HOKKIM AUTO-START CONTROL BOARD MANUAL FOR MODEL HAS-CB

INTRODUCTION

Thank you for purchasing the Hokkim Auto-Start Control Board model HAS-CB. We will do our utmost 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 this Hokkim Auto-Start model is to compliment our Integrated AMF models. It is much more compact and suitable for smaller generator. It comes mounted on a epoxy coated metal plate as standard or you can request for polycarbonate casing with IP65. Due to our policy of continuous development, we welcome suggestions for improvements. Thus, there may be changes after this manual is produced. If in doubt, do not hesitate to call for our technical support or information on our latest models like the Integrated AMF HAMF-8 / 4.

PARTS IDENTIFICATION

Figure 1 shows the top face with labeling of Light Emitting Diode indicating lights and knob adjustment. While figure 3 shows 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 Auto-Start and identify problems when they occur and replace the appropriate card.

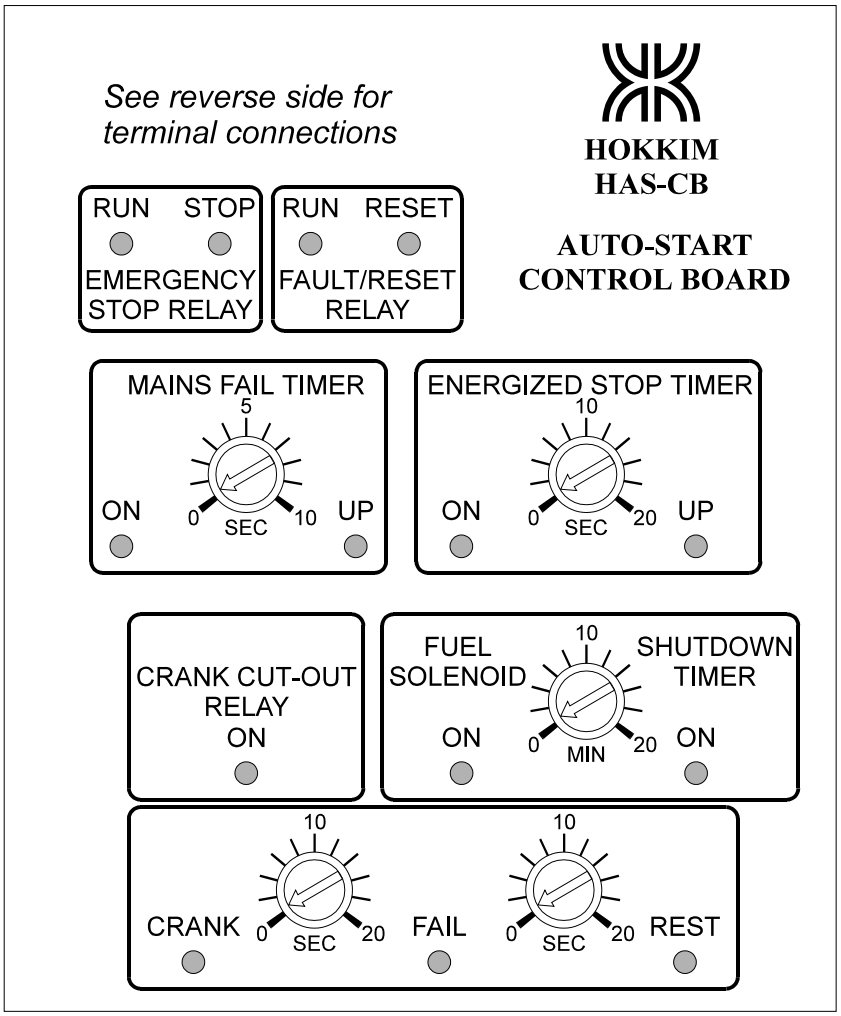
1) **ESR** - **E**mergency **S**top **R**elay.
   RUN (green) LED On - Relay energized to power the rest of the relay cards.
   STOP (red) LED On - Relay de-energized to cut power to the rest of the cards except the Energized Stop Timer.

2) **FSR** - **F**ault / **R**eset **R**elay.
   RUN (green) LED On - No faults detected at the Fault Input T10.
   Both LED Off - Fault at Input has not clear and cannot be reset.
   RESET (red) LED On - Fault at Input has cleared and can be reset.

3) **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.

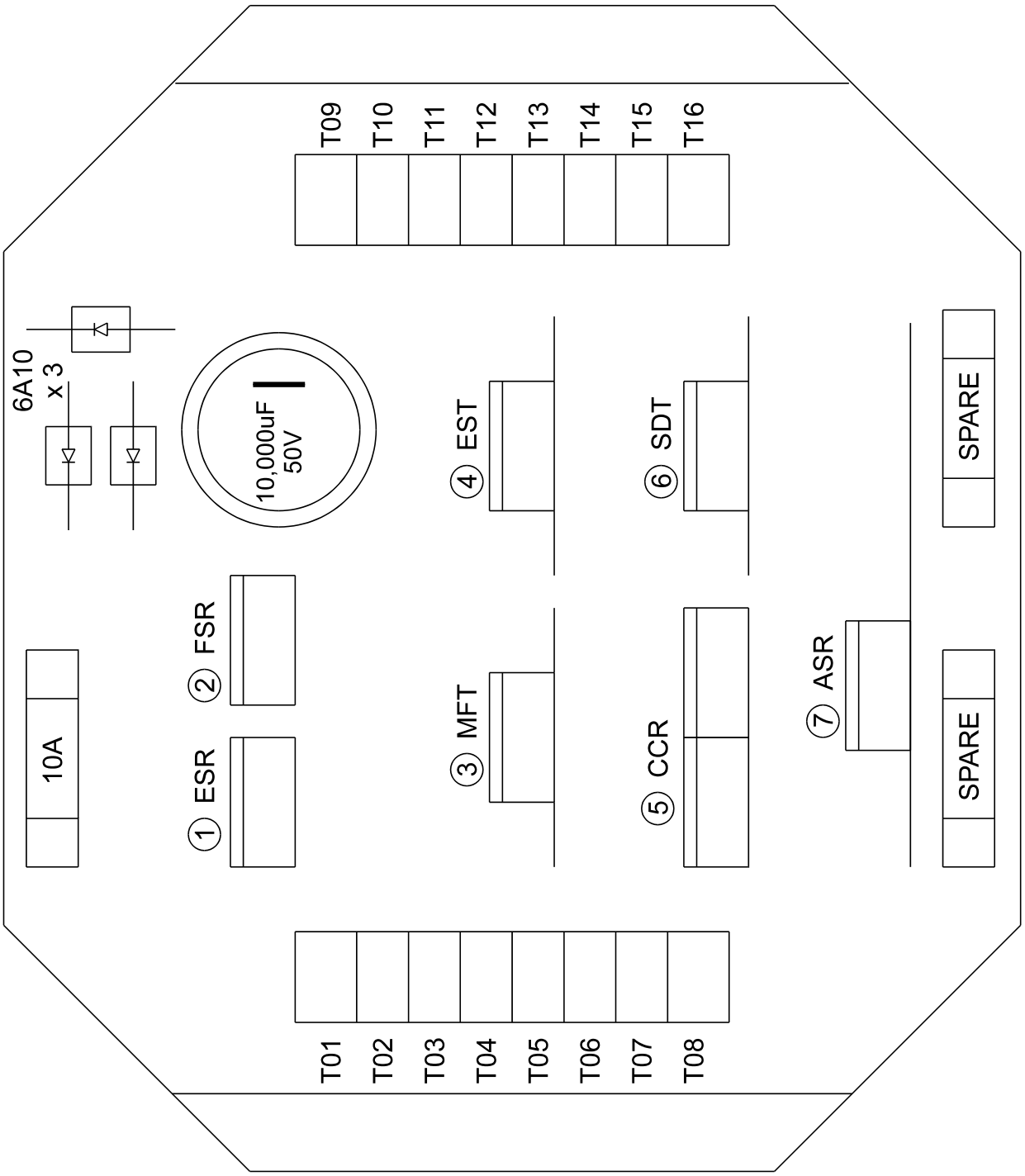
4) **EST** - **E**nergized **S**top **T**imer
   ON (green) LED On - Energized stop relay and the delay timer activated.
   UP (amber) LED On - Time delay up and stop relay released.
   Time Adjustment - 0 to 20 Sec.

5) **CCR** - **C**rank **C**utout **R**elay
   ON (Green) LED On - Crank cutout relay energized by closing of external AFR contact.



6) **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.

7) **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.


T09
T10
T11
T12
T13
T14
T15
T16
6A10
x 3
10,000uF
50V
④ EST
⑥ SDT
SPARE
② FSR
③ MFT
⑤ CCR
⑦ ASR
10A
① ESR
SPARE
T01
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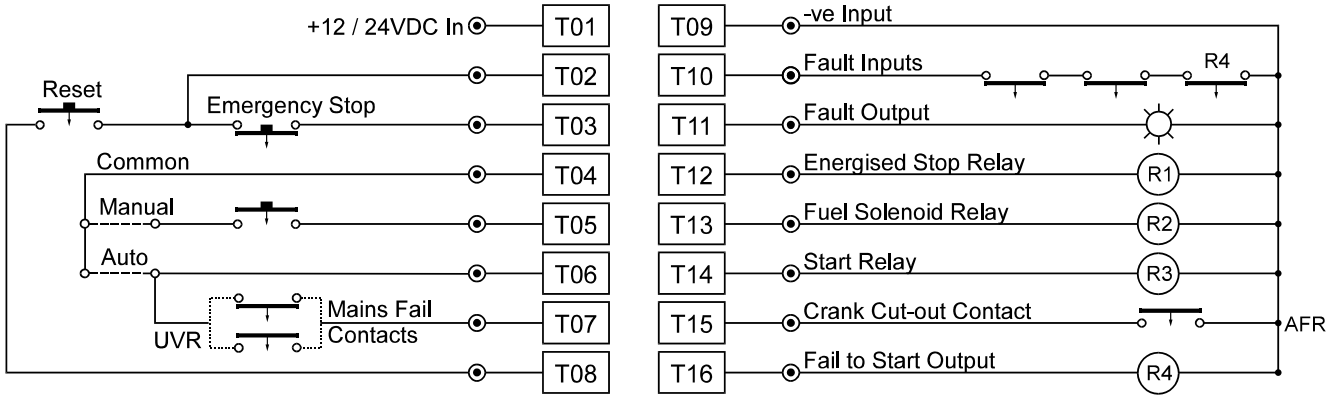

Figure 3

TERMINALS IDENTIFICATION

Now we will look at Figure 3 to identify the connection terminals located on the base PCB. These terminal connections shows you how to wired up the Auto-Start to external relays, push buttons, selector switch, fault signal input, etc. to complete the control board. A detailed description is given below:

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

T02 To Emergency Stop push-button (NC) and Reset push-button (NO).

T03 To Emergency Stop push-button (NC).

T04 To Common terminal of Manual - Auto selector switch.

T05 To Manual terminal of Manual - Auto selector switch via a Manual push-button (NO)

T06 To Auto terminal of Manual - Auto selector switch and Mains Fail Contact (NO or NC).

T08 To Reset push-button (NO).

T09 Negative (-) supply input from battery.

T10 To fault input/s (NC) to ground.

T11 Positive (+) supply output when Fault Reset Relay de-energized. For use as master alarm or in Building Automation System if required.

T12 Positive (+) supply output to external Energized Stop relay.

T13 Positive (+) supply output to external Fuel Solenoid Relay (Energized Run relay).

T14 Positive (+) supply output to external Start relay (Crank relay).

T15 To Crank Cutout contact (NO). From external AC Fail Relay (**AFR**) 240VAC.

T16 Positive (+) supply output when Fail to Start relay (**ASR)** energized.

PREPARATIONS BEFORE WIRING

There are certain parameters to be set in the HAS-CB. 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 toggle switch handle. 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 then one switch.

INSTALLATION AND WIRING

The HAS-CB comes in either a polycarbonate casing IP65 or a epoxy coated 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 Figure 3. 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. 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 HAS-CB 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, 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, FSR Reset 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 & T09 it should be same as the battery. Press the Reset push-button and the FSR Reset LED goes Off and Run LED comes On. The unit is ready on stand by.

3) Fault Stimulation.

Remove the wire connected to T10 to stimulate fault and notice the fault output indicating lamp/relay will on. The FSR Run LED will off. Press the Reset push-button and nothing will happen because the fault is still there. Connect back the wire to T10 and the Reset LED of the FSR will light. It shows that the faulthas cleared and can be reset. Press the Reset push-button and the FSR Reset LED goes off and Run LED comes on. The unit is ready on stand by.

4) Auto Start

Set the Auto-Manual 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.

5) Fail To Start

In step No. 4 do not allow the generator to run. That is, the CCR input contact AFR should not close. Depending on your selection, the fail to start alarm will be triggered after the set no. of attempts. If you have wired according to figure 3, R4 will energize and produce a fault signal at T10. Refer to step No. 3.

6) Generator Run

After the fault has been reset, the MFT will On again and attempt start the generator. This time, switch on the CCR contact. Once the CCR is on, the ASR is disabled. This is the stage the generator is in operation. The CCR contact is taken from an external 240VAC relay usually called the AFR (AC Fail Relay) connected to the generator incoming bus-bars.

7) Automatic Shutdown

Repeat step 6 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 HAS-CB 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 CCR contact on for testing purpose, you should now off it. This will complete the auto shutdown.

8) 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).

9) Manual Start

Set the Auto-Manual selector to the Manual position. Nothing will happen until you press the Manual Start push button. 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 the Manual Start push button is disabled. The generator is now in operation. To stop the generator you either turn the selector to Auto for automatic shutdown or press the Emergency Stop push button.

10) Fault Output

You can add a relay at the Fault output and use the contacts for remote signaling to the BAS (Building Automation System) or the guard house to warn that the generator has failed or start the standby generator.

TROUBLE SHOOTING

The HAS-CB is designed in such a way that parts replacement is easy and of minimal cost compared to the whole unit. There are only 7 plug-in relay cards. The only electronic component on the base PCB is 3 nos. 6A 1000V rectifier diode. 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 card. 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 HAS-CB is the base PCB. Therefore, care should be taken, to ensure it does not get damaged. Here are a 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 is 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.

After taking care that the base PCB is not damaged, trouble shooting the HAS-CB is easy, the worse you could do is replace all the 7 relay cards, which only takes less then 5 minutes. To replace any relay card, you have to remove the five knobs and four mounting screws of the top face label plate. Replace 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**.