TECHNICAL BULLETIN

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[Title] Troubleshooting for safety controller (MELSEC-WS series)
[Date of Issue] August 2010 (Ver.A: March 2011)
[Relevant Models] MELSEC-WS series
(WS0-CPU0, WS0-CPU1, WS0-MPL, WS0-XTIO, WS0-XTDI,
WS0-4RO, WS0-GETH, WS0-GCC1)

Thank you for your continued support of Mitsubishi safety controller, MELSEC-WS series.

This bulletin describes meaning of items in Diagnostics, major error codes, their causes and corrective actions, and parameter setting for safety I/O module to supplement the descriptions in the manuals.
Please perform your troubleshooting in accordance with this bulletin.
And please read related manuals additionally for your operation.

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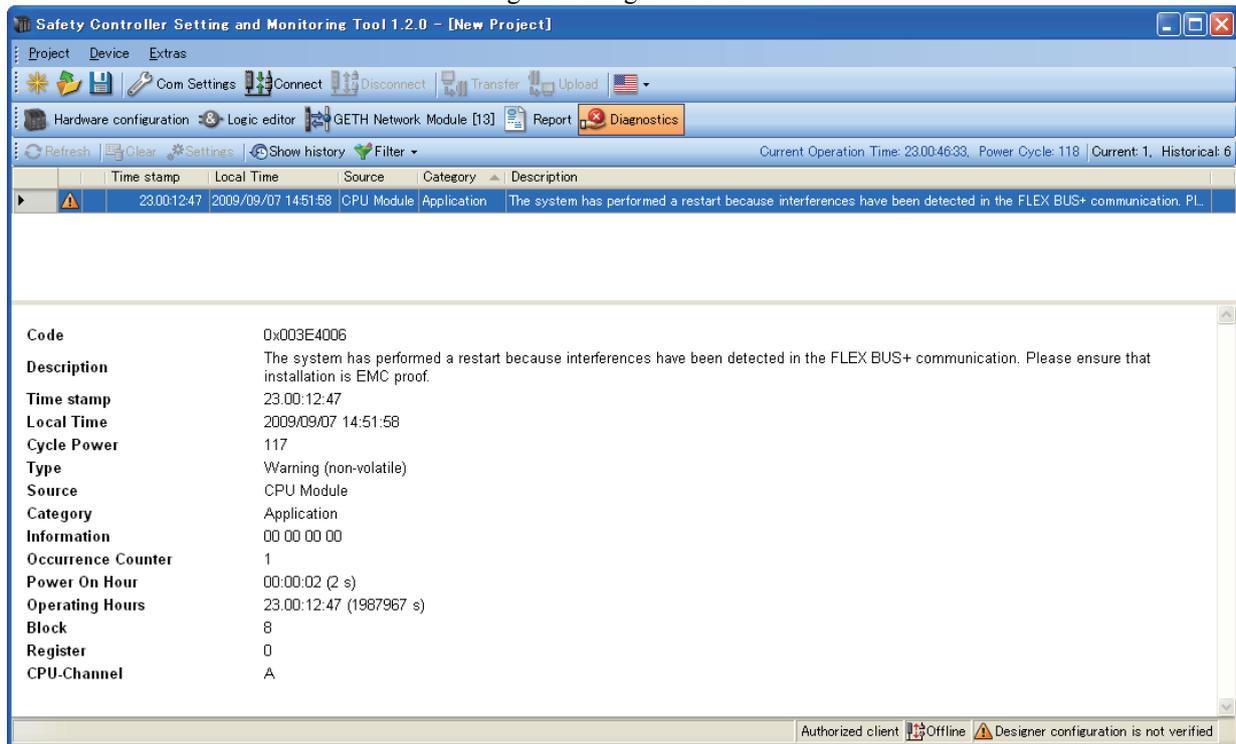　　　　　　　　　　(WS0-CPU0, WS0-CPU1, WS0-MPL, WS0-XTIO, WS0-XTDI,
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1. Meaning of items in Diagnostics view

Detected errors can be found in Diagnostics view.

This section describes meanings of items in Diagnositics view.

Figure 1: Diagnostics view

Code	Error code (hex)
Description	Meanings of the error
Time Stamp	Total running time of CPU at the error occurrence (day:hour:min:sec)
Local Time	The error occurrence time of PC at connecting with CPU, not be shown for historical errors
Cycle Power	Times of power on of CPU
Type	Information, warning, recoverable error, unrecoverable error (critical error)
Source	A module detected the error
Category	A part or function detected the error
Information	An internal information about the error
Occurrence Counter	A repetition time of the error
Power On Hour	A running time from the last power on of CPU, reset at the power off
Operating Hours	A total running time of CPU, not the time of error occurrences
Block	A record area, 8=RAM (during the last running), 88=EEPROM (in the past running cycle)
Register	An index in the block
CPU-Channel	MPU who detected the error in CPU (A or B)

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2. Majour error codes, their causes and corrective actions

This section lists and describes the majour error codes, their causes and corrective actions which may take place in safety controllers.

Table 1: Majour error codes

Module	Error Code	Message	Cause	Corrective Action
CPU	0x0001C005 0x0003C006 0x0006C002 0x0007C002	Internal error in the MELSEC-WS system.	1) Follow on error for other critical errors. 2) Disturbance of CPU module internal signals due to heavy EMC disturbance. 3) Hardware failure of CPU module.	To reset the error, turn power supply of CPU module off and on. 1) Check the other diagnosis messages for critical faults with almost same time stamp. 2) Check installation for EMC aspects (FE connection of DIN rail and control cabinet, star wiring of 24V power supply, local separation of power parts and control parts, …). 3) Replace CPU module.
CPU	0x0001C013 0x0005C013 0x000CC013	FLEXBUS+ communication disturbed. Check for EMC disturbance.	1) FLEXBUS+ communication (backplane communication with safety I/O modules and network modules) disturbed due to EMC disturbance. 2) FLEXBUS+ communication (backplane communication with safety I/O modules and network modules) disturbed due to critical fault in safety I/O modules. In this case this is a follow on error and there will be also other critical fault with almost same time stamp (+/- 1 second) in the diagnosis history.	To reset the error, turn power supply of CPU module off and on. 1) Check installation for EMC aspects (FE connection of DIN rail and control cabinet, star wiring of 24V power supply, local separation of power parts and control parts, …) 2) Check the other diagnosis messages with almost same time stamp.
CPU	0x0003C013	Internal error in the MELSEC-WS system.	1) Follow on error due to hardware failure of an extension module (safety I/O module or network module). 2) Unexpected behaviour of an extension module (safety I/O module or network module).	To reset the error, turn power supply of CPU module off and on. 1) Check the other diagnosis messages with almost same time stamp. 2) Send project file and diagnosis report to manufacturer service.
CPU	0x0004C013	Internal error in the MELSEC-WS system.	1) FLEXBUS+ communication (backplane communication with safety I/O modules and network modules) disturbed due to EMC disturbance. 2) FLEXBUS+ communication (backplane communication with safety I/O modules and network modules) disturbed due to critical fault in any extension module (safety I/O module or network module). In this case this is a follow on error and there will be also other critical fault with almost same time stamp (+/- 1 second) in the diagnosis history.	To reset the error, turn power supply of CPU module off and on. 1) Check installation for EMC aspects (FE connection of DIN rail and control cabinet, star wiring of 24V power supply, local separation of power parts and control parts, …) 2) Check the other diagnosis messages with almost same time stamp.

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Module	Error Code	Message	Cause	Corrective Action
CPU	0x0005000D	Serial read access to block n: failed.	1) Last configuration procedure has not been completed successfully, e.g. because power supply has been turned off, before writing configuration to memory plug has been completed. 2) Hardware failure of memory plug.	1) Download configuration again, and ensure that power supply at CPU module is on, until download procedure has been completed in Setting and Monitoring Tool. 2) Replace memory plug and download configuration again.
CPU	0x0005C006	Internal error in the MELSEC-WS system.	Follow on error for other critical errors.	To reset the error, turn power supply of CPU module off and on. Check the other diagnosis messages for critical faults with almost same time stamp.
CPU	0x000A0011	Function block n: Discrepancy error at pair 1/2.	1) There are mechanical positions, where only one of both switches changes the state, without the other switch following within the configured discrepancy time. 2) Short circuit in the wiring of the dual channel inputs to another wire, e.g. 24V or 0V. 3) Hardware failure of switch, e.g. one of both contacts is permanently closed or opened.	To reset the error, turn off the effected switch (effected input states low/low for equivalent dual channel inputs, low/high for complementary dual channel inputs) and on again, or turn power supply of CPU module off and on. 1) Check mechanical dependency of both switches. 2) Check wiring of effected inputs. 3) Please switch in hardware installation.
CPU	0x000E0006 0x000E4006	Configuration in the memory plug is invalid.	1) Last configuration procedure has not been completed successfully, e.g. because power supply has been turned off, before writing configuration to memory plug has been completed. 2) Hardware failure of memory plug.	1) Download configuration again, and ensure that power supply at CPU module is on, until download procedure has been completed in Setting and Monitoring Tool. 2) Replace memory plug and download configuration again.
CPU	0x000F0013 0x001F0006 0x00230006	Configuration in the memory plug is incompatible for at least one extension module.	1) Memory plug has been configured for a different extension module (safety I/O module or network module) This error comes additional to the error message from the extension module. 2) Wrong extension module type is used in the hardware installation.	1) Download a configuration, which has the same extension module type as in hardware installation. 2) Replace extension module in the hardware installation by module with same module type as selected in the project file.
CPU	0x00100011	Function block n: EDM / Valve monitoring: Feedback signal did not follow the control signal within the max. feedback delay time.	1) Hardware failure of connected relay or failure in the wiring. 2) Used relay has greater switching delay for monitor contact.	1) Check for failure of the relays and wiring. 2) Increase discrepancy time of the function block, if acceptable for the application.
CPU	0x00160005	Configuration in the memory plug is incompatible, because it is for a different module type.	1) Memory plug has been used before in a system with different CPU module type (e.g. CPU0 instead of CPU1, or vice versa). 2) Wrong CPU module type is used in the hardware installation.	1) Download a configuration, which has the same CPU module type as in hardware installation. 2) Replace CPU module in the hardware installation by module with same module type as selected in the project file.

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Module	Error Code	Message	Cause	Corrective Action
CPU	0x00170005	Configuration in the memory plug is incompatible, because it is for a different firmware version of the CPU module.	1) Memory plug has been configured for an incompatible higher CPU firmware version (e.g. V2.00.0 instead of V1.11.0). 2) A CPU module firmware version is used in the hardware installation, which is too old.	1) Download a configuration, which has the same or smaller CPU firmware version (e.g. V1.xx instead of V2.xx). 2) Replace CPU module in the hardware installation by module with equal or greater version selected in the project file.
CPU	0x0029C006	Internal error in the MELSEC-WS system: Probably an extension module is malfunctioning.	Follow on error for other critical errors, caused by an extension module (safety I/O module or network module).	To reset the error, turn power supply of CPU module off and on. Check the other diagnosis messages for critical faults with almost same time stamp.
CPU	0x002AC006	Unequal input data from extension module n (*1)	1) A dual channel input at XTIO module or XTDI module has 2 signals dips (high to low) with a time distance of 2ms (e.g. test gaps of a OSSD output, or bouncing relay contacts). 2) A signal channel input at XTIO module or XTDI module changes state in intervals of 4ms for a duration of 40ms or more (e.g. proximity switch to a tooth wheel).	To reset the error, turn power supply of CPU module off and on. Activate the ON-OFF-filter and OFF-ON-filter. Please be aware that by this the response time for this signal is increased by at least 8ms.
CPU	0x002D4006	MELSEC-WS system performed a restart due to power supply dip at the CPU module.	1) Power supply of CPU module had short voltage dip (to almost 0V). 2) Power supply of CPU module had a voltage drop (approx. down to 6V to 16V) and increased back to operating range.	1) Ensure that power supply is capable to buffer power interruption up to 20ms. 2) Ensure that power supply is capable to drive the load, so that switching of loads do not cause a drop of the supply voltage. 3) Check power supply wiring of CPU module. Use separate to other big loads, to avoid voltage drop on the supply cable by other load currents.
CPU	0x003E4006	The system has performed a restart because interferences have been detected in the FLEXBUS+ communication. Please ensure that installation is EMC proof.	1) FLEXBUS+ communication (backplane communication with safety I/O modules and network modules) disturbed due to EMC disturbance. 2) FLEXBUS+ communication (backplane communication with safety I/O modules and network modules) disturbed due to critical fault in any extension module (safety I/O module or network module). In this case this is a follow on error and there will be also other critical fault with almost same time stamp (+/- 1 second) in the diagnosis history.	1) Check installation for EMC aspects (FE connection of DIN rail and control cabinet, star wiring of 24V power supply, local separation of power parts and control parts, …) 2) Check the other diagnosis messages with almost same time stamp.

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Module	Error Code	Message	Cause	Corrective Action
I/O	0x4429	Extension module n: Discrepancy time error at dual channel input Ii (*2)	1) There are mechanical positions, where only one of both switches changes the state, without the other switch following within the configured discrepancy time. 2) Short circuit in the wiring of the dual channel inputs to another wire, e.g. 24V or 0V. 3) Hardware failure of switch, e.g. one of both contacts is permanently closed or opened.	To reset the error, turn off the effected switch (effected input states low/low for equivalent dual channel inputs, low/high for complementary dual channel inputs), or turn power supply of CPU module off and on. 1) Check mechanical dependency of both switches. 2) Check wiring of effected inputs. 3) Please switch in hardware installation.
I/O	0x4601	Extension module n: Cross circuit at input Qi	For inputs which are connected to test output: 1) Short circuit to 24V or cross circuit in wiring for tested sensors. 2) Cable interruption in wiring for safety mat. 3) Defect testable sensor or safety mat	1) Check wiring of effected input. 2) Replace testable sensor. To reset the error turn off the effected input (input state Low/Low for equivalent dual channel inputs, Low/High for complementary dual channel inputs) or power cycle the main module.
I/O	0x4701	Extension module n: Cross circuit at output Qi	1) Short circuit between the wire from the safety output (Q1 to Q4) to any other signal with 24V. 2) Capacitive load exceeded the allowed maximum value (e.g. by capacitor for spark quenching). 3) Hardware failure of XTIO module.	To reset the error, all outputs of the effected module must be turned off from logic of CPU module, e.g. by turning off related input signals as E-stop. Error reset can take up to 8 seconds. Alternatively turn power supply of CPU module off and on. 1) Check wiring for short circuit. 2) Check capacitive load. 3) Replace XTIO module.
I/O	0x4804	Extension module n: Supply voltage for outputs too low	Supply voltage at XTIO is to low or interrupted.	Check supply voltage at terminals A1 (24V) and A2 (0V) at the XTIO module, also under worst case load conditions.
I/O	0x4901	Configuration in the memory plug is invalid for extension module n.	1) Last configuration procedure has not been completed successfully, e.g. because power supply has been turned off, before writing configuration to memory plug has been completed. 2) Hardware failure of memory plug.	1) Download configuration again, and ensure that power supply at CPU module is on, until download procedure has been completed in Setting and Monitoring Tool. 2) Replace memory plug and download configuration again.
I/O	0x4904	Configuration in the memory plug is invalid for extension module n: Invalid input mode.	Failure in Setting and Monitoring Tool.	Download configuration again. If error persists, send project file and diagnosis report to manufacturer service.
I/O	0xC306	Internal error in the MELSEC-WS system.	Internal hardware failure of XTIO / XTDI module.	Replace XTIO / XTDI module.
I/O	0xC307	Power supply at terminal A2 (GND) of XTIO module interrupted.	Supply voltage at XTIO is to low or interrupted.	Check supply voltage at terminals A1 (24V) and A2 (0V) at the XTIO module, also under worst case load conditions.
I/O	0xC943	Internal error in the MELSEC-WS system.	Follow on error for other critical errors.	Check the other diagnosis messages for critical faults with almost same time stamp.

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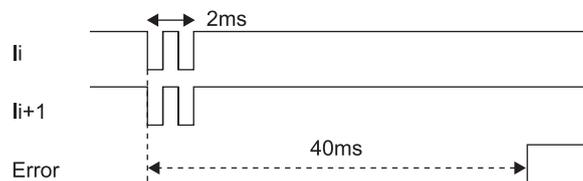**[Date of Issue]** August 2010 (Ver.A: March 2011)
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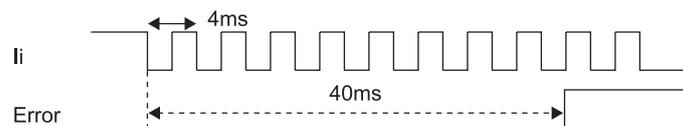*1 "Unequal input data from extension module n "may occur by following signal inputs.

1) "A dual channel input has 2 single dips (high to low) with a time distance of 2ms"

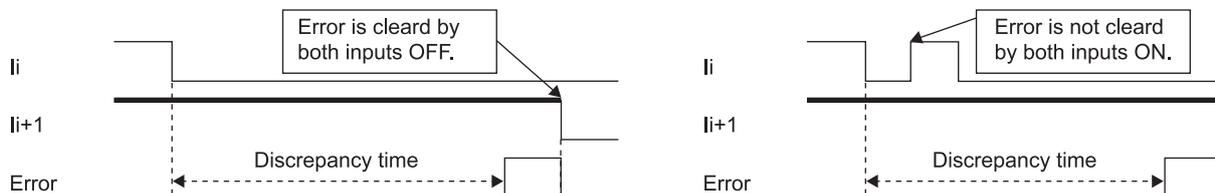Figure 2: Behavior of unequal input data 1)

2) "A signal channel input changes state in intervals of 4ms for a duration of 40ms or more."

Figure 3: Behavior of unequal input data 2)

*2 After one of the dual channel inputs is set to ON and another is OFF, when the discrepancy time passes, "Extension module n: Discrepancy time error at dual channel input Ii" should occur. This discrepancy can be cleared when both inputs turn OFF (the left side of Figure 4). However both inputs turn ON during the discrepancy, it is not cleared and this error should occur (the right side of Figure 4).

Figure 4: Behaviors of a discrepancy error

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3. Parameter setting for safety I/O module

This section describes how to set parameters of elements of safety I/O module (XTIO/XTDI).

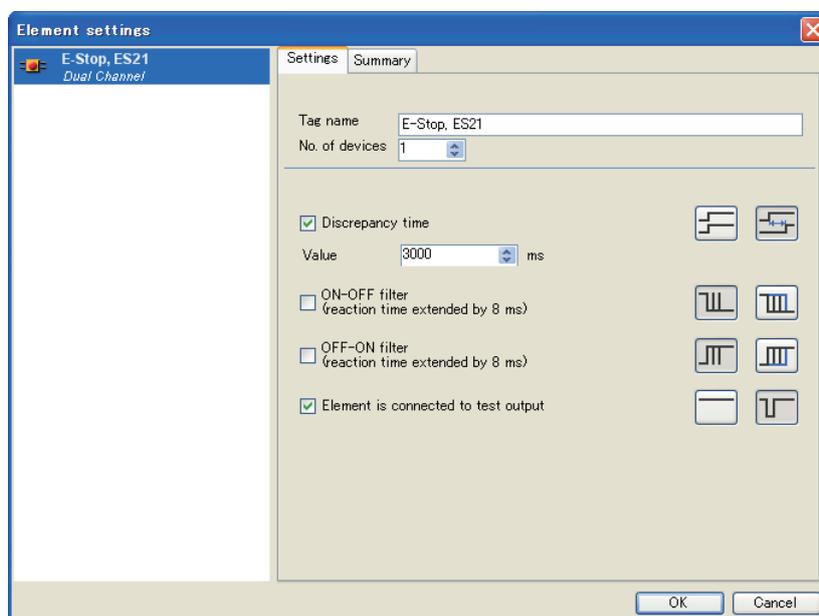### (1) Parameterization of connected elements

Input and output elements can be parameterized when they are located in the **Parking area** or in the **Configuration area**. Depending on the type of element you can

– assign a tag name (identifying name for the element)
– set evaluated parameters for the element, for example the discrepancy time, ON-OFF or OFF-ON filter, test pulse active/not active, etc.

(2) How to parameterize a connected element:

⇒ Double click on the element or right click an element in the **Parking area** or in the **Configuration area** and select **Edit**... from the context menu. The **Element settings** window is opened.

Figure 5: Element settings window for an ES21 emergency stop button

a) Tag name
⇒ Enter a tag name for the element, if desired. Otherwise the default tag name is used.

b) No. of devices
⇒ Adjust the **No. of devices**, if necessary. E.g. if you have connected a cascade of several L21 testable type 2 sensors to one input, you can use this function to adjust the number of devices that will appear on the bill of material in the project report to match the actual number of devices used.

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c) Discrepancy time

Dual channel elements can be evaluated with or without a **Discrepancy time**.

⇒To activate or deactivate the **Discrepancy time**, either click on the checkbox or on the 3D buttons on the right side of the element settings dialog.

For elements connected to XTDI and XTIO modules, the following restrictions apply:

● The value for the discrepancy time can be set from 0 ms (inactive) to 30s.

● If signals of tested sensors are connected to XTDI and XTIO modules, the discrepancy time has to be greater than the value (test gap time + the max. OFF-ON delay time) of the used test output. You can find these values in the project report under **Configuration, I/O module, Test pulse parameter**.

● If you try to set a lower discrepancy time than allowed, the minimum value will be shown in the dialog window.

● The discrepancy time will be rounded automatically to the next multiple of 4ms due to the internal sampling frequency of the modules.

d) ON-OFF filter and OFF-ON filter

Several unintentional brief signal changes occur when opening or closing a component fitted with contacts as the result of the bouncing of the contacts. As this may influence the evaluation of the input, you can use the **ON-OFF filter** for negative edges (i.e. transitions from Active (High) to Inactive (Low)) and the **OFF-ON filter** for positive edges to eliminate this effect.

⇒To activate or deactivate the **ON-OFF filter** or the **OFF-ON filter**, either click on the checkbox or on the 3D buttons on the right side.

If the **ON-OFF filter** or the **OFF-ON filter** is activated, a signal change will be recognized only if it is confirmed by three consecutive identical samples of the input with a sample rate of 4ms, meaning 8ms constant signal.

<WARNING>

Consider extended reaction times when using the input filters!

⇒ Due to the modules' internal sampling rate of 4ms, the ON-OFF filter and the OFF-ON filter extend the reaction time by at least 8ms.

⇒ If the signal is alternating within these initial 8ms, the signal change can be delayed for much longer, i.e. until a constant signal of at least 8ms has been detected.

Note

For dual-channel elements with complementary evaluation, the respective filter (ON-OFF or OFF-ON) is always related to the leading channel. Filtering of the complementary channel is activated automatically.

e) Element is connected to test output

By activating or deactivating the option **Element is connected to test output**, you can determine whether the respective element shall be tested or not. By connecting an element to the test outputs,

● short circuits to 24V in the sensor wiring which could inhibit the switch-off condition can be detected,

● electronic sensors with test inputs (e.g. L21) can be tested.

⇒To activate or deactivate the **Element is connected to test output**, either click on the checkbox or on the 3D buttons on the right side.

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Note
One XTDI has 2 test sources only, even if it has 8 test output terminals.

<WARNING>
Protect tested single channel inputs against short circuits and cross circuits! A machine may start unexpectedly.

- If a tested single channel input has short circuits or cross circuits, the test detects them and makes it Inactive (Low).
  Then, an unexpected falling edge is generated.
- If this single channel input is used to a machine start-up, an unexpected falling edge at this input may lead to a dangerous
  situation (ex. unexpected start-up a machine), the following measures have to be taken:
  – Protected cabling of the related signal (to exclude cross circuits to other signals)
  – No cross circuit detection, i.e. no connection to test output.
  This especially needs to be considered for the following inputs:
  – Reset input on the Reset function block
  – Restart input on the Restart function block
  – Restart input on the Press function blocks (Eccentric Press Contact, Universal Press Contact, N-break, Press Setup,
    Press Single Stroke, Press Automatic)
  – Override input on the Muting function blocks
  – Reset input on the Valve Monitoring function block
  – Reset input and Reload input on the Event Counter function block

REVISIONS

Version	Print Date	Revision
-	August 2010	First edition
A	March 2011	Supplementary notes are added to Table 1 in Chapter 2.

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