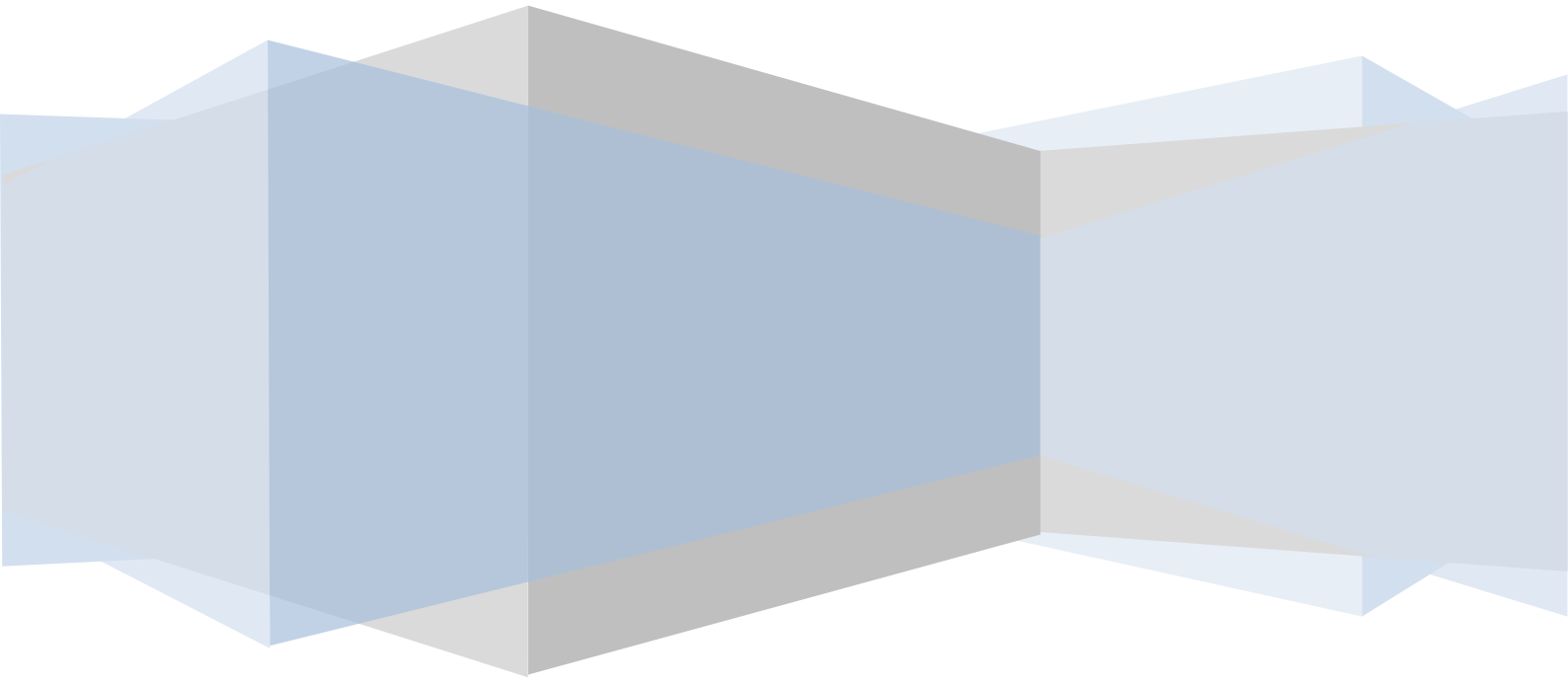
MSB and AMF Board - General Description and Operation Manual



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Main Switch Board

General Description

The Main Switch Board (MSB) receives supply from 2 sources. The main supply source is from SESCO. The backup supply source is from the generator.

The soruce is automatically selected by the Change Over Contactor. SESCO supply has priority over generator supply. When SESCO supply is unavailable and generator has started, the change over contactor will change over to the generator supply. Once SESCO supply has been restored, the change over contactor will change back to SESCO supply.

The delay duration for the changeover is 6 seconds. The durataion can be adjusted via timers at the change over contactor compartment.

Earth Fault and Overcurrent protection relays are installed for the Mains Incoming and Generator Incoming. If an earth fault or overcurrent condition occurs, the protection relays will trip the ACBs/MCCBs.

A digital power meter (DPM) is installed to monitor the main incoming supply and outgoing supply. The DPM provides power quality readings for operators.

A surge arrestor is installed at the MSB. The surge arrestor functions to divert lightning surge current to the ground to prevent voltage spikes that may damage equipment. The surge arrestor is protected by 3-phase fuses.

The MSB has several outgoing MCCBs supplying to different equipment/loads. The MCCBs are equiped with thermal magnetic tripping units. Any overload or short at the equipement or load will cause the MCCB to trip.

A capacitor bank is installed at the MSB to prevent low power factor condition. The capacitor bank is controlled by a Power Factor Regulator (PFR). The PFR will determine how many steps of capacitor bank to switch on, depending on the power factor at that time.

Operating Instructions for Main Switch Board

Air Circuit Breaker (ACB)

To turn on the ACB, make sure that the closing spring is charged. To charge the closing spring, pump the spring charging handle until the indication shows that the spring is charged. The press the “ON” button to turn on the ACB.

To turn off the ACB, press the “OFF” button.

To withdraw the ACB from its cradle, remove the ACB handle from its storage position. Position it on the cranking slot, press the unlock button and start turning the handle anti-clockwise. The indicator will show when the ACB has been disconnected. Once disconnected, the ACB can be racked out and removed.

To reinstall the ACB, push the ACB into the cradle and turn the handle clockwise. The indicator will show when the ACB has been connected. A resistance can also be felt at the cranking handle when the ACB has been fully racked in.

Moulded Case Circuit Breaker (MCCB)

To turn on the MCCB, push the operating handle upwards. To turn off the MCCB, pull the operating handle downwards.

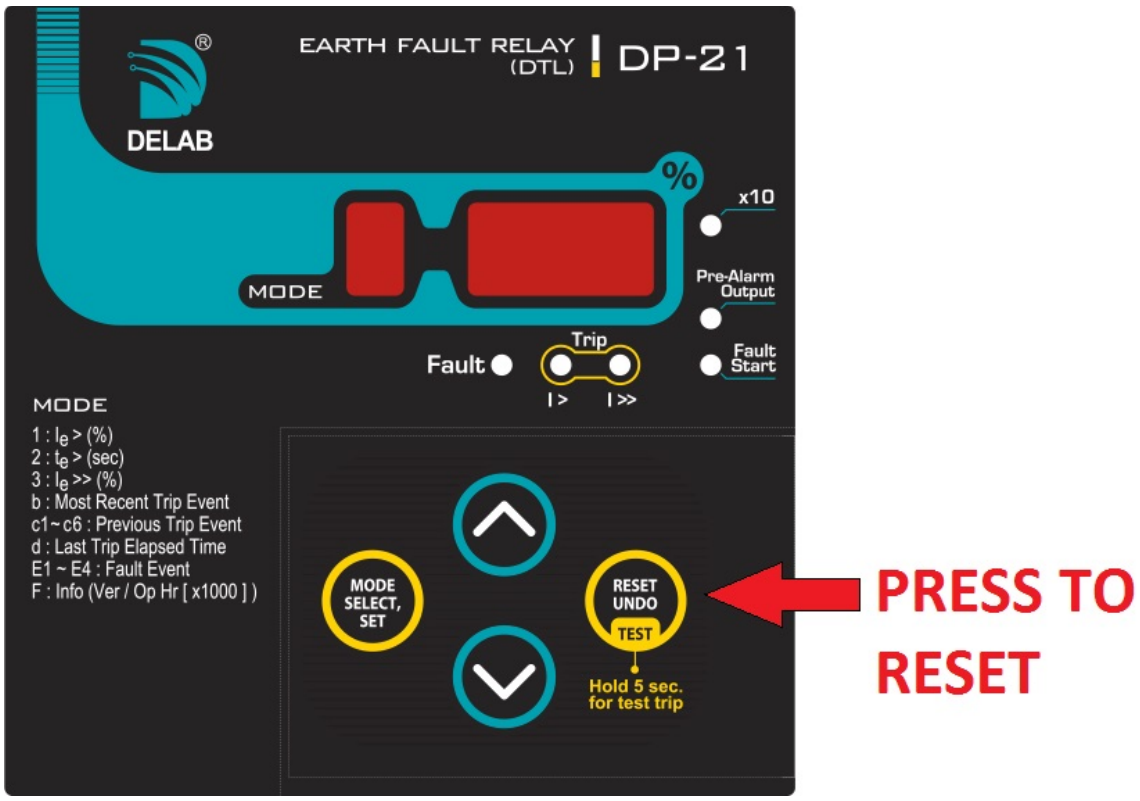
If the MCCB has tripped, the operating handle will be in the middle position. Investigate the cause of the trip before turning it back on.

To turn the MCCB back on, pull the operating handle downwards first, then push it upwards.

Protection Relays

The protection relays will have a red indicator showing that it has tripped. Investigate the cause of the trip before resetting it.

To reset the protection relays, press the “Reset” button on the protection relay.



Change over contactor (manual mode override)

The change over contactor usually operates in the automatic mode. In case the automatic controls are defective, the change over contactor can be operated in the manual mode.

Before operating in the manual mode, disconnect the supply to the change over contactor by removing the control fuses at the change over compartment.

Insert the manual operating handle into the change over contactor. Position the handle to the desired position (SESCO or Generator).

After the change over contactor has been positioned, remove the manual operating handle.

Capacitor Bank

Ensure that the MCCB to the Capacitor Bank is turned on. Ensure that the Power Factor Regulator is in “Auto” mode. Ensure that the MCCBs for individual capacitors are turned on.

For more information, please refer to the Delab NV-6s Power Factor Regulator User Manual.

Digital Power Meter

Use the arrow keys to view monitored parameters.

For more information, please refer to the DPM User Manual.

Lightning Surge Arrestors

The surge arrestors should be periodically checked to ensure they are in good condition. The surge arrestor is in good condition if the indicators are GREEN. The surge arrestors will need to be replaced when the indicators turn RED.

MSB Operation (Sesco Available):

1. Ensure **Incoming ACB/MCCB** is turned on.
2. Ensure all 3 phase indicator lights are on.
3. A green “AUX” light should be lit on both E/F and O/C.
4. 4P Auto Change-Over Contactor Compartment **GREEN SESCO light** will turn on.
5. Ensure Essential Incoming ACB/MCCB is turned on.
6. Turn on the other relevant MCCBs as required.

MSB Operation (Power Failure):

1. 4P Auto Change-Over Contactor Compartment **RED GENSET light** will turn on after the Genset auto-starts.
2. Ensure Essential Incoming ACB/MCCB is turned on.
3. Genset power will only supply the Essential Busbar.
4. Turn on the other relevant MCCBs as required.

AMF Board

General Description

The AMF Board controls and receives supply from the genrator. The main supply source is from the generator.

The AMF Board can be operated in manual, auto and test mode.

In manual mode, the operator can start the generator manually.

In auto mode, the generator will start automatically when there is a power failure detected by the MSB.

In test mode, the AMF will simulate a power failure and start the generator. This test mode should be used for periodic checking of the correct functioning of the AMF Board.

When a power failure is detected by the MSB, it sends a signal to the AMF Board to start the generator. The start delay is 5 seconds, and it can be adjusted via timers in the AMF Board.

Earth Fault and Overcurrent protection relays are installed for Generator Incoming. If an earth fault or overcurrent condition occurs, the protection relays will trip the ACB.

A digital power meter (DPM) is installed to monitor the generator supply. The DPM provides power quality readings for operators.

A surge arrestor is installed at the AMF Board. The surge arrestor functions to divert lightning surge current to the ground to prevent voltage spikes that may damage equipment. The surge arrestor is protected by 3-phase fuses.

A battery charger rated for 24V@10A is installed to maintain the battery charge level when the generator is not running. The battery charger receives supply from the MSB.

Operating Instructions for AMF Board

Air Circuit Breaker (ACB)

To turn on the ACB, make sure that the closing spring is charged. To charge the closing spring, pump the spring charging handle until the indication shows that the spring is charged. The press the “ON” button to turn on the ACB.

To turn off the ACB, press the “OFF” button.

To withdraw the ACB from its cradle, remove the ACB handle from its storage position. Position it on the cranking slot, press the unlock button and start turning the handle anti-clockwise. The indicator will show when the ACB has been disconnected. Once disconnected, the ACB can be racked out and removed.

To reinstall the ACB, push the ACB into the cradle and turn the handle clockwise. The indicator will show when the ACB has been connected. A resistance can also be felt at the cranking handle when the ACB has been fully racked in.

Moulded Case Circuit Breaker (MCCB)

To turn on the MCCB, push the operating handle upwards. To turn off the MCCB, pull the operating handle downwards.

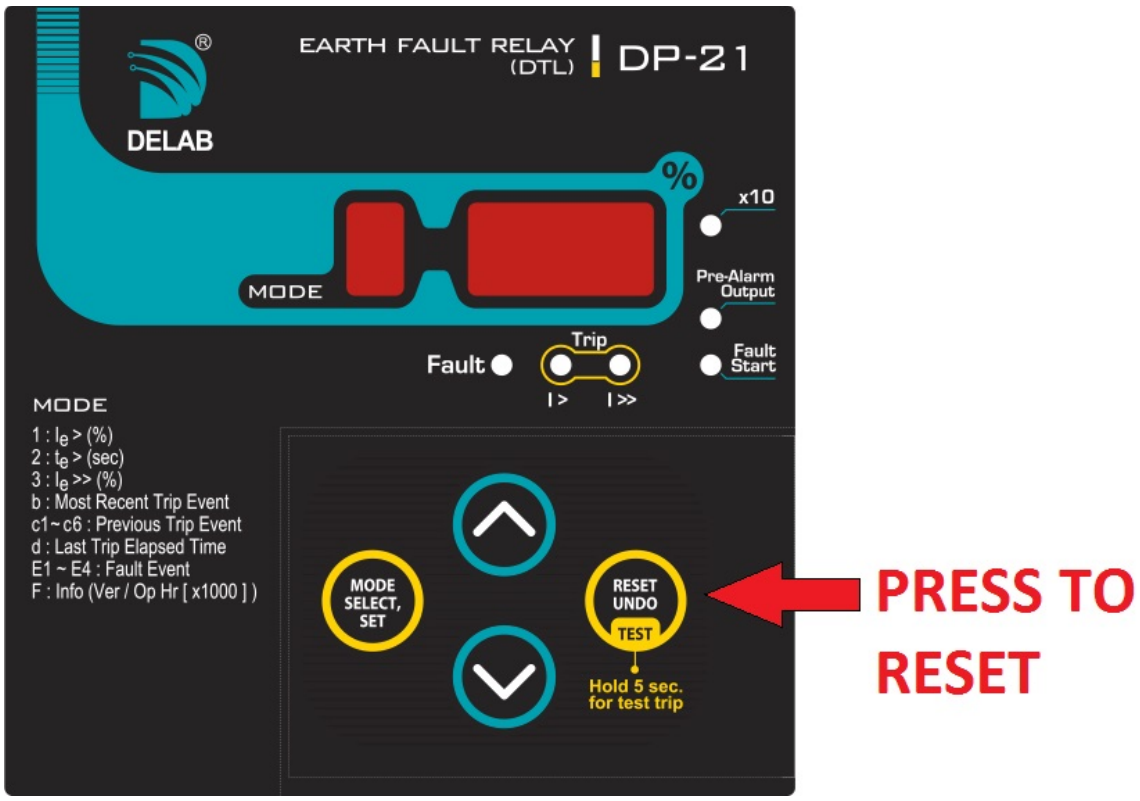
If the MCCB has tripped, the operating handle will be in the middle position. Investigate the cause of the trip before turning it back on.

To turn the MCCB back on, pull the operating handle downwards first, then push it upwards.

Protection Relays

The protection relays will have a red indicator showing that it has tripped. Investigate the cause of the trip before resetting it.

To reset the protection relays, press the “Reset” button on the protection relay.



Digital Power Meter

Use the arrow keys to view monitored parameters.

For more information, please refer to the DPM User Manual.

Lightning Surge Arrestors

The surge arrestors should be periodically checked to ensure they are in good condition. The surge arrestor is in good condition if the indicators are GREEN. The surge arrestors will need to be replaced when the indicators turn RED.

Battery Charger

The battery charger should be kept always on to ensure that the generator batteries are sufficiently charged. A voltmeter and ammeter is used to monitor the battery voltage and charging current.

AMF Operation - Standby (Auto-start):

1. Ensure **Genset Incoming ACB/MCCB** is turned on.
2. Ensure “Control” selector is “ON”.
3. Ensure “Mode” selector is “AUTO”.
4. Ensure “Charger” selector is “ON”.
5. Ensure “Auto/Boost” is “ON” (For AUTO mode charging).
6. In case of a SESCO power failure, the genset will automatically start.
7. When SESCO power is resumed, the genset will automatically stop. No operator action is required.

AMF Operation - Test:

1. Ensure **Genset Incoming ACB/MCCB** is turned on.
2. Ensure “Control” selector is “ON”.
3. Ensure “Mode” selector is “AUTO”.
4. Ensure “Charger” selector is “ON”.
5. Ensure “Auto/Boost” is “ON” (For AUTO mode charging).
6. Turn the “Test” selector to “On”, the genset will automatically start.
7. Turn the “Test” selector to “Off”, the genset will automatically stop. No operator action is required.

AMF Operation - Manual:

1. Ensure **Genset Incoming ACB/MCCB** is turned on.
2. Ensure “Control” selector is “ON”.
3. Ensure “Mode” selector is “Manual”.
4. To start the genset, press the green “Start” button. The genset will start.
5. To stop the genset, press the red “Stop” button. The genset will stop.

Disable Auto-start Operation:

1. Ensure **Genset Incoming ACB/MCCB** is turned off.
2. Ensure “Control” selector is “OFF”.
3. Ensure “Mode” selector is “OFF”.
4. Ensure “Charger” selector is “ON”.
5. Ensure “Auto/Boost” is “ON” (For AUTO mode charging).
6. During power failure, the genset will NOT auto-start. The battery charger will keep the genset battery properly charged for future use.

Troubleshooting Guide

Symptom	Causes	Rectification
No power supply to MSB.	1. Sesco Failure. 2. Incoming ACB/MCCB not turned on.	1. Ensure Sesco supply available. 2. Turn on incoming ACB/MCCB
Genset does not auto-start.	1. Selector switch at AMF Board not in “Auto”. 2. Control supply switch at AMF Board not turned “On”.	1. Turn selector switch to “Auto” 2. Turn selector switch to “On”
Genset auto-start but does not supply to MSB.	1. Genset incoming ACB/MCCB at AMF Board not turned on.	1. Turn on Genset incoming ACB/MCCB at AMF Board.
Unable to turn on ACB.	1. Ensure that the EF or OC has not tripped. 2. Ensure that the ACB spring has been charged.	1. If EF or OC has tripped (Red LED ON), reset the EF or OC and try turning on the ACB again. 2. Use the charging handle to charge the ACB spring and try turning on the ACB again.
Unable to turn on MCCB.	1. Ensure that the EF or OC has not tripped. 2. Outgoing cables or board shorted.	1. If EF or OC has tripped (Red LED ON), reset the EF or OC and try turning on the MCCB again. 2. Check outgoing cables for any shorts.

Power Factor Log Sheet

1. KWH and KVArh Meter is to be checked on every 5th, 12th, 20th & 28th of each month. If it is a Public Holiday, checking will be carried out on the following day.
2. The meter reading should not be less than 0.85 lead/lag.
3. Attached is the checking form for the periodical checks.

POWERTECH ENGINEERING

Periodical Checks on Power Factor Correction Capacitor Bank at Sesco Incoming Main Switchboard

Client : _____ Sesco Incoming Amp : _____

Location : _____ Cap. Bank Size/Make : _____

Date	KWH Meter Reading (S/N :)	KVARH Meter Reading (S/N :)	Average P.F. (Min. 0.85)	Remarks

Average Power Factor Calculation base on KWH & KVARH Meters Reading of the period

$$X\ Factor = \frac{\text{KVARH Units (Current) - (Previous)}}{\text{KWH Units (Current) - (Previous)}}$$

X - Factor	*Average P.F.*
1.3	0.61
1.2	0.64
1.1	0.67
1	0.71
0.9	0.74
0.8	0.78
0.7	0.82
0.6	0.86
0.5	0.89
0.4	0.93
0.3	0.96

Note : To Be Check on Every 5th, 12th, 20th & 28th of each month. If it is a Public Holiday, checking will be carried out the following day.