HOKKIM INTEGRATED AMF CONTROL BOARD MANUAL FOR MODELS: HAMF-8 AND HAMF-4

INTRODUCTION

Thank you for purchasing the Hokkim Integrated Automatic Mains Failure Control Board model HAMF-8 or HAMF-4. We shall strive to provide you with the best service in terms of technical support, stock and parts replacement. This manual should be read through before attempting to install the unit or replace faulty parts. A copy should be handed to the owner's maintenance team for future reference.

The design and development of the Hokkim Integrated AMF models comes from many years of studying the traditional AMF boards hard wired with relays and timers. The integrated AMF is based on traditional timers and relays and not on micro controllers. It is very flexible, comes with many features and easy to use. Due to our policy of continuous development, we welcome suggestions for improvements. Thus, there may be changes after this manual is printed. If in doubt, do not hesitate to call for our technical support.

PARTS IDENTIFICATION

Figures 1 & 3 show the top faces with labeling of Light Emitting Diode indicating lights and knob adjustments for the respective model. While figures 2 & 4 show the bottom base Printed Circuit Board with labeling of terminals and plug-in PCB cards. We will now identify each PCB card and familiarize you with the LED indicating lights and knob adjustments. Once familiarized, you will be able to follow the operation of the Integrated AMF and identify problems when they occur and replace the appropriate card.

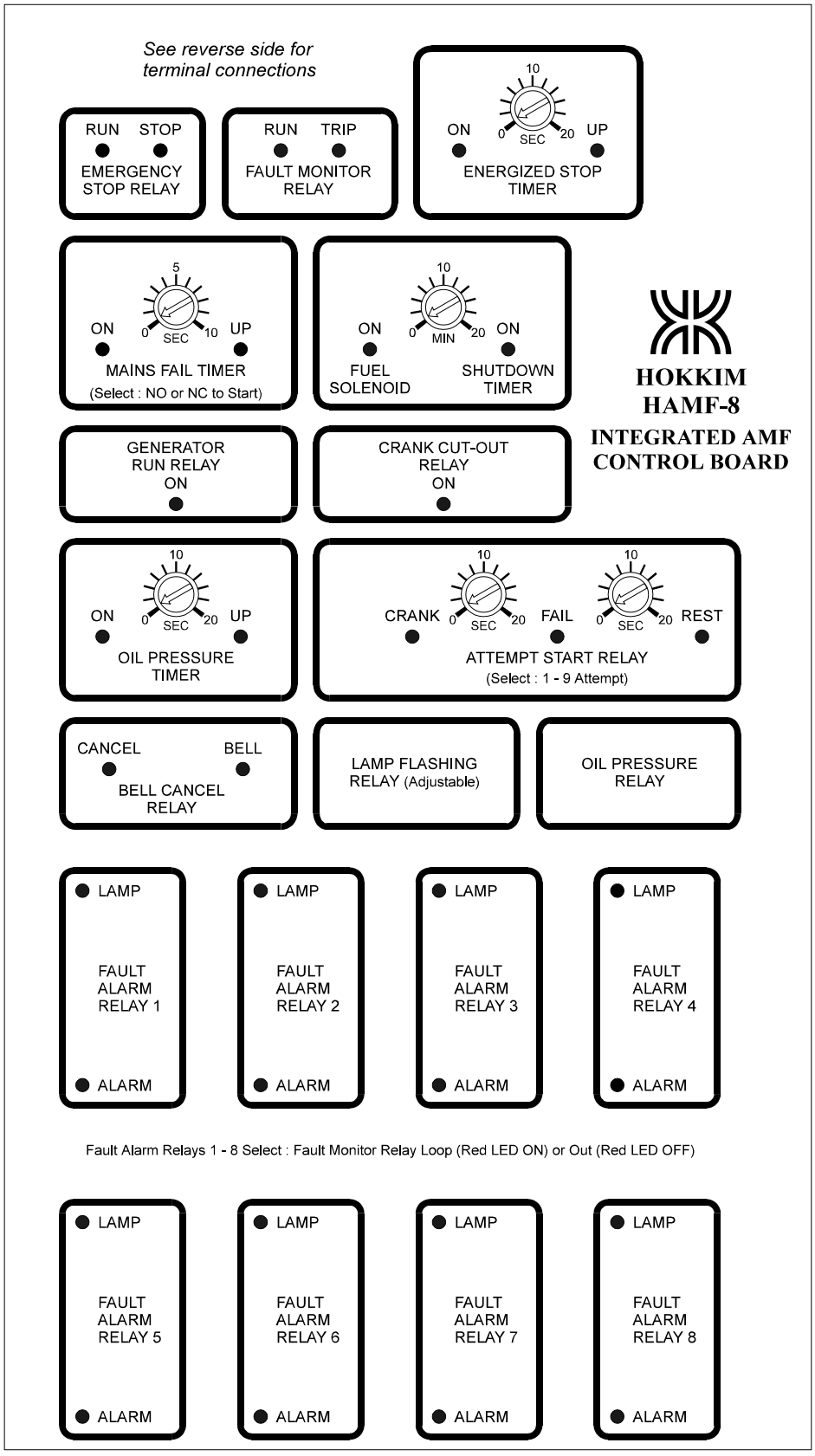
1) **ESR** - **E**mergency **S**top **R**elay.
   RUN (green) LED On - Relay energized to power the rest of the relay cards.
   STOP (red) LED On - Relay de-energized to cut power to the rest of the cards except the Energized Stop Timer.

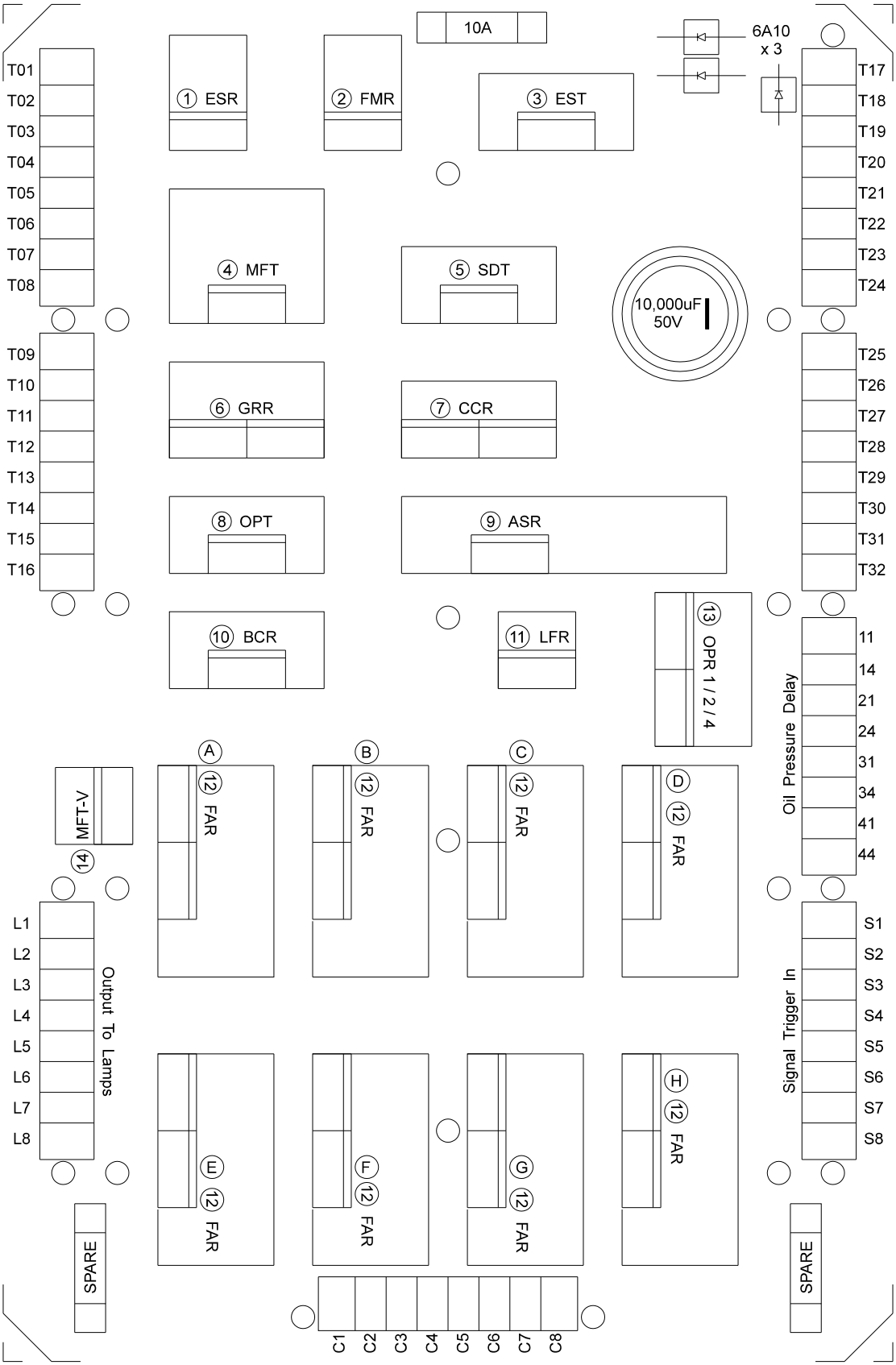
2) **FMR** - **F**ault **M**onitor **R**elay.
   RUN (green) LED On - No faults detected by the Fault Alarm Relays.
   TRIP (red) LED On - One or more faults detected. Generator Stopped.

3) **EST** - **E**nergized **S**top **T**imer
   ON (green) LED On - Energized stop relay and the delay timer activated.
   UP (amber) LED On - Time delay up and stop relay released.
   Time Adjustment - 0 to 20 Sec.

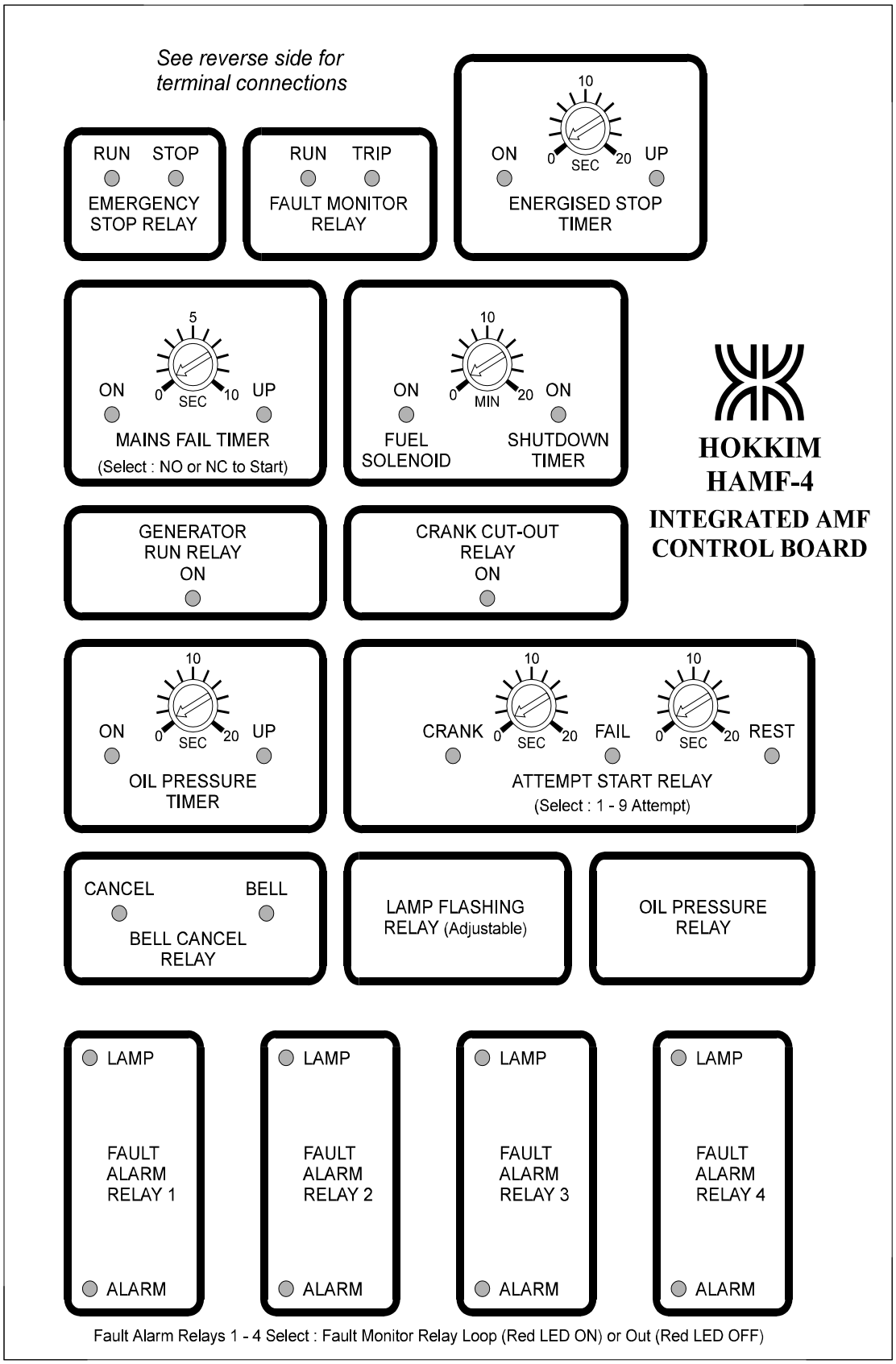
4) **MFT** - **M**ains **F**ail **T**imer
   ON (green) LED On - Mails failure detected and delay timer activated.
   UP (amber) LED On - Timer relay energized and start generator sequence activated.
   Time Adjustment - 0 to 10 Sec.
   Selection - Normally Open or Normally Close to run.

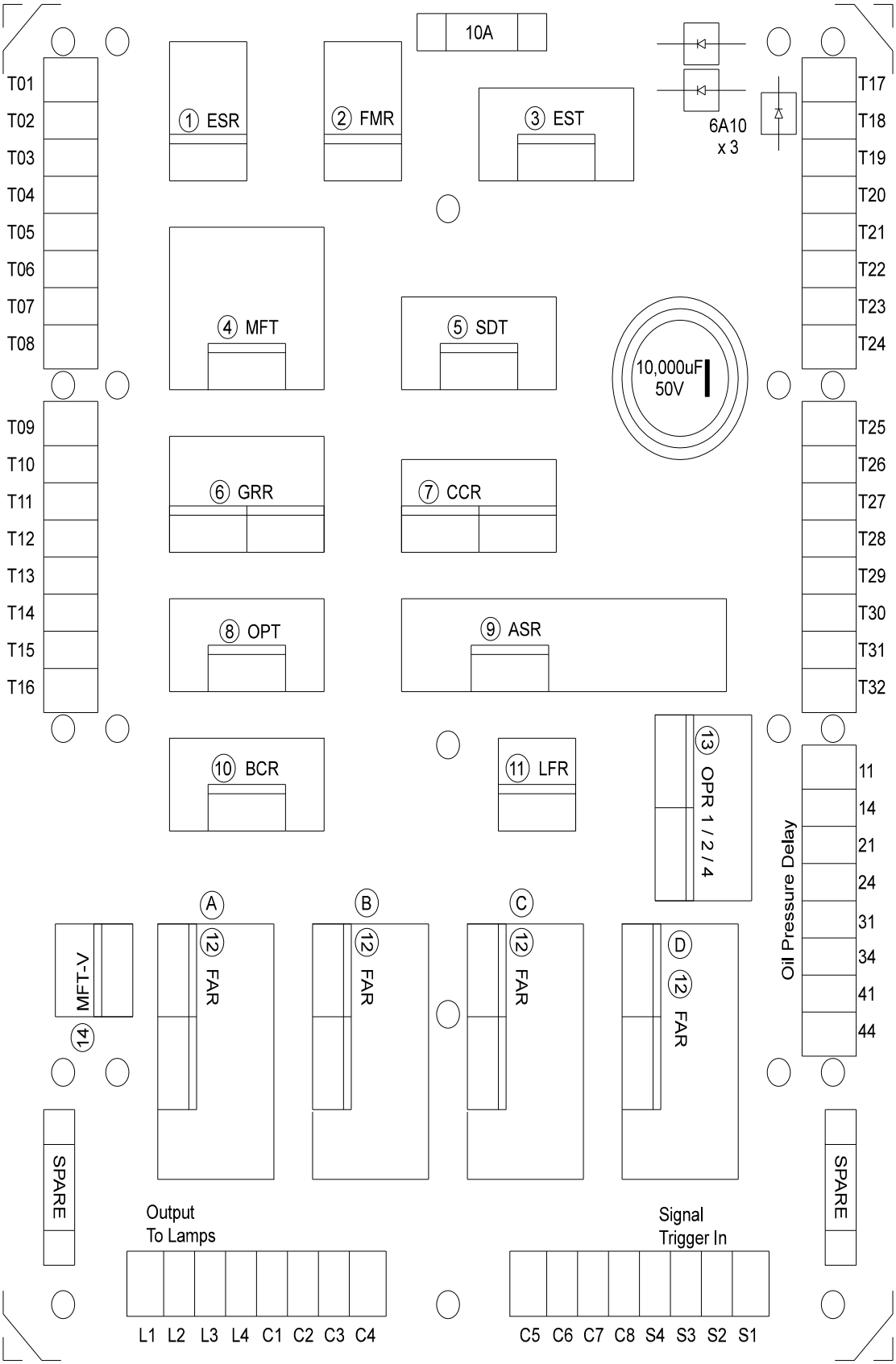
5) **SDT** - **S**hut **D**own **T**imer & Fuel Solenoid
   ON (green) LED On - Fuel solenoid relay activated.
   ON (green) LED On - Shut Down Timer activated and timer count down begins.
   Time Adjustment - 0 to 20 Min


See reverse side for terminal connections
RUN STOP
EMERGENCY STOP RELAY
RUN TRIP
FAULT MONITOR RELAY
10
ON 0 SEC 20 UP
ENERGIZED STOP TIMER
5
ON 0 SEC 10 UP
MAINS FAIL TIMER
(Select : NO or NC to Start)
10
ON 0 MIN 20 ON
FUEL SOLENOID
SHUTDOWN TIMER
HOKKIM
HAMF-8
INTEGRATED AMF CONTROL BOARD
GENERATOR RUN RELAY ON
CRANK CUT-OUT RELAY ON
10
ON 0 SEC 20 UP
OIL PRESSURE TIMER
10
CRANK 0 SEC 20
10
FAIL 0 SEC 20 REST
ATTEMPT START RELAY
(Select : 1 - 9 Attempt)
CANCEL BELL
BELL CANCEL RELAY
LAMP FLASHING RELAY (Adjustable)
OIL PRESSURE RELAY
LAMP
FAULT ALARM RELAY 1
ALARM
LAMP
FAULT ALARM RELAY 2
ALARM
LAMP
FAULT ALARM RELAY 3
ALARM
LAMP
FAULT ALARM RELAY 4
ALARM
Fault Alarm Relays 1 - 8 Select : Fault Monitor Relay Loop (Red LED ON) or Out (Red LED OFF)
LAMP
FAULT ALARM RELAY 5
ALARM
LAMP
FAULT ALARM RELAY 6
ALARM
LAMP
FAULT ALARM RELAY 7
ALARM
LAMP
FAULT ALARM RELAY 8
ALARM


T01
T02
T03
T04
T05
T06
T07
T08
T09
T10
T11
T12
T13
T14
T15
T16
T17
T18
T19
T20
T21
T22
T23
T24
T25
T26
T27
T28
T29
T30
T31
T32
10A
6A10
x 3
1 ESR
2 FMR
3 EST
4 MFT
5 SDT
10,000uF
50V
6 GRR
7 CCR
8 OPT
9 ASR
10 BCR
11 LFR
13 OPR 1 / 2 / 4
11
14
21
24
31
34
41
44
Oil Pressure Delay
A 12 FAR
B 12 FAR
C 12 FAR
D 12 FAR
MFT-V
14
L1
L2
L3
L4
L5
L6
L7
L8
Output To Lamps
S1
S2
S3
S4
S5
S6
S7
S8
Signal Trigger In
E 12 FAR
F 12 FAR
G 12 FAR
H 12 FAR
SPARE
SPARE
C1
C2
C3
C4
C5
C6
C7
C8

HOKKIM *Giving You Control* Control & Protection Relays




10A
6A10
x 3
T01
T02
T03
T04
T05
T06
T07
T08
T09
T10
T11
T12
T13
T14
T15
T16
T17
T18
T19
T20
T21
T22
T23
T24
T25
T26
T27
T28
T29
T30
T31
T32
① ESR
② FMR
③ EST
④ MFT
⑤ SDT
10,000uF
50V
⑥ GRR
⑦ CCR
⑧ OPT
⑨ ASR
⑩ BCR
⑪ LFR
⑬ OPR 1 / 2 / 4
11
14
21
24
31
34
41
44
Oil Pressure Delay
MFT-V
⑭
Ⓐ ⑫ FAR
Ⓑ ⑫ FAR
Ⓒ ⑫ FAR
Ⓓ ⑫ FAR
SPARE
SPARE
Output
To Lamps
L1 L2 L3 L4 C1 C2 C3 C4
Signal
Trigger In
C5 C6 C7 C8 S4 S3 S2 S1

6) **GRR - G**enerator **R**un **R**elay
ON (green) LED On - Generator output voltage is stable. Relay energized.

7) **CCR - C**rank **C**utout **R**elay
ON (Green) LED On - Crank cutout relay energized.

8) **OPT - O**il **P**ressure **T**imer
ON (green) LED On - Generator voltage stable and oil pressure timer activated.
UP (amber) LED On - Timer relay energized and oil pressure delay contacts closed.
Time Adjustment - 0 to 20 Sec.

9) **ASR - A**ttempt **S**tart **R**elay
CRANK (amber) LED On - Crank relay energized and output to external start relay.
Time Adjustment - 0 to 20 Sec.
REST (green) LED On - Crank relay de-energized, no output to external start relay.
Time Adjustment - 0 to 20 Sec.
FAIL (red) LED On - Fail to start relay energized and output to fault alarm relay.
Selection - 1 to 9 attempt.

10) **BCR - B**ell **C**ancel **R**elay
CANCEL (green) LED On - Bell cancel push-button pressed (close). Bell silenced.
BELL (amber) LED On - Bell relay energized and output to external bell.

11) **LFR - L**amp **F**lashing **R**elay
Flashes on-off the lamp output relay in the Fault Alarm Relay card.
Adjustment - Flashing rate from slow to fast and steady

.

12) **FAR - F**ault **A**larm **R**elay
LAMP (amber) LED On - Lamp relay energized and output to external lamp.
ALARM (red) LED On - Fault signal detected and alarm activated.
Selection - Loop to next FAR or Out to FMR.

13) **OPR - O**il **P**ressure **R**elay
Provides 4 nos. delay-on contacts, set by OPT, for fault alarm signals.

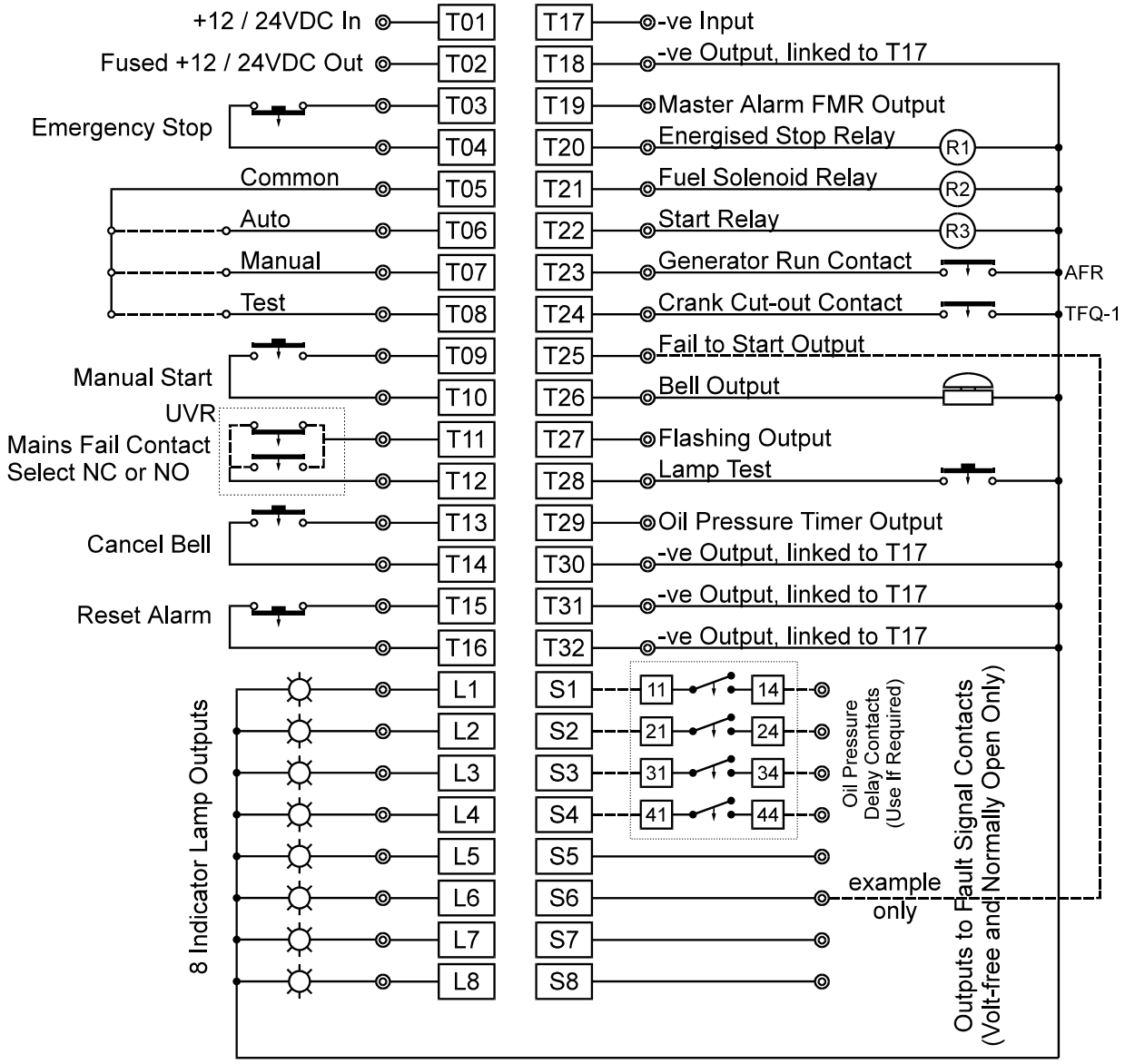
14) **MFT-V - M**ains **F**ail **T**imer - **V**aristor
Contains metal oxide varistors to absorb voltage surge, above 56VDC, at terminals T11 & T12.

15) **MAMF - AMF M**otherboard
Base printed circuit board for HAMF-8/4.

TERMINALS IDENTIFICATION

Now we will look at Figure 5 to identify the connection terminals located on the base PCB. These terminal connections shows you how to wired up the Integrated AMF to external relays, push buttons, selector switch, bell, fault signal input, etc. to complete the control board.
For easier identification, the terminals are broken into 5 sections, they are; T01 to T32, L1 to L8, S1 to S8, 11 to 44 and lastly, C1 to C8. A detailed description is given below:

HOKKIM HAMF-8 TERMINALS CONNECTION DIAGRAM
(For HAMF-4, omit L5-L8 & S5-S8)



Terminals for C1 C2 C3 C4 C5 C6 C7 C8 Alarm Extension

R1 R2 R3 R4 R5 R6 R7 R8

Fault Alarm Relay Extension Board FARX-8/4 or NFAR-1

TERMINALS T01 TO T32 - MAIN CONTROLS

T01 Positive supply (+12Vdc or +24Vdc) input direct from fuse or circuit breaker.

T02 Positive supply output protected by 10A fuse on base PCB. For use, if required.

T03 To Emergency Stop push-button (Normally Close).

T04 To Emergency Stop push-button (Normally Close).

T05 To Common terminal of Auto - Manual - Test selector switch.

T06 To Auto terminal of Auto - Manual - Test selector switch.

T07 To Manual terminal of Auto - Manual - Test selector switch.

T08 To Test terminal of Auto - Manual - Test selector switch.

T09 To Manual Start push-button (Normally Open).

T10 To Manual Start push-button (Normally Open).

T11 To Mains Fail contact (selectable Normally Open or Normally Close).

T12 To Mains Fail contact (selectable Normally Open or Normally Close).

T13 To Bell Cancel push-button (Normally Open).

T14 To Bell Cancel push-button (Normally Open).

T15 To Alarm Reset push-button (Normally Close).

T16 To Alarm Reset push-button (Normally Close).

T17 Negative (-) supply input from battery.

T18 Negative (-) supply output. Internally connected to T17.

T19 Positive (+) supply output when Fault Monitor Relay trips. For use as master alarm or in Building Automation System if required.

T20 Positive (+) supply output to external Energized Stop relay.

T21 Positive (+) supply output to external Fuel Solenoid Relay (Energized Run relay).

T22 Positive (+) supply output to external Start relay (Crank relay).

T23 To Generator Run contact (Normally Open). From external 240VAC **AFR** relay.

T24 To Crank Cutout contact (Normally Open). From external Speed Sensing Relay **TFQ-1**.

T25 Positive (+) supply output when Fail to Start relay (**ASR)** energized.

T26 Positive (+) supply output to Alarm Bell.

T27 Flashing (On - Off) positive (+) supply output. For use, if required.

T28 To Lamp Test push-button (Normally Open).

T29 Positive (+) supply output when Oil Pressure Delay timer Up. For use if additional contacts are required.

T30 Negative (-) supply output. Internally connected to T17.

T31 Negative (-) supply output. Internally connected to T17.

T32 Negative (-) supply output. Internally connected to T17.

TERMINALS L1 TO L8 - LAMP OUTPUTS

L1 To indicator lamp No. 1 (corresponding to **S1**).

L2 To indicator lamp No. 2 (corresponding to **S2**).

L3 To indicator lamp No. 3 (corresponding to **S3**).

L4 To indicator lamp No. 4 (corresponding to **S4**).

L5 To indicator lamp No. 5 (corresponding to **S5**).

L6 To indicator lamp No. 6 (corresponding to **S6**).

L7 To indicator lamp No. 7 (corresponding to **S7**).

L8 To indicator lamp No. 8 (corresponding to **S8**).

TERMINALS S1 TO S8 - FAULT SIGNAL INPUTS

S1 To volt-free fault signal contacts (Normally Open) No. 1. Close to +ve or -ve to trigger.

S2 To volt-free fault signal contacts (Normally Open) No. 2. Close to +ve or -ve to trigger.

S3 To volt-free fault signal contacts (Normally Open) No. 3. Close to +ve or -ve to trigger.

S4 To volt-free fault signal contacts (Normally Open) No. 4. Close to +ve or -ve to trigger.

S5 To volt-free fault signal contacts (Normally Open) No. 5. Close to +ve or -ve to trigger

S6 To volt-free fault signal contacts (Normally Open) No. 6. Close to +ve or -ve to trigger.

S7 To volt-free fault signal contacts (Normally Open) No. 7. Close to +ve or -ve to trigger.

S8 To volt-free fault signal contacts (Normally Open) No. 8. Close to +ve or -ve to trigger.

TERMINALS 11 TO 44 - DELAY CLOSE CONTACTS

11 Oil Pressure Delay contacts (Normally Open) No. 1.

14 Oil Pressure Delay contacts (Normally Open) No. 1.

21 Oil Pressure Delay contacts (Normally Open) No. 2.

24 Oil Pressure Delay contacts (Normally Open) No. 2.

31 Oil Pressure Delay contacts (Normally Open) No. 3.

34 Oil Pressure Delay contacts (Normally Open) No. 3.

41 Oil Pressure Delay contacts (Normally Open) No. 4.

44 Oil Pressure Delay contacts (Normally Open) No. 4.

NOTE: You can have options of 1, 2 or 4 oil pressure delay contacts.

TERMINALS C1 TO C8 - ALARM EXTENSION

C1 To Extension Fault Alarm Relay Board **FARX** terminal **R1**. For use, if required.

C2 To Extension Fault Alarm Relay Board **FARX** terminal **R2**. For use, if required.

C3 To Extension Fault Alarm Relay Board **FARX** terminal **R3**. For use, if required.

C4 To Extension Fault Alarm Relay Board **FARX** terminal **R4**. For use, if required.

C5 To Extension Fault Alarm Relay Board **FARX** terminal **R5**. For use, if required.

C6 To Extension Fault Alarm Relay Board **FARX** terminal **R6**. For use, if required.

C7 To Extension Fault Alarm Relay Board **FARX** terminal **R7**. For use, if required.

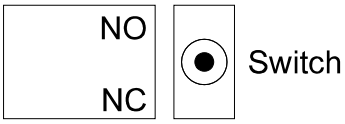
C8 To Extension Fault Alarm Relay Board **FARX** terminal **R8**. For use, if required.

Note: There are three types of alarm extension available. 1) **NFAR-1** for single alarm.
2) **FARX-4** for four alarms.
3) **FARX-8** for eight alarms

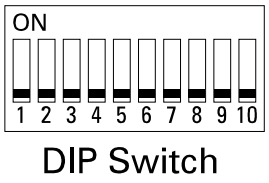
HOKKIM *Giving You Control* Control & Protection Relays

PREPARATIONS BEFORE WIRING

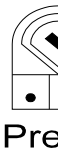
There are certain parameters to be set in the HAMF-8/4. It is easier to do so before wiring up the unit because of accessibility. They are as follows:-



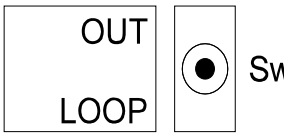
1) **Mains Fail Timer** In addition to the time delay adjustment at the top, the MFT allows you to choose between Normally Open or Normally Close contacts to start the generator. Look at the left hand side of the MFT and you will see a switch. It is labeled NO and NC (see diagram). Select as required.



2) **Attempt Start Relay** The ASR allows you to select the number of attempts the relay makes before sending a fail to start signal to the fault alarm relay. Look at the right hand side of the relay. You will see the 10-way DIP switch (see diagram). To select the number of attempt required, push one of the switch to the ON position. Note: switch No.10 gives the same number of attempts as No. 9. If non of the switch is selected, the relay will attempt start continuously. Do **NOT** push on more than one switch



3) **Lamp Flashing Relay** The LFR is factory set at a rate of 90 cycle per minute. If another rate of flashing is preferred, it can be adjusted to a faster rate by turning the Preset anti-clockwise and vice versa. The Preset is located on the left hand side of the relay (see diagram). To adjust it you need a slim and long insulated screw driver.



4) **Fault Alarm Relay** There are certain fault signals that do not require shut-down of the generator. Examples are: Low Fuel or Charger Fail. The FAR allows you to set these parameters. There is a switch at the bottom corner labeled Loop and Out (see diagram). The FARs should all be set to Loop until the last one which should be set to Out to the Fault Monitor Relay.

Example 1: All faults require shut-down of generator. Set FAR No.1 to No.7 to Loop and No.8 to Out. All the red LEDs in the FAR card are on.

Example 2: Two faults does not require shut-down of generator. Set FAR No. 1 to No. 5 to Loop and No. 6 to Out. The setting of No.7 and No. 8 do not matter as they are disabled and will not effect shut-down. Notice that the red LEDs in the FAR cards No.7 and No.8 are off. The same rule follows if an **FARX** extension is added. Any FAR that comes after the one that is set to Out is disabled. At least one FAR has to be set to Out or the FMR will not energize (Trip).

INSTALLATION AND WIRING

The HAMF-8/4 has a metal base plate with mounting holes in each corner. Place the unit onto your switchboard panel and mark the holes. Drill and tap accordingly. After cleaning, mount the unit with appropriate screws and washers. Commence wiring by referring to Fig. 5. If possible, label the wires according to the terminal markings. This allows for easier trouble shooting. Some of the terminations will not be required as the unit allows for various possibilities. Do Not over tighten the terminal screws, if you damage the terminal, the unit has to be send back to our factory for parts replacement. The base PCB does not have user replaceable parts except the 10A glass fuse.

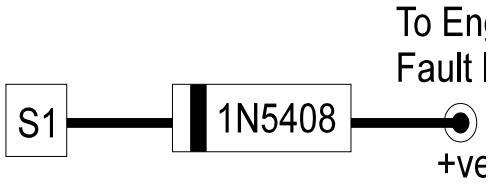
TESTING

After completing the wiring, use a continuity tester to check that the wiring are properly done and the unit is ready for testing. It should be noted that the HAMF-8 / 4 is only designed for 12VDC or 24VDC. Do Not feed 240VAC mains supply into any part of the unit as it will definitely be damaged. Make sure the +ve output to relays, push buttons, selector switch, bell or lamps is not shorted to ground or the 10A fuse will blow. As the testing process is long, it is broken into steps, at any time feel free to repeat the steps, as follows:

1) Check Voltage
   Check the charger and battery voltage. It should be around 27VDC or 13.5VDC depending on the battery type used.

2) Switch On
   Switch On the circuit breaker. Notice that the ESR Run, FMR Run and EST On LED are lighted. At the same time the Energize Stop Relay should be engaged. After the set delay, the EST Up LED is lighted and the Energize Stop Relay is released. Check the voltage across terminal T01 & T17 it should be same as the battery. Then check the voltage across terminal T17 & S1 - S8 it should be one half (1/2) the battery voltage.

3) Fault Stimulation
   Using a short wire with both ends strip of insulation, short the fault signal input to either +ve or -ve as desired starting from No. 1 to 8. It should be noted that fault signal which is loop through the OPR contacts cannot be triggered externally. When one or more fault is triggered, the following should happen: The FMR will trip (this is only true if the fault Loop/Out has not been disabled). The Bell LED will light and external bell ring. The corresponding Lamp LED will flash together with the external lamp. The corresponding Alarm LED will light.



   Note: It has come to our attention that certain Caterpillar or Cummins engines which give a +ve fault signal are sensitive to the one half (1/2) supply voltage at the fault input S1 - S8. A reverse blocking diode (1N5408) is required to prevent false triggering. See diagram for connection

4) Flashing Rate
   The rate of lamp flashing can be adjusted. Turn the Preset on the LFR card clockwise and the rate is slower. Anti-clockwise and the rate is faster. Fully anti-clockwise and the lamp is steady On. Use a slim and long insulated screw driver.

5) Bell Cancel
   Press the Alarm Cancel button and notice that the Cancel LED will light. At the same time the external bell is silenced and the Bell LED no longer lighted. All corresponding Lamp LEDs and external lamps remained steady On.

6) Alarm Reset
   Press the Reset button and notice the Lamp and Alarm LED goes off. In case the external fault is still present the fault alarm is re-triggered as in step 3.

7) Auto Start

Set the Auto-Manual-Test selector to the Auto position. Open or close the Mains Fail Contact (depending on your selection). Immediately the MFT On LED will light. After the set time delay, the following will happen simultaneously: a) The EST On and Up LED will go off. b) The Fuel Solenoid On LED will light and external fuel solenoid will energize. c) The ASR begins the Crank and Rest cycles. Each time the Crank LED is lighted the external start relay is energize. Set the Crank and Rest timer as required.

8) Fail To Start

In step No.7 do not allow the generator to run. That is, neither the GRR or CCR should on. Depending on your selection, the fail to start alarm will be triggered after the set number of attempts. Cancel and reset the alarm.

9) Generator Run

After the alarm has been reset the MFT will on again and attempt start the generator. This time switched on the CCR followed by the GRR. Once the CCR is on, the ASR is disabled and once the GRR is on the OPT is also on. After the set time delay the OPT up LED will light. This is the stage the generator is in operation and external fault sensors that was loop through the OPR can be tested.

The GRR contact is taken from an external 240VAC relay usually called the AFR (AC Fail Relay) connected to the generator incoming bus. The CCR contact is taken from the Speed Sensing Relay e.g. Hokkim TFQ-1 / M which is DC operated and speed sensing signal taken from the charger alternator or magnetic pickup. The CCR is for additional safety and sometimes is not used.

10) OPR Fault Simulation

Repeat steps 3, 5 & 6 with fault inputs loop through the OPR 11-14, 21-24, 31-34 & 41-44 contacts. Fault can only be stimulated after the OPT is up and OPR energized. It can be noted that each time a fault is stimulated the FMR trips , cutting supply to MFT, SDT, GRR, CCR, OPT & OPR. The EST will on and after the set delay, up and releases the external stop solenoid. When the stimulated fault is reset, the cycle will repeat with the MFT on etc. Remember, when shut down occurs, the GRR and CCR should open. Complete the cycle up to the generator in operation before triggering the next fault.

11) Automatic Shutdown

Repeat step 9 until the generator is in operation. In normal circumstances, fault does not occur as in step 10. What will happen is that the Utilities Supply (TNB) will return. When this happen, the HAMF-8 / 4 will go into the shutdown mode. To test this, set the Mains Fail Contact to the original position. The MFT On LED will be off and the shutdown timer On LED will light but nothing else seems to happen. Wait until the set time delay of the SDT and the following will occur. The fuel solenoid will be cut and EST on. Most probably you only use either one of them. If you bypass the GRR and CCR on for testing purpose, you should now off them. This will complete the auto shutdown.

12) Emergency Stop
Along various stages of testing you can test emergency stop by pressing the Emergency Stop button. In all cases you can see that all relay cards are disabled except the EST. In an emergency situation the EST is required to shutdown the generator (only if your system is energized stop).

13) Manual Start
Set the Auto-Manual-Test selector to the Manual position. Nothing will happen until you press the Manual Start pushbutton. Then, the fuel solenoid will on and EST off. The Start relay will respond each time you press the button. Bypass on the CCR and GRR relay and the Manual Start pushbutton is disabled. The OPT will on and up the OPR and the generator is in operation. To stop the generator you either turn the selector to Auto for automatic shutdown or press the Emergency Stop pushbutton.

14) Test Start
Set the Auto-Manual-Test selector to the Test position. Immediately the ASR will begin the Crank and Rest cycle. The fuel solenoid will on and the EST will off. Bypass on the CCR and GRR. The OPT will on and up the OPR and the generator is in operation. To stop the generator you either turn the selector to Auto for automatic shutdown or press the Emergency Stop pushbutton.

15) Optional Outputs
There are a few outputs not mentioned in the testing procedure above. They are the FMR output, Flashing output, Oil Pressure Timer output and Fused +ve out. If you are using any of those optional outputs, test that they are in working order.
You can add a relay to the FMR output and use the contacts for remote signaling to the BAS (Building Automation System) or the guard house to warn that the gen-set has failed. Take note that the FMR does not give an output for FAR cards that is set for no shut down.
By adding a relay to the flashing output, you can series the NO contacts with the bell thus causing it to ring on and off.
Four nos. OPR contacts are provided, but if they are insufficient, you can add a relay to the Oil Pressure Timer output for additional contacts.
You can use the Fused +ve out terminal (T02) as a power source for additional controls if needed. It is protected by the 10A fuse on the base PCB.

TROUBLE SHOOTING

The HAMF-8 / 4 is designed in such a way that parts replacement are easy and of minimal costs in comparison to the cost of the whole unit. There are 21 / 16 plug-in relay cards of only 13 different types. ESR and FMR are the same while there are 8 / 4 nos. of FAR. The only electronic components on the base PCB are 3 nos. 6A 1000V rectifier diodes. Their function is to blow the fuse in case of reverse polarity connection of the input supply. They also help to absorb feedback from inductive load which may be harmful to some of the relay cards. Lastly, they block the energy stored in the 10,000uF 50V capacitor, from flowing out when there is a sudden drop in voltage while the Start Relay is being cranked.

Before we continue further, there is one thing you should take note.
The most expensive and difficult to replace part of the HAMF-8/4 is the base PCB.
Therefore, care should be taken, to ensure it does not get damaged. Here are few pointers:

1) Only replace with correct amperage fuse i.e. 10Amps. Two spare fuses are provided. Even though the base PCB track width is 3 times (3mm) the relay cards track width (1mm), the high energy of a battery can damage it, if not protected by a fuse.

2) Do not allow small metal parts like screws, washers etc. to fall in between the base PCB and metal panel. The reason is obvious.

3) Do not over tighten the terminal screw even though there is a shield to protect the wires from the screw. Test your connection by slightly tugging the wire.

4) Use a screw driver of correct size. Over size drivers will damage the terminals.

5) Double check your wiring with a meter to ensure that +ve outputs are not shorted to ground.

6) When removing or replacing the relay cards, do not over stress the plug-in connectors, by bending excessively.

7) After replacing a relay card, check that it is done properly. There are no guides on both ends of the connectors, it is easy to miss one or two connections to the left or right. See that the relay card is in line with the legend on the base PCB.

8) The MFT-V has to be replaced after it absorbs any voltage surge. Its rating is 56VDC. Any voltage higher then that across terminals T11 & T12 will cause the metal oxide varistors to activate. Usually this happens when lightning strike the Under Voltage Relay and cause a flash over to its relay contacts.

After taking care that the base PCB is not damaged, trouble shooting the HAMF-8 / 4 is easy, in the worse scenario, all you have to do is to replace all the 21 / 16 relay cards, which takes less then 10 minutes. To replace any relay card, you have to remove the six knobs and six mounting screws of the top face label plate. After replacing the suspected faulty relay card; test that the unit is working before replacing the top face label plate. You have to align all the LEDs to their appropriate holes before fixing the mounting screws and knobs.

You should use logic to deduce which relay card is faulty by looking at the LED and testing the outputs with external wires removed if necessary. This is to eliminate faults caused by external sources. It is impossible to list all possibilities of fault symptoms and their causes but you can contact us for assistance or demonstration of our demo. unit at these numbers: Tel: **03-90 805 498**, **03-90 805 630**, **90 805 992**, **90 801 192** and Fax: **03-90 851 191**.