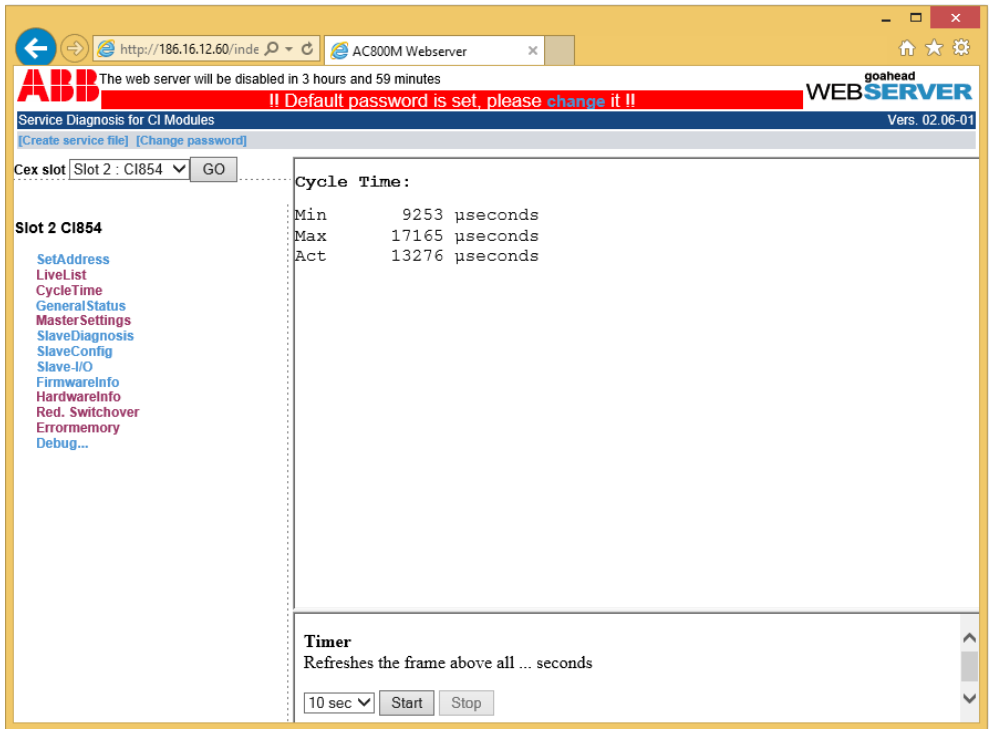


Figure 6.11: CycleTime for CI854B

The value for the cycle time is indicated in µsec. By activating the Refresh Timer the cycle time can be updated automatically.

For CI854B, along with the actual cycle time, additionally the minimum and maximum cycle time is also shown.

6.4.4 GeneralStatus

Use this function to get a general overview about the running PROFIBUS.

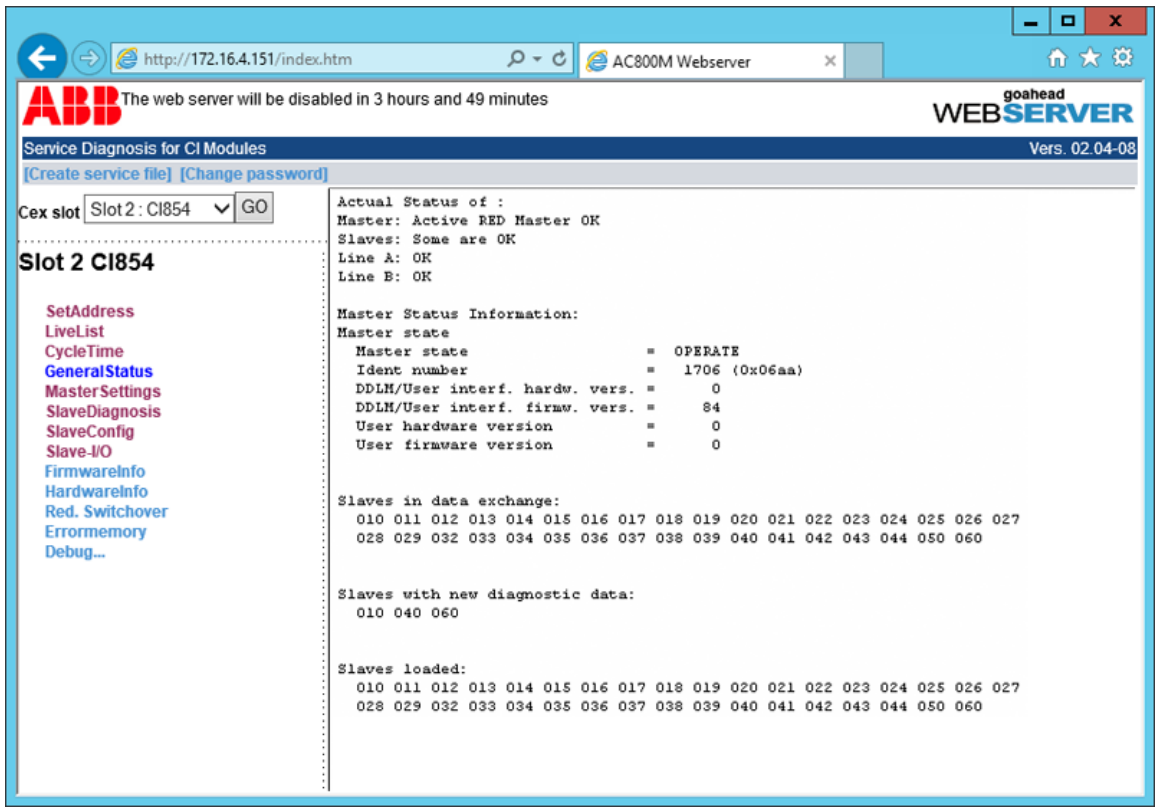


Figure 6.12: GeneralStatus for CI854A

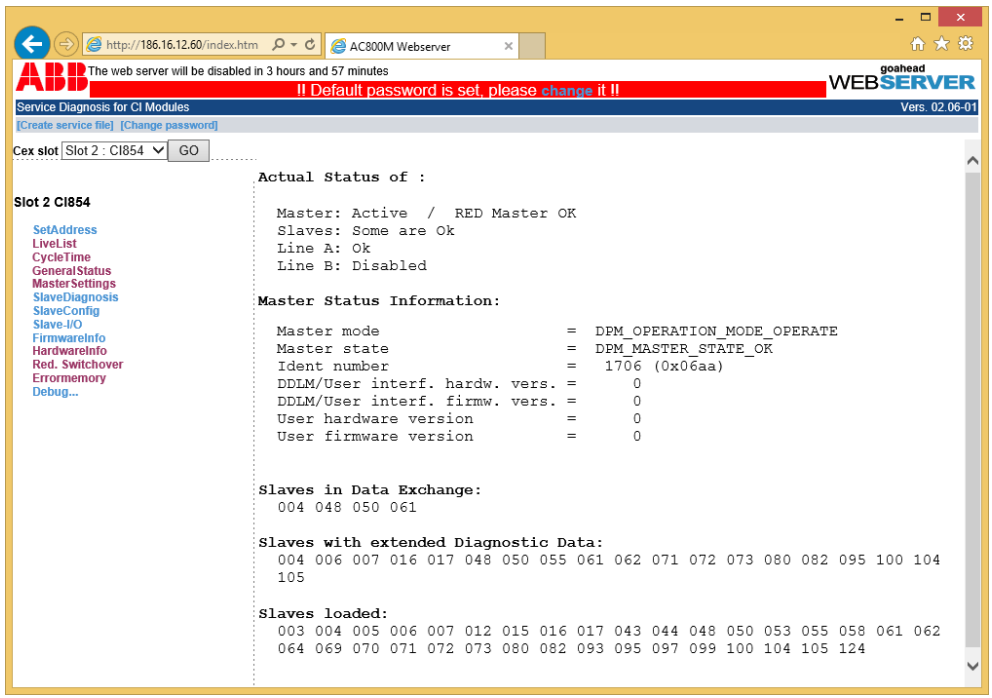


Figure 6.13: GeneralStatus for CI854B

In the content frame you will get information about:

- Master
  - Selected master is active (primary) or passive (backup or not configured); the communication to the redundant master is ok or disturbed.
  - Status of PROFIBUS Line A and B.
  - Status of PROFIBUS master. It can be in Stop, Clear or Operate mode.
- Slaves
  - List of all slaves that are in DataExchange.
  - List of all slaves that have diagnostic data.
  - List of all slaves that are configured on CI854.

In some scenarios where an actual slave with address 125 is not available on the PROFIBUS network or is not configured and there is an All Slaves failed condition, a dummy slave with address 125 is observed in the *Slaves Loaded* field when there is no other configured slave that has diagnostics data. This dummy slave is introduced as a part of the internal handling and should not be misinterpreted with an actual slave. This is applcable only for CI854A and not for CI854B.

6.4.5 MasterSettings

Use this function to see which settings are currently loaded in the CI854 PROFIBUS master unit. In the content frame you will get the following information:

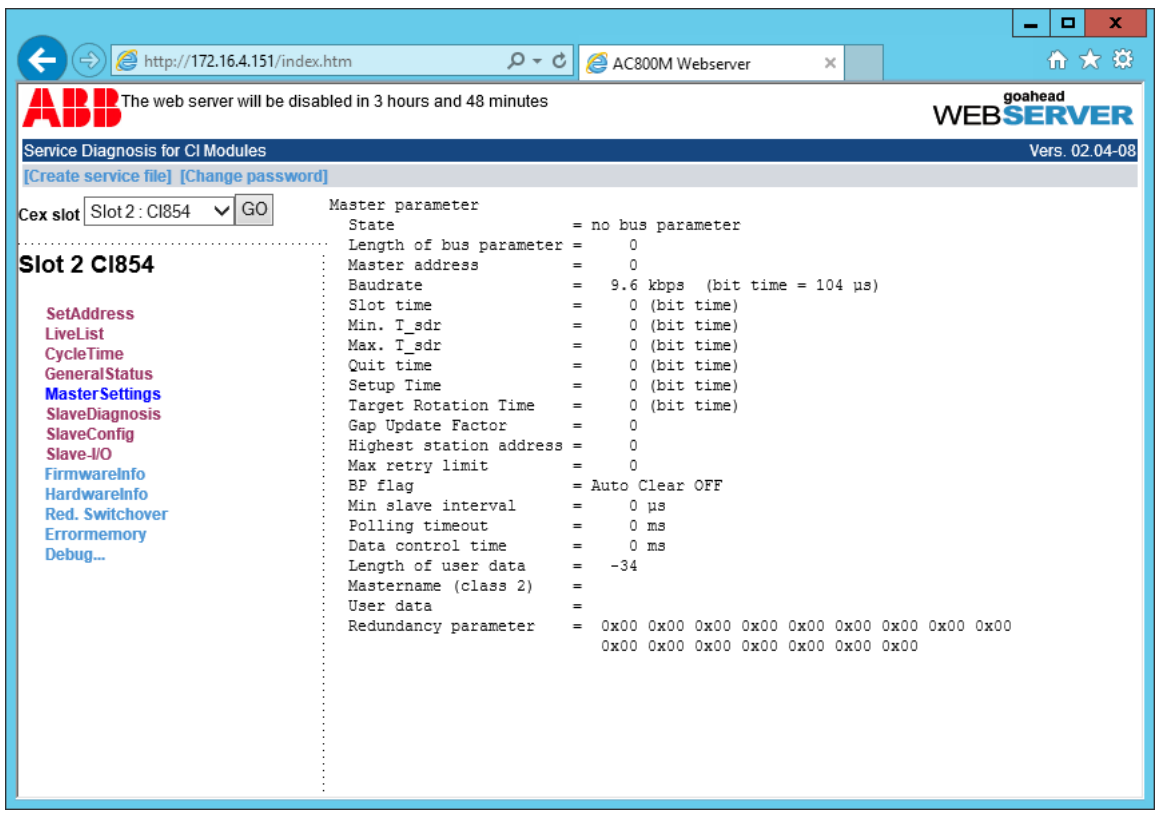


Figure 6.14: MasterSettings for CI854A

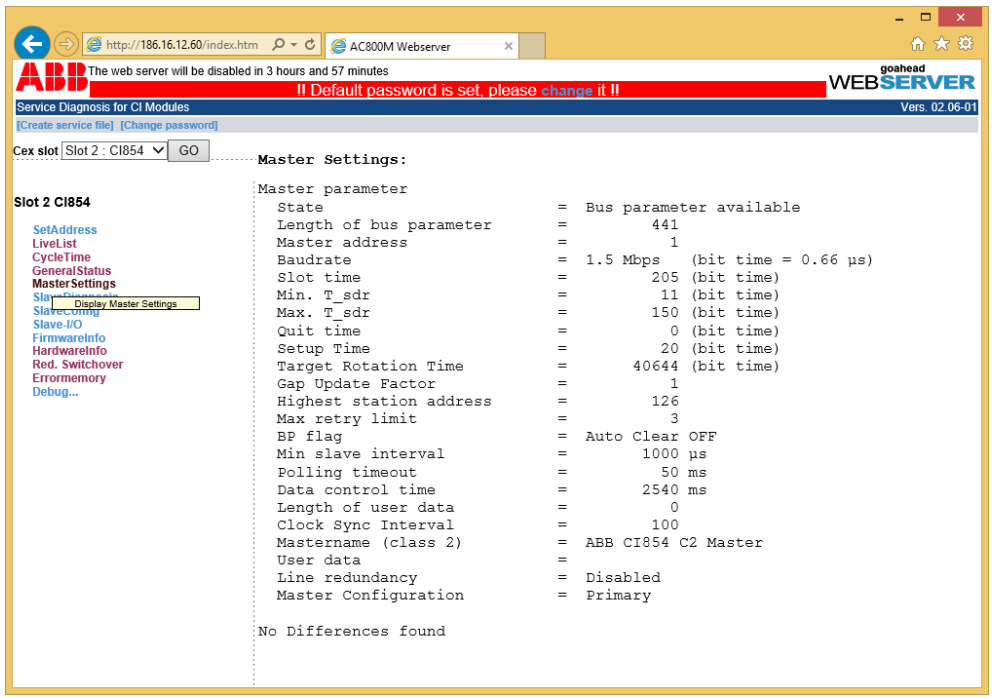


Figure 6.15: MasterSettings for CI854B

To get the current watchdog time please select **SlaveConfig**.

6.4.6 SlaveDiagnosis

Use this function to see which diagnostics are currently present in the slave unit. In the input dialog enter the node address for the slave device you would like to read the diagnostic data for. In the content frame you will get the following information:

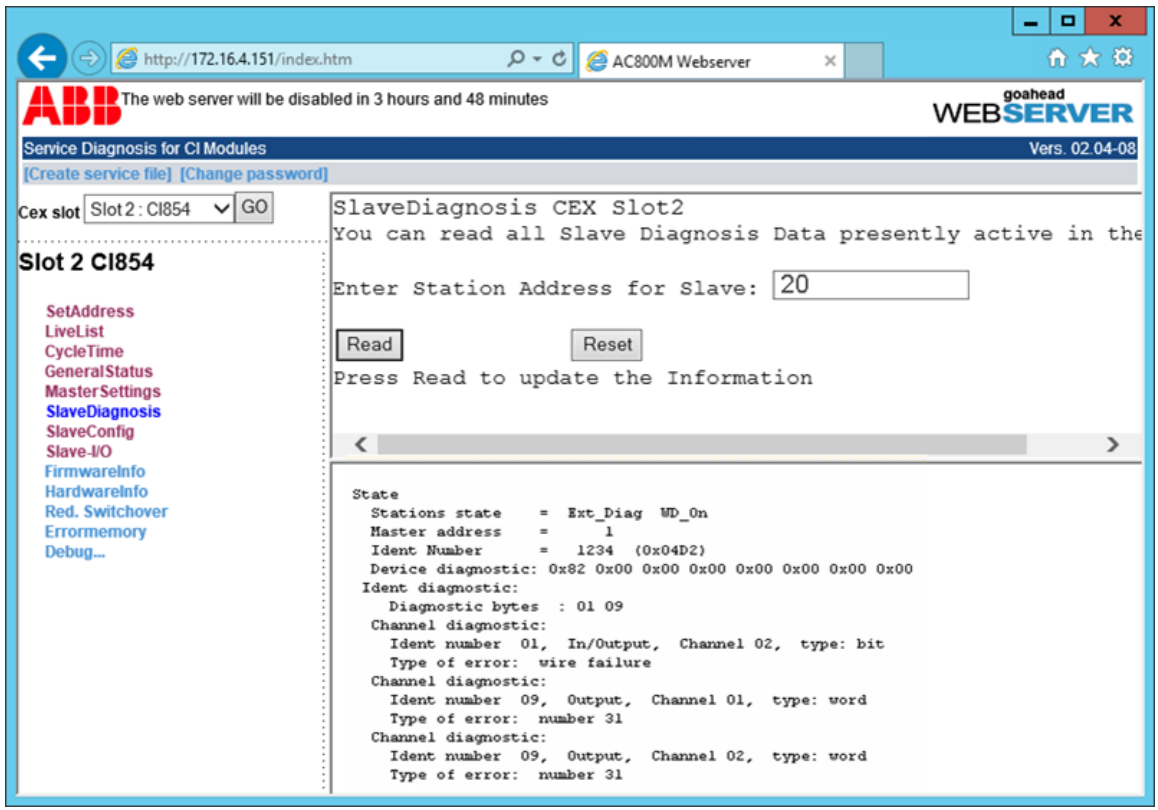


Figure 6.16: SlaveDiagnosis

If Ext_Diag_Overflow is set (shown in the stations state when active) then the slave unit has currently more diagnostics than it can indicate via the PROFIBUS diagnosis. In this case the number of active diagnosis bytes exceeds Max_Diag_Data_Len that is defined in the GSD file of the slave.

For the interpretation of “Device diagnostic” you have to compare the definitions for UnitDiagBit and UnitDiagArea in the slave GSD-file.

With the “Ident diagnostic” each module is indicated with its slot number if the module has currently diagnostic data. In the example above diagnostics are indicated for the modules with the numbers 1 and 9.

With “Channel diagnostic” the active channel errors are listed. Each error is indicated with two lines of information. The first line shows some general information. These

are the slot number of the module, the direction if the channel is an input or output, the channel number on the module and the type of the channel. The channel type can be for example word (analog I/O) or bit (binary I/O). The second line specifies the type of the channel error. If the current active error is defined by the PROFIBUS standard then the error will be indicated with the correct message like “Wire failure” as shown in the example. Otherwise only the error-code will be presented. In this case you have to check the definitions for Channel_Diag in the slave GSD-file. The example shows the current error code 31 “HART comm. error” for the analog input module of S900 that is defined by the entry *Channel_Diag(31) = “HART comm. error”* in the S900 GSD file.

6.4.7 SlaveConfig

Use this function to get the current loaded configuration and parameter data for the slave device. In the input dialog enter the node address for the slave device you would like to read the data for. Press the Read button to update the information.

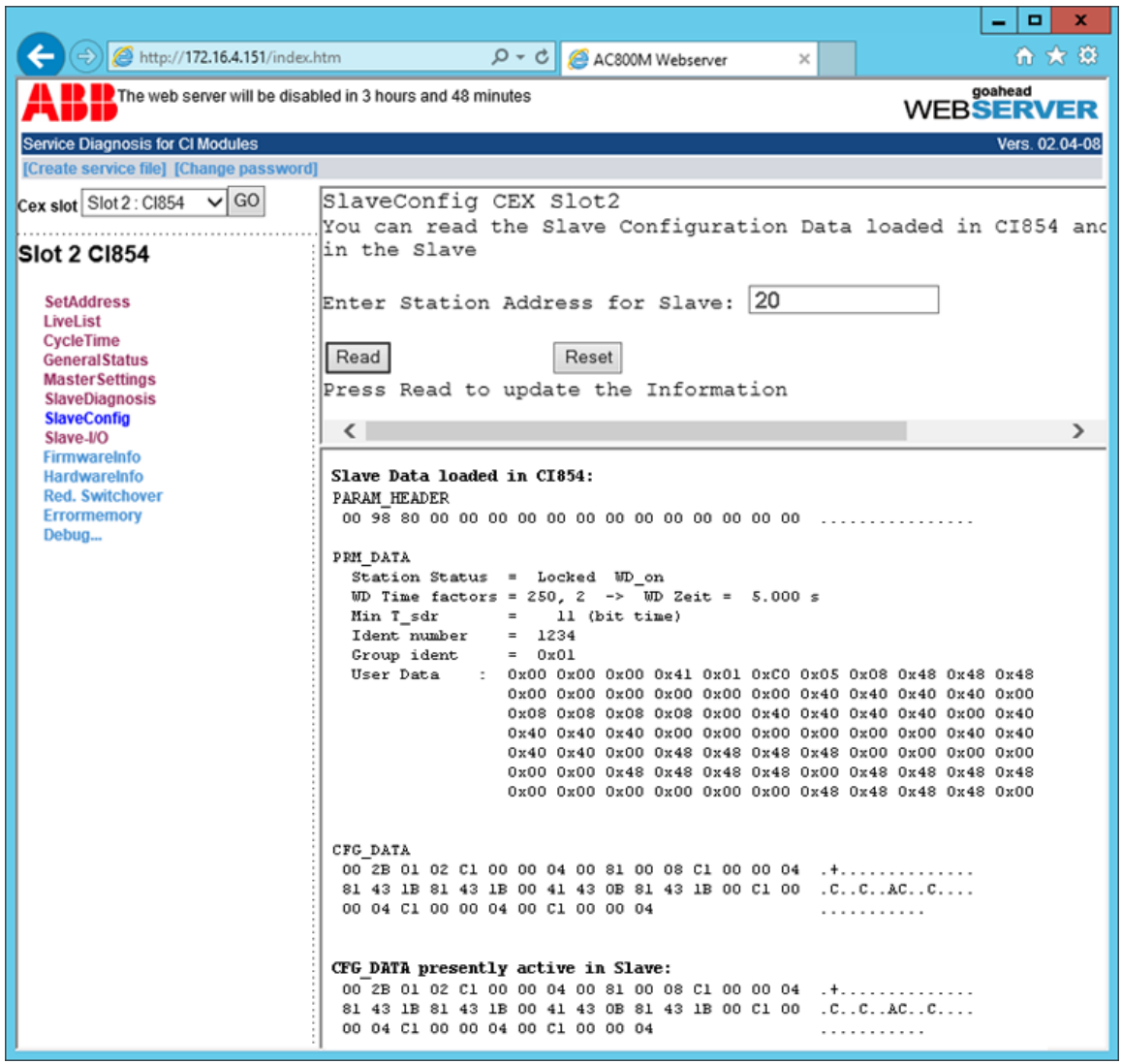


Figure 6.17: SlaveConfig for CI854A

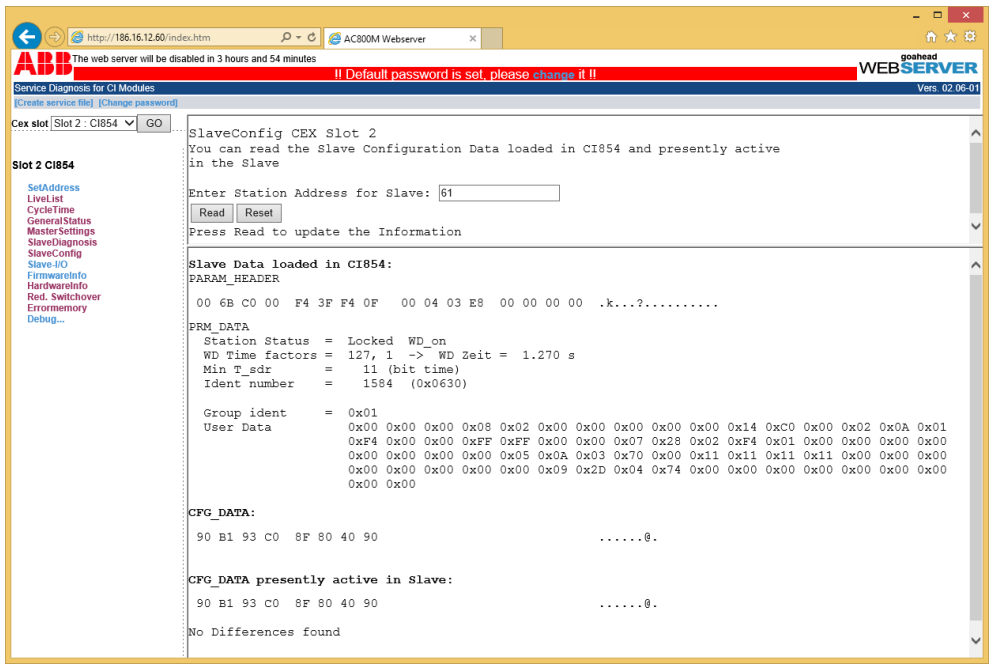


Figure 6.18: SlaveConfig for CI854B

In the content frame the parameter and configuration data downloaded to CI854 are presented for the selected slave. Also the configuration data actual present in the slave unit are shown.

If you have problems to get the slave into DataExchange, please verify that the configuration data on CI854 and on the slave unit itself are identical. In this case verify the hardware configuration on the slave itself with the hardware configuration in Control Builder M.

6.4.8 Slave-I/O

Use this function to read the input and output data for a specific slave unit. In the input dialog enter the node address for the slave device you would like to read the data for. Press the Read button to update the information.

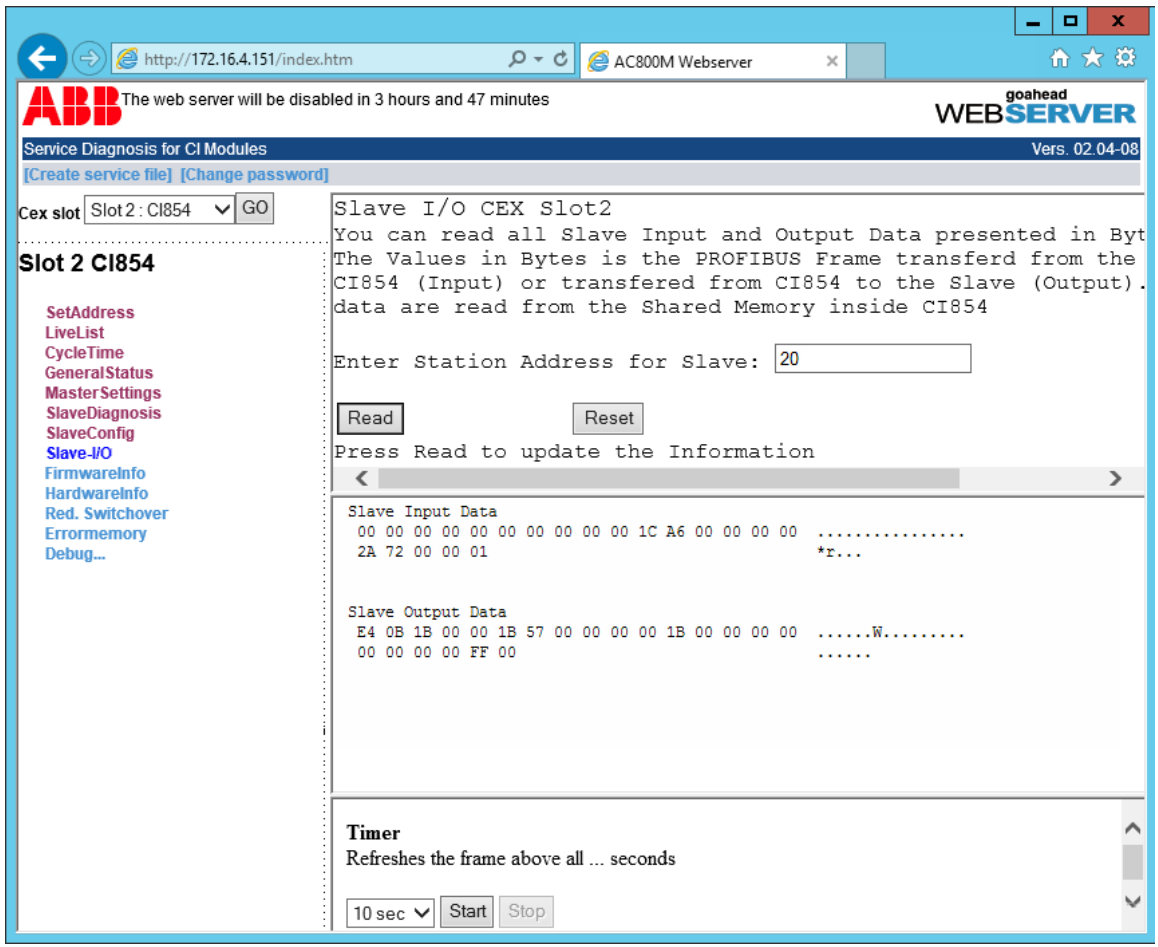


Figure 6.19: Slave-I/O

The I/O-data can be updated automatically by activating the Refresh Timer.

6.4.9 FirmwareInfo

Use this function to display the current firmware information of CI854. A sample screen shot of CI854B firmware information is shown in Figure 6.20.

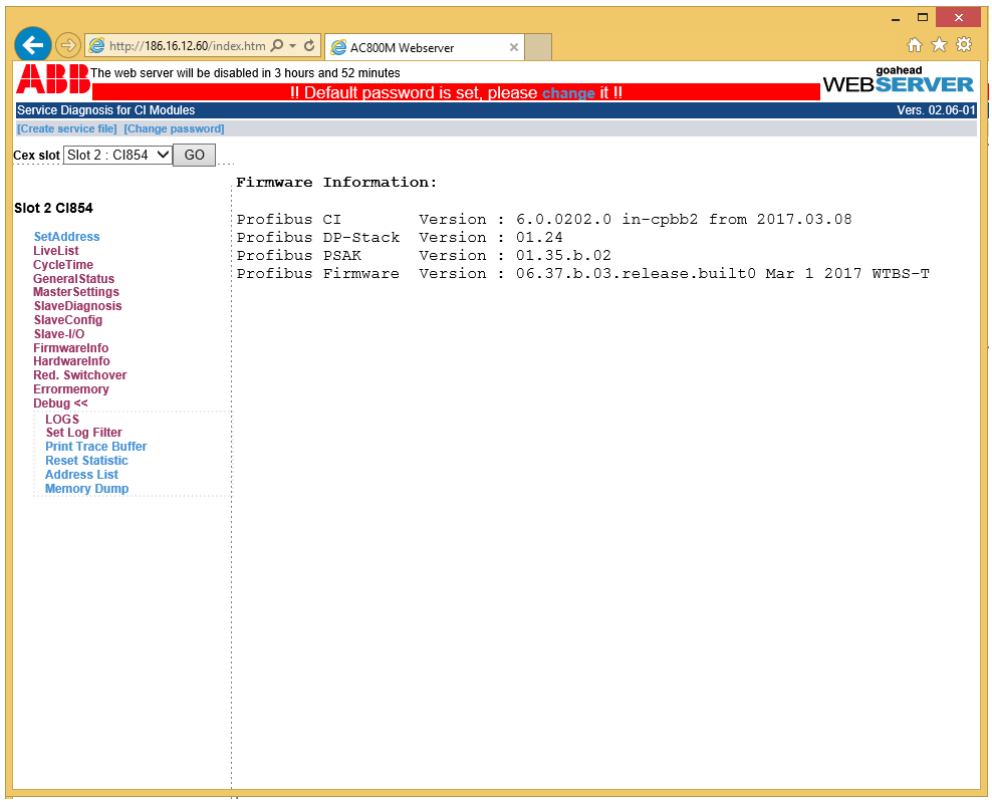


Figure 6.20: FirmwareInfo for CI854B

6.4.10 HardwareInfo

Use this function to display the current hardware information of CI854.

Hardware information page provides production details of the CI854 module. For example: Module type, Serial number, Inspection date, and so on.

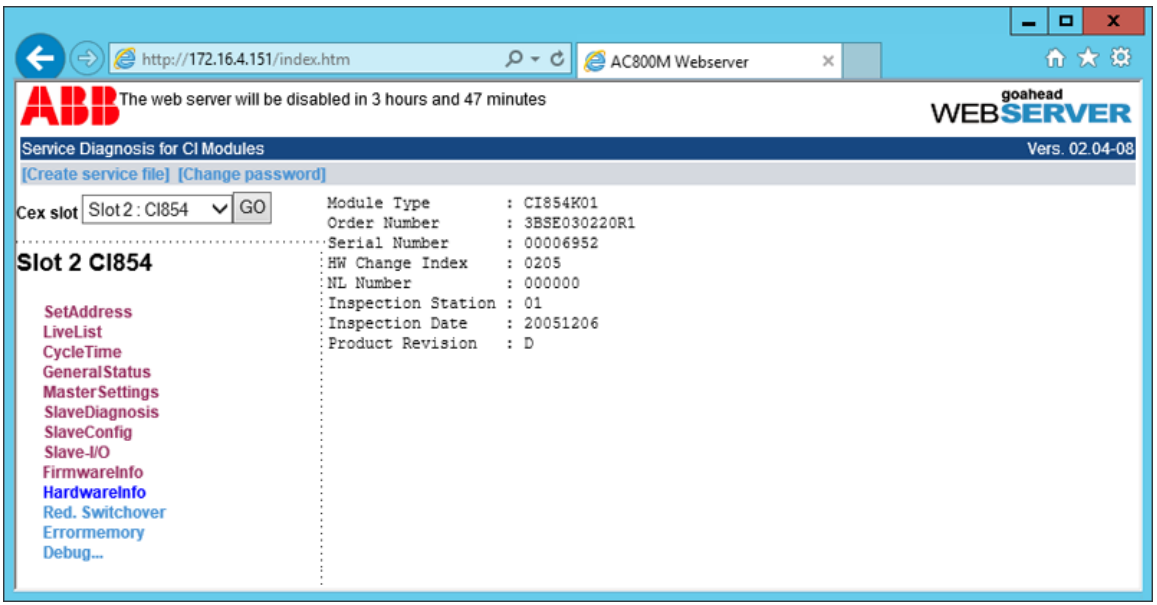


Figure 6.21: HardwareInfo

6.4.11 Redundancy Switchover

Use this function to perform a redundancy switchover of a connected PROFIBUS slave device. In the input dialog enter the node addresses for primary and backup slave you would like to perform the switchover for. Press the Apply button to perform the switchover.

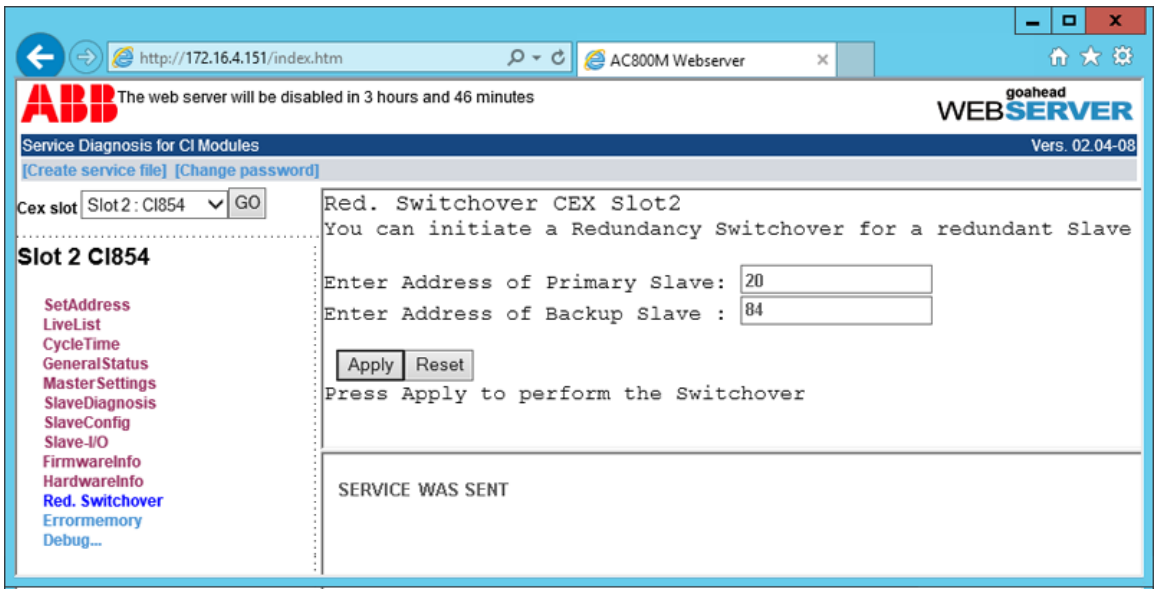


Figure 6.22: Redundancy Switchover

In the response you will get the result of the action. The result in case of an error or a successful operation will be indicated as follows:

Successful operation:	SERVICE WAS SENT
Error:	Error performing function

In case of a successful operation it has to be checked on the slave itself that the switchover took place.

The function Redundancy Switchover only works with slaves that support the PNO slave redundancy.

6.4.12 Errormemory

This information is of relevance only for the ABB service engineer in case of an error.

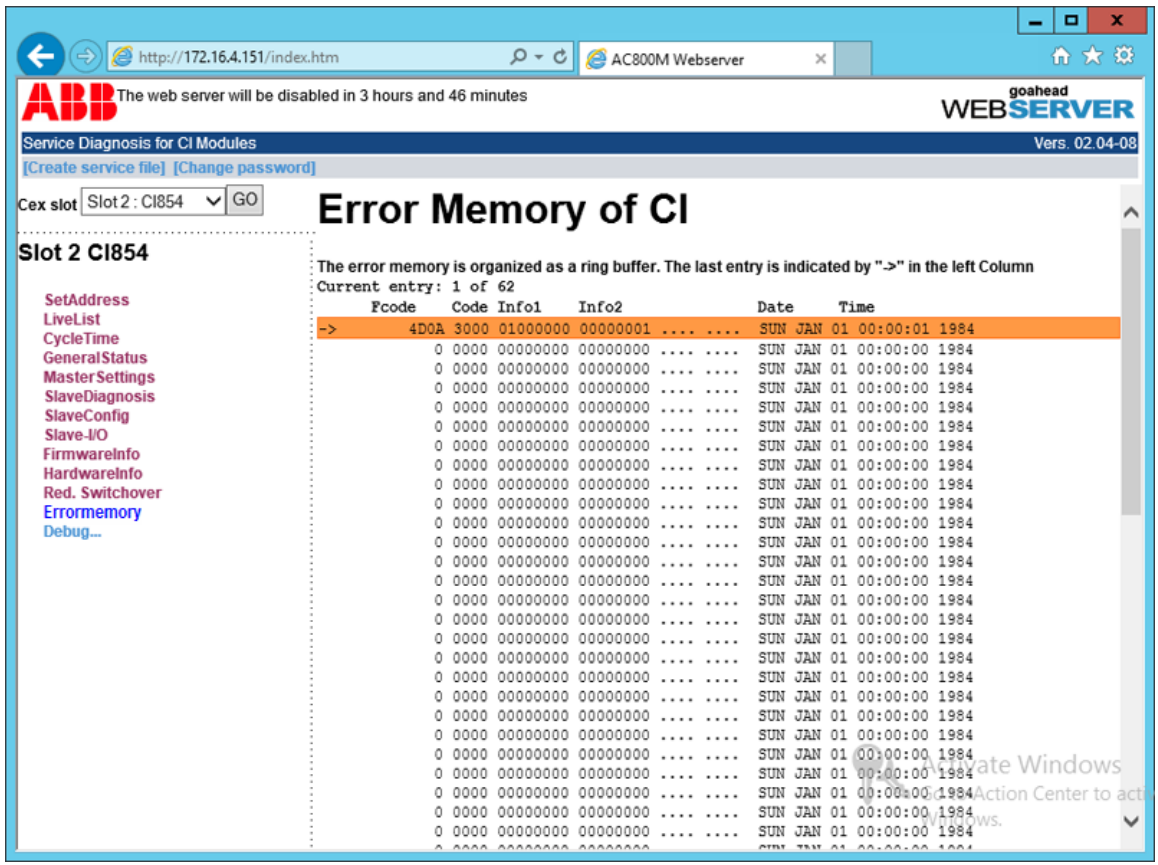


Figure 6.23: Errormemory

If you are supposed to provide the Errormemory then please provide it always as a textfile and not as a screen dump. Preferable use the **Create service file** functionality for that.

6.4.13 Debug, DMJ Buffer

With Debug<< a submenu can be started. This information is of relevance only for the ABB service engineer in case of an error. As the most useful information the DMJ Buffer is mentioned here. The DMJ Buffer is a journal memory and very helpful in addition to the Errormemory. To get access to the DMJ Buffer select Debug <<, DMJ

and then BUFFER. In the Input Dialog you do not have to enter anything, click the Read button.

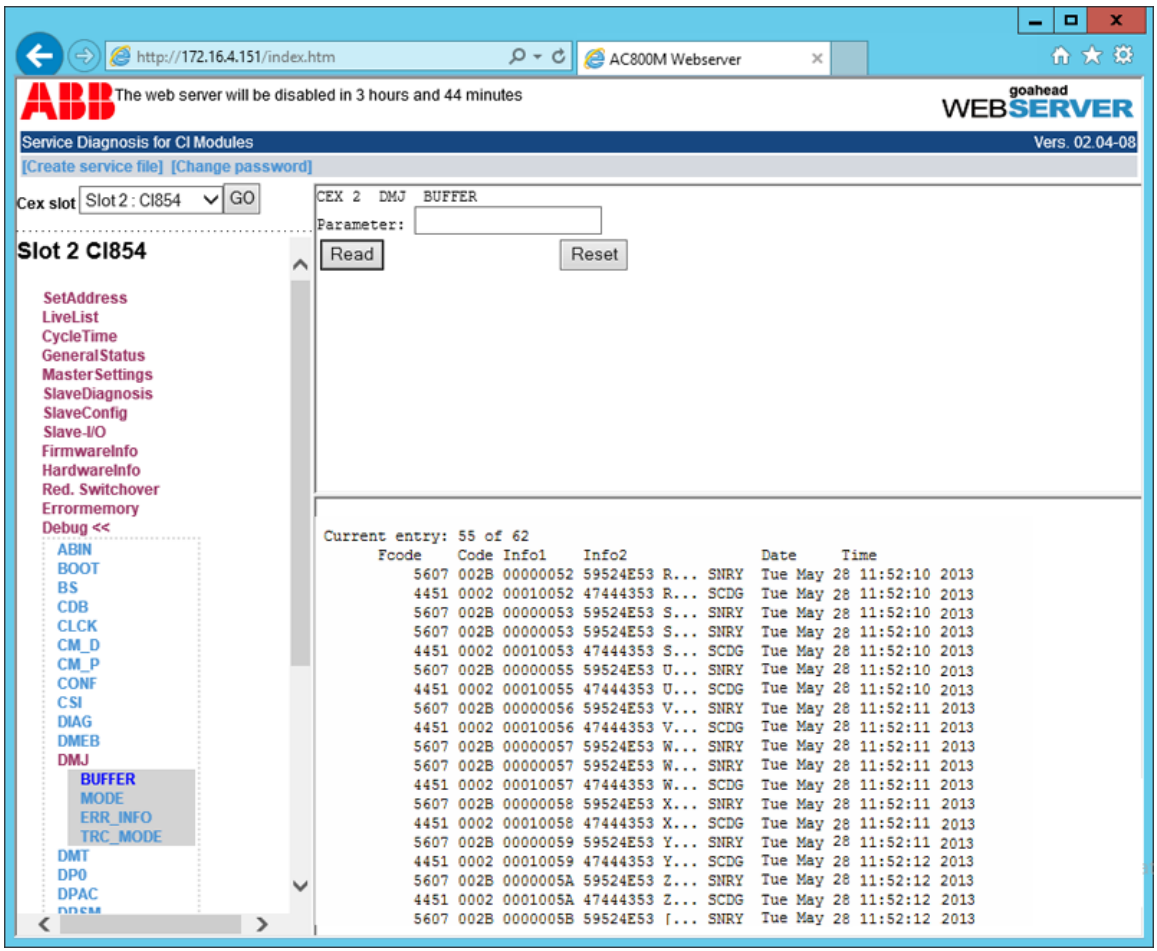


Figure 6.24: DMJ Buffer

If you are supposed to provide the DMJ Buffer, then always provide it as a textfile and not as a screen dump. Preferably use the “Create CI854 service file” functionality for that.

6.4.14 Debug

The debug options for CI854A and CI854B are different and these are used for troubleshooting and debuging problems.

6.4.15 Service File

The Web Interface supports the functionality to automatically collect the most needed information in case of a support action into one file. This service file contains all information that is accessible via the function list instead of slave specific data.

To create the service file select **Create service file** in the upper left corner of the browser window. A dialog opens to select the CI854 you would like to collect the data for. To have all information in place always select all modules.

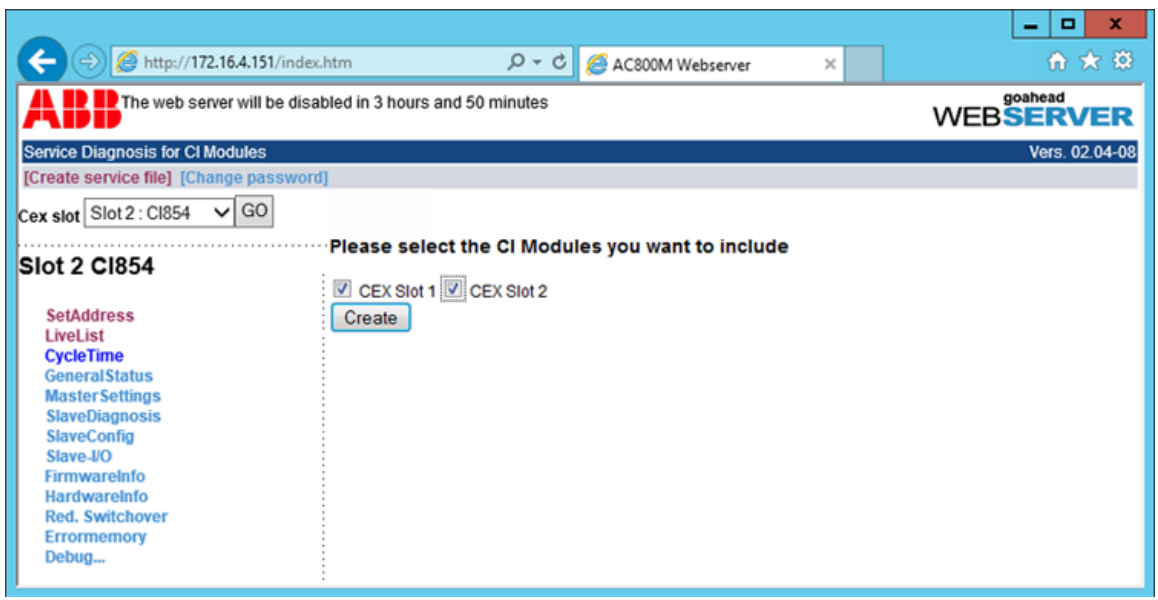


Figure 6.25: Select CI854 for service file

Select Create to start the download. A download window opens and assists you to write the service file to disk.

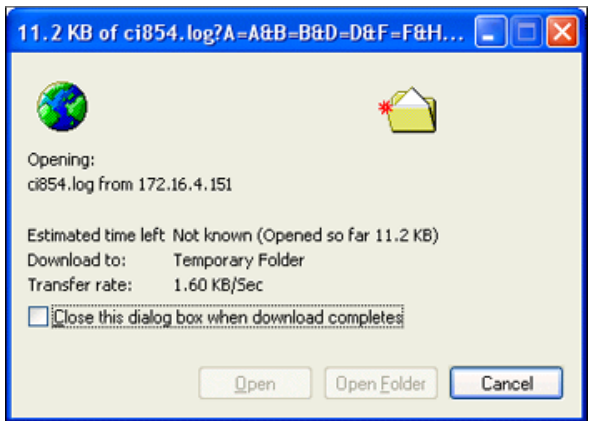


Figure 6.26: Downloading service file

DMJ buffer is applicable only for CI854A and not for CI854B.

6.4.16 Change Password

The controller password should not be changed when several users are using the web server at the same time. If several web browser pages are connected to the web server, close all except for one before changing the password.

The **Change Password** page is used for changing the default password of the web server. The web server page displays a caution to change the default password, when a user login for the first time as shown in the Figure 6.4. The caution is displayed for every login, until the default password is changed to a new password.

After the controller password has been changed through web server page, a login window appears, you need to login again with the new password.

To change the password from default, select the **Change password** option available at the top left corner of the browser window. Enter the current and the new password and confirm the new password.

A successful operation is confirmed with a message *Change password succeeded*. The new password is active immediately and stored nonvolatile in the AC 800M controller.

6.4.17 Reset Default Password

Use the IP Config Tool to reset the controller password to default password. Perform the following to reset the default password:

Ensure that the COM port of the PM8xx controller is connected to a COM port of the computer through a serial cable (If it is a PM86x controller, the port of the controller to be connected is the marked **COM4**.). In the IP Config tool select the COM port of the computer that is connected to the controller.

1. Open **IP Config** and select **Settings** menu.

   From the **Com Port** context menu, select the corresponding Com port of the computer. In this example, **Com1** is selected as shown in Figure 6.27. After selecting the COM port, click **Connect.**

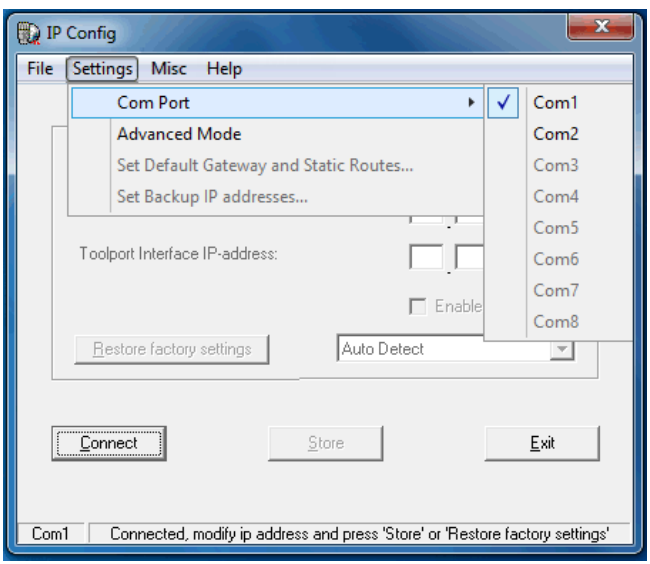


Figure 6.27: IP Config Tool - COM Port Settings

IP Config tool can be started only after a long reset of the controller. Later a fresh download is performed, as the configuration is erased during reset.

2. In the **Misc** menu, click **Reset Controller Password**.

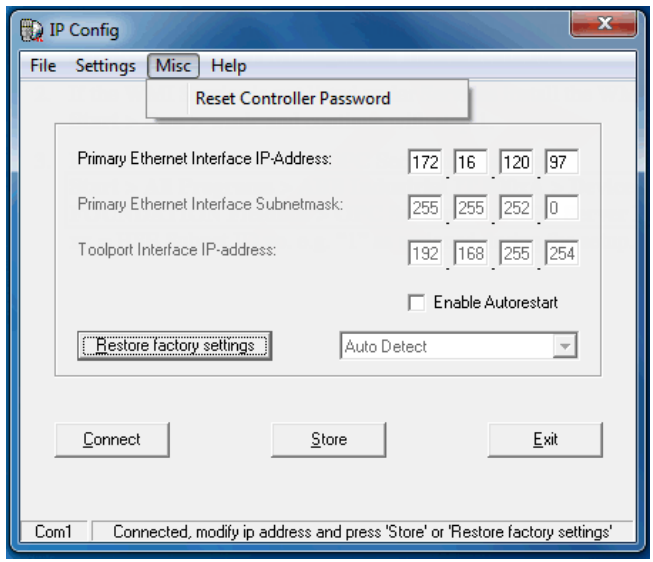


Figure 6.28: IP Config Tool - Reset Controller Password

3. A confirmation window, *The Controller password has been reset* appears.

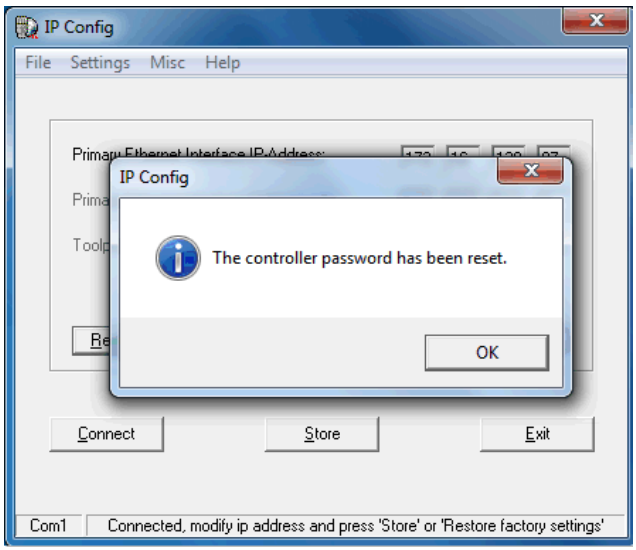


Figure 6.29: Reset Password - Confirmation Window

Appendix A Revision History

This section provides information on the revision history of this User Manual.

The following table lists the revision history of this User Manual.

Revision Index	Description	Date
-	Published for System 800xA 6.0	December 2013
A	Published for System 800xA 6.0	April 2016
C	Published for System 800xA 6.0.3.2	February 2018

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3BDS009030-600 C