Opal Pro MS6 SERIES

Mod TCP Interface Users Manual

Revision 1.02

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 Brock Solutions 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.

Brock Solutions 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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Introduction

The Opal Pro can be monitored and controlled over a EtherNet communication network using the Mod TCP protocol. The Opal Pro connects to the Ethernet network through and 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. The Opal Pro is a Mod TCP Slave and responds to a Mod TCP scanner's requests.

Hardware

Connection is made via a 10Mbaud Ehernet 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.

LED State	**Ethernet Interface Card Status**
OFF	No power
Flashing Red	Recoverable configuration fault (card is not configured, contact Brock Solutions for support)
Solid Red	Hardware Error (contact Brock Solutions 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 Brock Solutions for support)

The lower LED indicator indicates the Ethernet Network status.

LED State	**Ethernet Network Status**
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 Ehernet 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 slave 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:

Input Words (Polled)	**Modbus Register**	**Name**	**Description**
Word 1	40001	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	40002	Current Reference	0 –1000, 833 = 500% of Motor Current set in parameter 13.01
Word 3	40003	Phase Angle Reference	0 – (0.5 * Line Freq Cycle time in usec) ie: 60 Hz 0 – 8333
Word 4	40004	Reserved	

Output Words (Polled)	**Modbus Register**	**Name**	**Description**
Word 1	40001	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	40002	Current Feedback	833 = 500% of motor name plate current as set in 13.01
Word 3	40003	Phase Angle Actual	Amount of time phased on in microseconds
Parameter	**Modbus Register**	**Name**	**Description**
1.01	40004	Current	Current feedback in Amps
1.02	40005	L1 to L2 Voltage	Line 1 to Line 2 Voltage in Volts
1.03	40006	L1 to L3 Voltage	Line 1 to Line 3 Voltage in Volts
1.04	40007	L2 to L3 Voltage	Line 2 to Line 3 Voltage in Volts
1.05	40008	DI Status	Digital input status
			Bit 0 – Start
			Bit 1 – Stop
			Bit 2 – Jog
			Bit 3 – Reverse
			Bit 4 – Reset
1.06	40009	Analog Input	Analog input value in Volts X 100

1.07	40010	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	40011	Analog Output	Analog Output value in Volts X 100
2.01	40012	Stack Size	Opal Pro Stack Size in Amps
2.02	40013	Comm Module Type	0 – None 2 – Ethernet
2.03	40014	Firmware Version	Opal Pro Firmware Version x 100
10.01	40015	Start/Stop Control	4 = 2 Wire 5 = 3 Wire 6 = Comm Module
10.02	40016	Ramp Time	Time is seconds
10.03	40017	Step Current	In % of nameplate current
10.04	40018	Current Reference	7 = Internal 8 = Analog Input 9 = Comm Module
10.05	40019	Phase Angle	10 = Internal 11 = Analog Input 12 = Comm Module
10.06	40020	Jog Accel Current Limit	In % of nameplate current
10.07	40021	Jog Current Limit	In % of nameplate current
10.08	40022	Jog Ramp	Time is seconds x 10
11.01	40023	Stop Mode	13 = Coast 14 = Soft Stop 15 = DC Injection
11.02	40024	Soft Stop Step	In % of incoming line voltage
11.03	40025	Soft Stop Ramp	Time in seconds
11.04	40026	DCI Current	In % of nameplate current
11.05	40027	DCI Time	Time in seconds

12.01	40028	Analog Output	16 = Current Reference 17 = Current Feedback 18 = Overload level 19 = Phase Angle
13.01	40029	Motor Amps	Motor nameplate current in Amps
13.02	40030	Motor Volts	Motor nameplate volts in Volts
13.03	40031	Service Factor	Motor nameplate service factor x 100
14.01-14.06	40032-40037	Reserved	
14.07	40038	Node Number	1 – 254
14.08	40039	IP Address 1	0 – 255
14.09	40040	IP Address 2	0 – 255
14.10	40041	IP Address 3	0 – 255
14.11	40042	IP Address 4	0 – 255
14.12	40043	SubNet 1	0 – 255
14.13	40044	SubNet 2	0 – 255
14.14	40045	SubNet 3	0 – 255
14.15	40046	SubNet 4	0 – 255
15.01	40047	Shear Pin Flt	34 = Enabled 35 = Disabled
15.02	40048	MOL Fault	36 = Disabled 37 = Class 10 37 = Class 15 37 = Class 20 37 = Class 30
15.03	40049	Overload Level	In % Drive trips at 100%
15.04	40050	Comm Fault	41 = Enabled 42 = Disabled
15.05	40051	Comm Flt Time	Time in seconds x 10

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