INCOM SYSTEM COMMUNICATIONS

IL 17384 – Part D
Motor Protection and Control

June 2004
Revision 3.20

A reference guide for programming INCOM system communications – including the INCOM RS-232 and INCOM/UDP protocols.

EATON | Cutler-Hammer

INCOM SYSTEM COMMUNICATIONS

IL 17384 – Part D
Motor Protection and Control

June 2004
Revision 3.20

A reference guide for programming INCOM system communications – including the INCOM RS-232 and INCOM/UDP protocols.

EATON | Cutler-Hammer

Limits of Liability and Disclaimer of Warranty

The authors and publisher of this manual have used their best efforts in preparing this user manual and the programs contained in it. These efforts include the development, research, and testing of the theories and programs to determine their effectiveness. The authors and publisher make no warranty of any kind, expressed or implied, with regard to these programs or documentation contained in this book. The authors and publisher shall not be liable in any event for incidental or consequential damages in connection with, or arising out of, the furnishing, performance, or use of these programs or this user manual.

If further information is desired by purchaser regarding the installation, operation, or maintenance of the software described in this user manual, the local Eaton Electrical representative should be contacted.

ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE ARE DISCLAIMED.

Trademarks

INCOM and IMPACC are trademarks of the Eaton Corporation.

Eaton Electrical
Power Quality Division
150 Industry Drive
Pittsburgh, PA 15275

Eaton Electrical INCOM System Communications
June 2004

Part D – Motor Protection and Control

This page intentionally left blank.

COMMUNICATIONS PROTOCOL – IQ 1000 II

The IQ 1000 II is backward-compatible with the IQ 1000. The IQ 1000 II thus will respond to all of the commands described in Section 304. This was done for renewal parts considerations. New INCOM System communications software should utilize the commands outlined in this section.

Fast Status (3 0 0)

Division Code = 1

Product ID: 3 = Standard IQ 1000 II

48 = Goldstar IQ 1000 II

Comm Version = 5

Supported Commands

	Reference Section
(3 0 0) Fast Status	Part A, 5.2.3
(3 0 3) Transmit All Standard Buffers	Part A, 5.2.8
(3 0 5) Transmit Current Buffer	Part A, 5.2.9
(3 0 F) Transmit Temperature Buffer Temperature Buffer (N=000001) (Expanded Buffer #1)	Part A, 5.2.17 Part A, 5.2.17.1
(3 C 8) Transmit Flags Buffer	Part A, 5.2.19, this section
(3 C 9) Transmit Setpoints Buffer	Part A, 5.2.20, this section
(3 C B) Transmit Time-Stamped Trip Data Buffer	Part A, 5.2.21, this section
(3 D 0) Slave Action	Part A, 5.2.23.1, 5.3.7, this section
(3 F 9) Download Setpoints	Part A, 5.2.26.2, this section

FLAGS Buffer Description (3 C 8)

Message	Byte	Name	Description	
1	Byte0		Number of additional data messages=7	
	Byte1	Flags1:	**Bit**	**Definition**
			B0	Instantaneous Over Current Trip
			B1	I-Squared T Trip
			B2	Phase Unbalance Trip
			B3	Ground Fault Trip
			B4	Jam Trip
			B5	Under Load Trip
			B6	Trip Bypass
			B7	Remote Trip (via Hardware Input)
	Byte2	Flags2:	**Bit**	**Definition**
			B0	Motor Bearing Temperature Trip
			B1	Load Bearing Temperature Trip
			B2	Winding Temperature Trip
			B3	Reverse Sequence Trip
			B4	Incomplete Sequence Trip
			B5	A/D Converter Error
			B6	RAM Error
			B7	ROM Error

FLAGS Buffer Description (3 C 8) – Continued

Message	Byte	Name	Description
2	Byte0	Flags3:	**Bit** **Definition**
			B0 Opto-Coupler Failure
			B1 Transition Not Completed
			B2 Full Load Amps/CT Value Error
			B3 Battery Low
			B4 External Trip (via INCOM)
			B5 Differential Trip on AC Input
			B6 Ambient Temperature Trip
			B7 Reserved
	Byte1:	Flags4 (Alarm Flags):	
			Bit **Definition**
			B0 Phase Unbalance Alarm
			B1 Winding Temperature Alarm
			B2 Motor Bearing Temperature Alarm
			B3 Load Bearing Temperature Alarm
			B4 Jam Alarm
			B5 Under Load Alarm
			B6 Ambient Temperature Alarm
			B7 Reserved
	Byte2:	Flags5: Reserved Flags	
3	Byte0:	Flags6: Conditional Flags:	
			Bit **Definition**
			B0 I Squared T Alarm/Trip
			B1 Starts per Hour Alarm/Trip
			B2-B7 Reserved
	Byte1:	Operations Count – Low byte	
	Byte2:	Operations Count – High byte	
4	Byte0	Run Time – Low byte	
	Byte1	Run Time – High byte	
	Byte2	Remaining Starts	

FLAGS Buffer Description (3 C 8) – Continued

Message	Byte	Name	Description
5	Byte0		Oldest Start Time
	Byte1		Percent I2T – low byte
	Byte2		Percent I2T – high byte
6	Byte0		Highest Phase Current – low byte
	Byte1		Highest Phase Current – high byte
	Byte2		Highest RTD Temperature
7	Byte0		Number of I2T Trips
	Byte1		Number of Instantaneous Over Current Trips
	Byte2		Number of Under Load Trips
8	Byte0		Number of Jam Trips
	Byte1		Number of Ground Fault Trips
	Byte2		Number of RTD Trips

SETPOINT Buffer Description (3 C 9)

Message	Byte	Description
1	Byte0	Number of additional data messages = 15
	Byte1	Firmware Revision
	Byte2	Firmware Version
2	Byte0	BIT BYTE0:

Bit	Definition
B0	1=auto reset for I2T, 0=manual reset for I2T
B1	1=2 second trip delay on Phase Unbalance
B2	1=transition on time out, 0=trip on time out
B3	1=60Hz, 0=50Hz
B4	1=Trip Mode 2, 0=Trip Mode 1
B5	1=reversing is allowed, 0=non-reversing mode
B6	1=Setpoints programmable when stopped/tripped 0=Setpoints programmable only when stopped
B7	1=degrees F, 0=degrees C (local RTD display)

Byte1 BIT BYTE1:

Bit	Definition
B0	1=Single Phase Operation, 0=3 Phase
B1	1=IOC Protection Disabled, 0=IOC Enabled
B3,B2	00= Current Loop Out Prop. to 100% Full Load 01= Current Loop Out Prop. to 125% Full Load 10= Current Loop Out Prop. to Max Winding RTD 11= Current Loop Out Prop. to I2T Trip Level
B6,B5,B4	000 = Remote Reset 001 = Remote Trip 010 = Remote Differential Trip 011 = Motor Stop 100 = Reset Disabled
B7	Reserved

Byte2 Winding Temperature Trip Setpoint

3	Byte0	Motor Bearing Temp Trip Setpoint
	Byte1	Load Bearing Temp Trip Setpoint
	Byte2	Ambient Temp Trip Setpoint

SETPOINT Buffer Description (3 C 9) – Continued

Message	Byte	Description
4	Byte0	Winding Temperature Alarm Setpoint
	Byte1	Motor Bearing Temp Alarm Setpoint
	Byte2	Load Bearing Temp Alarm Setpoint
5	Byte0	Ambient Temperature Alarm Setpoint
	Byte1	Ground Fault Trip Setpoint
	Byte2	Ground Fault Start Delay Setpoint
6	Byte0	Ground Fault Run Delay Setpoint
	Byte1	Inst Over Current Trip Setpoint – LSB
	Byte2	Inst Over Current Trip Setpoint – MSB
7	Byte0	Inst Over Current Start Delay Setpoint
	Byte1	Locked Rotor Current Setpoint – LSB
	Byte2	Locked Rotor Current Setpoint – MSB
8	Byte0	Locked Rotor Stall Time Setpoint
	Byte1	Ultimate Trip Current Setpoint
	Byte2	I Squared T Alarm Setpoint
9	Byte0	Jam Alarm Setpoint – LSB
	Byte1	Jam Alarm Setpoint – MSB
	Byte2	Jam Trip Setpoint – LSB
10	Byte0	Jam Trip Setpoint – MSB
	Byte1	Jam Start Delay Time Setpoint
	Byte2	Jam Run Delay Setpoint
11	Byte0	Under Load Alarm Setpoint
	Byte1	Under Load Trip Setpoint
	Byte2	Under Load Start Delay Setpoint

SETPOINT Buffer Description (3 C 9) – Continued

Message	Byte	Description
12	Byte0	Under Load Run Delay Setpoint
	Byte1	Phase Unbalance Alarm Setpoint
	Byte2	Phase Unbalance Delay Setpoint
13	Byte0	Starts Per Minute Setpoint
	Byte1	Starts Time Limit Setpoint
	Byte2	Transition Current Level Setpoint
14	Byte0	Transition Time Setpoint
	Byte1	Incomplete Sequence Time Setpoint
	Byte2	Anti-Backspin Delay Setpoint – LSB
15	Byte0	Anti-Backspin Delay Setpoint – MSB
	Byte1	Full Load Amps Setpoint – LSB
	Byte2	Full Load Amps Setpoint – MSB
16	Byte0	Current Transformer Ratio – LSB
	Byte1	Current Transformer Ratio – MSB
	Byte2	Aux Trip relay:

Bit	Definition
B3-B0	0000 = All trips
	0001 = Instantaneous Over Current Only
	0010 = I^2T Only
	0011 = Ground Fault Only
	0100 = Jam Only
	0101 = Under Load Only
	0110 = Motor Bearing Temperature Only
	0111 = Load Bearing Temperature Only
	1000 = Winding Temperature Only
	1001 = Reversing Only
B7-B4	Reserved

TIME-STAMPED TRIP DATA Buffer Description (3 C B)

Message	Byte	Description	Format
1	Byte0	Number of additional data messages = 35	
	Byte1	TRIP DATA Buffer number = 1	
	Byte2	Number of unread Trip Data Buffers = 0	
2	Byte0	Trip Time Offset Trip Time Offset in	
	Byte1	Trip Time Offsetseconds = 256*BYTE2	
	Byte2	Trip Time Offset+BYTE1.BYTE0/256	
3		Buffers Supported Map = 010028h	
4		Phase A Current	IMPACC 24-Bit Floating Point
5		Phase B Current	IMPACC 24-Bit Floating Point
6		Phase C Current	IMPACC 24-Bit Floating Point
7		Ground Fault Current	IMPACC 24-Bit Floating Point
8	Byte0	Reserved	
	Byte1	Winding Temperature 1	
	Byte2	Winding Temperature 2	
9	Byte0	Winding Temperature 3	
	Byte1	Winding Temperature 4	
	Byte2	Winding Temperature 5	
10	Byte0	Winding Temperature 6	
	Byte1	Motor Bearing Temperature 1	
	Byte2	Motor Bearing Temperature 2	
11	Byte0	Load Bearing Temperature 1	
	Byte1	Load Bearing Temperature 2	
	Byte2	Ambient Temperature	
12	Byte0	Temperature Validity 1	
	Byte1	Temperature Validity 2	
	Byte2	Reserved	

TIME-STAMPED TRIP DATA Buffer Description (3 C B) – Continued

Message	Byte	Description	Format
13-20		Flags Buffer	
21-36		Setpoint Buffer	

SLAVE ACTION Description (3 D 0)

Byte2	Byte1	Byte0	Definition
0	0	1	Reset Trip/Alarm
0	0	2	Reset Trip/Alarm
0	1	1	Reset (Peak) Demand Current
2	0	3	Trip (Stop)

Download Setpoints Description (3 F 9)

Message	Byte	Description
1	Byte0	Number of additional data messages = 35
	Byte1	Protection mode, 0=three phase, 1=single phase
	Byte2	0
2	Byte0	RTD Display: 0=Degrees C, 1=Degrees F
	Byte1	0
	Byte2	Winding Temperature Trip Setpoint
3	Byte0	0
	Byte1	Motor Bearing Temperature Trip Setpoint
	Byte2	0
4	Byte0	Load Bearing Temp Trip Setpoint
	Byte1	0
	Byte2	Auxiliary Temperature Trip Setpoint
5	Byte0	0
	Byte1	Winding Temperature Alarm Setpoint
	Byte2	0
6	Byte0	Motor Bearing Temperature Alarm Setpoint
	Byte1	
	Byte2	Load Bearing Temperature Alarm Setpoint
7	Byte0	0
	Byte1	Auxiliary Temperature Alarm Setpoint
	Byte2	0
8	Byte0	Ground Fault Trip Level Setpoint in amps
	Byte1	0
	Byte2	Ground Fault Start Delay in line cycles

Download Setpoints Description (3 F 9) – Continued

Message	Byte	Description
9	Byte0	0
	Byte1	Ground Fault Run Delay in line cycles
	Byte2	0
10	Byte0	IOC On or Off, 0=IOC enabled, 1=IOC disabled
	Byte1	0
	Byte2	IOC Trip Setpoint LSB
11	Byte0	IOC Trip Setpoint MSB
	Byte1	IOC Start Delay in line cycles
	Byte2	0
12	Byte0	Locked Rotor Current Setpoint LSB
	Byte1	Locked Rotor Current Setpoint MSB
	Byte2	Locked Rotor Time
13	Byte0	0
	Byte1	Ultimate Trip Current Setpoint
	Byte2	0
14	Byte0	I2T Alarm Level Setpoint
	Byte1	0
	Byte2	I2T Reset Mode, 0=Manual mode, 1=Auto mode
15	Byte0	0
	Byte1	Jam Alarm Level Setpoint LSB
	Byte2	Jam Alarm Level Setpoint MSB
16	Byte0	Jam Trip Level Setpoint LSB
	Byte1	Jam Trip Level Setpoint MSB
	Byte2	Jam Start Delay Setpoint

Download Setpoints Description (3 F 9) – Continued

Message	Byte	Description
17	Byte0	0
	Byte1	Jam Run Delay Setpoint
	Byte2	0
18	Byte0	Under Load Alarm Setpoint
	Byte1	0
	Byte2	Under Load Trip Setpoint
19	Byte0	0
	Byte1	Under Load Start Delay Setpoint
	Byte2	0
20	Byte0	Under Load Run Delay Setpoint
	Byte1	0
	Byte2	Phase Unbalance Alarm Level
21	Byte0	0
	Byte1	Phase Unbalance Run Delay Setpoint
	Byte2	0
22	Byte0	I2T Trip, 0=I2T Trip, 1=Phase Unbalance Trip
	Byte1	0
	Byte2	Number of Starts allowed
23	Byte0	0
	Byte1	Time Period for Allowed Starts
	Byte2	0
24	Byte0	Operation Count Reset, 0=No Reset, 1=Reset
	Byte1	0
	Byte2	Run Time Reset, 0=No Reset, 1=Reset

Download Setpoints Description (3 F 9) – Continued

Message	Byte	Description
25	Byte0	0
	Byte1	Transition Current Setpoint
	Byte2	0
26	Byte0	Transition Time Setpoint
	Byte1	0
	Byte2	Trip or Transition on Time, 0=Trip, 1=Transition
27	Byte0	0
	Byte1	Incomplete Sequence Report Back Setpoint
	Byte2	0
28	Byte0	Anti-backspin setpoint LSB
	Byte1	Anti-backspin setpoint MSB
	Byte2	Full Load Current Setpoint LSB
29	Byte0	Full Load Current Setpoint MSB
	Byte1	Line Frequency: 0=50Hz, 1=60Hz
	Byte2	0
30	Byte0	Trip Mode, 0=Mode 1, 1=Mode 2
	Byte1	0
	Byte2	Reversing Setpoint, 0=Non-Reversing, 1=Reversing
31	Byte0	0
	Byte1	Remote Input Selection, 0=Remote reset, 1=Remote trip 2=Remote differential trip, 3=Motor stop, 4=Reset disabled
	Byte2	0

Download Setpoints Description (3 F 9) – Continued

Message	Byte	Description
32	Byte0	4 to 20 ma output, 0=100% FLA, 1=125% FLA,
		2=Trip Level of Max W RTD, 3= % of I2T Trip Level
	Byte1	0
	Byte2	Auxiliary Trip Relay, 0=All trips, 1=IOC, 2=I2T, 3=Ground Fault
		4=Jam, 5=Under load, 6=Motor Bearing Temp
		7=Load Bearing Temp, 8=Winding Temp, 9=Motor Reversal
33	Byte0	0
	Byte1	Trip Count Reset, 0=No Reset, 1=Reset
	Byte2	0
34	Byte0	Max value reset, 0=No Reset, 1=Program Only Reset,
		2=Face Plate Reset Enabled
	Byte1	CT Ratio Setpoint LSB
	Byte2	CT Ratio Setpoint MSB
35	Byte0	0
	Byte1	CT Ratio setpoint LSB
	Byte2	CT Ratio setpoint MSB
36	Byte0	Checksum (sum of previous 35 messages) – LSB
	Byte1	Checksum (sum of previous 35 messages) – MSB
	Byte2	Complement of Checksum LSB

Note: The IQ 1000 II will respond with an ACK message after each setpoint message it receives.

CHANGE RECORD

Revision	Date	Changes
1.00	6/28/02	Taken from IL 17384 Revision 3.10 (June 2002) Part D; made into separate document for inclusion in Revision 3.20.

COMMUNICATIONS PROTOCOL – MP-3000

The MP-3000 is backward-compatible with the IQ 1000 II if the INCOM Communication Mode setpoint is set to IQ2 EN. With this setpoint configured, the MP-3000 will respond to all of the commands described in Part D, Section 301, and the Fast Status with the Acknowledge command (3 0 1) described in Section 304 for the IQ 1000. This was done for renewal parts considerations. The MP-3000 is **not** backward-compatible with the IQ 1000 except as already noted. New INCOM System communications software should utilize the commands outlined in this section.

Fast Status (3 0 0)

Division Code = 1

Product ID: 50 = MP-3000

Comm Version: 0 – Initial product version

1 – The range of the Anti-Backspin Time setpoint is changed from 1-240 minutes to 1-3,600 seconds.

2 – New Stop Current Level setpoint to (3 C F) N=500101 with dependencies.

- Change dependencies of FLA and CTR
- Change dependencies of JAM and IOC functions on the FLA/CTR
- New dependencies on Underload Trip, Underload Alarm, Transition Current, and Start Current Level with Stop Current Level.
- Addition of discrete input states to (3 C 8) Flags buffer

Status Bits:

Bit	Definition
S0	Start is prevented (anti-backspin, time between starts, starts per hour, program mode if setpoint Program While Running is set to 0)
S1	Unread Motor Start Profile buffer available, released via Slave Action (3 D 1) (3 0 9).
S2	Unread Minor Event buffer available, released via Slave Action (3 D 1) (3 0 8)
S3	Unread Major Event buffer available, released via Slave Action (3 D 1) (3 0 0)
S4	Powered on since last Fast Status request
S5	Set when start to run state transition occurs; cleared when in Ready state.

S7, S6, S0

Value	Definition
0 0 0	Ready (stopped condition ready to start)
0 0 1	Ready (start is blocked)
0 1 x	Running (motor is in run or start condition)
1 0 x	Tripped
1 1 x	Alarmed

Supported Commands

			Reference Section
(3 0 0)	Fast Status		Part A, 5.2.3
(3 0 3)	Transmit All Standard Buffers		Part A, 5.2.8
(3 0 F)	Transmit Expanded Buffer		Part A, 5.2.17, this section
	N=000001	Transmit Temperature Buffer	Part A, 5.2.17.1
	N=000003	Transmit Current Buffer	Part A, 5.2.17.3
		Response Msg 1: Number of Additional Messages = 6	
		Response Msg 2: Phase A current	
		Response Msg 3: Phase B current	
		Response Msg 4: Phase C current	
		Response Msg 5: Ground current	
		Response Msg 6: Reserved	
		Response Msg 7: Average Phase current	
	N=000024	Transmit Operations Count, Runtime	Part A, 5.2.17.36
	N=000025	Transmit Motor Data Maximum Values	Part A, 5.2.17.37
	N=000026	Transmit Motor Trip Counters	Part A, 5.2.17.38
	N=000027	Transmit Motor Alarm Counters	Part A, 5.2.17.39
	N=000028	Transmit Motor Data	Part A, 5.2.17.40
(3 A 4)	Transmit INCOM Slave-Interface Statistics Buffer		Part A, 5.2.28.2
(3 C 8)	Transmit Flags Buffer		Part A, 5.2.19, this section
(3 1 F)	Transmit Setpoints Data Block Size		Part A, 5.3.4, this section
	N=510000H	Transmit Setpoint Summary Buffer	This section
	N=510101H	Transmit Setpoints Group 1, Block 1 Size	
	N=510102H	Transmit Setpoints Group 1, Block 2 Size	
	N=510103H	Transmit Setpoints Group 1, Block 3 Size	
(3 C B)	Transmit Major Event Data Buffer		Part A, 5.2.21, this section
(3 C C)	Transmit Minor Event Data Buffer		This section
(3 C D)	Transmit Motor Start Profile Data Buffer		This section

Supported Commands – Continued

	Reference Section
(3 C F) Transmit Setpoints Data Buffer	Part A, 5.3.6, this section
N=500101H Transmit Setpoints pages 1-4	
N=500102H Transmit Setpoints pages 5-9	
N=500103H Transmit Setpoints pages 10-13	
(3 D 0) Slave Action	Part A, 5.2.23.1, 5.3.7, this section
(3 D 8) Receive Current Date and Time	Part A, 5.2.25.1
(3 F 9) Download Setpoints	Part A, 5.2.26.2, this section
(3 F B) Download Setpoints Buffer Request	Part A, 5.3.9, this section
(D E 3) Broadcast Synchronize RTC	Part A, 5.2.27

Transmit Setpoint Summary Buffer (3 1 F) N=510000H

Message	Byte	Description
1	Byte0	Number of additional data messages = 5
	Byte1	Firmware Revision
	Byte2	Firmware Version
2	Byte0	LSB of Setpoints Sequence Number
	Byte1	MSB of Setpoints Sequence Number
	Byte2	Number of Setpoint Groups = 1
3	Byte0	Number of blocks in Group 1 = 3
	Byte1	Number of blocks in Group 2 = 0
	Byte2	Number of blocks in Group 3 = 0
4	Byte0	Number of blocks in Group 4 = 0
	Byte1	Number of blocks in Group 5 = 0
	Byte2	Number of blocks in Group 6 = 0
5	Byte0	Number of blocks in Group 7 = 0
	Byte1	Number of blocks in Group 8 = 0
	Byte2	Number of blocks in Group 9 = 0
6	Byte0	LSB of checksum
	Byte1	MSB of checksum
	Byte2	Complement of checksum

Transmit Setpoint Data Block 1 Size Description (3 1 F) N=510101H

Message	Byte	Description
1	Byte0	Number of additional data messages = 3
	Byte1	Block Number = 01
	Byte2	Group Number = 01
2	Byte0	LSB of Setpoints Sequence Number
	Byte1	MSB of Setpoints Sequence Number
	Byte2	Reserved = 0
3	Byte0	Number of messages = 30
	Byte1	Reserved = 0
	Byte2	Reserved = 0
4	Byte0	Checksum (sum of previous 3 messages) – LSB
	Byte1	Checksum (sum of previous 3 messages) – MSB
	Byte2	Complement of LSB of checksum

Transmit Setpoint Data Block 2 Size Description (3 1 F) N= 510102H

Message	Byte	Description
1	Byte0	Number of additional data messages = 3
	Byte1	Block Number = 02
	Byte2	Group Number = 01
2	Byte0	LSB of Setpoints Sequence Number
	Byte1	MSB of Setpoints Sequence Number
	Byte2	Reserved = 0
3	Byte0	Number of messages = 46
	Byte1	Reserved = 0
	Byte2	Reserved = 0
4	Byte0	Checksum (sum of previous 3 messages) – LSB
	Byte1	Checksum (sum of previous 3 messages) – MSB
	Byte2	Complement of LSB of checksum

Transmit Setpoint Data Block 3 Size Description (3 1 F) N=510103H

Message	Byte	Description
1	Byte0	Number of additional data messages = 3
	Byte1	Block Number = 03
	Byte2	Group Number = 01
2	Byte0	LSB of Setpoints Sequence Number
	Byte1	MSB of Setpoints Sequence Number
	Byte2	Reserved = 0
3	Byte0	Number of messages = 30
	Byte1	Reserved = 0
	Byte2	Reserved = 0
4	Byte0	Checksum (sum of previous 3 messages) – LSB
	Byte1	Checksum (sum of previous 3 messages) – MSB
	Byte2	Complement of LSB of checksum

FLAGS Buffer Description (3 C 8)

Message	Byte	Name	Description	
1	Byte0		Number of additional data messages=4	
	Byte1		Status Reason – low byte See Below: Standard IMPACC	
	Byte2		Status Reason – high byte Reason Constants Supported	
2	Byte0		Status – low byte	See Below: Standard IMPACC
	Byte1		Status – high byte	Status Constants Supported
	Byte2		Reserved = 0	
3	Byte0	Flags1:	**Bit**	**Definition**
			B0	Stop Mode
			B1	Start Mode
			B2	Run Mode
			B3	Trip
			B4	Alarm
			B5	Relay Disarmed Alarm
			B6	Program Mode
			B7	Anti-Backspin
	Byte1	Flags2:	**Bit**	**Definition**
			B0	Instantaneous Over Current Trip
			B1	I-Squared T Trip
			B2	Phase Unbalance Trip
			B3	Ground Fault Trip
			B4	Jam Trip
			B5	Under Load Trip
			B6	Trip Bypass
			B7	Remote Trip (via Hardware Input)
	Byte2	Flags3:	**Bit**	**Definition**
			B0	Motor Bearing Temperature Trip
			B1	Load Bearing Temperature Trip
			B2	Winding Temperature Trip
			B3	Reverse Sequence Trip
			B4	Incomplete Sequence Trip
			B5	A/D Converter Error (Alarm or Trip)
			B6	RAM Error (Alarm or Trip)
			B7	ROM Error (Alarm or Trip)

FLAGS Buffer Description (3 C 8) – Continued

Message	Byte	Description		
4	Byte0	Flags4:	**Bit**	**Definition**
			B0	Opto-Coupler Failure (Alarm or Trip)
			B1	Transition Not Completed Trip
			B2	Reserved = 0
			B3	Battery-backed RAM Failure (Alarm or Trip)
			B4	External Trip (via INCOM)
			B5	Differential Trip on AC Input
			B6	Ambient Temperature Trip
			B7	Time Between Starts Trip
	Byte1	Flags5:	**Bit**	**Definition**
			B0	Phase Unbalance Alarm
			B1	Winding Temperature Alarm
			B2	Motor Bearing Temperature Alarm
			B3	Load Bearing Temperature Alarm
			B4	Jam Alarm
			B5	Under Load Alarm
			B6	Ambient Temperature Alarm
			B7	Ground Fault Alarm
	Byte2	Flags6:	**Bit**	**Definition**
			B0	RTD Failure Alarm
			B1	Universal RTD Communication Failure Alarm
			B2	Starts per Hour Alarm
			B3	Reserved = 0
			B4	Zero Speed Switch Trip
			B5	Starts per Hour Trip
			B6-B7	Reserved

FLAGS Buffer Description (3 C 8) – Continued

Message	Byte	Description		
5	Byte0	Flags7:	**Bit**	**Definition**
			B0	I Squared T Alarm
			B1	Setpoint Download In-Progress
			B2-B7	Reserved – Comm Versions 0, and 1
			B2	Discrete input 1 state (1=ON) – Comm Versions >1
			B3	Discrete input 2 state (1=ON) – Comm Versions >1
			B4-B7	Reserved – Comm Version >1
	Byte1	Master Node Address – low byte		
	Byte2	Master Node Address – high byte		

TIME-STAMPED Major Event Data Buffer Description (3 C B)

Message	Byte	Description	
1	Byte0	Number of additional data messages = 20	
	Byte1	Major Event Data Buffer number	Range: 1 - 20
	Byte2	Number of Unacknowledged Trip Data Buffers	Range: 0 - 19
2	Byte0	Number of major events currently buffered	Range: 1 - 20
	Byte1	1/100 seconds = 0	(resolution is to nearest second)
	Byte2	Hour (0-23)	Packed BCD
3	Byte0	Minute (0-59)	Packed BCD
	Byte1	Second (0-59)	Packed BCD
	Byte2	Month (1-12)	Packed BCD
4	Byte0	Day (1-31)	Packed BCD
	Byte1	Year (0-99)	Packed BCD
	Byte2	Buffer Type = 3 (Major Event)	
5		Buffers Supported Map = 010020H	
6		Phase A Current	(IMPACC 24-Bit Floating Point)
7		Phase B Current	(IMPACC 24-Bit Floating Point)
8		Phase C Current	(IMPACC 24-Bit Floating Point)
9		Ground Fault Current	(IMPACC 24-Bit Floating Point)
10	Byte0	Event Reason – low byte	See Below: Standard INCOM
	Byte1	Event Reason – high byte	Reason Constants Supported
	Byte2	Event Status – low byte	See Below: Standard INCOM Status Constants Supported
11	Byte0	Event Status – high byte	
	Byte1	Reserved = 0	
	Byte2	Reserved = 0	
12		Flags Buffer	Refer to Flags Buffer Description (3 C 8).
13		Flags Buffer	
14		Flags Buffer	

TIME-STAMPED Major Event Data Buffer Description (3 C B) – Continued

Message	Byte	Description	
15		Flags Buffer	
16		Flags Buffer	
17	Byte0	% of Thermal Capacity used	Range: 0 - 255%
	Byte1	% of phase unbalance	Range:-100% to +100% 255 = Invalid
	Byte2	Winding Temperature 1	Refer to Part A, 5.2.21 Range 0-200, 255 = Invalid
18	Byte0	Winding Temperature 2	
	Byte1	Winding Temperature 3	
	Byte2	Winding Temperature 4	
19	Byte0	Winding Temperature 5	
	Byte1	Winding Temperature 6	
	Byte2	Motor Bearing Temperature 1	
20	Byte0	Motor Bearing Temperature 2	
	Byte1	Load Bearing Temperature 1	
	Byte2	Load Bearing Temperature 2	
21	Byte0	Ambient Temperature	
	Byte1	Temperature Validity 1	
	Byte2	Temperature Validity 2	

Time-Stamped Minor Event Data Buffer Description (3 C C)

Message	Byte	Description	
1	Byte0	Number of additional data messages = 6	
	Byte1	Minor Event Data Buffer number	Range: 1 - 100
	Byte2	No. of Unacknowledged Minor Event Buffers	Range: 0 - 99
2	Byte0	No. of minor events currently buffered	Range: 1 - 100
	Byte1	1/100 seconds = 0	(Resolution is to nearest second)
	Byte2	Hour (0-23) Packed BCD	
3	Byte0	Minute (0-59) Packed BCD	
	Byte1	Second (0-59) Packed BCD	
	Byte2	Month (1-12) Packed BCD	
4	Byte0	Day (1-31) Packed BCD	
	Byte1	Year (0-99) Packed BCD	
	Byte2	Buffer Type = 4 (Minor Event)	
5		Buffers Supported Map = 000000H	
6	Byte0	Event Reason – low byte	See Below: Standard INCOM
	Byte1	Event Reason – high byte	Reason Constants Supported
	Byte2	Event Status – low byte	See Below: Standard INCOM Reason Constants Supported
7	Byte0	Event Status – high byte	
	Byte1	Reserved = 0	
	Byte2	Reserved = 0	

Time-Stamped Motor Start Profile Data Buffer Description (3 C D)

Message	Byte	Description	
1	Byte0	Number of additional data messages = 55	
	Byte1	Motor Start Profile Data Buffer number	Range: 1 - 4
	Byte2	No. of Unacknowledged Motor Start Profiles	Range: 0 - 3
2	Byte0	No. of Motor Start Profiles currently buffered	Range: 1 - 4
	Byte1	1/100 seconds = 0 (Resolution is to nearest second)	
	Byte2	Hour (0-23) Packed BCD	
3	Byte0	Minute (0-59) Packed BCD	
	Byte1	Second (0-59) Packed BCD	
	Byte2	Month (1-12) Packed BCD	
4	Byte0	Day (1-31) Packed BCD	
	Byte1	Year (0-99) Packed BCD	
	Byte2	Buffer Type = 5 (Motor Start Profile Event)	
5		Buffers Supported Map = 000000H	
6	Byte0	Event Reason – low byte	See Below: Standard IMPACC
	Byte1	Event Reason – high byte	Reason Constants Supported
	Byte2	Event Status – low byte	See Below: Standard IMPACC
			Status Constants Supported
7	Byte0	Event Status – high byte	
	Byte1	Reserved = 0	
	Byte2	Reserved = 0	
8		Maximum Phase A Current during start (IMPACC24-Bit Floating Point)	
9		Maximum Phase B Current during start (IMPACC 24-Bit Floating Point)	
10		Maximum Phase C Current during start (IMPACC 24-Bit Floating Point)	
11		Maximum Ground Fault Current (IMPACC 24-Bit Floating Point)	
12		Maximum Phase Unbalance (IMPACC 24-Bit Floating Point)	
		If negative, then phase reversal.	

Time-Stamped Motor Start Profile Data Buffer Description (3 C D) – Continued

Message	Byte	Description
13		Average Phase Current at Transition (IMPACC 24-Bit Floating Point)
14	Byte0	Time from start to current transition – low byte 0 – 1,200 seconds
	Byte1	Time from start to current transition – high byte FFFF – Invalid
	Byte2	Time from start to run or trip – low byte 0 – 1,200 seconds
15	Byte0	Time from start to run or trip – high byte
	Byte1	Sample time in line cycles for plot – low byte 3 – 720 cycles
	Byte2	Sample time in line cycles for plot – high byte
16	Byte0	Locked Rotor Current setpoint – low byte 300 – 1,200 amps
	Byte1	Locked Rotor Current setpoint – high byte
	Byte2	Locked Rotor Time setpoint 1 – 120 seconds
17	Byte0	Instantaneous Over Current setpoint – low byte 300 – 1,600 %FLA
	Byte1	Instantaneous Over Current setpoint – high byte
	Byte2	Instantaneous Over Current Start Delay setpoint 0 – 60 cycles
18	Byte0	Ultimate Trip Current setpoint – low byte 85-150% FLA
	Byte1	Ultimate Trip Current setpoint – high byte
	Byte2	Long Acceleration Time setpoint – low byte1-1,200 seconds
19	Byte0	Long Acceleration Time setpoint – high byte0xFFFF – OFF
	Byte1	Jam Trip Current setpoint – low byte 100-1,200 %FLA
	Byte2	Jam Trip Current setpoint – high byte 0xFFFF –OFF
20	Byte0	Jam Start Delay setpoint – low byte 0-1,200 seconds
	Byte1	Jam Start Delay setpoint – high byte
	Byte2	Jam Trip Run Delay setpoint – low byte 0-240 seconds

Time-Stamped Motor Start Profile Data Buffer Description (3 C D) – Continued

Message	Byte	Description
21	Byte0	Jam Trip Run Delay setpoint – high byte
	Byte1	LRC Multiplier to get Current Scale Factor (1 byte integer X 10^{-1})
	Byte2	Frequency setpoint Bit0: 0 = 50Hz, 1 = 60Hz
22	Byte0	Full Load Amps (FLA) setpoint-low byte
	Byte1	Full Load Amps (FLA) setpoint-high byte
	Byte2	Reserved = 0
23 - 56		1^{st} through 100^{th} data points Range: 0-254 255 – Invalid Data

Multi-Block Setpoint Data Packet Description (3 C F)

Transmit Setpoint Data Packet (N=50xxyyH)

BYTE2 (most significant byte)
80_{10} = Transmit setpoints

BYTE1

Group Number = 1

BYTE0 (least significant byte)

Block Number Range: 1-3

Transmit Setpoint Block 1 (3 C F) N=500101H

Message	Byte	Description	
1	Byte0	Number of additional data messages = 29	
	Byte1	Block Number = 1	
	Byte2	Group Number = 1	
2	Byte0	Setpoints Sequence Number – Low byte	
	Byte1	Setpoints Sequence Number – High byte	
	Byte2	Reserved = 0	
3	Byte0	Full Load Amps – low byte	Range: 10-3000 amps
	Byte1	Full Load Amps – high byte	(See Note 1, Page 22.)
	Byte2	Locked Rotor Current – low byte	Range: 300-1,200 %FLA
4	Byte0	Locked Rotor Current – high byte	
	Byte1	Locked Rotor Time	Range: 1-120 seconds
	Byte2	Reserved = 0	
5	Byte0	Ultimate Trip Current	Range: 85-150 %FLA
	Byte1	Reserved = 0	
	Byte2	Phase Current CT Ratio – low byte	Range: 10-4,000 amps
6	Byte0	Phase Current CT Ratio – high byte	(See Note 1, Page 22.)
	Byte1	Ground Current CT Ratio – low byte	Range: 10-4,000 amps
	Byte2	Ground Current CT Ratio – high byte	Range: 10-4,000 amps
7	Byte0	**Bit** **Definition**	
		B0 Frequency	0 = 50Hz, 1 = 60Hz
		B1-B7 Reserved	
	Byte1	Reserved = 0	
	Byte2	Starter Type	0 = Non-Reversing, 1 = Reversing

Transmit Setpoint Block 1 (3 C F) N=500101H – Continued

Message	Byte	Description	
8	Byte0	Reserved (Comm versions 0,1)	
		Stop Current Level (Comm versions >1) Range: 2-20% of PCTR Numerator (See Note 3, Page 22.)	
	Byte1	**Bit** **Definition**	
		B0 Local display 0=Degrees C, 1=Degrees F	
		B7-B1 Reserved	
	Byte2	Reserved = 0	
9	Byte0	Winding Temperature Trip – low byte	1-199 Deg. C
	Byte1	Winding Temperature Trip – high byte	0xFFFF = off
	Byte2	Winding Temperature Alarm – low byte	1-199 Deg. C
10	Byte0	Winding Temperature Alarm – high byte	0xFFFF = off
	Byte 1	Motor Bearing Temperature Trip – low byte	1-199 Deg. C
	Byte 2	Motor Bearing Temperature Trip – high byte	0xFFFF = off
11	Byte 0	Motor Bearing Temperature Alarm – low byte	1-199 Deg. C
	Byte 1	Motor Bearing Temperature Alarm – high byte	0xFFFF = off
	Byte 2	Load Bearing Temperature Trip – low byte	1-199 Deg. C
12	Byte0	Load Bearing Temperature Trip – high byte	0xFFFF = off
	Byte1	Load Bearing Temperature Alarm – low byte	1-199 Deg. C
	Byte2	Load Bearing Temperature Alarm – high byte	0xFFFF = off
13	Byte0	Auxiliary Temperature Trip – low byte	1-199 Deg. C
	Byte1	Auxiliary Temperature Trip – high byte	0xFFFF = off
	Byte2	Auxiliary Temperature Alarm – low byte	1-199 Deg. C
14	Byte0	Auxiliary Temperature Alarm – high byte	0xFFFF = off
	Byte1	**Bit** **Definition**	
		B0 RTD Diagnostics: 0 = Diagnostics off, 1 = Diagnostics on	
		B7-B1 Reserved	
	Byte2	Reserved = 0	

Transmit Setpoint Block 1 (3 C F) N=500101H – Continued

Message	Byte	Description	
15	Byte0	Ground Fault Trip – low byte	2-55% Ground Current
	Byte1	Ground Fault Trip – high byte	CT Ratio (0xFFFF = Off)
	Byte2	Ground Fault Start Delay	2-60 cycles
16	Byte0	Reserved = 0	
	Byte1	Ground Fault Run Delay	0-60 cycles
	Byte2	Reserved = 0	
17	Byte0	Instantaneous Over Current – low byte	300-1,600 %FLA
	Byte1	Instantaneous Over Current – high byte (0xFFFF=Off) (See Note 2, Page 22.)	
	Byte2	Instantaneous Over Current Start Delay	2-60 cycles
18	Byte0	Reserved = 0	
	Byte1	Jam Trip Current – low byte	100-1,200 %FLA
	Byte2	Jam Trip Current – high byte (0xFFFF=Off) (See Note 2, Page 22.)	
19	Byte0	Jam Start Delay – low byte	0-1,200 seconds
	Byte1	Jam Start Delay – high byte	
	Byte2	Jam Trip Run Delay	0-240 seconds
20	Byte0	Reserved = 0	
	Byte1	Under Load Trip – low byte	6-90 %FLA
	Byte2	Under Load Trip – high byte (0xFFFF = Off) (See Note 3, Page 22.)	
21	Byte0	Under Load Start Delay	0-120 seconds
	Byte1	Reserved = 0	
	Byte2	Under Load Trip Run Delay	0-240 seconds
22	Byte0	Reserved = 0	
	Byte1	Phase Unbalance Trip Level – low byte	4-40 %
	Byte2	Phase Unbalance Trip Level – high byte	(0xFFFF = Off)

Transmit Setpoint Block 1 (3 C F) N=500101H – Continued

Message	Byte	Description	
23	Byte0	Phase Unbalance Start Delay	0-120 seconds
	Byte1	Reserved = 0	
	Byte2	Phase Unbalance Trip Run Delay	0-240 seconds
24	Byte0	Reserved = 0	
	Byte1	Ground Fault Alarm – low byte	2-55 % Ground Current
	Byte2	Ground Fault Alarm – high byte	CT Ratio (0xFFFF= Off)
25	Byte0	I2T (overload) Alarm – low byte	60-99 % of bucket
	Byte1	I2T (overload) Alarm – high byte	(0xFFFF= Off)
	Byte2	Jam Alarm Current – low byte	100-1,200 %FLA
26	Byte0	Jam Alarm Current – high byte (0xFFFF= Off) (See Note 2, Page 22.)	
	Byte1	Jam Alarm Run Delay	0-240 seconds
	Byte2	Reserved = 0	
27	Byte0	Under Load Alarm – low byte	6-90 %FLA
	Byte1	Under Load Alarm – high byte (See Note 3, Page 22.)	(0xFFFF= Off)
	Byte2	Under Load Alarm Run Delay	0-240 seconds
28	Byte0	Reserved = 0	
	Byte1	Phase Unbalance Alarm – low byte	4-40 %
	Byte2	Phase Unbalance Alarm – high byte	(0xFFFF= Off)
29	Byte0	Phase Unbalance Alarm Run Delay	0-240 seconds
	Byte1	Reserved = 0	
	Byte2	Reserved = 0	
30	Byte0	Checksum (sum of previous 29 messages) – LSB	
	Byte1	Checksum (sum of previous 29 messages) – MSB	
	Byte2	Complement of LSB of checksum	

Transmit Setpoint Block 1 (3 C F) N=500101H – Continued

Note 1:

Comm Versions 0 and 1:

The ratio of Full Load Amps to Phase Current CT Ratio must be greater or equal to 0.5 andless than or equal to 1.5 (i.e. 0.5 <= (Full Load Amps / Phase Current CT Ratio) <= 1.5)

Comm Versions >1:

The ratio of Full Load Amps to Phase Current CT Ratio must be greater or equal to 0.25 and less than or equal to 1.5 (i.e. 0.25 <= (Full Load Amps / Phase Current CT Ratio) <= 1.5)

Note 2:

Comm Versions 0 and 1:

*Full Load Amps * Setpoint Value)/(the Phase CT Ratio * 20) must be less than 51)*

Comm Versions >1:

*Full Load Amps * Setpoint Value)/(the Phase CT Ratio * 20) must be less than 56)*

Note 3:

Comm Versions 0 and 1

No Stop Current Level setpoint,

Comm Versions >1

Under Load Trip and Alarm value must be greater than the Stop Current Level:

*UL SP > Stop Current * CTR/FLA and,*

The Stop current level must be < Start Current level:

*Stop Current Level * the Phase CT ratio / Full load Amps < 30*

Transmit Setpoint Block 2 (3 C F) N=500102H

Message	Byte	Description	
1	Byte0	Number of additional data messages = 45	
	Byte1	Block Number = 2	
	Byte2	Group Number = 1	
2	Byte0	Setpoints Sequence Number – Low byte	
	Byte1	Setpoints Sequence Number – High byte	
	Byte2	Reserved = 0	
3	Byte0	Reserved = 0	
	Byte1	Starts Per Programmed Time – low byte	1-10 starts
	Byte2	Starts Per Programmed Time – high byte	
4	Byte0	Time for Programmed No. of Starts – low byte	1-240 minutes
	Byte1	Time for Programmed No. of Starts – high byte	(0xFFFF= Off)
	Byte2	Time Between Starts – low byte	1-240 minutes
5	Byte0	Time Between Starts – high byte	(0xFFFF= Off)
	Byte1	Number of Cold Starts	1-5 starts
	Byte2	Reserved = 0	
6	Byte0	Start to Run Transition Current Level – low byte	10-300 %FLA
	Byte1	Start to Run Transition Current Level – high byte (See Note 4, Page 36.)	
	Byte2	Start to Run Transition Time – low byte	0-1,200 seconds
7	Byte0	Start to Run Transition Time – high byte	
	Byte1	Start to Run Transition Event	

Bit	Definition	
B1-B0	00	Transition on time
	01	Transition on current
	10	Transition on time or current
	11	Transition on time and current
B7-B2	Reserved	

	Byte2	Reserved = 0	

Transmit Setpoint Block 2 (3 C F) N=500102H – Continued

Message	Byte	Description
8	Byte0	Incomplete Sequence Time Out – low byte 1-240 seconds
	Byte1	Incomplete Sequence Time Out – high byte (0xFFFF= Off)
	Byte2	Incomplete Sequence Timer Start Event (See Note 5, Page 36.)
		Bit **Definition**
		B0 0 = Start timer on start to run transition
		1 = Start timer on stop to start transition
		B7-B1 Reserved
9	Byte0	Reserved = 0
	Byte1	Long Acceleration Time – low byte 1=1,200 seconds
	Byte2	Long Acceleration Time – high byte (0xFFFF= Off)
10	Byte0	Zero Speed Switch (See Note 6, Page 36.)
		Bit **Definition**
		B0 0 = Zero Speed Switch Off
		1 = Zero Speed Switch On
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	Anti-Backspin Time – low byte For range, see the note in Message 11.
11	Byte0	Anti-Backspin Time – high byte (0xFFFF= Off)
		Note: For Comm Version 0 the range is 1- 240 minutes.
		For Comm Versions 1 (and greater), the range is 1- 3,600 seconds.
	Byte1	Discrete Input 1 Function (See Note 6, Page 36.)
		Bit **Definition**
		B2-B0 000 Remote reset function
		001 Remote trip function
		010 Differential trip function
		011 Motor stop function
		100 Reset Disable function
		101 Emergency Override
		110 Zero Speed Switch
		B7-B3 Reserved
	Byte2	Reserved = 0

Transmit Setpoint Block 2 (3 C F) N=500102H – Continued

Message	Byte	Description
12	Byte0	Discrete Input 2 Function (See Note 5, Page 36.)
		Bit **Definition**
		B2-B0 000 Remote reset function
		001 Remote trip function
		010 Differential trip function
		011 Motor stop function
		100 Reset Disable function
		101 Emergency Override
		110 Incomplete Sequence function
		B7-B3 Reserved
	Byte1	Reserved = 0
	Byte2	Ground Fault Event to Activate Alarm Relay
		Bit **Definition**
		B1-B0 00 Neither to activate relay
		01 Ground fault alarm to activate relay
		10 Ground fault trip to activate relay
		B7-B2 Reserved
13	Byte0	Reserved = 0
	Byte1	I2T Event to Activate Alarm Relay
		Bit **Definition**
		B1-B0 00 Neither to activate relay
		01 I2T alarm to activate relay
		10 I2T trip to activate relay
		B7-B2 Reserved
	Byte2	Reserved = 0

Transmit Setpoint Block 2 (3 C F) N=500102H – Continued

Message	Byte	Description		
14	Byte0	Jam Event to Activate Alarm Relay		
		Bit	**Definition**	
		B1-B0	00	Neither to activate relay
			01	Jam alarm to activate relay
			10	Jam trip to activate relay
		B7-B2	Reserved	
	Byte1	Reserved = 0		
	Byte2	Under Load Event to Activate Alarm Relay		
		Bit	**Definition**	
		B1-B0	00	Neither to activate relay
			01	Under Load alarm to activate relay
			10	Under Load trip to activate relay
		B7-B2	Reserved	
15	Byte0	Reserved = 0		
	Byte1	Phase Unbalance to Activate Alarm Relay		
		Bit	**Definition**	
		B1-B0	00	Neither to activate relay
			01	Phase Unbalance alarm to activate relay
			10	Phase Unbalance trip to activate relay
		B7-B2	Reserved	
	Byte2	Reserved = 0		

Transmit Setpoint Block 2 (3 C F) N=500102H – Continued

Message	Byte	Description
16	Byte0	Motor Winding RTD to Activate Alarm Relay
		Bit **Definition**
		B1-B0 00 Neither to activate relay
		01 Motor Winding RTD alarm to activate relay
		10 Motor Winding RTD trip to activate relay
		B7-B2 Reserved
	Byte1	Reserved = 0
	Byte2	Motor Bearing RTD to Activate Alarm Relay
		Bit **Definition**
		B1-B0 00 Neither to activate relay
		01 Motor Bearing RTD alarm to activate relay
		10 Motor Bearing RTD trip to activate relay
		B7-B2 Reserved
17	Byte0	Reserved = 0
	Byte1	Load Bearing RTD to Activate Alarm Relay
		Bit **Definition**
		B1-B0 00 Neither to activate relay
		01 Load Bearing RTD alarm to activate relay
		10 Load Bearing RTD trip to activate relay
		B7-B2 Reserved
	Byte2	Reserved = 0

Transmit Setpoint Block 2 (3 C F) N=500102H – Continued

Message	Byte	Description
18	Byte0	Auxiliary RTD to Activate Alarm Relay
		Bit **Definition**
		B1-B0 00 Neither to activate relay
		01 Auxiliary RTD alarm to activate relay
		10 Auxiliary RTD trip to activate relay
		B7-B2 Reserved
	Byte1	Reserved = 0
	Byte2	Starts per Hour to Activate Alarm Relay
		Bit **Definition**
		B1-B0 00 Neither to activate relay
		01 Starts per Hour alarm to activate relay
		10 Starts per Hour trip to activate relay
		B7-B2 Reserved
19	Byte0	Reserved = 0
	Byte1	Time Between Starts to Activate Alarm Relay
		Bit **Definition**
		B0 0 = Time Between Starts to NOT activate relay
		1 = Time Between Starts to activate relay
		B7-B1 Reserved
	Byte2	Reserved = 0
20	Byte0	RTD Failure to Activate Alarm Relay
		Bit **Definition**
		B0 0 = RTD Failure to NOT activate relay,
		1 = RTD Failure to activate relay
		Bit B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	RTD Communication Failure to Activate Alarm Relay
		Bit **Definition**
		Bit B0 0 = RTD Communication Failure to NOT activate relay
		1 = RTD Communication Failure to activate relay
		Bit B7-B2 Reserved

Transmit Setpoint Block 2 (3 C F) N=500102H – Continued

Message	Byte	Description
21	Byte0	Reserved = 0
	Byte1	Instantaneous Over Current to Activate Alarm Relay
		Bit **Definition**
		B0 0 = Instantaneous Over Current to NOT activate relay
		1 = Instantaneous Over Current to activate relay
		B7-B1 Reserved
	Byte2	Reserved = 0
22	Byte0	Phase Reversal to Activate Alarm Relay
		Bit **Definition**
		B0 0 = Phase Reversal to NOT activate relay
		1 = Phase Reversal to activate relay
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	Incomplete Sequence to Activate Alarm Relay
		Bit **Definition**
		B0 0 = Incomplete Sequence to NOT activate relay
		1 = Incomplete Sequence to activate relay
		B7-B1 Reserved
23	Byte0	Reserved = 0
	Byte1	Remote Trip to Activate Alarm Relay
		Bit **Definition**
		B0 0 = Remote Trip to NOT activate relay
		1 = Remote Trip to activate relay
		B7-B1 Reserved
	Byte2	Reserved = 0

Transmit Setpoint Block 2 (3 C F) N=500102H – Continued

Message	Byte	Description
24	Byte0	Differential Trip to Activate Alarm Relay
		Bit **Definition**
		B0 0 = Differential Trip to NOT activate relay
		1 = Differential Trip to activate relay
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	INCOM Trip to Activate Alarm Relay
		Bit **Definition**
		B0 0 = INCOM Trip to NOT activate relay
		1 = INCOM Trip to activate relay
		B7-B1 Reserved
25	Byte0	Reserved = 0
	Byte1	Transition Trip to Activate Alarm Relay
		Bit **Definition**
		B0 0 = Transition Trip to NOT activate relay
		1 = Transition Trip to NOT activate relay
		B7-B1 Reserved
	Byte2	Reserved = 0
26	Byte0	Zero Speed Switch Trip to Activate Alarm Relay
		Bit **Definition**
		B0 0 = Zero Speed Switch Trip to NOT activate relay
		1 = Zero Speed Switch Trip to activate relay
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	Trip Bypass to Activate Alarm Relay
		Bit **Definition**
		B0 0 = Trip Bypass to NOT activate relay
		1 = Trip Bypass to activate relay
		B7-B1 Reserved

Transmit Setpoint Block 2 (3 C F) N=500102H – Continued

Message	Byte	Description	
27	Byte0	Reserved = 0	
	Byte1	Load Shed Pick Up Current – low byte	50-150 %FLA
	Byte2	Load Shed Pick Up Current – high byte	(0xFFFF= Off)
			See Note 7, Page 36.)
28	Byte0	Load Shed Drop Out Current – low byte	50-150 %FLA
	Byte1	Load Shed Drop Out Current – high byte	(0xFFFF= Off)
	Byte2	Load Shed Delay in 1/10 seconds	0-50 1/10-sec
29	Byte0	Reserved = 0	
	Byte1	Ground Fault Event to Activate Aux1 Relay	
		Bit **Definition**	
		B1-B0 00 = Neither to activate relay	
		01 = Ground fault Aux1 to activate relay	
		10 = Ground fault trip to activate relay	
		B7-B2 Reserved	
	Byte2	Reserved = 0	
30	Byte0	I2T Event to Activate Aux1 Relay	
		Bit **Definition**	
		B1-B0 00 = Neither to activate relay	
		01 = I2T alarm to activate relay	
		10 = I2T trip to activate relay	
		B7-B2 Reserved	
	Byte1	Reserved = 0	
	Byte2	Jam Event to Activate Aux1 Relay	
		Bit **Definition**	
		B1-B0 00 = Neither to activate relay	
		01 = Jam alarm to activate relay	
		10 = Jam trip to activate relay	
		B7-B2 Reserved	

Transmit Setpoint Block 2 (3 C F) N=500102H – Continued

Message	Byte	Description
31	Byte0	Reserved = 0
	Byte1	Under Load Event to Activate Aux1 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Under Load alarm to activate relay
		10 = Under Load trip to activate relay
		B7-B2 Reserved
	Byte2	Reserved = 0
32	Byte0	Phase Unbalance to Activate Aux1 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Phase Unbalance alarm to activate relay
		10 = Phase Unbalance trip to activate relay
		B7-B2 Reserved
	Byte1	Reserved = 0
	Byte2	Motor Winding RTD to Activate Aux1 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Motor Winding RTD alarm to activate relay
		10 = Motor Winding RTD trip to activate relay
		B7-B2 Reserved
33	Byte0	Reserved = 0
	Byte1	Motor Bearing RTD to Activate Aux1 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Motor Bearing RTD alarm to activate relay
		10 = Motor Bearing RTD trip to activate relay
		B7-B2 Reserved
	Byte2	Reserved = 0

Transmit Setpoint Block 2 (3 C F) N=500102H – Continued

Message	Byte	Description
34	Byte0	Load Bearing RTD to Activate Aux1 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Load Bearing RTD alarm to activate relay
		10 = Load Bearing RTD trip to activate relay
		B7-B2 Reserved
	Byte1	Reserved = 0
	Byte2	Auxiliary RTD to Activate Aux1 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Auxiliary RTD alarm to activate relay
		10 = Auxiliary RTD trip to activate relay
		B7-B2 Reserved
35	Byte0	Reserved = 0
	Byte1	Starts per Hour to Activate Aux1 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Starts per Hour alarm to activate relay
		10 = Starts per Hour trip to activate relay
		B7-B2 Reserved
	Byte2	Reserved = 0
36	Byte0	Time Between Starts to Activate Aux1 Relay
		Bit **Definition**
		B0 0 = Time Between Starts to NOT activate relay
		1 = Time Between Starts to activate relay
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	RTD Failure to Activate Aux1 Relay
		Bit **Definition**
		B0 0 = RTD Failure to NOT activate relay
		1 = RTD Failure to activate relay
		B7-B1 Reserved

Transmit Setpoint Block 2 (3 C F) N=500102H – Continued

Message	Byte	Description
37	Byte0	Reserved = 0
	Byte1	RTD Communication Failure to Activate Aux1 Relay
		Bit **Definition**
		B0 0 = RTD Communication Failure to NOT activate relay
		1 = RTD Communication Failure to activate relay
		B7-B1 Reserved
	Byte2	Reserved = 0
38	Byte0	Instantaneous Over Current to Activate Aux1 Relay
		Bit **Definition**
		B0 0 = Instantaneous Over Current to NOT activate relay
		1 = Instantaneous Over Current to activate relay
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	Phase Reversal to Activate Aux1 Relay
		Bit **Definition**
		B0 0 = Phase Reversal to NOT activate relay
		1 = Phase Reversal to activate relay
		B7-B1 Reserved
39	Byte0	Reserved = 0
	Byte1	Incomplete Sequence to Activate Aux1 Relay
		Bit **Definition**
		B0 0 = Incomplete Sequence to NOT activate relay
		1 = Incomplete Sequence to activate relay
		B7-B1 Reserved
	Byte2	Reserved = 0

Transmit Setpoint Block 2 (3 C F) N=500102H – Continued

Message	Byte	Description
40	Byte0	Remote Trip to Activate Aux1 Relay
		Bit **Definition**
		B0 0 = Remote Trip to NOT activate relay
		1 = Remote Trip to activate relay
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	Differential Trip to Activate Aux1 Relay
		Bit **Definition**
		B0 0 = Differential Trip to NOT activate relay
		B7-B1 Reserved
41	Byte0	Reserved = 0
	Byte1	INCOM Trip to Activate Aux1 Relay
		Bit **Definition**
		B0 0 = INCOM trip to NOT activate relay
		1 = INCOM trip to activate relay
		B7-B1 Reserved
	Byte2	Reserved = 0
42	Byte0	Transition Trip to Activate Aux1 Relay
		Bit **Definition**
		B0 0 = Transition trip to NOT activate relay
		1 = Transition trip to activate relay
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	Zero Speed Switch Trip to Activate Aux1 Relay
		Bit **Definition**
		B0 0 = Zero Speed Switch Trip to NOT activate relay
		1 = Zero Speed Switch Trip to activate relay
		B7-B1 Reserved

Transmit Setpoint Block 2 (3 C F) N=500102H – Continued

Message	Byte	Description
43	Byte0	Reserved = 0
	Byte1	Trip Bypass to Activate Aux1 Relay
		Bit **Definition**
		B0 0 = Trip Bypass to NOT activate relay
		1 = Trip Bypass to activate relay
		B7-B1 Reserved
	Byte2	Reserved = 0
44	Byte0	Reserved = 0
	Byte1	Reserved = 0
	Byte2	Reserved = 0
45	Byte0	Reserved = 0
	Byte1	Reserved = 0
	Byte2	Reserved = 0
46	Byte0	Checksum (sum of previous 45 messages) – LSB
	Byte1	Checksum (sum of previous 45 messages) – MSB
	Byte2	Complement of LSB of checksum

Note 4: The Start to Run Transition Current Level must be greater than the stop current level (Block):
*Start to Run Transition Current Level * FLA / CTR > Stop Current Level*

Note 5: If the Incomplete Sequence Time Out setpoint is not OFF, then the Discrete Input 2 unction must be Incomplete Sequence (i.e. 6). If the Discrete Input 2 Function is Incomplete Sequence, then the Incomplete Sequence Time Out cannot be OFF.

Note 6: If the Zero Speed Switch is ON, then the Discrete Input 1 Function must be Zero Speed Switch (i.e. 6). If the Discrete Input 1 Function is Zero Speed Switch, then the Zero Speed Switch cannot be OFF.

Note 7: Load Shed Pick Up Current >= Load Shed Drop Out Current

Transmit Setpoint Block 3 (3 C F) N=500103

Message	Byte	Description
1	Byte0	Number of additional data messages = 29
	Byte1	Block Number = 3
	Byte2	Group Number = 1
2	Byte0	Setpoints Sequence Number – Low byte
	Byte1	Setpoints Sequence Number – High byte
	Byte2	Reserved = 0
3	Byte0	Reserved = 0
	Byte1	Transition Relay Output on Aux2 (See Note 8, Page 47.)
		Bit **Definition**
		B0 0 = Transition function off
		1 = Transition function on
		B7-B1 Reserved
	Byte2	Reserved = 0
4	Byte0	Ground Fault Event to Activate Aux2 Alarm Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Ground fault Aux1 to activate relay
		10 = Ground fault trip to activate relay
		B7-B2 Reserved
	Byte1	Reserved = 0
	Byte2	I2T Event to Activate Aux2 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = I2T alarm to activate relay
		10 = I2T trip to activate relay
		B7-B2 Reserved

Transmit Setpoint Block 3 (3 C F) N=500103 – Continued

Message	Byte	Description
5	Byte0	Reserved = 0
	Byte1	Jam Event to Activate Aux2 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Jam alarm to activate relay
		10 = Jam trip to activate relay
		B7-B2 Reserved
	Byte2	Reserved = 0
6	Byte0	Under Load Event to Activate Aux2 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Under Load alarm to activate relay
		10 = Under Load trip to activate relay
		B7-B2 Reserved
	Byte1	Reserved = 0
	Byte2	Phase Unbalance to Activate Aux2 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Phase Unbalance alarm to activate relay
		10 = Phase Unbalance trip to activate relay
		B7-B2 Reserved
7	Byte0	Reserved = 0
	Byte1	Motor Winding RTD to Activate Aux2 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Motor Winding RTD alarm to activate relay
		10 = Motor Winding RTD trip to activate relay
		B7-B2 Reserved
	Byte2	Reserved = 0

Transmit Setpoint Block 3 (3 C F) N=500103 – Continued

Message	Byte	Description
8	Byte0	Motor Bearing RTD to Activate Aux2 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Motor Bearing RTD alarm to activate relay
		10 = Motor Bearing RTD trip to activate relay
		B7-B2 Reserved
	Byte1	Reserved = 0
	Byte2	Load Bearing RTD to Activate Aux2 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Load Bearing RTD alarm to activate relay
		10 = Load Bearing RTD trip to activate relay
		B7-B2 Reserved
9	Byte0	Reserved = 0
	Byte1	Auxiliary RTD to Activate Aux2 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Auxiliary RTD alarm to activate relay
		10 = Auxiliary RTD trip to activate relay
		B7-B2 Reserved
	Byte2	Reserved = 0

Transmit Setpoint Block 3 (3 C F) N=500103 – Continued

Message	Byte	Description
10	Byte0	Starts per Hour to Activate Aux2 Relay
		Bit **Definition**
		B1-B0 00 = Neither to activate relay
		01 = Starts per Hour alarm to activate relay
		10 = Starts per Hour trip to activate relay
		B7-B2 Reserved
	Byte1	Reserved = 0
	Byte2	Time Between Starts to Activate Aux2 Relay
		Bit **Definition**
		B0 0 = Time Between Starts to NOT activate relay
		1 = Time Between Starts to activate relay
		B7-B1 Reserved
11	Byte0	Reserved = 0
	Byte1	RTD Failure to Activate Aux2 Relay
		Bit **Definition**
		B0 0 = RTD Failure to NOT activate relay
		1 = RTD Failure to activate relay
		B7-B1 Reserved
	Byte2	Reserved = 0
12	Byte0	RTD Communication Failure to Activate Aux2 Relay
		Bit **Definition**
		B0 0 = RTD Communication Failure to NOT activate relay
		1 = RTD Communication Failure to activate relay
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	Instantaneous Over Current to Activate Aux2 Relay
		Bit **Definition**
		B0 0 = Instantaneous Over Current to NOT activate relay
		1 = Instantaneous Over Current to activate relay
		B7-B1 Reserved

Transmit Setpoint Block 3 (3 C F) N=500103 – Continued

Message	Byte	Description
13	Byte0	Reserved = 0
	Byte1	Phase Reversal to Activate Aux2 Relay
		Bit **Definition**
		B0 0 = Phase Reversal to NOT activate relay
		1 = Phase Reversal to activate relay
		B7-B1 Reserved
	Byte2	Reserved = 0
14	Byte0	Incomplete Sequence to Activate Aux2 Relay
		Bit **Definition**
		B0 0 = Incomplete Sequence to NOT activate relay
		1 = Incomplete Sequence to activate relay
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	Remote Trip to Activate Aux2 Relay
		Bit **Definition**
		B0 0 = Remote Trip to NOT activate relay
		1 = Remote Trip to activate relay
		B7-B1 Reserved
15	Byte0	Reserved = 0
	Byte1	Differential Trip to Activate Aux2 Relay
		Bit **Definition**
		B0 0 = Differential Trip to NOT activate relay
		1 = Differential Trip to activate relay
		B7-B1 Reserved
	Byte2	Reserved = 0

Transmit Setpoint Block 3 (3 C F) N=500103 – Continued

Message	Byte	Description
16	Byte0	INCOM Trip to Activate Aux2 Relay
		Bit **Definition**
		B0 0 = INCOM Trip to NOT activate relay
		1 = INCOM Trip to activate relay
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	Transition Trip to Activate Aux2 Relay
		Bit **Definition**
		B0 0 = Transition Trip to NOT activate relay
		1 = Transition Trip to activate relay
		B7-B1 Reserved
17	Byte0	Reserved = 0
	Byte1	Zero Speed Switch Trip to Activate Aux2 Relay
		Bit **Definition**
		B0 0 = Zero Speed Switch Trip to NOT activate relay
		1 = Zero Speed Switch Trip to activate relay
		B7-B1 Reserved
	Byte2	Reserved = 0
18	Byte0	Trip Bypass to Activate Aux2 Relay
		Bit **Definition**
		B0 0 = Trip Bypass to NOT activate relay
		1 = Trip Bypass to activate relay
		B7-B1 Reserved
	Byte1	Reserved = 0

Transmit Setpoint Block 3 (3 C F) N=500103 – Continued

Message	Byte	Description
18	Byte2	Analog Output Function
		Bit **Definition**
		B1-B0 00 = MAX 100: 4mA = 0% FLA, 20mA = 100% FLA
		01 = MAX 125 4mA = 0% FLA 20mA = 125% FLA
		10 = MAX WRTD 4mA = 0C on max winding RTD 20mA = RTD trip level for winding
		11 = MAX %I2T 4mA = Thermal capacity @ 40 C. 20mA = 100% thermal capacity
		B7-B2 Reserved
19	Byte0	Reserved = 0
	Byte1	Trip Relay Mode
		Bit **Definition**
		B1-B0 01 = Mode1 – Trip Relay energizes on trip condition
		10 = Mode2 – Trip Relay de-energizes on trip condition
		B7-B2 Reserved
	Byte2	Reserved = 0

Transmit Setpoint Block 3 (3 C F) N=500103 – Continued

Message	Byte	Description
20	Byte0	Alarm Relay Mode
		Bit **Definition**
		B1-B0 01= Mode1 – Alarm Relay energizes on programmed condition
		10= Mode2 – Alarm Relay de-energizes on programmed condition
		B7-B2 Reserved
	Byte1	Reserved = 0
	Byte2	Aux1 Relay Mode
		Bit **Definition**
		B1-B0 01= Mode1 – Aux1 Relay energizes on programmed condition
		10= Mode2 – Aux1 Relay de-energizes on programmed condition
		B7-B2 Reserved
21	Byte0	Reserved = 0
	Byte1	Aux2 Relay Mode
		Bit **Definition**
		B1-B0 01= Mode1 – Aux2 Relay energizes on programmed condition
		10= Mode2 – Aux2 Relay de-energizes on programmed condition
		B7-B2 Reserved
	Byte2	Reserved = 0

Transmit Setpoint Block 3 (3 C F) N=500103 – Continued

Message	Byte	Description
22	Byte0	I2T Reset Mode
		Bit **Definition**
		B0 0 = Manual reset of I2T trips
		1 = Automatic reset of !2T trips
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	Program While Running
		Bit **Definition**
		B0 0 = Motor must be stopped to enter program mode
		1 = Motor can be running to enter program mode
		B7-B1 Reserved
23	Byte0	Reserved = 0
	Byte1	Emergency Override Enable or Disable
		Bit **Definition**
		B0 0 = Emergency Override function is disabled
		1 = Emergency Override function is enabled
		B7-B1 Reserved
	Byte2	Reserved = 0
24	Byte0	Display Time Stamps in 12 or 24 Hour Mode
		Bit **Definition**
		B0 0 = Display 12 hour time stamps
		1 = Display 24 hour time stamps
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	Display Date Stamps in MDY or DMY Format Setpoint
		Bit **Definition**
		B0 0 = Display Month Day Year format
		1 = Display Day Month Year format
		B7-B1 Reserved

Transmit Setpoint Block 3 (3 C F) N=500103 – Continued

Message	Byte	Description
25	Byte0	Reserved = 0
	Byte1	IMPACC Communication Mode
		Bit **Definition**
		B0 0 = MP-3000 IMPACC communication mode (Read only Setpoint, must be set to 0.)
		1 = IQ1000II IMPACC communication mode
		B7-B1 Reserved
	Byte2	Reserved = 0
26	Byte0	MP-3000 Self-Test Failure Action
		Bit **Definition**
		B1-B0 00 = Trip on MP-3000 Self-Test Failure
		01 = Alarm on MP-3000 Self-Test Failure
		10 = Alarm and Trip on MP-3000 Self-Test Failure
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	INCOM communication trip enable
		Bit **Definition**
		B0 0 = INCOM communication trip disabled
		1 = INCOM communication trip enabled
		B7-B1 Reserved
27	Byte0	Reserved = 0
	Byte1	Trip Relay Armed or Disarmed (See Note 9.)
		Bit **Definition**
		B0 0 = Trip Relay is disarmed (CAUTION the relay can not cause a trip)
		1 = Trip Relay is armed
		B7-B1 Reserved
	Byte2	Reserved = 0

Transmit Setpoint Block 3 (3 C F) N=500103 – Continued

Message	Byte	Description
28	Byte0	Relay Test Mode
		Bit **Definition**
		B0 0 = 3 phase mode (normal)
		1 = 1 phase mode (test)
		B7-B1 Reserved
	Byte1	Reserved = 0
	Byte2	Reserved = 0
29	Byte0	Reserved = 0
	Byte1	Reserved = 0
	Byte2	Reserved = 0
30	Byte0	Checksum (sum of previous 29 messages) – LSB
	Byte1	Checksum (sum of previous 29 messages) – MSB
	Byte2	Complement of LSB of checksum

Note 8: If the Transition Relay Output on Aux2 is ON, then there can be no other use for AUX2.

Note 9: If the Trip Relay Armed or Disarmed setpoint is Disarmed (i.e. 0), then the relay can no longer cause a trip of the motor.

SLAVE ACTION Description (3 D 0)

Byte2	Byte1	Byte0	Definition
0	0	1	Reset Trip/Alarm
0	0	2	Reset Trip/Alarm
0	1	25H	Reset Motor Data Maximum Values
0	1	26H	Reset Motor Trip Counters
0	1	27H	Reset Motor Alarm Counters
2	0	3	Trip (stop)
2	0	0AH	Emergency Override (trip)
3	0	0	Release Time-Stamped Major Event Buffer
3	0	2	Reset INCOM Slave-Interface Statistics
3	0	3	Reset all history pages except total history page
3	0	7	Acknowledge Setpoint Change
3	0	8	Release Time-Stamped Minor Event Buffer
3	0	9	Release Time-Stamped Motor Start Profile Buffer
3	0	0AH	Abort downloading setpoints and exit program mode

Receive Multi-Block Setpoints Data Packet (3 F 9)

Message	Byte	Description
1	Byte0	Number of additional data messages = N-1
	Byte1	Block Number Range: 1-3
	Byte2	Group Number = 1
2	Byte0	Setpoints sequence number – low byte
	Byte1	Setpoints sequence number – high byte
	Byte2	Reserved = 0
3		Setpoints message 3
4		Setpoints message 4
…		…
N-1		Setpoints message N-1
N	Byte0	Checksum – low byte
	Byte1	Checksum – high byte
	Byte2	Complement of checksum low byte

Receive Setpoint Block 1 (3 F 9)

Message	Byte	Description
1	Byte0	Number of additional data messages = 29
	Byte1	Block Number = 1
	Byte2	Group Number = 1
2	Byte0	Setpoints sequence number – low byte
	Byte1	Setpoints sequence number – high byte
	Byte2	Reserved = 0
3		Message 3 of Setpoints Group Number 1, Block 1
4		Message 4 of Setpoints Group Number 1, Block 1
…		…
30	Byte0	Checksum – low byte
	Byte1	Checksum – high byte
	Byte2	Complement of checksum low byte

Receive Setpoint Block 2 (3 F 9)

Message	Byte	Description
1	Byte0	Number of additional data messages = 45
	Byte1	Block Number = 2
	Byte2	Group Number = 1
2	Byte0	Setpoints sequence number – low byte
	Byte1	Setpoints sequence number – high byte
	Byte2	Reserved = 0
3		Message 3 of Setpoints Group Number 1, Block 2
4		Message 4 of Setpoints Group Number 1, Block 2
…		…
46	Byte0	Checksum – low byte
	Byte1	Checksum – high byte
	Byte2	Complement of checksum low byte

Receive Setpoint Block 3 (3 F 9)

Message	Byte	Description
1	Byte0	Number of additional data messages = 29
	Byte1	Block Number = 3
	Byte2	Group Number = 1
2	Byte0	Setpoints sequence number – low byte
	Byte1	Setpoints sequence number – high byte
	Byte2	Reserved = 0
3		Message 3 of Setpoints Group Number 1, Block 3
4		Message 4 of Setpoints Group Number 1, Block 3
…		…
30	Byte0	Checksum – low byte
	Byte1	Checksum – high byte
	Byte2	Complement of checksum low byte

Download Setpoints Buffer Request (3 F B)

Message	Byte	Description
1	Byte0	Number of additional data messages = 2
	Byte1	Setpoints sequence number – low byte
	Byte2	Setpoints sequence number – high byte
2	Byte0	Node address of Network Master – LSB
	Byte1	Node address of network Master – MSB
	Byte2	2 = Download setpoints request
3	Byte0	Checksum (sum of previous 2 messages) – LSB
	Byte1	Checksum (sum of previous 2 messages) – MSB
	Byte2	Complement of checksum LSB

Note: The MP-3000 will respond with an ACK message after each message it receives. If there is a previously requested setpoints download in progress, the MP-3000 will respond with a (3 1 C) NACK. If the setpoints sequence number doesn't match the MP-3000's current setpoints sequence number, the MP-3000 will respond to the last message with a (3 1 5) NACK response.

Note: Upon accepting a Download setpoints request, the MP-3000 will:

1. *Set the "Setpoints Download In-Progress" bit in the Flags buffer Message 5, Byte0.*
2. *Enter remote program mode. Local front panel requests to change setpoints are locked-out. This lockout will be cleared when the MP-3000 receives the (3 0 7) Slave Action command.*

The MP-3000 must receive the (3 F 9) Download setpoints command within 30 seconds, and each subsequent (3 F 9) command must be received within 30 seconds of the previous. The (3 0 7) Exit program mode and execute downloaded setpoints Slave Action command must be received by the MP-3000 within 30 seconds of the last (3 F 9) command.

Note: A network master can command the MP-3000 to abort downloading setpoints and exit the remote program mode by sending Slave Action command [(3 0 A) – Abort downloading setpoints and exit program mode] while the MP-3000 is in remote program mode.

Standard INCOM Status Constants Supported

Value	Constant Name	Description
0	REASON_UNKNOWN	Unknown
3	STATUS_TRIPPED	Trip
4	STATUS_ALARM	Alarm
7	STATUS_READY	Ready
10	STATUS_RUNNING	Running
41	STATUS_UNDEFINED	Undefined
42	STATUS_BLOCKED	Blocked

Standard INCOM Reason for Status Constants Supported

Value	Constant Name	Description
0	STATUS_UNKNOWN	Unknown
1	REASON_NORMAL	Normal
7	REASON_EXTERNAL	External
11	REASON_INST	Instantaneous Overcurrent
13	REASON_GND_TRIP	Ground Fault Trip
16	REASON_OVERIDE	Override
18	REASON_RAM	RAM Failure
19	REASON_ROM	ROM Failure
22	REASON_PHASE_UB	Phase Unbalance
25	REASON_I2T	I^2T
26	REASON_JAM	Jam
27	REASON_UNDER_LOAD	Underload
28	REASON_TRIP_BYPASS	Trip Bypass
29	REASON_REMOTE	Remote
32	REASON_AD_CONVERTER	A/D Converter Failure
33	REASON_REV_SEQENCE	Reverse Sequence
34	REASON_INCOMPLETE_SEQ	Incomplete Sequence
35	REASON_OPTO	Opto-Coupler Failure
36	REASON_TRANS_INCOMPLETE	Incomplete Transition
37	REASON_FLA_OVERFLOW	FLA Error
39	REASON_WIND_TEMP	Winding Temperature
40	REASON_BEARING_TEMP	Bearing Temperature
41	REASON_LOAD_TEMP	Load Bearing Temperature
43	REASON_STARTS_PER_HR	Starts/Hour Exceeded
74	REASON_PROGRAM	Program
82	REASON_AMBIENT	Ambient Temperature
110	REASON_START	Start
122	REASON_INCOM	INCOM
170	REASON_RTD_FAILURE	RTD Failure
171	REASON_ANTIBACKSPIN	Anti-backspin
172	REASON_ZERO_SPEED	Zero Speed
173	REASON_TIME_BETWEEN_STARTS	Time Between Starts
174	REASON_MULTIPLE_REASONS	Multiple Reasons

Value	Constant Name	Description
221	REASON_RTD_LINK_FAILURE	RTD Link Failure
222	REASON_PROGRAMMING ERROR	Programming Error
223	REASON_ DIFFERENTIAL	Differential
224	REASON_AUX_RTD_TEMP	Aux Temperature
225	REASON_GROUND	Ground
226	REASON_DISARMED	Disarmed
227	REASON_STOP	Stop
228	REASON_RESET	Reset

Resolution and Range of Standard Buffers Data

Command	Value	Resolution	Range
(3 0 F) N=000001	degrees Celsius	1	0 ... +200
(3 0 F) N=000003	amps (I_A, I_B, I_C, I_{Avg})	1	0 … 40,729
	amps (I_G)	0.1	0 … 2,020
(3 0 F) N=000028	% FLA	1	0 ... 100
	minutes	1	0 … 255
	starts	1	0 ... 255
(3 0 F) N=000024	Operations count	1	0...65,535
	Runtime in hours	1	0...65,535
(3 0 F) N=000025	amps (I_{Avg})	1	0 … 40,729
	% unbalance	1	0 ... 100
	degrees Celsius	1	0 ... +200
(3 0 F) N=000026	Counters	1	0 ... 255

CHANGE RECORD

Revision	Date	Changes
1.00	6/28/02	Taken from IL 17384 Revision 3.10 (June 2002) Part D; made into separate document for inclusion in Revision 3.20.

COMMUNICATIONS PROTOCOL – IQ 500

Fast Status (3 0 0)

Division Code = 1

Product ID: 15 = IQ 500L

16 = Size 1/2 (IQ 502)

18 = Size 3/4 (IQ 504)

Comm Version: 0 = Original

1 = Adds support for the IQ 500L, revises ULM trip indication (now sets Fast Status to “tripped” when ULM trip occurs), and revises the Reset command support (not to respond with a “NACK” when the ULM function is selected and no current is flowing).

Supported Commands

	Reference Section
(3 0 0) Fast Status	Part A, 5.2.3
(3 0 3) Transmit All Standard Buffers	Part A, 5.2.8
(3 0 5) Transmit Current Buffer	Part A, 5.2.9
(3 C 8) Transmit Flags Buffer	Part A, 5.2.19, this section
(3 C 9) Transmit Setpoints Buffer	Part A, 5.2.20, this section
(3 C B) Transmit Time-Stamped Trip Data Buffer	Part A, 5.2.21, this section
(3 D 0) Slave Action	Part A, 5.2.23.1, 5.3.7, this section
(3 F 9) Receive Setpoints	Part A, 5.2.26.2, this section

FLAGS Buffer Description (3 C 8)

Message	Byte	Name	Description	
1	Byte0		Number of additional data messages=0	
	Byte1	FLAGS1:	**Bit**	**Definition**
			B0	Overload Trip
			B1	Phase Unbalance Trip
			B2	Ground Fault Trip
			B3	Jam Trip
			B4	ULM Trip
			B5	INCOM Trip
			B6	INCOM Reset
			B7	O/L Alarm
	Byte2		Reserved	

SETPOINT Buffer Description (3 C 9) (IQ 502 and IQ 504)

Message	Byte	Description
1	Byte0	Number of additional data messages = 2
	Byte1	Firmware Revision
	Byte2	Firmware Version
2	Byte0	Dip Switch 1
	Byte1	Dip Switch 2
	Byte2	Dip Switch 4
3	Byte0	Dip Switch 6
	Byte1	Dip Switch 3
	Byte2	Dip Switch 5

Note: Please refer to the IQ 500 User's Manual for information on the meaning of the dip switches.

SETPOINT Buffer Description (3 C 9) (IQ 500L)

Message	Byte	Description
1	Byte0	Number of additional data messages = 3
	Byte1	Firmware Revision
	Byte2	Firmware Version
2	Byte0	Dip Switch 1
	Byte1	Dip Switch 2
	Byte2	Dip Switch 4
3	Byte0	Dip Switch 6
	Byte1	Dip Switch 3
	Byte2	Dip Switch 5
4	Byte0	5 Amp CT Secondary Turns Ratio – LSB
	Byte1	5 Amp CT Secondary Turns Ratio – MSB
	Byte2	Reserved

Note: Please refer to the IQ 500L User's Manual for information on the meaning of the Dip switches.

TIME-STAMPED TRIP DATA Buffer Description (3 C B) (IQ 502 and IQ 504)

Message	Byte	Description	Format
1	Byte0	Number of additional data messages = 10	
	Byte1	TRIP DATA Buffer number = 1	
	Byte2	Number of unread Trip Data Buffers = 0	
2	Byte0	Trip Time Offset	Trip Time Offset in
	Byte1	Trip Time Offset	seconds = 256*BYTE2
	Byte2	Trip Time Offset+BYTE1.BYTE0/256	
3		Buffers Supported Map	
4		Phase A Current	IMPACC 24-Bit Floating Point
5		Phase B Current	IMPACC 24-Bit Floating Point
6		Phase C Current	IMPACC 24-Bit Floating Point
7		Ground Current	IMPACC 24-Bit Floating Point
8	Byte0	Reserved	
	Byte1	Flags1	
	Byte2	Reserved	
9	Byte0	Reserved	
	Byte1	Firmware Version	
	Byte2	Firmware Revision	
10	Byte0	Dip Switch 1	
	Byte1	Dip Switch 2	
	Byte2	Dip Switch 4	
11	Byte0	Dip Switch 6	
	Byte1	Dip Switch 3	
	Byte2	Dip Switch 5	

TIME-STAMPED TRIP DATA Buffer Description (3 C B) (IQ 500L)

Message	Byte	Description	Format
1	Byte0	Number of additional data messages = 11	
	Byte1	TRIP DATA Buffer number = 1	
	Byte2	Number of Unread Trip Data Buffers = 0	
2	Byte0	Trip Time Offset	Trip Time Offset in
	Byte1	Trip Time Offsetseconds = 256*BYTE2	
	Byte2	Trip Time Offset+BYTE1.BYTE0/256	
3		Buffers Supported Map	
4		Phase A Current	IMPACC 24-Bit Floating Point
5		Phase B Current	IMPACC 24-Bit Floating Point
6		Phase C Current	IMPACC 24-Bit Floating Point
7		Ground Current	IMPACC 24-Bit Floating Point
8	Byte0	Reserved	
	Byte1	Flags1	
	Byte2	Reserved	
9	Byte0	Reserved	
	Byte1	Firmware Version	
	Byte2	Firmware Revision	
10	Byte0	Dip Switch 1	
	Byte1	Dip Switch 2	
	Byte2	Dip Switch 4	
11	Byte0	Dip Switch 6	
	Byte1	Dip Switch 3	
	Byte2	Dip Switch 5	
12	Byte0	5 Amp CT Secondary Turns Ratio – LSB	
	Byte1	5 Amp CT Secondary Turns Ratio – MSB	
	Byte2	Reserved	

SLAVE ACTION Description (3 D 0)

Byte2	Byte1	Byte0	Definition
0	0	2	Reset Trip/Unit
0	0	20h	Reset Trip Buffer
1	0	0	Trip (Open)

Download Setpoints Description (3 F 9) (IQ 500L Only)

Message	Byte	Description
1	Byte0	Number of additional data messages = 4
	Byte1	Reserved
	Byte2	Reserved
2	Byte0	Reserved
	Byte1	Reserved
	Byte2	Reserved
3	Byte0	Reserved
	Byte1	Reserved
	Byte2	Reserved
4	Byte0	5 Amp CT Secondary Turns Ratio – LSB
	Byte1	5 Amp CT Secondary Turns Ratio – MSB
	Byte2	Reserved
5	Byte0	Checksum (sum of previous 4 messages) – LSB
	Byte1	Checksum (sum of previous 7 messages) – MSB
	Byte2	Complement of LSB of checksum

Note: The IQ 500L will respond with an ACK message after each setpoint message it receives.

CHANGE RECORD

Revision	Date	Changes
1.00	6/28/02	Taken from IL 17384 Revision 3.10 (June 2002) Part D; made into separate document for inclusion in Revision 3.20.

This page intentionally left blank.

COMMUNICATIONS PROTOCOL – IQ 1000

The IQ 1000 II is backward-compatible with the IQ 1000. The IQ 1000 II thus responds to all of the commands described in this section, as well as the commands described in Part D, Section 301. This was done for renewal parts considerations. However, new INCOM system communications software should utilize the commands outlined in Part D, Section 301.

The IQ 1000 does not conform to the INCOM Communications Standard (described in IL 17384, Part A, Section 5).

Fast Status (3 0 1)

Division Code = 1

Product ID = 3

Supported Commands

	Reference Section
(3 0 0) Status (only)	Part A, 5.2.2.1, this section
(3 0 1) Status, Division Code and ID	This section
(3 0 4) Transmit Buffer X	This section
(3 1 Y) Transmit Message Y of Buffer X	This section
(3 2 Y) Transmit up to Msg Y of Buffer X	This section
(3 8 X) Select Buffer X	This section
(3 9 0) Reset IQ 1000	This section
(3 9 1) Trip IQ 1000	This section
(3 D 0) Reset IQ 1000	Part A, 5.2.23.1, this section
(3 D 1) Trip IQ 1000	Part A, 5.2.24, this section

Status Description (3 0 0)

Message	Byte	Description		
1	Byte0	Reserved		
	Byte1	Reserved		
	Byte2	Status:	**Bit**	**Definition**
			B5-B0	Reserved
			B7-B6	00 = Ready
				01 = Running
				10 = Tripped
				11 = Alarm

Status, Division Code, and ID Description (3 0 1)

Message	Byte	Name	Description		
1	Byte0	Stat0:	**Bit**	**Definition**	
			B5-B0	Division Code = 1	
			B7-B6	S/W version bits 1 and 0	
	Byte1	Stat1:	**Bit**	**Definition**	
			B1-B0	S/W version bits 3 and 2	
			B7-B2	Product ID = 3	
	Byte2	Stat2:	**Bit**	**Definition**	
			B3-B0	Reserved	
			B7-B4	0000 = Ready	0001 = Program
				0010 = Start	0011 = Reserved
				0100 = Running	0101 = Reserved
				0110 = Start	0111 = Reserved
				1000 = Trip	1001 = Trip/Program
				1010 = Anti-Backspin	1011 = Anti-Bkspin/prog
				1100 = Alarm/Running	1101 = Alarm/Program
				1110 = Alarm/Start	1111 = Reserved
2			Acknowledge – Refer to Part A, Section 5.1.1.		

Transmit Buffer X (3 0 4)

The IQ 1000 responds with Buffer X, where X is the buffer number specified in the most recently sent "Select Buffer X" command. The format of the Transmit Buffer X command is as follows:

C/D	= 1
INST	= 3
COMM	= 0
ADDRESS	= IQ 1000 INCOM address
SCOMM	= 4

Refer to "Buffer Definitions" at the end of this section for detailed information on each buffer.

Transmit Message Y of Buffer X (3 1 Y)

The IQ 1000 responds with Message Y of Buffer X, where X is the buffer number specified in the most recently sent "Select Buffer X" command. The format of the Transmit Message Y of Buffer X command is as follows:

C/D	= 1
INST	= 3
COMM	= 1
ADDRESS	= IQ 1000 INCOM address
SCOMM	= Y (message number)

Refer to "Buffer Definitions" at the end of this section for detailed information on each buffer.

Select Buffer X (3 8 X)

The IQ 1000 responds with an Acknowledge message. The format of the Select Buffer X command is as follows:

C/D	= 1
INST	= 3
COMM	= 8
ADDRESS	= IQ 1000 INCOM address
SCOMM	= X (buffer number)

Refer to "Buffer Definitions" at the end of this section for detailed information on each buffer.

Reset IQ 1000 (3 9 0)

The IQ 1000 responds with an Acknowledge message. The format of the Reset IQ 1000 command is as follows:

C/D	= 1
INST	= 3
COMM	= 9 or D
ADDRESS	= IQ 1000 INCOM address
SCOMM	= 0

Trip IQ 1000 (3 9 1)

The IQ 1000 responds with an Acknowledge message. The format of the Trip IQ 1000 command is as follows:

C/D	= 1
INST	= 3
COMM	= 9 or D
ADDRESS	= IQ 1000 INCOM address
SCOMM	= 1

Buffer Definition for Buffer Number 0

Message	Byte	Name	Description
1		Status	Refer to Status Description
2	Byte0	Flags0:	**Bit** / **Definition**
			B0 Instantaneous Over Current Trip
			B1 I-Squared T Trip
			B2 Phase Unbalance Trip
			B3 Ground Fault Trip
			B4 Jam Trip
			B5 Under Load Trip
			B6 Trip Bypass
			B7 Remote Trip (via Hardware Input)
	Byte1	Flags1:	**Bit** / **Definition**
			B0 Motor Bearing Temperature Trip
			B1 Load Bearing Temperature Trip
			B2 Winding Temperature Trip
			B3 Reverse Phase Trip
			B4 Incomplete Sequence Trip
			B5 A/D Converter Error
			B6 Ram Error
			B7 Rom Error
	Byte2	Flags2:	**Bit** / **Definition**
			B0 Opto-Coupler Failure
			B1 Transition Not Completed
			B2 Full Load Amps/CT Value Error
			B3 Battery Low
			B4 External Trip (via INCOM)
			B5-B7 Reserved

Buffer Definition for Buffer Number 0 – Continued

Message	Byte	Name	Description		
3	Byte0	Alarm Flags:	**Bit**	**Definition**	
			B0	Phase Unbalance Alarm	
			B1	Winding Temperature Alarm	
			B2	Motor Bearing Temperature Alarm	
			B3	Load Bearing Temperature Alarm	
			B4-B7	Reserved	
	Byte1	Reserved Flags:			
	Byte2	Conditional Flags:	**Bit**	**Definition**	
			B0	I Squared T Alarm/Trip	
			B1	Starts per Hour Alarm/Trip	
			B2-B7	Reserved	
4	Byte0	Reserved			
	Byte1	Reserved			
	Byte2	Phase A current – Low byte			
5	Byte0	Phase A current – High byte			
	Byte1	Phase B current – Low byte			
	Byte2	Phase B current – High byte			
6	Byte0	Phase C current – Low byte			
	Byte1	Phase C current – High byte			
	Byte2	Percent of full scale for Phase A current – Low byte			
7	Byte0	Percent of full scale for Phase A current – High byte			
	Byte1	Percent of full scale for Phase B current – Low byte			
	Byte2	Percent of full scale for Phase B current – High byte			
8	Byte0	Percent of full scale for Phase C current – Low byte			
	Byte1	Percent of full scale for Phase C current – High byte			
	Byte2	Winding Temperature 1 – Low byte			
9	Byte0	Winding Temperature 1 – High byte			
	Byte1	Winding Temperature 2 – Low byte			
	Byte2	Winding Temperature 2 – High byte			
10		Acknowledge message			

Buffer Definition for Buffer Number 1

Message	Byte	Description
1		Status – Refer to Status Description
2	Byte0	Winding Temperature 3 – Low byte
	Byte1	Winding Temperature 3 – High byte
	Byte2	Winding Temperature 4 – Low byte
3	Byte0	Winding Temperature 4 – High byte
	Byte1	Winding Temperature 5 – Low byte
	Byte2	Winding Temperature 5 – High byte
4	Byte0	Winding Temperature 6 – Low byte
	Byte1	Winding Temperature 6 – High byte
	Byte2	Motor Bearing Temperature 1 – Low byte
5	Byte0	Motor Bearing Temperature 1 – High byte
	Byte1	Motor Bearing Temperature 2 – Low byte
	Byte2	Motor Bearing Temperature 2 – High byte
6	Byte0	Load Bearing Temperature 1 – Low byte
	Byte1	Load Bearing Temperature 1 – High byte
	Byte2	Load Bearing Temperature 2 – Low byte
7	Byte0	Load Bearing Temperature 2 – High byte
	Byte1	Operations Count – Low byte
	Byte2	Operations Count – High byte
8	Byte0	Run Time – Low byte
	Byte1	Run Time – High byte
	Byte2	Remaining Starts – Low byte
9	Byte0	Remaining Starts – High byte
	Byte1	Oldest Start Time – Low byte
	Byte2	Oldest Start Time – High byte
10		Acknowledge message

Buffer Definition for Buffer Number 2

Message	Byte	Description
1		Status – Refer to Status Description
2	Byte0	Software version number – Low byte
	Byte1	Software version number – High byte
	Byte2	Winding Temperature Trip Setpoint – Low byte
3	Byte0	Winding Temperature Trip Setpoint – High byte
	Byte1	Motor Bearing Temperature Trip Setpoint – Low byte
	Byte2	Motor Bearing Temperature Trip Setpoint – High byte
4	Byte0	Load Bearing Temperature Trip Setpoint – Low byte
	Byte2	Load Bearing Temperature Trip Setpoint – High byte
	Byte0	Winding Temperature Alarm Setpoint – Low byte
5	Byte0	Winding Temperature Alarm Setpoint – High byte
	Byte1	Motor Bearing Temperature Alarm Setpoint – Low byte
	Byte2	Motor Bearing Temperature Alarm Setpoint – High byte
6	Byte0	Load Bearing Temperature Alarm Setpoint – Low byte
	Byte1	Load Bearing Temperature Alarm Setpoint – High byte
	Byte2	Ground Fault Trip Setpoint – Low byte
7	Byte0	Ground Fault Trip Setpoint – High byte
	Byte1	Ground Fault Start Delay Setpoint – Low byte
	Byte2	Ground Fault Start Delay Setpoint – High byte
8	Byte0	Ground Fault Run Delay Setpoint – Low byte
	Byte1	Ground Fault Run Delay Setpoint – High byte
	Byte2	Instantaneous Over Current Trip Setpoint – Low byte
9	Byte0	Instantaneous Over Current Trip Setpoint – High byte
	Byte1	Instantaneous Over Current Start Delay Setpoint – Low byte
	Byte2	Instantaneous Over Current Start Delay Setpoint – High byte
10		Acknowledge message

Buffer Definition for Buffer Number 3

Message	Byte	Description
1		Status – Refer to Status Description
2	Byte0	Locked Rotor Current Setpoint – Low byte
	Byte1	Locked Rotor Current Setpoint – High byte
	Byte2	Locked Rotor Stall Time Setpoint – Low byte
3	Byte0	Locked Rotor Stall Time Setpoint – High byte
	Byte1	Ultimate Trip Current Setpoint – Low byte
	Byte2	Ultimate Trip Current Setpoint – High byte
4	Byte0	I Squared T Alarm Setpoint – Low byte
	Byte1	I Squared T Alarm Setpoint – High byte
	Byte2	I2T Reset, 0 = Manual, 1 = Auto
5	Byte0	Reserved
	Byte1	Jam Trip Setpoint – Low byte
	Byte2	Jam Trip Setpoint – High byte
6	Byte0	Jam Start Delay Time Setpoint – Low byte
	Byte1	Jam Start Delay Time Setpoint – High byte
	Byte2	Jam Run Delay Setpoint – Low byte
7	Byte0	Jam Run Delay Setpoint – High byte
	Byte1	Under Load Trip Setpoint – Low byte
	Byte2	Under Load Trip Setpoint – High byte
8	Byte0	Under Load Start Delay Setpoint – Low byte
	Byte1	Under Load Start Delay Setpoint – High byte
	Byte2	Under Load Run Delay Setpoint – Low byte
9	Byte0	Under Load Run Delay Setpoint – High byte
	Byte1	Phase Unbalance Alarm Setpoint – Low byte
	Byte2	Phase Unbalance Alarm Setpoint – High byte
10		Acknowledge message

Buffer Definition for Buffer Number 4

Message	Byte	Description
1		Status – Refer to Status Description
2	Byte0	Phase Unbalance Delay Setpoint – Low byte
	Byte1	Phase Unbalance Delay Setpoint – High byte
	Byte2	0 = Wait for I2T, 1 = Trip Instantaneously on Phase Unbalance
3	Byte0	Reserved
	Byte1	Starts per timer Setpoint – Low byte
	Byte2	Starts per timer Setpoint – High byte
4	Byte0	Allowed time per allotted starts – Low byte
	Byte1	Allowed time per allotted starts – High byte
	Byte2	Transition Current Level Setpoint – Low byte
5	Byte0	Transition Current Level Setpoint – High byte
	Byte1	Transition Time Setpoint – Low byte
	Byte2	Transition Time Setpoint – High byte
6	Byte0	Trip or transition on time out, 0 =Trip, 1 = Transition
	Byte1	Reserved
	Byte2	Incomplete Sequence Time Setpoint – Low byte
7	Byte0	Incomplete Sequence Time Setpoint – High byte
	Byte1	Anti-backspin delay Setpoint – Low byte
	Byte2	Anti-backspin delay Setpoint – High byte
8	Byte0	Full Load Amps Setpoint – Low byte
	Byte1	Full Load Amps Setpoint – High byte
	Byte2	Line Frequency, 0 = 50Hz, 1 = 60Hz
9	Byte0	Reserved
	Byte1	Trip Mode, 0 = Mode 1, 1 = Mode 2
	Byte2	Reserved
10		Acknowledge message

Buffer Definition for Buffer Number 5

Message	Byte	Description
1		Status – Refer to Status Description
2	Byte0	0 = Non-reversing starter, 1 = Reversing starter
	Byte1	Reserved
	Byte2	0 = The AC input is for remote trip, 1 = The AC input is for reset.
3	Byte0	Reserved
	Byte1	CT Ratio – Low byte
	Byte2	CT Ration – High byte
4	Byte0	Time in minutes since last start
	Byte1	Number of trips not timed out
	Byte2	Amount of time to wait if trip occurs
5		Reserved
6		Reserved
7		Reserved
8		Reserved
9		Reserved
10		Acknowledge message

Buffer Definition for Buffer Number 6

Message	Byte	Description
1		Status – Refer to Status Description
2	Byte0	Phase Unbalance Timer down timer – Low byte
	Byte1	Phase Unbalance Timer down timer – High byte
	Byte2	Jam Timer down timer – Low byte
3	Byte0	Jam Timer down timer – High byte
	Byte1	Transition Timer down timer – Low byte
	Byte2	Transition Timer down timer – High byte
4	Byte0	Under Load Timer – Low byte
	Byte1	Under Load Timer – High byte
	Byte2	Incomplete Sequence Timer – Low byte
5	Byte0	Incomplete Sequence Timer – High byte
	Byte1	Setpoints view mode LED Timer – Low byte
	Byte2	Setpoints view mode LED Timer – High byte
6	Byte0	Anti-Backspin Timer – Low byte
	Byte1	Anti-Backspin Timer – High byte
	Byte2	Instantaneous Over Current Timer – Low byte
7	Byte0	Instantaneous Over Current Timer – High byte
	Byte1	Ground Fault Timer – Low byte
	Byte2	Ground Fault Timer – High byte
8		Reserved
9		Reserved
10		Acknowledge message

Buffer Definition for Buffer Number 7

Message	Byte	Description
1		Status – Refer to Status Description
2	Byte0	0 = RTD board is not present, 1 = RTD board is present
	Byte1	0 = RTD1 is not present, 1 = RTD1 is present
	Byte2	0 = RTD2 is not present, 1 = RTD2 is present
3	Byte0	0 = RTD3 is not present, 1 = RTD3 is present
	Byte1	0 = RTD4 is not present, 1 = RTD4 is present
	Byte2	0 = RTD5 is not present, 1 = RTD5 is present
4	Byte0	0 = RTD6 is not present, 1 = RTD6 is present
	Byte1	0 = RTD7 is not present, 1 = RTD7 is present
	Byte2	0 = RTD8 is not present, 1 = RTD8 is present
5	Byte0	0 = RTD9 is not present, 1 = RTD9 is present
	Byte1	0 = RTD10 is not present, 1 = RTD10 is present
	Byte2	Reserved
6		Reserved
7		Reserved
8		Reserved
9		Reserved
10		Acknowledge message

CHANGE RECORD

Revision	Date	Changes
1.00	6/28/02	Taken from IL 17384 Revision 3.10 (June 2002) Part D; made into separate document for inclusion in Revision 3.20.

COMMUNICATIONS PROTOCOL – ADVANTAGE

Fast Status (3 0 0)

Division Code = 1

Comm Version = 4

Product ID:
- 6 = Size 3, 4 Starter, 3 PH
- 8 = Size 1, 2 Starter, 3 PH
- 9 = Size 5, 6 Starter, 3 PH
- 10 = Size 3, 4 Overload, 3 PH
- 11 = Size 1, 2 Overload, 3 PH
- 13 = Size 5, 6 Overload, 3 PH
- 14 = Size 3, 4 Contactor
- 23 = Size 5, 6 Contactor
- 24 = Size 1,2 Contactor
- 25 = Size 1L Starter, 3 PH
- 26 = Size 1L Starter, 1 PH
- 27 = Size 1L Overload, 3 PH
- 28 = Size 1, 2 Starter, 1 PH

Status Bits:

Bit		Definition
S7-S6	0 0	Open
	0 1	Closed
	1 0	Tripped
	1 1	Alarmed
S5		Set if opened via INCOM communications.
S4		Set during powerup; cleared by first Fast Status read.
S3		Set when trip detected; indicates the Time-Stamped Trip Data Buffer is available.
S2		Set indicates that PONI-Advantage communications are functional on powerup.
S0		Set indicates communication watchdog/IMPACC control is enabled (*Comm Version 4 or higher).*

Supported Commands

	Reference Section
(3 0 0) Fast Status	Part A, 5.2.3 and above
(3 0 3) Transmit All Standard Buffers	Part A, 5.2.8
(3 0 5) Transmit Current Buffer	Part A, 5.2.9
Response Msg 1: Phase A current	
Response Msg 2: Phase B current	
Response Msg 3: Phase C current	
Response Msg 4: Reserved	
(3 A 3) Transmit PONI Configuration Buffer	Part A, 5.2.28.1
(3 C 8) Transmit Flags Buffer	Part A, 5.2.19, this section
(3 C 9) Transmit Setpoints Buffer	Part A, 5.2.20, this section
(3 C B) Transmit Time-Stamped Trip Data Buffer	Part A, 5.2.21, this section
(3 D 0) Slave Action	Part A, 5.2.23.1, 5.3.7, this section
(D F F) Reset WebPONI Watchdog Timer	This section

Note: The text in this note applies to Comm Versions 1-3 only.

- *If the least-significant digit of the INCOM network address for the Advantage is in the range of Ah to Fh, a watchdog timer is enabled and the product will trip/open if no INCOM messages are received for a 5-second period.*

Note: The text in this note applies to Comm Version 4 only.

- *If the communications watchdog switch is in the ON or up position, the communications watchdog timer is enabled and the product will open/trip if no INCOM messages are received for a 5-second period. All Slave Action stop/start control commands will not function when the switch is in the OFF or down position.*

FLAGS Buffer Description (3 C 8)

Message	Byte	Name	Description
1	Byte0		Number of additional data messages = 2
	Byte1	Flags1:	**Bit** **Definition**
			B3 Run/Closed indication
			B4 Ready/Open indication
			B5 Trip Indication
			B7 Overload Condition Exists
	Byte2	Flags2:	**Bit** **Definition**
			B0 1 = Slave Action Start/Stop command received *(Comm Version 4 or higher)*
			B1 1 = Run Permit Signal Present
			B2 1 = Start Signal Present
			B3 0 = Remote Reset Signal Present
			B7 0 = Local Reset Signal Present
2	Byte0	Flags3:	**Value** **Definition**
			1 Overload
			2 Ground Current Trip
			3 Phase Loss Trip
			4 Phase Unbalance Trip
			10h Ground. Current Exceeds Interrupt Capacity
			20h Control Voltage too low -> unit will open
			30h Control Voltage too low to pick up
			40h Control Voltage too high to pick up *(Comm Versions 3 or lower only<4)*
			50h Current too low to close
			70h External Trip (via INCOM) *(Comm Versions 3 or lower only<4)*
	Byte1	VOLTS	Coil Voltage (units of volts)
	Byte2	MAXCOIL	Maximum Coil Current on closing
3	Byte0	CHOLDHI	(high byte) Time equivalent of the delay from
	Byte1	CHOLDLO	(low byte) the middle of each half cycle to the beginning of holding pulse.
	Byte2	COIL_I	The recorded holding current

SETPOINTS Buffer Description (3 C 9)

Message	Byte	Name	Description
1	Byte0		Number of additional data messages = 2
	Byte1		Firmware Revision
	Byte2		Firmware Version
2	Byte0	Dipheater	**Bit** — **Definition**: B4-B0 Heater Number (0-31); B6,B5 00 = Class 10 Overload, 01 = Class 20 Overload, 10 = Class 30 Overload, 11 = No Protection; B7 1 = Automatic Reset
	Byte1	Econfig	**Bit** — **Definition**: B0 1 = Ground Fault is enabled.; B1 1 = Phase Protection is enabled.; B2 1 = Thermal Overload is enabled.; B3 1 = Unit is 50Hz, 0 = Unit is 60Hz; B4 1 = Unit is an Overload, 0 = Unit is a Contactor/Starter; B5 1 = Ultrasonic holding is enabled *(Comm Version 3 or lower)*; 1 = Phase loss protection is enabled *(Comm Version 4 or higher)*; B6 1 = Local reset is disabled; B7 1 = Unit will not reset thermal trip on power up even if reset conditions are met.
	Byte2		Surever ROM version of the Sure chip
3	Byte0		Reserved
	Byte1		Reserved
	Byte2		Reserved

TIME-STAMPED TRIP DATA Buffer Description (3 C B)

Message	Byte	Description	Format
1	Byte0	Number of additional data messages = 12	
	Byte1	TRIP DATA Buffer number = 1	
	Byte2	Number of unread Trip Data Buffers = 0	
2	Byte0	Trip Time Offset	Trip Time Offset (in seconds) = seconds = 256*BYTE2 + BYTE1.BYTE0/256
	Byte1	Trip Time Offset	
	Byte2	Trip Time Offset	
3		Buffers Supported Map	
4		Phase A Current	IMPACC 24-Bit Floating Point
5		Phase B Current	IMPACC 24-Bit Floating Point
6		Phase C Current	IMPACC 24-Bit Floating Point
7		Reserved	
8		Flags Buffer	
9		Flags Buffer	
10		Flags Buffer	
11		Setpoints Buffer	
12		Setpoints Buffer	
13		Setpoints Buffer	

SLAVE ACTION Description (3 D 0)

Byte2	Byte1	Byte0	Definition
0	0	2	Reset Trip/Unit
0	0	20h	Reset Trip Buffer
2	0	1	Start
2	0	3	Trip/Stop

CHANGE RECORD

Revision	Date	Changes
1.00	6/28/02	Taken from IL 17384 Revision 3.10 (June 2002) Part D; made into separate document for inclusion in Revision 3.20.
	11/10/03	• Modified to include W-PONI Comm Version 4 f/w changes. • Minor edits for clarification.

This page intentionally left blank.

COMMUNICATIONS PROTOCOL – ADVANTAGE CONTROL MODULE (ACM)

Fast Status (3 0 0)

Division Code = 1

Comm Version = 4

Product ID:
35 = Full Voltage, non-reversing
36 = Forward/Reverse
37 = Fast/Slow – 2 winding
38 = Fast/Slow – constant horsepower
39 = Fast/Slow – constant torque
40 = Reduced Voltage – primary resistance
41 = Reduced Voltage – part winding
42 = Reduced Voltage – auto transformer
43 = Reduced Voltage – Wye-Delta open transition
44 = Reduced Voltage – Wye-Delta closed transition
45 = Metering

Status Bits:

Bit		Definition
S7-S6	0 0	Open
	0 1	Closed
	1 0	Tripped
	1 1	Alarmed

S5 Set if opened via INCOM communications.

S4 Set during powerup; cleared by first Fast Status read.

S3 Set when trip detected; indicates the Time-Stamped Trip Data Buffer is available.

S2 Set indicates that PONI-ACM communications are functional on powerup.

Note: See ACM Status Command (3 C C) for status of the ACM-Advantage communications link.

S0 Set indicates that communication watchdog/IMPACC control is enabled (*Comm Version 4 or higher only)*.

Supported Commands

	Reference Section
(3 0 0) Fast Status	Part A, 5.2.3 and above
(3 0 3) Transmit All Standard Buffers	Part A, 5.2.8
(3 0 5) Transmit Current Buffer	Part A, 5.2.9
(3 C 8) Transmit Flags Buffer	Part A, 5.2.19, this section
(3 C 9) Transmit Setpoints Buffer	Part A, 5.2.20, this section
(3 C B) Transmit Time-Stamped Trip Data Buffer	Part A, 5.2.21, this section
(3 C C) Transmit ACM Status	This section
(3 D 0) Slave Action	Part A, 5.2.23.1, 5.3.7, this section
(3 A 3) Transmit PONI Configuration Buffer	Part A, 5.2.28.1

Note: The text in this note applies to Comm Versions 1-3 only.

- *If the least-significant digit of the INCOM network address for the Advantage is in the range of Ah to Fh, a watchdog timer is enabled and the product will trip/open if no INCOM messages are received for a 5-second period.*

Note: The text in this note applies to Comm Version 4 only.

- *If the communications watchdog switch is in the ON or up position, the communications watchdog timer is enabled and the product will open/trip if no INCOM messages are received for a 5-second period. All Slave Action stop/start control commands will not function when the switch is in the OFF or down position.*

FLAGS Buffer Description (3 C 8)

For cases where multiple starters are being controlled by the ACM, the FLAGS Buffer from the closed starter is sent to the master. When both starters are open, the FLAGS Buffer from Starter #1 is sent to the master. The ACM Status Buffer contains the starter number for the starter whose FLAGS Buffer is being sent to the master. Refer to Transmit ACM Status (3 C C) on Page 7.

Message	Byte	Name	Description
1	Byte0		Number of additional data messages = 2
	Byte1	Flags1:	**Bit** **Definition**
			B3 Run/Closed indication
			B4 Ready/Open indication
			B5 Trip Indication
			B7 Overload condition exists
	Byte2	Flags2:	**Bit** **Definition**
			B0 1 = Slave Action Start/Stop command received *(Comm Version 4 or higher)*
			B1 1 = Run Permit Signal Present
			B2 1 = Start Signal Present
			B3 0 = Remote Reset Signal Present
			B7 0 = Local Reset Signal Present
2	Byte0	Flags3 :	**Value** **Definition**
			1 Overload trip
			2 Ground current trip
			3 Phase loss trip
			4 Phase unbalance trip
			10h Ground current exceeds interrupt capacity
			20h Control Voltage too low -> unit will open
			30h Control Voltage too low to pick up
			40h Control Voltage too high to pick up *(Comm Version 3 or lower only)*
			50h Current too low to close
			70h External Trip (via INCOM) *(Comm Version 3 or lower only)*
	Byte1	VOLTS	Coil Voltage (units of volts)
	Byte2	MAXCOIL	Maximum Coil Current on closing
3	Byte0	CHOLDHI	(high byte) Time equivalent of the delay from
	Byte1	CHOLDLO	(low byte) the middle of each half cycle, to the beginning of holding pulse.
	Byte2	COIL_I	The recorded holding current

Setpoints Buffer Description (3 C 9)

For cases where multiple starters are being controlled by the ACM, the Setpoints Buffer from the closed starter is sent to the master. When both starters are open, the Setpoints Buffer from starter #1 is sent to the master. The ACM Status Buffer contains the starter number for the starter whose Setpoints Buffer is being sent to the master. Refer to Transmit ACM Status (3 C C) on Page 7.

Message	Byte	Name	Description
1	Byte0		Number of additional data messages = 2
	Byte1		Firmware Revision
	Byte2		Firmware Version
2	Byte0	Dipheater	**Bit** — **Definition** B4-B0 — Heater Number (0-31) B6,B5 — 00 = Class 10 Overload 01 = Class 20 Overload 10 = Class 30 Overload 11 = No Protection B7 — 1 = Automatic Reset
	Byte1	Econfig	**Bit** — **Definition** B0 — 1 = Ground Fault enabled B1 — 1 = Phase Protection enabled B2 — 1 = Thermal Overload enabled B3 — 1 = Unit is 50Hz, 0 = Unit is 60Hz. B4 — 1 = Unit is an Overload 0 = Unit is a Contactor/Starter B5 — 1 = Ultrasonic holding is enabled *(Comm Version 3 or lower)* 1 = Phase loss protection is enabled *(Comm Version 4 or higher)* B6 — 1 = Local reset is disabled. B7 — 1 = Unit will not reset thermal trip on power up even if reset conditions are met.
	Byte2		Surever ROM version of the Sure chip

Setpoints Buffer Description (3 C 9) – Continued

For cases where multiple starters are being controlled by the ACM, the setpoints buffer from the closed starter is sent to the master. When both starters are open, the setpoints buffer from starter #1 is sent to the master. The ACM status buffer contains the starter number for the starter whose setpoints buffer is being sent to the master. Refer to Transmit ACM Status (3 C C) on Page 7.

Message	Byte	Name	Description
3	Byte0		Product ID of starter number 1 (at address 1)
	Byte1		Product ID of starter number 2 (at address 4)
	Byte2		**ACM Status Byte2 – For forward/reverse or fast/slow**

Bit	Definition
B0	1=IMPACC auto mode 0=Not IMPACC auto mode
B1-B3	Reserved
B4	Current or most recent running starter: 1=Starter #4, 0=Starter #1
B5	1=Remote Auto mode, 0=not in Remote Auto
B6	1=ACM subnetwork comm OK, 0= comm failure
B7	Reserved

ACM Status Byte2 – For reduced voltage

Bit	Definition
B0	1=IMPACC auto mode 0=not IMPACC auto mode
B1	Reserved
B2	Incomplete sequence trip
B3	Start transition in progress
B4	Anti-recycle lockout
B5	1=Remote Auto mode, 0=not in Remote Auto
B6	1=ACM subnetwork comm OK, 0= comm failure
B7	Transition timeout trip

Note: The "ACM Status Byte2" information is also provided in the ACM Status Buffer. See ACM Status Buffer Description (3 C C) command, which starts on Page 7.

TIME-STAMPED EVENT DATA Buffer Description (3 C B)

For cases where multiple Advantage starters are being controlled by the ACM, the Time-Stamped Event Buffer from the most recently tripped starter is sent to the master.

Message	Byte	Description	Format
1	Byte0	Number of additional data messages = 12	
	Byte1	EVENT DATA Buffer number = 1	
	Byte2	Number of unread Event Data Buffers = 0	
2	Byte0	Event Time Offset	Event Time Offset in
	Byte1	Event Time Offset	seconds = 256*BYTE2
	Byte2	Event Time Offset	+BYTE1.BYTE0/256
3		Buffers Supported Map	
4		Phase A Current	IMPACC 24-Bit Floating Point
5		Phase B Current	IMPACC 24-Bit Floating Point
6		Phase C Current	IMPACC 24-Bit Floating Point
7		Reserved	
8		Flags Buffer	
9		Flags Buffer	
10		Flags Buffer	
11		Setpoints Buffer	
12		Setpoints Buffer	
13		Setpoints Buffer	

Note: Message 13, third byte, bit 4 indicates the address of the tripped starter.

ACM Status Buffer Description (3 C C)

Message	Byte	Description
1	Byte0	Number of additional data messages = 1
	Byte1	ACM Status Byte1 – Full voltage, forward/reverse, or fast/slow

Bit	Definition
B0	1 = Trip
B1	1 = Alarm
B2	1 = Stop
B3	1 = Forward/Fast Run
B4	1 = Reverse/Slow Run
B5	1 = Off Mode
B6	1 = Auto Mode
B7	1 = Hand Mode

ACM Status Byte1 – For reduced voltage

Bit	Definition
B0	1 = Trip
B1	1 = Alarm
B2	1 = Hand mode
B3	1 = Reserved
B4	1 = Run, 0 = Stop
B5	1 = Off Mode
B6	1 = Auto Mode
B7	Reserved

Byte2 ACM Status Byte2 – For forward/reverse or fast/slow

Bit	Definition
B0	1=IMPACC auto mode, 0=not IMPACC auto mode
B1-B3	Reserved
B4	1=Starter #4, 0=Starter #1
B5	1=Remote Auto mode, 0=not in Remote Auto
B6	1=ACM subnetwork comm OK, 0= comm failure
B7	Reserved

ACM Status Byte2 – For reduced voltage

Bit	Definition
B0	1=IMPACC auto mode, 0=not IMPACC auto mode
B1	Reserved
B2	Incomplete sequence trip
B3	Start transition in progress

ACM Status Buffer Description (3 C C) – Continued

Message	Byte	Description
1	Byte2	**Bit** **Definition** B4 Anti-recycle lockout B5 1=Remote Auto mode, 0=not in Remote Auto B6 1=ACM subnetwork comm OK, 0= comm failure B7 Transition timeout trip
2	Byte0	ACM Firmware Version
	Byte1	Definition for Reduced Voltage **Bit** **Definition** B0-B6 Reserved B7 0=No metering module connected 1=Metering module connected
	Byte2	ACM Dip Switch Settings For the forward/reverse or fast/slow version **Bit** **Definition** B0 1=Three-contactor (0=Two-contactor) fast/slow B1 1=Mandatory timed stop (0=Plugging allowed) B2 1=Compel Accel Enabled (only allowed if plugging is enabled) B3 1=Compel Decel Enabled (only allowed if plugging is enabled) B4-B7 Timer settings: 0000=0 seconds 0001=2 seconds 0010=4 seconds : : 1111=30 seconds

ACM Status Buffer Description (3 C C) – Continued

Message	Byte	Description
	Byte2	For the reduced voltage version:

Bit	Definition
B0-B2	000=Primary resistance configuration – Setup #1
	001=Part winding configuration
	010=Auto transformer configuration – Setup #1
	011=Wye-delta open transition configuration
	100=Wye-delta closed transition configuration
	101=Primary resistance configuration – Setup #2
	110==Auto transformer configuration – Setup #2
B3	1=Transition on current (0=transition on time)
B4	1=Transition on timeout (0=Trip on time out)
B5-B7	Timer settings:
	000=0 seconds
	001=4 seconds
	010=8 seconds
	: :
	111=28 seconds

SLAVE ACTION Description (3 D 0)

Supported by Product ID

Byte2	Byte1	Byte0	Definition	35_	36_	37_	38_	39_	40_	41_	42_	43_	44_	45_
0	0	2	Reset trip/unit	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
0	0	20h	Reset event buffer	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
2	0	1	Start fast forward	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no
2	0	2	Start reverse	no	yes	no	no	no	no	no	no	no	no	no
2	0	3	Stop	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no
2	0	5	Start slow forward	no	no	yes	yes	yes	no	no	no	no	no	no

CHANGE RECORD

Revision	Date	Changes
1.00	6/28/02	Taken from IL 17384 Revision 3.10 (June 2002) Part D; made into separate document for inclusion in Revision 3.20. • Released as part of IL 17384 Revision 3.10 Part D (June 2002)
	11/10/03	• Modified to include W-PONI Comm Version 4 f/w changes. • Minor edits for clarification.

This page intentionally left blank.

COMMUNICATIONS PROTOCOL – ADVANTAGE CONTROL PONI

The Advantage Control PONI is a stand-alone-slave-type INCOM device. It conforms to the communications standards of a stand-alone slave as described Part A, Section 4 of IL 17384.

Supported INCOM Commands

Refer to Section 4.2, Standard Master-to-Stand-Alone Slave Command Set, for a complete description of the following 7 INCOM commands.

- (0,F,F) Start – Do Not Reply
- (1,F,F) Stop – Do Not Reply
- (5,F,F) Block Stop – up to 16 Advantage Control PONIs and other stand-alone slaves
- (8,F,F) Start – Send Reply
- (9,F,F) Stop – Send Reply
- (E,F,F) Stop all Advantage Control PONIs and other stand-alone slaves
- (F,x,x) Send Status

All commands except for "(F,x,x) Send Status" must be sent twice.

Note: The status of the Advantage motor controller is transmitted in bits 2 and 3 of the SCOMM field (bits 25 and 26 of the 33-bit INCOM message):

Status Bits:	**Bit**	**Definition**	
	B26 -B25	0 0	Open
		0 1	Closed
		1 0	Tripped
		1 1	Alarmed

CHANGE RECORD

Revision	Date	Changes
1.00	6/28/02	Taken from IL 17384 Revision 3.10 (June 2002) Part D; made into separate document for inclusion in Revision 3.20.

COMMUNICATIONS PROTOCOL – ACCUTROL 400

Fast Status (3 0 0)

Division Code = 7

Comm. Software Version = 0

Product ID: 2

Status Bits:

Bit		Definition
S7-S6	0 0	Off or Ready
	0 1	Running
	1 0	Tripped
	1 1	Alarmed
S5		Set off because of an INCOM communications command.
S4		Set during power-up; cleared by first Fast Status read.
S3		Set indicates than an unread Time-Stamped Trip Buffer is available.

Supported Commands

	Reference Section
(3 0 0) Fast Status	Part A, 5.2.3 and above
(3 0 3) Transmit All Standard Buffers	Part A, 5.2.8
(3 0 8) Transmit Power Buffer(1) Response Msg 1: AC Apparent Power Response Msg 2: Reserved Response Msg 3: Reserved	Part A, 5.2.12
(3 C 8) Transmit Flags Buffer	Part A, 5.2.19, this section
(3 C 9) Transmit Setpoints Buffer	Part A, 5.2.20, this section
(3 C B) Transmit Time-Stamped Trip Data Buffer	Part A, 5.2.21, this section
(3 C C) Transmit Accutrol 400 Status Buffer	This section
(3 D 0) Slave Action	Part A, 5.2.23.1, 5.3.7, this section
(3 F 8) Receive Frequency	Part A, 5.2.26.1, this section

FLAGS Buffer Description (3 C 8)

Message	Byte	Name	Description	
1	Byte0		Number of additional data messages = 11	
	Byte1	Flags1:	**Bit**	**Definition**
			B0	Master Trip (set upon all trip occurrences)
			B1	Reserved
			B2	Overload Alarm
			B3	Reserved
			B4	Reserved
			B5	Reserved
			B6	Inverter Enable
			B7	Reserved
	Byte2	Flags2:	**Bit**	**Definition**
			B0	Jog Active
			B1	Preset Speed 1 Active
			B2	Preset Speed 2 Active
			B3	Preset Speed 3 Active
			B7-B4	Reserved
2	Byte0	Flags3:	**Bit**	**Definition**
			B7-B0	Reserved
	Byte1	Flags4:	**Bit**	**Definition**
			B2-B0	Reserved
			B3	Relay 4 Active
			B4	Reserved
			B5	Trip coil (set on trip, clears when trip reset)
			B6	Untrip coil (set on trip reset; clears when trip occurs)
			B7	Reserved
	Byte2		Reserved	
3	Byte0		Isolated Input Signal 1 – low byte	(Percent x 100)
	Byte1		Isolated Input Signal 1 – high byte	see note1
	Byte2		Process Signal Min Level – low byte (% full range x 100)	

FLAGS Buffer Description (3 C 8) – Continued

Message	Byte	Name	Description	
4	Byte0		Process Signal Min Level – high byte	
	Byte1		Frequency Command (most recent) – low byte	(Hz x 100)
	Byte2		Frequency Command (most recent) – high byte	
5	Byte0		Reserved	
	Byte1		Reserved	
	Byte2		Reserved	
6	Byte0		Reserved	
	Byte1		Output Current – low byte	(Amperes)
	Byte2		Output Current – high byte	
	Note 1: To convert the Isolated Input Signal value to units of percent, divide its value by 100.			
7	Byte0		Reserved	
	Byte1		Reserved	
	Byte2		Reserved	
8	Byte0		Reserved	
	Byte1		Output Voltage – low byte	(Volts)
	Byte2		Output Voltage – high byte	
9	Byte0		Link Voltage – low byte	(Volts DC)
	Byte1		Link Voltage – high byte	
	Byte2		Reserved	
10	Byte0		Reserved	
	Byte1		Output Frequency – low byte	(Hz x 100)
	Byte2		Output Frequency – high byte	See Note 1.

FLAGS Buffer Description (3 C 8) – Continued

Message	Byte	Name	Description
11	Byte0		Cause of most recent trip
			1=over current 2=over voltage
			3=overload 4=undervoltage
			5=phase loss 6=over temperature
			7=ground fault 8=emergency trip
			9=software trip 10=INCOM initiated trip
	Byte1		Elapsed Runtime – LSB (Hours x 10)
	Byte2		Elapsed Runtime (See Note 2.)
12	Byte0		Elapsed Runtime – MSB
	Byte1		Motor Speed (calculated) – low byte (RPM)
	Byte2		Motor Speed (calculated) – high byte

Note 1: To convert the Output Frequency to units of hertz, divide the value in message 10 (Bytes 1 and 2) by 100.

Note 2: To convert the Elapsed Runtime to units of hours, divide the value returned in Message 11 (Bytes 1 and 2) and Message 12 (Byte0) by 10.

SETPOINTS Buffer Description (3 C 9)

Message	Byte	Name	Description
1	Byte0		Number of additional data messages = 1
	Byte1		Firmware Revision
	Byte2		Firmware Version
2	Byte0	Setpt1:	**Bit** **Definition**
			B0 Critical Frequency Avoidance On/Off 1 = On
			B1 Multiple Attempt Restart On/Off 1 = On
			B2 Catch Spinning Motor On/Off 1 = On
			B3-B5 Process Signal In 001 = 0-10 VDC, 010 = 4-20 mA, 100 = 3-15 psi
			B6 Process Signal 0 = PSIG Normal 1 = PSIG Inverted
			B7 Process Signal Loss Action 0 = Stop Process 1 = Preset Speed
	Byte1	Setpt2:	**Bit** **Definition**
			B0 Electronic Pot "EPOT" On/Off 1 = On
			B1-B3 Process Signal Out 001 = POUT_VAC, 010 = POUT_AMP, 100 = POUT_KW
			B4-B7 Relay 4 0000 = Up to speed
			0001 = Overload warning
			0010 = Over current trip
			0011 = Over voltage trip
			0100 = Under voltage trip
			0101 = Phase loss trip
			0110 = External trip
			0111 = Permissive trip
			1000 = Over temperature trip
			1001 = Over frequency trip
			1010 = Process Signal Loss
			1011 = Ground fault trip
			1100 = Overload trip
			1101 = Remote Speed Command
			1110 = Remote Run Command
			1111 = MARS lockout
	Byte2		Reserved

TIME-STAMPED TRIP DATA Buffer Description (3 C B)

Message	Byte	Description
1	Byte0	Number of additional data messages = 19
	Byte1	TRIP DATA Buffer number
	Byte2	Number of unread Trip Data buffers
2	Byte0	Trip Time Offset=0 (*Note: The Accutrol 400 does not*
	Byte1	Trip Time Offset=0 *calculate the trip time offset).*
	Byte2	Trip Time Offset=0
3		Buffers Supported Map (Byte0=00H, Byte1=01H, Byte2=00H)
4		Reserved
5		Reserved
6		Reserved
7	Byte0	Reserved (Beginning of Flags Buffer – saved at time of trip)
	Byte1	Flags1
	Byte2	Flags2
8	Byte0	Flags3
	Byte1	Flags4
	Byte2	Reserved
9		Reserved
10	Byte0	Reserved
	Byte1	Frequency Command (at trip) – low byte
	Byte2	Frequency Command (at trip) – high byte
11		Reserved
12	Byte0	Reserved
	Byte1	Output current – low byte
	Byte2	Output current – high byte
13		Reserved
14		Reserved

TIME-STAMPED TRIP DATA Buffer Description (3 C B) – Continued

Message	Byte	Description
15	Byte0	DC Link voltage – low byte
	Byte1	DC Link voltage – high byte
	Byte2	Reserved
16	Byte0	Reserved
	Byte1	Output Frequency – low byte
	Byte2	Output Frequency – high byte
17	Byte0	Cause of trip
		1=over current 2=over voltage
		3=over load 4=undervoltage
		5=phase loss 6=over temperature
		7=ground fault 8=emergency trip
		9=software trip 10=INCOM initiated trip
	Byte1	Elapsed Runtime – LSB
	Byte2	Elapsed Runtime
18	Byte0	Elapsed Runtime – MSB
	Byte1	Reserved
	Byte2	Reserved (End of Flags Buffer saved at time of trip.)
19	Byte0	Reserved
	Byte1	Firmware Revision
	Byte2	Firmware Version
20	Byte0	Setpt1
	Byte1	Setpt2
	Byte2	Reserved

Accutrol 400 Status Buffer Description (3 C C)

Message	Byte	Description
1	Byte0	Number of additional data messages = 0
	Byte1	Accutrol 400 Status Byte1

Bit	Definition
B0	1 = Local (keypad speed entry enabled)
B1	1 = Remote (remote speed entry enabled)
B2	1 = Off Mode
B3	1 = Auto mode (remote start/stop enabled)
B4	1 = Hand mode (start/stop via keypad enabled)
B5	1 = Ready (OK to run)
B6	1 = Serial-Remote (speed entry via IMPACC-enabled)
B7	1 = Serial-Auto (Start/stop via IMPACC-enabled)

Byte2 Accutrol 400 Status Byte2

Bit	Definition
B0	1 = Motor Direction (1=forward, 0=reverse)
B1-B7	Reserved

SLAVE ACTION Description (3 D 0)

Byte2	Byte1	Byte0	Definition
0	0	2	Reset Trip/Alarm
0	0	20h	Reset Time-Stamped Trip Data Buffer
0	1	3	Reset Run Time
2	0	1	Start Forward
2	0	2	Start Reverse
2	0	3	Stop
3	0	0	Advance to the Next Time-Stamped Trip Buffer

RECEIVE Frequency (3 F 8)

This command is used to download the frequency (speed) setting for the motor. The Accutrol 400 will respond with an Acknowledge message, then the following data message must be sent.

Message	Byte	Description
1	Byte0	Number of additional data messages = 0
	Byte1	Frequency (speed) – low byte (1-12,000 in 1/100 % units)
	Byte2	Frequency (speed) – high byte

The Accutrol 400 will respond with an ACK after accepting this message.

CHANGE RECORD

Revision	Date	Changes
1.00	6/28/02	Taken from IL 17384 Revision 3.10 (June 2002) Part D; made into separate document for inclusion in Revision 3.20.

This page intentionally left blank.

COMMUNICATIONS PROTOCOL – AF97

Fast Status (3 0 0)

Division Code = 7

Product ID = 1

Comm Version = 1

Status Bits:

Bit		Definition
S7-S6	0 0	Off
	0 1	On
	1 0	Tripped
	1 1	Alarmed
S5		Set if off because of an INCOM communications command.
S4		Set during power-up; cleared by first Fast Status read.
S3		Reserved

Note: AF97 Adjustable Frequency Drives with a Comm Version of 1 or greater support IMPACC communications.

Supported Commands

	Reference Section
(3 0 0) Fast Status	Part A, 5.2.3 and above
(3 0 3) Transmit All Standard Buffers	Part A, 5.2.8
(3 0 5) Transmit Current Buffer	Part A, 5.2.9 and below
Response msg 1: Phase A current – line side	
Response msg 2: Phase B current – line side	
Response msg 3: Phase C current – line side	
Response msg 4: Reserved	
(3 0 6) Transmit Line-to-Line (line side) Voltage Buffer	Part A, 5.2.10
(3 0 8) Transmit Power Buffer(1)	Part A, 5.2.12
Response msg 1: DC Power	
Response msg 2: Reserved	
Response msg 3: Reserved	
(3 C 8) Transmit Flags Buffer	Part A, 5.2.19, this section
(3 C 9) Transmit Setpoints Buffer	Part A, 5.2.20, this section
(3 C C) Transmit AF97 Status Buffer	This section

Supported Commands

	Reference Section
(3 D 0) Slave Action	Part A, 5.2.23.1, 5.3.7, this section
(3 F 8) Receive Frequency	Part A, 5.2.26.1, this section

FLAGS Buffer Description (3 C 8)

Message	Byte	Name	Description
1	Byte0		Number of additional data messages = 11
	Byte1	Flags1:	**Bit** **Definition**
			B0 Master Trip (set upon all trip occurrences)
			B1 Decel Limit Alarm
			B2 Torque Limit Alarm
			B3 Phase A Loss
			B4 Phase B Loss
			B5 Phase C Loss
			B6 Inverter Enable
			B7 Converter Enable
	Byte2	Flags2:	**Bit** **Definition**
			B0 Digital Input 1
			B1 Digital Input 2
			B2 Digital Input 3
			B3 Digital Input 4
			B4 Digital Input 5
			B5 Digital Input 6
			B6 Digital Input 7
			B7 Digital Input 8

FLAGS Buffer Description (3 C 8) – Continued

Message	Byte	Name	Description
2	Byte0	Flags3:	**Bit** **Definition**
			B0 Digital Input 9
			B1 Digital Input 10
			B2 Digital Input 11
			B3 Digital Input 12
			B4 Digital Input 13
			B5 Digital Input 14
			B6 Input Phase Rotation (0=ACB, 1=ABC)
			B7 Reserved
	Byte1	Flags4:	**Bit** **Definition**
			B0 Relay 1 (Digital Output)
			B1 Relay 2 (Digital Output)
			B2 Relay 3 (Digital Output)
			B3 Relay 4 (Digital Output)
			B4 Relay 5 (Digital Output)
			B5 Trip coil (set when trip occurs, clears when reset)
			B6 Untrip coil (set when trip reset, clear when trip occurs)
			B7 Reserved
	Byte2		Reserved
3	Byte0		Isolated Input Signal 1 – low byte (Percent x 100)
	Byte1		Isolated Input Signal 1 – high byte (See Note 1, Page 6.)
	Byte2		Isolated Input Signal 2 – low byte (Percent x 100)
4	Byte0		Isolated Input Signal 2 – high byte (Note 1, Page 6 .)
	Byte1		Frequency Command (most recent) – low byte (Hz x 100)
	Byte2		Frequency Command (most recent) – high byte (See Note 1 on Page 6.)
5	Byte0		Forward Speed Command Pot – low byte Percent x 100
	Byte1		Forward Speed Command Pot – high byte (See Note 1, Page 6.)
	Byte2		Air Pressure Command – low byte 3-15 PSI x 100

FLAGS Buffer Description (3 C 8) – Continued

Message	Byte	Name	Description
6	Byte0		Air Pressure Command – high byte (See Note 2 on Page 6.)
	Byte1		Phase A RMS Current (load side) – low byte Amperes
	Byte2		Phase A RMS Current (load side) – high byte
7	Byte0		Phase B RMS Current (load side) – low byte Amperes
	Byte1		Phase B RMS Current (load side) – high byte
	Byte2		Phase C RMS Current (load side) – low byte Amperes
8	Byte0		Phase C RMS Current (load side) – high byte
	Byte1		Phase A RMS Voltage (load side) – low byte Volts
	Byte2		Phase A RMS Voltage (load side) – high byte
9	Byte0		PHASE B RMS Voltage (load side) – low byte Volts
	Byte1		PHASE B RMS Voltage (load side) – high byte
	Byte2		PHASE C RMS Voltage (load side) – low byte Volts
10	Byte0		PHASE C RMS Voltage (load side) – high byte
	Byte1		Output Frequency – low byte Hz x 100
	Byte2		Output Frequency – high byte (See Note 3 on Page 6.)
11	Byte0		Cause of most recent trip 1=over current 2=over voltage 3=overload 4=under voltage 5=phase loss 6=over temperature 7=ground fault 8=emergency trip 9=software trip 10=INCOM initiated trip
	Byte1		Elapsed Runtime – LSB Hours x 10
	Byte2		Elapsed Runtime (See Note 4 on Page 6.)
12	Byte0		Elapsed Runtime – MSB
	Byte1		Motor Speed (calculated) – low byte RPM
	Byte2		Motor Speed (calculated) – high byte

FLAGS Buffer Description (3 C 8) – Continued

Note 1: To convert an isolated input signal, frequency command, or the forward speed command, pot the value to units of percent then divide the value by 100.

Note 2: To convert the air pressure command value to units of PSI, divide the value by 100.

Note 3: To convert the Output Frequency to units of hertz, divide the value in message 10 (Bytes 1 and 2) by 100.

Note 4: To convert the Elapsed Runtime to units of hours, divide the value returned in Message 11 (Bytes 1 and 2) and Message 12 (Byte0) by 10.

Setpoints Buffer Description (3 C 9)

Message	Byte	Description
1	Byte0	Number of additional data messages = 0
	Byte1	Firmware Revision
	Byte2	Firmware Version

AF97 Status Buffer Description (3 C C)

Message	Byte	Description
1	Byte0	Number of additional data messages = 0
	Byte1	AF97 Status Byte1

Bit	Definition
B0	1 = Local (keypad speed entry enabled)
B1	1 = Remote (remote speed entry enabled)
B2	1 = Off Mode
B3	1 = Auto mode (remote start/stop enabled)
B4	1 = Hand mode (start/stop via keypad enabled)
B5	1 = Ready (OK to run)
B6	1 = Serial-Remote (speed entry via IMPACC-enabled)
B7	1 = Serial-Auto (Start/stop via IMPACC-enabled)

Byte2 AF97 Status Byte2

Bit	Definition
B0	1 = Motor Direction (1=forward, 0=reverse)
B1-B7	Reserved

SLAVE ACTION Description (3 D 0)

Byte2	Byte1	Byte0	Definition
0	0	2	Reset Trip/Alarm
0	1	3	Reset Run Time
2	0	3	Stop
2	0	4	Start
2	0	7	Set Direction to Forward
2	0	8	Set Direction to Reverse

RECEIVE Frequency (3 F 8)

This command is used to download the frequency (speed) setting for the motor. The AF97 will respond with an Acknowledge message; then the following data message must be sent:

Message	Byte	Description
1	Byte0	Number of additional data messages = 0
	Byte1	Frequency (speed) – low byte (0-15,000 in 1/100 % units)
	Byte2	Frequency (speed) – high byte

The AF97 will respond with an ACK after receiving this message.

CHANGE RECORD

Revision	Date	Changes
1.00	6/28/02	Taken from IL 17384 Revision 3.10 (June 2002) Part D; made into separate document for inclusion in Revision 3.20.

This page intentionally left blank.