



# SOFTWARE MANUAL

RF POWER AMPLIFIER

CA1300BW1-5766R-SL

R&K Company Limited

Date	Author	Authorized	Document number	version
May 5, 2016	R. Kotsubo	K.Nishimura	SE-CT-1553-X-01	2

## Revision History

Version	Data	Author(s)	Revision Note
1	April 5, 2016	R. Kotsubo	Original
2	November 04, 2016	Y. Kobayashi	
Description of change	Red colored letters has been changed. Column order on register map has been changed. DC PS control DAC value to output voltage conversion table and equation are added on pg24-25. Final Amplifier transistor pair ADC reading to Power conversion equation is added on pg26.		

## 2.3. INTERFACE

The Model CA1300BW1-5766R-SL can be controlled with Lantronix Xport.

Xport is set up by Deviceinstaller.

IP address is assigned automatically. Port is 502.

### <Modbus/TCP>

Transaction Identifier	Protocol Identifier	Length	Unit Identifier
2byte 0XXXXX	2byte 0XXXXX	2byte 0XXXXX	1byte 0XXX

Response returns same one as received Header

(Transaction identifier, Protocol identifier, Unit identifier)

### <Function Code>

Supports following Function Code.

### <0x03 Read Holding Registers>

Read only.

One or continuous registers read is enabled. (125 max.)

#### 1) Request

Transaction Identifier		Protocol Identifier		Length		Unit Identifier	Function	Starting Address		Quantity of Registers	
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8	byte9	byte10	byte11
Hi	Lo	Hi	Lo	Hi	Lo	1 byte	1 byte	Hi	Lo	Hi	Lo
0XX	0XX	0XX	0XX	0X00	0X06	0XX	0X03	0X00	0X02	0X00	0X03

#### 2) Response

Transaction Identifier		Protocol Identifier		Length		Unit Identifier	Function	Byte count	Data 1		Data 2		Data 3	
byte0	byte1	byte2	byte3	bite4	byte5	byte6	byte7	byte8	byte9	byte10	byte11	byte12	byte13	byte14
Hi	Lo	Hi	Lo	Hi	Lo	1 byte	1 byte	1 byte	Hi	Lo	Hi	Lo	Hi	Lo
0XX	0XX	0XX	0XX	0X00	0X09	0XX	0X03	0X06	0XX	0XX	0XX	0XX	0XX	0XX

## 3) Exception Response

Transaction Identifier		Protocol Identifier		Length		Unit Identifier	Function	Exception Code
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8
Hi	Lo	Hi	Lo	Hi	Lo	1 byte	1 byte	1 byte
0xFF	0xFF	0xFF	0xFF	0x00	0x03	0xFF	0x83	0xFF

Exception Code	MODBUS Name	Comments
0x01	Illegal Function Code	The function code is unknown by the server
0x02	Illegal Data Address	Dependent on the request
0x03	Illegal Data Value	Dependent on the request
0x04	Server Failure	The server failed during the exaction

## &lt;0x06 Write Single Register&gt;

Write only

One register rewriting is enabled

It is used to command below

- Power ON/OFF
- RF ON/OFF
- Voltage control setting of switching power supply
- Reset for alarm clear (Clear latched faults)
- Reboot
- Time setting

## 1) Request

Transaction Identifier		Protocol Identifier		Length		Unit Identifier	Function	Register Address		Register Value	
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8	byte9	byte10	byte11
Hi	Lo	Hi	Lo	Hi	Lo	1 byte	1 byte	Hi	Lo	Hi	Lo
0xFF	0xFF	0xFF	0xFF	0x00	0x06	0xFF	0x06	0x00	0x02	0x01	0x03

## 2) Response

Transaction Identifier		Protocol Identifier		Length		Unit Identifier	Function	Register Address		Register Value	
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8	byte9	byte10	byte11
Hi	Lo	Hi	Lo	Hi	Lo	1 byte	1 byte	Hi	Lo	Hi	Lo
0xXX	0xXX	0xXX	0xXX	0x00	0x08	0xXX	0x06	0x00	0x02	0x01	0x03

## 3) Exception Response

Transaction Identifier		Protocol Identifier		Length		Unit Identifier	Function	Exception Code
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8
Hi	Lo	Hi	Lo	Hi	Lo	1 byte	1 byte	1 byte
0xXX	0xXX	0xXX	0xXX	0x00	0x03	0xXX	0x86	0xXX

Exception Code	MODBUS Name	Comments
0x01	Illegal Function Code	The function code is unknown by the server
0x02	Illegal Data Address	Dependent on the request
0x03	Illegal Data Value	Dependent on the request
0x04	Server Failure	The server failed during the exaction

## &lt;0x08 Diagnostics&gt;

It is used to confirm the Modbus communication and checks whether same data can be received as transmitted data.

Sub function Code is 0x0000. The data is any 16bit.

## 1) Request

Transaction Identifier		Protocol Identifier		Length		Unit Identifier	Function	Sub-function Code		Data	
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8	byte9	byte10	byte11
Hi	Lo	Hi	Lo	Hi	Lo	1 byte	1 byte	Hi	Lo	Hi	Lo
0xXX	0xXX	0xXX	0xXX	0x06		0xXX	0x08	0x00	0x00	0xXX	0xXX

Sub-function Code	Name
0x00	Return Query Data

## 2) Response

Transaction Identifier		Protocol Identifier		Length		Unit Identifier	Function	Sub-function Code		Data	
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8	byte9	byte10	byte11
Hi	Lo	Hi	Lo	Hi	Lo	1 byte	1 byte	Hi	Lo	Hi	Lo
0xXX	0xXX	0xXX	0xXX	0x06		0xXX	0x08	0x00	0x00	0xXX	0xXX

## 3) Exception Response

Transaction Identifier		Protocol Identifier		Length		Unit Identifier	Function	Exception Code
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8
Hi	Lo	Hi	Lo	Hi	Lo	1 byte	1 byte	1 byte
0xFF	0xFF	0xFF	0xFF	0x00	0x03	0xFF	0x88	0xFF

Exception Code	MODBUS Name	Comments
0x01	Illegal Function Code	The function code is unknown by the server
0x03	Illegal Data Value	Dependent on the request
0x04	Server Failure	The server failed during the exaction

## &lt;0x10 Write Multiple Registers&gt;

One or continuous register writing is performed.

It is available only when you set the time.

## 1) Request

Transaction Identifier		Protocol Identifier		Length		Unit Identifier	Function	Starting Address		Quantity of Output	
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8	byte9	byte10	byte11
Hi	Lo	Hi	Lo	2 byte		1 byte	1 byte	Hi	Lo	Hi	Lo
0xXX	0xXX	0xXX	0xXX	0x02*(N+3)+1		0xXX	0x10	0x00	0xXX	0x00	0xXX

Byte Counter	Data 1		Data---		Data N	
byte12	byte13	byte14	• • •	• • •	byte13+N	byte14+N
1 byte	Hi	Lo	Hi	Lo	Hi	Lo
0x02*N	0xXX	0xXX	0xXX	0xXX	0xXX	0xXX

## 2) Response

Transaction Identifier		Protocol Identifier		Length		Unit Identifier	Function	Starting Address		Quantity of Output	
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8	byte9	byte10	byte11
Hi	Lo	Hi	Lo	2 byte		1 byte	1 byte	Hi	Lo	Hi	Lo
0xXX	0xXX	0xXX	0xXX	0x06		0xXX	0x10	0x00	0xXX	0x00	0xXX



## 3) Exception Response

Transaction Identifier		Protocol Identifier		Length		Unit Identifier	Function	Exception Code
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8
Hi	Lo	Hi	Lo	Hi	Lo	1 byte	1 byte	1 byte
0xFF	0xFF	0xFF	0xFF	0x00	0x03	0xFF	0x90	0xFF

Exception Code	MODBUS Name	Comments
0x01	Illegal Function Code	The function code is unknown by the server
0x02	Illegal Data Address	Dependent on the request
0x03	Illegal Data Value	Dependent on the request
0x04	Server Failure	The server failed during the exaction

## &lt;Register Map&gt;

Below is the list of Register Map. Address offset is enabled.

◆ Definition: Default: AC Enable, DC Disable (**PS Output Control Voltage 700mV**), RF Disable

◆ Reset Operation

➤ Default: **Internal Fault, External Fault**

When these errors are detected, SSA operation goes to Default.

To recover from this state:

1. Send the “Fault Reset” command (Address 4) to the SSA via Modbus.
2. Send the “DC Enable” command (Address 1) to the SSA via Modbus.
3. **Send the “PS Output Control Voltage” command (Address 3) to the SSA via Modbus.**
4. Send the “RF Enable” command (Address 2) to the SSA via Modbus.

➤ Remove Cause: **Warning**

When there errors are detected, an Error code will be notified on Address 15 but SSA operation continues as before the error detection.

To remove these Error Code:

1. Check what causing the error and remover or fix the error cause.
2. Send the “Fault Reset” command (Address 4) to the SSA via Modbus. SSA operation continues as before putting reset command.

◆ Multiplier

➤ 1

The number shown on the Modbus is the actual performance value.

➤ 0.1

The actual performance value is **x 0.1**. The last number shown on the Modbus is actually the first number after the decimal point.

Address	Address	Description	Function	Display Range	Multiplier	Unit	Permitted Raw Value	Threshold (Lower)	Threshold (Upper)	command /status	Error Code	Error Type	Error Operation	Reset Operation
1	0x0001	DC Enable/Disable	0x03,06	0 or 1	n/a	n/a	0 or 1	n/a	n/a	0: Disable 1: Enable	n/a	n/a	n/a	n/a
2	0x0002	RF Enable/Disable	0x03,06	0 or 1	n/a	n/a	0 or 1	n/a	n/a	0: Disable 1: Enable	n/a	n/a	n/a	n/a
3	0x0003	PS Output Control Voltage	0x03,06	0 – 4095	1	mV	700 - 2520	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
4	0x0004	Fault Reset	0x06	1	n/a	n/a	<b>1, 2, 4</b>	n/a	n/a	<b>1: Internal</b> <b>2: External</b> <b>4: Warning</b>	n/a	n/a	n/a	n/a
5	0x0005	X-Port Reboot	0x06	1	n/a	n/a	1	n/a	n/a	1: Reboot	n/a	n/a	n/a	n/a
6	0x0006	System Reboot	0x06	1	n/a	n/a	1	n/a	n/a	1: Reboot	n/a	n/a	n/a	n/a
7	0x0007	-	-	-	-	-	-	-	-	-	-	-	-	-
8	0x0008	-	-	-	-	-	-	-	-	-	-	-	-	-
9	0x0009	-	-	-	-	-	-	-	-	-	-	-	-	-
10	0x000a	AC Enabled ( <b>480VAC Breaker</b> )	0x03	0 or 1	n/a	n/a	Read only	n/a	n/a	0: Disable 1: Enable	n/a	n/a	n/a	n/a
11	0x000b	DC Enabled	0x03	0 or 1	n/a	n/a	Read only	n/a	n/a	0: Disable 1: Enable	n/a	n/a	n/a	n/a
12	0x000c	RF Enabled	0x03	0 or 1	n/a	n/a	Read only	n/a	n/a	0: Disable 1: Enable	n/a	n/a	n/a	n/a
13	0x000d	Internal Fault Error Code	0x03	0 or <b>31 - 580</b>	n/a	n/a	Read only	n/a	n/a	0: No Error <b>31 - 580: Error</b>	See Error code list	Internal	DC: Disable RF: Disable	Default

Address	Address	Description	Function	Display Range	Multiplier	Unit	Permitted Raw Value	Threshold (Lower)	Threshold (Upper)	command /status	Error Code	Error Type	Error Operation	Reset Operation
14	0x000e	External Fault Error Code	0x03	0 or <b>511 - 525</b>	n/a	n/a	Read only	n/a	n/a	0: No Error <b>511 - 525</b> : Error ( Bit )	Fault1: <b>511</b>	External	DC: Disable RF: Disable	Default
											Fault2: <b>512</b>			
											Fault3: <b>514</b>			
											Fault4: <b>518</b>			
15	0x000f	Warning Code	0x03	0 or 1 - <b>503</b>	n/a	n/a	Read only	n/a	n/a	0: No Error 1 - <b>503</b> : Error	See Error code list	Warning	Notification Only	Remove Cause
16	0x0010	Input Drive Power	0x03	0 - 3300	1	mV	Read only	0mV	2500mV	Operation Value	500	Internal	DC: Disable RF: Disable	Default
17	0x0011	Forward Power	0x03	0 - 4500	1	W	Read only	0W	4200W	Operation Value	501	Internal	DC: Disable RF: Disable	Default
18	0x0012	Reflected Power	0x03	0 - 4500	1	W	Read only	0W	<b>500W</b>	Operation Value	530	Internal	DC: Disable RF: Disable	Default
19	0x0013	-	-	-	-	-	-	-	-	-	-	-	-	-
20	0x0014	-	-	-	-	-	-	-	-	-	-	-	-	-
21	0x0015	-	-	-	-	-	-	-	-	-	-	-	-	-
22	0x0016	Control Unit Air Temperature	0x03	0 - <b>125.0</b>	0.1	degC	Read only	+10.0degC	+60.0degC	Operation Value	550	Internal	DC: Disable RF: Disable	Default
23	0x0017	Control Unit Fan Rotation Speed	0x03	0 - 12000	1	rpm	Ready only	<b>6300</b> rpm	<b>11700</b> rpm	Operation Value	503	Warning	Notification Only	Remove Cause
24	0x0018	-	-	-	-	-	-	-	-	-	-	-	-	-
25	0x0019	Thermostat Status	0x03	0 or 1	n/a	n/a	Read only	n/a	n/a	0: OK 1: Alarm	560	Internal	DC: Disable RF: Disable	Default
26	0x001a	-	-	-	-	-	-	-	-	-	-	-	-	-
27	0x001b	-	-	-	-	-	-	-	-	-	-	-	-	-
28	0x001c	Water Leak Status	0x03	0 or 1	n/a	n/a	Read only	n/a	n/a	0: OK 1: Alarm	502	Internal	DC: Disable RF: Disable	Default
29	0x001d	-	-	-	-	-	-	-	-	-	-	-	-	-
30	0x001e	-	-	-	-	-	-	-	-	-	-	-	-	-
31	0x001f	-	-	-	-	-	-	-	-	-	-	-	-	-
32	0x0020	DA <b>Unit</b> -1 Current	0x03	0 - <b>20.0</b>	0.1	A	Read only	<b>+0.5A</b>	<b>+3.0A</b>	Operation Value	001	Warning	Notification Only	Remove Cause
33	0x0021	-	-	-	-	-	-	-	-	-	-	-	-	-

Address	Address	Description	Function	Display Range	Multiplier	Unit	Permitted Raw Value	Threshold (Lower)	Threshold (Upper)	command /status	Error Code	Error Type	Error Operation	Reset Operation
34	0x0022	DA Unit-2 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	002	Warning	Notification Only	Remove Cause
35	0x0023	-	-	-	-	-	-	-	-	-	-	-	-	-
36	0x0024	-	-	-	-	-	-	-	-	-	-	-	-	-
37	0x0025	-	-	-	-	-	-	-	-	-	-	-	-	-
38	0x0026	-	-	-	-	-	-	-	-	-	-	-	-	-
39	0x0027	-	-	-	-	-	-	-	-	-	-	-	-	-
40	0x0028	-	-	-	-	-	-	-	-	-	-	-	-	-
41	0x0029	-	-	-	-	-	-	-	-	-	-	-	-	-
42	0x002a	-	-	-	-	-	-	-	-	-	-	-	-	-
43	0x002b	-	-	-	-	-	-	-	-	-	-	-	-	-
44	0x002c	DA Unit-1 Power Supply Voltage	0x03	0 - 100.0	0.1	V	Read only	+10.0V	+14.0V	Operation Value	021	Warning	Notification Only	Remove Cause
45	0x002d	DA Unit-2 Power Supply Voltage	0x03	0 - 100.0	0.1	V	Read only	+10.0V	+48.0V	Operation Value	022	Warning	Notification Only	Remove Cause
46	0x002e	DA Unit Heat Sink Temperature	0x03	0 - 125.0	0.1	degC	Read only	+10.0degC	+60.0degC	Operation Value	031	Internal	DC: Disable RF: Disable	Default
47	0x002f	DA Unit Fan Rotation Speed	0x03	0 - 12000	1	rpm	Read only	5250rpm	9750rpm	Operation Value	041	Warning	Notification Only	Remove Cause
48	0x0030	FA Unit1-1 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	101	Warning	Notification Only	Remove Cause
49	0x0031	FA Unit1-2 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	102	Warning	Notification Only	Remove Cause
50	0x0032	FA Unit1-3 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	103	Warning	Notification Only	Remove Cause
51	0x0033	FA Unit1-4 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	104	Warning	Notification Only	Remove Cause
52	0x0034	FA Unit1-5 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	105	Warning	Notification Only	Remove Cause
53	0x0035	FA Unit1-6 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	106	Warning	Notification Only	Remove Cause
54	0x0036	FA Unit1-7 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	107	Warning	Notification Only	Remove Cause

Address	Address	Description	Function	Display Range	Multiplier	Unit	Permitted Raw Value	Threshold (Lower)	Threshold (Upper)	command /status	Error Code	Error Type	Error Operation	Reset Operation
55	0x0037	FA Unit1-8 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	108	Warning	Notification Only	Remove Cause
56	0x0038	FA Unit-1-1 Module Power	0x03	0 - 900	1	W	Read only	0W	550W	Operation Value	111	Warning	Notification Only	Remove Cause
57	0x0039	FA Unit-1-2 Module Power	0x03	0 - 900	1	W	Read only	0W	550W	Operation Value	112	Warning	Notification Only	Remove Cause
58	0x003a	FA Unit-1-3 Module Power	0x03	0 - 900	1	W	Read only	0W	550W	Operation Value	113	Warning	Notification Only	Remove Cause
59	0x003b	FA Unit-1-4 Module Power	0x03	0 - 900	1	W	Read only	0W	550W	Operation Value	114	Warning	Notification Only	Remove Cause
60	0x003c	FA Unit1-1 Power Supply Voltage	0x03	0 - 100.0	0.1	V	Read only	+10.0V	+48.0V	Operation Value	121	Warning	Notification Only	Remove Cause
61	0x003d	FA Unit1-2 Power Supply Voltage	0x03	0 - 100.0	0.1	V	Read only	+10.0V	+48.0V	Operation Value	122	Warning	Notification Only	Remove Cause
62	0x003e	FA Unit1 Heat Sink Temperature	0x03	0 - 125.0	0.1	degC	Read only	+10.0degC	+60.0degC	Operation Value	131	Internal	DC: Disable RF: Disable	Default
63	0x003f	FA Unit1 Fan Rotation Speed	0x03	0 - 12000	1	rpm	Read only	5250rpm	9750rpm	Operation Value	141	Warning	Notification Only	Remove Cause
64	0x0040	FA Unit2-1 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	201	Warning	Notification Only	Remove Cause
65	0x0041	FA Unit2-2 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	202	Warning	Notification Only	Remove Cause
66	0x0042	FA Unit2-3 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	203	Warning	Notification Only	Remove Cause
67	0x0043	FA Unit2-4 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	204	Warning	Notification Only	Remove Cause
68	0x0044	FA Unit2-5 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	205	Warning	Notification Only	Remove Cause
69	0x0045	FA Unit2-6 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	206	Warning	Notification Only	Remove Cause
70	0x0046	FA Unit2-7 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	207	Warning	Notification Only	Remove Cause
71	0x0047	FA Unit2-8 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	208	Warning	Notification Only	Remove Cause

Address	Address	Description	Function	Display Range	Multiplier	Unit	Permitted Raw Value	Threshold (Lower)	Threshold (Upper)	command /status	Error Code	Error Type	Error Operation	Reset Operation
72	0x0048	FA Unit2-1 Module Power	0x03	0 - 900	1	W	Read only	0W	550W	Operation Value	211	Warning	Notification Only	Remove Cause
73	0x0049	FA Unit2-2 Module Power	0x03	0 - 900	1	W	Read only	0W	550W	Operation Value	212	Warning	Notification Only	Remove Cause
74	0x004a	FA Unit2-3 Module Power	0x03	0 - 900	1	W	Read only	0W	550W	Operation Value	213	Warning	Notification Only	Remove Cause
75	0x004b	FA Unit2-4 Module Power	0x03	0 - 900	1	W	Read only	0W	550W	Operation Value	214	Warning	Notification Only	Remove Cause
76	0x004c	FA Unit2-1 Power Supply Voltage	0x03	0 - 100.0	0.1	V	Read only	+10.0V	+48.0V	Operation Value	221	Warning	Notification Only	Remove Cause
77	0x004d	FA Unit2-2 Power Supply Voltage	0x03	0 - 100.0	0.1	V	Read only	+10.0V	+48.0V	Operation Value	222	Warning	Notification Only	Remove Cause
78	0x004e	FA Unit2 Heat Sink Temperature	0x03	0 - 125.0	0.1	degC	Read only	+10.0degC	+60.0degC	Operation Value	231	Warning	Notification Only	Remove Cause
79	0x004f	FA Unit2 Fan Rotation Speed	0x03	0 - 12000	1	rpm	Read only	5250rpm	9750rpm	Operation Value	241	Warning	Notification Only	Remove Cause
80	0x0050	FA Unit3-1 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	301	Warning	Notification Only	Remove Cause
81	0x0051	FA Unit3-2 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	302	Warning	Notification Only	Remove Cause
82	0x0052	FA Unit3-3 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	303	Warning	Notification Only	Remove Cause
83	0x0053	FA Unit3-4 Current	0x03	0 - 20.0	0.1	A	Read only	0A	+11.5A	Operation Value	304	Warning	Notification Only	Remove Cause
84	0x0054	-	-	-	-	-	-	-	-	-	-	-	-	-
85	0x0055	-	-	-	-	-	-	-	-	-	-	-	-	-
86	0x0056	-	-	-	-	-	-	-	-	-	-	-	-	-
87	0x0057	-	-	-	-	-	-	-	-	-	-	-	-	-
88	0x0058	FA Unit3-1 Module Power	0x03	0 - 900	1	W	Read only	0W	550W	Operation Value	311	Warning	Notification Only	Remove Cause
89	0x0059	FA Unit3-2 Module Power	0x03	0 - 900	1	W	Read only	0W	550W	Operation Value	312	Warning	Notification Only	Remove Cause
90	0x005a	-	-	-	-	-	-	-	-	-	-	-	-	-
91	0x005b	-	-	-	-	-	-	-	-	-	-	-	-	-

Address	Address	Description	Function	Display Range	Multiplier	Unit	Permitted Raw Value	Threshold (Lower)	Threshold (Upper)	command /status	Error Code	Error Type	Error Operation	Reset Operation
92	0x005c	FA Unit3-1 Power Supply Voltage	0x03	0 - 100.0	0.1	V	Read only	+10.0V	+48.0V	Operation Value	321	Warning	Notification Only	Remove Cause
93	0x005d	FA Unit3-2 Power Supply Voltage	0x03	0 - 100.0	0.1	V	Read only	+10.0V	+48.0V	Operation Value	322	Warning	Notification Only	Remove Cause
94	0x005e	FA Unit3 Heat Sink Temperature	0x03	0 - 125.0	0.1	degC	Read only	+10.0degC	+60.0degC	Operation Value	331	Internal	DC: Disable RF: Disable	Default
95	0x005f	FA Unit3 Fan Rotation Speed	0x03	0 - 12000	1	rpm	Read only	5250rpm	9750rpm	Operation Value	341	Warning	Notification Only	Remove Cause
96	0x0060	480VAC Out Status	0x03	0 - 7	n/a	n/a	Read only	n/a	n/a	Bit0: L1	401	Internal	DC: Disable RF: Disable	Default
										Bit1: L2	402			
										Bit2: L3	403			
										ALL	580			
97	0x0061	PS Unit Power Supply Fault	0x03	0 - 6	1	pc(s)	Read only	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
98	0x0062	PS Unit Air Temperature	0x03	0 - 125.0	0.1	degC	Read only	+10.0degC	+60.0degC	Operation Value	404	Internal	DC: Disable RF: Disable	Default
99	0x0063	Heat Exchanger Inlet Air Temperature	0x03	0 - 125.0	0.1	degC	Read only	+10.0degC	+45.0degC	Operation Value	405	Internal	DC: Disable RF: Disable	Default
100	0x0064	Inlet LCW Temperature	0x03	0 - 70.0	0.1	degC	Read only	+22.0degC	+38.0degC	Operation Value	410	Internal	DC: Disable RF: Disable	Default
101	0x0065	Outlet LCW Temperature	0x03	0 - 70.0	0.1	degC	Read only	+22.0degC	+45.0degC	Operation Value	411	Internal	DC: Disable RF: Disable	Default
102	0x0066	Moisture	0x03	0 - 99.0	0.1	%	Read only	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
103	0x0067	Outlet LCW Flow Rate	0x03	0 - 80.0	0.1	L/min.	Read only	10.0L/min	30.0L/min	Operation Value	409	Internal	DC: Disable RF: Disable	Default
104	0x0068	PS Unit Power Supply Fault Status	0x03	0 - 63 (3F)	n/a	n/a	Read only	n/a	n/a	Bit0: PS1	421	Warning	Notification Only	Remove Cause
										Bit1: PS2	422			
										Bit2: PS3	423			
										Bit3: PS4	424			
										Bit4: PS5	425			
										Bit5: PS6	426			
										Bit6: 0	Over 3pcs Errors: 420	Internal	DC: Disable RF: Disable	Default
										Bit7: 0				
105	0x0069	Heat Exchanger Unit Fan1 Rotation Speed	0x03	0 - 12000	1	rpm	Read only	6300rpm	11700rpm	Operation Value	431	Warning	Notification Only	Remove Cause

Address	Address	Description	Function	Display Range	Multiplier	Unit	Permitted Raw Value	Threshold (Lower)	Threshold (Upper)	command /status	Error Code	Error Type	Error Operation	Reset Operation
106	0x006a	Heat Exchanger Unit Fan2 Rotation Speed	0x03	0 - 12000	1	rpm	Read only	6300rpm	11700rpm	Operation Value	432	Warning	Notification Only	Remove Cause
107	0x006b	Heat Exchanger Unit Fan3 Rotation Speed	0x03	0 - 12000	1	rpm	Read only	6300rpm	11700rpm	Operation Value	433	Warning	Notification Only	Remove Cause
108	0x006c	Heat Exchanger Unit Fan4 Rotation Speed	0x03	0 - 12000	1	rpm	Read only	6300rpm	11700rpm	Operation Value	434	Warning	Notification Only	Remove Cause
109	0x006d	PS Unit Fan1 Rotation Speed	0x03	0 - 12000	1	rpm	Read only	5250rpm	9750rpm	Operation Value	435	Warning	Notification Only	Remove Cause
110	0x006e	PS Unit Fan2 Rotation Speed	0x03	0 - 12000	1	rpm	Read only	5250rpm	9750rpm	Operation Value	436	Warning	Notification Only	Remove Cause
111	0x006f	PS Unit Fan3 Rotation Speed	0x03	0 - 12000	1	rpm	Read only	2800rpm	5980rpm	Operation Value	437	Warning	Notification Only	Remove Cause
112	0x0070	Year for Calendar	0x03,06,10	15 - 99	1	Year	15 - 99	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
113	0x0071	Month for Calendar	0x03,06,10	1 - 12	1	Month	1 - 12	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
114	0x0072	Date for Calendar	0x03,06,10	1 - 31	1	Date	1 - 31	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
115	0x0073	Hour for Calendar	0x03,06,10	0 - 23	1	Hour	0 - 23	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
116	0x0074	Minute for Calendar	0x03,06,10	0 - 59	1	Minute	0 - 59	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
117	0x0075	-	-	-	-	-	-	-	-	-	-	-	-	-
118	0x0076	-	-	-	-	-	-	-	-	-	-	-	-	-
119	0x0077	-	-	-	-	-	-	-	-	-	-	-	-	-
120	0x0078	Main Software Version	0x03	n/a	XXX	Version	Read only	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
121	0x0079	Main Software Version (Second Level Numbering )	0x03	n/a	XXX	Number	Read only	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
122	0x007a	SD Software Version	0x03	n/a	XXX	Version	Read only	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
123	0x007b	SD Software Version (Second Level Numbering )	0x03	n/a	XXX	Number	Read only	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
124	0x007c	Sub Software Version	0x03	n/a	XXX	Version	Read only	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
125	0x007d	Sub Software Version (Second Level Numbering )	0x03	n/a	XXX	Number	Read only	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
126	0x007e	PS Software Version	0x03	n/a	XXX	Version	Read only	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
127	0x007f	PS Software Version (Second Level Numbering )	0x03	n/a	XXX	Number	Read only	n/a	n/a	Operation Value	n/a	n/a	n/a	n/a
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Address	Address	Description	Function	Display Range	Multiplier	Unit	Permitted Raw Value	Threshold (Lower)	Threshold (Upper)	command /status	Error Code	Error Type	Error Operation	Reset Operation
128	0x0080	Input Drive Power Upper Limit	0x03	0 - 3300	1	mV	Read only	n/a	2500mV	Operation Value	n/a	n/a	n/a	n/a
129	0x0081	Input Drive Power Lower Limit	0x03	0 - 3300	1	mV	Read only	0mV	n/a	Operation Value	n/a	n/a	n/a	n/a
130	0x0082	Forward Power Upper Limit	0x03	0 - 4500	1	W	Read only	n/a	4200W	Operation Value	n/a	n/a	n/a	n/a
131	0x0083	Forward Power Lower Limit	0x03	0 - 4500	1	W	Read only	0W	n/a	Operation Value	n/a	n/a	n/a	n/a
132	0x0084	Reflected Power Upper Limit	0x03	0 - 4500	1	W	Read only	n/a	500W	Operation Value	n/a	n/a	n/a	n/a
133	0x0085	Reflected Power Lower Limit	0x03	0 - 4500	1	W	Read only	0W	n/a	Operation Value	n/a	n/a	n/a	n/a
134	0x0086	Control Unit Air Temperature Upper Limit	0x03	0 - 125.0	0.1	degC	Read only	n/a	+60.0degC	Operation Value	n/a	n/a	n/a	n/a
135	0x0087	Control Unit Air Temperature Lower Limit	0x03	0 - 125.0	0.1	degC	Read only	+10.0degC	n/a	Operation Value	n/a	n/a	n/a	n/a
136	0x0088	Control Unit Fan Rotation Speed Upper Limit	0x03	0 - 12000	1	rpm	Read only	n/a	11700rpm	Operation Value	n/a	n/a	n/a	n/a
137	0x0089	Control Unit Fan Rotation Speed Lower Limit	0x03	0 - 12000	1	rpm	Read only	6300rpm	n/a	Operation Value	n/a	n/a	n/a	n/a
138	0x008a	DA Unit-1 Current Upper Limit	0x03	0 - 20.0	0.1	A	Read only	n/a	+3.0A	Operation Value	n/a	n/a	n/a	n/a
139	0x008b	DA Unit-1 Current Lower Limit	0x03	0 - 20.0	0.1	A	Read only	+0.5A	n/a	Operation Value	n/a	n/a	n/a	n/a
140	0x008c	DA Unit-2 Current Upper Limit	0x03	0 - 20.0	0.1	A	Read only	n/a	+11.5A	Operation Value	n/a	n/a	n/a	n/a
141	0x008d	DA Unit-2 Current Lower Limit	0x03	0 - 20.0	0.1	A	Read only	0A	n/a	Operation Value	n/a	n/a	n/a	n/a
142	0x008e	DA Unit-1 Power Supply Voltage Upper Limit	0x03	0 - 100.0	0.1	V	Read only	n/a	+14.0V	Operation Value	n/a	n/a	n/a	n/a
143	0x008f	DA Unit-1 Power Supply Voltage Lower Limit	0x03	0 - 100.0	0.1	V	Read only	+10.0V	n/a	Operation Value	n/a	n/a	n/a	n/a
144	0x0090	DA Unit-2 Power Supply Voltage Upper Limit	0x03	0 - 100.0	0.1	V	Read only	n/a	+48.0V	Operation Value	n/a	n/a	n/a	n/a
145	0x0091	DA Unit-2 Power Supply Voltage Lower Limit	0x03	0 - 100.0	0.1	V	Read only	+10.0V	n/a	Operation Value	n/a	n/a	n/a	n/a
146	0x0092	DA Unit Heat Sink Temperature Upper Limit	0x03	0 - 125.0	0.1	degC	Read only	n/a	+60.0degC	Operation Value	n/a	n/a	n/a	n/a
147	0x0093	DA Unit Heat Sink Temperature Lower Limit	0x03	0 - 125.0	0.1	degC	Read only	+10.0degC	n/a	Operation Value	n/a	n/a	n/a	n/a
148	0x0094	DA Unit Fan Rotation Speed Upper Limit	0x03	0 - 12000	1	rpm	Read only	n/a	9750rpm	Operation Value	n/a	n/a	n/a	n/a
149	0x0095	DA Unit Fan Rotation Speed Lower Limit	0x03	0 - 12000	1	rpm	Read only	5250rpm	n/a	Operation Value	n/a	n/a	n/a	n/a

Address	Address	Description	Function	Display Range	Multiplier	Unit	Permitted Raw Value	Threshold (Lower)	Threshold (Upper)	command /status	Error Code	Error Type	Error Operation	Reset Operation
150	0x0096	FA Unit1 Current Upper Limit	0x03	0 - 20.0	0.1	A	Read only	n/a	+11.5A	Operation Value	n/a	n/a	n/a	n/a
151	0x0097	FA Unit1 Current Lower Limit	0x03	0 - 20.0	0.1	A	Read only	0A	n/a	Operation Value	n/a	n/a	n/a	n/a
152	0x0098	FA Unit1 Module Power Upper Limit	0x03	0 - 900	1	W	Read only	n/a	550W	Operation Value	n/a	n/a	n/a	n/a
153	0x0099	FA Unit1 Module Power Lower Limit	0x03	0 - 900	1	W	Read only	0W	n/a	Operation Value	n/a	n/a	n/a	n/a
154	0x009a	FA Unit1 Power Supply Voltage Upper Limit	0x03	0 - 100.0	0.1	V	Read only	n/a	+48.0V	Operation Value	n/a	n/a	n/a	n/a
155	0x009b	FA Unit1 Power Supply Voltage Lower Limit	0x03	0 - 100.0	0.1	V	Read only	+10.0V	n/a	Operation Value	n/a	n/a	n/a	n/a
156	0x009c	FA Unit1 Heat Sink Temperature Upper Limit	0x03	0 - 125.0	0.1	degC	Read only	n/a	+60.0degC	Operation Value	n/a	n/a	n/a	n/a
157	0x009d	FA Unit1 Heat Sink Temperature Lower Limit	0x03	0 - 125.0	0.1	degC	Read only	+10.0degC	n/a	Operation Value	n/a	n/a	n/a	n/a
158	0x009e	FA Unit1 Fan Rotation Speed Upper Limit	0x03	0 - 12000	1	rpm	Read only	n/a	9750rpm	Operation Value	n/a	n/a	n/a	n/a
159	0x009f	FA Unit1 Fan Rotation Speed Lower Limit	0x03	0 - 12000	1	rpm	Read only	5250rpm	n/a	Operation Value	n/a	n/a	n/a	n/a
160	0x00a0	FA Unit2 Current Upper Limit	0x03	0 - 20.0	0.1	A	Read only	n/a	+11.5A	Operation Value	n/a	n/a	n/a	n/a
161	0x00a1	FA Unit2 Current Lower Limit	0x03	0 - 20.0	0.1	A	Read only	0A	n/a	Operation Value	n/a	n/a	n/a	n/a
162	0x00a2	FA Unit2 Module Power Upper Limit	0x03	0 - 900	1	W	Read only	n/a	550W	Operation Value	n/a	n/a	n/a	n/a
163	0x00a3	FA Unit2 Module Power Lower Limit	0x03	0 - 900	1	W	Read only	0W	n/a	Operation Value	n/a	n/a	n/a	n/a
164	0x00a4	FA Unit2 Power Supply Voltage Upper Limit	0x03	0 - 100.0	0.1	V	Read only	n/a	+48.0V	Operation Value	n/a	n/a	n/a	n/a
165	0x00a5	FA Unit2 Power Supply Voltage Lower Limit	0x03	0 - 100.0	0.1	V	Read only	+10.0V	n/a	Operation Value	n/a	n/a	n/a	n/a
166	0x00a6	FA Unit2 Heat Sink Temperature Upper Limit	0x03	0 - 125.0	0.1	degC	Read only	n/a	+60.0degC	Operation Value	n/a	n/a	n/a	n/a
167	0x00a7	FA Unit2 Heat Sink Temperature Lower Limit	0x03	0 - 125.0	0.1	degC	Read only	+10.0degC	n/a	Operation Value	n/a	n/a	n/a	n/a
168	0x00a8	FA Unit2 Fan Rotation Speed Upper Limit	0x03	0 - 12000	1	rpm	Read only	n/a	9750rpm	Operation Value	n/a	n/a	n/a	n/a

Address	Address	Description	Function	Display Range	Multiplier	Unit	Permitted Raw Value	Threshold (Lower)	Threshold (Upper)	command /status	Error Code	Error Type	Error Operation	Reset Operation
169	0x00a9	FA Unit2 Fan Rotation Speed Lower Limit	0x03	0 - 12000	1	rpm	Read only	5250rpm	n/a	Operation Value	n/a	n/a	n/a	n/a
170	0x00aa	FA Unit3 Current Upper Limit	0x03	0 - 20.0	0.1	A	Read only	n/a	+11.5A	Operation Value	n/a	n/a	n/a	n/a
171	0x00ab	FA Unit3 Current Lower Limit	0x03	0 - 20.0	0.1	A	Read only	0A	n/a	Operation Value	n/a	n/a	n/a	n/a
172	0x00ac	FA Unit3 Module Power Upper Limit	0x03	0 - 900	1	W	Read only	n/a	550W	Operation Value	n/a	n/a	n/a	n/a
173	0x00ad	FA Unit3 Module Power Lower Limit	0x03	0 - 900	1	W	Read only	0W	n/a	Operation Value	n/a	n/a	n/a	n/a
174	0x00ae	FA Unit3 Power Supply Voltage Upper Limit	0x03	0 - 100.0	0.1	V	Read only	n/a	+48.0V	Operation Value	n/a	n/a	n/a	n/a
175	0x00af	FA Unit3 Power Supply Voltage Lower Limit	0x03	0 - 100.0	0.1	V	Read only	+10.0V	n/a	Operation Value	n/a	n/a	n/a	n/a
176	0x00b0	FA Unit3 Heat Sink Temperature Upper Limit	0x03	0 - 125.0	0.1	degC	Read only	n/a	+60.0degC	Operation Value	n/a	n/a	n/a	n/a
177	0x00b1	FA Unit3 Heat Sink Temperature Lower Limit	0x03	0 - 125.0	0.1	degC	Read only	+10.0degC	n/a	Operation Value	n/a	n/a	n/a	n/a
178	0x00b2	FA Unit3 Fan Rotation Speed Upper Limit	0x03	0 - 12000	1	rpm	Read only	n/a	9750rpm	Operation Value	n/a	n/a	n/a	n/a
179	0x00b3	FA Unit3 Fan Rotation Speed Lower Limit	0x03	0 - 12000	1	rpm	Read only	5250rpm	n/a	Operation Value	n/a	n/a	n/a	n/a
180	0x00b4	PS Unit Air Temperature Upper Limit	0x03	0 - 125.0	0.1	degC	Read only	n/a	+60.0degC	Operation Value	n/a	n/a	n/a	n/a
181	0x00b5	PS Unit Air Temperature Lower Limit	0x03	0 - 125.0	0.1	degC	Read only	+10.0degC	n/a	Operation Value	n/a	n/a	n/a	n/a
182	0x00b6	Heat Exchanger Inlet Air Temperature Upper Limit	0x03	0 - 125.0	0.1	degC	Read only	n/a	+45.0degC	Operation Value	n/a	n/a	n/a	n/a
183	0x00b7	Heat Exchanger Inlet Air Temperature Lower Limit	0x03	0 - 125.0	0.1	degC	Read only	+10.0degC	n/a	Operation Value	n/a	n/a	n/a	n/a
184	0x00b8	Outlet LCW Flow Rate Upper Limit	0x03	0 - 80.0	0.1	L/min.	Read only	n/a	30.0L/min	Operation Value	n/a	n/a	n/a	n/a
185	0x00b9	Outlet LCW Flow Rate Lower Limit	0x03	0 - 80.0	0.1	L/min.	Read only	10.0L/min	n/a	Operation Value	n/a	n/a	n/a	n/a

Address	Address	Description	Function	Display Range	Multiplier	Unit	Permitted Raw Value	Threshold (Lower)	Threshold (Upper)	command /status	Error Code	Error Type	Error Operation	Reset Operation
186	0x00ba	Inlet LCW Temperature Upper Limit	0x03	0 - 70.0	0.1	degC	Read only	n/a	+38.0degC	Operation Value	n/a	n/a	n/a	n/a
187	0x00bb	Inlet LCW Temperature Lower Limit	0x03	0 - 70.0	0.1	degC	Read only	+22.0degC	n/a	Operation Value	n/a	n/a	n/a	n/a
188	0x00bc	Outlet LCW Temperature Upper Limit	0x03	0 - 70.0	0.1	degC	Read only	n/a	+45.0degC	Operation Value	n/a	n/a	n/a	n/a
189	0x00bd	Outlet LCW Temperature Lower Limit	0x03	0 - 70.0	0.1	degC	Read only	+22.0degC	n/a	Operation Value	n/a	n/a	n/a	n/a
190	0x00be	Heat Exchanger Unit Fan Upper Limit	0x03	0 - 12000	1	rpm	Read only	n/a	11700rpm	Operation Value	n/a	n/a	n/a	n/a
191	0x00bf	Heat Exchanger Unit Fan Lower Limit	0x03	0 - 12000	1	rpm	Read only	6300rpm	n/a	Operation Value	n/a	n/a	n/a	n/a
192	0x00c0	PS Unit Fan1,2 Rotation speed Upper Limit	0x03	0 - 12000	1	rpm	Read only	n/a	9750rpm	Operation Value	n/a	n/a	n/a	n/a
193	0x00c1	PS Unit Fan1,2 Rotation speed Lower Limit	0x03	0 - 12000	1	rpm	Read only	5250rpm	n/a	Operation Value	n/a	n/a	n/a	n/a
194	0x00c2	PS Unit Fan3 Rotation speed Upper Limit	0x03	0 - 12000	1	rpm	Read only	n/a	5980rpm	Operation Value	n/a	n/a	n/a	n/a
195	0x00c3	PS Unit Fan3 Rotation speed Lower Limit	0x03	0 - 12000	1	rpm	Read only	2800rpm	n/a	n/a	n/a	n/a	n/a	n/a

## &lt;Error code&gt;

Below is the list of Error Code.

When you read register 13~15, the codes below are displayed if any errors have occurred.

Error Code 0: No error

●:Default (RF Disable, DC Disable, AC Enable)

○: Error Code Notification Only

Error Code	Error Name	Threshold	Internal Fault	External Fault	Warning
001	DA Unit-1 Current	<0.5A or >3.0A			○
002	DA Unit-2 Current	>11.5A			○
021	DA Unit-1 Power Supply Voltage	<+10.0V or >+14.0V			○
022	DA Unit-2 Power Supply Voltage	<+10.0V or >+48.0V			○
031	DA Unit Heat Sink Temperature	<10.0°C or >60.0°C	●		
041	DA Unit Fan Rotation Speed	<5250rpm or >9750rpm			○
101	FA Unit1-1 Current	>11.5A			○
102	FA Unit1-2 Current	>11.5A			○
103	FA Unit1-3 Current	>11.5A			○
104	FA Unit1-4 Current	>11.5A			○
105	FA Unit1-5 Current	>11.5A			○
106	FA Unit1-6 Current	>11.5A			○
107	FA Unit1-7 Current	>11.5A			○
108	FA Unit1-8 Current	>11.5A			○
111	FA Unit1-1 Module Power	>550W			○
112	FA Unit1-2 Module Power	>550W			○
113	FA Unit1-3 Module Power	>550W			○
114	FA Unit1-4 Module Power	>550W			○
121	FA Unit1-1 Power Supply Voltage	<+10.0V or >+48.0V			○

Error Code	Error Name	Threshold	Internal Fault	External Fault	Warning
122	FA Unit1-2 Power Supply Voltage	<+10.0V or >+48.0V			○
131	FA Unit1 Heat Sink Temperature	<10.0°C or >60.0°C	●		
141	FA Unit1 Fan Rotation Speed	<5250rpm or >9750rpm			○
201	FA Unit2-1 Current	>11.5A			○
202	FA Unit2-2 Current	>11.5A			○
203	FA Unit2-3 Current	>11.5A			○
204	FA Unit2-4 Current	>11.5A			○
205	FA Unit2-5 Current	>11.5A			○
206	FA Unit2-6 Current	>11.5A			○
207	FA Unit2-7 Current	>11.5A			○
208	FA Unit2-8 Current	>11.5A			○
211	FA Unit2-1 Module Power	>550W			○
212	FA Unit2-2 Module Power	>550W			○
213	FA Unit2-3 Module Power	>550W			○
214	FA Unit2-4 Module Power	>550W			○
221	FA Unit2-1 Power Supply Voltage	<+10.0V or >+48.0V			○
222	FA Unit2-1 Power Supply Voltage	<+10.0V or >+48.0V			○
231	FA Unit1 Heat Sink Temperature	<10.0°C or >60.0°C	●		
241	FA Unit2 Fan Rotation Speed	<5250rpm or >9750rpm			○
301	FA Unit3-1 Current	>11.5A			○
302	FA Unit3-2 Current	>11.5A			○
303	FA Unit3-3 Current	>11.5A			○
304	FA Unit3-4 Current	>11.5A			○

Error Code	Error Name	Threshold	Internal Fault	External Fault	Warning
311	FA Unit3-1 Module Power	>550W			○
312	FA Unit3-2 Module Power	>550W			○
321	FA Unit3-1 Power Supply Voltage	<+10.0V or >+48.0V			○
322	FA Unit3-2 Power Supply Voltage	<+10.0V or >+48.0V			○
331	FA Unit3 Heat Sink Temperature	<10.0°C or >60.0°C	●		
341	FA Unit3 Fan Rotation Speed	<5250rpm or >9750rpm			○
401	480VAC L1 Status	L1 Fault	●		
402	480VAC L2 Status	L2 Fault	●		
403	480VAC L3 Status	L3 Fault	●		
404	PS Unit Air Temperature	<10°C or >60°C	●		
405	Heat Exchanger Inlet Air Temperature	<10°C or >45°C	●		
409	Outlet LCW Flow Rate	<10L/min or >30L/min	●		
410	Inlet LCW Temperature	<22°C or >38°C	●		
411	Outlet LCW Temperature	<22°C or >45°C	●		
420	PS Unit Power Supply Fault Status (Over Three Errors)	<2 (No Error) or >3 (Error)	●		
421	PS Unit Power Supply Fault Status (bit0 : PS1)	0 (No Error) or 1 (Error)			○
422	PS Unit Power Supply Fault Status (bit1 : PS2)	0 (No Error) or 1 (Error)			○
423	PS Unit Power Supply Fault Status (bit2 : PS3)	0 (No Error) or 1 (Error)			○
424	PS Unit Power Supply Fault Status (bit3 : PS4)	0 (No Error) or 1 (Error)			○
425	PS Unit Power Supply Fault Status (bit4 : PS5)	0 (No Error) or 1 (Error)			○

Error Code	Error Name	Threshold	Internal Fault	External Fault	Warning
426	PS Unit Power Supply Fault Status (bit5 : PS6)	0 (No Error) or 1 (Error)			○
431	Heat Exchanger Unit Fan1 Rotation Speed	<6300rpm or >11700rpm			○
432	Heat Exchanger Unit Fan2 Rotation Speed	<6300rpm or >11700rpm			○
433	Heat Exchanger Unit Fan3 Rotation Speed	<6300rpm or >11700rpm			○
434	Heat Exchanger Unit Fan4 Rotation Speed	<6300rpm or >11700rpm			○
435	PS Unit Fan1 Rotation Speed	<5250rpm or >9750rpm			○
436	PS Unit Fan2 Rotation Speed	<5250rpm or >9750rpm			○
437	PS Unit Fan3 Rotation Speed	<2800rpm or >5980rpm			○
500	Input Drive Power	>2500mV	●		
501	Forward Power	>4200W	●		
502	Water Leak Status	0 (No Error) or 1 (Error)	●		
503	Control Unit Fan Rotation Speed	<6300rpm or >11700rpm			○
511	External Fault No.1 24V Permit Line	0 (No Error) or 511 (Error)		●	
512	External Fault No.2 24V Permit Line	0 (No Error) or 512 (Error)		●	
514	External Fault No.3 24V Permit Line	0 (No Error) or 514 (Error)		●	
518	External Fault No.4 24V Permit Line	0 (No Error) or 518 (Error)		●	
530	Reflected Power	>500W	●		
550	Control Unit Air Temperature	<10°C or >60°C	●		
560	Thermostat Status	0 (No Error) or 1 (Error)	●		
570	120VAC OFF or Reboot	Start of SSPA	●		
580	480VAC Status	All Phase Fault of 480VAC	●		



## PS Output Control Voltage Raw Data

PS Output Control Voltage Modbus Input Raw Value	Modbus Drain Voltage (V) Address 3
2520	48V
2460	47V
2410	46V
2370	45V
2310	44V
2260	43V
2210	42V
2150	41V
2100	40V
2050	39V
2000	38V
1940	37V
1890	36V
1840	35V
1780	34V
1730	33V
1680	32V
1630	31V
1570	30V
1520	29V
1470	28V
1420	27V
1360	26V
1310	25V
1260	24V
1210	23V
1150	22V
1100	21V
1050	20V
1000	19V
940	18V
890	17V
840	16V
790	15V
730	14V
700	13.5V

## Input Drive Power Reference Value

RF Input Level From Signal Generator	Modbus Indication Value (mV) Address 16
-10.0dBm (0.10mW)	228 mV
-9.5dBm (0.11mW)	248 mV
-9.0dBm (0.13mW)	267 mV
-8.5dBm (0.14mW)	290 mV
-8.0dBm (0.16mW)	314 mV
-7.5dBm (0.18mW)	340 mV
-7.0dBm (0.20mW)	364 mV
-6.5dBm (0.22mW)	394 mV
-6.0dBm (0.25mW)	424 mV
-5.5dBm (0.28mW)	455 mV
-5.0dBm (0.32mW)	488 mV
-4.5dBm (0.35mW)	524 mV
-4.0dBm (0.40mW)	562 mV
-3.5dBm (0.45mW)	600 mV
-3.0dBm (0.50mW)	640 mV
-2.5dBm (0.56mW)	684 mV
-2.0dBm (0.63mW)	731 mV
-1.5dBm (0.71mW)	778 mV
-1.0dBm (0.79mW)	830 mV
-0.5dBm (0.89mW)	883 mV
0dBm (1.00mW)	940 mV
+0.5dBm (1.12mW)	998 mV
+1.0dBm (1.26mW)	1064 mV
+1.5dBm (1.41mW)	1127 mV
+2.0dBm (1.58mW)	1196 mV
+2.5dBm (1.78mW)	1269 mV
+3.0dBm (2.00mW)	1346 mV
+3.5dBm (2.24mW)	1427 mV
+4.0dBm (2.51mW)	1510 mV
+4.5dBm (2.82mW)	1600 mV
+5.0dBm (3.16mW)	1694 mV
+5.5dBm (3.55mW)	1795 mV
+6.0dBm (4.00mW)	1904 mV
+6.5dBm (4.47mW)	2018 mV
+7.0dBm (5.01mW)	2138 mV
+7.5dBm (5.62mW)	2267 mV
+8.0dBm (6.31mW)	2408 mV
+8.3dBm (6.67mW)	2500 mV

Table on page 24 is according to below equation.

\*Drain voltage range of this amplifier' power supply is from 13.5 to 48V

$$\text{Output voltage} = \frac{\text{The voltage between TRM and COM}}{2.5 \text{ [V]}} \times \text{rated output voltage} \cdots \textcircled{1}$$

Final Amplifier transistor pair (10 per SSA rack) ADC reading to Power (Watt) conversion equation

### Table

Fwd Table 1

#	0	1	2	3	4	5	6	7	8	9
Power (Watt)	10	20	30	40	50	60	70	80	90	100
Detected Voltage (mV)	214	286	358	405	505	548	591	634	677	722

Fwd Table 2

#	0	1	2	3	4	5	6	7	8	9	10
Power (Watt)	100	150	200	250	300	350	400	450	500	550	600
Detected Voltage (mV)	722	884	1022	1140	1247	1332	1424	1515	1593	1670	1740

### Equation

Equation 1

$$\text{Forward Power} = \frac{(\text{Detected Voltage} - \text{Lower Bound Voltage}) * 10}{(\text{Higher Bound Voltage} - \text{Lower Bound Voltage})} + \text{Lower Bound Power (Watt)}$$

Equation 2

$$\text{Forward Power} = \frac{(\text{Detected Voltage} - \text{Lower Bound Voltage}) * 50}{(\text{Higher Bound Voltage} - \text{Lower Bound Voltage})} + \text{Lower Bound Power (Watt)}$$

### Example/Explanation

There are two series of Tables and Equations.

For 10-100W power, Table 1 and Equation 1 are used.

For 100-600W power, Table 2 and Equation 2 are used.

#### Example 1

If 375mV was detected, Lower Bound Voltage is 358, Higher Bound Voltage is 405, and Lower Bound Power is 30 on table 1.

So, calculation is;

$$\text{Forward Power} = (375-358)*10 / (405-358) + 30 = 34\text{W (cut off after the decimal point)}$$

#### Example 2

If 1200mV was detected, Lower Bound Voltage is 1140, Higher Bound Voltage is 1247, and Lower Bound Power is 250 on table 2.

So, calculation is:

$$\text{Forward Power} = (1200-1140)*50 / (1247-1140) + 250 = 255\text{W (cut off after the decimal point)}$$