

**MSC-3**  
**OPTION BOARD 3**  
**METASYS N2 SYSTEM**  
**PROTOCOL**



# MSC-3 Option Board Manual

## ZENER TECHNOLOGY AND QUALITY ASSURANCE

Since 1978 Zener Electric has supplied many thousands of AC drives to industry. These drives have been installed into numerous applications resulting in a wealth of in house experience. The Zener MSC-3 AC variable speed controller is the culmination of this experience, modern technology and industrial application requirements. The Zener Quality Assurance program ensures that every MSC-3 manufactured has proven to operate correctly in the production test bay before dispatch.

## MSC-3 PRODUCT WARRANTY

Zener Electric warrants the MSC-3 against defective workmanship and materials for a period of 24 months from the date of dispatch. Such defects will be rectified free of charge for both labour and material, at Zener Electric's premises subject to:

1. Zener Electric's customer raising an order upon Zener for service and/or repairs, subject to a warranty claim. The order is to state particulars of the model and serial number, the date of original purchase and invoice/delivery docket number.
2. All damage resulting from incorrect installation or use other than in accordance with the instruction manuals issued by Zener Electric is excluded from this warranty.
3. The Warranty being rendered invalid if the product is misused or if any unauthorised alteration, modification or substitution of any part of the product be made or the serial number of the product is defaced or altered.
4. The cost of transportation (both ways) is to be met by the owner if it's necessary to return the product, or any part of it, to Zener Electric's premises.
5. A charge being accepted by the owner for travelling time and expenses incurred in connection with warranty service at the user's site as requested by the owner.
6. If the product was not purchased from Zener Electric directly, then a warranty claim must be lodged with the original supplier in the first instance. Repairs will not be effected by Zener Electric unless approved by the original supplier. Goods not of our own manufacture incorporated in our supply or sold by us, carry their maker's warranty only.
7. Goods returned for claim under warranty will be accepted on the condition that should the claim be rejected then all costs, including inspection, will be charged to the customer's account.
8. Zener Electric is not liable for any consequential loss.

## SAFETY

Your MSC-3 must be applied, installed and operated in a safe manner. It is the responsibility of the user to ensure compliance with all regulations and practices covering the installation and wiring of your MSC-3. The instruction manual should be completely read and understood before attempting to connect or operate the MSC-3. Only skilled personnel should install this equipment.

**THE CONTENTS OF THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE**

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# MSC-3 Option Board Manual

## Introduction

This manual describes the installation, features and operations of the **MSC-3** communication option. The features of this option include:

### **METASYS N2 System compliant communications protocol**

- Drive ID - 1 to 255

### **Extra speed preset**

- For more convenient use with communications
- Allows all of the existing presets to still be used

### **Fault Log**

- Saves the last 10 faults, with time / date stamp
- A fault mask, enabled or disabled by the user to filter out power fail / under voltage events to avoid filling the log. The user can clear the log.
- Viewable fault log

### **Kilowatt-hour meter**

- Non volatile storage
- Can be reset

### **Hours run meter**

- Non volatile storage
- Can be reset

### **Essential services operation (ESO) log**

With supplementary information of ESO activation and drive stress in ESO operation (ie trips ignored)

### **Real time clock with battery backup.**

- Set Date/Time
- Used to timestamp log entries

## Compatibility

This manual describes the features of Option Board 3 – METASYS N2 SYSTEM Protocol with Software version 1.00 and is compatible with MSC-3 Control Board Software version 1.29 or later.

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## Installation

**WARNING!** The MSC3 under operation has hazardous internal voltages. Ensure all power sources are removed for the duration of the Option Board installation. Allow at least 2 minutes for hazardous voltage levels to discharge.

### IP30 Chassis A Installation

1. Ensure all power sources have been removed for at least 2 minutes and that they remain that way for the rest of the installation.
2. Remove the bottom section of the MSC3 blue plastic moulding to reveal the power terminals.
3. Remove the screw holding the control board/display assembly and pull it off the drive.
4. Turn the control board/display assembly over and plug the Option Board into one of the available option connectors.
5. Lay the Mylar insulation sheet on top off the exposed metal work and replace the control board/display/option assembly.
6. Replace the original mounting screw and install the Option Board mounting screw. The Option Board is ready for control wiring. Refer to the wiring diagram for wiring examples.
7. Once control wiring is complete replace the bottom moulding.
8. When the MSC-3 is switched on change the K02 DRIVE ID to a unique value. Refer to the K02 DRIVE ID section of this manual for details.

### IP 66 Chassis A Installation and all other chassis

1. Ensure all power sources have been removed for at least 2 minutes and that they remain that way for the rest of the installation.
2. Open the front door and remove the screws securing the control board to the chassis and lift off the control board.
3. Turn the control board over and plug the Option Board into one of the available option connectors.
4. Lay the Mylar insulation sheet on top off the exposed metal work and replace the control board/option assembly.
5. Replace the mounting screws. The Option Board is ready for control wiring. Refer to the wiring diagram for wiring examples.
6. Once control wiring is complete close the front door.
7. When the MSC-3 is switched on change the K02 DRIVE ID to a unique value. Refer to the K02 DRIVE ID section of this manual for details.

## Battery Replacement

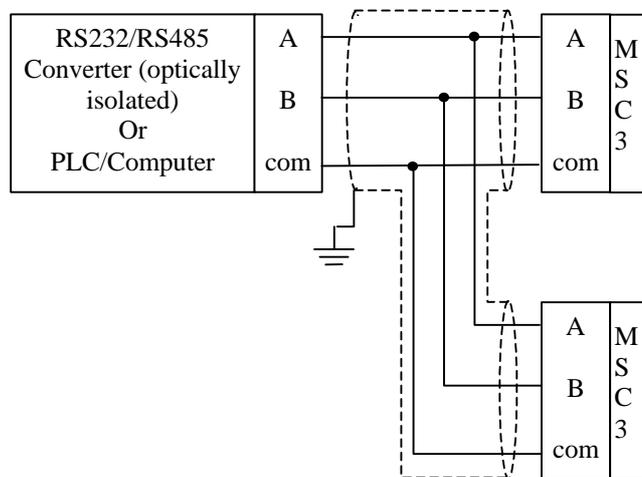
The battery used for time keeping is a **CR2032 3V Lithium** type. To replace the battery follow the first few steps of the installation section above to access the option board. Replace the old battery. Reassemble the drive as described in the installation section above.

# MSC-3 Option Board Manual

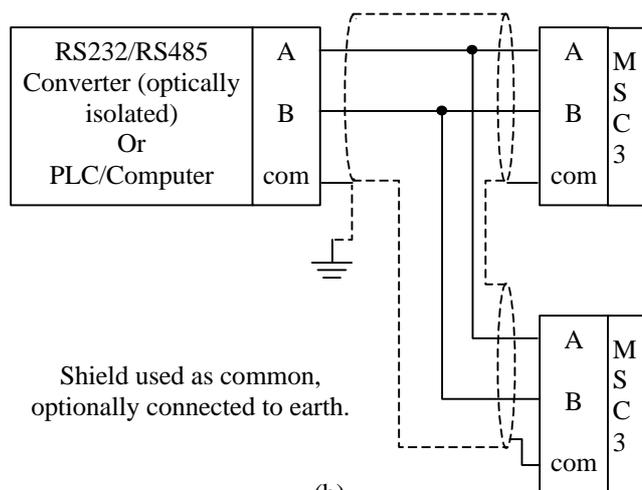
## Installation - Wiring

If the METASYS N2 feature is to be used, extra wiring is required as shown in Figure 1, which contains the two network configurations supported. In each case some wiring installation precautions will help minimise the risk of network failure. These precautions include:

- Use twisted pair shielded communications cable.
- It is recommended that the circuit commons be connected in addition to communication conductors.
- Each length of cable should have its shield connected to ground at one end only (earthing recommended at the computer / controller end). The shield connection should be made as close as possible to the earthing conductor.
- Avoid laying communication cables adjacent to power cabling and wiring. If not possible utilise the best separation of communication cabling and power cabling.
- If possible communication cables should cross power cables at right angles to each other.
- Up to 32 drives may be connected to the same network without the need of a RS-485 Repeater.



(a)

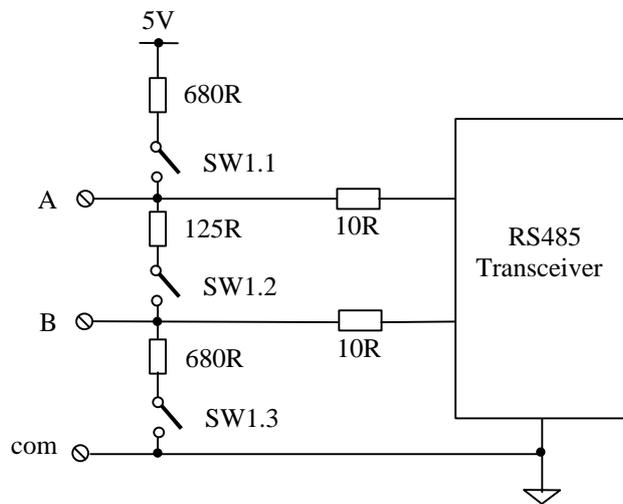


(b)

**Figure 1:** Wiring configurations for RS-485. Use shielded cable in all cases to minimise susceptibility to electrical noise.

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MSC-3 Option Board 3 provides for termination and line bias of the communication cabling by switch selection of SW1. SW1.1 selects the positive line bias, SW1.2 selects the line termination and SW1.3 selects the negative line bias. Figure 2 has details of SW1 designation and shows the default switch configuration.



**Figure 2:** RS485 interface circuit configuration showing location of DIP Switches used to configure the port.

## Communications Setup

Communication setup must be completed or at least checked before communications can begin. For the MSC3 the K00 COMMS SETUP menu is where alterations to the setup may be made. Setup items include protocol selection and drive ID selection.

### **K00 COMMS SETUP**

Menu Location: First menu

Choices:       K01 Protocol  
              K02 Drive ID

#### **K01 Protocol**

Menu Location: K00 Communications

Choice:        Metasys N2 Protocol

#### **K02 Drive ID**

Menu Location: K00 Communications

Range:         1 (initial setting) to 255

Each MSC-3 with an Option Board 3 requires a unique drive ID. The drive ID is used to identify the drive on the communication network. Use the up & down push buttons to alter the ID, press Enter to accept or Escape to abort.

## Fault Log

The fault log will record the date, time and drive status when a fault or trip occurs. The last 10 faults are recorded. A fault mask is provided to filter out power fail and under volt trips to avoid filling the log with power down trips.

### K04 Fault Log

Menu Location: First menu

Choices: K05 View Log  
K06 PF/UV Mask  
K07 Clear Log

### K05 View Log

Menu Location: K04 Fault Log

Display format: top line FF: XXXXXXXXXX  
bottom line yyyyMMMdd hh:mm

Where:

FF is the fault where 1 is the latest fault and 10 is the oldest.  
XXXXXXXXXX fault status code (a '1' indicates the corresponding fault). The digits are read left to right and the corresponding trip is read top to bottom  
Output Short Circuit  
Over Voltage  
Over current  
DC Low  
Power Fail  
Supply Fail  
Over temperature  
I2t trip  
Thermistor over temperature

yyyyMMMdd is the date of the fault

hh:mm is the time of the fault

The up and down push buttons move through the log. Press Enter or Esc to finish viewing the log. To facilitate correct logging check for correct date and time. See menu K16DATE/TIME for details.

### K06 PF/UV Mask

Menu Location: K04 Fault Log

Choices: K23 Enabled  
K24 Disabled (initial setting)

The K06 PF/UV Mask when enabled prevents a power fail or undervolts trip from making an entry in the fault log. This may be useful in those applications where the power is cycled on and off regularly. Use the up and down push buttons to select enable or disable, press Enter to accept the displayed setting or Esc to abort the change.

### K07 Clear Log

Menu Location: K04 Fault Log

This is a two step sequence to clear the fault log. Press Enter once and the "K25 continue ?" question is displayed which provides an opportunity to abort clearing the fault log. Press Enter a second time to clear the fault log or press Esc to abort.

## Run Log

The run log records motor and drive run time information, such as hours run and kilo Watt hours.

### **K08 Run log**

Menu Location: First menu

Choices:       K09 Hours run  
                  K10 kWh  
                  K11 Clear Log

### **K09 Hours run**

Menu Location: K08 Run log

Initial value:   0

The number of hours the motor has been running for is recorded in the run log. If the drive is on and the motor has not been running as indicated by the O00 RUN relay output, no time is recorded. Press Esc to return to the menu.

### **K10 kWh**

Menu Location: K08 Run log

Initial value:   0

The kWh log records the energy used by the motor. Press Esc to return to the menu.

### **K11 Clear log**

Menu Location: K08 Run log

This is a two step sequence to clear the run log. Press Enter once and the "K25 continue ?" question is displayed which provides an opportunity to abort clearing the run log. Press Enter a second time to clear the run log or press Esc to abort.

## Essential Services Override Log

Supplementary ESO information is recorded by the MSC3. The date and time of ESO feature activation is recorded as well as the date and time of drive stress (operated beyond design specifications) in ESO mode. Reset of the activation and stressed date and time is security code protected.

### K12 ESO log

Menu Location: First menu

Choices:       K13 ESO activated  
                  K14 ESO stressed  
                  K15 Clear log

#### K13 ESO activated

Menu Location: K12 ESO log

Display format: top line       K13 ESO activated  
                                  bottom line     yyyyMMMdd hh:mm

Where:

          yyyyMMMdd   is the date of activation  
          hh:mm        is the time of activation

This menu displays the date and time of the last activation of the ESO feature. Activation is detected when the MSC3 enters ESO mode operation. Press Esc to return to the menu.

#### K14 ESO stressed

Menu Location: K12 ESO log

Display format: top line       K13 ESO stressed  
                                  bottom line     yyyyMMMdd hh:mm

Where:

          yyyyMMMdd   is the date when the MSC3 was stressed  
          hh:mm        is the time when the MSC3 was stressed

In ESO mode the MSC3 will ignore any of the following trips: SUPPLY F, I2T TRIP, OT and OT THERM. When this occurs, the MSC3 and/or motor is operated beyond design specifications. The date and time of the last occurrence of this event is recorded in the K14 ESO stressed menu. Press Esc to return to the menu.

#### K15 Clear log

Menu Location: K12 ESO log

The ESO log is security coded against accidental clearing. Press Enter and MSC3 waits for the security code **1472** to be entered. Use the Up and Down push buttons to set the code and press Enter to accept the code and if correct it will clear the ESO log.

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## Time keeping

There are several features that require a date and time. To support these features time keeping needs to be set with the correct time. Date and time adjustments are done in the K15 Date/Time menu. Press Enter to begin time adjustment.

### K15 DATE/TIME

Menu Location: First menu

### K16 Year

Menu Location: K15 Date/Time

Initial value: 2000

Range: 2000...2099

Use the up and down push buttons to adjust the year. Press Enter to accept the setting or Esc to abort. Pressing Esc will abort the adjustment and proceed to the month setting.

### K17 Month

Menu Location: K15 Date/Time

Choices: JAN (initial value)    MAY    SEP  
          FEB                        JUN    OCT  
          MAR                        JUL    NOV  
          APR                        AUG    DEC

Use the up and down push buttons to change the month. Press Enter to accept the setting or Esc to abort. Pressing Esc will abort the adjustment and proceed to the day adjustment

### K18 Day

Menu Location: K15 Date/Time

Initial value: 1

Range: 1...31

Use the up and down push buttons to adjust the day of the month. Press Enter to accept the setting or Esc to abort. Pressing Esc will abort the adjustment and proceed to the hour setting.

### K19 Hours

Menu Location: K15 Date/Time

Initial value: 0

Range: 0...23

Use the up and down push buttons to adjust the hour. Press Enter to accept the setting or Esc to abort. Pressing Esc will abort the adjustment and proceed to the minute setting.

### K20 Minutes

Menu Location: K15 Date/Time

Initial value: 0

Range: 0...59

Use the up and down push buttons to adjust the minutes. Press Enter to accept the setting or Esc to abort.

### **K22 COMMS PRESET**

Menu Location: Reference selection list

Range: -100...100 %

The "K22 COMMS PRESET" is an additional speed reference is provided for use with external communications. Use the up and down push buttons to adjust the reference between -100 to 100% of the maximum speed. Press Enter to accept the value or Esc to abort.

Note: Adjustment of the K22 COMMS PRESET through the console will be remembered after the power has been cycled. This is not the case when accessed by communications.

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## MSC3 METASYS N2 PROTOCOL

Option Board 3 of the MSC-3 Option Board family is for communication and control of the MSC-3 via a half duplex, RS-485 serial link and a METASYS N2 compliant protocol. It has a multi drop capability allowing up to 64 MSC-3 units on one N2 network. Any MSC-3 drive connected to a N2 network is known as a Vendor Developed (VND) slave device. All it's modes, controls and parameters can be controlled and monitored from a N2 master such as a Network Control Module (NCM).

METASYS N2 protocol is a **Johnson Control Inc.** communication Specification. This protocol describes the data format and data structures of N2 Network. Option board 3 implements and supports all mandatory formats required as per the N2 System Protocol Specification Rev B. The remainder of this manual describes the supported N2 Point map structures of MSC-3.

### ABBREVIATIONS and DEFINITIONS

ADF	Internal Floating Points
ADI	Internal Integers
AI	Analog Inputs
AO	Analog Outputs
BI	Binary Inputs
BO	Binary Outputs
JCI	Johnson Control Inc. developers of the METASYS N2 protocol
N2	Metasys N2
N2 master	A N2 master is either a PC with JCI software or a dedicated JCI controller such as an NCM
NCM	Network Control Module
NPA	N2 Point Address (Each N2 Point Type has a address range from 0 to 255)
NPT	N2 Point Type
VND	Vendor Device Type – Vendor Developed

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## MSC3 METASYS POINT MAP

MSC-3 consists of 22 points, which are accessed via N2 network. There are 6 Analog inputs, 7 Binary inputs, 1 Analog output, 4 Binary inputs and 4 internal integer types that can be addressed to retrieve information from the MSC-3 drive.

**TABLE 1: METASYS POINT MAP**

NPT	NPA	UNITS	POINT DESCRIPTION	RANGE/VALUE	NOTES
<b>ANALOG INPUTS</b>					
AI	1	Hz	Speed	± 200.0	
AI	2	%	Load	± 200	
AI	3	Amp	Current		± Rated Current of the Drive
AI	4	kW	Power		± Rated Power of the Drive
AI	5	%	PID Feedback	± 100.0	
AI	6	%	Control Board Reference	± 100.0	
<b>BINARY INPUTS</b>					
BI	1		Run		
BI	2		Trip		
BI	3		ESO		
BI	4		Proof		Normal state is Logic 1
BI	5		A/R Fail		
BI	6		Forward		
BI	7		Reverse		
<b>ANALOG OUTPUTS</b>					
AO	1	%	Speed Reference (Cpreset)	± 100.0	% of Max Hz
<b>BINARY OUTPUTS</b>					
BO	1		Forward	0-Disable 1-Enable	Refer Note 1 for Unsupported Attributes
BO	2		Reverse	0-Disable 1-Enable	Refer Note 1 for Unsupported Attributes
BO	3		Reset	0-Disable 1-Enable	Refer Note 1 for Unsupported Attributes
BO	4		ESO	0-Disable 1-Enable	Refer Note 1 for Unsupported Attributes
<b>INTERNAL INTEGERS(ADI)</b>					
ADI	1		Drive Status Flag Reg 0		Refer to Table 2 for Status Field
ADI	2		Drive Status Flag Reg 1		Refer to Table 2 for Status Field
ADI	3		Drive Status Flag Reg 2		Refer to Table 2 for Status Field
ADI	4		Drive Status Flag Reg 3		Refer to Table 2 for Status Field

**Note1:** The Unsupported attributes in the Binary Outputs are: 3-Minimum On Time, 4-Minimum Off Time and 5-Maximum Cycles/Hour. However, messages to these attributes are handled properly by the Option Board 3.

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**TABLE 2: CONTROL BOARD STATUS FLAG DEFINITIONS**

Flag symbol	Word.bit	WHEN CLEARED	WHEN SET
OC_EF	0.15	NO Over Current Earth Fault	Hardware detected OC or EF
OVERVOLTAGE	0.14	NO Over voltage trip	Hardware detected Over voltage
OVERCURRENT	0.13	Current magnitude < threshold	Software detected Over current
DC_LOW	0.12	Bus voltage > threshold	Software detected Under voltage
PWRFAIL	0.11	No power fail detected	Software detected power fail
SUPPLYFAIL	0.10	Supply good	Software detected supply fault
OVERTEMP	0.9	Operating conditions will not generate excessive heat	Software detected Operating conditions has generated excessive heat
I2TTRIP	0.8	Thermal load < threshold	Software thermal overload
	0.7 (reserved)		
TRIPPED	0.6	The drive is not tripped	The drive is tripped
VLIMIT	0.5	NOT in voltage limit	In voltage limit
CLIMIT	0.4	NOT in current limit	In current limit
ZEROSPEED	0.3	Speed NOT zero	Speed is zero
ATSPEED	0.2	Speed does NOT equal the reference	Speed is equal to the reference
SHUTOFF	0.1	Output switching permitted	Output NOT switching
RUN	0.0	The drive is not running	The drive is running
INITDONE	1.15	Initialisation incomplete	Initialisation complete
ESO	1.14	No ESO input	ESO input true
STOPBAR	1.13	Motor permitted to start	Motor stopping or stopped.
FORWARD	1.12	No forward input	Forward input true
FWDLATCH	1.11	No latch forward input	Forward and latch input true
UPENTER	1.10	No console jog forward input	Console jog forward true
UP	1.9	No motorised potentiometer UP input	Motorised potentiometer UP input true
JOGFWD	1.8	No jog forward input	Jog forward input true
CONUP	1.7	No console UP input	Console UP input detected
REVERSE	1.6	No reverse input	Reverse input true
REVLATCH	1.5	No latch reverse input	Reverse and latch input true
DOWNENTER	1.4	No console jog reverse input	Console reverse jog input true
DOWN	1.3	No motorised potentiometer DOWN input	Motorised potentiometer DOWN input true
JOGREV	1.2	No jog reverse input	Jog reverse input true
CONDOWN	1.1	No console DOWN input	Console DOWN input true
REMOTE_T	1.0	Local control	Remote control
AR_FAIL	2.15	A/R has not failed	Drive failed to A/R
SWITCHING	2.14	No output switching	Output is switching
ESOMODE	2.13	Drive in normal mode	Drive in ESO mode
RAMP2ZERO	2.12	Not ramping to zero speed	Ramping to zero speed
COASTING	2.11	Not coasting	Coasting
	2.10 (reserved)		
	2.9 (reserved)		
LATCHREV	2.8	Drive has not latched in reverse	Drive is latched in reverse
LATCHFWD	2.7	Drive has not latched in forward	Drive is latched in forward
T_RESET	2.6	No Reset from terminals	Reset from terminals
PB_RESET	2.5	No Reset from push button	Reset from stop push button
PF_RESET	2.4	No reset from PF	Reset from PF
AR_RESET	2.3	No Reset from AR	AR generated reset
ENABLED	2.2	Drive not enabled	Drive enabled
POWEREDUP	2.1	Bus relay is not energised	Bus relay is energised
BUSCHARGED	2.0	Bus has not been charged	Bus has been charged

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Flag symbol	Word.bit	WHEN CLEARED	WHEN SET
TRIPPENDING	3.15	No trip waiting	There is a trip waiting
JOGSELECT1	3.14	Using JOG REVERSE reference	Using JOG FORWARD reference
JOGSELECT2	3.13	No JOG reference required	A JOG reference required
REFSELECT	3.12	Zero reference is required	A reference is required
REVERSEDIR	3.11	Stopped or forward operation	Reverse operation
BIPOLARREF	3.10	Unipolar reference	Bipolar reference required
MOTPOTUP	3.9	No motorised potentiometer speed increase	Increasing motorised pot speed
MOTPOTDOWN	3.8	No motorised potentiometer speed decrease	Decreasing motorised pot speed
MOTPOTEDGE	3.7	No MOTPOTUP/ MOTPOTDOWN edge	Negative MOTPOTUP/ MOTPOTDOWN edge
STARTPULSE	3.6	Drive stopped or running	Drive required to start
PWRBDBAD	3.5	S/W supports power board	Power Board Not Supported
ESOSTRESSED	3.4	No ESO stress since power on	ESO has been stressed
STSUPDPENDING	3.3	No status message waiting	Status message waiting
RUNDISPLAY	3.2	Display is in menu mode	Display is in run mode
PFCONDITION	3.1	Power OK	Power Fail
	3.0 (reserved)		
OPTION 0	4.15	Option not present	Option present
OPTION 1	4.14	Option not present	Option present
OPTION 2	4.13	Option not present	Option present
OPTION 3	4.12	Option not present	Option present
OPTION 4	4.11	Option not present	Option present
OPTION 5	4.10	Option not present	Option present
OPTION 6	4.9	Option not present	Option present
OPTION 7	4.8	Option not present	Option present
OPTION 8	4.7	Option not present	Option present
OPTION 9	4.6	Option not present	Option present
OPTION 10	4.5	Option not present	Option present
OPTION 11	4.4	Option not present	Option present
OPTION 12	4.3	Option not present	Option present
OPTION 13	4.2	Option not present	Option present
OPTION 14	4.1	Option not present	Option present
OPTION 15	4.0	Option not present	Option present

### **Analog Input 1 – Speed**

Indicates the actual output frequency of the drive in hertz as displayed on the MSC-3 console. Factors that control the speed include, C02 MAX Hz and the drive configuration.

### **Analog Input 2 – Load**

This is the relative motor load measured in percentage as displayed on the MSC-3 console. The factors that affect the percentage load reading include the motor nameplate information such as B02 MOTOR AMPS and actual current drawn by the motor.

### **Analog Input 3 – Current**

This indicates the drive output current in amperes as displayed on the MSC-3 console. The factors that affect the current reading include the drive rating and actual load on the drive.

### **Analog Input 4 – Power**

This indicates the drive output power in kilowatt as displayed on the MSC-3 console. The factors that affect the Power reading include the drive rating and actual load on the drive.

### **Analog Input 5 – PID Feedback**

This is the analog input on the option board 1, which may be set for voltage or current input by the on board switch combination. This input may be used as an additional speed reference or used in conjunction with the in built PID controller as the process variable. The factors that may affect the PID Feed back reading is the rescaling of the analog input via P23 Ref at 0% and P24 Ref at 100% and the input signal.

### **Analog Input 6 – Control Board Reference**

This is the analog input speed reference on the control board. The factors that may affect the Control Board Reference reading is the scaling of the analog input via R01 Ref at 0% and R02 Ref at 100% and the input signal.

### **Binary Input 1 – Run**

Indicates that the drive is running in either forward or reverse direction.

### **Binary Input 2 – Trip**

Indicates the presence of a trip that has stopped the output of the drive.

### **Binary Input 3 – ESO**

Indicates that the MSC3 is in the essential services mode.

### **Binary Input 4 – Proof**

Indicates that the MSC-3 is enabled and not tripped.

### **Binary Input 5 – A/R Fail**

Indicates that the drive could not auto restart as all restarts have been exhausted. Parameters that govern Auto Restart are adjustable through the MSC-3 console.

### **Binary Input 6 – Forward**

Indicates that the motor is running in the forward direction.

### **Binary Input 7 – Reverse**

Indicates that the motor is running in the reverse direction.

## **Analog Output 1 – Speed Reference (K22 COMMS PRESET)**

Writing values to this output permits speed control by the Metasys N2 system. In most cases, for Speed control by the Metasys N2 system, the F01 REMOTE reference must be set to K22 COMMS PRESET. This is done through the MSC-3 console. Also the remote terminal must be wired in. Refer to the MSC-3 Instruction manual for details on remote wiring.

## **Binary Output 1 – Forward**

Setting this output high or energised will command the MSC-3 to run the motor in the forward direction and when low or de-energised, the motor will stop running (non-latching).

## **Binary Output 2 – Reverse**

Setting this output high or energised will command the MSC-3 to run the motor in the reverse direction and when low or de-energised, the motor will stop running (non-latching).

## **Binary Output 3 – Reset**

This output when energised will attempt to reset a trip condition.

## **Binary Output 4 – ESO**

Setting this output high or energised, the MSC-3 will operate in essential services override (ESO). Note: ESO mode will use the reference defined by the F03 ESO setting of the MSC-3.

## **Internal Integer 1,2,3,4 or Drive Status Flag Reg 0,1,2,3 respectively**

This is the collection of flags that give more detail of the operating conditions of the MSC-3. For example ADI1 may be accessed to determine a specific trip condition, when the MSC-3 has tripped. Table 2 lists the flags and their respective meanings.

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