Honeywell

FSC Safety Manager
Service Manual

for use with the Honeywell FSC System
Release 400

FS13-500

TotalPlant®

Honeywell

Implementation
FSC Safety Manager

FSC Safety Manager
Service Manual

for use with the Honeywell FSC System
Release 400

FS13-500
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TotalPlant®

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Honeywell
Industrial Automation and Control
Automation College
2820 West Kelton Lane
Phoenix, AZ 85023

(602) 313-5669

About This Publication

This publication is designed to assist you in servicing the FSC Safety Manager Module (FSC-SMM) for use with the Honeywell FSC system Release 400. Use this manual as a guide for diagnosing faults and troubleshooting your system.

Please note that this document primarily focuses on the FSC Safety Manager Module. The entire FSC-SM also comprises an FSC component, which has its own set of documents. Please refer to these documents for more detailed information on the FSC part of the FSC-SM system.

All references in this manual to "FSC Safety Manager" or "FSC Safety Manager Module" pertain only for use with the Honeywell FSC system.

Table of Contents

Figures and Tables

Acronyms

ACK ..... Acknowledgment
APM ..... Advanced Process Manager
APMM ..... Advanced Process Manager Module
CPU ..... Central Processor Unit
DCS ..... Distributed Control System
DBM ..... Diagnostic and Battery Module
DMA ..... Direct Memory Access
EMF ..... Electromagnetic Field
EMI ..... Electromagnetic Interference
EPNI ..... Enhanced Process Network Interface
EPROM ..... Erasable Programmable Read-Only Memory
FLD ..... Functional Logic Diagram
FSC ..... Fail Safe Control
FSC-DS ..... FSC Development System
FSC-SM ..... FSC Safety Manager
FSC-SMM ..... FSC Safety Manager Module
HBD ..... Horizontal Bus Driver
HM ..... History Module
I/O ..... Input/Output
LC ..... Logic Controller
LCN ..... Local Control Network
LED ..... Light Emitting Diode
LLC ..... Logic Link Control
LM ..... Logic Manager
MAC ..... Medium Access Control
N/A ..... Not Applicable
NAK ..... Negative Acknowledgment
NCM ..... Network Communication Module
NIM ..... Network Interface Module
PLC ..... Programmable Logic Controller
PM ..... Process Module
PMM ..... Process Manager Module
PNI ..... Process Network Interface
PSU ..... Power Supply Unit
PU ..... Processing Unit
RAM ..... Random Access Memory
RDR ..... Request Data Response
RWR ..... Request With Response
SM ..... Safety Manager
SMM ..... Safety Manager Module
TAC ..... Technical Assistance Center
TBC ..... Token Bus Controller
TDC ..... Total Distributed Control
TPS ..... TotalPlant Solution
UART ..... Universal Asynchronous Receiver Transmitter
UCN ..... Universal Control Network
US ..... Universal Station
VBD ..... Vertical Bus Driver
WD ..... Watchdog

Parameters

CCSRC .....Contact Cut Out Source
LCIOCDFL .....LC communication or I/O card fault
LCLLNOSC .....LC not scanning
LCTSFLT .....LC time synchronization failure
LODSTN .....Logic Output Connection Destination
NOSYNCH .....Secondary not synchronized
PLCADDR ..... FSC-SRS Alias Address
PPXOVRUN .....Point processing overrun
PTEXECST ..... Point Execution State
SMTSFLT .....FSC-SMM time synchronization failure
UCNOVRUN ..... UCN overrun
UCNPRSFL ..... UCN primary to secondary failure
UCNSCPFL ..... UCN secondary to primary failure

References

For TotalPlant Solution (TPS) documentation:

Publication Title	Publication Number	Binder Title	Binder Number
FSC Safety Manager Control Functions	FS09-500	Implementation FSC Safety Manager	TPS 3076
FSC Safety Manager Installation Guide	FS20-500	Implementation FSC Safety Manager	TPS 3076
FSC Safety Manager Parameter Reference Dictionary	FS09-550	Implementation FSC Safety Manager	TPS 3076
FSC Safety Manager Configuration Forms	FS88-500	Implementation FSC Safety Manager	TPS 3076
FSC Safety Manager Service Manual	FS13-500	Implementation FSC Safety Manager	TPS 3076

For FSC documentation:

Publication Title	Publication Number	Version
FSC Safety Manual	PM.MAN.8047	400
FSC Hardware Manual	PM.MAN.8048	400
FSC Software Manual	PM.MAN.8025	400

Section 1 – FSC-SM Hardware and Software Dependencies

1.1 Overview

About this section

This section contains a brief description and functional summary of the FSC Safety Manager (FSC-SM), and provides hardware and software requirements and dependencies. The topics included in this section are:

Description

As illustrated in Figure 1-1, the FSC-SM is a process-connected device that resides on the Universal Control Network (UCN) of the TotalPlant Solution (TPS) System, which is the evolution of the TDC 3000X system. It consists of an FSC Controller, which includes an FSC Safety Manager Module (FSC-SMM).

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Description,
continued

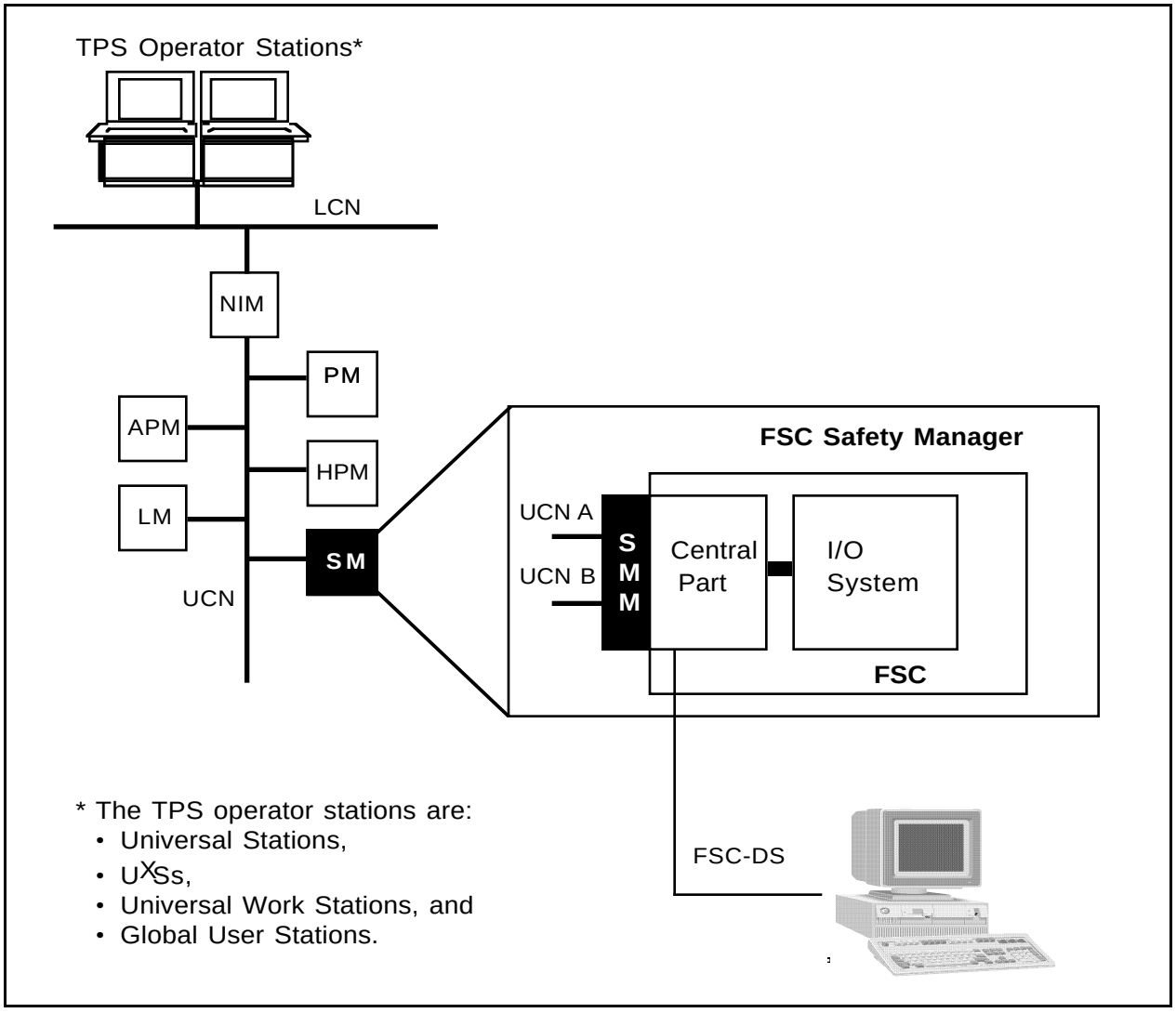

Figure 1-1 – FSC Safety Manager as a component of the TPS system

Human interfaces

As shown in Figure 1-1, two human interfaces are used in conjunction with the FSC Safety Manager:

- the operator stations – i.e. Universal Stations (US), UXSs, Universal Work Stations and Global User Stations – are configurations of the TPS level user interface, and
- the FSC Development System (FSC-DS), which interfaces with the FSC Controller.

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Frontplate features

As illustrated in Figure 1-2, the FSC-SMM frontplate includes the following major features:

- Diagnostic and operation LED indicators, which indicate:
  - the result of self-test diagnostics ('STATUS' LED),
  - UCN transmit status ('Tx' LED),
  - the primary (On) or secondary (Off) ('P' LED),
  - the UCN cable that is currently carrying message traffic ('A' LED / 'B' LED).
- F-style connectors, which provide a link to the redundant Universal Control Network (A and B) via drop cables.

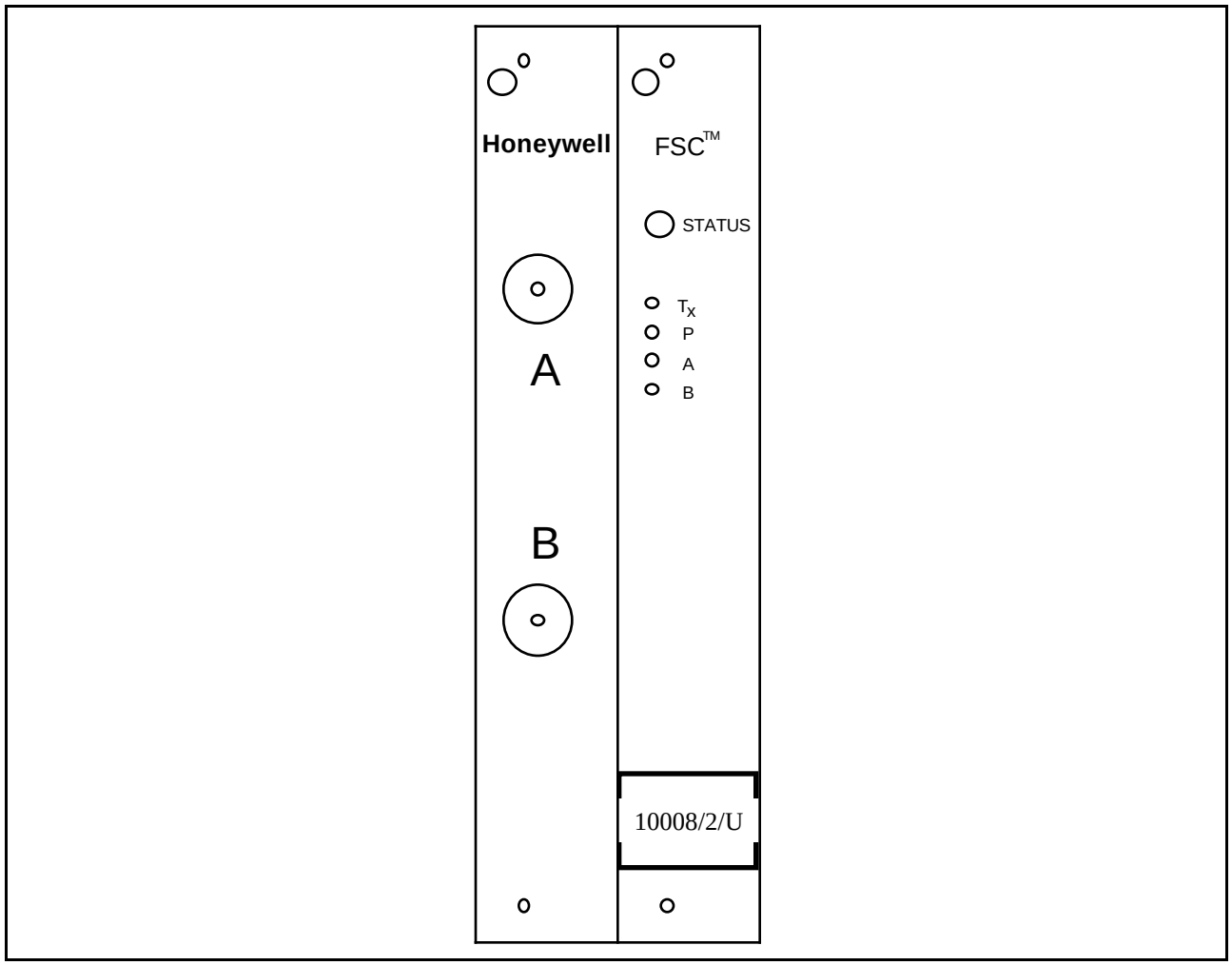

Figure 1-2 – FSC Safety Manager Module frontplate features

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Functional summary

The FSC Safety Manager provides a dual redundant fault-tolerant controller for safety and emergency shutdown applications on the UCN. The two redundant FSC Control Processors collect, process and output process information in parallel.

Depending on the configuration of the FSC Controller, the processors may share an I/O module (non-redundant I/O configuration), or may have exclusive access to the module (redundant I/O configuration).

The control process accesses the I/O part via an I/O bus structure consisting of a vertical bus, which interconnects the FSC Central Part rack with the I/O racks. The vertical bus is controlled by the Vertical Bus Driver (VBD) module. In redundant I/O configurations, each control process has its own vertical bus to the I/O part, and has exclusive access to that vertical bus. In non-redundant configurations, the control processors share access to the I/O parts, via a single vertical bus.

The FSC Control Processors perform self-tests of the FSC hardware on a continuous basis. Diagnostic information on detected faults is provided to the user via the US and the FSC Development System (FSC-DS).

- Each field input signal is:
  - collected, and
  - scanned by its Control Processor, via an input module.

- The Control Processors:
  - synchronize the input signals with the redundant control processor over a high-speed inter Central Part communication link, including diagnostic information obtained from the system self-tests, and
  - process the input data by executing its control program.

- The output module:
  - is updated with the output information as calculated by the control program, and
  - transmits the output signal to the connected field device.

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FSC-SM architecture

Figure 1-3 illustrates the dual-redundant architecture employed in the FSC Safety Manager.

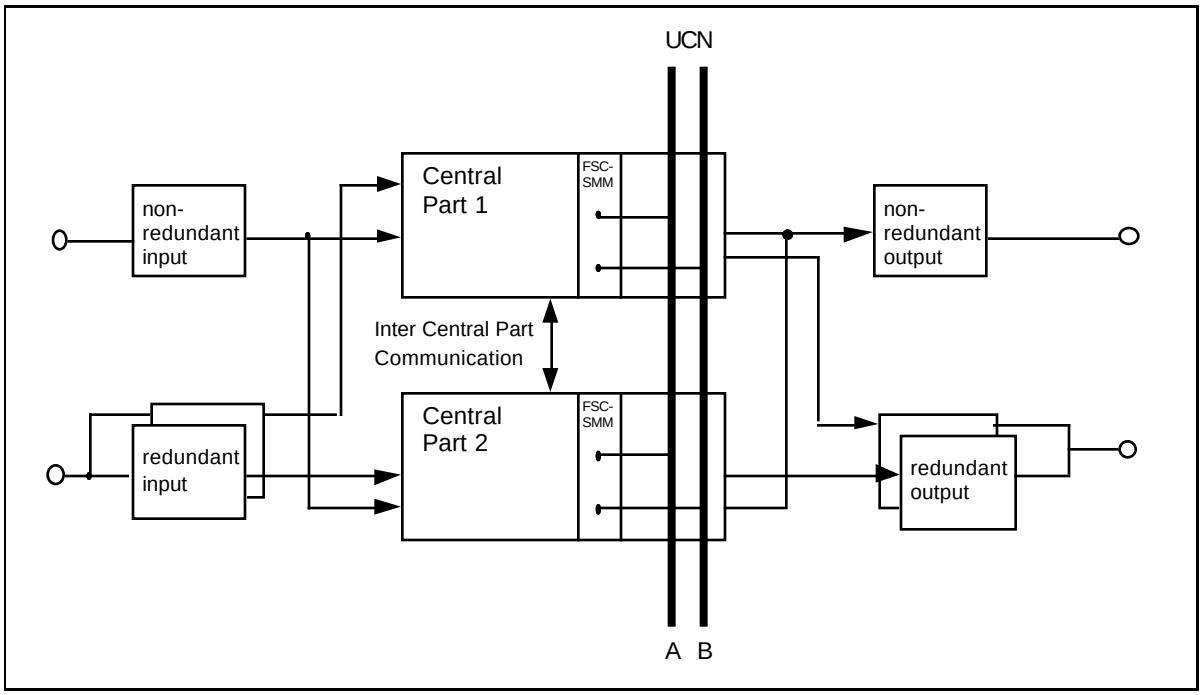
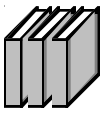


Figure 1-3 – FSC-SM architecture



REFERENCE — For detailed information regarding concepts and functions described in this section, refer to the *FSC Safety Manager Control Functions*, the *FSC Safety Manager Implementation Guidelines* and the *FSC Safety Manager Installation Guide*.

1.2 Hardware Dependencies

Minimum equipment required

The following list gives the minimum pieces of equipment needed for a dual-redundant FSC Safety Manager system:

- two FSC Central Part racks, each consisting of:
  - one power supply unit (PSU) (10300/./.)
  - one central processor unit (CPU) (10002/./.)
  - one watchdog module (WD) (10005/./.)
  - one vertical bus driver module (VBD) (10001/./.)
  - one diagnostic and battery module (DBM) (10006/./.)
  - one communication processor (COM) (10004/./.)
  - one FSC Safety Manager Module (FSC-SMM) (10008/U/.)
- FSC I/O racks, each consisting of:
  - horizontal bus driver module(s) (HBD) (10100/./.)
  - digital input module(s) (10101/./., 10104/./.)
  - digital output module(s) (10201/./., 10202/./., 10203/./., 10206/./., 10207/./., 10208/./., 10209/./., 10212/./., 10213/./., 10214/./., 10215/./., 10216/./.)
  - analog input module(s) (10102/./.)
  - analog output module(s) (10205/./.)
  - watchdog repeater module(s) (WDR) (10302/./.)
- one FSC Development System (FSC-DS), consisting of a 386/486 IBM-compatible personal computer with 640 KB RAM, 6 MB hard disk space, Hercules/EGA/VGA graphics, an HSMS 07177/1/. hardware key and the FSC-DS software,
- one TPS system including a Universal Station (US), a History Module (HM) and a Network Interface Module (NIM), and
- as required, a Local Control Network (LCN), Universal Control Network (UCN) and FSC communication cabling.

Figure 1-1 on page 2 shows the FSC-SM relationship to the TPS system.

ATTENTION Refer to Subsection 1.4 *(FSC-SM Installation and Configuration Checklist).*

1.3 Software Dependencies

Minimum software releases

The software dependencies for the Safety Manager are:

- the FSC system must be Release 400 or higher, and
- the TPS control system must be Release 510 or higher.

ATTENTION Refer to Subsection 1.4 *(FSC-SM Installation and Configuration Checklist).*

1.4 FSC-SM Installation and Configuration Checklist

Summary

The following checklist is intended to highlight the most critical steps in the installation and configuration of an FSC Safety Manager.

Installation Checklist

Minimum Equipment Complement	❑ two FSC Central Part racks. ❑ one or more FSC I/O racks (as required). ❑ one FSC-DS, consisting of a 386/486 PC with 640 KB RAM, 6 MB hard disk space, Hercules/EGA/VGA graphics, an HSMS 07177/1/. hardware key and the FSC-DS software. ❑ one TPS system including a Universal Station (US), a History Module (HM) and a Network Interface Module (NIM) ❑ as required, Local Control Network (LCN), Universal Control Network (UCN) and FSC communication cabling
Minimum Requirements	❑ Minimum hardware revision levels satisfied. ❑ Minimum firmware revision levels satisfied. ❑ Minimum software revision levels satisfied.
FSC-SM Installation	❑ All central part modules at the configured positions. ❑ All I/O rack modules at the configured positions.
FSC-SMM Installation	❑ Module installed on the configured position and cover screws fastened. ❑ UCN cables attached and torqued to specification. ❑ No UNAPPROVED right angle F-connectors used.
FSC-DS Installation	❑ 07177/./. hardware key installed in PC. ❑ FSC communication cabling installed and on proper ports. ❑ FSC EPROM programmer installed. ❑ Up-to-date FSC software installed and operational.

Configuration Checklist

FSC-DS Configuration	❑ FSC-SM hardware configuration completed. ❑ FSC-SM application configuration completed. ❑ FSC-SM application translated.
FSC-SMM Configuration at FSC-DS	❑ FSC-SMM configuration completed (UCN address: odd number, 1...63).
DCS Addresses	❑ DCS addresses assigned to all FSC variables that will be used by the TPS application (DCS addresses correspond to PLC addresses).
FSC-SM Configuration Downloaded / Programmed	❑ Main processor module EPROMs burned and correctly placed on the main processor module. ❑ Main processor application downloaded (optional). ❑ Communication processor module EPROMs burned and correctly placed on the communicatior processor module. ❑ FSC-SMM EPROM burned and correctly placed on the FSC-SMM. ❑ FSC-SM started.

At this point, the FSC-SM should be ready for **Node** and **Point Configuration** at the LCN level.

1.5 Specifications

Summary

Refer to the *FSC Safety Manager Specification and Technical Data* for information on:

- operating and storage temperatures,
- humidity,
- shock and vibration tolerance,
- protection from atmosphere,
- EMI susceptibility, and
- conformity to standards and codes.

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Section 2 – Spare Parts

2.1 Overview

Summary

The only spare part for the FSC Safety Manager system is the FSC Safety Manager Module (FSC-SMM). Its HSMS part number is 3400144.

For assistance in ordering this part, cabling or any other FSC parts, consult your Honeywell representative.

ATTENTION For more information on part numbers etc. please refer to the *FSC Spare Parts List*.

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Section 3 – Diagnostics and Troubleshooting

3.1 Overview

About this section

This section contains the following topics:

Introduction

This section contains information on

- different types of failures,
- configuration and communication errors,
- how to access error information, and
- what actions, if any, to take.

ATTENTION Refer to Subsection 1.4 *(FSC-SM Installation and Configuration Checklist)* to ensure that the FSC-SM has been installed and configured properly.

3.2 Soft Failures

Summary

Soft failures are situations where control and process view are maintained, but a fault has jeopardized system integrity.

An FSC Safety Manager softfail may have many different causes.

Softfail descriptions

Table 3-1 lists the types of softfails that may be encountered.

Table 3-1 – Softfail Descriptions

Code	Journaled Text	Text Displayed on FSC-SMM Diagnostic Displays	FSC-SMM Interpretation and/or Comments
19	UCNPRSFL	Pri Cannot Talk to Sec on UCN	FSC-SMM has lost the ability to communicate over the UCN.
20	UCNSCPFL	Sec Cannot Talk to Pri on UCN	FSC-SMM has lost the ability to communicate over the UCN.
21	NOSYNCH	Secondary Not Synched	Loss of FSC-SMM redundancy.
34	UCNOVRUN	UCN Overrun	FSC-SMM unable to prefetch data from remote nodes (peer-to-peer inputs).
35	PPXOVRUN	Point Processor Overrun	FSC-SMM point scanning is lagging behind schedule.
54	LCLLNOSC	LC Not Scanning	FSC-SMM Point Processing requires the Logic Controller to scan its inputs and its user program.
63	LCIOCDFL	LC Comm or I/O Card Fault	FSC System Aliases are signaling an I/O fault.
80	SMTSFLT	FSC-SMM Time Synch Failure	Set by an FSC-SMM upon detection of a UCN Time Sync failure. Causes include: • UCN Time Sync hardware/software failure.
81	LCTSFLT	LC Time Synch Failure	Set by an FSC-SMM upon detection of a Logic Controller Time Sync error. Causes include: • FSC Time Sync hardware failure. • FSC Time Sync command processing failure.

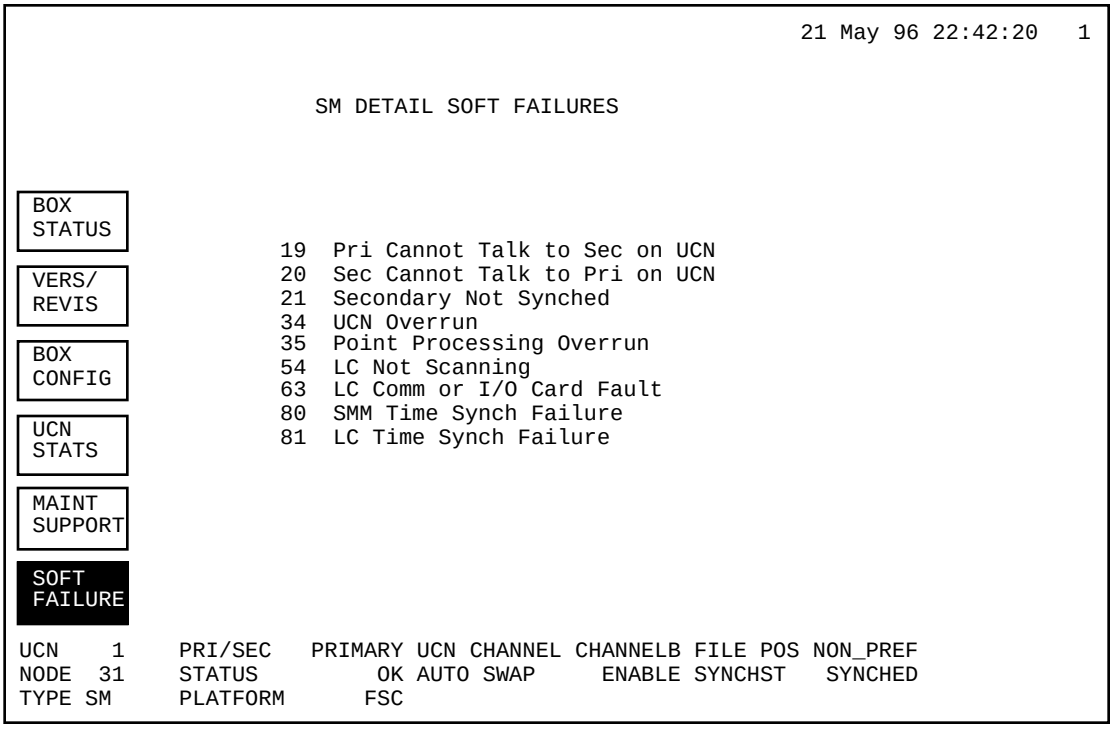
Continued on next page

Soft failures US display

Figure 3-1 shows a US display which provides the various FSC Safety Manager soft failures and their corresponding error codes.

ATTENTION Active soft failures will be highlighted.

Figure 3-1 – US Display - Soft Failures



3.3 Hard Failures

Hard failures summary

Hard failures will result in FSC-SMM shutdown (to the FAIL state). Hard failures include the following:

- component failure,
- program or database failure.

Crash codes

Fail (crash) situations involve a large number of possible error codes. Contact the Technical Assistance Center (TAC) for help in identifying the causes of such failures.

3.4 Point Configuration Errors

Errors in configuring points

The FSC-SMM will only recognize LC aliases previously configured within the FSC. Table 3-2 lists configuration errors for the FSC Safety Manager.

Table 3-2 – Configuration Errors

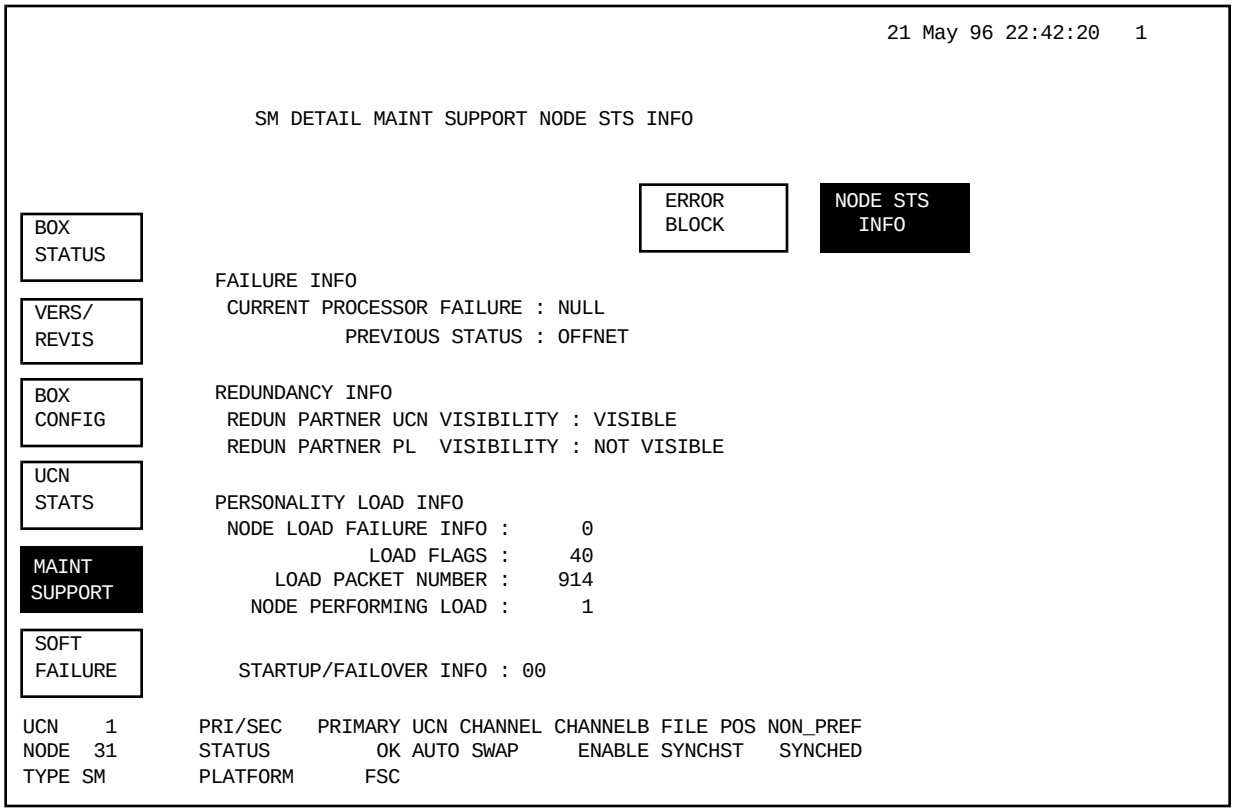
Error	Description
ILLEGAL VALUE	Attempt to write an FSC hardware addressing parameter (e.g. PLCADDR, LODSTN, CCSRC, ILCxxxxx, etc.) which specifies an Alias not available within the host FSC.
READ ONLY	Response to attempts to write to a read-only FSC-SM parameter.
CONFIGURATION MISMATCH	An invalid LC alias (PLCADDR). Attempts to change PTEXECST to ACTIVE will be denied.

3.5 Communication Errors

US display for communication errors target

Figure 3-2 is the US display which allows you to access the Communication Error Block screen. To do this, you need to select the "NODE STS INFO" target.

Figure 3-2 – US Display - NODE STS INFO Target



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US display showing UCN statistics

Figure 3-3 shows the US UCN statistics display which lists the various UCN communication error statistics, along with other UCN statistics. The values given are samples of what might be expected in a system which operates correctly.

Figure 3-3 – US Display - UCN Statistics Screen, Page 1

```
                                                        21 May 96 22:42:20   1

                          SM DETAIL UCN STATS PAGE 1

                                              HELP      RESET     STATS
                                                        STATS     PAGE 2
BOX
STATUS       NO COPY BUFFERS            0      TOTAL CABLE SWAPS          1
             TOKEN ROTATION TIME        0      CABLE A SILENCE            0
VERS/        NO SUCCESSOR FOUND         0      CABLE B SILENCE            0
REVIS        ASKED WHO FOLLOWS          0      CABLE A NOISE              0
             TOKEN PASSED FAILED        0      CABLE B NOISE              0
BOX          NOISE BITS                 0      NO-RESPONSE ERRORS         0
CONFIG       CHECKSUM ERROR             0      UNEXPECTED RESPONSES       0
             REPEATER ERROR             0      ERRORS IN RESPONSES        0
UCN          PARTIAL FRAME              0      AUTO-RECONNECTS            0
STATS        RECEIVED FRAME TOO LONG    0
             NO RECEIVE BUFFERS         0      LOCAL MESSAGES             0
MAINT        RECEIVE OVERRUN            0      MESSAGES SENT            306
SUPPORT      DUPLICATE RWR              0      MESSAGES RECEIVED        122
             NULL RWR (RESYNCH)         0      MESSAGES DISCARDED         0
SOFT         TRANSMIT UNDERRUN          0      REPLY TIMEOUTS             0
FAILURE      TRANSMIT FRAME TOO LONG    0

UCN     1    PRI/SEC   PRIMARY UCN CHANNEL CHANNELB FILE POS NON_PREF
NODE   31    STATUS         OK AUTO SWAP     ENABLE SYNCHST   SYNCHED
TYPE SM      PLATFORM      FSC
```

Continued on next page

Local UCN statistics description

Table 3-3 describes each of the local UCN communication error statistics listed in the example US display in Figure 3-3. It also gives a probable cause or probable causes for why each error might occur.

Table 3-3 – Local UCN Statistics

Statistic	Description	Nominal Range Over Specified Time Period; How the System Recovers	Probable Cause
No Copy Buffers	Network Interface Module (NIM) only; no buffers in the processor to copy received messages.	Ideally, should be zero (0). Events are throttled to reduce the probability of errors; the event recovery logic will ensure events are up-to-date.	Increases when the NIM is congested.
Token Rotation Time	NIM only; the average network token rotation in 0.1 millisecond units.	Depends on number of configured nodes that are on the network (e.g. for a six node UCN network, the nominal range is between 4-5 ms). When running smoothly, the user should record the nominal range of his/her system for comparison.	Increases when the node is offnet or the UCN node addresses have gaps. Also increases with more traffic.
No Successor Found	The token ring collapsed.	Should be zero in systems with two or more nodes passing tokens and no communication problems.	Fewer than two token passers, a network communication problem.
Asked Who Follows	A successor node change.	N/A Communication system will automatically look for a new successor.	The shutdown of a node, the powering off of a node, a communication fault.
Token Passes Failed	Token pass to the successor retried.	Should be zero in a smooth network with no faults or nodes entering or leaving.	Communication fault, shutdown or power-down node failover.
Noise Bits	Noise detected.	_1 count per 10 seconds is typical; the lower, the better. Messages Retried count does not necessarily imply lost messages.	Communication fault, grounding problem.
Checksum Error	Corrupt message, checksum detected.	Should be zero in a smooth system. The message is retried.	Communication fault, marginal modem.
Repeater Error	Corruption in the end delimiter.	Should be zero. The message is retried.	Communication fault, electromagnetic field (EMF) nearby.

Continued on next page

Local UCN statistics description,
continued

Table 3-3 – Local UCN Statistics (continued)

Statistic	Description	Nominal Range Over Specified Time Period; How the System Recovers	Probable Cause
Partial Frame	Full message not received.	Should be zero in a smooth system. The message is retried.	Communication fault.
Received Frame Too Long	Message received > 1 kB.	Should be zero.	Has not yet occurred.
No Receive Buffers	No buffers for TBC to receive messages.	Should be zero if not overloaded. See recovery procedure for No Copy Buffers.	Overload.
Receive Overrun	Not enough DMA bandwidth for the TBC to copy the received message to memory.	Should be zero.	Hardware problem.
Duplicate RWR	Duplicate message received.	In a smooth system, this may occur about twice a day.	ACK lost.
Null RWR (Resynch)	Used to resynch communications.	N/A	Node startup, failover node failure, communication fault.
Transmit Underrun	Not enough DMA bandwidth for the TBC to transmit.	Should be zero.	Hardware problem.
Transmit Frame Too Long	Inconsistent information given to TBC.	Should be zero.	Software bug.
Total Cable Swaps	The sum of all swaps: operational, automatic and periodic.	Once every 15 minutes when there are no faults, noise or silence present.	Periodic cable swap enabled.
Cable A Silence	No energy on Cable A.	Should be zero. The network swaps to Cable B.	Cabling not connected correctly, bad cable.
Cable B Silence	No energy on Cable B.	Should be zero. The network swaps to Cable A.	Cabling not connected correctly, bad cable.

Continued on next page

Local UCN statistics description,
continued

Table 3-3 – Local UCN Statistics (continued)

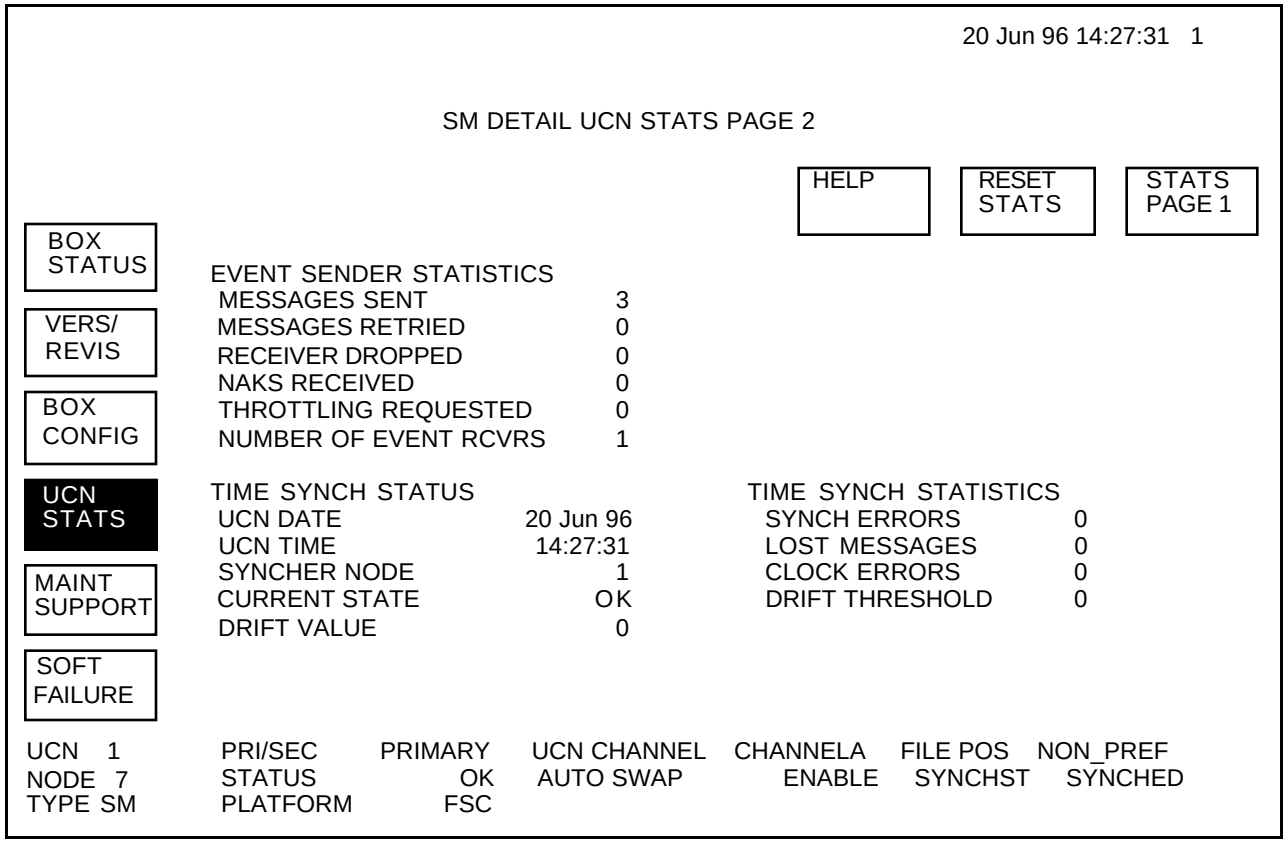
Statistic	Description	Nominal Range Over Specified Time Period; How the System Recovers	Probable Cause
Cable A Noise	Excessive noise on Cable A.	Should be zero. The network swaps to Cable B.	Cabling not connected correctly, bad cable, missing terminator ground.
Cable B Noise	Excessive noise on Cable B.	Should be zero. The network swaps to Cable A.	Cabling not connected correctly, bad cable, missing terminator ground.
No-Response Errors	One or more node did not respond to an RDR.	Should be zero in a smooth system with all nodes on net and properly configured.	Node(s) offnet, node(s) overloaded.
Unexpected Responses	MAC control incorrect in RWR.	Should be zero.	LLC bug or contention (more than one node believes it has the token).
Errors In Responses	LLC part of RWR incorrect.	Should be zero.	LLC bug.
Auto-Reconnect	Network reconnect attempts.	N/A	Network problems.
Local Messages	Intranode local messages.	An increasing number in NIM, zero in FSC-SM.	N/A
Messages Sent	Messages sent from node.	N/A	N/A
Messages Received	Messages received by node.	N/A	Reply received after reply timeout, duplicate reply because of lost ACK, bad protocol version, messages from a nonconfigured node (NIM only).
Messages Discarded	Messages ignored.	Should be zero.	Response received after timeout, ACK lost, NIM received a message from a nonconfigured node, protocol version mismatch.
Reply Timeouts	Reply not received in applicable time.	Should be zero.	Overload, failover, power off, shutdown.

Continued on next page

UCN STATS display, page 2

Figure 3-4 shows an example of page 2 of the UCN STATS display. You can access this screen, from page 1 of the UCN STATS display, by selecting the STATISTICS PAGE TWO target.

Figure 3-4 – US Display - UCN Statistics Screen, Page 2



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Event sender UCN statistics description

Table 3-4 describes each of the event sender UCN communication error statistics listed in the example US display in Figure 3-4. It also gives a probable cause or probable causes for why each error might occur.

Table 3-4 – Event Sender UCN Statistics

Statistic	Description	Nominal Range Over Specified Time Period; How the System Recovers	Probable Cause
Messages Sent	Event messages sent, not including retry.	N/A if no new event. Heartbeat message sent every 10 seconds.	N/A
Messages Retried	Retries caused by NORESP, NAK or lost ACK for the event.	N/A	Event overload, communication fault.
Receiver Dropped	The number of times an event receiver did not respond after retry.	Zero in NIM, one in FSC-SM if there is a NIM failure.	NIM shutdown, NIM failure, NIM congested.
NAKs Received	Message not accepted by receiver.	Should be zero except under heavy event load.	Heavy event load.
Throttling Requested	The number of times the node was requested to delay before sending the next message.	Should be zero except under heavy event load.	Heavy event load.
Number Of Event Rcvrs	The number of nodes ACKing events; FSC-SM, LM and PM only.	The number of NIMs running on the UCN.	N/A

Continued on next page

Time synch statistics description

Table 3-5 describes each of the time synchronization error statistics listed in the example US display in Figure 3-4. It also gives a probable cause or probable causes for why each error might occur.

Table 3-5 – Time Synch Statistics

Statistic	Description	Nominal Range Over Specified Time Period; How the System Recovers	Probable Cause
Synch Errors	Time synchronization not performed successfully.	0 to 2 counts at start-up.	Multiple TimeSync messages per time synchronization cycle. Syncher contention. Faulty timeset-timer hardware.
Lost Messages	Node and/or serial number of the SyncTime message do not match the node and/or serial number of the TimeSync message.	Increments on Syncher change.	Syncher change. Network problem.
Clock Errors	Discrepancy between LCN and EPNI, or between FSC-SMM and UCN time.	N/A	LCN clock problem.
Drift Threshold	N/A	N/A	N/A

Continued on next page

Time synch status description

Table 3-6 describes the time synchronization status portion of the example US display in Figure 3-4.

Table 3-6 – Time Synch Status

Statistic	Description
LCN Date	Reflects LCN date within the FSC-SMM.
LCN Time	Reflects LCN time within the FSC-SMM. The time is accurate to ± 1 second.
Syncher Node	The UCN node number of the syncher node.
Current State	The time synch state of this node. A PNI NIM or an NIM with time synch disabled will report “Failed.”
Drift Value	N/A

UCN addressing errors

An FSC Safety Manager UCN Address is configured using the FSC-DS. Range checking within the FSC-DS is assumed (1-63, odd addresses only). The top/bottom module placement within a given slot determines top/bottom shadow addressing. It is therefore impossible for an FSC-SMM to operate with an invalid UCN address. However, there is no protection against duplicate use of a UCN address.

3.6 FSC-SMM Status Indicators

Status indicators

The front panel of the FSC-SMM includes components which provide status information (see Figure 1-2). The front panel includes:

- a (red/green) 'STATUS' LED, and
- four additional (red) LEDs.

The **'STATUS'** LED is:

- off when the 5 VDC power on the FSC Central Part system bus is down,
- red when the module is offnet or alive,
- green when the UCN program is running (idle or OK),
- red/green flashing when the UCN program has failed.

If the **'STATUS'** LED is green, the four small LEDs provide additional information about the UCN communication:

- The **'Tx'** LED is on when data is being transmitted.
- The **'P'** LED is on when the node is primary (and off when the node is secondary).
- The **'A'** LED is on when the A channel is the active channel.
- The **'B'** LED is on when the B channel is the active channel.

Continued on next page

Status indicators, continued

If the **'STATUS'** LED blinks green/red, counting the number of times that the LED turns green provides diagnostic information on the error that has occurred. (Stop counting when the LED stays red for about four seconds.)

Table 3-7 lists the number of 'green flash' counts with their associated errors.

Table 3-7 – Error codes with 'STATUS' LED flashing red/green

Counts	Error
1	Bus error
2	Address error
3	Illegal instruction
4	Division by zero
5	Chk instruction failure
6	Trapv instruction failure
7	Prv violation failure
8	Trace failure
9	Line 1010 emulation
10	Line 1111 emulation
11	Trap #0 failure
12	Timer #0 failure
13	Timer #1 failure
14	Timer #2 failure
15	UART failure

3.7 FSC Diagnostic Information

FSC diagnostic display

The FSC system provides extensive diagnostic information about the operating status of its system components. Any faults are reported in the FSC Diagnostic Display at the US (see Figure 3-5). It will show a description of the component(s) affected, together with their module number and exact location (rack, position), as well as the date and time that the fault(s) occurred.

The FSC Diagnostic Display can be called as follows:

1) From the System Status (SYST STATS) screen, select a valid LCN node.
2) Select the NTWK/HWY STATUS (Network/Highway Status) target.
3) Select the UCN node you want diagnostic information about.
4) Select the DETAIL STATUS target.
5) Select the FSC DIAG target.

ATTENTION For more information about the various fault descriptions, error codes and the actions to be taken for each fault situation, refer to the *FSC Software Manual* under the 'View FSC system and process status' section.

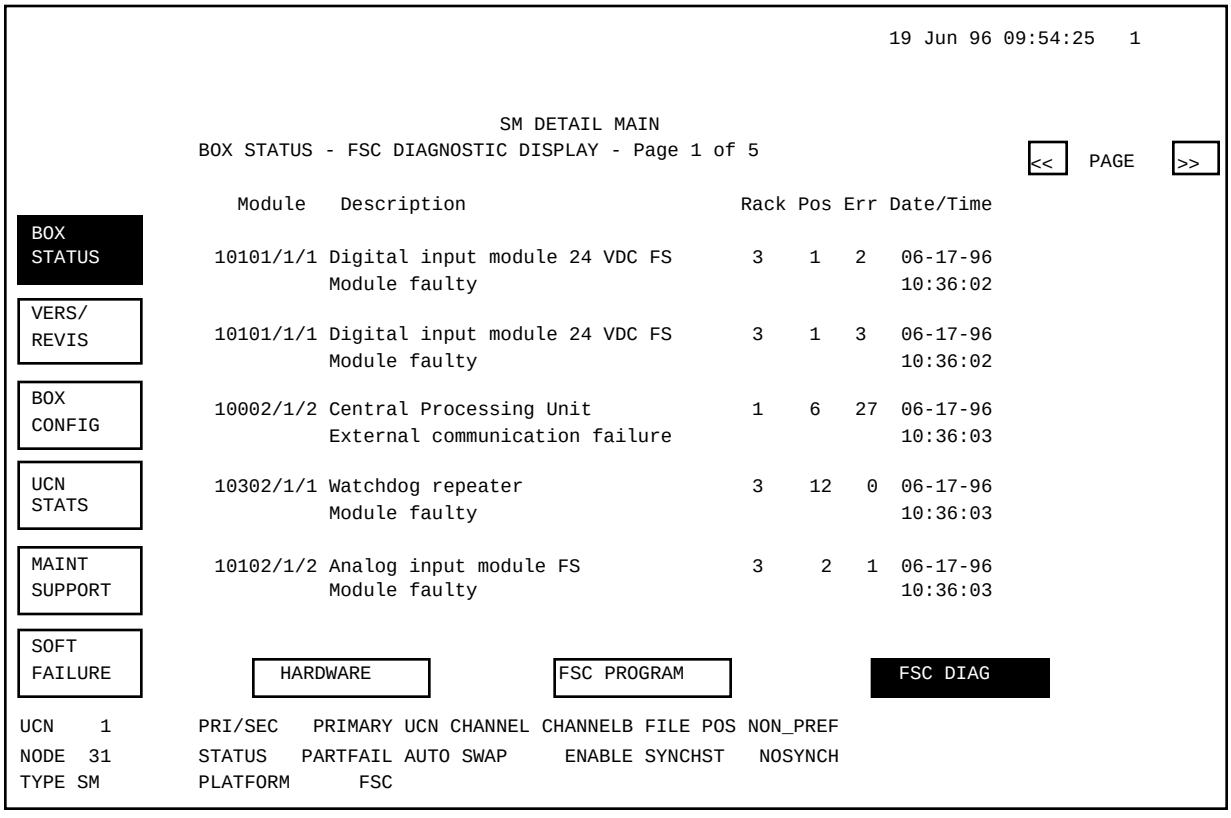

Figure 3-5 – FSC Diagnostic Display

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Section 4 – Removal and Replacement

4.1 Overview

About this section

This section provides instructions and references for the removal and replacement of the FSC Safety Manager Module and its components. The topics included in this section are:

4.2 Replacing an FSC-SMM

Replacement of the FSC-SMM

Table 4-1 describes the procedure for replacing the FSC Safety Manager Module (FSC-SMM).

Table 4-1 – Procedure for FSC-SMM replacement

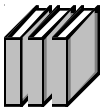
Step	Action	Done (✓)
1	Shut down the Central Part containing the FSC-SMM you want to replace, by disconnecting the flatcable of the 10005/./. watchdog (WD) module of that Central Part. After shutting down the Central Part, make sure to reconnect the watchdog flatcable.	
2	Turn the keyswitch on the 10002/./. Central Processing Unit (CPU) module to the STOP position (horizontal).	
3	Shut off the power to the Central Part by switching the circuit breaker which controls the power to the Central Part.	
4	Using the UCN Connector Torque Wrench Kit (51109612-100), disconnect the UCN communication cables from the FSC-SMM.	
5	Remove the screws at the top and bottom of the FSC-SMM board which secure it to the Central Part rack.	
6	Carefully pull the FSC-SMM out of the Central Part rack.	
7	Carefully insert the new FSC-SMM into the Central Part rack.	
8	Secure the FSC-SMM at the top and bottom using the two screws that were removed in step 5.	
9	Using the UCN Connector Torque Wrench Kit (51109612-100), reconnect the UCN communication cables to the FSC-SMM.	
10	Restore power to the Central Part with the new FSC-SMM by switching the circuit breaker which controls the power to the Central Part.	
11	Turn the keyswitch on the 10002/./. Central Processing Unit (CPU) module back to the RUN position (vertical).	
12	Perform a fault reset to bring the Central Part back into operation.	

4.3 Replacing the Firmware EPROMs

Introduction

EPROMs contain the firmware version currently being used in the FSC Safety Manager system. Each EPROM has a label which provides the following information:

- EPROM type,
- software revision number, and
- module serial number.



Refer to the *FSC Hardware Manual* for details on the location of the FSC firmware at the 10002/1/2 Central Processor Module and 10004/./. Communication Module.

CAUTION

CAUTION — It is extremely important that you wear a properly connected Electrostatic Discharge (ESD) wriststrap while removing, handling and installing any electronic components.

Slip the strap on your wrist like a wristwatch and connect its clip to the ground bus, which is located inside the cabinet. There is no danger of receiving a shock from an approved wriststrap.

Be sure to keep any electronic component in a static-safe carrying pouch whenever it is not in use.

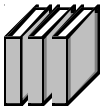
Continued on next page

FSC firmware upgrade

Table 4-2 describes the procedure for upgrading the FSC-SMM firmware EPROMs.

Table 4-2 – Procedure for FSC firmware upgrade

Step	Action	Done (✓)
1	Shut down Central Part 1 as described in Table 4-1 (steps 1 to 3).	
2	Remove the FSC-SMM from Central Part 1 as described in Table 4-1 (steps 4 to 6).	
3	Replace the firmware EPROM of the FSC-SMM with the new firmware EPROM.	
4	Reinstall the FSC-SMM in Central Part 1 as described in Table 4-1 (steps 7 to 9).	
5	Bring Central Part 1 back into operation as described in Table 4-1 (steps 10 to 12).	
6	Repeat steps 1 to 5 for Central Part 2.	



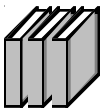
Refer to Appendix D ("On line modification") of the *FSC Software Manual* for information on replacing other EPROMs in the FSC system.

4.4 FSC-SMM Slot Keys

Summary

Each FSC slot is fitted with metal keys at the top and bottom so that only one particular type of module fits in that slot.

- If you ordered the FSC Safety Manager Module at the same time you ordered a new FSC, the keys are correct and no action is required.
- If you ordered the FSC-SMM separately, then you have to replace the keys.



Refer to the *FSC-SM Hardware Manual* for more information on key coding.

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Index

T

U, V, W, X, Y, Z

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Honeywell Inc.
Industrial Automation and Control
Automation College
2820 West Kelton Lane
Phoenix, AZ 85023-3028

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