



# **Opal Pro MS6 SERIES**

## **SAF GlobalData Interface Users Manual**

*Revision 1.00*



## **FOR YOUR SAFETY**

Only qualified personnel should install this equipment, after first reading and understanding all the information in this manual. All instructions should be strictly adhered to. The user should consult SAF Drives or a SAF OPAL Starters supplier for clarification of the contents of this manual should any doubt or questions arise.

The installation of this equipment must be conducted in accordance with all national, regional and local electrical codes.

All drawings and technical representations included in this manual are for typical installations and should not in any way be considered for specific applications or modifications. Consult SAF OPAL Starters for supplemental instructions.

SAF Drives Inc. accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation, application or adjustment of this equipment.

The contents of this manual are believed to be correct at the time of printing. In following with our commitment to the ongoing development and improvement of our products SAF OPAL Starters reserves the right to change the specification of this product and/or the content of this instruction manual without notice.



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## Opal Pro to Mod TCP

### Introduction

The Opal Pro can be monitored and controlled over a EtherNet communication network using the SAF GlobalData protocol. The Opal Pro connects to the Ethernet network through an optional Ethernet card that is mounted on the main Opal Pro control card (CA530). Access is gained to the Ethernet card via the communication opening on the right side of the Opal Pro.

### Hardware

Connection is made via a 10Mbaud Ethernet port which utilizes a RJ45 connector. Connection should be made using CAT 5 cable.

### Jumper Settings

Jumper	Setting	Description
J3	Not installed	Boot Block write enable
J4	Installed on pins 1 and 2	Disable test mode

## LED Indicators

Two bi-colour (red/green) LED indicators are mounted beside the network connector. The upper LED indicates the Ethernet interface card status.

<b>LED State</b>	<b>Ethernet Interface Card Status</b>
OFF	No power
Flashing Red	Recoverable configuration fault (card is not configured, contact SAF Drives for support)
Solid Red	Hardware Error (contact SAF Drives for support)
Flashing Green	No errors client interface is not open ( check software firmware version of Opal Pro)
Solid Green	No errors (normal operation)
Amber (Red/Green)	Configuration Mode (card is not configured, contact SAF Drives for support)

The lower LED indicator indicates the Ethernet Network status.

<b>LED State</b>	<b>Ethernet Network Status</b>
OFF	Network interface offline, No network power
Flashing Red	I/O connection in timed-out state or other Recoverable fault
Flashing Green	Device in online but has no connections
Solid Red	Unrecoverable fault
Solid Green	Online with established connections
Amber (Red/Green)	Device is in Communication Faulted state and responding to an Identify Communication Faulted Request

## Opal Pro Parameter Settings

The parameters in the Opal Pro used to configure the Ethernet interface card (group 14) are only accessible if a Ethernet interface card is installed. The parameter settings are as follows:

Opal Pro Parameter	Setting	Description
2.02 Comm Module	Ethernet	Type of interface card installed (read only)
10.01 Start/Stop	Comm Module	This allows the Opal Pro to be started and stopped over the communication link
10.04 Iref Source	Comm Module	If this is set to Comm Module the Opal pro will follow the Current refernce from the communication link. If there is no reference being sent on the communication link this should be set to "Internal"
10.05 Phase Angle Source	Comm Module	If this is set to Comm Module the Opal pro will follow the Phase Angle reference from the communication link. If there is no reference being sent on the communication link this should be set to "Internal"
14.07 Node	1 – 254	This is the Node # of the Opal Pro
14.08 IP Addr 1	0-255	First number in the IP address of the Opal Pro
14.09 IP Addr 2	0-255	Second number in the IP address of the Opal Pro
14.10 IP Addr 3	0-255	Third number in the IP address of the Opal Pro
14.11 IP Addr 4	0-255	Fourth number in the IP address of the Opal Pro. (the node number as set in 14.07 is added on to this number to get the final IP address)
14.12 SubNet 1	0-255	First number in the SubNet Mask
14.13 SubNet 2	0-255	Second number in the SubNet Mask
14.14 SubNet 3	0-255	Third number in the SubNet Mask
14.15 SubNet 4	0-255	Fourth number in the SubNet Mask



15.04 Comm Fault	Enable Disable	Enable – Opal Pro trips out on a communication fault Disable – Nothing happens on a communication fault
15.05 Comm Fault Time	0.1 to 5.0 secs	This is the time setting that the Opal Pro uses to detect a communication fault. Bit 15 of the command word must change state twice with in the time set in this parameter.

If parameters in group 14 are modified the changes do not take effect until the control power for the Opal Pro is turned off and then back on again.

## **I/O Configuration**

The Opal Pro supports 4 input words and 51 output words. Their description is as follows:

<b>Input Words</b>	<b>Name</b>	<b>Description</b>
Word 1	Command	Bit 0 – Run Command
		Bit 1 – Jog Command
		Bit 2 – Reverse Command
		Bit 3 – Reset Command
		Bit 4 – DCI/Soft Stop Enable
		Bit 5 – Reserved
		Bit 6 – Reserved
		Bit 7 – Reserved
		Bit 8 – Reserved
		Bit 9 – Reserved
		Bit 10 – Reserved
		Bit 11 – Reserved
		Bit 12 – Reserved
		Bit 13 – Reserved
		Bit 14 – Reserved
		Bit 15 – Watch Dog bit (this bit must change at least twice in the time set by parameter 15.05)
Word 2	Current Reference	0 –1000, 833 = 500% of Motor Current set in parameter 13.01
Word 3	Phase Angle Reference	0 – (0.5 * Line Freq Cycle time in usec) ie: 60 Hz 0 – 8333
Word 4	Reserved	

<b>Output Words</b>	<b>Name</b>	<b>Description</b>
Word 1	Status	Bit 0 – Ready to Run (drive is enable and has 3 phase power)
		Bit 1 –Running (start is regulating)
		Bit 2 – Full On (starter is phased fully on)
		Bit 3 – Up to Speed (started is phased fully on and the current is below 105% of nameplate current as set in 13.01)
		Bit 4 – Reverse
		Bit 5 – Jogging
		Bit 6 – DC Injecting
		Bit 7 – Faulted
		Bit 8 – IOC Fault
		Bit 9 – MOL Fault
		Bit 10 – Phase Loss Fault
		Bit 11 – Shear Pin Fault
		Bit 12 – Shorted SCR Fault
		Bit 13 – Heat Sink OT Fault
		Bit 14 – Reserved
Bit 15 – Watch Dog Bit		
Word 2	Current Feedback	833 = 500% of motor name plate current as set in 13.01
Word 3	Phase Angle Actual	Amount of time phased on in microseconds
<b>Parameter</b>	<b>Name</b>	<b>Description</b>
1.01 (Word 4)	Current	Current feedback in Amps
1.02 (Word 5)	L1 to L2 Voltage	Line 1 to Line 2 Voltage in Volts
1.03(Word 6)	L1 to L3 Voltage	Line 1 to Line 3 Voltage in Volts
1.04(Word 7)	L2 to L3 Voltage	Line 2 to Line 3 Voltage in Volts
1.05(Word 8)	DI Status	Digital input status
		Bit 0 – Start
		Bit 1 – Stop
		Bit 2 – Jog
		Bit 3 – Reverse
		Bit 4 – Reset

1.06 (Word 9)	Analog Input	Analog input value in Volts X 100
1.07 (Word 10)	Relay Status	Status of the Relay Outputs
		Bit 0 – Running
		Bit 1 – By-Pass
		Bit 2 – Shorted SCR
		Bit 3 – Reverse
		Bit 4 – Faulted
1.08 (Word 11)	Analog Output	Analog Output value in Volts X 100
2.01 (Word 12)	Stack Size	Opal Pro Stack Size in Amps
2.02 (Word 13)	Comm Module Type	0 – None
		2 – Ethernet
2.03 (Word 14)	Firmware Version	Opal Pro Firmware Version x 100
10.01 (Word 15)	Start/Stop Control	4 = 2 Wire 5 = 3 Wire 6 = Comm Module
10.02 (Word 16)	Ramp Time	Time is seconds
10.03 (Word 17)	Step Current	In % of nameplate current
10.04 (Word 18)	Current Reference	7 = Internal
		8 = Analog Input
		9 = Comm Module
10.05 (Word 19)	Phase Angle	10 = Internal
		11 = Analog Input
		12 = Comm Module
10.06 (Word 20)	Jog Accel Current Limit	In % of nameplate current
10.07 (Word 21)	Jog Current Limit	In % of nameplate current
10.08 (Word 22)	Jog Ramp	Time is seconds x 10
11.01 (Word 23)	Stop Mode	13 = Coast
		14 = Soft Stop
		15 = DC Injection
11.02 (Word 24)	Soft Stop Step	In % of incoming line voltage
11.03 (Word 25)	Soft Stop Ramp	Time in seconds
11.04 (Word 26)	DCI Current	In % of nameplate current
11.05 (Word 27)	DCI Time	Time in seconds

12.01 (Word 28)	Analog Output	16 = Current Reference 17 = Current Feedback 18 = Overload level 19 = Phase Angle
13.01 (Word 29)	Motor Amps	Motor nameplate current in Amps
13.02 (Word 30)	Motor Volts	Motor nameplate volts in Volts
13.03 (Word 31)	Service Factor	Motor nameplate service factor x 100
14.01-14.06 (Word 32 - 37)	Reserved	
14.07 (Word 38)	Node Number	1 – 254
14.08 (Word 39)	IP Address 1	0 – 255
14.09 (Word 40)	IP Address 2	0 – 255
14.10 (Word 41)	IP Address 3	0 – 255
14.11 (Word 42)	IP Address 4	0 – 255
14.12 (Word 43)	SubNet 1	0 – 255
14.13 (Word 44)	SubNet 2	0 – 255
14.14 (Word 45)	SubNet 3	0 – 255
14.15 (Word 46)	SubNet 4	0 – 255
15.01 (Word 47)	Shear Pin Flt	34 = Enabled 35 = Disabled
15.02 (Word 48)	MOL Fault	36 = Disabled 37 = Class 10 37 = Class 15 37 = Class 20 37 = Class 30
15.03 (Word 49)	Overload Level	In % Drive trips at 100%
15.04 (Word 50)	Comm Fault	41 = Enabled 42 = Disabled
15.05 (Word 51)	Comm Flt Time	Time in seconds x 10

**NOTE: The Opal Pro must have firmware version 1.63 or higher.**