



GPD 506/P5 Apogee - FLN™ Technical Manual



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Table of Contents

1. INTRODUCTION	2
2. HARDWARE INSTALLATION.....	3
2.1 OPTION CARD MOUNTING.....	3
2.2 DRIVE SET-UP	5
2.3 NETWORK CONNECTION.....	5
2.3.1 <i>Bus Terminating Resistor</i>	6
2.4 NETWORK ADDRESSING	6
3. APPLICATION 2712 - OVERVIEW.....	8
3.1 LOGICAL ANALOG INPUT (LAI) SUMMARY	8
3.2 LOGICAL ANALOG OUTPUT (LAO) SUMMARY.....	9
3.3 LOGICAL DIGITAL INPUT (LDI) SUMMARY.....	9
3.4 LOGICAL DIGITAL OUTPUT (LDO) SUMMARY	9
3.5 POINT SUMMARY – BY NUMBER.....	10
4. STANDARD OPERATION	12
4.1 DRIVE CONFIGURATION	12
4.1.1 <i>Accel/Decel Times – #31, #32</i>	12
4.1.2 <i>Frequency Command Limits – #38, #39</i>	12
4.1.3 <i>Operational Mode – #55</i>	12
4.1.4 <i>PID Configuration – #63, #64, #65</i>	13
4.1.5 <i>General Purpose Setup – #72, #73</i>	13
4.2 DRIVE COMMAND AND CONTROL.....	14
4.2.1 <i>Forward/Reverse Command – #22</i>	14
4.2.2 <i>Run/Stop Command – #24</i>	14
4.2.3 <i>Input Terminal Commands – #25, #26, #27, #28</i>	14
4.2.4 <i>Frequency Command – #60</i>	14
4.2.5 <i>Terminal S1 Run Interlock - #80</i>	15
4.2.6 <i>Terminal S5 Auto Run - #81</i>	15
4.2.7 <i>Fault/Fault Reset Commands – #94, #96</i>	15
4.3 DRIVE MONITORING	16
4.3.1 <i>Operating Status</i>	16
4.3.2 <i>Reading Other Parameters – #70, #71</i>	17
4.4 CABLE LOSS BEHAVIOR.....	18
4.4.1 <i>Continue Running at Last Frequency</i>	18
4.4.2 <i>Continue Running at Preset Frequency</i>	18
4.4.3 <i>Stop Running</i>	19
4.4.4 <i>Fault</i>	19
4.5 DEFINING A NEW SLOPE & INTERCEPT	20
5. BYPASS APPLICATIONS	21
5.1 TYPICAL PARAMETER SETTINGS	21
6. PARAMETER MANAGEMENT FUNCTIONS.....	22
6.1 SAVE PARAMETERS	22
6.2 RESTORE PARAMETERS	23
6.3 COMPARE PARAMETERS.....	23
7. DIAGNOSTIC LEDS.....	24
7.1 RXD	24
7.2 TXD.....	24
7.3 FAULT	24

1. Introduction

The **FLN** communication option allows the **GPD505** or **GPD506/P5** to be integrated into a Siemens Building Technologies' (formerly Landis & Staefa) **System 600 APOGEE™** control system. This interface is fully compatible with previous versions of the **System 600** control system.

This manual applies to **Application 2712**. It describes the steps necessary for hardware installation, network identification, and operation of the interface. Refer to the appropriate Technical Manual for additional information regarding drive operation and setup.

2. Hardware Installation

This section describes steps necessary to install the option card and configure the drive for its use. Since this option is available pre-installed or in kit form, many of these steps may have been completed at the factory. If already installed, users are encouraged to review these steps to become familiar with the procedure.

Refer to **Figure 1** for the physical location of switches, LEDs and connectors.

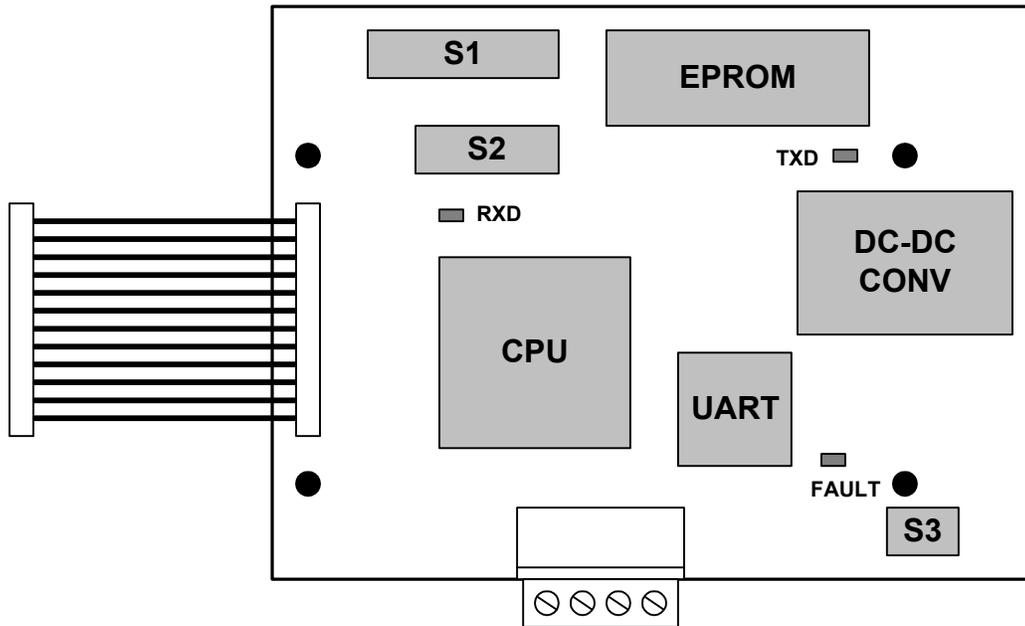


Figure 1. Option Card Layout

2.1 Option Card Mounting

CAUTION: Make sure that the input power to the drive is **TURNED OFF** and the **CHARGE** lamp inside the unit is **OFF** before installing the option card.

Step 1. Remove the digital operator, applying pressure to the locking plate on its lower right side, as illustrated in

Figure 2. Lift the operator out by pulling forward.

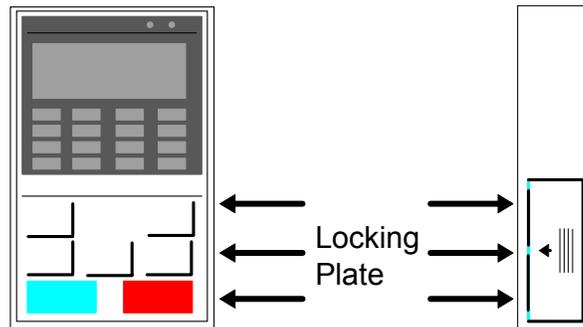


Figure 2. Operator Removal

- Step 2.** Remove the drive cover, applying pressure to the locking tabs on either side of the cover as illustrated in **Figure 3**. With the locking tabs disengaged, pivot the cover out from the bottom. Continue pivoting it until the top hinge disengages.

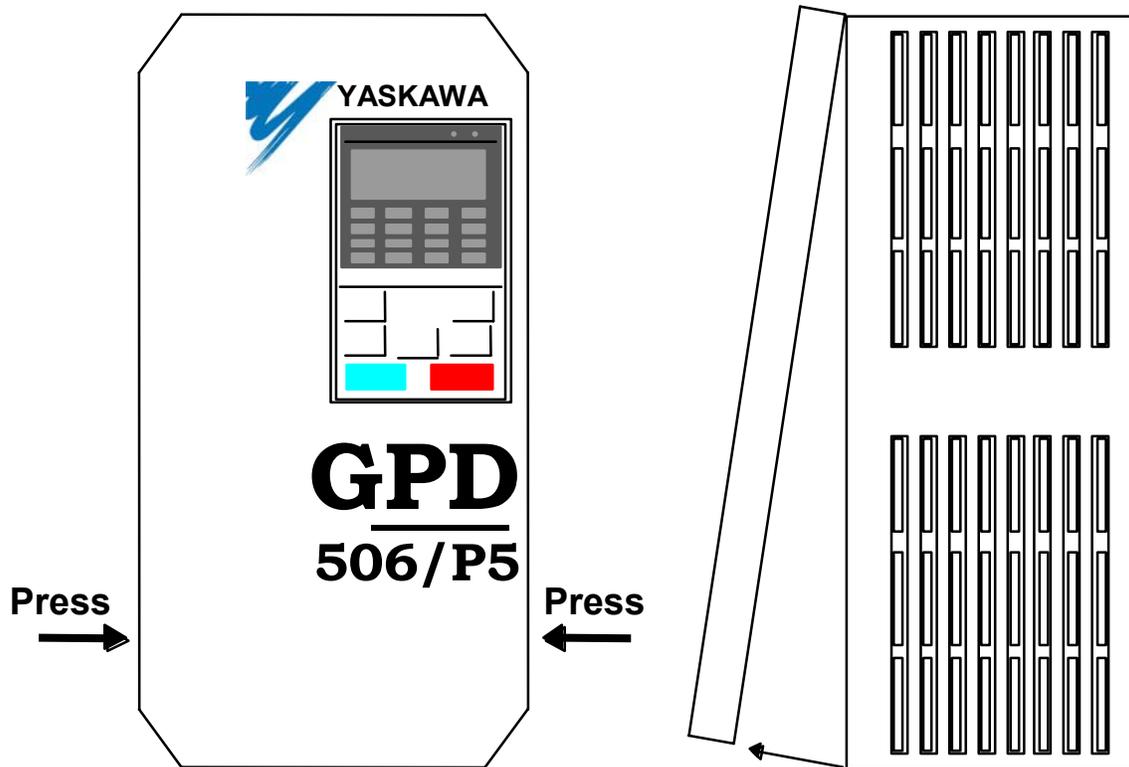


Figure 3. Cover Removal

- Step 3.** Position the option card so that the 12-pin interface cable is to the left, as illustrated in **Figure 4**. Carefully press the attached cable connector into connector 2CN until it is firmly seated. Please note the orientation of the locking tab relative to the connector mounted on the control board.
- Step 4.** Position the option board mounting holes directly over the four standoffs on the control board. Carefully press the option board onto the standoffs until it is firmly seated.

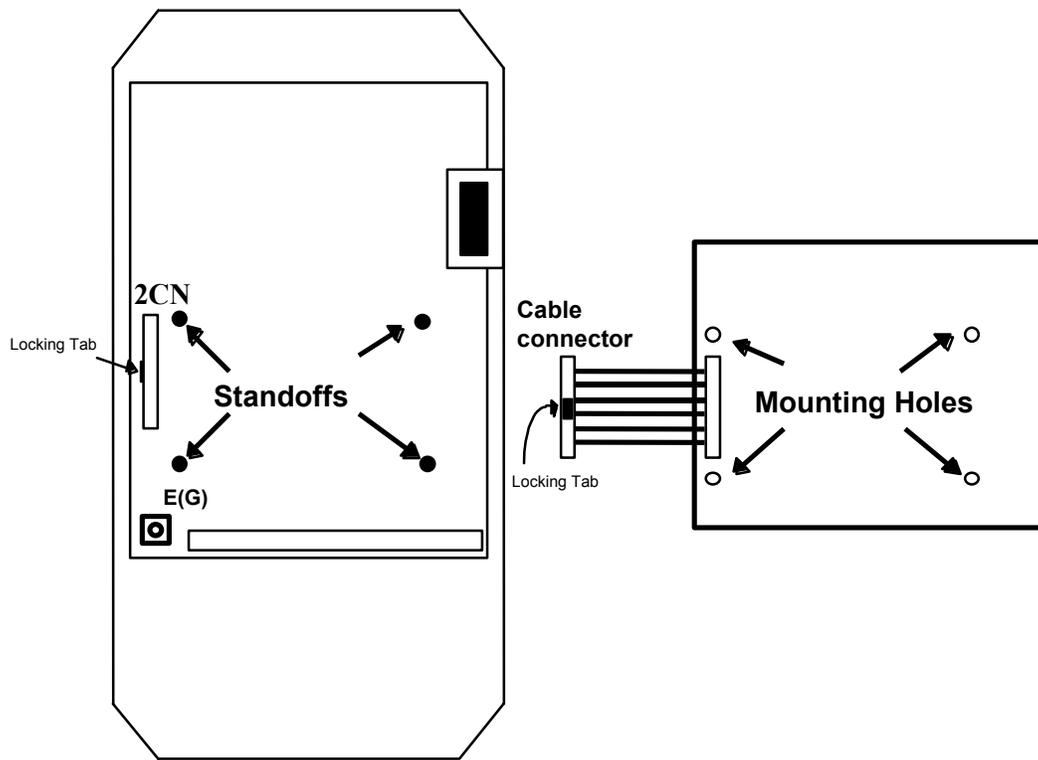


Figure 4. Option Card Positioning

2.2 Drive Set-up

The drive must be properly configured to communicate with the option card, as described below:

GPD505 Parameter	GPD506/P5 Parameter	Setting	Description
n106	n104	1	Address (01)
n107	n105	2	Baud Rate (9600)
n108	n106	0	Parity (None)

NOTE: Parameter n001 must be set to 3 to change these parameters. New settings will not take affect until drive power is cycled.

If any of these settings are incorrect, “**CALL**” will blink on the digital operator, as will the RXD, TXD and FAULT LEDs. This is an indication that the drive has not yet established communication with the option card. Once the drive has properly exchanged messages with the option card, all blinking should stop.

2.3 Network Connection

Communication on the network is half-duplex, two-wire RS-485, with communication parameters fixed at 4800 baud, eight data bits, no parity and one start/stop bit. The connection medium is shielded twisted pair cable.

Network connection is facilitated by a pluggable 4-way Phoenix-style connector, as illustrated in **Figure 5**. Particular attention should be given to the polarity of the network connection. Proper communication cannot be established with these terminals reversed.

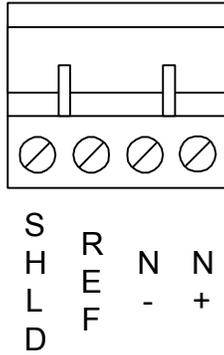


Figure 5. Network Connector

2.3.1 Bus Terminating Resistor

A bus terminating resistor (120Ω) is available on each option board and can be applied to the bus by setting the switches of S3 to their ON position.

In a multi-node system, only those nodes at the end of a bus segment should have terminating resistors. Before applying a terminating resistor as described above, care should be taken to understand the physical layout of the network and where other resistors might already be applied. An overloaded bus may not function properly.

2.4 Network Addressing

A drive's network address is assigned by selecting the proper setting for switch S1, as detailed in **Table 1**:

Network Address	S1 Setting 87654321						
N/A	00000000	64	01000000	128	10000000	192	11000000
1	00000001	65	01000001	129	10000001	193	11000001
2	00000010	66	01000010	130	10000010	194	11000010
3	00000011	67	01000011	131	10000011	195	11000011
4	00000100	68	01000100	132	10000100	196	11000100
5	00000101	69	01000101	133	10000101	197	11000101
6	00000110	70	01000110	134	10000110	198	11000110
7	00000111	71	01000111	135	10000111	199	11000111
8	00001000	72	01001000	136	10001000	200	11001000
9	00001001	73	01001001	137	10001001	201	11001001
10	00001010	74	01001010	138	10001010	202	11001010
11	00001011	75	01001011	139	10001011	203	11001011
12	00001100	76	01001100	140	10001100	204	11001100
13	00001101	77	01001101	141	10001101	205	11001101
14	00001110	78	01001110	142	10001110	206	11001110
15	00001111	79	01001111	143	10001111	207	11001111
16	00010000	80	01010000	144	10010000	208	11010000
17	00010001	81	01010001	145	10010001	209	11010001
18	00010010	82	01010010	146	10010010	210	11010010
19	00010011	83	01010011	147	10010011	211	11010011
20	00010100	84	01010100	148	10010100	212	11010100
21	00010101	85	01010101	149	10010101	213	11010101
22	00010110	86	01010110	150	10010110	214	11010110
23	00010111	87	01010111	151	10010111	215	11010111
24	00011000	88	01011000	152	10011000	216	11011000
25	00011001	89	01011001	153	10011001	217	11011001
26	00011010	90	01011010	154	10011010	218	11011010
27	00011011	91	01011011	155	10011011	219	11011011
28	00011100	92	01011100	156	10011100	220	11011100
29	00011101	93	01011101	157	10011101	221	11011101
30	00011110	94	01011110	158	10011110	222	11011110
31	00011111	95	01011111	159	10011111	223	11011111
32	00100000	96	01100000	160	10100000	224	11100000
33	00100001	97	01100001	161	10100001	225	11100001
34	00100010	98	01100010	162	10100010	226	11100010
35	00100011	99	01100011	163	10100011	227	11100011
36	00100100	100	01100100	164	10100100	228	11100100
37	00100101	101	01100101	165	10100101	229	11100101
38	00100110	102	01100110	166	10100110	230	11100110
39	00100111	103	01100111	167	10100111	231	11100111
40	00101000	104	01101000	168	10101000	232	11101000
41	00101001	105	01101001	169	10101001	233	11101001
42	00101010	106	01101010	170	10101010	234	11101010
43	00101011	107	01101011	171	10101011	235	11101011
44	00101100	108	01101100	172	10101100	236	11101100
45	00101101	109	01101101	173	10101101	237	11101101
46	00101110	110	01101110	174	10101110	238	11101110
47	00101111	111	01101111	175	10101111	239	11101111
48	00110000	112	01110000	176	10110000	240	11110000
49	00110001	113	01110001	177	10110001	241	11110001
50	00110010	114	01110010	178	10110010	242	11110010
51	00110011	115	01110011	179	10110011	243	11110011
52	00110100	116	01110100	180	10110100	244	11110100
53	00110101	117	01110101	181	10110101	245	11110101
54	00110110	118	01110110	182	10110110	246	11110110
55	00110111	119	01110111	183	10110111	247	11110111
56	00111000	120	01111000	184	10111000	248	11111000
57	00111001	121	01111001	185	10111001	249	11111001
58	00111010	122	01111010	186	10111010	250	11111010
59	00111011	123	01111011	187	10111011	251	11111011
60	00111100	124	01111100	188	10111100	252	11111100
61	00111101	125	01111101	189	10111101	253	11111101
62	00111110	126	01111110	190	10111110	254	11111110
63	00111111	127	01111111	191	10111111	255	11111111

Table 1. Network Address Settings

3. Application 2712 - Overview

The drive is configured, controlled, and monitored by a comprehensive set of Analog and Digital points, as illustrated in **Figure 6**. Note the convention regarding inputs and outputs (i.e. Network Output = Drive Input, Network Input = Drive Output).

This chapter summarizes the available points first by type and then by number. Additional detail can be found in **Section 4, Standard Operation**, where points are grouped together by function.

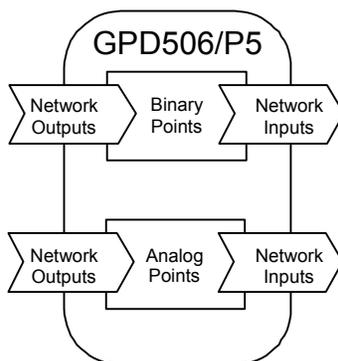


Figure 6. Device Overview

3.1 Logical Analog Input (LAI) Summary

Point Description	Point #	GPD505 Monitor	GPD506/P5 Monitor	Units (SI)	Slope	Intercept	Min	Max
Network Address	1	n/a	n/a		1.0	0	1	255
Application Number	2	n/a	n/a		1.0	0	2712	2712
Output Frequency	3	U-02	U-02	Hz	0.1	0	0	Note 1
Output Percentage	4	U-02	U-02	%	0.1	0	0	100
Output Speed	5	U-02	U-02	rpm	1.0	0	0	Note 1
Output Current	6	U-03	U-03	A	0.1	0	0	Note 2
Output Power	8	n/a	U-06	kW	0.1	0	0	9999
Drive Temperature	9	n/a	Note 3	°C	1.0	0		
Kilowatt Hour Meter	10	n/a	U-15	kWh	Note 5	0	0	9999
Megawatt Hour Meter	11	n/a	U-16	mWh	1.0	0	0	9999
DC Bus Voltage	13	U-05	U-05	V	1.0	0	0	Note 2
AC Output Voltage	14	U-04	U-04	V	1.0	0	0	Note 2
Elapsed Timer – Hrs	15	U-11	U-11	Hr	1.0	0	0	9999
Elapsed Timer – 10K Hrs	16	U-12	U-12	10K Hr	1.0	0	0	27
Fault Code	17	U-09	U-09		1.0	0	0	8191
Frequency Reference	61	U-01	U-01	Hz	0.1	0	0	Note 1
PID Feedback	62	n/a	U-13	Hz	0.1	0	0	Note 1
Read Parameter Data	71	Note 4	Note 4	Note 4	1.0	0	Note 4	Note 4

Notes

1. Value dependent on maximum output frequency of the drive. Default is **60.0 Hz**.
2. Value dependent on drive capacity. Refer to appropriate Technical Manual.
3. Internal value only available via serial communication.
4. Value depends on the parameter being read (**#70**).
5. Slope is dependent on drive capacity. For drives with a rated current of 180 A or less, the slope is 0.1. For higher capacity drives, the slope is 1.0.

3.2 Logical Analog Output (LAO) Summary

Point Description	Point #	GPD505 Parameter	GPD506/P5 Parameter	Units (SI)	Slope	Intercept	Default	Min	Max
Override Time	20	n/a	n/a	Hrs	1.0	0	8	1	12
Acceleration Time	31	n019	n018	Sec	0.1	0	10.0	0	3276.7
Deceleration Time	32	n020	n019	Sec	0.1	0	10.0	0	3276.7
Freq Command Upper Limit	38	n030	n031	%	1.0	0	100	0	109
Freq Command Lower Limit	39	n031	n032	%	1.0	0	0	0	100
Operational Mode Select	55	n002	n002	-	1.0	0	6	0	8
Frequency Command	60	n/a	n/a	Hz	0.1	0	0	0	Note 1
PID Proportional Gain	63	n086	n086	-	0.1	0	1.0	0.0	10.0
PID Integral Time	64	n087	n087	Sec	0.1	0	10.0	0.0	100.0
PID Mode Select	65	n084	n084	-	1.0	0	0	0	3
Read Parameter Number	70	n/a	n/a	-	1.0	0	0	1	114
Write Parameter Number	72	n/a	n/a	-	1.0	0	0	1	114
Write Parameter Data	73	n/a	n/a	-	1.0	0	0	0	9999
Cable Loss Frequency	91	n/a	n/a	Hz	0.1	0	0	0	Note 1
Cable Loss Timeout	92	n/a	n/a	Sec	0.1	0	0	0	3276.7

Notes

1. Value dependent on maximum output frequency of the drive. Default is **60.0 Hz**.

3.3 Logical Digital Input (LDI) Summary

Point Description	Point #	Off (0) State	On (1) State
Forward/Reverse Monitor	21	Forward	Reverse
Run/Stop Monitor	23	Stopped	Running
Drive Ready Monitor	35	Not Ready	Ready
Multifunction Output 1	40	Note 1	Note 1
Multifunction Output 2	41	Note 1	Note 1
Terminal S1 Monitor	42	Open	Closed
Terminal S2 Monitor	43	Open	Closed
Terminal S3 Monitor	44	Open	Closed
Terminal S4 Monitor	45	Open	Closed
Terminal S5 Monitor	46	Open	Closed
Terminal S6 Monitor	47	Open	Closed
Fault Monitor	93	Not Faulted	Faulted

Notes

1. States are dependent on the setup of the Multifunction Outputs. Refer to appropriate Technical Manual.

3.4 Logical Digital Output (LDO) Summary

Point Description	Point #	Off (0) State	On (1) State	Default
Forward/Reverse Command	22	Forward	Reverse	Off
Run/Stop Command	24	Stop	Run	Off
Terminal S3 Command	25	Open (See Note 1)	Closed (See Note 1)	Off
Terminal S4 Command	26	Open (See Note 1)	Closed (See Note 1)	Off
Terminal S5 Command	27	Open (See Note 1)	Closed (See Note 1)	Off
Terminal S6 Command	28	Open (See Note 1)	Closed (See Note 1)	Off
Day/Night Mode Selection	29	Day Mode	Night Mode	Off

Point Description	Point #	Off (0) State	On (1) State	Default
Terminal S1 Run Interlock	80	Disabled (S1 state does not affect run command)	Enabled (S1 must be closed to enable run command)	Enabled
Terminal S5 Auto Run	81	Disabled (S5 state has no affect)	Enabled (S5 closure initiates run command. NOTE: point 80 has priority)	Enabled
Cable Loss Fault	90	Disabled (EF0 not declared if cable loss detected)	Enabled (EF0 declared if cable loss detected)	Disabled
Fault Reset	94	No Reset	Reset	Off
Serial Fault (EF0) Command	96	No Fault	EF0 Fault	Off

Notes

1. Functions implemented are dependent on the setup of the Multifunction Terminal Inputs. Refer to appropriate Technical Manual.

3.5 Point Summary – By Number

Point #	Database Descriptor	Point Type	Units (SI)	Slope	Intercept	On Text	Off Text	Default
{01}	CTLR ADDRESS	LAI	--	1.0	0	--	--	99
{02}	APPLICATION	LAI	--	1.0	0	--	--	2712
{03}	OUTPUT FREQ	LAI	HZ	0.1	0	--	--	0
{04}	OUTPUT PCT	LAI	PCT	0.1	0	--	--	0
{05}	OUTPUT SPEED	LAI	RPM	1.0	0	--	--	0
{06}	OUTPUT I	LAI	A	0.1	0	--	--	0
{08}	OUTPUT POWER	LAI	KW	0.1	0	--	--	0
{09}	DRIVE TEMP	LAI	DEG C	1.0	0	--	--	0
{10}	DRIVE KWH	LAI	KWH	Note 1	0	--	--	0
{11}	DRIVE MWH	LAI	MWH	1.0	0	--	--	0
{13}	DC BUS VOLTS	LAI	VOLTS	1.0	0	--	--	0
{14}	AC OUT VOLTS	LAI	VOLTS	1.0	0	--	--	0
{15}	RUN TIME 1	LAI	HR	1.0	0	--	--	0
{16}	RUN TIME 2	LAI	10K HR	1.0	0	--	--	0
{17}	DRIVE FAULT	LAI	--	1.0	0	--	--	0
{20}	OVRD TIME	LAO	HRS	1.0	0	--	--	0
{21}	FWD REV MON	LDI	--	--	--	REV	FWD	FWD
{22}	FWD REV CMD	LDO	--	--	--	REV	FWD	FWD
{23}	RUN STOP MON	LDI	--	--	--	RUN	STOP	STOP
{24}	RUN STOP CMD	LDO	--	--	--	RUN	STOP	STOP
{25}	TERM S3 CMD	LDO	--	--	--	CLOSED	OPEN	OPEN
{26}	TERM S4 CMD	LDO	--	--	--	CLOSED	OPEN	OPEN
{27}	TERM S5 CMD	LDO	--	--	--	CLOSED	OPEN	OPEN
{28}	TERM S6 CMD	LDO	--	--	--	CLOSED	OPEN	OPEN
{29}	DAY.NGT	LDO	--	--	--	NGT	DAY	DAY
{31}	ACC TIME	LAO	SEC	0.1	0	--	--	10.0
{32}	DECL TIME	LAO	SEC	0.1	0	--	--	10.0
{35}	DRIVE READY	LDI	--	--	--	READY	NOTRDY	NOTRDY
{38}	FREQ UP LIM	LAO	PCT	1.0	0	--	--	100

Point #	Database Descriptor	Point Type	Units (SI)	Slope	Intercept	On Text	Off Text	Default
{39}	FREQ LOW LM	LAO	PCT	1.0	0	--	--	0
{40}	MULTI OUT 1	LDI	--	--	--	ON	OFF	OFF
{41}	MULTI OUT 2	LDI	--	--	--	ON	OFF	OFF
{42}	TERM S1 MON	LDI	--	--	-	CLOSED	OPEN	OPEN
{43}	TERM S2 MON	LDI	--	--	-	CLOSED	OPEN	OPEN
{44}	TERM S3 MON	LDI	--	--	-	CLOSED	OPEN	OPEN
{45}	TERM S4 MON	LDI	--	--	-	CLOSED	OPEN	OPEN
{46}	TERM S5 MON	LDI	--	--	-	CLOSED	OPEN	OPEN
{47}	TERM S6 MON	LDI	--	--	-	CLOSED	OPEN	OPEN
{55}	OP MODE SEL	LAO	--	1.0	0	--	--	6
{60}	FREQ REF	LAO	HZ	0.1	0	--	--	0
{61}	FREQ REF MON	LAI	HZ	0.1	0	--	--	0
{62}	PID FEEDBACK	LAI	HZ	0.1	0	--	--	0
{63}	PI GAIN	LAO	--	0.1	0	--	--	1.0
{64}	PI TIME	LAO	SEC	0.1	0	--	--	10.0
{65}	PID SELECT	LAO	--	1.0	0	--	--	0
{70}	RD PARAM NUM	LAO	--	1.0	0	--	--	0
{71}	RD PARAM DAT	LAI	--	1.0	0	--	--	0
{72}	WR PARAM NUM	LAO	--	1.0	0	--	--	0
{73}	WR PARAM DAT	LAO	--	1.0	0	--	--	0
{80}	S1 RUN ILOCK	LDO	--	1.0	0	ENABLE	DISABL	ENABLE
{81}	S5 AUTO RUN	LDO	--	1.0	0	ENABLE	DISABL	ENABLE
{90}	CBL LOSS FLT	LDO	--	1.0	0	ENABLE	DISABL	DISABL
{91}	CBL LOSS FRQ	LAO	HZ	0.1	0	--	--	0
{92}	CBL LOSS TMR	LAO	SEC	0.1	0	--	--	0
{93}	FAULT	LDI	--	--	--	FAULT	NO FLT	NO FLT
{94}	FAULT RESET	LDO	--	--	--	RST ON	RSTOFF	RSTOFF
{96}	EXTERNAL FLT	LDO	--	--	--	FLT ON	FLTOFF	FLTOFF

Notes

1. Slope is dependent on drive capacity. For drives with a rated current of 180 A or less, the slope is 0.1. For higher capacity drives, the slope is 1.0.

4. Standard Operation

This interface features 57 logical points: 18 Logical Analog Inputs (LAI), 15 Logical Analog Outputs (LAO), 12 Logical Digital Inputs (LDI) and 12 Logical Digital Outputs (LDO). These points configure, control, or monitor the operation of the drive.

This chapter describes each aspect of operation, grouping the points together by function. Points are summarized by type and number in **Section 3, Application 2712 - Overview**.

4.1 Drive Configuration

This section describes the logical points used to configure the drive. Refer to the appropriate Technical Manual for additional information.

4.1.1 Accel/Decel Times – #31, #32

These points define the ramp rates for starting and stopping the motor, configuring the drive as described below:

Point #	Point Description	GPD505 Parameter	GPD506/P5 Parameter	Units (SI)	Slope	Intercept	Default	Min	Max
31	Acceleration Time	n019	n018	Sec	0.1	0	10.0	0	3276.7
32	Deceleration Time	n020	n019	Sec	0.1	0	10.0	0	3276.7

4.1.2 Frequency Command Limits – #38, #39

These points define the upper and lower frequency command limits. Each value is specified as a percentage of the maximum drive output frequency, defined by **GPD505** parameter **n012** or **GPD506/P5** parameter **n011**. These points configure the drive as described below:

Point #	Point Description	GPD505 Parameter	GPD506/P5 Parameter	Units (SI)	Slope	Intercept	Default	Min	Max
38	Freq Command Upper Limit	n030	n031	%	1.0	0	100	0	109
39	Freq Command Lower Limit	n031	n032	%	1.0	0	0	0	100

4.1.3 Operational Mode – #55

This point defines the source for run and frequency commands, as described below:

	Run/Reverse Command Source	Frequency Command Source	Remarks
0	Digital Operator	Digital Operator	#60, #24, #22 have no affect.
1	External Terminals	Digital Operator	#60, #24, #22 have no affect.
2	Digital Operator	External Terminals	#60, #24, #22 have no affect.
3	External Terminals	External Terminals	#60, #24, #22 have no affect.
4	Digital Operator	Network	#60 sets frequency command. #24, #22 have no affect
5	External Terminals	Network	#60 sets frequency command. #24, #22 have no affect
6	Network	Network	#60 sets frequency command. #24 sets run command. #22 sets forward/reverse command.
7	Network	Digital Operator	#60 has no affect. #24 sets run command. #22 sets forward/reverse command.
8	Network	External Terminals	#60 has no affect. #24 sets run command. #22 sets forward/reverse command.

This point configures the drive as described below:

Point #	Point Description	GPD505 Parameter	GPD506/P5 Parameter	Units (SI)	Slope	Intercept	Default	Min	Max
55	Operational Mode Select	n002	n002	-	1.0	0	6	0	8

4.1.4 PID Configuration – #63, #64, #65

These points define the gains and mode of the PID controller. The PID modes selectable by #65 are described below:

#65	PID Mode
0	PID Disabled
1	PID Enabled
2	PI with Feed Forward
3	Inverted PID

These points configure the drive as described below:

Point #	Point Description	GPD505 Parameter	GPD506/P5 Parameter	Units (SI)	Slope	Intercept	Default	Min	Max
63	PID Proportional Gain	n086	n086	-	0.1	0	1.0	0.0	10.0
64	PID Integral Time	n087	n087	Sec	0.1	0	10.0	0.0	100.0
65	PID Mode Select	n084	n084	-	1.0	0	0	0	3

4.1.5 General Purpose Setup – #72, #73

Two points are defined for setting any drive parameter:

#72 - Specifies the drive parameter to be set. Writing to this point initiates the write sequence.

#73 - Specifies the value to be written to the specified parameter. Writing to this point completes the write sequence and causes the value to be sent to the drive.

Refer to the appropriate Technical Manual for a detailed description of all parameters.

NOTE: The increment listed in the Technical Manual must be considered when specifying a value. For example, to set GPD506/P5 parameter n070 (GPD505 n066), DC Injection Time at Stop, to 1 second, #73 must be set to 10, since the increment for this parameter is 0.1 seconds.

4.2 Drive Command and Control

This section describes the logical points used to command and control the drive. Refer to the appropriate Technical Manual for additional information.

4.2.1 Forward/Reverse Command – #22

This point controls the Forward/Reverse command to the drive, as described below. The drive must be configured for a network Forward/Reverse Command (#55 = 6,7,8) for this input to control the drive.

Point #	Point Description	Off (0) State	On (1) State	Default
22	Forward/Reverse Command	Forward	Reverse	Forward

4.2.2 Run/Stop Command – #24

This point controls the run/stop command to the drive, as described below. The drive must be configured for a network Run/Stop Command (#55 = 6,7,8) for this input to control the drive.

Point #	Point Description	Off (0) State	On (1) State	Default
24	Run/Stop Command	Stop	Run	Stop

4.2.3 Input Terminal Commands – #25, #26, #27, #28

These points control the multifunction terminal input commands, as described below. These commands are equivalent to contact closures on external terminals S3 - S6, respectively. Function selection for these inputs are configured in **GPD505** parameters **n036-n039** and **GPD506/P5** parameters **n037-n040**.

Point #	Point Description	Off (0) State	On (1) State	Default
25	Terminal S3 Command	Depends on Terminal S3 function selection	Depends on Terminal S3 function selection	Off
26	Terminal S4 Command	Depends on Terminal S4 function selection	Depends on Terminal S4 function selection	Off
27	Terminal S5 Command	Depends on Terminal S5 function selection	Depends on Terminal S5 function selection	Off
28	Terminal S6 Command	Depends on Terminal S6 function selection	Depends on Terminal S6 function selection	Off

4.2.4 Frequency Command – #60

This point sets the frequency command of the drive, as described below. The drive must be configured for a network Frequency Command (#55 = 4,5,6) for this input to control the drive.

Point #	Point Description	GPD505 Parameter	GPD506/P5 Parameter	Units (SI)	Slope	Intercept	Default	Min	Max
60	Frequency Command	n/a	n/a	Hz	0.1	0	0	0	Note 1

Notes

- Value dependent on maximum output frequency of the drive. Default is **60.0 Hz**.

4.2.5 Terminal S1 Run Interlock - #80

In many applications featuring a hard-wired run contact at terminal S1, normally closed system safeties are wired in series to override the normal run command. Thus, if a safety opens, the drive either stops or remains stopped, depending on the state of the run contact.

With point #80 enabled, a network run command (#24) starts the drive only if S1 is closed. If S1 opens, the drive is stopped and then restarted once the contact closes.

Point #	Point Description	Off (0) State	On (1) State	Default
80	Terminal S1 Run Interlock	Disabled (S1 state does not affect run command)	Enabled (S1 must be closed to enable run command)	Enabled

4.2.6 Terminal S5 Auto Run - #81

The default function for a contact closure at input terminal S5 is to command the frequency reference to Multistep Speed Reference A. In many applications featuring a hard-wired run contact at terminal S1, a contact closure at terminal S5 simultaneously closes a contact at S1, thus implementing an “auto run” feature. MagneTek’s standard bypass package implements this feature.

With point #81 enabled, a run command is automatically issued upon closure of terminal S5.

NOTE: Point #80, Terminal S1 Run Interlock, has priority over the Terminal S5 Auto Run feature.

Point #	Point Description	Off (0) State	On (1) State	Default
81	Terminal S5 Auto Run	Disabled (S5 state has no affect)	Enabled (S5 closure initiates run command)	Enabled

4.2.7 Fault/Fault Reset Commands – #94, #96

These points provide fault and fault reset control, as described below. These commands control the drive for all settings of #55.

Point #	Point Description	Off (0) State	On (1) State	Default
94	Fault Reset Command	No Reset	Reset	No Reset
96	Serial Fault (EF0) Command	No Fault	Fault	No Fault

4.3 Drive Monitoring

This section describes the logical points used to monitor the drive. Refer to the appropriate Technical Manual for additional information.

4.3.1 Operating Status

The following table summarizes the input points available for monitoring the operating status of the drive.

Operating Variable	Point #	Description																																							
Output Frequency	3	Reports output frequency in Hz.																																							
Output Percentage	4	Reports operating output as a percentage of maximum output frequency.																																							
Output Speed	5	Reports output speed in RPM (4-pole motor).																																							
Output Current	6	Reports output current.																																							
Output Power	8	Reports output power. This point is only available on GPD506/P5 drives.																																							
Drive Temperature	9	Reports drive temperature. This point is only available on GPD506/P5 drives.																																							
Kilowatt Hour Meter	10	Reports cumulative drive energy usage in kilowatts. This point is only available on GPD506/P5 drives.																																							
Megawatt Hour Meter	11	Reports cumulative drive energy usage in megawatts. This point is only available on GPD506/P5 drives.																																							
DC Bus Voltage	13	Reports DC bus voltage.																																							
AC Output Voltage	14	Reports AC output voltage (i.e. voltage applied to motor).																																							
Elapsed Timer – Hrs	15	Reports cumulative run time in hours.																																							
Elapsed Timer – 10K Hrs	16	Reports cumulative run time in increments of 10K hours.																																							
Fault Code	17	Reports drive fault status. This value is the decimal equivalent of a binary fault word. It is the sum of the values associated with each fault bit, as listed below: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Fault</th> <th>Bit</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Overcurrent, Ground, Short Circuit</td> <td>0</td> <td>1</td> </tr> <tr> <td>Overvoltage</td> <td>1</td> <td>2</td> </tr> <tr> <td>Drive Overload</td> <td>2</td> <td>4</td> </tr> <tr> <td>Overheat</td> <td>3</td> <td>8</td> </tr> <tr> <td>Main Circuit</td> <td>5</td> <td>32</td> </tr> <tr> <td>Brake Transistor</td> <td>6</td> <td>64</td> </tr> <tr> <td>External</td> <td>7</td> <td>128</td> </tr> <tr> <td>Hardware</td> <td>8</td> <td>256</td> </tr> <tr> <td>Motor Overload</td> <td>9</td> <td>512</td> </tr> <tr> <td>During Undervoltage</td> <td>11</td> <td>2048</td> </tr> <tr> <td>Power Loss</td> <td>12</td> <td>4096</td> </tr> <tr> <td>Phase</td> <td>13</td> <td>8192</td> </tr> </tbody> </table>	Fault	Bit	Value	Overcurrent, Ground, Short Circuit	0	1	Overvoltage	1	2	Drive Overload	2	4	Overheat	3	8	Main Circuit	5	32	Brake Transistor	6	64	External	7	128	Hardware	8	256	Motor Overload	9	512	During Undervoltage	11	2048	Power Loss	12	4096	Phase	13	8192
Fault	Bit	Value																																							
Overcurrent, Ground, Short Circuit	0	1																																							
Overvoltage	1	2																																							
Drive Overload	2	4																																							
Overheat	3	8																																							
Main Circuit	5	32																																							
Brake Transistor	6	64																																							
External	7	128																																							
Hardware	8	256																																							
Motor Overload	9	512																																							
During Undervoltage	11	2048																																							
Power Loss	12	4096																																							
Phase	13	8192																																							
Forward/Reverse Status	21	Reports the forward/reverse status (1=Reverse) as commanded from the source selected by #55 (operator, terminal, or network). This allows the status to be monitored even when the network is not the command source. This value matches #22 only when the network is selected as the command source (#55 = 6,7,8).																																							
Run Status	23	Reports the run status (1=Run) as commanded from the source selected by #55 (operator, terminal, or network). This allows the status to be monitored even when the network is not the command source. This value matches #24 only when the network is selected as the command source (#55 = 6,7,8).																																							
Multifunction Output 1	25	Reports the status of Multifunction Output 1 (1=On). The function assigned to this output is programmed in GPD505 parameter n040 or GPD506/P5 parameter n041 .																																							
Multifunction Output 2	26	Reports the status of Multifunction Output 2 (1=On). The function assigned to this output is programmed in GPD505 parameter n041 or GPD506/P5 parameter n042 .																																							
Drive Ready Status	35	Reports whether or not the drive is ready to accept a run command (1=Ready).																																							
Terminal S1 Monitor	42	Reports the status of Terminal S1 (1=Closed).																																							
Terminal S2 Monitor	43	Reports the status of Terminal S2 (1=Closed).																																							
Terminal S3 Monitor	44	Reports the status of Terminal S3 (1=Closed).																																							
Terminal S4 Monitor	45	Reports the status of Terminal S4 (1=Closed).																																							
Terminal S5 Monitor	46	Reports the status of Terminal S5 (1=Closed).																																							
Terminal S6 Monitor	47	Reports the status of Terminal S6 (1=Closed).																																							
Frequency Reference	61	Reports the frequency reference as commanded from the source selected by #55 (operator, terminal, or network). This allows frequency reference to be monitored																																							

Operating Variable	Point #	Description
		even when the network is not the command source. This value matches #60 only when the network is selected as the command source (#55 = 4,5,6).
PID Feedback	62	Reports PID feedback. If PID is disabled, this value will be zero. This point is only available on GPD506/P5 drives.
Fault Status	93	Reports the drive fault status (1=Fault).

4.3.2 Reading Other Parameters – #70, #71

Two points are defined for reading any drive parameter:

#70 - Specifies the parameter to be read.

#71 - Reports the value of the specified parameter.

Refer to the appropriate Technical Manual for a detailed description of all parameters.

NOTE: The increment listed in the Technical Manual must be considered when interpreting a reported value. For example, a read of GPD506/P5 parameter n070 (GPD505 n066), DC Injection Time at Stop, which reports 10 in #71 is actually a setting of 1, since the increment for this parameter is 0.1 seconds.

4.4 Cable Loss Behavior

This section describes the configurable cable loss feature of the option card. This feature offers a user maximum flexibility in determining the drive's response to a loss of communication.

After some interval without receipt of a message, the drive can be configured to respond in one of the following manners:

- Continue at last frequency
- Continue at preset frequency
- Stop
- Fault (EF0)

Three points are used to select the desired behavior:

- **#90** – Cable Loss Fault
- **#91** – Cable Loss Frequency
- **#92** – Cable Loss Timeout

The following table summarizes the settings for each type of behavior (*X = don't care*):

Behavior	Cable Loss Fault (#90)	Cable Loss Frequency (#91)	Cable Loss Timeout (#92)
Continue at last frequency	X	X	0
Continue at preset frequency	Disable	Preset Frequency	Timeout Interval
Stop Running	Disable	0	Timeout Interval
Fault (EF0)	Enable	X	Timeout Interval

Each behavior is described in additional detail below.

Notes

1. Communication must first be established and then lost for these features to function as described. If a drive is powered-up without a cable connected or with the master controller offline, a timeout does not occur.
2. For modes which describe the drive running after a timeout, a run command must have been issued (**#24 = 'On'**) prior to loss of communications. For safety purposes, it will not automatically start from a stopped condition. If a user requires the drive to start automatically, additional external wiring may be added to accomplish this (consult factory).
3. Upon expiration of the timeout interval, the FAULT LED lights and remains lit until communication is restored.

4.4.1 Continue Running at Last Frequency

In this mode, Cable Loss Timeout (**#92**) is set to **0**, disabling the cable loss feature. The other 2 settings (**#90**, **#91**) are ignored. If communication is lost, the drive simply maintains its last commanded state.

4.4.2 Continue Running at Preset Frequency

In this mode, Cable Loss Timeout (**#92**) is set to the desired interval and Cable Loss Frequency (**#91**) is set to the desired preset frequency. If the time between messages exceeds the timeout interval, the drive's frequency command (**#60**) is set to the Cable Loss Frequency (**#91**) and the drive continues running at this new frequency. Cable Loss Fault (**#90**) must be **'Disabled'**.

4.4.3 Stop Running

In this mode, Cable Loss Timeout (**#92**) is set to the desired interval and Cable Loss Frequency (**#91**) is set to **0**. If the time between messages exceeds the timeout interval, the drive's frequency command (**#60**) is set to **0** and the run command (**#24**) is set to **'Off'**. Cable Loss Fault (**#90**) must be **'Disabled'**.

4.4.4 Fault

In this mode, Cable Loss Timeout (**#92**) is set to the desired interval and Cable Loss Fault (**#90**) is set to **'Enable'**. If the time between messages exceeds the timeout interval, an **'EF0'** fault is declared and the drive stops. Cable Loss Frequency (**#91**) is ignored.

4.5 Defining a New Slope & Intercept

Each analog point is defined with a default slope and intercept which scales data to its default units. Often, a user may want to change these units to be consistent with the control variables of a system. A common conversion for this drive is to convert frequency data points to a new reference unit.

Unit conversion is accomplished by “unbundling” a point and defining a new slope and intercept. The following example illustrates how this is done:

1. A drive is installed in a pumping application and must maintain water pressure to a control point defined in inches of water. The **differential pressure sensor has a range of ± 2.5 inches of water**.
2. Frequency command (**#60**) controls the drive setpoint in hertz, with a **default slope of 0.1 and intercept of 0**. The **default range of this point is 0 – 60 hertz**. An unbundled point can be added with a slope and intercept defined to **convert this range to ± 2.5 inches of water**:
 - The **intercept of the unbundled point** is the low end of the new range, or **–2.5**.
 - The **slope of the unbundled point** is calculated as follows:

$$\text{New Slope} = \frac{(\text{New Range}) \times (\text{Current Slope})}{(\text{Current Range})}$$

$$\text{New Slope} = \frac{(5.0) \times (0.1)}{(60.0)} = 0.008333$$

Using these values, the unbundled point can be commanded over the range of ±2.5, and the control system will convert the values into the 0 – 60 hertz range for the drive.

5. Bypass Applications

For many applications, the drive is integrated into a **bypass** or **engineered** package. This type of package typically features an enclosure with contactors which allow the user to run the motor from line power (bypass mode) or from the drive (drive mode). This package also provides the flexibility for interfacing normally closed safety interlocks (firestat, freezestat, vibration sensors, etc.) which stop the drive if the contacts open.

5.1 Typical Parameter Settings

Because of the widespread use of this type of application, the following parameter set-up table is provided to aid in the start-up of such a drive.

GPD505 Parameter	GPD505 Setting	GPD506/P5 Parameter	GPD506/P5 Setting	Description
n001	3	n001	3	Enables Parameter Write Access
n002	6	n002	6	Operational Mode (Network Control)
n006	1	n006	1	Reverse Run Disabled
n007	0	n007	0	Local/Remote Button Disabled
n019	60	n018	60	Accel Time (secs)
n020	60	n019	60	Decel Time (secs)
n025	10	n024	10	Initial Reference (Hz)
n026	6	n025	6	Alternate Reference (Hz)
n037	5	n038	5	Terminal S4 Select - Local/Remote
n038	9	n039	10	Terminal S5 Select - Manual Speed
n039	19	n040	21	Terminal S6 Select - PID Disable
n051	1	n055	1	Momentary Power Loss
n064	50	n068	50	DC Injection Braking Level (%)
n066	5	n070	5	DC Injection Time at Start (sec)
n103	1	n101	1	Modbus Timeout Enabled
n104	0	n102	0	Ramp to Stop on Modbus Timeout

6. Parameter Management Functions

Several parameter management functions have been included with the option card. These functions are accessed by setting all S1 switches off and using switch S2 to select the desired function, as summarized in Table 2 below:

Function	S1 Setting (87654321)	S2 Setting (654321)	Description
Save Parameter Settings	ALL OFF	000001	This function saves the current parameter settings to the option card.
Restore Parameter Settings	ALL OFF	000010	This function restores the parameter settings to the values saved in the option card.
Compare Parameter Settings	ALL OFF	000100	This function compares the current parameter settings to the values saved in the option card, displaying differences on the digital operator.

Table 2. User Function Switch Settings

NOTE: These functions detect the current drive type (GPD505/GPD506/P5) as well as that of the image stored in the option card. If they differ, the functions will not complete and the ERROR LED will be lit.

6.1 Save Parameters

This function saves the current parameters to the option card.

This feature may be particularly useful to users as a final step in their setup procedure. Once a drive has been “fine-tuned” for a particular application, its unique setup can be saved for future use. A particular setup may then be recalled when replacing a drive, copying to other drives, or restoring a setup that has been altered.

To use this function, the following sequence should be observed:

1. Remove drive power.
2. Remove the network connection.
3. Select the desired function by setting switches S1 and S2 as described in Table 2.
4. Re-apply drive power.
5. Observe the RXD LED flashing. This occurs while the parameters are being read from the drive and stops when this step is complete.
6. Observe the TXD LED flashing. This occurs while the parameters are being written to the option card EEPROM and stops when this step is complete.
7. Upon successful completion of this function, the TXD LED remains on and all other LEDs should be off.
8. Remove drive power.
9. Reset switches S1 and S2 to their usual settings.
10. Attach the network connection.
11. Re-apply drive power.

6.2 Restore Parameters

This function restores the parameters to the values saved in the option card.

With a unique drive setup already saved in the option card, this feature may be used when replacing a drive, copying to other drives, or restoring a setup that has been altered.

To use this function, the following sequence should be observed:

1. Remove drive power.
2. Remove the network connection.
3. Select the desired function by setting switches S1 and S2 as described in Table 2.
4. Re-apply drive power.
5. Observe the RXD LED flashing. This occurs while the parameters are being read from the option card EEPROM stops when this step is complete.
6. Observe the TXD LED flashing. This occurs while the parameters are being written to the drive and stops when this step is complete.
7. Upon successful completion of this function, the TXD LED remains on and all other LEDs should be off. *If any errors occurred, the ERROR LED will be flashing. Monitor U-11 is used to display the data which failed to be written. The parameter number is displayed first, as '1xxx', where 'xxx' is the parameter number. The next value displayed is the value which failed to be written. The list of failed parameters is displayed repeatedly until power is removed.*
8. Remove drive power.
9. Reset switches S1 and S2 to their usual settings.
10. Attach the network connection.
11. Re-apply drive power.

6.3 Compare Parameters

This function compares the current parameters to the values saved in the option card, displaying differences on the digital operator.

With a unique drive setup already saved in the option card, this feature may be used to evaluate which parameters have been changed since the setup was saved. This may be particularly useful in summarizing parameter changes during a troubleshooting process or determining what changes have been made since a drive's initial installation.

To use this function, the following sequence should be observed:

1. Remove drive power.
2. Remove the network connection.
3. Select the desired function by setting switches S1 and S2 as described in Table 2.
4. Re-apply drive power.
5. Observe the RXD LED flashing. This occurs while the parameters are being read from the drive stops when this step is complete.
6. Observe the TXD LED flashing. This occurs while the current parameter settings are being compared to the values stored in the option card EEPROM and stops when this step is complete.
7. Upon successful completion of this function, the TXD LED remains on and all other LEDs should be off if no differences exist. *If there are any differences, the ERROR LED will be flashing. Monitor U-11 is used to display the data which is different. The parameter number is displayed first, as '1xxx', where 'xxx' is the parameter number. The next value displayed is the value stored in the option card EEPROM. These values can be recorded and compared to the current drive settings. The list of differences is displayed repeatedly until power is removed.*
8. Remove drive power.
9. Reset switches S1 and S2 to their usual settings.
10. Attach the network connection.
11. Re-apply drive power.

7. Diagnostic LEDs

7.1 RXD

This LED is lit under the following conditions:

- While the drive is attempting to establish communication with the option card, the RXD, TXD, and FAULT LEDs blink in unison and “CALL” blinks on the digital operator. If this condition occurs, repeat the steps outlined in **Section 2.2, Drive Set-up**.
- During normal operation with the drive attached and configured on the network, this LED blinks anytime the drive receives a message addressed to it. Its blinking under these conditions indicates a “healthy” link between the drive and the network.
- During normal operation with the drive either unattached or unconfigured on the network, this LED blinks while the option card is communication with the drive. Its blinking under these conditions indicates a “healthy” link between the drive and the option card.
- During use of the parameter management functions, this LED blinks during the first phase of each function and is off upon completion (**See Section 6, Parameter Management Functions**).

7.2 TXD

This LED is lit under the following conditions:

- While the drive is attempting to establish communication with the option card, the RXD, TXD, and FAULT LEDs blink in unison and “CALL” blinks on the digital operator. If this condition occurs, repeat the steps outlined in **Section 2.2, Drive Set-up**.
- During normal operation, this LED blinks anytime the drive is responding to a message from the network. Its blinking indicates a “healthy” link between the drive and the network.
- During use of the parameter management functions, this LED blinks during the second phase of each function and remains lit upon completion (**See Section 6, Parameter Management Functions**).

7.3 FAULT

This LED is lit under the following conditions:

- While the drive is attempting to establish communication with the option card, the RXD, TXD, and FAULT LEDs blink in unison and “CALL” blinks on the digital operator. If this condition occurs, repeat the steps outlined in **Section 2.2, Drive Set-up**.
- During normal operation, this LED is lit if a cable loss is detected (**See Section 4.4, Cable Loss Behavior**). Once communication is re-established, this LED should be off.
- During use of the parameter management functions, this LED blinks if there is data to be read on the digital operator (**See Section 6, Parameter Management Functions**).

GPD 506/P5 Apogee - FLN™

Yaskawa technical support is available to provide telephone assistance for **installation, programming, & troubleshooting** of Yaskawa drives. All support is available during normal business hours. Emergency breakdown support is available on a 24 hour / 7 day basis.

Help us help you. When you call, please have the following information available.

- Have this manual at hand. The support associate will refer to it.
- Drive model and all nameplate data.
- Motor type, brand, and all nameplate data.

For Troubleshooting, additional information may be required.

- Power distribution information (type – delta, wye; power factor correction; other major switching devices used; voltage fluctuations)
- Installation wiring (separation of power & control wire; wire type/class used; distance between drive and motor, grounding.
- Use of any devices between the drive & motor (output chokes, etc.).

Please phone us at 1-800-541-0939 for technical support.

Additional technical information is available at www.drives.com.



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Yaskawa Electric America, Inc.
16555 W. Ryerson Road
New Berlin, WI 53151

(800) 541-0939, (262) 782-0200, Fax (262) 782-3418
www.drives.com • www.yaskawa.com