# UltraFLEX HD Test System
# Power-One 40KVA
# Power Vault Service Manual

Product Number: 1-155462 Rev.: AC

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Print History

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Part Number: 1-155462

Revision Level: AC

Reason for Change

**Table 1: Revision History**

| Rev | Change |
|---|---|
| AB | Initial Release |
| AC | Changed 36 KVA to 40KVA, added Teradyne part numbers to spares list table, added Teradyne part number for power vault to Chapter 1 |
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# Contents

# Power Vault Service Manual

## 1 About This Manual

This manual provides the procedures and information required to maintain and repair the Power-One 40KVA Power Vault, Teradyne part number 601-872-02. It is intended for trained maintenance personnel.

The local Teradyne Service office can assist with any additional questions you may have about Power-One Power Vault.

We welcome any comments or feedback you have about this manual and Power-One Power Vault. Please send feedback to Teradyne Knowledge Technical Support at: customercare@teradyne.com.

For your convenience, we have also included a Manual Comment Form at the end of this manual.

### 1.1 Viewing This Manual Online

When viewing this manual online, you may click any hyperlink, cross-reference or page number to jump to that topic.



Part Number: 1-155462 Rev.: AB

# 2 Introduction

The UltraFLEX HD Test System Power-One 40KVA Power Vaults are engineered to provide a conditioned 3-phase output of 208 volts AC to the tester using input voltages of either 190 - 240 volts AC or 380 - 480 volts AC. Table 1 lists the part numbers of the power vaults and applications.

Table 1 Power vault part number matrix

| Tester Type | Power Vault Type | Power Vault P/N | Teradyne P/N |
|---|---|---|---|
| UltraFLEX HD Tester | 40KVA - 1Module | 1-154860G | 601-872-02 |

The 40KVA vault can be used for the UltraFLEX HD test system. The standard power vault is designed to power a single UltraFLEX HD Tester and the associated computer equipment.

This manual provides the procedures and information required to maintain and repair the vaults and contains the following information:

- *Power Vault Overview*
- *Unpacking*
- *Preparing the Power Vault*
- *Adding Input Cable and Tester Cable*
- *Input Voltage Changeover*
- *Testing the Vault*
- *Closing the Vault*
- *Schematic Drawing*
- *Product specifications*
- *Maintenance and Spare Parts*

Ensure that you have all the necessary items required to maintain or repair the vault prior to starting any of the procedures outlined in this manual.

NOTE Prior to performing any repairs on the Power Vault, familiarize yourself with the information outlined in the Safety Information section of the UltraFLEX Test System Service Manual, as appropriate. Pay particular attention to this information as it is related to equipment lockout-tagout.

# 3 Power Vault Overview

The Power Vault is an optional external transformer providing 3-phase 208 V AC WYE configured power to the UltraFLEX HD Test System. The vault contains a multiple tap, 3-phase, 36 KVA, isolation transformer **T1** that converts the customer's factory power, Delta or WYE, to 208 V AC, 3 phase WYE that is required by the tester.

The Delta input of the vault can be connected to either a four wires Delta input, which uses three phases and ground or a five wire WYE input, which uses three phases, neutral and ground.

If the vault is being connected to a five wire WYE source, the main input neutral wire should terminated at the facility power circuit breaker distribution box and not be connected to the vault.

The AC input power is connected to the input power circuit breaker **CB1** inside the vault. The rating of the input power circuit breaker will vary depending on the input voltage that is connected to the vault.

The vault is designed to operate using two different input voltage ranges. Main Circuit Breaker CB1 is programmable; its current rating can be changed by adjusting the dip switches. The first range is designed to operate using input voltages of 190 to 240 volts AC. The Main Circuit Breaker CB1 can be adjusted to 100 Amp for 36 KVA vaults operating on these input voltages. The second range is designed for input voltages of 380 to 480 volts AC. The Main Circuit Breaker CB1 is adjusted to 60 Amp for 36 K VA vaults operating on these input voltages. The breaker must be manually turned on to apply power to the input of the vault transformer **T1**.

The transformer output is three phase WYE, 120 V per phase, with a neutral and ground. The neutral is tied to the vault chassis ground at the transformer. This provides the tester with a much lower level of noise than if the neutral line was used directly out of the vault transformer.

This 3-phase output is distributed as follows:

One phase is used to supply 120 V for accessory outlets. Two phases are tapped to supply 208 volts to the low voltage transformer **T2** in the vault, which produces 24 volts AC that is used for system control. These 24 volts controls the power on contactor **K1**, which then supplies AC power to the test system through a COR-COM brand Electro-magnetic Interference (EMI) power filter.

The EMI filter provides the tester with Radio Frequency Interference (RFI) protection from noise and also prevents from the vault from emitting any noise into the facility power lines. The contactor is self latching, which means, that when 24 volts AC is applied, it uses its own contacts to stay closed and only drops out when the Power Off **S2** or Emergency Off (EMO) **S1** switches are pressed. The contactor is energized by the Power On switch **S3** located at the front of the vault. With the contactor energized, power is distributed to the

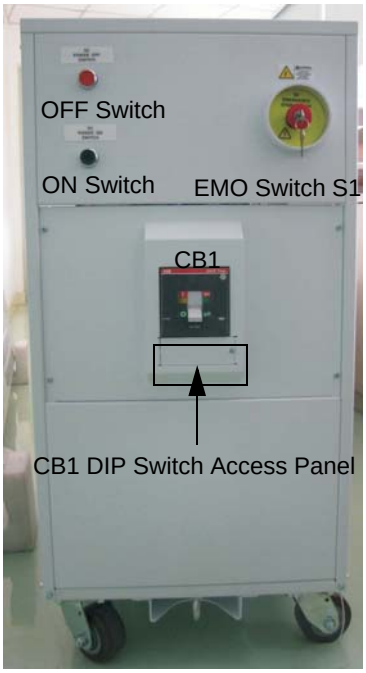
output power module circuit to provide 208 volts AC that controls AC power to the UltraFLEX HD Test System.

The vault can be powered on and tested for correct output voltage without a tester or the computer equipment being connected.

The necessary circuit breakers and AC outlets to power the test system are contained in the vault. The tester must be connected to and powered from the vault.

Figure 1 UltraFLEX HD 36 KVA Power Vault

Front View

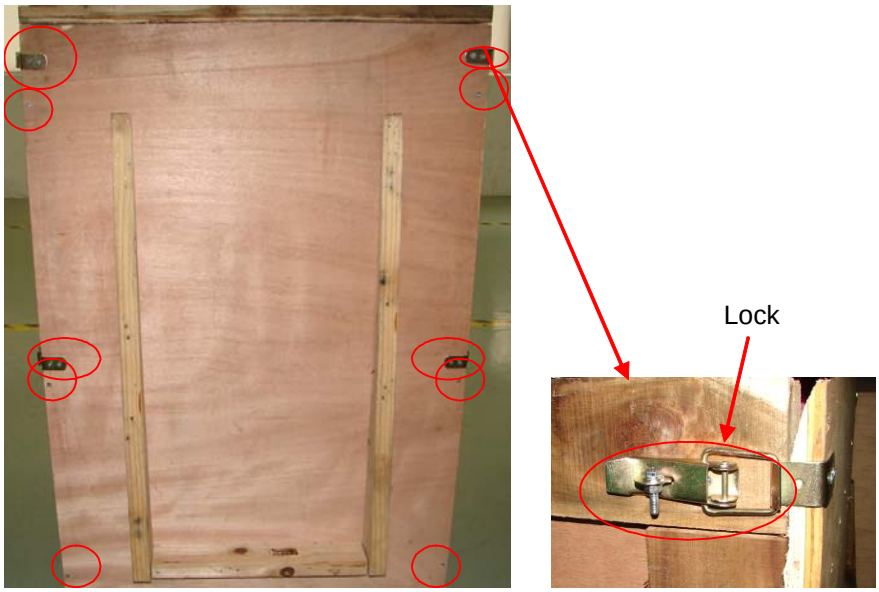



Back View

# 4 Unpacking

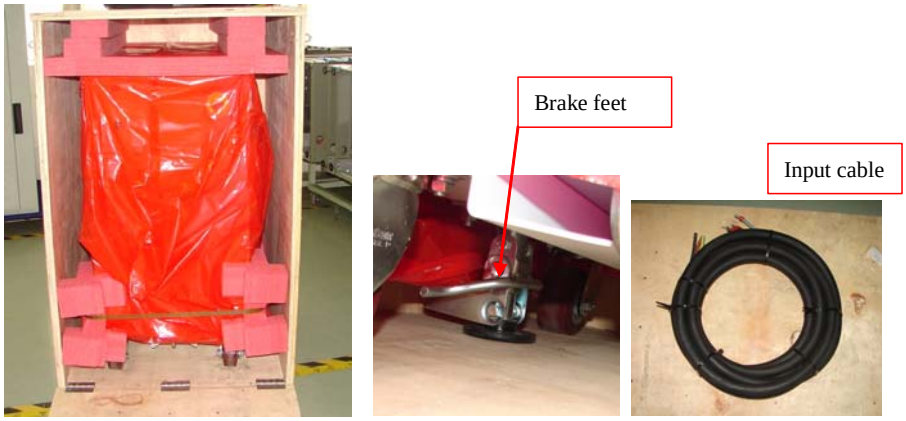
1. Unscrew the the six screws in the front door and remove them; Unscrew the four (six) screws, four (six) nuts and eight (twelve) washers which fix the locks and remove them. See Figure 2.

Figure 2 Unopened Crate




2. Release and open the door downward to the floor refer to Figure 3 on page 5.

Figure 3 Opened Crate



3. Remove the input cable by removing the two cable ties, and then remove the output cable at the left side in the crate.
4. Loosen brake feet at the two sides of the power vault which are fixed below the bottom panel by your feet's stepping.
5. Pull the power vault out of the crate.
6. Remove whole the foam, packing bag and packing strip.

# 5 Preparing the Power Vault

This section of the manual outlines the procedures required to properly prepare the vault for maintenance or repair.

**CAUTION** Implement lockout-tagout procedures prior to starting any work on the Power Vault. Refer to the Safety Information chapter of the UltraFLEX Test System Service Reference Manual, as appropriate for lockout-tag out procedures.

**CAUTION** If lockout-tag out procedures is not enforced, place a lock on the factory power switch once power is turned off. Retain possession of the key until all work on the vault has been completed.

NOTE Be sure to order the appropriate replacement part(s) prior to starting any of the procedures outlined in this manual. Part numbers for replacement parts can be found in the UltraFLEX Test System Service Reference Manual or in the on-line FRU Navigator.

The following tools are required to prepare the vault:

- PH2 cross head screwdriver.
- Adjustable torque driver capable of 13.3 in*lbs (1.5 N*m), which is used with screwdriver bit.
- 11/32" socket.
- Torque wrench capable of 13.3 in*lbs (1.5 N*m), which is used with 11/32" socket.

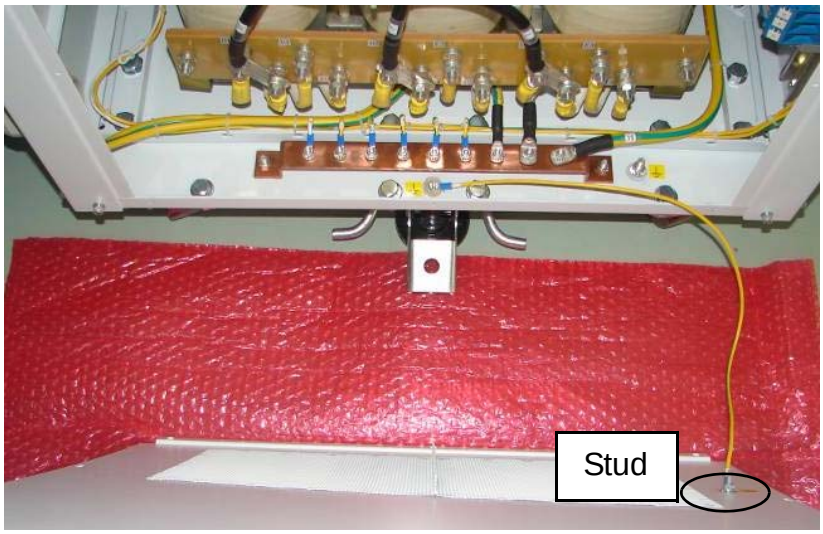
NOTE Save all hardware removed during disassembly, it will be required for reassembly.

1. Ensure that the UltraFLEX HD Tester and Computer System have been properly prepared, shut down and disconnected as outlined in the Safety chapter of the UltraFLEX Test System Service Reference Manual, as appropriate.
2. Turn off the Control Power Circuit Breaker **CB6** at the rear of the vault.
3. Turn off the Main Circuit Breaker **CB1** at the front of the vault.
4. Turn off the factory power circuit breaker that the Power Vault is connected to then lock the breaker.

NOTE If at all possible, disconnect the vault from the factory power source.

5. If the vault is installed close to the tester it may be necessary to swing the vault away from the tester to access vault service panel.
6. While facing the front of the vault (Emergency OFF Switch - S1) identify the left side (service panel side) of the vault. See Figure 1 on page 4.
7. Unfasten the left side panel from the vault by removing the 14 (6-32 x3/8) screws, 14 lock washers and 14 flat washers from the panel using the PH2 cross head screw bit and adjustable driver.
8. Remove the ground cable by removing one (8-32) nut and two tooth washers using the 11/32" socket and torque wrench from the side panel. See Figure 4.

Figure 4



9. Lift and remove left (service) side panel from power vault.

# 6 Adding Input Cable and Tester Cable

## 6.1 Connect the input cable into power vault

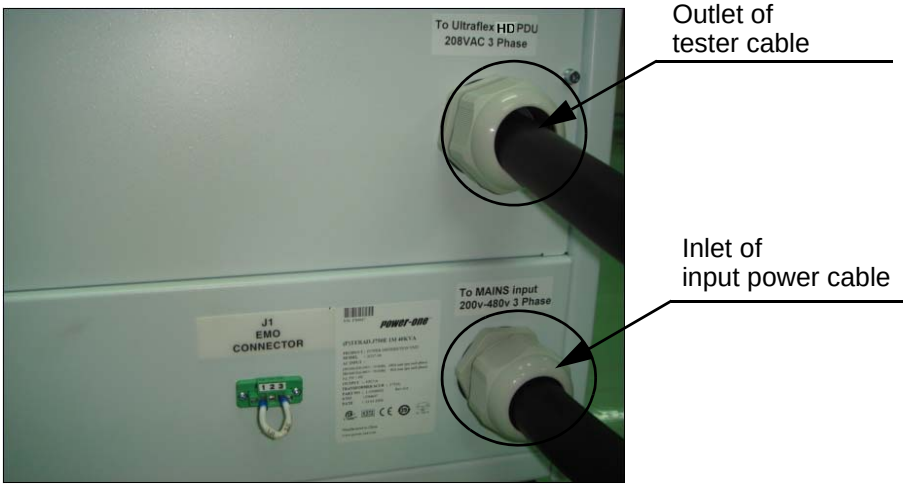
The following tools are required to mount input power cable and tester cable into power vault:

- 7/32" head screwdriver bit
- Adjustable torque driver capable of 31 in*lbs (3.5 N*m), which is used with screwdriver bit.
- 1/2" socket.
- Torque wrench capable of 70.8 in*lbs (8 N*m), which is used with 1/2" socket.

Perform the following steps to connect the input power cable to the vault:

1. Ensure that the vault, tester and computer equipment are properly prepared as outlined in *Preparing the Power Vault* on page 6.
2. Loosen cable retaining nut on inlet cable entrance
3. Route one end of input power cable through retaining nut and inlet power cable entrance as shown in Figure 5.

Figure 5 Inlet and Outlet Layout



4. Connect the input power cable into terminal connections,Then tighten the screws by using the 7/32" slotted head bit and adjustable torque driver by torquing to 31 in*lbs (3.5 N*m) as shown in Figure 6 on page 9 .(The cable lines L1, L2 and L3 are indicated in brown, black, and grey separately).
5. Connect the ground cable to bottom stud. Fasten the ground cable to the stud by using the 5/16-18 nut and tighten using the 1/2" socket and the torque wrench by torquing to 70.8 in*lbs (8 N*m) as shown in Figure 6 on page 9.
6. Fasten the cables on the support rail with cable ties as shown in Figure 6 on page 9.

Figure 6 Input Power Cable Connections


7. Tighten cable retaining nut on inlet cable entrance.

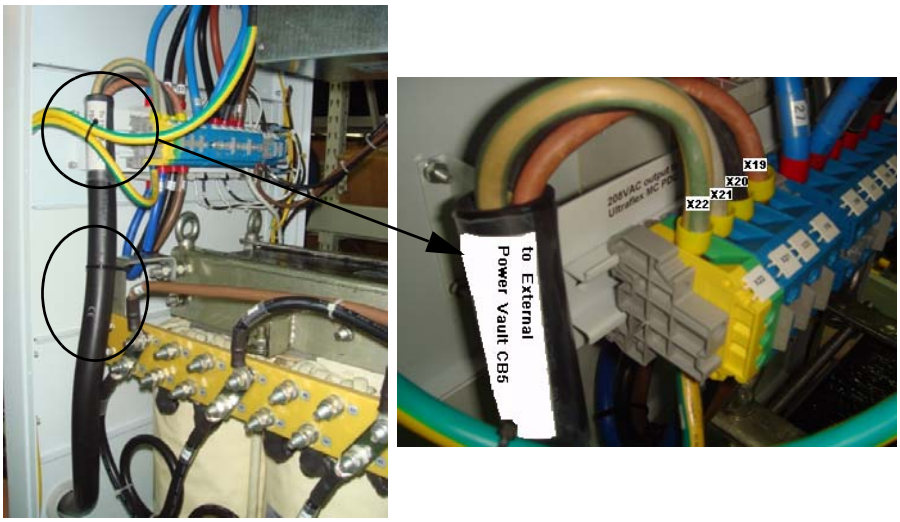
## 6.2 Connect the tester cable into power vault

Perform the following steps to add tester cable to the vault:

1. Ensure that the vault, tester and computer equipment are properly prepared as outlined in *Preparing the Power Vault* on page 6.
2. Loosen cable retaining nut on outlet cable exit.
3. Route one end of output power cable through retaining nut and outlet power cable exit as shown in Figure 5 on page 8.

4. Connect the output power cable into terminal connections (X22 for ground and X19, X20 and X21 for output phases). Then tighten the screws by using the 7/32" slotted head bit and adjustable torque driver by torquing to 31in*lbs (3.5 N*m) as shown in Figure 7 on page 10.
5. Fasten the cables to the transformer bracket with cable ties as shown in Figure 7 on page 10.
6. Tighten cable retaining nut on outlet cable exit.

Figure 7 Tester cable connections



# 7 Input Voltage Changeover

Changing the input voltage of the vault consists of, as a minimum, rewiring the step down isolation transformer to accommodate the new input voltage. It may also consist of reconfiguring the Dip switches of the Main Circuit Breaker CB1 to meet the new input voltage.

The vault is designed to operate using two input voltage ranges. The first range is designed for the vault to operate using input voltages of 190 to 240 volts AC. The second range is designed for input voltages of 380 to 480 volts AC.

The circuit breaker must be reconfigured when the input voltage to the vault is changed from one range to the other.

This section of the manual outlines the following procedures:

- Rewiring the Transformer.
- Reconfiguring the Main Circuit Breaker-CB1.

## 7.1 Rewiring the Transformer

This section of the manual outlines the procedures required to rewire the transformer in the Power Vault.

The following tools are required to rewire the transformer:

- 9/16" open-end wrench
- 9/16" socket
- Torque wrench capable of 88.5 in*lbs (10 N*m) which is used with 9/16" socket

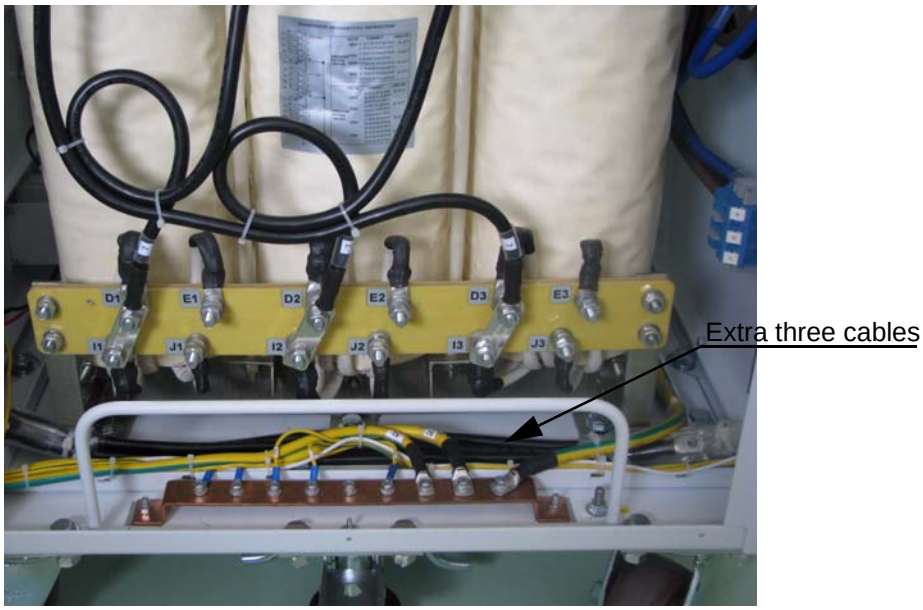
Perform the following steps to rewire the transformer:

NOTE Save all hardware removed during disassembly, it will be required for reassembly.

1. Ensure that the vault, tester and computer equipment are properly prepared as outlined in *Preparing the Power Vault* on page 6.
2. Refer to Table 2 and determine the correct wire connections that need to be made on the transformer to accommodate the new input voltage.
3. Remove the mounting hardware, nuts, flat washers and lock washers from the transformer terminals that will be used when rewiring the transformer.
4. Remove the cables from where they are already installed if necessary.

5. According to Table 2, Prepare the Extra jumper cables if necessary. The extra three jumper cables are required when rewiring the transformer for operation with 380-480 VAC input power. Extra three jumper cables as a kit are put under the main transformer primary side, refer to Figure 8.

Figure 8 Position of extra three jumper cables




6. Place the cable terminals on the transformer terminals for the new connection needed for the transformer rewiring.
7. Secure the wires to the transformer terminals using the nut, lock washer and flat washers which were previously removed. Place the flat washer 1st, then the lock washer and finally the nut.
8. The cables be aligned and placed so that cable terminals do not touch each other.
9. Hold the nut that is closest to the insulator block with a 9/16" wrench.
10. Using the 9/16" socket and torque wrench fasten the cable/jumper to the terminal by torquing the 2nd nut, the one furthest from the insulator block, to 88.5 in*lbs (10 N*m).
11. Secure the nut, lock washer and flat washers to where they are already removed to remove the cables and terminal is not going to be used for the rewiring, repeat step 9 and 10.

Table 2 Power vault transformer connections

| Input Voltage | Transformer Wire Connections | Main Lines From CB1 |
|---|---|---|
| 190 | B1 to G1 to A2 to F2<br>B2 to G2 to A3 to F3<br>B3 to G3 to A1 to F1 | A2, A3, A1 |
| 200 | C1 to H1 to A2 to F2<br>C2 to H2 to A3 to F3<br>C3 to H3 to A1 to F1 | A2, A3, A1 |
| 208 | D1 to I1 to A2 to F2<br>D2 to I2 to A3 to F3<br>D3 to I3 to A1 to F1 | A2, A3, A1 |
| 240 | E1 to J1 to A2 to F2<br>E2 to J2 to A3 to F3<br>E3 to J3 to A1 to F1 | A2, A3, A1 |
| 380 | F1 to B1, F2 to B2, F3 to B3<br>G1 to A2, G2 to A3, G3 to A1 | A2, A3, A1 |
| 400 | F1 to C1, F2 to C2, F3 to C3<br>H1 to A2, H2 to A3, H3 to A1 | A2, A3, A1 |
| 416 | F1 to D1, F2 to D2, F3 to D3<br>I1 to A2, I2 to A3, I3 to A1 | A2, A3, A1 |
| 480 | E1 to F1, E2 to F2, E3 to F3<br>J1 to A2, J2 to A3, J3 to A1 | A2, A3, A1 |

Figure 9 and Figure 10 show examples of different transformer wiring diagrams.

Figure 9 208V input voltage transformer - T1 wiring diagram

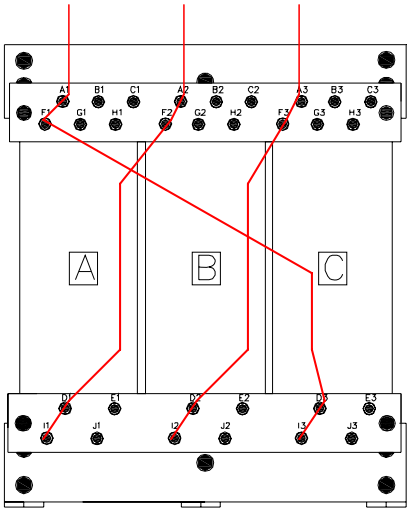
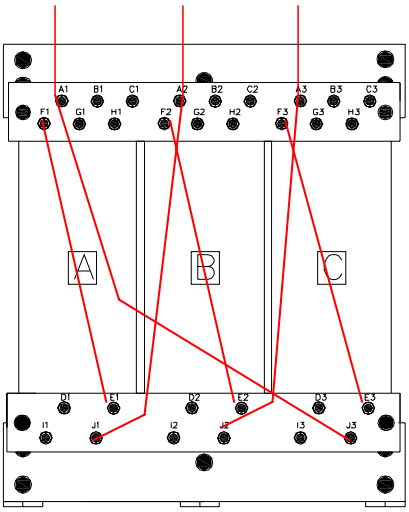



Figure 10 480V input voltage transformer - T1 wiring diagram




12. Dress the wires, then apply cable ties to secure the wires as appropriate.

13. Once the transformer has been rewired, proceed to the section 9 Testing the Vault of this manual unless additional maintenance or repair is required.

## 7.2 Reconfiguring the Main Circuit Breaker-CB1

This section of the manual outlines the procedures required to reconfigure the Main Circuit Breaker CB1 in the Power Vault.

Table 3 CB1 Information

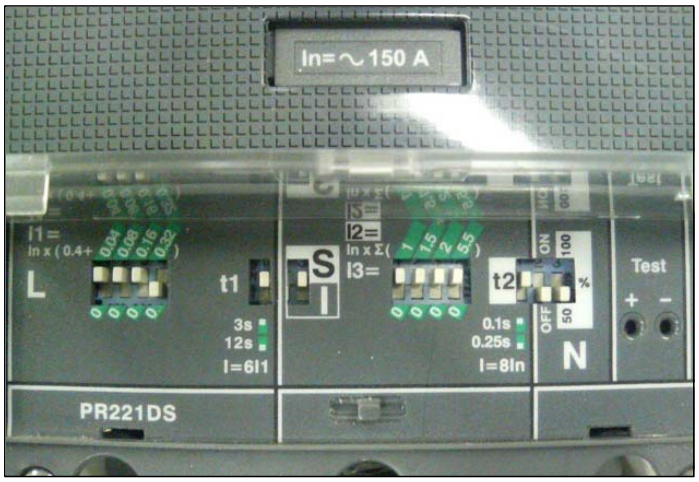
| Components Description | Manufacturer Name | Manufacturer P/N | Power-One P/N | Teradyne P/N |
|---|---|---|---|---|
| Main Circuit Breaker CB1 (T4N 250 UL/CSA PR221DA-LS/I150 3) | ABB | 1SDA055412R1 | 82100001625-G | |

The following tools are required to reconfigure the Main Circuit Breaker **CB1**:

- PH2 cross head screwdriver bit.
- Adjustable torque driver capable of 13.3 in*lbs (1.5 N*m) , which is used with screwdriver bit.

The DIP switch on the breaker **CB1** can be configured so that the power vault can be used over different input voltage ranges.

Figure 11 The Dip switch on the breaker CB1




The general Formula to adjust the current rating **I1** is as below:

**I1=150 x (0.4+I2+I3+I4+I5)**

**I2=0.04; 0**

**I3=0.08; 0**

**I4=0.16; 0**

**I5=0.32; 0**

Figure 12 Input voltage range 190-240Vac (102A)

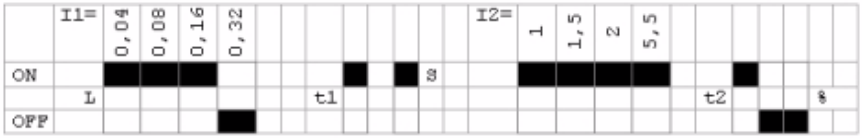
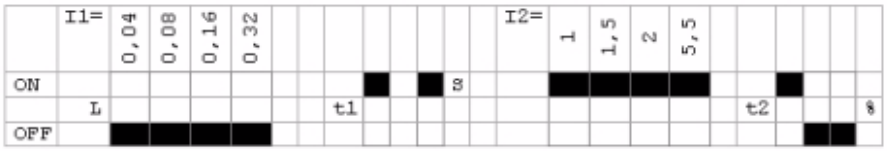



Figure 13 Input voltage range 380-480Vac (60A)




Perform the following steps to reconfigure the DIP switches, refer to Figure 14.

1. Remove the metal cover by removing the mounting screw with PH2 cross head screw bit and torque driver. Also remove the lock and flat washers. Set hardware aside to be used when reinstalling cover .
2. Release and raise the plastic cover to the up position.
3. Refer to Figure 12 or Figure 13 for different input voltage ranges and the correct DIP switch settings for those voltages.
4. Drop the plastic cover down and press slightly to clamp it in position.
5. Place the metal cover onto the front panel and fasten it with the screw, lock washer and flat washer which were removed in step 1 by using PH2 cross head screwdriver bit and adjustable torque driver. Torque the hardware to 13.3 in*lbs (1.5 N*m).

Figure 14 Front Panel


# 8 Testing the Vault

This section of the manual outlines the procedures for testing the vault after maintenance or repair has been performed.

The following tool is required to test the vault:

- The AC Volt meter capable of bigger than 300V RMS.

Perform the following steps to test the vault, refer to Figure 1 on page 4 and Figure 7 on page 10:

1. Ensure that all circuit breakers on the vault are in the **OFF** position.
2. If previously disconnected, reconnect the Power Vault to the factory power source.
3. Turn on the factory power circuit breaker that the Power Vault is connected to.
4. Remove any lockout-tagout devices attached to the vault.
5. Turn on the Main Circuit Breaker **CB1** at the front of the vault.
6. Turn on the Control Power Circuit Breaker **CB6** at the rear of the vault.
7. Insert the key into the Emergency OFF Switch **S1** at the front of the vault and turn the key to unlock the switch (the switch should release.)
8. Push the green Power ON Switch at **S3** at the front of the vault, the switch will illuminate.
9. Turn on the three (3) Auxiliary Circuit Breakers CB3 (120 V AC), CB4 (120 V AC), CB5 (208VAC 3 phase) at the rear of the vault.

10. Using an AC volt meter, confirm that 24 volts AC is present at the Outlet Receptacle J1 at the rear of the vault:
11. Using an AC volt meter, confirm that 197.6-218.4 volts AC is present between each two of three terminals X19, X20, X21 which control by CB5 at the rear of the vault.
12. Using an AC volt meter, confirm that 114-126 volts AC is present between each terminal X19, X20, X21 and X22 which control by CB5 at the rear of the vault.

NOTE Be sure to check the tester power for the appropriate voltage/ phase reference to the neutral pin. Refer to step 12.

13. Once the vault has been tested, proceed to the Closing the Vault section of this manual.

# 9 Closing the Vault

This section of the manual outlines the procedures required to close the vault after maintenance and repair has been performed.

The following tools are required to close the vault:

- PH2 cross head screwdriver bit.
- Adjustable torque driver capable of 13.3 in*lbs (1.5 N*m), which is used with screwdriver bit.
- 11/32" socket.
- Torque wrench capable of 13.3 in*lbs (1.5 N*m), which is used used with 11/32" socket.

Perform the following steps to close the vault:

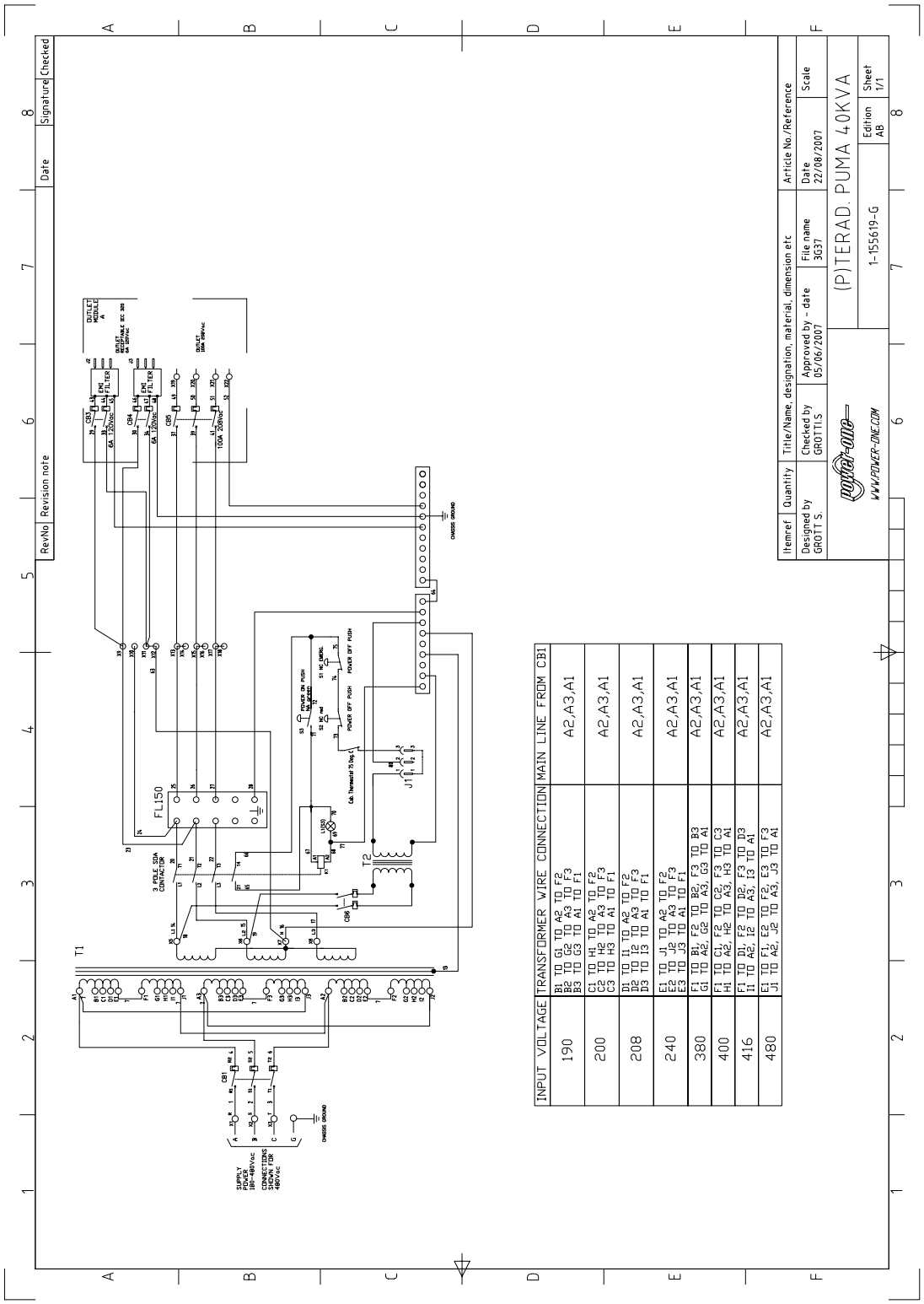
1. Reconnect the green and yellow ground wire to the left side panel. Secure the wire to the panel using the tooth washer and nut (8-32) that were previously removed. Torque the hardware to 13.3 in*lbs (1.5 N*m) using the 11/32î socket and the torque wrench.
2. Reassemble the side panel to the vault using the crossed head screw14 (6-32 x3/8), lock washers and flat washers that were previously removed from the panel. Fasten the screws by torquing them to 13.3 in*lbs (1.5 N*m) using the PH2 cross head screwdriver bit and the adjustable torque driver.
3. If the right side panel was removed, repeat steps 1 and 2 for right side panel.

4. Once that vault is closed, it is ready to return to service.

# 10 Schematic Drawing

The schematic drawing provides more details of this system.

Figure 15 40KVA Power-One Ultraflex HD Outer Vault



# 11 Product specifications

## 11.1 Electrical characteristic

**Mains input:**

- Input voltage and current limit: 190-280VAC/100A, 390-480VAC/60A, three phase
- Frequency: 50/60Hz
- Power factor:> 0.9 typical

**Output:**

- Single phase output voltage: 120 V AC
- Single phase output current limit: 6A
- Three phase output voltage: 208VAC
- Three phase output current limit: 100A
- Power: 40KVA
- Efficiency:> 95%

Figure 16 Output panel


**EMO (Emergency Off) thermostat description:**

Inside the power vault, there is a thermostat (MFG: TI. P/N: 17AM 022) which is fixed on the roof, and is connected on between the EMO connector and the power-off switch (S2). When the temperature inside the power vault reach or is higher than 75°C (167°F), the thermostat will be changed from normal close to open status, and then the power vault will be shut down to protect the electrical equipment. When the temperature inside the power vault is lower than 75°C (167°F), the thermostat will return to close status, and the PDU will be restarted again after pushing the green power-on switch (S3).

The information of the thermostat:

Table 4 Thermostat Information

| Components Description | Manufacturer Name | Manufacturer P/N | Power-One P/N | Teradyne P/N |
|---|---|---|---|---|
| External cabinet thermostat | TI | 17AM022 | 1-155709-G | 605-524-02 |

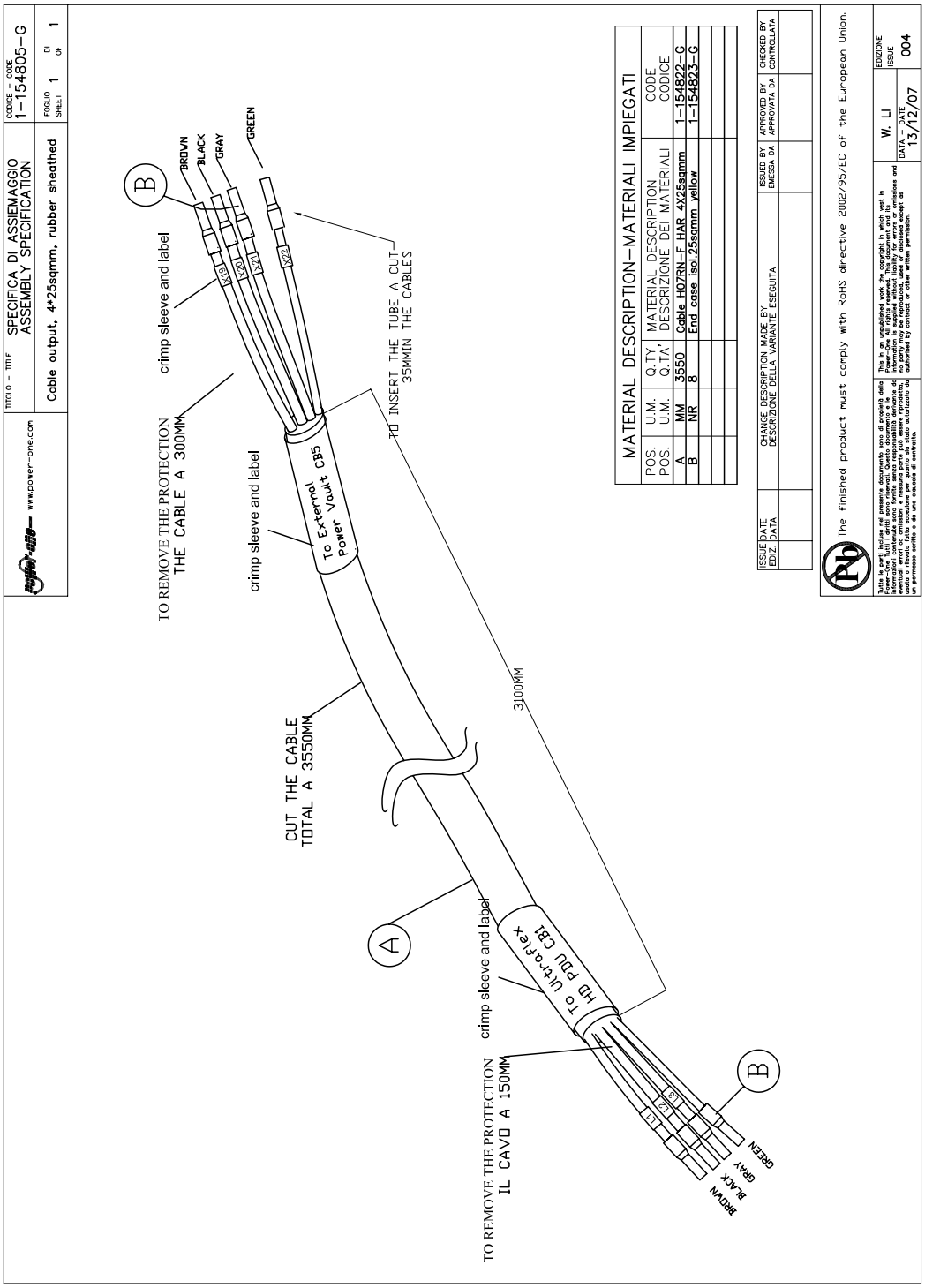
Figure 17 Front panel with EMO connector


The information of the EMO connector is shown in the below table:

Table 5 EMO Connector Information

| Components Description | Manufacturer Name | Manufacturer P/N | Power-One P/N | Teradyne P/N |
|---|---|---|---|---|
| 3 pos bulkhead panel IC-DFR 3 | Phoenix | 1852037 | 82000006409-G | 605-524-00 |
| 3 Terminal block 3p. MSTB 2.5/ 3-STF-5.08 | Phoenix | 1777992 | 82000006410-G | 605-525-00 |
| 3 pos bulkhead connector IC 2,5/3-STGF-5,08 | Phoenix | 1825514 | 82000006411-G | 605-527-00 |

Figure 18 Drawing of the output cable



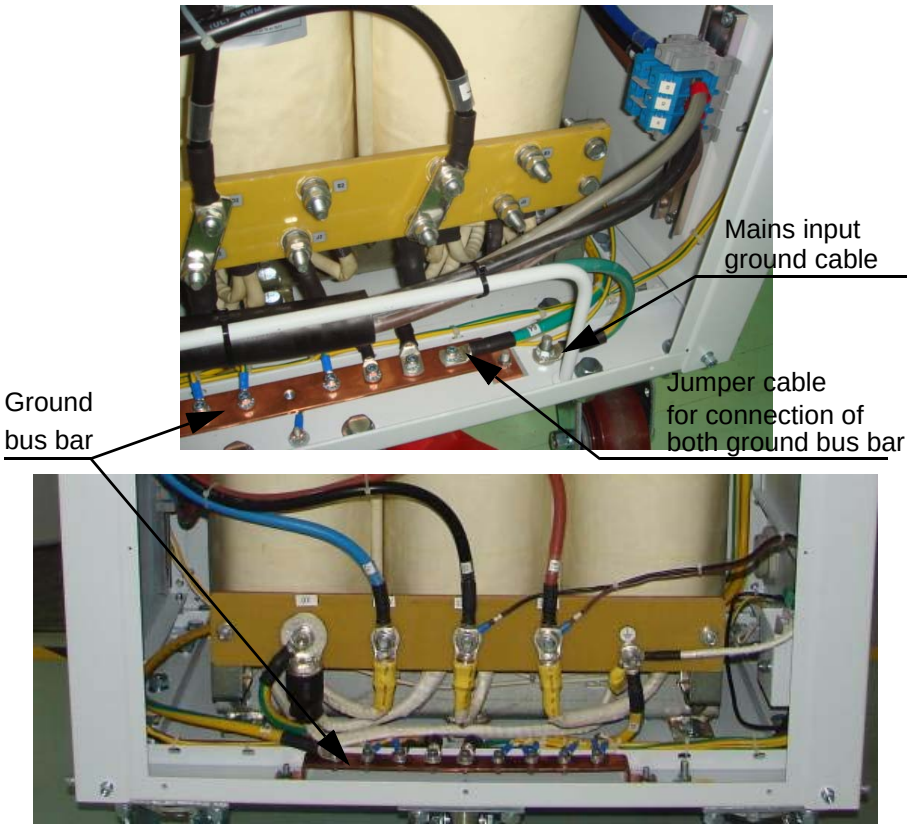
**EMI filter:**

The AYC series filters are designed for 3-phase, four-wire, WYE wiring applications. This filter helps better to protect electronic equipment in industrial applications. The series offers filtering up to 150 amps maximum and complies with International Standards including EN133200 and UL1283.

**Grounding:**

There are two copper bars, one on each side of the main transformer, that are fastened to the vault bottom panel by four screws. These two ground bars are connected together by a jumper cable. The input power ground cable is connected to the bottom panel through a stud. The two side panels are connected to the bottom panel through two cables and screws while all the other panels are connected to the two copper bars. For details, please refer to Figure 19.

Figure 19 Ground cable connection

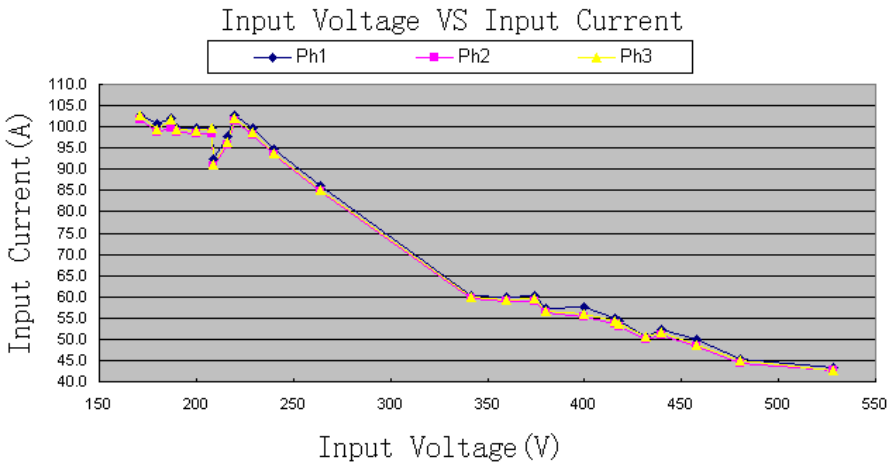


**Maximum inrush current:**

40KVA transformer maximum inrush current:1650 A

**Chart of input voltages and currents:**

Figure 20 Chart of input voltage and currents




## 11.2 Mechanical Specification

**Input/Output Cable Clamps:**

Table 6 Cable clamp Information

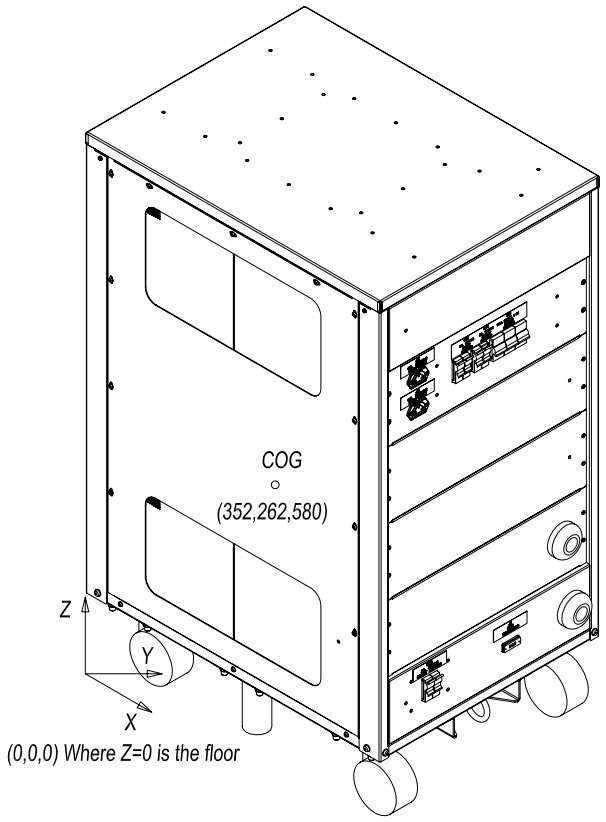
| Components Description | Manufacturer Name | Manufacturer P/N | Power-One P/N | Teradyne P/N |
|---|---|---|---|---|
| Grommet CEMBRE 1900.M50 | CEMBRE | 1900.M50 | 81500001155-G | |
| Gasket for GROMMET CEMBRE 1900.M50 | CEMBRE | 1143M50 | 1-154290-G | |

Cable range: diameter 27 mm - 35 mm

**Location of Center of Gravity:**

The unit of dimension is millimeter in the Figure 21.

Figure 21 Location of Center of Gravity



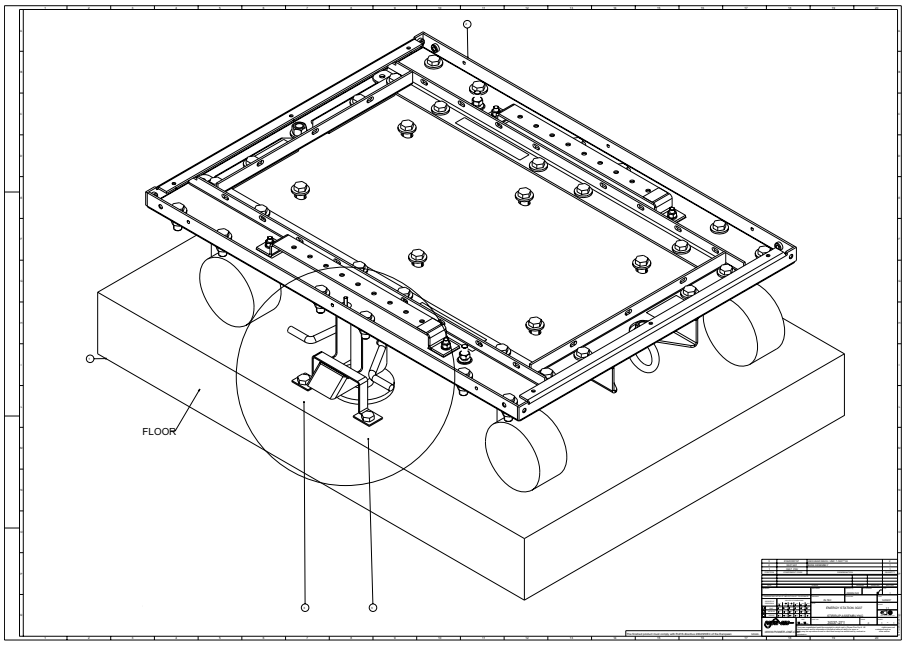

**Weight:**

- Vault only: 436Kg
- Vault in shipping crate: 497Kg

**Earthquake Protection:**

The power vault has passed the SEMI S2-0703 test, an additional interlock gives the vault the capability to be fastened to the floor, refer to Figure 22 on page 27.

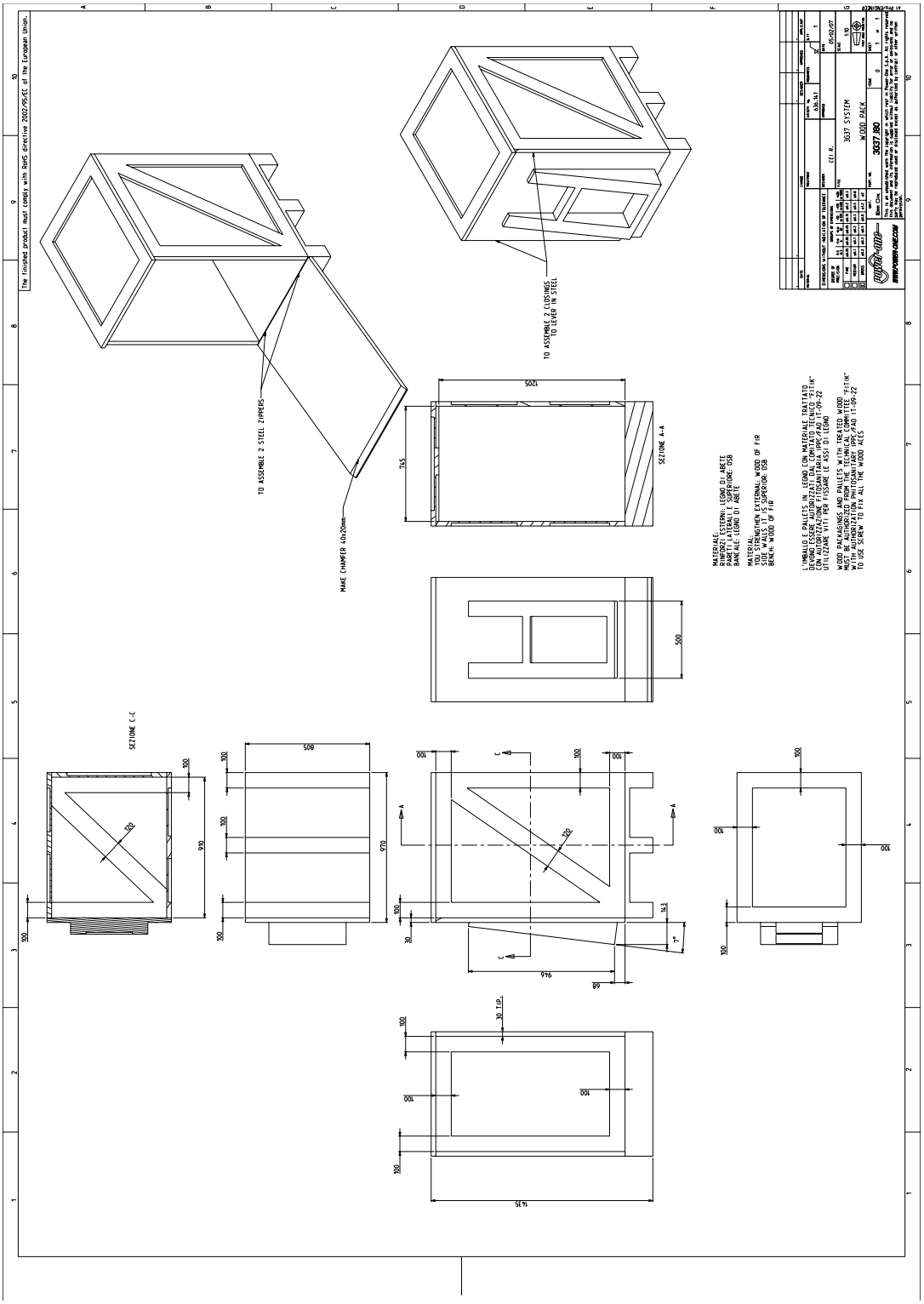
Figure 22 Earthquake Protection




**Dimension of Shipping Crate:**

- Height: 1435mm
- Length: 970mm
- Width: 805mm

Figure 23 Dimension of Shipping Crate



**Paint:**

- type of external paint used on vault:
  - FINISH: ("ORANGE PEEL EFFECT")
  - THICKNESS: 70-80micron
  - ADHESION: ISO 2409 (PETTINE 2mm) Gt0
- type of finish used inside vault:
  - VARNISH TYPE:P/N: AC-1822
  - GLOSS: ($60^{o}$) ISO 2813 15-25GLOSS
- Describe areas that are masked, for ground bonding to cabinet chassis:
  - SECC areas are diameter 10mm for ground cable connection of side panels and every front panel and rear panel.
  - SECC areas are square, their length and width are 35mm for two copper ground bar.

**Assembly Drawings:**

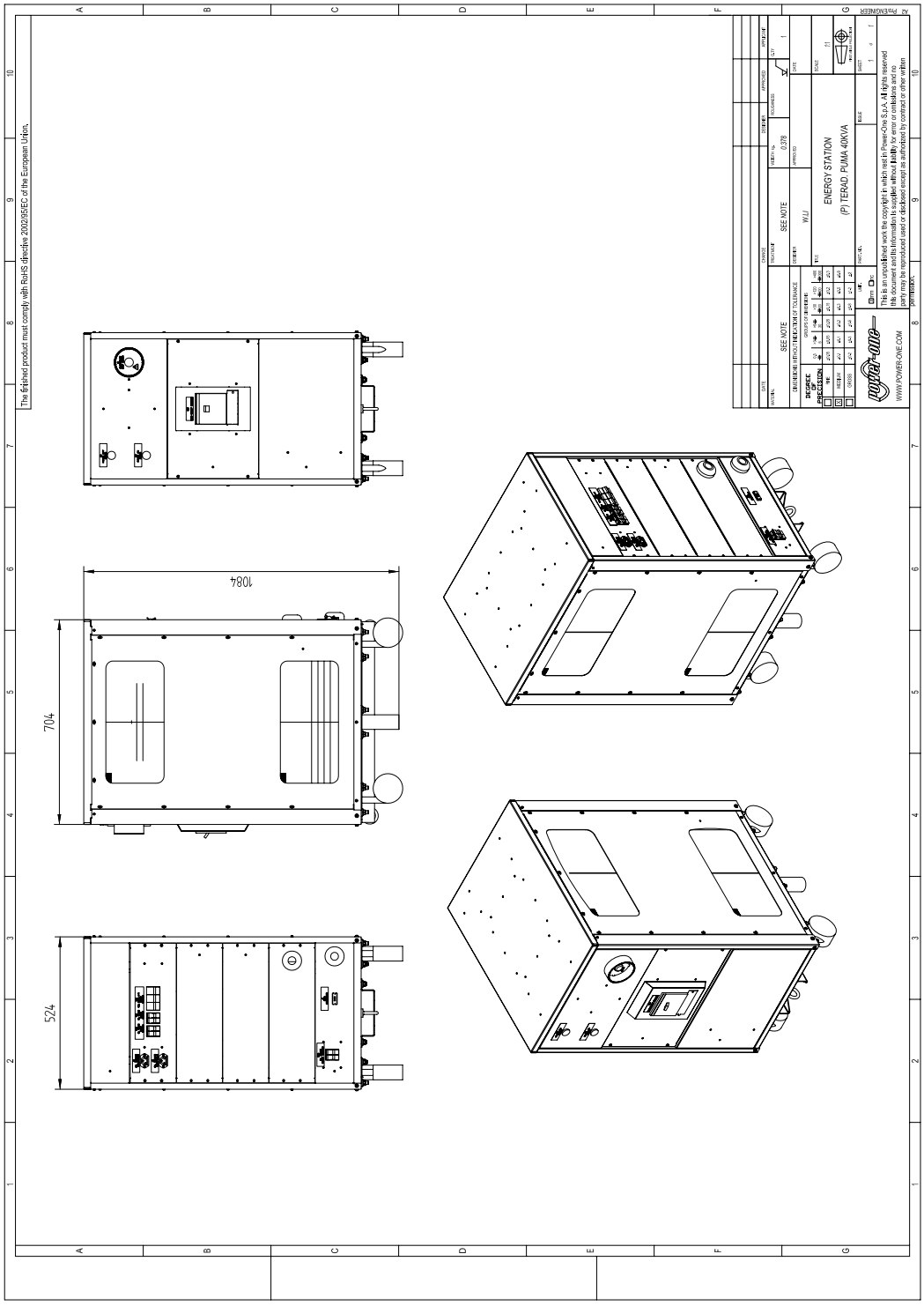
Dimension of the power vault:

Height: 1084mm

Length: 704mm

Width: 524mm

Figure 24 Assembly Drawings



## 11.3 Agency Certifications

KEMA.

## 11.4 Environmental Conditions

The Power vault have been designed for the following conditions:

- Indoor use
- Altitude up to 2000 m
- Pollution degree 2
- Installation category 2
- Temperature:
  - Operating Temperature: 20°C to 30°C(68°F to 86°F)
  - Storage Temperature: -20°C to 80°C(-4°F to 176°F)
- Humidity:
  - Operating Humidity: 30-85% RH non-condensing
  - Storage Humidity: 5-95% RH non-condensing
- Acoustic Noise: < 40 dB
- Vibration and Mechanical shock: Certification compliance SEMI S2

# 12 Maintenance and Spare Parts

Below is the list of spare parts that can be replaced during the life of the Power Vault.

WARNING BEFORE ANY ACTION IS TAKEN ON THE POWER VAULT THE MAIN AC MUST BE DECONNECTED FROM THE POWER VAULT

Table 7 Spare Parts Information

| Components Description | Manufacturer Name | Manufacturer P/N | Power-One P/N | Teradyne P/N |
|---|---|---|---|---|
| Accessory Outlet/Filter J2 and J3 | TYCO | 6EBFI | 82100001484-G | 521-186-01 |
| 3 Pole 100A Circuit Breaker CB5 | ABB SACE | S293-C100 | 1-154804-G | 605-526-00 |
| 2 Pole 6A Circuit Breaker CB3 and CB4 | ABB SACE | S202-C6 | 82100001362-G | 605-524-09 |
| 24V LED replacement Lamp for S3 | ABB SACE | MA5-1020 | 82100001515-G | 605-524-05 |
| ABB EMO pushbutton switch S1 and keys | ABB SACE | CE4K1-10R-02 | 82100001582-G | 605-528-00 |
| 2 Pole 2A Circuit Breaker CB6 ABB SACE | ABB SACE | S202-K2 | 82100001472-G | 605-524-12 |
| Main Circuit Breaker CB1 (T4N 250 UL/CSA PR221DA-LS/I150 3) | ABB-SACE | 1SDA055412R1 | 82100001625-G | 605-524-13 |
| Power-Off Pushbutton(red) S2 | ABB-SACE | MP1-20R | 82100001459-G | 605-524-06 |
| Power-On Pushbutton (green) S3 | ABB-SACE | MP1-21G | 82100001455-G | 605-524-14 |
| Contactor K1 A95 w/CAL 18-11 aux contact | ABB-SACE | A95-30-11 | 82100001475-G | 605-529-00 |
| External cabinet thermostat 75 Deg. | T1 | 17AM022 | 1-155709-G | 605-524-02 |
| Power Output Cable | Power One | 1-154805-G | 1-154805-G | 605-524-01 |
| 3 pos bulkhead panel IC-DFR 3 | Phoenix | 1852037 | 82000006409-G | 605-524-00 |
| 3 Terminal block 3p. MSTB 2.5/3-STF-5.08 | Phoenix | 1777992 | 82000006410-G | 605-525-00 |
| 3 pos bulkhead connector IC 2,5/3-STGF-5,08 | Phoenix | 1825514 | 82000006411-G | 605-527-00 |

The following tools are required to replace the parts in the vault:

- PH2 cross head screwdriver bit.

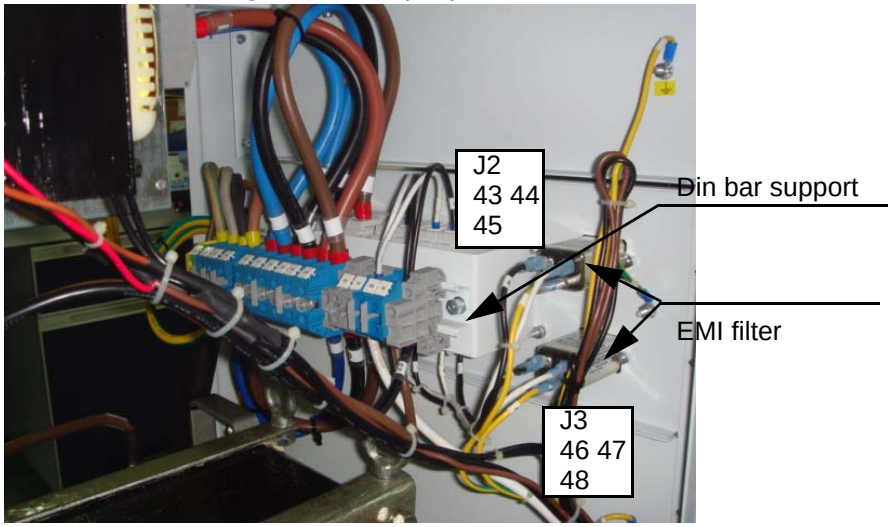
- 11/32" socket.
- 7/32" Hex head bit.
- 5/32" Hex head bit.
- 1/8" slotted head screw bit.
- Adjustable torque driver capable of 13.3 in*lbs (1.5 N*m), 8.9 in*lbs (1.0 N*m), 24.8 in*lbs (2.8 N*m), 17.7 in*lbs (2.0 N*m), 62.0 in*lbs (7.0 N*m), 159.3 in*lbs (18.0 N*m), 26.6 in*lbs (3.0 N*m), 6.2 in*lbs (0.7 N*m) , which are used with screwdriver and Hex head bits.
- Torque wrench capable of 13.3 in*lbs (1.5 N*m), which is used with 11/32" socket.

NOTE The numbers showed in the picture below during replacing the spare parts indicate wires.

## 12.1 Replacing Accessory Outlet/Filter J2 and J3

Filter J2 and J3 are a screw-mount type and located on the output panel of power vault, see details in Figure 25.

Figure 25 Output panel connection




Perform the following steps to replace the Accessory Outlet/Filter J2 and J3**:**

**Removal**

1. Remove the right side panel as outlined in *Preparing the Power Vault* on page 6.
2. Unplug the 3 wires on the EMI filter. Unplug wires 43, 44 and 45 if removing Filter J2 and unplug wires 46, 47 and 48 if removing Filter J3.
3. Unscrew 2 (5-40 x 1/2) screws with PH2 cross head screwdriver bit and adjustable torque driver, then adjustable torque driver, then remove 2 (5-40) nuts, 2 lock washers, 2 flat washers and 2 screws on both side of the filter.
4. Remove the filter from Output panel.

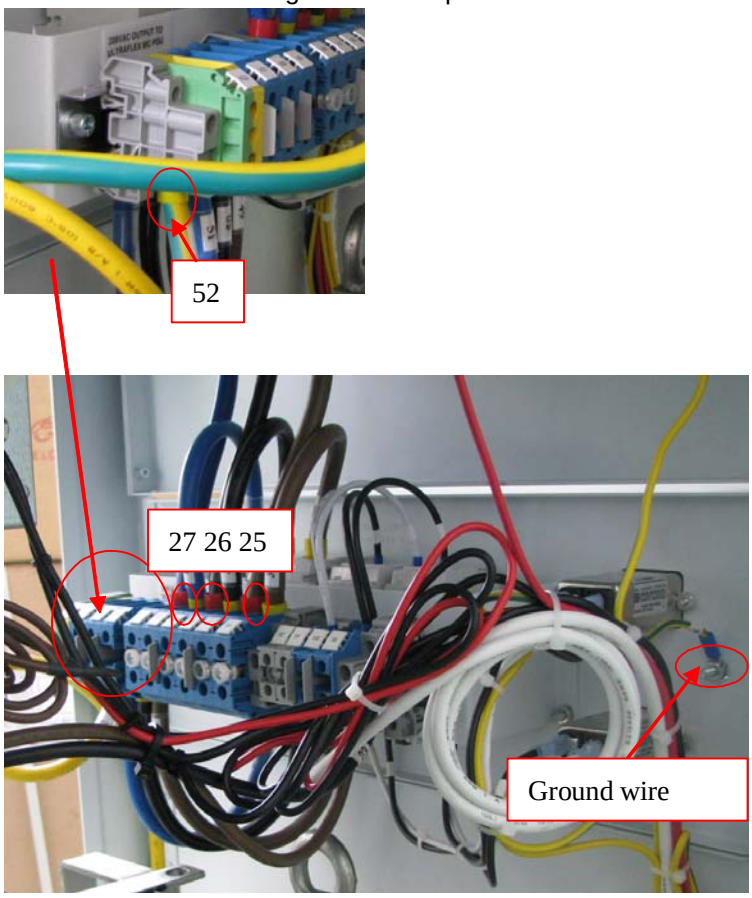
**Installation**

1. Put the new filter into output panel.
2. Fasten the filter with the 2(5-40) nuts, 2 lock washers, 2 flat washers and 2 (5-40 x1/2) screws, and torque the 2 screws to 8.9 in*lbs (1.0 N*m) using the PH2 cross head screwdriver bit and adjustable torque driver.
3. Plug 3 wires on the filter as indicated cable number in Figure 25 on page 33. Plug wires 43, 44 and 45 if installing Filter J2 and plug wires 46, 47 and 48 if installing Filter J3.
4. install the right side panel as outlined in *Closing the Vault* on page 18.

## 12.2 Replacing the Circuit Breaker CB3, CB4, CB5

The breaker is a din-mount type and located on the output panel of power vault, see details in Figure 27, Figure 28 on page 38.

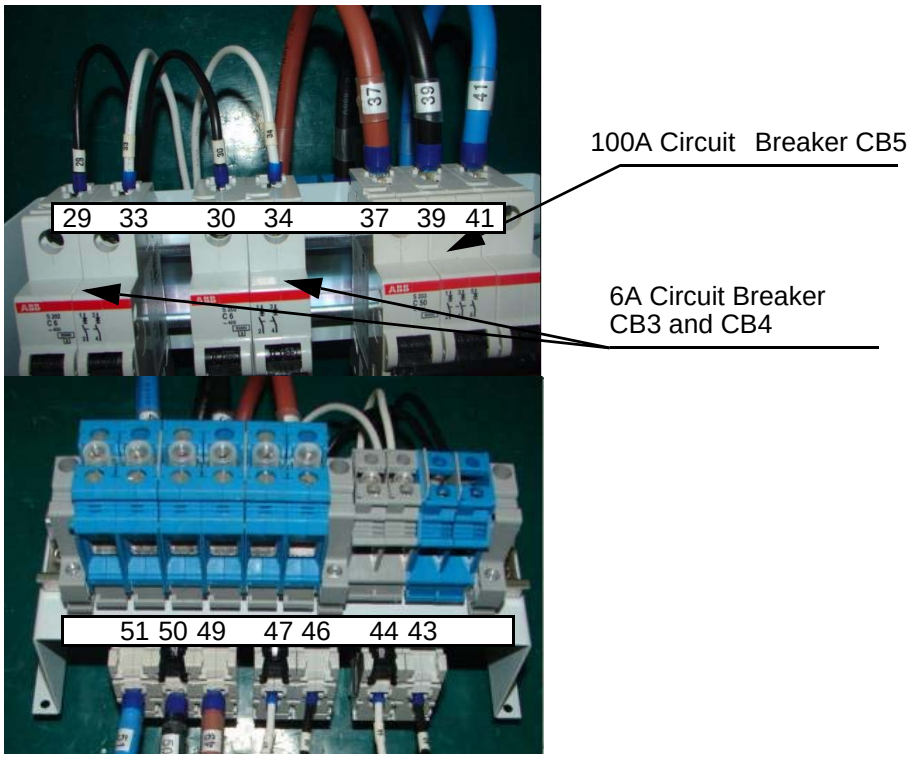
Figure 26 Output Panel






Part Number: 1-155462 Rev.: AB

Figure 27 Breaker Mounting




Perform the following steps to replace the Circuit Breaker CB3, CB4, CB5:

**Removal**:

1. Remove the right side panel as outlined in *Preparing the Power Vault* on page 6.
2. Remove separately the wires 25, 26, 27 and 52 from the terminal X14, X16, X18 and X22 by unscrewing the screw on the terminal using the PH2 cross head screwdriver bit and adjustable torque driver. Refer to the Figure 27 on page 36.
3. Unplug the ground wires 45 and 48 on the EMI filter.
4. Remove the green and yellow ground wire by removing one (8-32) nut and two tooth washers using the 11/32" socket and torque wrench from the output panel assembly. Refer to Figure 27 on page 36.
5. Unfasten the output panel assembly from the vault by removing 4 (10-24 x 3/8) screws, 4 lock washers and 4 flat washers from the panel using the PH2 cross head screwdriver bit and adjustable driver. Cut the cable ties which stop the output panel to be taken out, then lift and remove the output panel assembly.

6. Remove the Din bar support by removing totally 4(8-32) nuts, 4 lock washers and 4 flat washers from panel with 11/32" socket and torque wrench. Refer to Figure 27 on page 36.
7. Remove the wires that are connected to the breaker by unscrewing the screws of breaker with PH2 cross head screwdriver bit and adjustable torque driver. Remove the wires 29, 33, 43 and 44 if removing CB3; remove the wires 30, 34, 46 and 47 if removing CB4; remove wires 37, 39, 41, 49, 50 and 51 if removing CB5. Remove the breaker from the Din bar by pulling the handle of breaker.

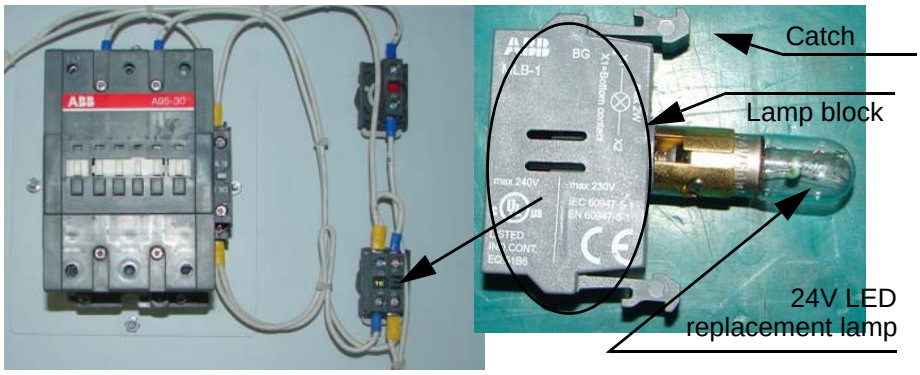
**Installation:**

1. Put the new breaker on the Din bar and press it to fix, reconnect the wires into breaker connection points as indicated wire number in Figure 27 on page 36 and Removal step 7, then tighten the screw of breaker by using PH2 cross head screwdriver bit and adjustable torque driver by torquing to 24.8 in*lbs (2.8 N*m),
2. Install the Din bar support on the panel by installing 4 (8-32) nuts, 4 lock washers and 4 flat washers on panel with 11/32" socket and torque wrench by torquing to 13.3 in*lbs (1.5 N*m).
3. Reassemble the output panel assembly to the vault using 4 (10-24 x 3/8) screws, 4 lock washers and 4 flat washers that were previously removed from the panel. Fasten the screws by torquing them to 26.6 in*lbs (3 N*m) using the PH2 cross head screwdriver bit and the adjustable torque driver.
4. Reconnect the green and yellow ground wire to the output panel. Secure the wire to the panel using the tooth washer and nut that were previously removed. Torque the hardware to 13.3 in*lbs (1.5 N*m) using the 11/32î socket and the torque wrench.
5. Plug the ground wires 45 and 48 on the EMI filter according to the Figure 25 on page 33.
6. Reconnect the wires 25, 26, 27 and 52 into terminal connections as instruction in Removal step 2. Then tighten the screws by using the 7/32" slotted head bit and adjustable torque driver by torquing to 31 in*lbs (3.5 N*m).
7. Fasten the wires by using cable ties on proper position.
8. Install the right side panel as outlined in *Closing the Vault* on page 18.

## 12.3 Replacing 24V LED Lamp

The LAMP is a plug-mount type and is located on the front high panel, see details in Figure 28.

Figure 28 Lamp mounting




Perform the following steps to replace the 24V LED lamp:

**Removal:**

1. Remove the left side panel as outlined in *Preparing the Power Vault* on page 6.
2. Take apart lamp block from the support by prizing the catch up one side of lamp block, and then unplug the lamp.

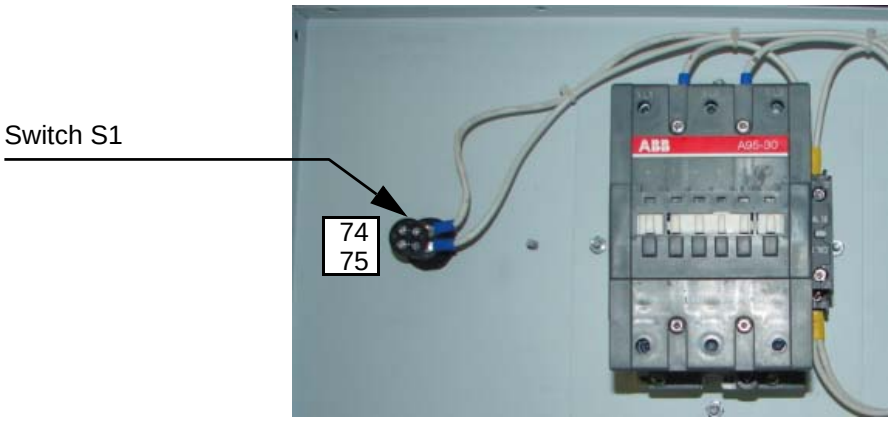
**Installation:**

1. Plug the new lamp, and then press the lamp block to fix it on the support.
2. Install the left side panel as outlined in *Closing the Vault* on page 18.

## 12.4 Replacing ABB EMO pushbutton switch S1

The switch S1 is a panel-mount type and located at the front high panel, see details in Figure 29:

Figure 29 Switch mounting




Perform the following steps to replace the SWITCH CE4K1-10R-02 ABB:

**Removal:**

1. Remove the right side panel as outlined in *Preparing the Power Vault* on page 6.
2. Unscrew 2 screws by using the PH2 cross head screwdriver bit and adjustable torque driver and remove the wires74, 75.
3. Hold the switch S1 outside the panel and turn the gasket counterclockwise to release it, and then remove the switch S1 from the panel.

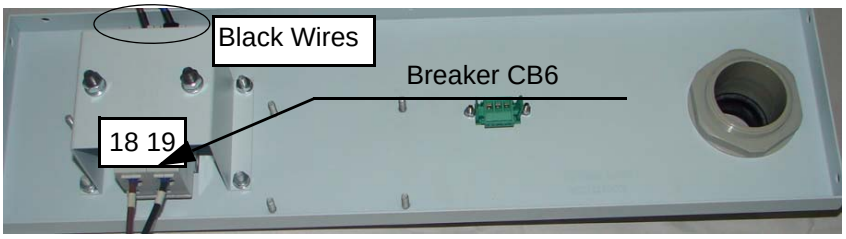
**Installation:**

1. Mount the new switch to the panel.
2. Reconnect the wires 74, 75 to the switch connection point and fasten 2 screws by torquing them to 17.7 in*lbs (2 N*m) using the PH2 cross head screwdriver bit and the adjustable torque driver.
3. Install the right side panel as outlined in *Closing the Vault* on page 18.

## 12.5 Replacing 2A Circuit Breaker CB6

The Breaker is a din-mount type and located on the rear low paned of power vault, refer to Figure 30.

Figure 30 Breaker mounting




Perform the following steps to replace the 2A Circuit Breaker CB6:

**Removal:**

1. Remove the right side panel as outlined in *Preparing the Power Vault* on page 6.
2. Remove the Din bar support by removing totally 4(8-32) nuts, 4 lock washers and 4 flat washers from panel with 11/32" socket and torque wrench.
3. Remove the two black wires and wires 18, 19 that are connected to the breaker by unscrewing the screws of breaker with PH2 cross head screwdriver bit and adjustable torque driver, then remove the breaker from the Din bar by pulling the handle of breaker.

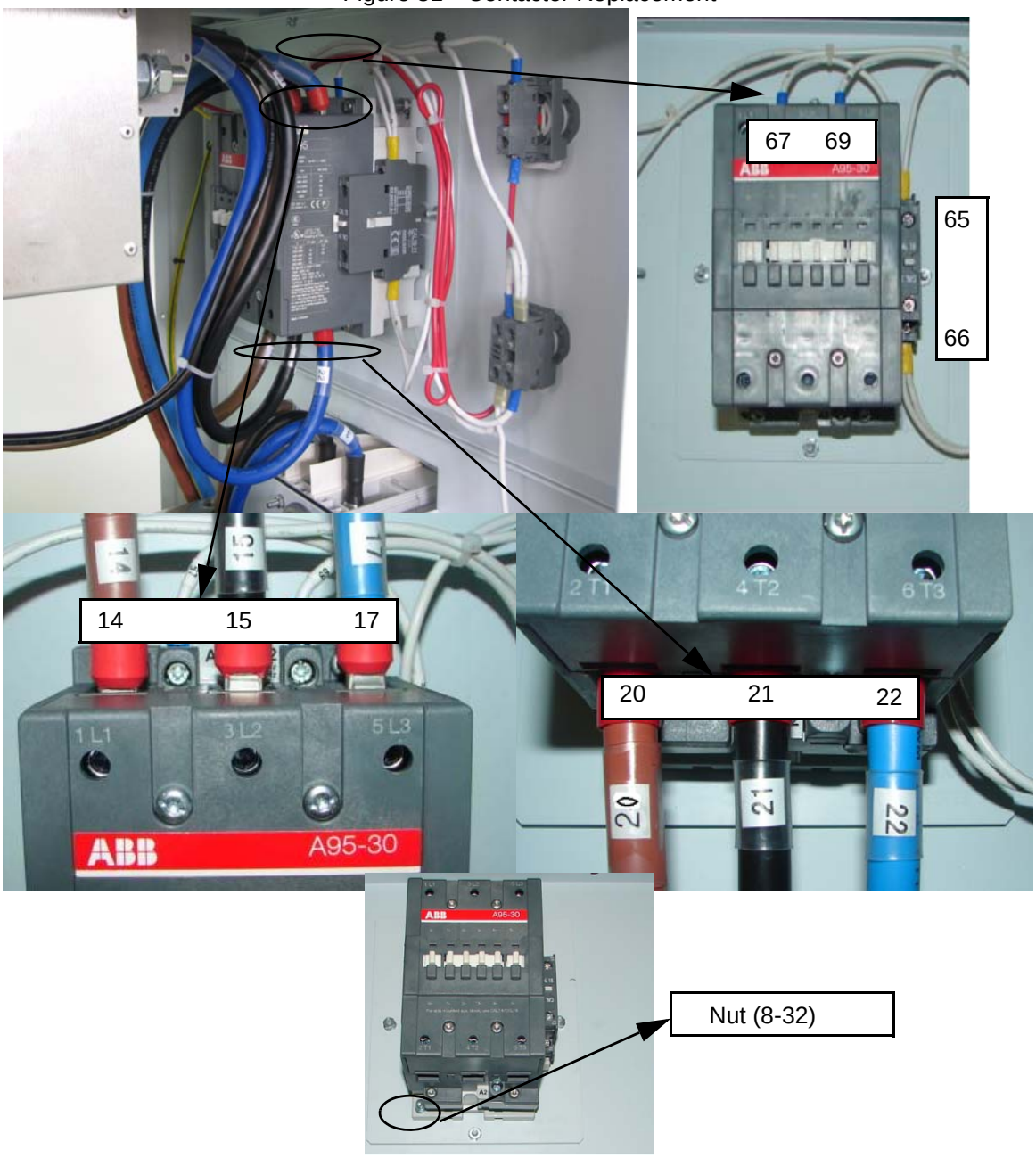
**Installation:**

1. Mount the new breaker on the Din bar and press it to fix, then reconnect the cable as indicated cable number in Figure 30 by tightening the screw of breaker.
2. Torquing to 24.8 in*lbs (2.8 N*m)with PH2 cross head screwdriver bit and adjustable torque driver.
3. Install the Din bar support on the panel by installing 4 (8-32) nuts, 4 lock washers and 4 flat washers on panel with 11/32" socket and torque wrench by torquing to 13.3 in*lbs (1.5 N*m).
4. Install the right side panel as outlined in *Closing the Vault* on page 18.

## 12.6 Replacing the Contactor K1 A95 w/CAL18-11 aux contact

The contactor is a screw-mount type and located on the front high panel of power vault, refer to Figure 31.

Figure 31 Contactor Replacement



Perform the following steps to replace the contactor K1 A95 w/CAL18-11 aux contact.

**Removal:**

1. Remove the left side panel as outlined in *Preparing the Power Vault* on page 6.
2. Unfasten the high front panel assembly from the vault by removing 8 (10-24 x 3/8) screws, 8 lock washers and 8 flat washers from the panel using the PH2 cross head screwdriver bit and adjustable driver. release the panel and show up the contactor.
3. Remove wires 14,15,17,20, 21, 22 in turn by unscrewing the screws of contactor with 5/32" Hex head bit and adjustable driver, and remove the 67, 69, 65, 66 in turn by unscrewing the screws of contactor with PH2 cross head screwdriver bit and adjustable driver from contactor.
4. Unfasten the ABB contactor from the contactor support by removing 2 (8-32) nuts, 2 lock washers and 2 flat washers with 11/32" socket and torque wrench, then lift and remove the contactor.

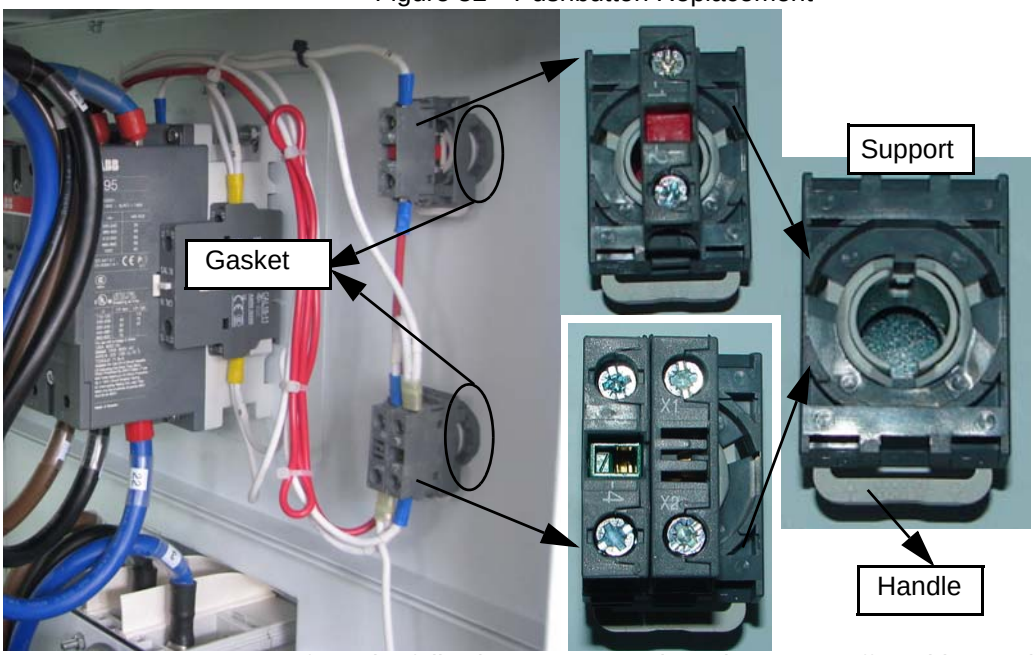
**Installation:**

1. Install new ABB contactor onto contactor support by installing 2 screws, 2 flat washers, 2 lock washers which were removed in removal step 1 with 11/32" socket by torquing to 13.3 in*lbs (1.5 N*m).
2. Connect control cables NO.67,69,65,66 to contactor by tightening screws with PH2 cross head screwdriver bit and adjustable driver by torquing to 17.7 in*lbs (2 N*m); Connect cables NO. 20, 21, 22,14,15,17 to contactor by tightening screws with 5/32" Hex head bit and adjustable driver by torquing to 62.0 in*lbs (7 N*m).
3. Reassemble the high front panel assembly to the vault using 8 (10-24 x 3/8) screws, 8 lock washers and 8 flat washers that were previously removed from the panel. Fasten the screws by torquing them to 26.6 in*lbs (3 N*m) using the PH2 cross head screwdriver bit and the adjustable torque driver.
4. Install the left side panel as outlined in *Closing the Vault* on page 18.

## 12.7 Replacing the Power-off Pushbutton (red) S2 and Power-on Pushbutton (green) S3

The Pushbutton S2 and S3 are a panel-mount type and located on the front high panel of power vault, refer to Figure 32.

Figure 32 Pushbutton Replacement




Perform the following steps to replace the Power-off Pushbutton (red) S2 and Power-on Pushbutton (green) S3:

**Removal:**

1. Remove the left side panel as outlined in *Preparing the Power Vault* on page 6.
2. Push the handle of support upward and remove the support from pushbutton.
3. Turn the gasket anticlockwise and take the pushbutton from panel.

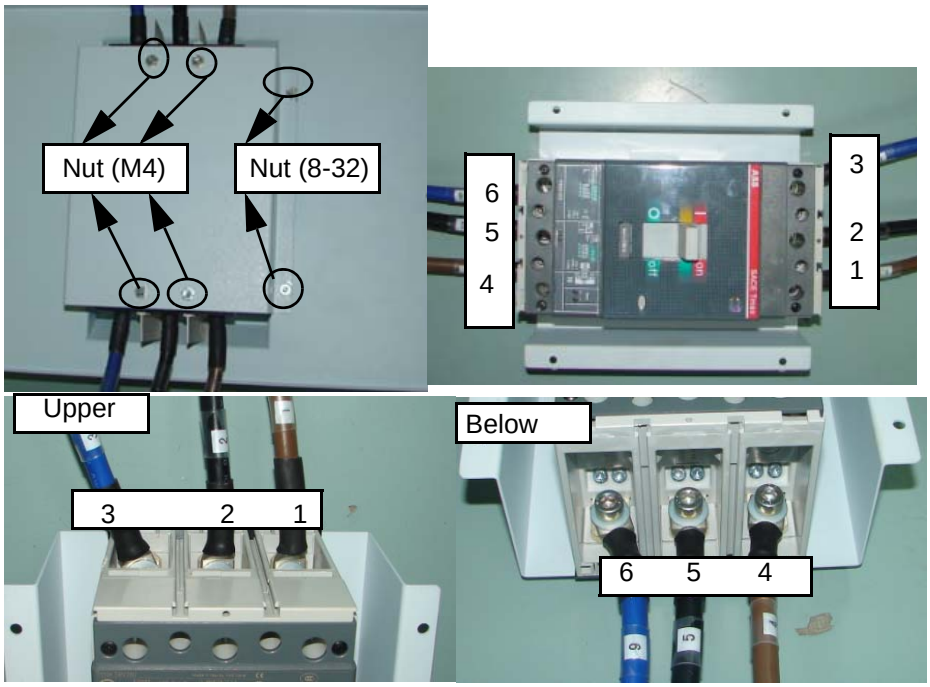
**Installation:**

1. Put the new pushbutton into the hole of panel and turn the gasket clockwise to fix the pushbutton.
2. Push the support onto the pushbutton.
3. Install the left side panel as outlined in *Closing the Vault* on page 18.

## 12.8 Replacing the Main Circuit Breaker CB1

The contactor is a screw-mount type and located on the front panel of power vault, refer to Figure 33.

Figure 33 Mai Circuit Breaker CB1 Replacement




Perform the following steps to replace the Main Circuit Breaker CB1:

**Removal:**

1. Unfasten the front panel assembly from the vault by removing 4 (10-24 x 3/8) screws, 4 lock washers and 4 flat washers from the panel using the PH2 cross head screwdriver bit and adjustable driver. release the panel and show up the CB1.
2. Remove the front panel by removing 4 (8-32) nuts, 4 lock washers and 4 flat washers from breaker support with 11/32" socket and torque wrench.
3. Remove wires 1-6 from breaker by unscrewing the screw with 7/32" Hex head screw bit and adjustable driver.
4. Remove the breaker from breaker support by removing 4 screws (M4), 4 lock washers, 4 flat washers and 4 nuts, hold the nut with 11/32" socket and torque wrench, and then unscrew the screws with the PH2 cross head screwdriver bit and adjustable driver.

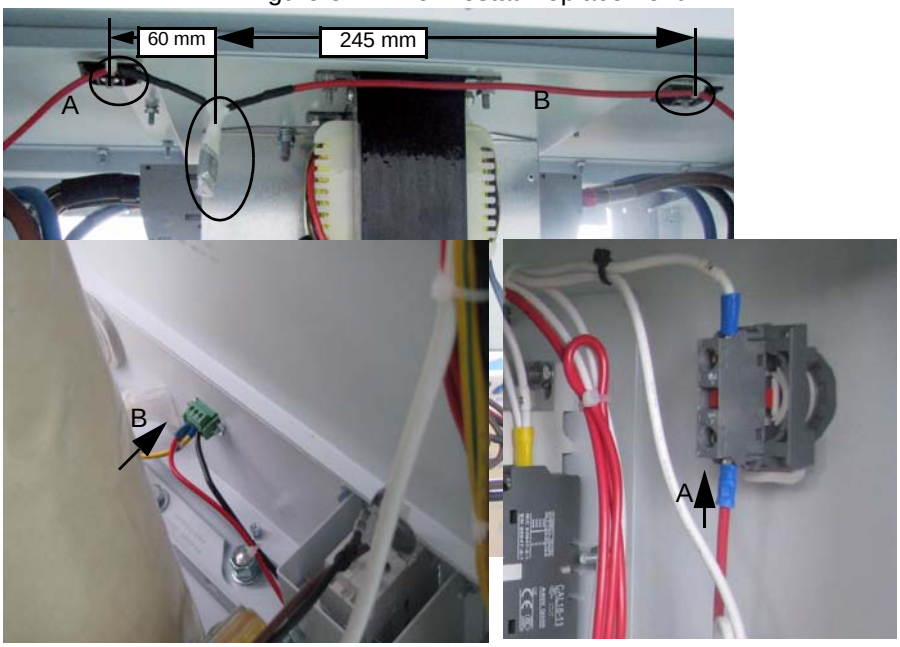
**Installation:**

1. Install the new breaker to breaker support by installing 4 screws (M4), 4 lock washers, 4 flat washers and 4 nuts which were removed in removal step 1, hold the nut with 11/32" socket and torque wrench, and then tighten the screw with the PH2 cross head screwdriver bit and adjustable driver.
2. Connect wire 1-6 to breaker, tighten the screw with7/32" Hex head screw bit and adjustable driver by torquing to 159.3 in*lbs (18 N*m).
3. Install the front panel to breaker support by installing 4 (8-32) nuts, 4 lock washers and 4 flat washers with 11/32" socket and torque wrench by torquing 13.3 in*lbs (1.5 N*m).
4. Reassemble the front panel assembly to the vault using 4 (10-24 x 3/8) screws, 4 lock washers and 4 flat washers that were previously removed from the panel. Fasten the screws by torquing them to 26.6 in*lbs (3 N*m) using the PH2 cross head screwdriver bit and the adjustable torque driver.

## 12.9 Replacing the Thermostat

The thermostat is a cable-mount type and located on the roof of power vault, refer to Figure 34.

Figure 34 Thermostat Replacement




Perform the following steps to replace the thermostat:

**Removal:**

1. Remove the two side panels as outlined in *Preparing the Power Vault* on page 6.
2. Disconnect one end of thermostat cable which the length is 1150mm from power-off push button (S2) by unscrewing the screw with PH2 cross head screwdriver bit and adjustable torque driver.
3. Disconnect another end of thermostat cable which the length is 1750 mm from EMO connector by unscrewing the screw with 1/8" slotted head screw bit and adjustable torque driver.
4. Remove cable ties which tie the cables of thermostat and remove the thermostat with cables.

**Installation:**

1. Reconnect one of the new thermostat cable which the length is 1150 mm to power-off pushbutton (S2) by screwing the screw with PH2 cross head screwdriver bit and adjustable torque driver by torquing to 17.7 in*lbs (2 N*m).
2. Reconnect one of the new thermostat cable which the length is 1750 mm to EMO connector by screwing the screw with 1/8" slotted head screw bit and adjustable torque driver by torquing to 6.2 in*lbs (0.7 N*m).
3. Tie the cable ties.
4. Install the two side panels as outlined in *Closing the Vault* on page 18.

# Personal Notes

## *Manual Comment Form*

We appreciate your feedback. Your comments are a valuable source of information for continuous improvement in our documentation effort. Please return this form together with a copy of the pages of concern from the manual marked with your comments to the address at the end of this form.

| | | |
|---|---|---|
| **Manual** | Name | |
| | Document number | |
| | Revision number and date | |
| **Sender** | Name | |
| | Company | |
| | Job title | |
| | Address | |

1. Briefly, in the space below, how would you describe this manual?
2. How do you use this manual?
   - ☐ I read it from beginning to end.
   - ☐ I only read the sections that pertain to my immediate needs.
   - ☐ I only read the sections that pertain to my job.
   - ☐ I use this manual for training purposes.
   - ☐ I use this manual for reference purposes.
3. When you need to find information in this manual, where is the first place that you look:
   - ☐ Table of Contents
   - ☐ Thumb through the pages until I find what I am looking for
4. How easily can you find information in this manual?
   - ☐ Not easily
   - ☐ Very easy



Part Number: 1-155462 Rev.: AB

5. How clear is the information in this manual?

   ☐ Not clear

   ☐ Very clear

6. When you actually try instructions in this manual, how easily can you follow them?

   ☐ Not easily

   ☐ Very easy

7. How well did you understand the product before reading this manual:

   ☐ Not at all

   ☐ Very well

8. After

   ☐ Not at all

   ☐ Very well

9. Was all of the information you needed included in this manual?

   ☐ Yes

   ☐ No

   ■ If not, what was missing?

10. The best aspect of this manual is:

11. If you could change one aspect of this manual, what would it be:

Other comments:

***Return to:***

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