GTEC UPS MODEL:

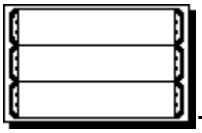
MUST400

Maintenance Guide

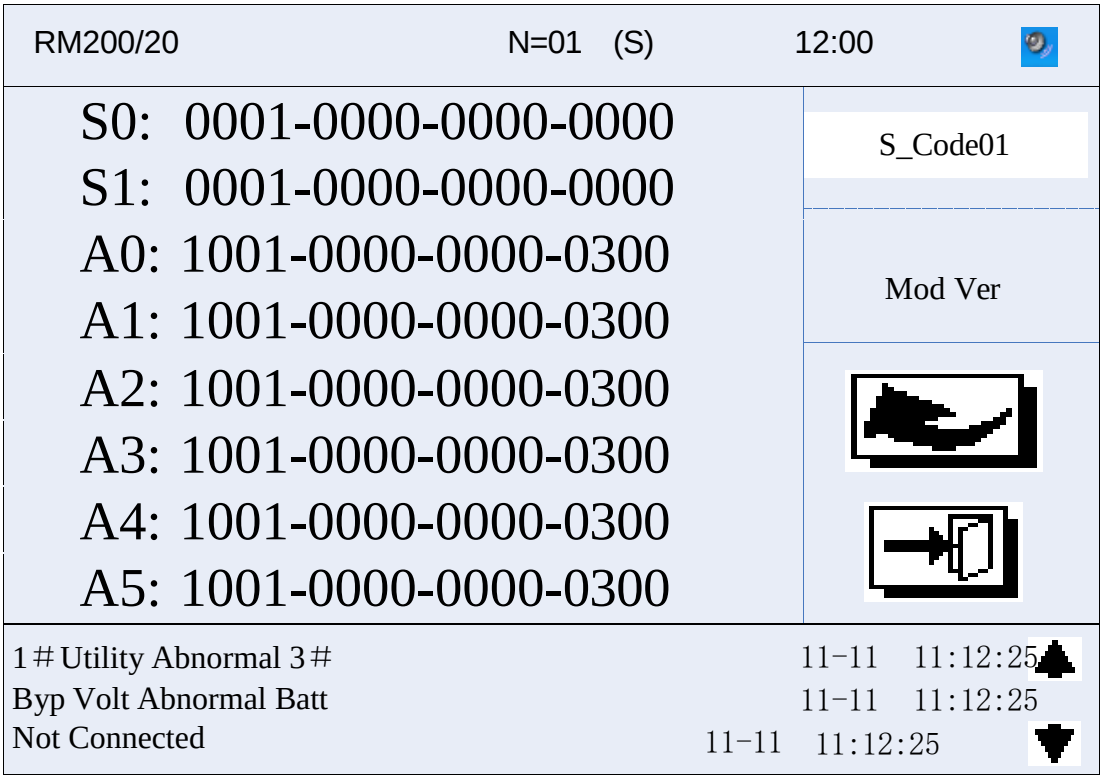
SERVICE MANUAL

Part I: Power Module (PM)

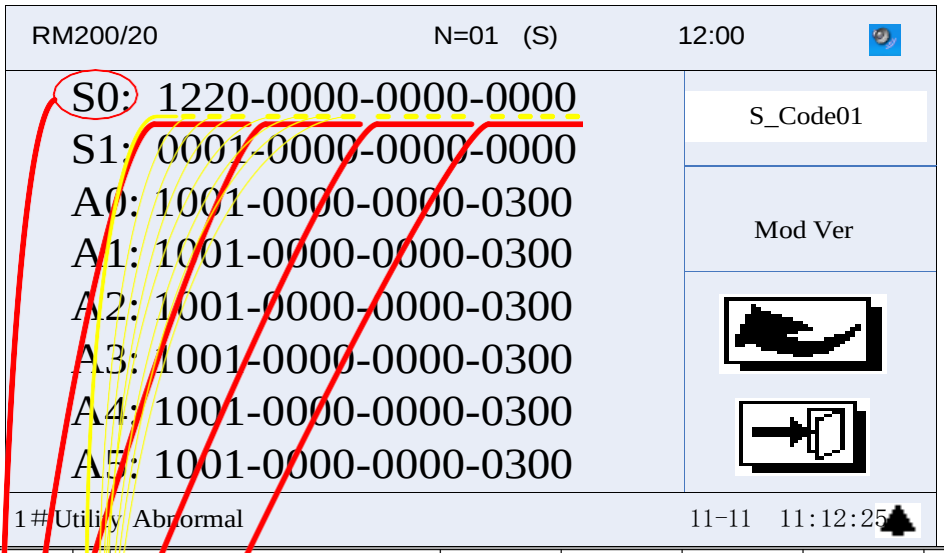
1.1 Reading Module S_CODE

 →Select the PM→ 

The following LCD interface will displayed.



Every bit of S0-S1 deputy one status.
Every bit of A0-A5 deputy one alarm (or Fault).



Seq.			Items	0	1	2	4	8
1	S0	1	Load on status	None	UPS	BYP	Other Module	
2		2	REC status	OFF	Soft-start	Normal work		
3		3	INV status	OFF	Soft-start	Normal work		
4		4	BYP status	Out range	Ok for supply			
5		5	Battery status	Not connected	Boost	float	Discharging	not work
6		6	Reserved					
7		7	Reserved					
8		8	Reserved					
9		9	Maintenance CB status	Open	Closed			
10		10	Reserved					
11		11	Reserved					
12		12	Positive Battery connect status	Not connect	Connected			
13		13	negative Battery connect status	Not connect	Connected			
14		14	INV allow on status	Inhibited On	Allow On			
15		15	INV supply status	Not allow to supply	Ready for supply	Supplying		
16		16	Generator in	Not Generator	Generator In			

For example, S0:1220-0000-0000-0000

From the table, S0,

Byte 1 = “1”, Byte 2 = “2”, Byte 3 = “2”, Byte 4= “0”

Byte 5 = “0”, Byte 6 = “0”, Byte 7 = “0”, Byte 8= “0”

Byte 9 = “0”, Byte 10 = “0”, Byte 11 = “0”, Byte 12= “0”

Byte 13 = “0”, Byte 14 = “0”, Byte 15 = “0”, Byte 16= “0”

For row, S0 Byte 1 means: “Load On Status”. From column, “0” means Load on None, “1” means “Load on UPS” , “2” means “Load on BYP”, “4” Means “Load on Other Module”.

For row, S0 Byte 2 means: “REC Status”. From column, “0” means “REC Status OFF”, “1” means “REC Status Soft-start”, “2” means “REC Status Normal Work”.

For row, S0 Byte 3 means: “INV Status”. From column, “0” means “INV Status OFF”, “1” means “INV Status Soft-start”, “2” means “INV Status Normal Work”.

For row, S0 Byte 4 means: “BYP Status”. From column, “0” means “BYP Status Out of Range”, “1” means “BYP Status OK for Supply”

1.2 Status Bits Description

Seq.				Items	0	1	2	4	8
1	S0	1	1	Load on status	None	UPS	BYP	Other Module	
2			2	REC status	OFF	Soft-start	Normal work		
3			3	INV status	OFF	Soft-start	Normal work		
4			4	BYP status	Out range	Ok for supply			
5		2	5	Battery status	Not connected	Boost	float	Discharging	not work
6			6	Reserved					
7			7	Reserved					
8			8	Reserved					
9		3	9	Maintenance CB status	Open	Closed			
10			10	Reserved					
11			11	Reserved					
12			12	Positive Battery connect status	Not connect	Connected			
13		4	13	negative Battery connect status	Not connect	Connected			
14			14	INV allow on status	Inhibited On	Allow On			
15			15	INV supply status	Not allow to supply	Ready for supply	Supplying		
16			16	Generator in	Not Generator	Generator In			
17	S1	1	1	Reserved					
18			2	Reserved					
19			3	Reserved					
20			4	Exterior BCB trip	Trip signal inactive	Trip signal active			
21		2	5	Exterior BCB connect status	Not connected	Connected			
22			6	Exterior BCB status	Open	Closed			
23			7	EPO status	Not EPO	EPO			

24			8	Module pulled Out	Pushed (Connected OK)	Pulled (Connected Fail)			
25		3	9	Inv available	Inv not available	Available			
26			10	System power up end	During power up step	Power up step ended.			
27			11	Reserved					
28			12	Reserved					
29		4	13	Reserved					
30			14	Reserved					
31			15	Reserved					
32			16	Reserved					

1.3 Alarm Bits Description

Seq.				Items	0	1	2	4	8
1	A 0	1	1	Synchronous Fault	Sync.	Not sync.			
2			2	Main Input Fault	OK	Fault			
3			3	REC Fault	OK	Fault			
4			4	INV Fault	OK	Fault			
5		2	5	Reserved					
6			6	Reserved					
7			7	Reserved					
8			8	Reserved					
9		3	9	Reserved					
10			10	Reserved					
11			11	Reserved					
12			12	Reserved					
13		4	13	Input phase A over current	OK	Fault			
14			14	Input phase B over current	OK	Fault			
15			15	Input phase C over current	OK	Fault			
16			16	Output phase A voltage Fault	OK	Fault			
17	A 1	1	1	Output phase B voltage Fault	OK	Fault			
18			2	Output phase C voltage Fault	OK	Fault			
19			3	Reserved					
20			4	Reserved					
21		2	5	Reserved					
22			6	Positive bus voltage Fault	OK	Low voltage	Over voltage		
23			7	Negative bus voltage Fault	OK	Low voltage	Over voltage		
24			8	Input current unbalance Fault	OK	Fault			
25		3	9	Input voltage Fault	OK	Fault			

26			10	Input Frequency Fault	OK	Fault			
27			11	Input Sequence Fault	OK	Fault			
28			12	REC soft-start Fault	OK	Fault			
29		4	13	REC IGBT over current	OK	Fault			
30			14	Reserved					
31			15	REC over temperature	OK	Fault			
32			16	Positive bus over voltage Fault	OK	Fault			
33		1	1	Negative bus over voltage Fault	OK	Fault			
34			2	Fan Fault	OK	Fault			
35			3	Reserved					
36			4	Reserved					
37		2	5	Positive bus under voltage	OK	Fault			
38			6	Negative bus under voltage	OK	Fault			
39			7	Positive battery reversed	OK	Fault			
40	A		8	Negative battery reversed	OK	Fault			
41	2	3	9	Reserved					
42			10	Reserved					
43			11	Positive charger voltage Fault	OK	under voltage	over voltage		
44			12	Negative charger voltage Fault	OK	under voltage	over voltage		
45		4	13	Reserved					
46			14	Reserved					
47			15	Positive charger Fault	OK	Fault			
48			16	Negative charger Fault	OK	Fault			
49		1	1	Positive battery voltage low	OK	Fault			
50			2	Negative battery voltage low	OK	Fault			
51	A		3	Positive battery EOD	OK	Fault			
52	3		4	Negative battery EOD	OK	Fault			
53		2	5	Input neutral lost	OK	Fault			
54			6	BYP sequence Fault	OK	Fault			

55			7	BYP voltage Fault	OK	Fault			
56			8	Reserved					
57		3	9	Reserved					
58			10	Reserved					
59			11	BYP frequency over track range	OK	Fault			
60			12	Reserved					
61		4	13	Reserved					
62			14	Over load time out	OK	Fault			
63			15	Reserved					
64			16	Reserved					
65		1	1	Manual shutdown	normal	shutdown			
66			2	INV protect	OK	Fault			
67			3	Transfer times limit in one hour	OK	Fault			
68			4	INV power back feed	OK	Fault			
69		2	5	Reserved					
70			6	Reserved					
71			7	Reserved					
72	A		8	INV over temperature Fault	OK	Fault			
73	4	3	9	INV IGBT over current	OK	Fault			
74			10	Reserved					
75			11	Over load	normal	over load			
76			12	INV relay or fuse Fault	OK	Fault			
77		4	13	Reserved					
78			14	Reserved					
79			15	Reserved					
80			16	Reserved					
81	A	1	1	Reserved					
82	5		2	Output shorted	OK	Fault			

83			3	Battery test	None	OK	Fault		
84			4	Battery maintenance	None	OK	Fault		
85		2	5	Reserved					
86			6	Reserved					
87			7	Reserved					
88			8	Reserved					
89		3	9	Reserved					
90			10	Reserved					
91			11	Reserved					
92			12	Reserved					
93		4	13	Reserved					
94			14	Reserved					
95			15	Reserved					
96			16	Reserved					

1.4 Alarms Check and Solution Index

1.4.1 Synchronous Fault

A) BYP frequency out of synchronize range.
B) SYNC signal in the parallel Fault.

1.4.2 Main Input Fault

A) Main input voltage out of range.
B) Main input frequency out of range.
C) Main input sequence is reversed

1.4.3 REC Fault

A) REC over temperature.
B) Dc bus over voltage latched.
C) REC soft-start Fault.
D) Input current unbalance.

1.4.4 INV Fault

A) INV IGBT over current.
B) INV over temperature.

1.4.5 Input phase A/B/C over current

A) Input current over limited.
Index 1: IGBT Fault.
Index 2: DC bus shorted.
Index 2: IGBT driver Fault.

1.4.6 Output Phase A/B/C Voltage Fault

A) INV voltage out of range.
Index 1: IGBT open.
Index 2: IGBT driver lost.
Index 3: Voltage detects and sample fail.

1.4.7 Positive/Negative Bus Voltage Fault

A) DC bus voltage out of range.

1.4.8 Input current unbalance fault

A) The difference of max current and min current of the input three phases is out of the limited range.
Index 1: One of the input current detecting CT/HALL fail..
Index 2: Some REC IGBT open.
Index 3: input current detecting and sample circuit fail.

1.4.9 Input Voltage Fault

A) Input voltage out of range.

1.4.10 Input Frequency fault

A) Input frequency out of range

1.4.11 Input Sequence Fault

A) Input sequence is reversed

1.4.12 REC soft-start fault

A) After the REC soft-start step, the bus voltage can not reach the limited value.
Index 1: REC SCR fail.
Index 2: REC SCR driver fail.
Index 3: Bus voltage detects and sample fail.

1.4.13 REC IGBT over current

A) Big current flow through REC IGBT.
Index 1: REC IGBT fail.
Index 2: DC Bus shorted.
Index 3: REC IGBT driver fail.

1.4.14 REC over temperature

A) REC temperature out of the limited range.

1.4.15 Positive/Negative bus over voltage fault

A) Bus voltage over the up limited.

1.4.16 Fan fault

A) At least one of the fan fail.

1.4.17 Positive/Negative bus under voltage

A) Bus voltage out of the down limited.

1.4.18 Positive/Negative battery reversed

A) Battery connection reversed.

1.4.19 Positive/Negative charger voltage fault

A) Charger voltage out of the range limited.
Index I: Charger IGBT fail.
Index 2: Charger IGBT driver fail.
Index 3: Charger voltage detecting and sampling circuit fail.

1.4.20 Positive/Negative charger fault

A) During charging step (boost or float), the charger voltage out of the range limited.
Index I: Charger IGBT fail.
Index 2: Charger IGBT driver fail.
Index 3: Charger voltage detecting and sampling circuit fail.

1.4.21 Positive/Negative battery voltage low
A) Battery voltage is low (a little bigger than the EOD point).

1.4.22 Positive/Negative battery EOD
A) Battery voltage reaches the end of discharge point.

1.4.23 BYP sequence fault
A) BYP sequence reversed.

1.4.24 BYP voltage fault
A) BYP voltage out of the range limited.

1.4.25 BYP frequency over track range
A) BYP frequency out of the sync window.

1.4.26 Over load time out
A) INV over load time out.

1.4.27 Manual shutdown
A) Manual Off button is pressed to shutdown the PM.

1.4.28 INV protect.
A) INV detects power back feed to dc bus.
B) INV voltage out of range.
C) INV detects the bus voltage over the limited.

NOTES: INV protect fault is auto cleared.

1.4.29 Transfer times limit in one hour
A) Transfer to BYP times in one hour exceeds the limited.

1.4.30 INV power back feed
A) INV detects power back feed to dc bus.

1.4.31 INV over temperature fault

A) INV temperature out of the limited range.

1.4.32 INV IGBT over current

A) Big current flow through INV IGBT.
Index 1: INV IGBT fail.
Index 2: INV IGBT driver fail.

1.4.33 Over load

A) PM over load.

1.4.34 INV relay or fuse fault.

A) INV relay Fail
Index 1: relay can not be closed.
Index 2: relay can not be opened.
B) INV fuse fail.

1.4.35 Output shorted

A) Output shorted is detected.

1.4.36 Battery test Fail.

A) Battery test condition is not allowed.
Index 1: Battery capacity low than 25%.
Index 2: Battery voltage (cell) smaller than (float voltage (cell) – 0.1V).
Index 3: BYP is not qualified.
Index 4: At least one Alarm exists in the system.
B) Battery discharging time smaller than 20 Sec.

1.4.37 Battery maintenance Fail.

A) Battery test condition is not allowed.
Index 1: Battery capacity low than 25%.
Index 2: Battery voltage (cell) smaller than (float voltage (cell) – 0.1V).
Index 3: BYP is not qualified.
Index 4: At least one Alarm exists in the system.
B) The time lasted before battery voltage low is smaller than 20 Sec.

Part II: Cabinet

2.1 Maintenance CB Operation.

Step 1: Transfer system to BYP manually.

 → Input Level 2 Pwd → "Fnc Key" → Tran Byp

Step 2: Close Maintenance CB.

Step 3: Open Output and Input CB.
Step 4: Doing maintenance.
Step 5: After system is fixed, Close Output and Input CB.
Step 6: After BYP SCR is fired, Open Maintenance CB.
Step 7: System will works automatically.

2.2 Cabinet Failures Description.

2.2.1 On UPS Inhibited

A) System transfer to UPS is inhibited.

Index 1: BYP SCR shorted.
Index 2: System is in EPO.
Index 3: Maintenance CB is Closed.
Index 4: Manual transfer to BYP latched.
Index 5: Transfer times per hours Limited.
Index 6: Output load is more than the total capacitor of the ready INV.

2.2.1 BYP Fault

A) BYP SCR shorted.

Index 1: SCR fail.
Index 2: SCR driver fail.

B) BYP SCR opened.

Index 1: SCR fail.
Index 2: SCR driver lost.

Part III: LED INDEX

		OFF	FLASHING GREEN	CONSTANT GREEN	FLASHING RED	CONSTANT RED
Power Module	REC	REC not work	REC soft-start.	REC works normally.	Input is abnormal.	REC failure.
	INV	INV not work	INV soft-start or started but not supply.	INV is supplying.	INV is not allowed to start.	INV failure.
	BATT	BATT not work	BATT is discharging.	BATT is charging.	BATT voltage is low.	EOD, not connected or connected reversely.
Cabinet Monitor	STATUS	---	---	System is normal.		Alarm or failure exists.
	REC	REC of all PMs do not work.	At least one PM's REC soft-starts.	REC of all PMs work normally.	At least one PM detected input failure.	At least one PM's REC failure.
	BYP	BYP is OK, but not supply output.	---	BYP is normal and is supplying output.	BYP is abnormal or frequency is out of the trace range.	BYP Failure (SCR shorted or Open)
	INV	INV of all PMs do not work.	At least one PM's INV soft-start or started but not supply.	At least one PM's INV is supplying output and all INV are not failure.	At least one PM's INV is supplying output and some INV is failure.	None INV supplies output and at least one INV is failure.
	OUTPUT	Output None.	---	Output is normal	Output is in over load	Over load time out or output shorted and output lost.
	BATTERY	Battery not work	Battery is discharging.	Battery is charging.	BATT voltage is low.	EOD, not connected or connected reversely.