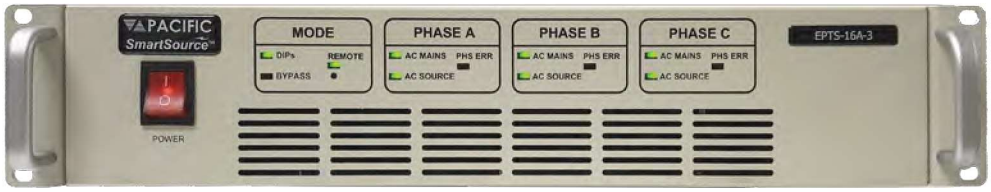
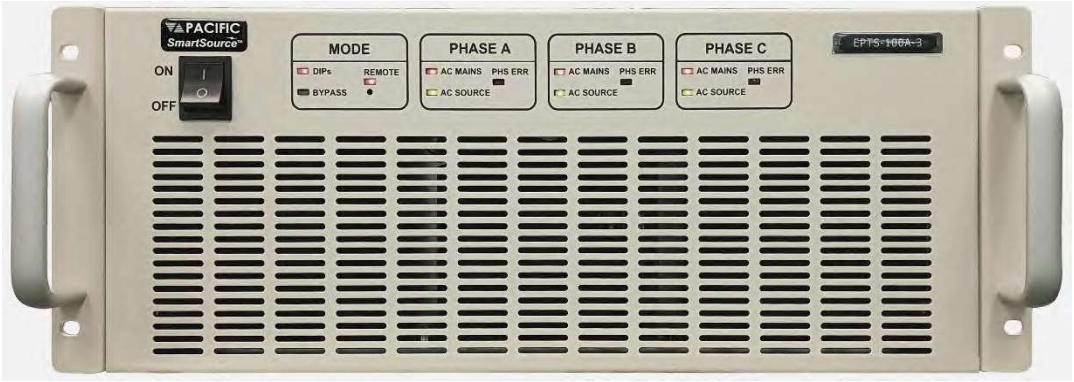
## Operation Manual

EPTS Series – Rev 1.8.3  P/N 160695-10

# EPTS Series

## Voltage Dips Modules




PACIFIC POWER SOURCE

Worldwide Supplier of Precision Programmable Power

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# Table of Contents

# Table of Tables

# Table of Figures

# 1 Contact Information

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# 2 Warranty, Service & Safety Information

## 2.1 Limited Warranty

Pacific Power Source, Inc. (PPS) warrants each unit to be free from defects in material and workmanship. For the period of one (1) year from the date of shipment to the purchaser, PPS will either repair or replace, at its sole discretion, any unit returned to one of PPS' designated service facilities. It does not cover damage arising from misuse of the unit or attempted field modifications or repairs. This warranty specifically excludes damage to other equipment connected to this unit.

Upon notice from the purchaser within (30) days of shipment of units found to be defective in material or workmanship, PPS will pay all shipping charges for the repair or replacement. If notice is received more than thirty (30) days from shipment, all shipping charges shall be paid by the purchaser. Units returned on debit memos will not be accepted and will be returned without repair.

**This warranty is exclusive of all other warranties, expressed or implied.**

## 2.2 Service and Spare Parts Limited Warranty

PPS warrants repair work to be free from defects in material and workmanship for the period of ninety (90) days from the invoice date. This Service and Spare Parts Limited Warranty applies to replacement parts or to subassemblies only. All shipping and packaging charges are the sole responsibility of the buyer. PPS will not accept debit memos for returned power sources or for subassemblies. Debit memos will cause return of power sources or assemblies without repair.

**This warranty is exclusive of all other warranties, expressed or implied.**

## 2.3 Safety Information

This chapter contains important information you should read BEFORE attempting to install and power-up PPS Equipment. The information in this chapter is provided for use by experienced operators. Experienced operators understand the necessity of becoming familiar with, and then observing, life-critical safety and installation issues. Topics in this chapter include:

- Safety Notices
- Cautions
- Preparation for Installation
- Installation Instructions

Make sure to familiarize yourself with the **SAFETY SYMBOLS** shown on the next page. These symbols are used throughout this manual and relate to important safety information and issues affecting the end user or operator.

**SAFETY SYMBOLS**


**Direct current (DC)**


**Alternating current (AC)**

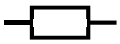

**Both direct and alternating current**


**Three-phase alternating current**


**Protective Earth (ground) terminal**


**On (Supply)**


**Off (Supply)**


**Fuse**


**Caution: Refer to this manual before this Product.**


**Caution, risk of electric shock**

## 2.4 Safety Notices

**SAFETY SUMMARY**

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Pacific Power Source assumes no liability for the customer's failure to comply with these requirements.

**GENERAL**

This product is a Safety Class 1 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

**ENVIRONMENTAL CONDITIONS**

This instrument is intended for indoor use in an installation category I, pollution degree 2 environments. It is designed to operate at a maximum relative humidity of 95% and at altitudes of up to 2000 meters / 6560 feet. Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

Keep all ventilation holes on the front and rear free from obstruction.

Do not operate or store under conditions where condensation may occur or where conducting debris may enter the cabinet.

**BEFORE APPLYING POWER**

Verify that the product is set to match the available line voltage and the correct fuse is installed.

**GROUND THE INSTRUMENT**

**CAUTION**

This product is a Safety Class 1 instrument (provided with a protective earth terminal). To minimize shock hazard, the instrument chassis or cabinet must be connected to an electrical safety ground. The instrument must be connected to the AC power supply mains through a properly rated three phase power cable with protective earth. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

**FUSES**

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired Fuses or short circuit the fuse holder. To do so could cause a shock or fire hazard.

**DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.**

Do not operate the instrument in the presence of flammable gases or fumes.

**KEEP AWAY FROM LIVE CIRCUITS.**

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified service personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power, discharge circuits and remove external voltage sources before touching components.

**DO NOT SERVICE OR ADJUST ALONE.**

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

**DO NOT EXCEED INPUT RATINGS.**

The AC inputs are rated at 400V rms. Do not exceed the rated input.

**MAINS POWER DISCONNECT**

**CAUTION**

The AC input connections must include a disconnect device (an external switch or circuit-breaker) as part of the installation. The disconnect device must be suitably located and easily reached and must be marked as the disconnecting device for the equipment. The disconnect device must disconnect all line conductors simultaneously.

An external overcurrent protection device must be provided (by, e.g., fuses or circuit breaker). The breaking capacity of the overcurrent protection device should be compatible with the current rating of the installation.

A minimum of basic insulation is required between mains-connected parts of opposite polarity on the supply side of the overcurrent protection device.

Overcurrent protection devices shall not be fitted in the protective conductor. Fuses or single pole circuit-breakers shall not be fitted in the neutral conductor of multi-phase equipment.

**DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT.**

There are no user serviceable parts inside the instrument – do not attempt to open the instrument, refer service to the manufacturer or his appointed agent.

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to a Pacific Power Source Sales and Service Office for service and repair to ensure that safety features are maintained.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

**AIRFLOW**

**CAUTION**

This equipment is air cooled using forced air fans. Air intake is in the front of the unit or cabinet and is exhausted at the back. When installing this equipment, make sure all front panel air intake vents and rear panel exhaust vents are unobstructed and there is at least 2 feet / 60 cm of clearing at the back of the unit or instrument rack. When installed in a 19" width instrument rack, make sure front and rear airflow remains unobstructed. Do not use solid front or rear panels or doors on 19" racks.

# 3 Product Overview

This chapter describes the general features of the PPS Electronic Power Transfer Switch (EPTS) Modules. It introduces the reader to general operating characteristics of these measurement devices.

## 3.1 General Description

The PPS EPTS power transfer switch modules contain semiconductor switches that are capable of connected either the AC grid power or the output of a programmable AC power source to a single load. The modules switches between the two AC sources under software control for a specific period of time. Default switch position is AC line (grid) connected. When switching the programmable AC power source output, the switches are changed back to the AC grid after this time period ends. Switching can be started at a specific phase angle of the 50Hz or 60Hz AC voltage.

A simplified block diagram of the EPTS Module is shown in below.

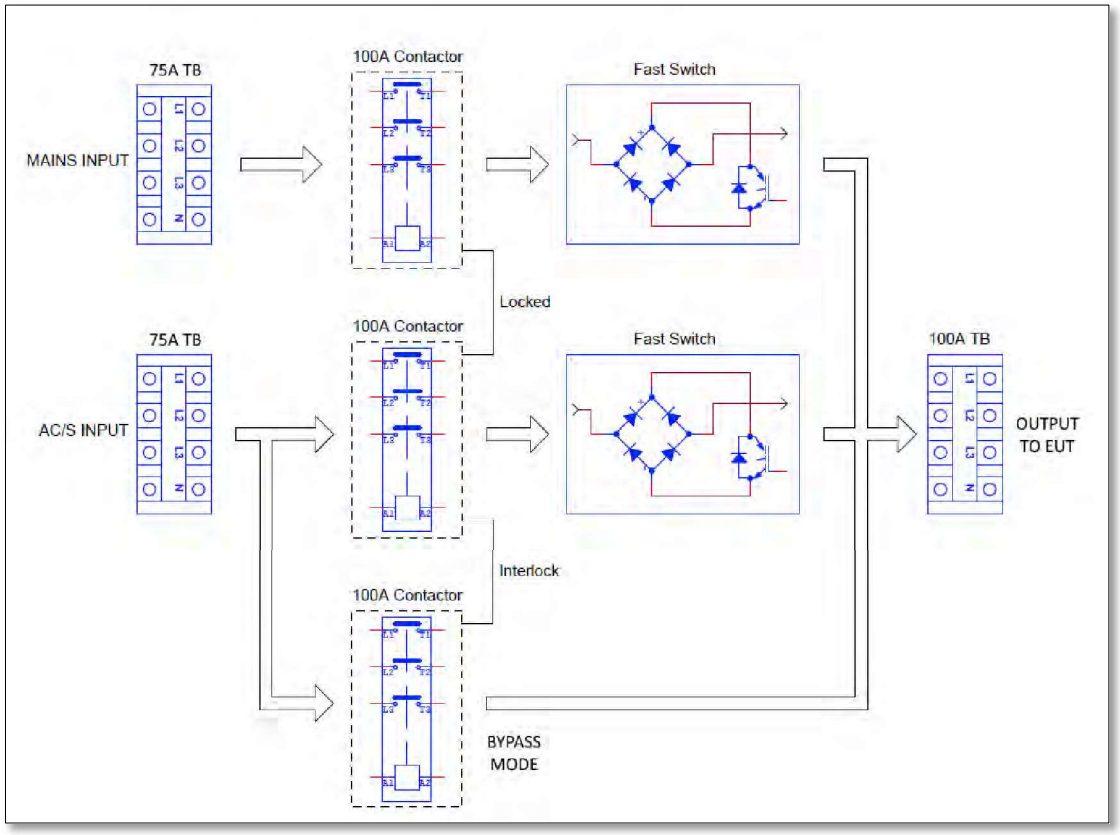



*Figure 3-1: EPTS Block Diagram*

Switching is accomplished fast enough to meet the IEC61000-4-11 and IEC61000-4-34 Voltage Dips and IEC61000-4-27 Voltage Unbalance compliance test standards. (less than 5 µsec).

**Note:** To ensure a smooth transition of the load connection to either AC source, both AC power inputs **must be synchronized** and phase aligned. For three phase AC inputs, Phase A **must** be aligned to 0° for both sources and phases B and C **must** have the same offset phase with respect to phase A for both AC source inputs. (Same phase rotations.)

A phase sync calibration procedure is provided to calibrate any phase A offsets between the two AC power sources used for input power.

The EPTS is controlled by the included EPTS Windows software using a simple USB-2 or USB-3 connection.

## 3.2 Product Features

The following features and functions are supported by the EPTS Electronic Power Transfer Switch:

- Immunity Test Software for AC Tests:
  - IEC61000-4-11
  - KS C 9610-4-11 (Korean standard)
  - IEC61000-4-27
  - IEC61000-4-34

  **Note** The EPTS module is only used for Voltage Dips and Interruptions. For voltage variations, the EPTS is placed in Bypass mode and voltage variations are programmed on the programmable AC power source.
- Single or Three Phase EPTS Module Configurations available
- Easy to Use Windows Software
- Optional Low Inductance 100 Ohm Resistive Test Load model VDT100R for verification or calibration.

## 3.3 Principle of Operation

### 3.3.1 Setup for AC Tests

The EPTS module is placed between the output of a programmable AC source and the equipment to be tested for compliance to IEC 61000-4-11or IEC 61000-4-34.

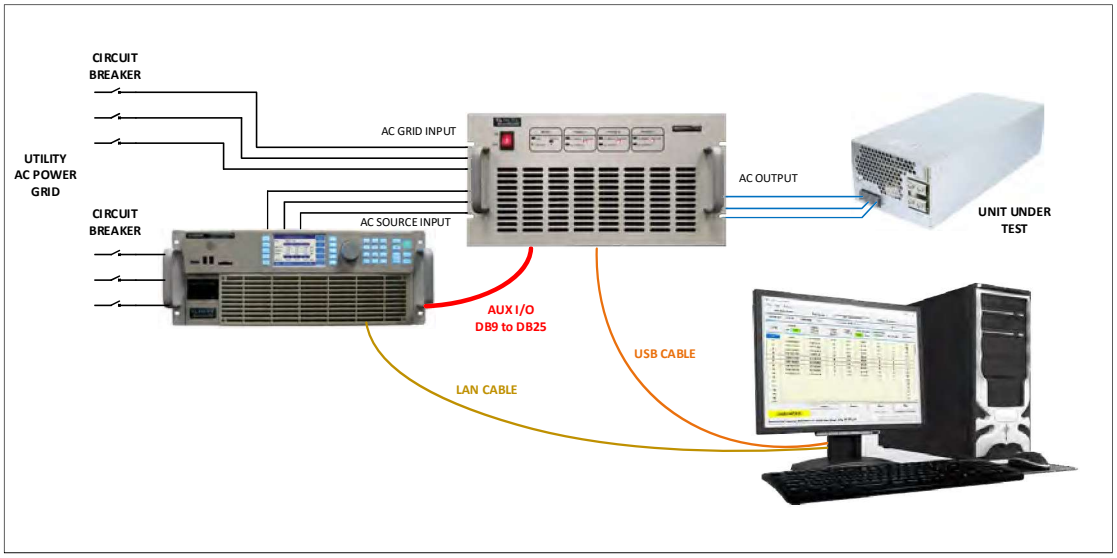



*Figure 3-2: Basic EPTS-3-XX Test Setup for IEC 61000-4-11 or IEC 61000-4-34*

The programmable AC Power Source is programmed to supply the Voltage Dip level called out in the test standard, either 80%, 70%, 40% or 0% of Unom or any other value from 0 Vrms to 400 Vrms.

For Voltage dips and interruption testing, the EPTS switches between the nominal AC line voltage provided by the grid and the output of the programmable AC source for a period determined by the EPTS control software as programmed per the IEC 61000-4-11/34 standard.

The user can configure specific test voltage dip levels and durations as required by the IEC 61000-4-11/34 and IEC61000-4-27 product standards and save these settings for future use as needed.

For the optional EIC 61000-4-11/-34Voltage Variations tests, the EPTS-3-XX switch is placed in BYPASS mode and the programmable AC power source is used only to generate the requisite voltage variation sweeps and timing.

## 3.4 Available Operating Modes

The EPTS Gui software can be used in one of two modes of operation:

- Full Compliance Mode — In this mode the EPTS power transfer switch is used to meet the less than 5 μsec rise and fall times for all AC voltage changes.
- Pre-compliance Mode — In this mode, the EPTS Gui can be used without the EPTS power transfer switch for pre-compliance test purposes. In this mode, the AC power source transient list system in used to perform all tests and the less than 5 μsec rise / fall times for voltage changes will be met.

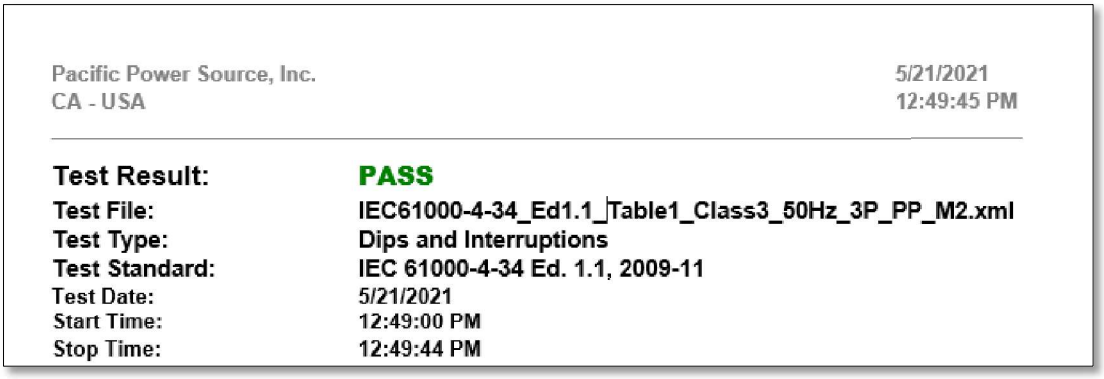
The EPTS Gui is included with the EPTS hardware option. If no EPTS hardware unit is purchased, the EPTS Gui can be purchases as an option for pre-compliance testing.

**Note:** If both licenses are available, the user can selected between full and pre compliance modes from the Options menu.

### 3.4.1 Full Compliance Mode

To use this mode, the EPTS must be present and connected to the controller PC via the USB interface. Once the EPTS hardware is detected, the EPST Gui will automatically operate in full compliance mode.

Test reports generated in Full Compliance mode will show the selected test standard



Pacific Power Source, Inc. 5/21/2021
CA - USA 12:49:45 PM

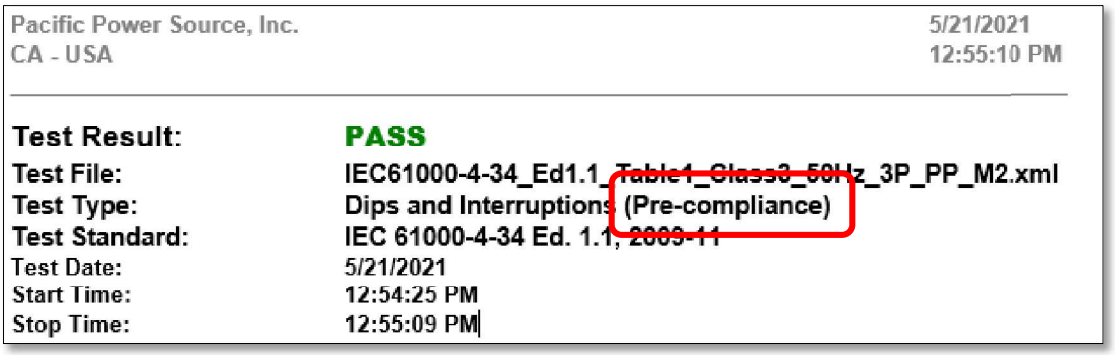
| | |
|---|---|
| **Test Result:** | **PASS** |
| **Test File:** | **IEC61000-4-34_Ed1.1_Table1_Class3_50Hz_3P_PP_M2.xml** |
| **Test Type:** | **Dips and Interruptions** |
| **Test Standard:** | **IEC 61000-4-34 Ed. 1.1, 2009-11** |
| **Test Date:** | **5/21/2021** |
| **Start Time:** | **12:49:00 PM** |
| **Stop Time:** | **12:49:44 PM** |

### 3.4.2 Pre-compliance Mode

This mode of operation is available for use without an EPTS transfer switch if a software license is obtained. See section 9.6.2 on page 75.

The rise and fall time requirement for the four supported IEC61000-4 test standards will not be met in this mode but the relevant voltage changes and timing remains the same.

Test reports generated in Pre-compliance mode will display a (Pre-compliance) test after the selected test standard as shown below.



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CA - USA 12:55:10 PM

| | |
|---|---|
| **Test Result:** | **PASS** |
| **Test File:** | **IEC61000-4-34_Ed1.1_Table1_Class3_50Hz_3P_PP_M2.xml** |
| **Test Type:** | **Dips and Interruptions (Pre-compliance)** |
| **Test Standard:** | **IEC 61000-4-34 Ed. 1.1, 2009-11** |
| **Test Date:** | **5/21/2021** |
| **Start Time:** | **12:54:25 PM** |
| **Stop Time:** | **12:55:09 PM** |

### 3.4.3 Compliance Mode Selection

On ECTS2 EMC systems with the EPTS option, it is possible to add the AC source software license for pre-compliance mode if so desired. In that case, the user can select between full compliance mode and pre-compliance mode using the Options menu.

Click on the Options menu and selected Dips and Interruptions. With both licenses installed, a selection between Pre-compliance and Full compliance will be available to select from.

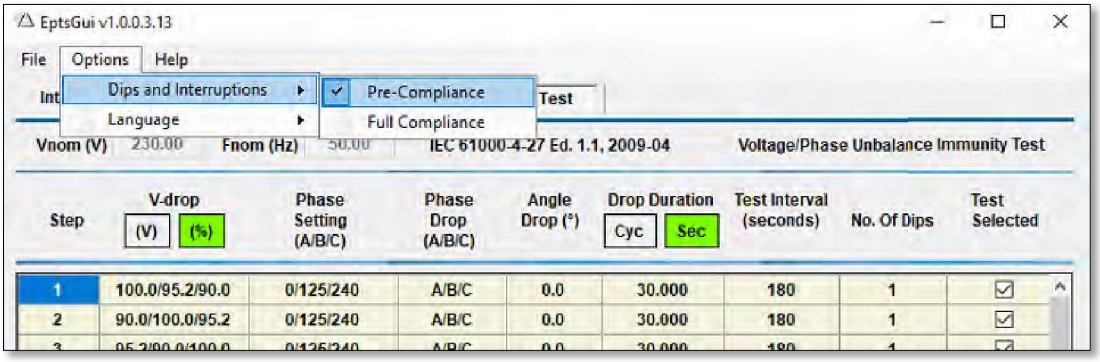



*Figure 3-3: Pre-compliance Selection Menu*

In Pre-compliance mode, the EPTS hardware – if present – will be in Bypass mode.

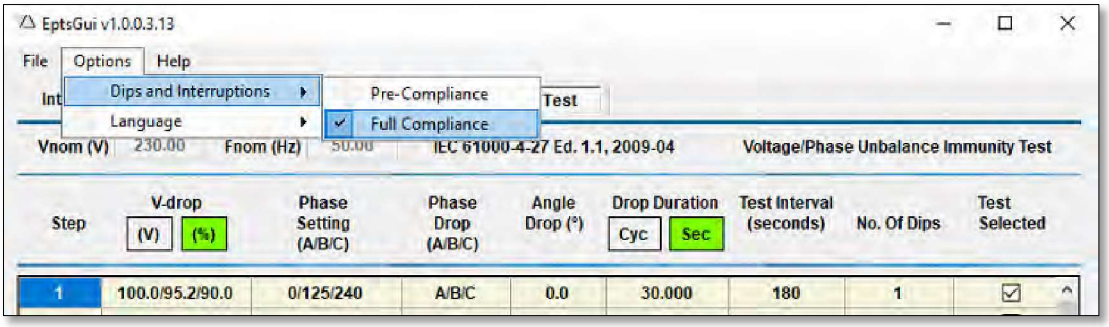



*Figure 3-4: Full compliance Selection Menu*

## 3.5 Accessories Included

The following accessories are included with each EPTS Module. If one or more of these is missing upon incoming inspection of the product, please contact Pacific Power Source customer service.

| Item | Quantity |
|---|---|
| **AC Line Cord** | 1 |
| **Interface Cables - USB** | 1 |
| **AUX I/O Cable pass-through Adapter DB25-DB9 for use with AFX Series AC Source**  | 1 |
| **Software** | CD ROM or Download from Pacific Power website |
| **Documentation in PDF Format** | Download from Pacific Power website |

*Table 3-1: Included Accessories*

## 3.6 Remote Control Interfaces

The following remote control interface is standard on the EPTS Series.

| Standard Interfaces – EPTS Chassis | |
|---|---|
| **USB Interface** | Control Interface |

*Table 3-2: Available Remote Control Interface*

## 3.7 Auxiliary I/O Interface

The AUX I/O DB9 connector provides the following input and output control signals.

| PIN | SIGNAL | SIGNAL |
|---|---|---|
| **1** | SYNC1 | AC Grid Phase A Sync Output |
| **2** | SYNC2 | AC Grid Phase B Sync Output |
| **3** | SYNC3 | AC Grid Phase C Sync Output |
| **4** | SYNC4 | AC Power Source Phase A Sync Output |
| **5** | SYNC5 | AC Power Source Phase B Sync Output |
| **6** | SYNC6 | AC Power Source Phase C Sync Output |
| **7, 8 , 9** | Ground | Ground |

*Table 3-3: Auxiliary I/O Interface Pins*

**Note:** The SYNC1 output (pin 1) and Ground (pin 7) of the EPTS-3-XX unit DB9 must be connected to the AUX I/O DB25 connector SYNC IN (pin 8) and Ground (pin 9) of the AFX AC Power source. Use the provided interconnect adaptor for this purpose.

# 4 Technical Specifications

Technical specifications shown here apply at an ambient temperature of 25° C ± 5°.

## 4.1 Compliance

| PARAMETER | IEC REQUIREMENT | EPTS-75A |
|---|---|---|
| AC Voltage Range | 230Vac (Europe)<br>300Vac (Japan) | 400Vac max. |
| Accuracy | < 5% | < 0.25% |
| Rise / Fall Time | 1 to 5 μsec | < 5 μsec |
| Frequency | 50.0 or 60.0 Hz ±2% | 45.0 - 65.0 Hz |
| Phase error (3 phase) | < 5° | ± 0.5° |
| Current | | |
| IEC 61000-4-11, Max. | 16A / Ph | 75A / Ph |
| IEC 61000-4-34, Max. | 75A / Ph | 75A / Ph |

## 4.2 AC Input (Bias Supply)

| AC INPUT | EPTS-16A-1 / -3 | EPTS-32A-1/-3, EPTS-60A-1 / -3<br>EPTS-75A-1/-3, EPTS-100A-1 / -3 |
|---|---|---|
| AC Voltage (Bias) | | |
| EPTS-16A-1 / EPTS-16A-3 | Universal input,<br>100V ~ 240 Vac | 110 Vac ± 10% or 230Vac ±10%, 2W+G<br>See system label for AC voltage input rating |
| Input Current | 1.5 A | 3 A |
| Internal Fuse Rating | 2 A @ 250Vac | 4 A @ 250Vac |
| Detachable Line Cord | IEC C13, 300/500V, 3 * 1.0 mm² | |
| Frequency | 50 / 60 Hz ± 3Hz | |

## 4.3 Test Standards

| TEST STANDARDS SUPPORTED | |
|---|---|
| IEC 61000-4-11 | AC - Voltage Dips and Interruptions |
| KS-C-9610-4-11 | Korean Version |
| IEC 61000-4-27 | AC – Voltage Unbalance |
| IEC 61000-4-34 | AC - Voltage Dips and Interruptions |
| KS-C-9610-4-34 | Korean Version |
| IEC 61000-4-29p | DC - Voltage Dips and Interruptions (pre compliance using EptsGui SW) |

## 4.4 Interface, Indicators and Controls

| INTERFACES, INDICATORS & CONTROLS | |
|---|---|
| Connectors - Rear Panel | |
| Power Input | AC Mains, 1 or 3 Phases + Neutral<br>AC Source, 1 or 3 Phases + Neutral |
| Power Output | To EUT, 1 or 3 Phases + Neutral |
| Control Interface | USB Device Type B, Rear panel |
| Line Sync | From AC Mains or Generator |
| Auxiliary I/O | DB9 Connector, Female, Rear panel |
| LED Indicators - Front Panel | |
| Mode | DIPS or Bypass |
| Phase Status | Mains or Source |
| Phase Error | For each Phase |
| Controls - Front Panel | |
| Power On/Off | Toggle Switch, Front panel |

## 4.5 Dimensions & Weight

| MECHANICAL & ENVIRONMENTAL | |
|---|---|
| Dimensions | |
| **EPTS-16A-1 & EPTS-16A-3 – 2 U Chassis** | |
| (H x W x D)<br>See drawing below | 89 x 425 x 552 mm<br>3.5” x 16.7” x 20.5” |
| Weights | |
| EPTS-16A-1 | 11.5 Kg / 25.4 lbs |
| EPTS-16A-3 | 12.0 Kg / 26.5 lbs |
| **EPTS-32A-3, EPTS-75A-3 & EPTS-100A-3 – 4U Chassis** (Rev AC or higher) | |
| (H x W x D)<br>See drawing below | 178 x 432 x 670 mm<br>7” x 17” x 26.4” |
| Weights | |
| EPTS 5U | 42.5 Kg / 93.7 lbs |
| **EPTS-32A-3, EPTS-75A-3 & EPTS-100A-3 – 5U Chassis** (Rev AB or lower) | |
| (H x W x D)<br>See drawing below | 222 x 432 x 585 mm<br>8.75” x 17” x 23” |
| Weights | |
| EPTS 5U | 42.5 Kg / 93.7 lbs |
| **All EPTS Models** | |
| Temperature | 0 - 40° / 32 - 104° |
| Humidity | 0-95 % non-condensing |
| Altitude | 6500 ft / 2000 m (operating) |

See dimension drawings on next page.

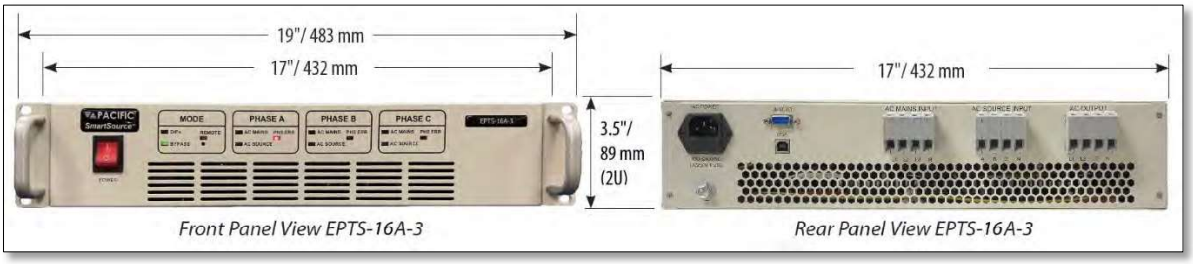



*Figure 4-1: Dimension Drawing EPTS Module Series 2U Models 16A*

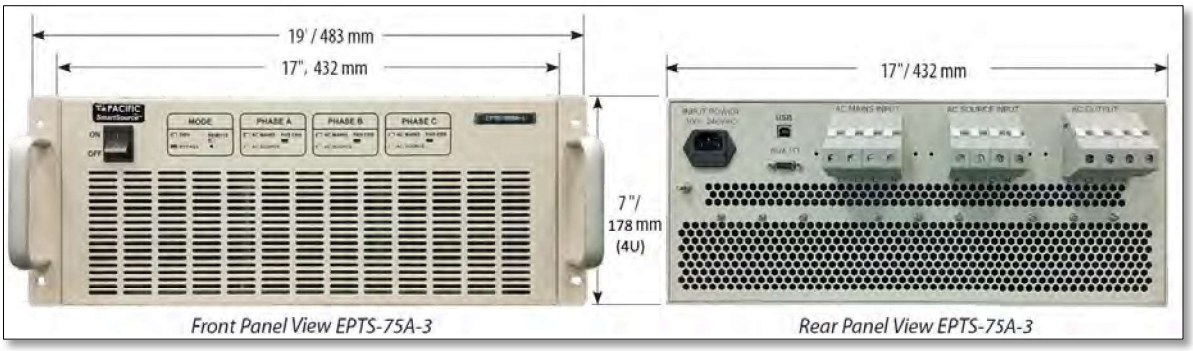



*Figure 4-2: Dimension Drawing EPTS Module Series 4U Models > 16A*

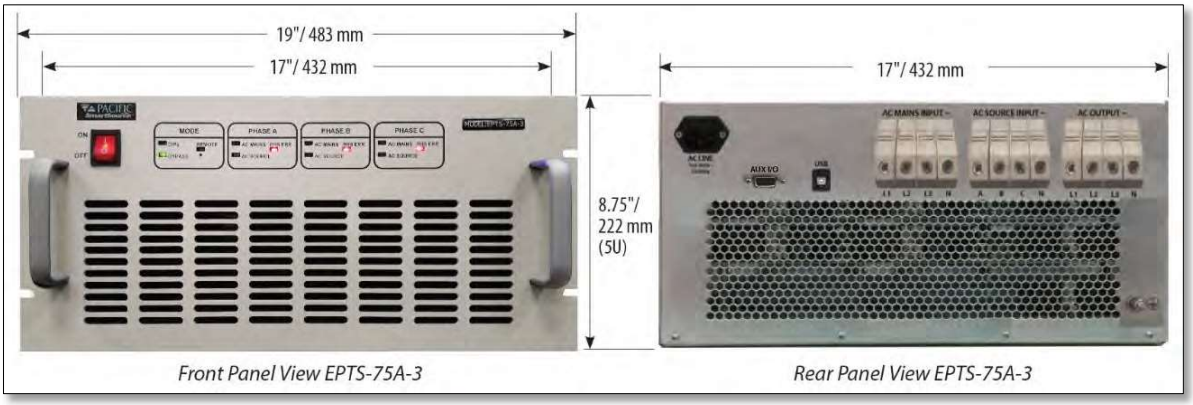



*Figure 4-3: Dimension Drawing EPTS Module Series 5U Models > 16A*

## 4.6 Environmental

| ENVIRONMENTAL | |
|---|---|
| Cooling | Fan Cooled |
| Operating Temperature | 0 to 40 °C / 32 to104 °F |
| Storage Temperature | -20 to 70 °C / -4 to 158 °F |
| Humidity | < 95%, non-condensing |
| Altitude (max.) | 2000 m / 6550 feet |
| Equipment ingress protection rating per IEC 60529 | IP20 |

# 5 Unpacking and Installation

## 5.1 Inspection & Protective Earth Connection

The EPTS Modules are carefully inspected before shipment. If instrument damage has occurred during transport, please inform Pacific Power Source' nearest sales and service office or representative.

The EPTS Module chassis is shipped ready for use –complete with an appropriate power cord. Prior to use, the phase A calibration between both AC input sources (AC grid and AC source or two AC sources) must be performed.

**CAUTION**

**THIS UNIT MUST BE GROUNDED.**

The unit is grounded via the bias supply AC Input. A line cord with proper Earth Ground must be used at all times. Furthermore, a high current rated grounding stud is located in the lower left bottom corner of the EPTS chassis. This ground stud must be connected to earth ground using a 75A rated ground wire. Correct grounding of your electrical system infrastructure according to applicable national standards must also be observed.

## 5.2 Rack Mount Installation

**CAUTION**

**THIS UNIT IS HEAVY.** Two persons are required to lift or carry this unit. DO NOT attempt to lift alone. DO NOT use the front panel rack handles alone to lift this unit. The unit must be supported in front and back when carrying.

If the unit is to be installed in an instrument rack, a suitable lift must be used to position the unit at the desired rack height and pushed in place using L-brackets (not included with the unit). The front panel handles may be used to pull or push the unit in or out of a rack space only.

## 5.3 Ship Kit Contents

Inside the packaging, there should be the following ship kit items:

| Item | Quantity |
|---|---|
| EPTS unit | 1 |
| AC Line Cord | 1 |
| Interface Cables - USB | 1 |
| AUX I/O Cable pass-through Adapter DB25-DB9 for use with AFX Series AC Source  | 1 |
| Software | USB Stick or Download from Pacific Power website |
| Documentation in PDF Format | Download from Pacific Power website |


*Figure 5-2: Ship Kit Content Hardware Items*

## 5.4 Software Installation

The following software components are required for the correct operation of the EPTS. Refer to Section 9, “Software Installation Instructions” on page 67 for details on installing all required software components on a new PC or laptop.

## 5.5 Hardware Installation

The hardware connections are very straightforward and shown in *Figure 5-3* and *Figure 5-4*. The following devices connect to the rear panel of the EPTS Chassis:

1. AC grid power to provide bias power supplies to the EPTS circuits,
2. AC Power Output connections from programmable AC power source. The maximum amount of current hat can be routed through the EPTS chassis is 20A for the EPTS-1 (Single-phase version) or 40A to 75A for the EPTS-3 (Three-phase version).
3. USB interface connection to control the EPTS Electronic Power Transfer switch hardware using the EptsGui Application software.
4. Connect the DB9 AUX I/O connector of the EPTS-3-XX unit to the DB25 AUX I/O connector of the AFX Series AC Power Source using the provided pass-through adapter. This allows the AC source to be synchronized to Phase L1 of the AC grid.

See system schematic on next page for interconnections between various components.

## 5.6 System Schematic

The schematic below applies to AC Mode testing. For DC testing, the AC grid connection is replaced by either a second DC power supply or by phase B output from the AFX so the interconnections are different between AC and DC modes. Refer to section 3.3 on page 15 for more details.

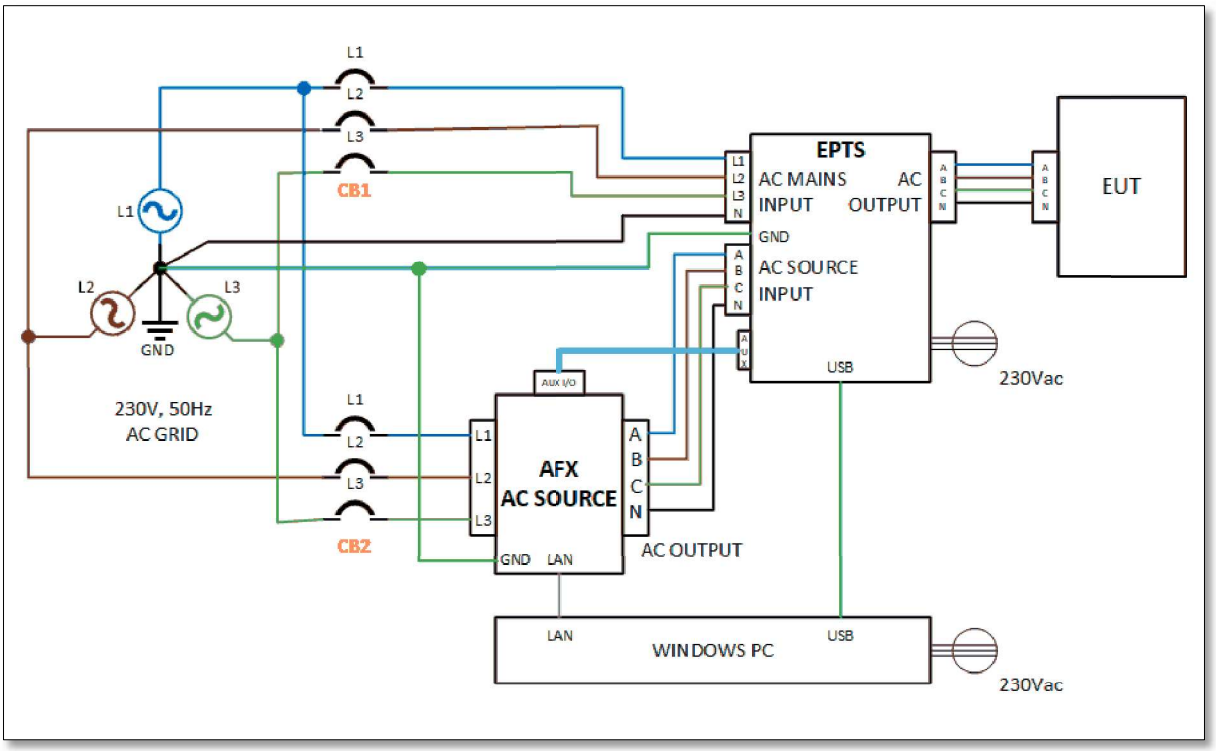
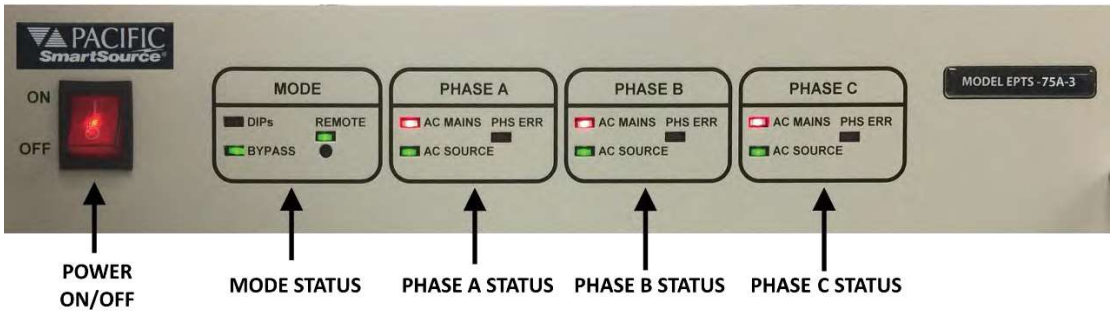



*Figure 5-3: EPTS System Schematic for AC Test Mode*

## 5.7 Front Panel Operation

The front panel of the EPTS chassis has the following controls, indicators and power connectors:




1. Power On/Off Switch. Turns internal control circuits on or off.
2. Mode Status of Transfer Switch Operation: DIPs Mode or BYPASS Mode. In Power OFF state, Mode is always BYPASS.
   Remote Control Active Status Indicator
3. PHASE A AC Mains and AC Source input present and Phase Sync Error Indicator
4. PHASE B AC Mains and AC Source input present and Phase Sync Error Indicator
5. PHASE C AC Mains and AC Source input present and Phase Sync Error Indicator

All other connections are made at the rear panel as described in the next several sections.

## 5.8 AC Bias Power

The EPTS requires only single-phase bias AC power. It has a standard IEC13 line cord connection at the rear. Total power consumption is less than 400W for EPTS-16A-1 / -3 or less than 750W for higher current models. AC input voltage is 220 Vac ~ 240Vac ± 10%, 50 Hz or 60 Hz.

**CAUTION**

DO NOT replace the included detachable AC Line cord with an inadequately rated line cord. Line cord used must meet or exceed voltage and current ratings as specified in section 4.2, page 20.

## 5.9 AC Power Input Sources

The EPTS needs two AC power input sources:

1. Fixed nominal AC voltage and frequency for required test. For European CE mark requirements, this will be 230Vac, 50Hz. In countries where this is the nominal grid voltage, the public utility grid can be used. For countries where the voltage and or frequency is not correct, a generator or additional programmable AC power source of sufficient current rating may be used instead.
2. A programmable AC power source with a 0 to 400Vac RMS programmable output voltage and 50Hz or 60Hz frequency setting. The current at the voltage dip levels available from the AC power source must be sufficiently high to support the levels called out in the IEC 61000-4-11 and IEC 61000-4-34 test standards.

These two AC power inputs are routed in through the real panel terminal blocks marked AC MAINS INPUT~ and AC SOURCE INPUT~ respectively. For single phase EPTS-1 models, only Phase A and Neutral are required on each input. For three phase applications, three phase power input is required for both AC inputs.

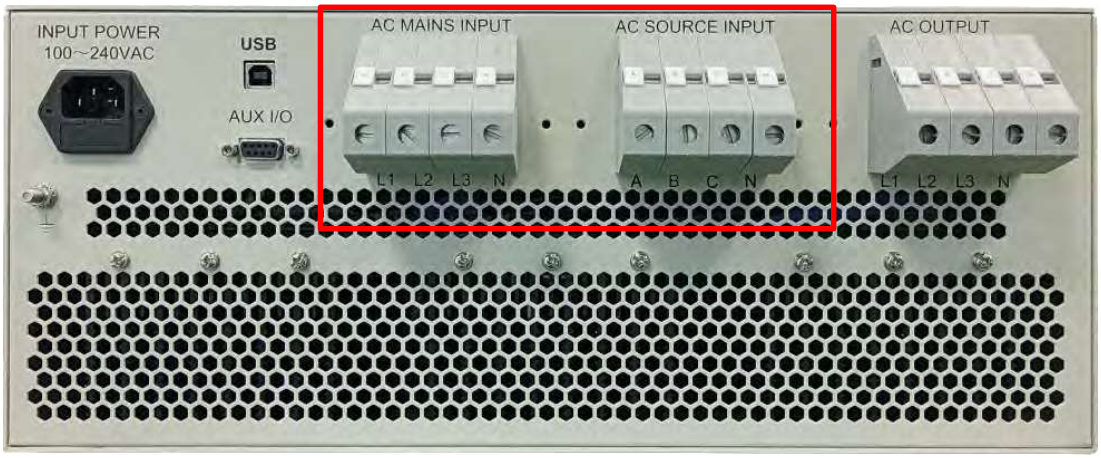



*Figure 5-4: EPTS-3 Three Phase Connection Locations*

### 5.9.1 AC Input & Output Wire Sizes

Required AC input and output wire sizes vary by EPTS model. The table below list recommended AC wires size by EPTS model. Wire size per phase is the same for single and three phase LFZ models.

**CAUTION**

**Consult a certified electrician to determine require AC Input and Output wiring type and size in accordance with local electrical codes.**

Wires size recommendations shown are for single copper wire, both AC input and AC output connections and are per phase.

| Single Core Copper | EPTS-16A-x | EPTS-32A-x | EPTS-75A-x | EPTS-100A-x |
|---|---|---|---|---|
| **US AWG Size** | 14 | 10 | 6 | 4 |
| **Metric diameter** | 1.6 mm | 2.6 mm | 4.1 mm | 5.2 mm |

## 5.10 EUT Power Connections

The product to be tested (EUT) must be connected to the AC OUTPUT~ terminal of the EPTS module. On ECTS2 Cabinet systems, an IEC style female connector is provided on the front of the cabinet for the EUT connection. A mating male connector is provided in the ship kit.

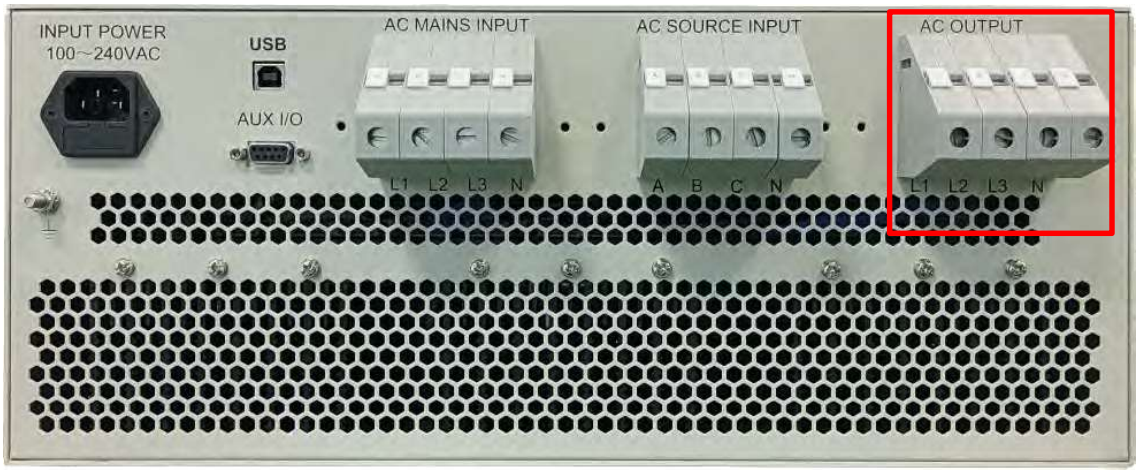



*Figure 5-5: EPTS-3 Chassis Rear Panel EUT OUTPUT POWER Connector*

## 5.11 USB Connection to Computer

The EPTS chassis has a single USB Device port on the rear panel. This USB port needs to be connected to the controller computer using the provided USB cable or equivalent.

## 5.12 DB9 AUX I/O Connection to AC Power Source

The DB9 AUX I/O connector must be connected to the programmable AC power source used to provide the voltage dip levels. (AC SOURCE INPUT connection). This output provided the mains synchronization signal to the AC power source. The required cable in provided in the ship kit.

**Note:** This DB25 Connector adaptor cable between the EPTS units and the AC Power Source or ECTS2 H&F test system **MUST** always be connected to ensure phase synchronization between the EPTS and the AC source. This connection also ensures the AC Source output voltage and current are limited to a maximum levels that are within the specification range of the EPTS hardware. (Applies to Pacific Power Source model series AFX, AZX, LSX and LMX only).

**Note:** If the AC power source is not used with the EPTS hardware, original maximum output ranges can be restored to normal by sending the following command:

**SOUR:ECTS 0**

This restores normal output ranges to the AC power source.

## 5.13 Powering Up

Before connecting the EPTS to a unit to be tested, first connect the mains cord from a properly grounded supply outlet to the inlet on the rear panel of the EPTS chassis.

In the event of any problem, please contact customer service or your local authorized representative. See Section 1.

## 5.14 Phase Synchronization Calibration

Before the EPST-3-XX unit can be used, the AC source must be phase calibrated to the same phase angle as the AC mains used. This is done using the Epts GUI windows software. Refer to Section 10, “Calibration Information” on page 77 for details.

## 5.15 In Case of Malfunction

In the unlikely event of an instrument malfunction or if the instrument does not turn on despite the presence of the correct AC line voltage, please attach a warning tag to the instrument to identify the owner and indicate that service or repair is required. Contact Pacific Power Source or its authorized representative to arrange for service.

## 5.16 Cleaning

**CAUTION**

BEFORE you clean the unit, switch the unit off at the front panel AND remove all mains power using the mains disconnect.

- Please do NOT use any organic solvent capable of changing the nature of the plastic such as benzene or acetone.
- Please ensure that no liquid is allowed to penetrate this product.





*Figure 5-6: Effect of Current Slew Rate Settings on Power Supply Testing*

# 6 IEC 61000-4-11/34 / KS C 9610-4-11 Software Operation

## 6.1 Preface

Operation of the EPTS-3-XX unit is only possible using the provided Windows Epts GUI software. This section describes operation and use of the software to perform AC voltage dips, interruptions and variations tests.

## 6.2 Interface Setup Tab

The first tab displayed upon program launch will be the Interface Setup. This screen is used to configure the remote control interfaces used.

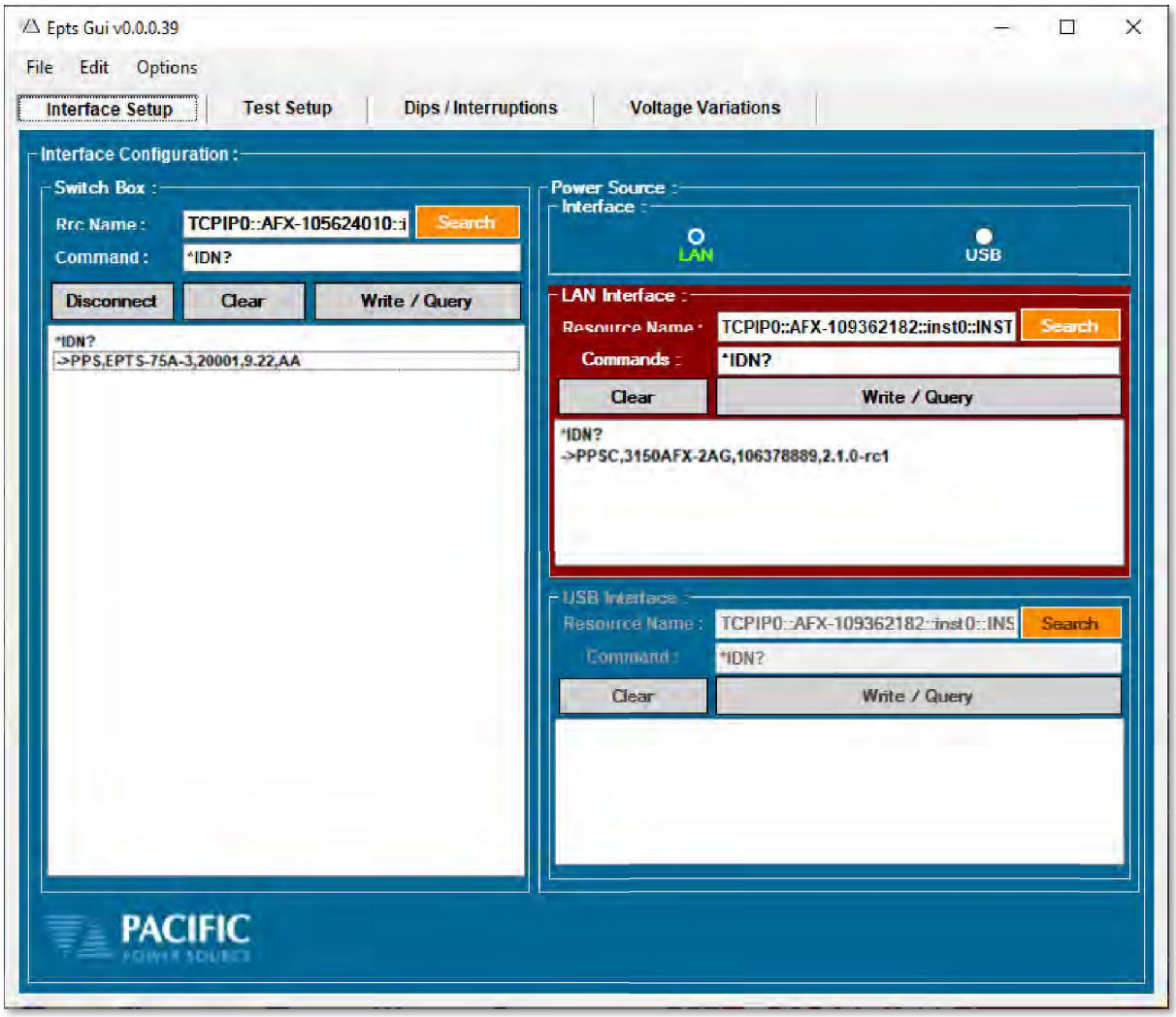



*Figure 6-1: GUI Interface Setup Tab Screen*

Steps to configure the two remote control interfaces used are as follows:

1. Make sure both the EptsGui software and the USB Device Driver for the EPTS-3-XX switch module are installed. Refer to section 9.3, “Installing the USB Driver” on page 67 if not.
2. Launch the Etps application.
3. Click on the **Interface Setup** tab, to configure the interface connection to the EPTS-3-XX switch module and the AFX Series power source.
4. On the left side, search for the EPTS-3-XX unit by clicking on the “Search…” button. Select the EPTS Visa resource from the visa resource list displayed.
5. Test the connection by clicking the “Write / Query” button while the *IDN? Command is shown in the Command line at the top.
6. The model, serial number and firmware revision of the EPTS-3-XX connected should be displayed in the text field below. This confirms the connection to the unit is working.
7. If there is no response (time-out), make sure the EPTS-3-XX is powered ON and the USB cable between the PC and the unit is installed.
8. Repeat the same procedure to verify connection to the AFX power source. First select either LAN or USB at the top in the right side window.
9. Depending on your selection, use the “LAN Interface:” window at the top or the “USB Interface:” window at the bottom to selected the Visa resource for the AC source and verify connection as described above. Note that only the selected interface type window is enabled.
10. You are now ready to proceed to the **Test Setup** tab.

## 6.3 Test Setup Tab

The Test Setup tab is used to select key test settings like IEC test standard used, nominal voltage and frequency settings and any optional settings. The actual test levels will be covered later.

The bottom part of this tab allows entry of user and EUT information that will carry over to any test reports generated. This information includes:

- Ambient temperature (user provided thermometer required)
- Relative Humidity (user provided humidity measurement device required)
- Operator Name
- EUT description and/or serial number
- Test Site or Test Lab Name
- Any comments the operator wants to add before, during or after a test run.

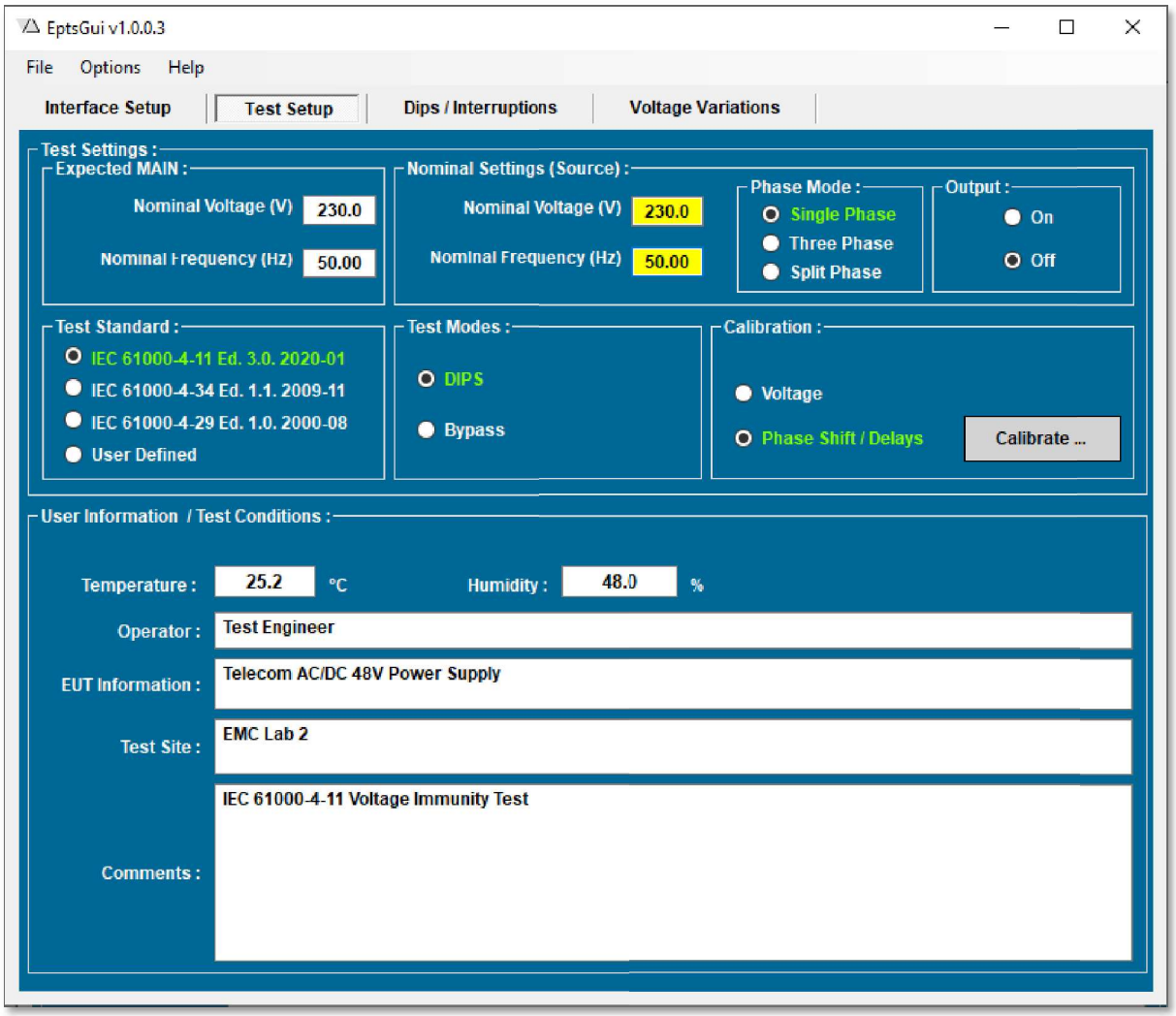



*Figure 6-2: Test Setup Screen*

### 6.3.1 Expected MAINS

This section is for display purposes only and shows the detected AC line voltage and Frequency. For DC tests, this information is greyed out as no line synchronization is required for IEC 61000-4-29 DC Dips testing.

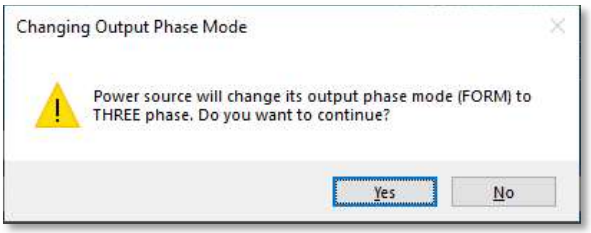
Make sure the voltage and frequency match your expectations. It is important to set the AC power source to the same AC voltage and Frequency as the local utility grid or the settings of the nominal AC voltage generator or AC power source used as the Mains.

### 6.3.2 Nominal Settings (Source)

This are allows entry of the AC voltage and Frequency for the programmable AC power source. It normally defaults to the last setting used but always make sure it matches the values shown in the Expected MAIN area to the left.

### 6.3.3 Phase Modes

If the programmable AC power source is a three-phase model – e.g. AFX, AZX or 360LMX – the output phase mode can be selected in this area. Note that any changes of phase mode will prompt a warning message before the actual source phase mode setting is changed.


This allows the operator to check the output wiring to the load to make sure the correct phase mode and load wiring is in place. If not, click on **No** to abort. If it is, click **Yes** to proceed.

Note: For LMX Series AC power source without a Transformer option, the Split Phase mode can be used to obtain a 270Vac or 300Vac output voltage for single phase AC Voltage dips testing. For AFX and AZX Series AC power source, the split phase mode is not required.

### 6.3.4 Split Phase Voltage Settings


When operating 140AMX or 140LMX based ECTS2 test systems in AC mode split phase – or any non AMXT or LMXT based test system - keep in mind that the Line to Line voltage in split phase output mode is present on phase A and B outputs and the output of the AC source must be connected to the L1 and Neutral input terminals of the EPTS AC Source Input terminal block.

It is also important to remember that the Line to Line output voltage is 2x the L to N voltage settings on phases A and B when the default split phase angle of 180° is set. Thus, the Nominal test voltage for split phase mode when the AC line voltage is still 220Vac or 230Vac but the AMX/LMX will set each phase output to 110Vac or 115Vac to produce the required phase A to B ac voltage.

### 6.3.5 1ø (FRM3) Setting


This mode is similar to the **Single Phase** mode but the AC source is configured for three-phase mode (Form 3 or FRM3). For many single phase EUTs, the output current available from the power source on a single phase when in three phase mode may be adequate. In that case, this 1ø (FRM3) phase mode selection may be used, eliminating the need to re-configure the output wiring. This mode applies to testing single phase EUTs connected to phase A output. In this mode, the test report will include data for phase A only.

**Note:** In this mode, there is no need to reconfigure the output connections for single phase mode as the source is operated in three phase mode.

**Note:** This mode must be enabled in the "Config.xml" configuration file. If set to False, this selection is greyed out. See instructions below.

1. To enable the 1ø (FRM3)AFX selection, close the program and locate the Config.xml file located in the in the EptsGui application folder:
   C:\Pacific Power Source\EptsGui\Config\
2. The relevant flag is near the end of config.xml file:

   To enable, set <Btn1PForm3Enabled> to true.

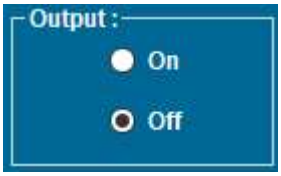
   ```
   <UiObjects>
       <Btn1PForm3Enabled>true</Btn1PForm3Enabled>
   </UiObjects>
   ```

   To disable set <Btn1PForm3Enabled> to false.

   ```
   <UiObjects>
       <Btn1PForm3Enabled>false</Btn1PForm3Enabled>
   </UiObjects>
   ```

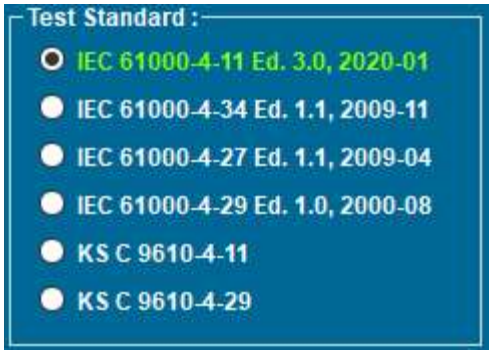
3. Save the xml file and close. Restart the GUI for this setting to take effect.

### 6.3.6 Output On/Off Control




The user can enable the output of the programmable AC power source using the On or Off radio button. Unless the output is enabled, a Voltage Dips or Variations test cannot be started.

### 6.3.7 Test Standard Selection




The applicable IEC test standard to use for the EUT to be evaluated can be selected using this control.

Supported test standard are

- IEC 61000-4-11 AC < 16A / phase
- IEC 61000-4-34 AC > 16A / phase
- IEC 61000-4-27 AC
- IEC 61000-4-29 DC
- KS C 9610-4-11 AC < 16A / phase
- KS C 9610-4-29 AC > 16A / phase

The User Defined selection is reserved for custom tests.

### 6.3.8 Test Mode Selection

Two selections are available for test mode:

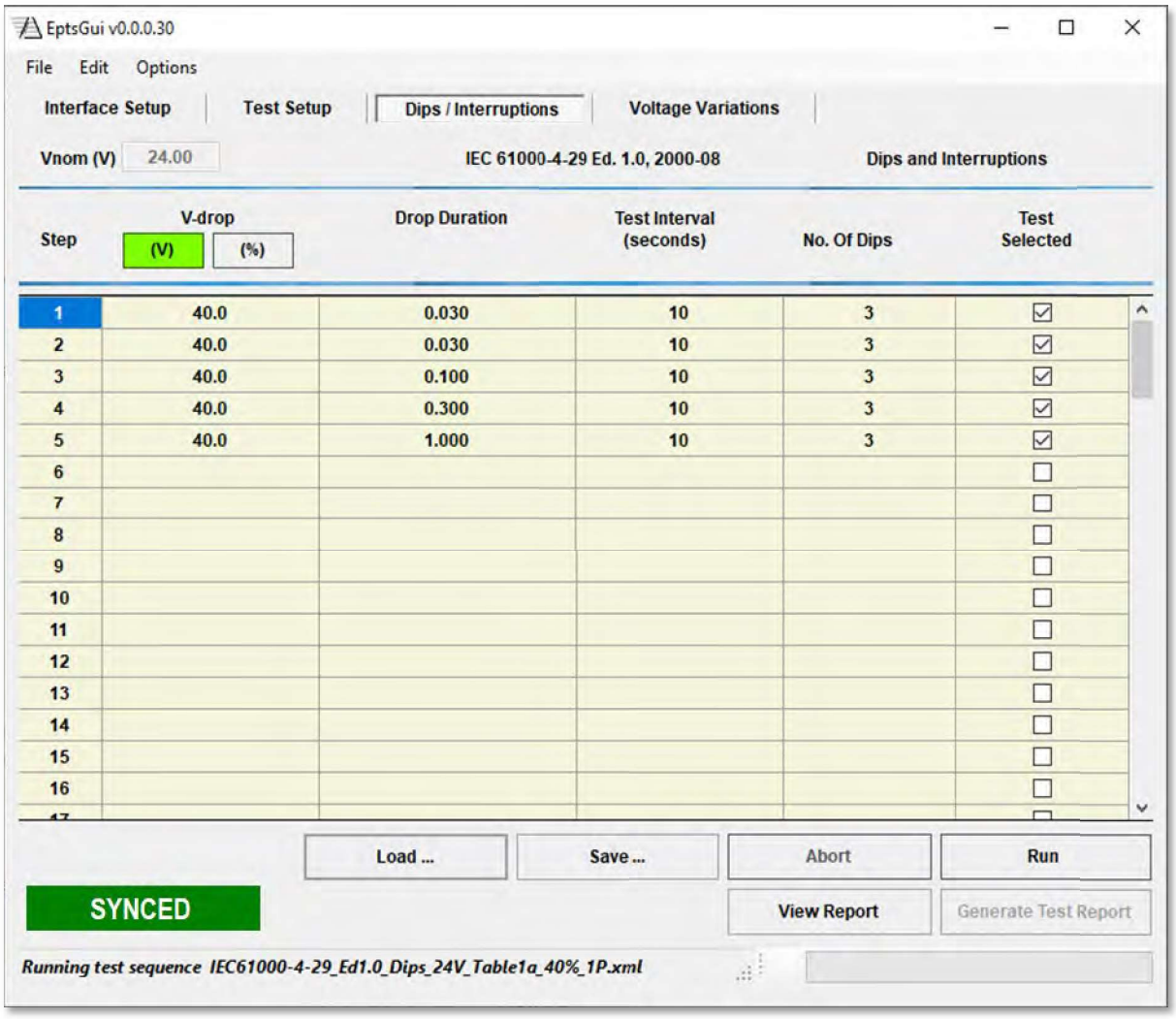
- DIPS Uses electronic transfer switch to perform Voltage Dips tests.
- Bypass. Bypasses the electronic transfer switch to allow other tests to be performed.

Note that when selecting the Voltage Variations Test tab, the EPTS is automatically bypassed as voltage variations don't require the use of the electronic switch.

## 6.4 Dips / Interruptions Tab

### 6.4.1 Preface

The Dips/Interruptions tab is used to load pre-defined IEC61000-4-11 or IEC61000-4-34 test sequences for voltage dips or voltage interruptions. The following sections will cover loading of test sequences, execution, editing test sequences, saving test sequences and generating test reports.



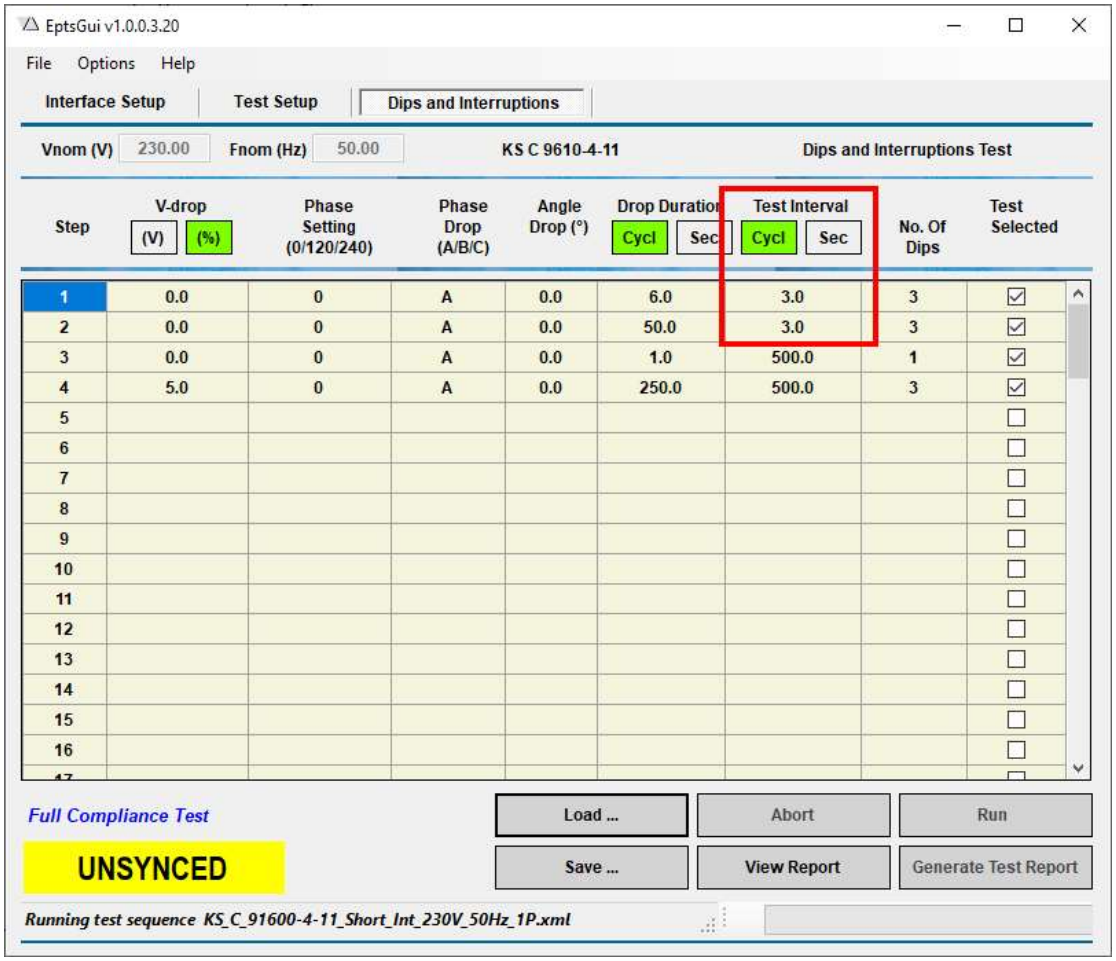
### 6.4.2 KS C 9610 Korean Version Timing Settings

The Korean Voltage Dips and Interruption test standards are largely similar to their IEC counter parts expect for some Voltage Dips Test Time Intervals that require much shorter times than the IEC version.

To support these different test time requirements, the Epts_Gui relies on the EPTS hardware units to implement these short duration test intervals rather than implementing these in the GUI running on Windows, which would not result in the required accuracy.

For these short duration test interval times, the Epts_Gui programs the EPTS hardware to execute these instead.

For example, test KS_C_91600-4-11_Short_Int_230V_50Hz_1P.xml uses 3.0 cycles for test intervals at step 1 and step 2 as shown below.




More details on available test interval setting ranges in this mode of operation as shown on the next page.

## Test Interval Setting Limit Values

There is limitation for the EPTS hardware based timer count setting. The maximum test interval for the EPTS hardware timer to work comfortably is 0.2 seconds (10 cycles). Because of this hardware limitation, the Epts_Gui enforces an allowable range for the test interval entry in the test sequence file.

The allowable setting ranges for the test interval test by test standard type is:

**IEC 61000-4-11, IEC 61000-4-34**

| Test Frequency | Available Test Interval Setting Range |
|---|---|
| **50Hz** | 1.000 second and higher |
| | 50 cycles and higher |
| **60Hz** | 1.000 second and higher |
| | 60 cycles and higher |

**KS C 9601-4-11**

| Test Frequency | Available Test Interval Setting Range |
|---|---|
| **50Hz** | 0.040 – 0.200 seconds, 1.000 second and higher |
| | 2 – 10 cycles, 50 cycles and higher |
| **60Hz** | 0.034 – 0.200 seconds, 1.000 second and higher |
| | 2 – 12 cycles, 60 cycles and higher |

## EPTS Hardware & Firmware Requirements

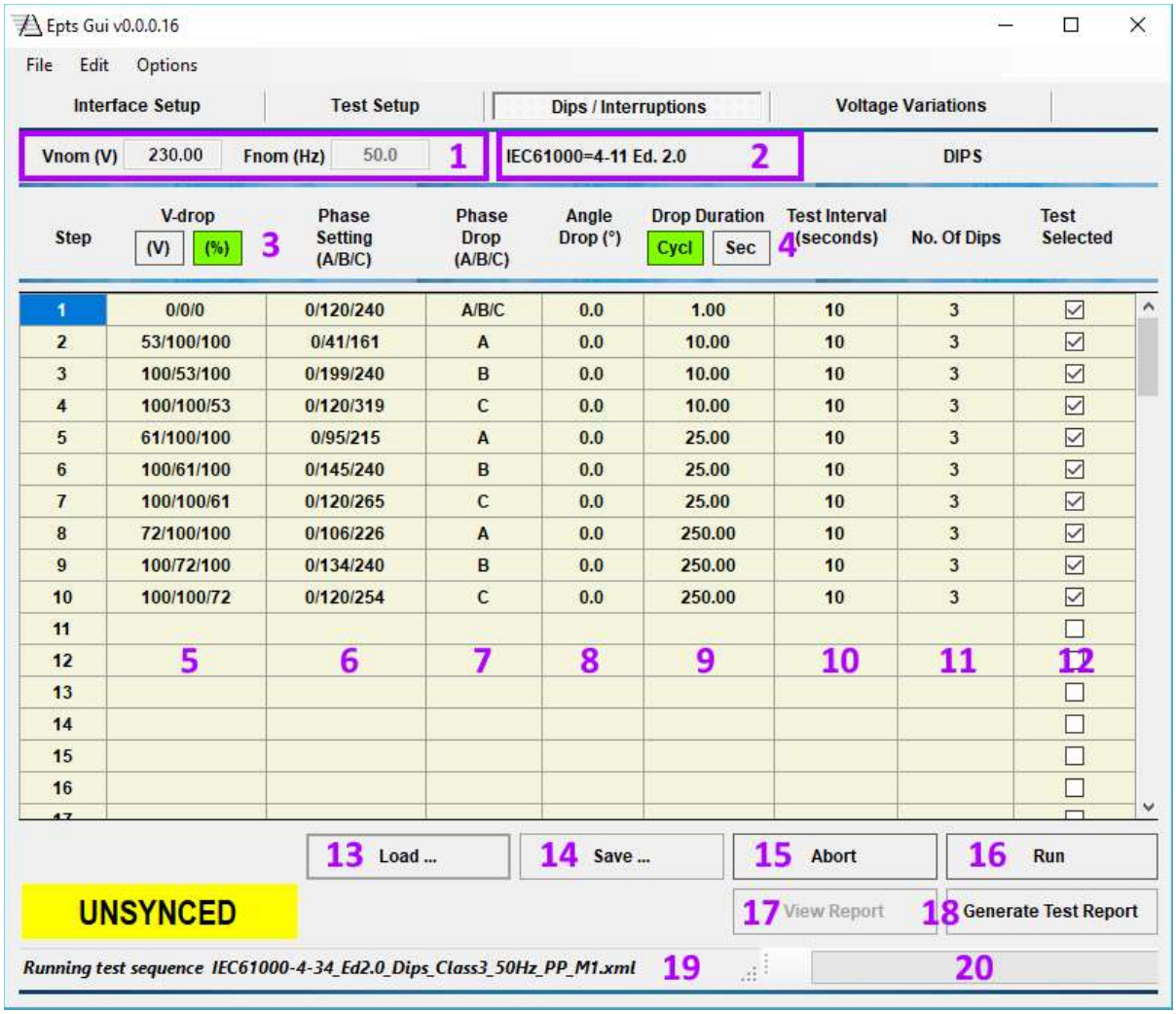
To support the KS C 9610 Test standard, the EPTS hardware unit may require a hardware and firmware update.

To update your EPTS hardware for support of KS C 9610, contact customer support. You will have to provide the serial number of your EPTS unit. Updates may require both hardware and firmware updates.

| EPTS Units | Required FW rev |
|---|---|
| Units with FW rev 1.0x | Rev. 1.05 or higher |
| Units with FW rev 2.0x | Rev. 2.04 or higher |

### 6.4.3 Controls and Status Indicators

The following controls and status fields identified by numbers in the figure below are available from the Dips / Interruptions tab window.




1. Selected Nominal Voltage and Frequency settings
2. Selected Test Standard Edition
3. Vdrop data entry mode, either in absolute Volts rms or Relative (%) to Unom
4. Drop duration data entry mode, either in cycles (Cycl) or seconds (Sec)
5. Voltage drop level data entry column
6. Phase settings in three phase mode data entry column
7. Selected phase to drop, either one only (A) or multiple phases (A/B/C) data entry column
8. Voltage Phase angle drop timing (in degrees) data entry column

9. Voltage drop duration (Cycles or seconds) data entry column
10. Test repeat interval (time between successive drop repeats) data entry column
11. No of voltage dip or interruption repeats data entry column
12. Test select or unselect data entry column. Unselected rows will be skipped
13. Control: Load test sequence files button
14. Control: Save edited test sequence file button
15. Control: Abort test in progress
16. Control: Run a test
17. Control: View previously generated test report
18. Control: Generate test report for completed test
19. Status: Test in progress name
20. Status: Progress completion bar

### 6.4.4 Loading AC Test Sequences

A library of test sequences is distributed with the Epts GUI software for customer use. Sequences can be edited and saved in this tab as needed to implement alternative types of dips or interruptions. There are two sets of these, one for 50Hz test and one for 60Hz tests. Both are in the following directory:

**C:\Pacific Power Source\Epts\Test Sequences\IEC61000-4-11\Dips and Interruptions**

There are two subdirectories for both frequency values, \50Hz and \60Hz.

All files are saved in XML format. The following files are part of the distribution.

| Class | Standard | Phases | XML File Name |
|---|---|---|---|
| 2 | IEC 61000-4-11 | 1 | IEC61000-4-11_Ed2.0_Dips_Class2_50Hz_1P |
| 2 | | 3 | IEC61000-4-11_Ed2.0_Dips_Class2_50Hz_3P |
| 3 | | 1 | IEC61000-4-11_Ed2.0_Dips_Class3_50Hz_1P |
| 3 | | 3 | IEC61000-4-11_Ed2.0_Dips_Class3_50Hz_3P |
| 3 | | 1 | IEC61000-4-11_Ed2.0_Short_Int_Class2_Class3_50Hz_1P |
| 3 | | 3 | IEC61000-4-11_Ed2.0_Short_Int_Class2_Class3_50Hz_3P |
| 2 | IEC 61000-4-34 | Phase + Neutral | IEC61000-4-34_Ed2.0_Dips_Class2_50Hz_PN |
| 2 | | Phs-Phs Method 1 | IEC61000-4-34_Ed2.0_Dips_Class2_50Hz_PP_M1 |
| 2 | | Phs-Phs Method 2 | IEC61000-4-34_Ed2.0_Dips_Class2_50Hz_PP_M2 |
| 3 | | Phase + Neutral | IEC61000-4-34_Ed2.0_Dips_Class3_50Hz_PN |
| 3 | | Phs-Phs Method 1 | IEC61000-4-34_Ed2.0_Dips_Class3_50Hz_PP_M1 |
| 3 | | Phs-Phs Method 2 | IEC61000-4-34_Ed2.0_Dips_Class3_50Hz_PP_M2 |
| 2 & 3 | | 3 | IEC61000-4-34_Ed2.0_Short_Int_Class2_Class3_50Hz_3P |

*Table 6-1: IEC 61000-4 Dips and Interruption Test Sequences for 50Hz EUTs*

| Class | Standard | Phases | XML File Name |
|---|---|---|---|
| 2 | IEC 61000-4-11 | 1 | IEC61000-4-11_Ed2.0_Dips_Class2_60Hz_1P |
| 2 | | 3 | IEC61000-4-11_Ed2.0_Dips_Class2_60Hz_3P |
| 3 | | 1 | IEC61000-4-11_Ed2.0_Dips_Class3_60Hz_1P |
| 3 | | 3 | IEC61000-4-11_Ed2.0_Dips_Class3_60Hz_3P |
| 3 | | 1 | IEC61000-4-11_Ed2.0_Short_Int_Class2_Class3_60Hz_1P |
| 3 | | 3 | IEC61000-4-11_Ed2.0_Short_Int_Class2_Class3_60Hz_3P |
| 2 | IEC 61000-4-34 | Phase + Neutral | IEC61000-4-34_Ed2.0_Dips_Class2_60Hz_PN |
| 2 | | Phs-Phs Method 1 | IEC61000-4-34_Ed2.0_Dips_Class2_60Hz_PP_M1 |
| 2 | | Phs-Phs Method 2 | IEC61000-4-34_Ed2.0_Dips_Class2_60Hz_PP_M2 |
| 3 | | Phase + Neutral | IEC61000-4-34_Ed2.0_Dips_Class3_60Hz_PN |
| 3 | | Phs-Phs Method 1 | IEC61000-4-34_Ed2.0_Dips_Class3_60Hz_PP_M1 |
| 3 | | Phs-Phs Method 2 | IEC61000-4-34_Ed2.0_Dips_Class3_60Hz_PP_M2 |
| 2 & 3 | | 3 | IEC61000-4-34_Ed2.0_Short_Int_Class2_Class3_60Hz_3P |

*Table 6-2: IEC 61000-4 Dips and Interruption Test Sequences for 60Hz EUTs*

To load any test sequences from the library, click the “Load…” button **(13)** at the lower left of the screen. Using the file open dialog, select the C:\Pacific Power Source\Epts\Test Sequence directory and then either \50Hz or \60Hz and select the desired file. Once opened, the contents of the data entry grid will show the settings from this test sequence file.

**Note:** Always make sure the frequency and voltage selected matches that of the local utility grid.

**Note:** If a test sequence file for one IEC 61000 test standard is selected while a different test standard is selected on the setup screen, an error message will be displayed and the sequence file will not be loaded.

## KS C 9610 Test Sequence Files

The Korean test standards is also distributed with the Epts GUI software for customer use. Sequences can be edited and saved in this tab as needed to implement alternative types of dips or interruptions. There are two sets of these, one for 50Hz test and one for 60Hz tests. Both are in the following directory:

**C:\Pacific Power Source\EptsGui\Test Sequences\KS_C_9610-4-11\Dips and Interruptions**

There are two subdirectories for both frequency values, \50Hz and \60Hz. Each of these has a 1P, 2P and 3P sub directory for singe, split and three phase versions of each test.

All files are saved in XML format. The following files are part of the distribution.

| Class | Standard | Phases | XML File Name |
|---|---|---|---|
| **50Hz 230Vac** | **KS C 9610-4-11** | 1 | KS_C_9610-4-11_Dips_230V_50Hz_1P |
| | | 1 | KS_C_91600-4-11_Short_Int_230V_50Hz_1P |
| | | 2 | KS_C_9610-4-11_Dips_230V_50Hz_2P |
| | | 2 | KS_C_91600-4-11_Short_Int_230V_50Hz_2P |
| | | 3 | KS_C_9610-4-11_Dips_230V_50Hz_3P_PN_PER_PHASE |
| | | 3 | KS_C_9610-4-11_Short_Int_230V_50Hz_3P |
| | | | |
| **60Hz 220Vac** | **KS C 9610-4-11** | 1 | KS_C_9610-4-11_Dips_220V_60Hz_1P |
| | | 1 | KS_C_91600-4-11_Short_Int_220V_60Hz_1P |
| | | 2 | KS_C_9610-4-11_Dips_220V_60Hz_2P |
| | | 2 | KS_C_91600-4-11_Short_Int_220V_60Hz_2P |
| | | 3 | KS_C_9610-4-11_Dips_220V_60Hz_3P_PN_PER_PHASE |
| | | 3 | KS_C_9610-4-11_Short_Int_220V_60Hz_3P |

*Table 6-3: KS C 9610-4-11 Dips and Interruption Test Sequences for 50Hz & 60Hz EUTs*

**Note:** Always make sure the frequency and voltage selected matches that of the local utility grid.

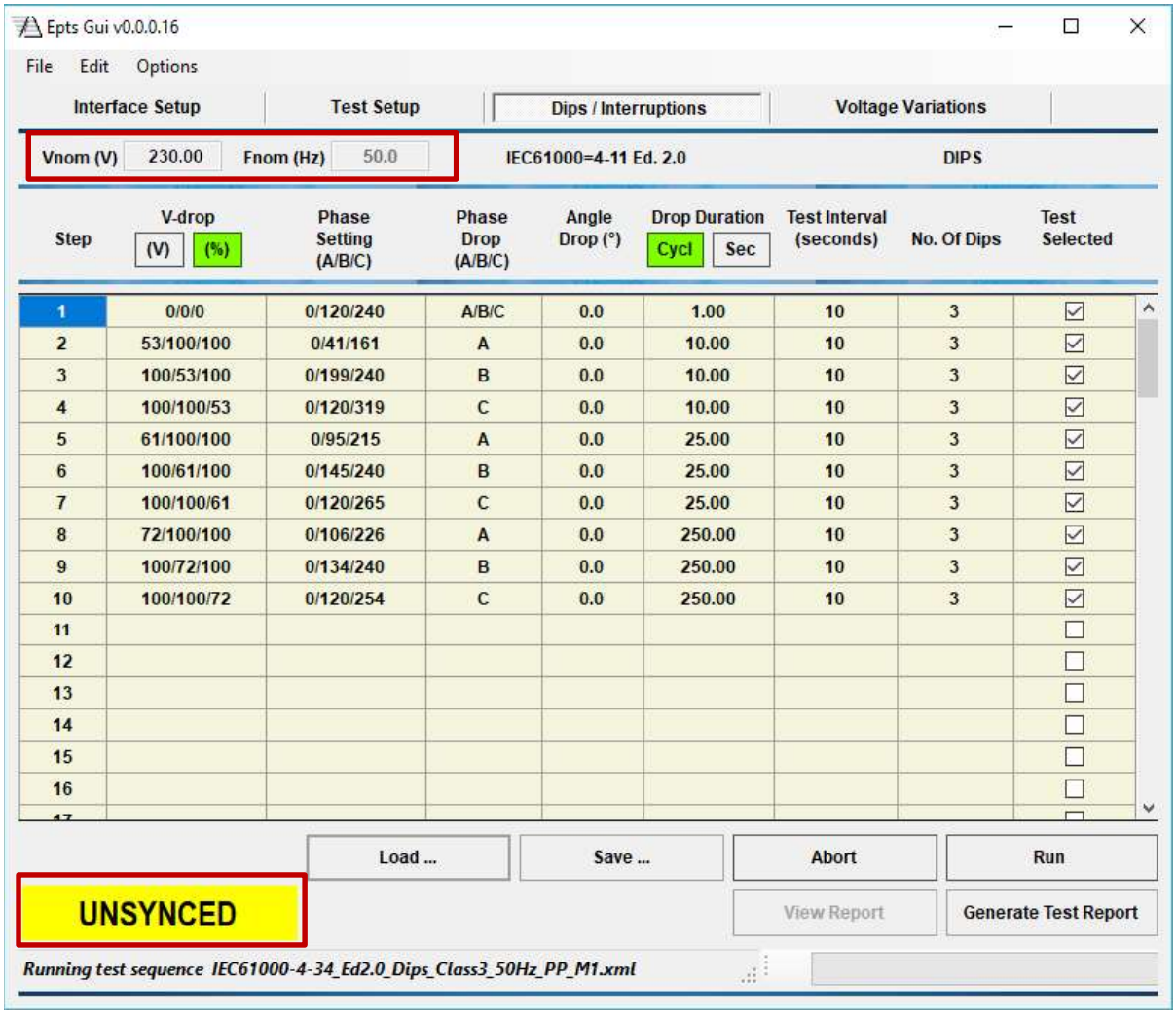
**Note:** If a test sequence file for one KS C 9610 test standard is selected while a different test standard is selected on the setup screen, an error message will be displayed and the sequence file will not be loaded.

### 6.4.5 Running a Dips or Interruptions Test

Before running any test, make sure the following conditions are met:

1. Selected Nominal Voltage and Frequency match those of the local utility connected to the Grid input of the EPTS-3-XX unit.
2. The EPTS-3-XX switch unit and the AC Power Source are both synchronized to the AC utility input frequency and phase aligned. This is indicated by the Green SYNCED indicator in the lower left corner of the screen.

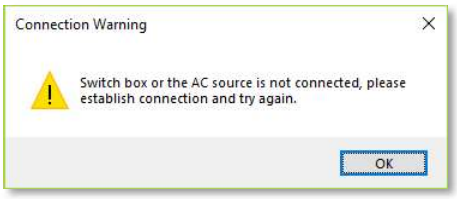
The example below shows an **UNSYNCED** condition.



There are other situations that may prevent a test from running. They are:

1. Programmable AC Source is connected or not powered on.
2. EPTS-3-XX switch box USB is not connecter or switch is not powered on
3. AC Grid Voltage is not present
4. Programmable AC Source is not phase synced to the AC grid voltage and frequency

For these conditions, a user dialog warning message will pop-up like the one shown below. The user has to correct the condition and then click on “OK” to continue.

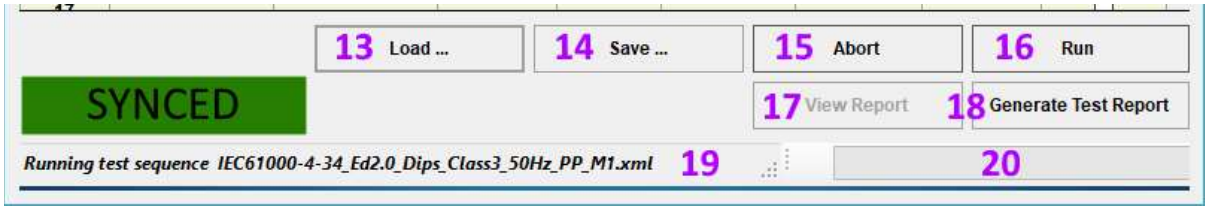



When all conditions are met, a test run can be started by clicking on the “RUN” button **(16)** in the lower right of the screen.

### 6.4.6 Test in Progress State

During test execution, the percentage of test time completed will be indicated by the status bar located at the bottom right of the screen. **(20).**

The “RUN” button **(16)** will be disabled while a test is running. A test in progress can be aborted by clicking on the “Abort” button.

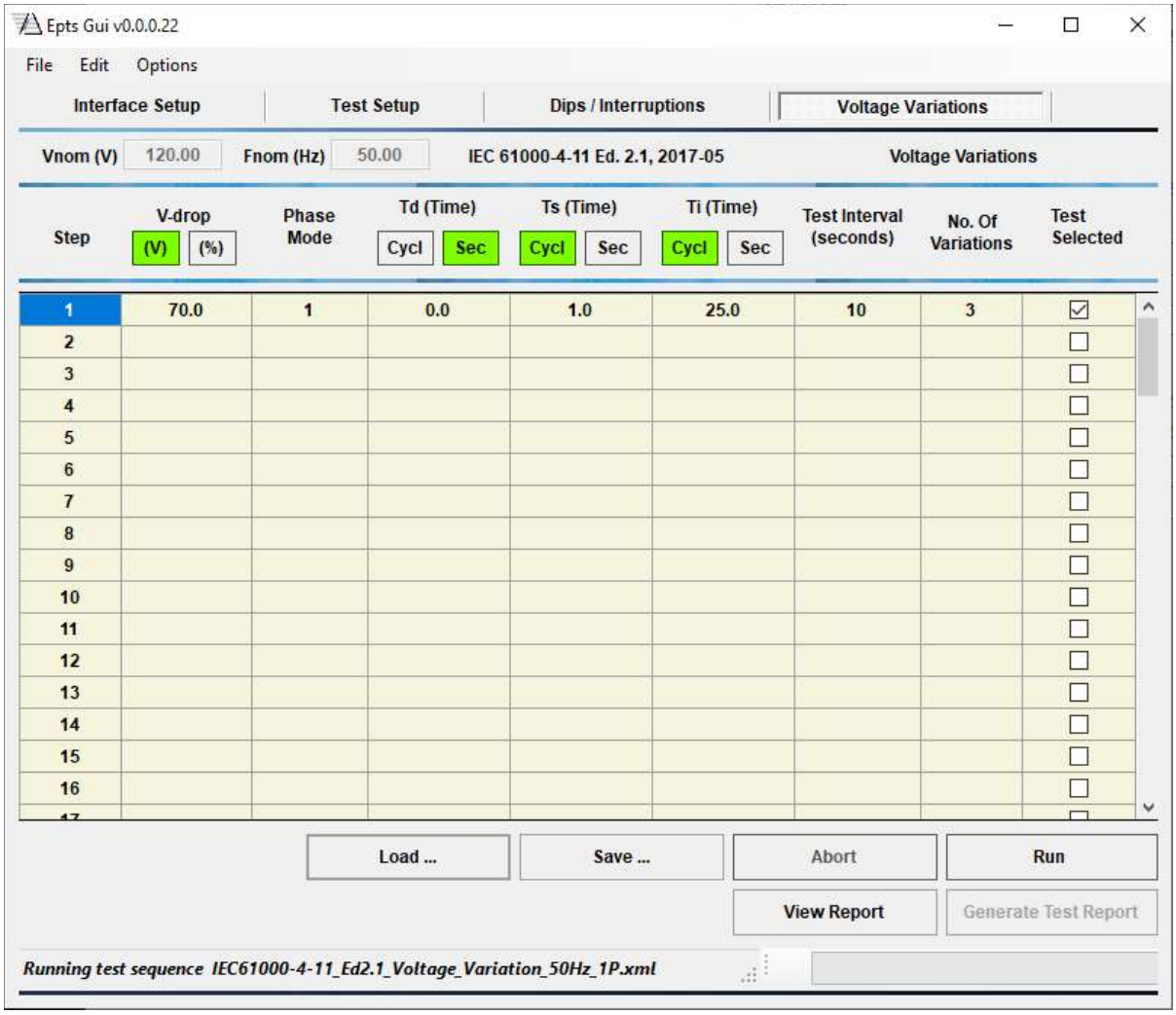


## 6.5 Voltage Variations Tab

### 6.5.1 Preface

The voltage variations tab may be used to run the optional IEC 61000-4-11 or IEC 61000-4-34 voltage variations test. In this mode, the EPTS-3-XX transfer switch is not being used. Instead, all voltage variations are performed by the AFX Series programmable AC power source, which is controlled by the Epts GUI. The EPTS-3-XX switch is placed in BYPASS mode.

This test can be run in the absence of the AC Grid connection so the EPTS-3-XX may indicate an UNSYNCED status. This does not affect voltage variations testing.



The following voltage variations levels and durations are documented in the IEC standard and provided as sequence files with the EptsGui:

| Voltage test level | Time for decreasing voltage | Time at reduced voltage($t_s$) | Time for increasing voltage ($t_i$) (50 Hz/60 Hz) |
|---|---|---|---|
| 70 % | Abrupt | 1 cycle | 25/30[b] cycles |
| X [a] | X[a] | X[a] | X[a] |

[a] To be defined by product committee.

[b] "25/30 cycles" means "25 cycles for 50 Hz test" and "30 cycles for 60 Hz test".

Example for 70% Voltage variation voltage test.

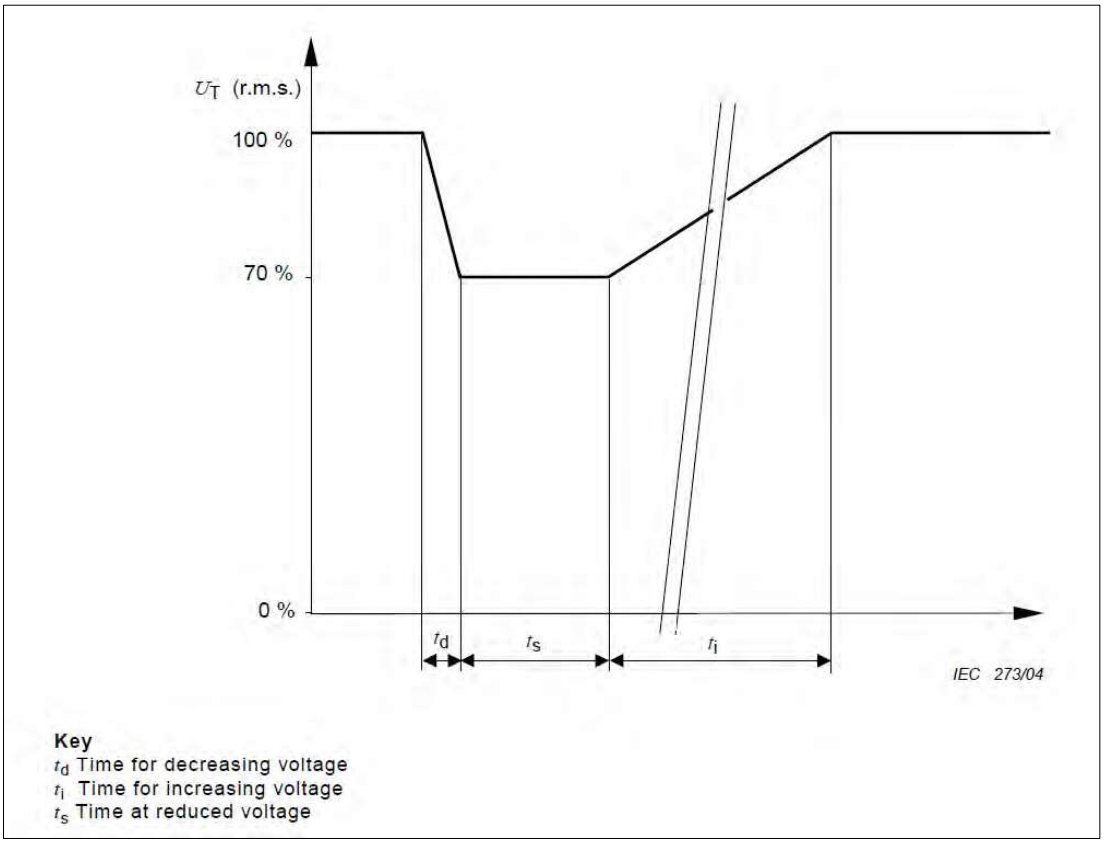
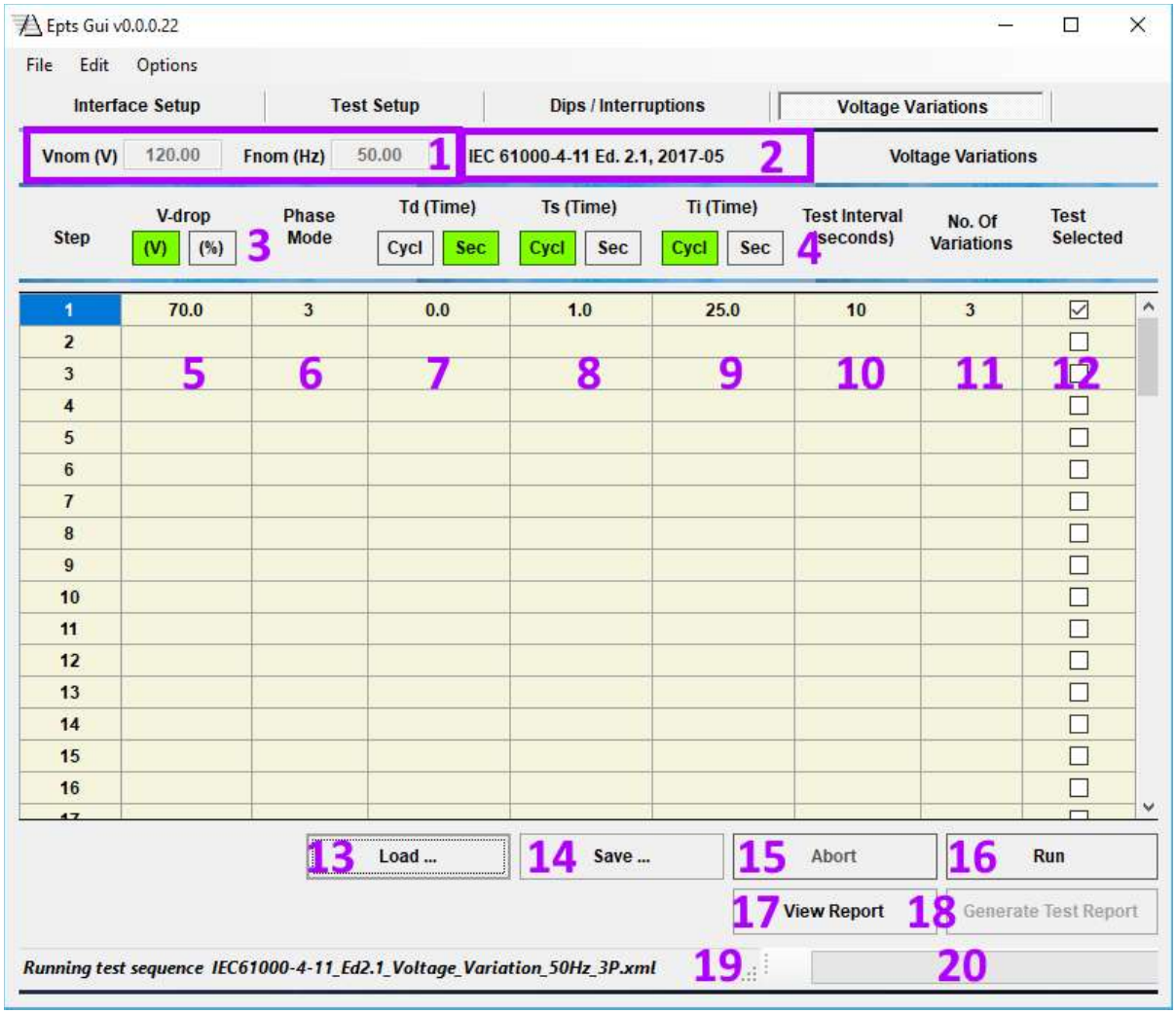



*Figure 6-3: Example for 70% Voltage variation*

### 6.5.2 Controls and Status Indicators

The following controls and status fields identified by numbers in the figure below are available from the Voltage Variations tab window.




1. Selected Nominal Voltage and Frequency settings
2. Selected Test Standard Edition
3. Voltage level for period Ts data entry, either in absolute Volts rms or Relative (%) to Unom
4. Time entry mode for all three time durations Td, Ts and Ti
5. Voltage steady level for test in absolute or relative to Unom  entry column
6. Phase mode, either 1 for Single Phase or 3 for Three Phase
7. Voltage down slew duration time Td data entry mode, either in cycles (Cycl) or seconds (Sec)

8. Voltage steady level duration time Ts data entry column, either in cycles (Cycl) or seconds (Sec)
9. Voltage increase slew duration time Ti data entry column, either in cycles (Cycl) or seconds (Sec)
10. Test repeat interval (time between successive variation repeats) data entry column
11. No of voltage variations repeats data entry column
12. Test select or unselect data entry column. Unselected rows will be skipped
13. Control: Load test sequence files button
14. Control: Save edited test sequence file button
15. Control: Abort test in progress
16. Control: Run a test
17. Control: View previously generated test report
18. Control: Generate test report for completed test
19. Status: Test in progress name
20. Status: Progress completion bar

### 6.5.3 Loading AC Test Sequences

A library of test sequences is distributed with the Epts GUI software for customer use. Sequences can be edited and saved in this tab as needed to implement alternative types of dips or interruptions. There are two sets of these, one for 50Hz test and one for 60Hz tests. Both are in the following directory:

**C:\Pacific Power Source\Epts\Test Sequences\IEC61000-4-11\Voltage Variations**

There are two subdirectories for both frequency values, \50Hz and \60Hz.

All files are saved in XML format. The following files are part of the distribution.

| Class | Standard | Phases | XML File Name |
|---|---|---|---|
| | IEC 61000-4-11 | 1 | IEC61000-4-11_Ed2.1_Voltage_Variation_50Hz_1P |
| | | 3 | IEC61000-4-11_Ed2.1_Voltage_Variation_50Hz_3P |
| | IEC 61000-4-34 | 1 | IEC61000-4-34_Ed1.1_Voltage_Variations_50Hz_1P |
| | | 3 | IEC61000-4-34_Ed1.1_Voltage_Variations_50Hz_3P |

*Table 6-4: Voltage Variations Test Sequences for 50Hz EUTs*

| Class | Standard | Phases | XML File Name |
|---|---|---|---|
| | IEC 61000-4-11 | 1 | IEC61000-4-11_Ed2.1_Voltage_Variation_60Hz_1P |
| | | 3 | IEC61000-4-11_Ed2.1_Voltage_Variation_60Hz_3P |
| | IEC 61000-4-34 | 1 | IEC61000-4-34_Ed1.1_Voltage_Variations_60Hz_1P |
| | | 3 | IEC61000-4-34_Ed1.1_Voltage_Variations_60Hz_3P |

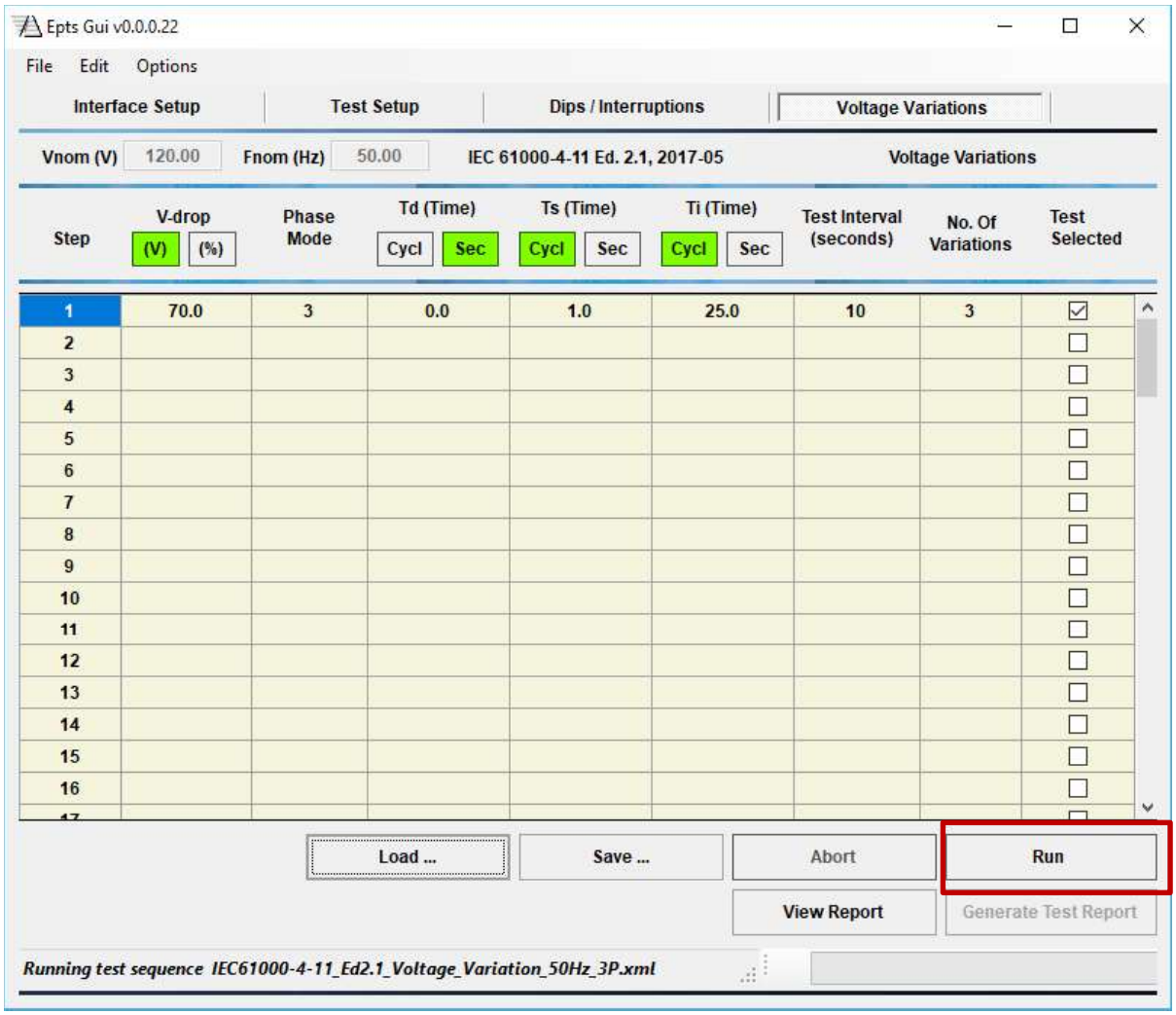
*Table 6-5: Voltage Variations Test Sequences for 60Hz EUTs*

To load any test sequences from the library, click the “Load…” button **(13)** at the lower left of the screen. Using the file open dialog, select the C:\Pacific Power Source\Epts\Test Sequences directory and then either \50Hz or \60Hz and select the desired file. Once opened, the contents of the data entry grid will show the settings from this test sequence file.

**Note:** Always make sure the frequency and voltage selected matches that of the local utility grid.

**Note:** If a test sequence file for one IEC 61000 test standard is selected while a different test standard is selected on the setup screen, an error message will be displayed and the sequence file will not be loaded.

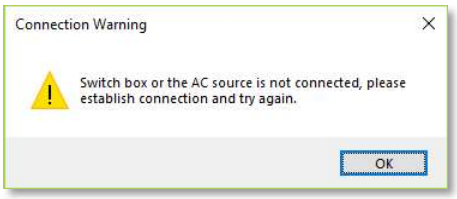
### 6.5.4 Running a Dips or Interruptions Test




There are situations that may prevent a test from running. They are:

1. Programmable AC Source is connected or not powered on.
2. EPTS-3-XX switch box USB is not connecter or switch is not powered on

For these conditions, a user dialog warning message will pop-up like the one shown below. The user has to correct the condition and then click on “OK” to continue.

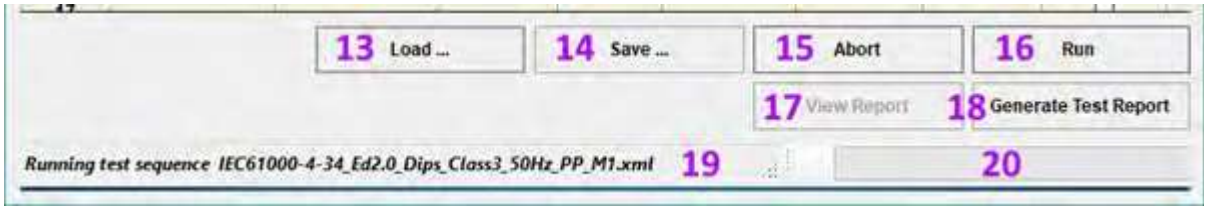


When all conditions are met, a test run can be started by clicking on the “RUN” button **(16)** in the lower right of the screen.

### 6.5.5 Test in Progress State

During test execution, the percentage of test time completed will be indicated by the status bar located at the bottom right of the screen. **(20).**

The “RUN” button **(16)** will be disabled while a test is running. A test in progress can be aborted by clicking on the “Abort” button.



## 6.6 Test Reports

Test reports are generated by the EptsGui software in Rich Text Format to support documenting EUT compliance. This report format is easily converted to other common file formats like MS Word or PDF using MS Word or a similar word processor application. Reports can be generated **after** completion of a test.

### 6.6.1 Report Generation

To create a test report:

1. Click on the "Generate Report" button in the bottom right corner of the **Dips/Interruptions** or **Voltage Variations** tab window.

The report for the last test run will now be created in both Adobe Acrobat (PDF) and Rich Text Formats (RTF)

### 6.6.2 Test Report Directory Locations

Test reports PDF and RTF files are stored in the following directories:

| | |
|---|---|
| Voltage Dips & Interruptions Reports | C:\Pacific Power Source\Epts\Test Reports\PDF\Dips and Interruptions<br>C:\Pacific Power Source\Epts\Test Reports\RTF\Dips and Interruptions |
| Voltage Variations Reports | C:\Pacific Power Source\Epts\Test Reports\PDF\Voltage Variations<br>C:\Pacific Power Source\Epts\Test Reports\RTF\Voltage Variations |

### 6.6.3 Viewing Reports

Test reports can be viewed by using Windows File Explorer, navigating to one of the directories listed above and opening the file with Adobe Viewer (PDF) or MS Word (RTF).

### 6.6.4 Test Report Examples

This section contains several examples of IEC 61000-4-11 and IEC 61000-4-34 voltage dips and interruption tests performed with the EPTS-3-XX switch module.

Pacific Power Source, Inc.
CA - USA

2/20/2019
8:14:59 AM

**Test Result:** Pass All Test Criteria
Test File: IEC61000-4-11_Ed2.1_Dips_Table1_Class3_50Hz_1P.xml
Test Type: Dips and Interruptions
Test Standard: IEC 61000-4-11 Ed. 2.1, 2017-05
Test Date: 2/20/2019
Start Time: 7:50:51 AM
Stop Time: 7:51:56 AM

Test Conditions:

| | |
|---|---|
| Nominal Voltage (V): | 120.00 |
| Nomimal Frequency (Hz): | 50.00 |
| EUT Information: | AFX |
| Temperature (°): | 34.0 |
| Humidity (%): | 24.0 |
| Test Site: | PPS |
| Test By: | Kevin |
| Comments: | None |

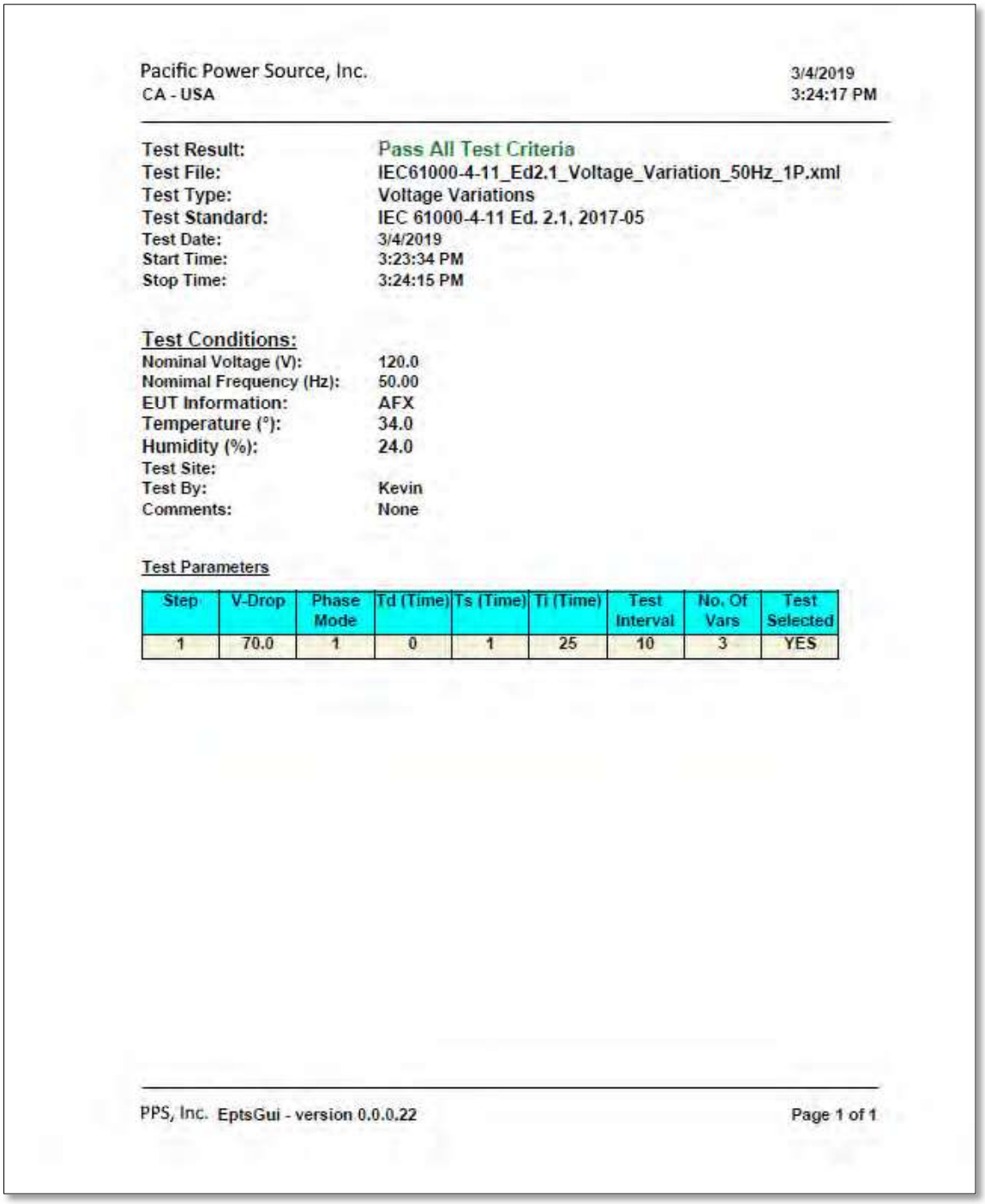
Test Parameters:

| Step | V-drop | Phase Setting | Phase Drop | Phase Angle Drop | Drop Duration | Test Interval | No. Of Dips | Test Selected |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | A | 0 | 0.5 | 10 | 3 | NO |
| 2 | 0 | 0 | A | 0 | 1 | 10 | 3 | NO |
| 3 | 40 | 0 | A | 0 | 10 | 10 | 3 | NO |
| 4 | 70 | 0 | A | 0 | 25 | 10 | 3 | NO |
| 5 | 80 | 0 | A | 0 | 250 | 10 | 3 | YES |

PPS, Inc. Epts Gui - version 1.0.0.0

Page 1 of 1

*Figure 6-4: Sample Voltage Dips Report*



Pacific Power Source, Inc.
CA - USA

3/4/2019
3:24:17 PM

| | |
|---|---|
| Test Result: | Pass All Test Criteria |
| Test File: | IEC61000-4-11_Ed2.1_Voltage_Variation_50Hz_1P.xml |
| Test Type: | Voltage Variations |
| Test Standard: | IEC 61000-4-11 Ed. 2.1, 2017-05 |
| Test Date: | 3/4/2019 |
| Start Time: | 3:23:34 PM |
| Stop Time: | 3:24:15 PM |

**Test Conditions:**

| | |
|---|---|
| Nominal Voltage (V): | 120.0 |
| Nomimal Frequency (Hz): | 50.00 |
| EUT Information: | AFX |
| Temperature (°): | 34.0 |
| Humidity (%): | 24.0 |
| Test Site: | |
| Test By: | Kevin |
| Comments: | None |

Test Parameters

| Step | V-Drop | Phase Mode | Td (Time) | Ts (Time) | Ti (Time) | Test Interval | No. Of Vars | Test Selected |
|---|---|---|---|---|---|---|---|---|
| 1 | 70.0 | 1 | 0 | 1 | 25 | 10 | 3 | YES |

PPS, Inc. EptsGui - version 0.0.0.22

Page 1 of 1

*Figure 6-5: Sample Voltage Variations Report*

# 7 IEC 61000-4-27 Software Operation

## 7.1 Preface

Operation of the EPTS-3-XX unit is only possible using the provided Windows Epts GUI software. This section describes operation and use of the software to perform three phase AC Voltage Unbalance tests per the IEC61000-4-27 standard.

## 7.2 Interface Setup Tab

The first tab displayed upon program launch will be the Interface Setup. This screen is used to configure the remote control interfaces used.

This is the same setup screen as covered under IEC 61000-4-11 and IEC 61000-4-34 Tests. Refer to section 6.2, “Interface Setup Tab" on page 31.

## 7.3 Test Setup Tab

The Test Setup tab is used to select key test settings like IEC test standard used, nominal AC voltage settings and any optional settings. The actual test levels will be covered later.

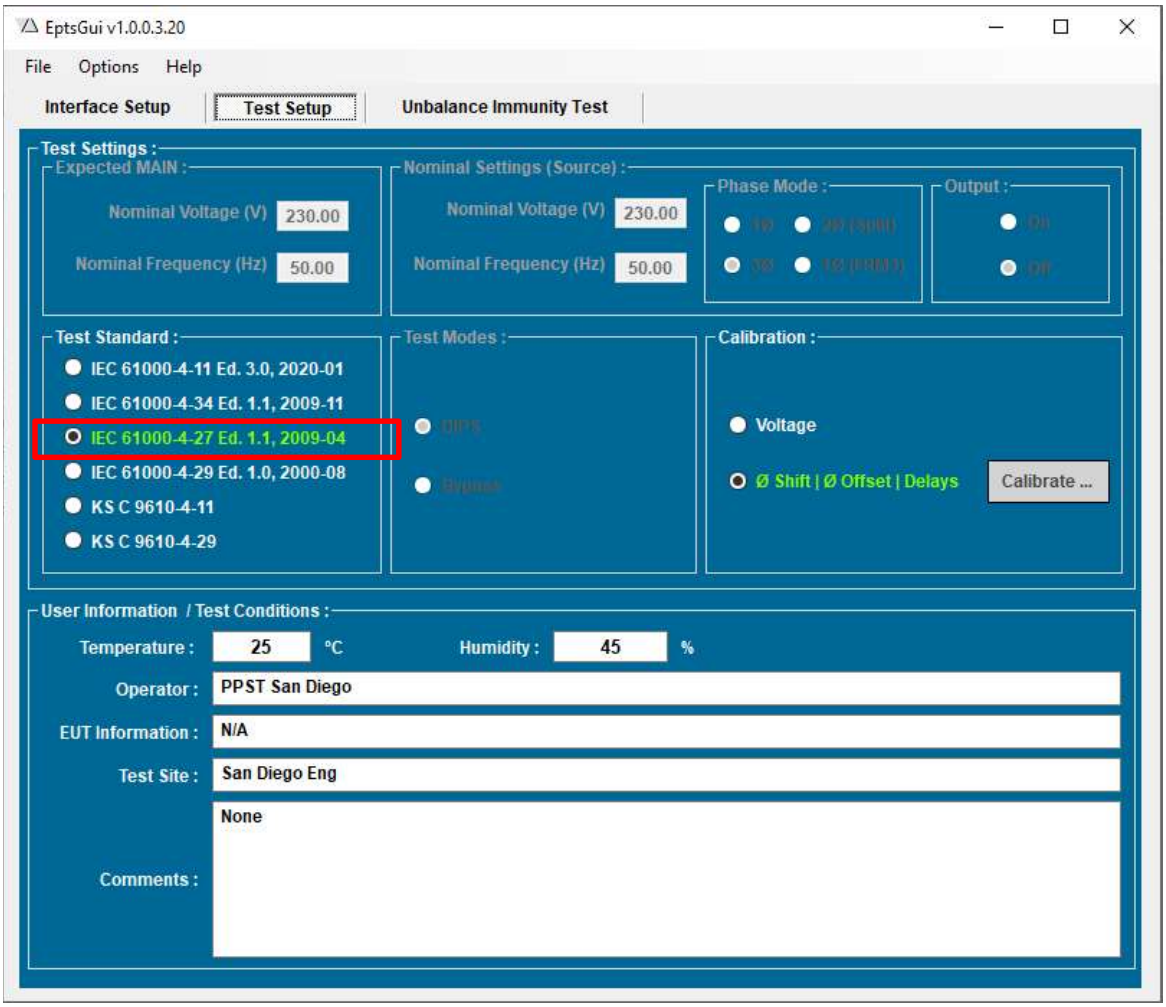



*Figure 7-1: IEC 61000-4-27 DC Test Setup Selection Screen*

The bottom part of this tab allows entry of user and EUT information that will carry over to any test reports generated. This information includes:

- Ambient temperature (user provided thermometer required)
- Relative Humidity (user provided humidity measurement device required)
- Operator Name
- EUT description and/or serial number
- Test Site or Test Lab Name
- Any comments the operator wants to add before, during or after a test run.

## 7.4 Unbalance Immunity Test Tab

### 7.4.1 Preface

The voltage Unbalance Immunity  tab may be used to run the IEC 61000-4-27 voltage variations test.  In this mode, the EPTS-3-XX transfer switch is used to switch between voltage levels on all three phases with a voltage transition time less than the required 5 µsec maximum.

The user interface for this test is similar to those for IEC 61000-4-11 and IEC 61000-4-34 testing. Refer to Section 6 for loading of test sequences, execution, editing test sequences, saving test sequences and generating test reports.

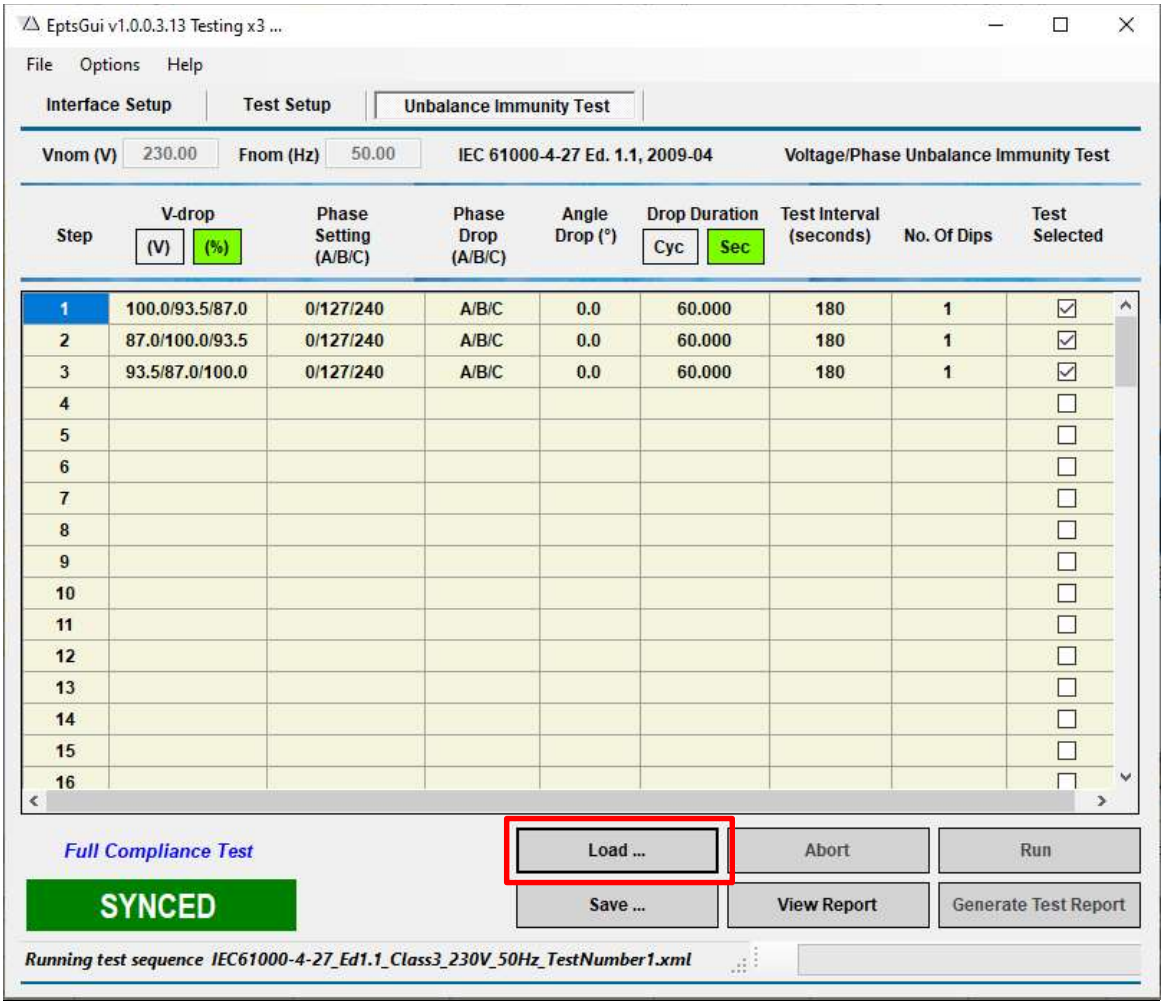



*Figure 7-2: IEC 61000-4-27 Voltage Unbalance Screen*

Predefined IEC 61000-4-27 voltage unbalance test sequence files in accordance with the IEC standard are provided with the program. These can be loaded using the **Load…** button.

### 7.4.2 Loading Unbalance Test Sequences

A library of AC Voltage Unbalance test sequences is distributed with the Epts GUI software for customer use. Sequences can be edited and saved in this tab as needed to implement alternative types of voltage variations:

**C:\Pacific Power Source\Epts\Test Sequences\IEC61000-4-27\Voltage-Phase Unbalance Immunity Test**

There are two subdirectories, one for 24V and one for 48V. For other nominal DC voltages, the user can either copy and paste, then edit the voltage settings or create an new DC test file inside the GUI.

All files are saved in XML format. The following files are part of the distribution.

| Standard | Nom. DC Volt | XML File Name |
|---|---|---|
| **IEC 61000-4-27** | 120V, 60Hz | IEC61000-4-27_Ed1.1_Class2_120V_60Hz_TestNumber1_2_3.xml |
| | 230V, 50Hz | IEC61000-4-27_Ed1.1_Class2_230V_50Hz_TestNumber1_2_3.xml |
| | 120V, 60Hz | IEC61000-4-27_Ed1.1_Class3_120V_60Hz_TestNumber1.xml |
| | 120V, 60Hz | IEC61000-4-27_Ed1.1_Class3_120V_60Hz_TestNumber1_2_3.xml |
| | 230V, 50Hz | IEC61000-4-27_Ed1.1_Class3_230V_50Hz_TestNumber1.xml |
| | 230V, 50Hz | IEC61000-4-27_Ed1.1_Class3_230V_50Hz_TestNumber1_2_3.xml |

*Table 7-1: Voltage Unbalance Test Sequences*

To load any test sequences from the library, click the "Load…" button **(13)** at the lower left of the screen. Using the file open dialog, select the C:\Pacific Power Source\Epts\Test Sequences directory and then either \50Hz or \60Hz and select the desired file. Once opened, the contents of the data entry grid will show the settings from this test sequence file.

**Note:** Always make sure the frequency and voltage selected matches that of the local utility grid.

**Note:** If a test sequence file for one IEC 61000 test standard is selected while a different test standard is selected on the setup screen, an error message will be displayed and the sequence file will not be loaded.

## 7.5 Test Reports

Test reports are generated by the EptsGui software in Rich Text Format to support documenting EUT compliance. This report format is easily converted to other common file formats like MS Word or PDF using MS Word or a similar word processor application. Reports can be generated **after** completion of a test.

Report generation and handling is similar as for IEC 61000-4-11 and IEC 61000-4-34 AC tests.

Refer to Section 6 for generating test reports.

# 8 IEC 61000-4-29p Software Operation

## 8.1 Preface

Operation of the EPTS-3-XX unit is only possible using the provided Windows Epts GUI software and in pre-compliance mode. The EPTS hardware is not used for this test as it is not intended for DC testing.

This mode of operation is available for use without an EPTS transfer switch if a software license is obtained. See section 9.6.2 on page 75.

This section describes operation and use of the software to perform DC voltage dips, interruptions and variations tests.

## 8.2 Interface Setup Tab

The first tab displayed upon program launch will be the Interface Setup. This screen is used to configure the remote control interfaces used.

This is the same setup screen as covered under IEC 61000-4-11 and IEC 61000-4-34 Tests. Refer to section 6.2, “Interface Setup Tab" on page 31.

## 8.3 Test Setup Tab

The Test Setup tab is used to select key test settings like IEC test standard used, nominal DC voltage settings and any optional settings. The actual test levels will be covered later.

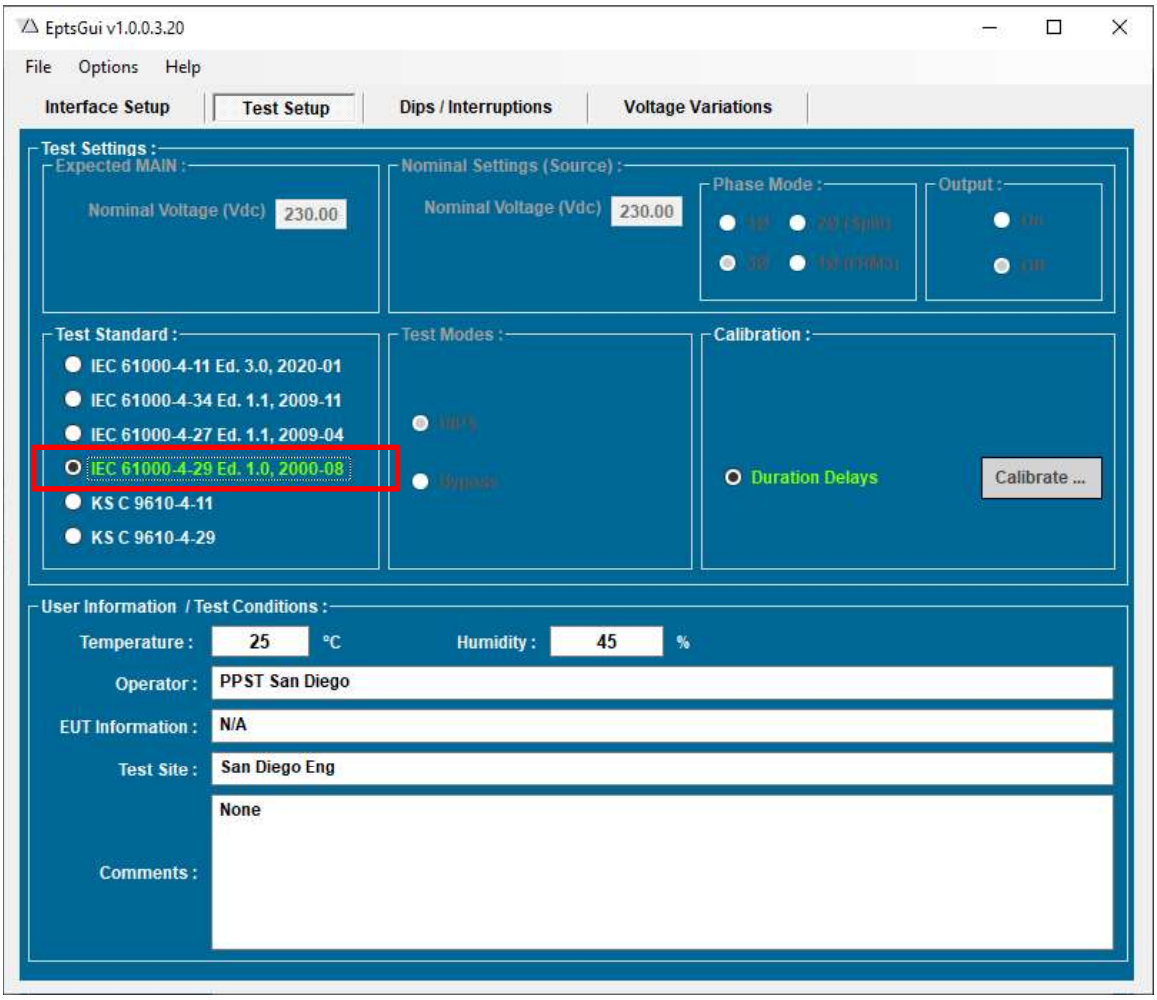



*Figure 8-1: IEC 61000-4-29 DC Test Setup Selection Screen*

The bottom part of this tab allows entry of user and EUT information that will carry over to any test reports generated. This information includes:

- Ambient temperature (user provided thermometer required)
- Relative Humidity (user provided humidity measurement device required)
- Operator Name
- EUT description and/or serial number
- Test Site or Test Lab Name
- Any comments the operator wants to add before, during or after a test run.

## 8.4 Dips / Interruptions Tab

### 8.4.1 Preface

The Dips/Interruptions tab is used to load pre-defined IEC61000-4-29 test sequences for voltage dips or voltage interruptions.

The operation of this test is similar to those for IEC 61000-4-11 and IEC 61000-4-34 testing. Refer to Section 6 for loading of test sequences, execution, editing test sequences, saving test sequences and generating test reports.

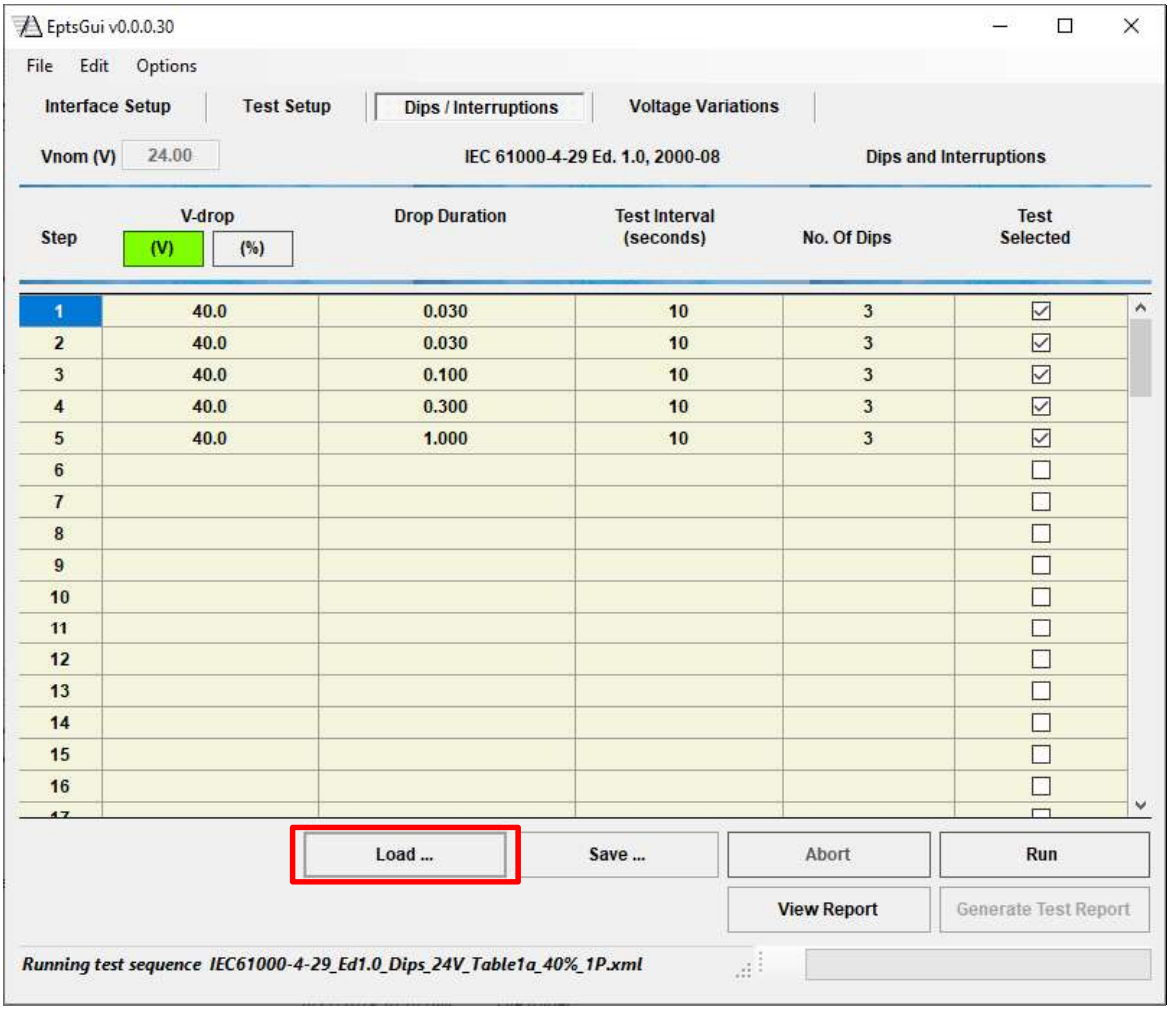



*Figure 8-2: IEC 61000-4-29 Voltage Dips & Interruptions Screen*

Predefined IEC 61000-4-29 voltage dips and interruptions test sequence files in accordance with the IEC standard are provided with the program. These can be loaded using the **Load...** button.

### 8.4.2 Loading DC Test Sequences

A library of DC test sequences is distributed with the Epts GUI software for customer use. Sequences can be edited and saved in this tab as needed to implement alternative types of dips or interruptions:

**C:\Pacific Power Source\Epts\Test Sequences\IEC61000-4-29\Dips and Interruptions**

There are two subdirectories, one for 24V and one for 48V. For other nominal DC voltages, the user can either copy and paste, then edit the voltage settings or create an new DC test file inside the GUI.

All files are saved in XML format. The following files are part of the distribution.

| Standard | Nom. DC Volt | XML File Name |
|---|---|---|
| IEC 61000-4-29 | 24V | IEC61000-4-29_Ed1.0_Dips_24V_Table1a_40%_1P |
| | 24V | IEC61000-4-29_Ed1.0_Dips_24V_Table1a_70%_1P |
| | 24V | IEC61000-4-29_Ed1.0_Short_24V_Table1b_0%_High_Imp_1P |
| | 24V | IEC61000-4-29_Ed1.0_Short_24V_Table1b_0%_Low_Imp_1P |

*Table 8-1: IEC 6100-4-29 Dips and Interruption Test Sequences for 24Vdc EUTs*

| Standard | Nom. DC Volt | XML File Name |
|---|---|---|
| IEC 61000-4-29 | 48V | IEC61000-4-29_Ed1.0_Dips_48V_Table1a_40%_1P |
| | 48V | IEC61000-4-29_Ed1.0_Dips_48V_Table1a_70%_1P |
| | 48V | IEC61000-4-29_Ed1.0_Short_48V_Table1b_0%_High_Imp_1P |
| | 48V | IEC61000-4-29_Ed1.0_Short_48V_Table1b_0%_Low_Imp_1P |

*Table 8-2: IEC 6100-4-29 Dips and Interruption Test Sequences for 48Vdc EUTs*

To load any test sequences from the library, click the “Load…” button **(13)** at the lower left of the screen. Using the file open dialog, select the C:\Pacific Power Source\Epts\Test Sequences directory and then either \50Hz or \60Hz and select the desired file. Once opened, the contents of the data entry grid will show the settings from this test sequence file.

**Note:** Always make sure the voltage selected matches that of the EUT

**Note:** If a test sequence file for one IEC 61000 test standard is selected while a different test standard is selected on the setup screen, an error message will be displayed and the sequence file will not be loaded.

## KS C 9610 Test Sequence Files

The Korean test standards is also distributed with the Epts GUI software for customer use. Sequences can be edited and saved in this tab as needed to implement alternative types of dips or interruptions. These are located in the following directory:

**C:\Pacific Power Source\EptsGui\Test Sequences\KS_C_9610-4-29\Dips and Interruptions**

There are two subdirectories for nominal DC test level values, \24Vdcand \48Vdc. Each of these has a 1P, 2P and 3P sub directory for singe, split and three phase versions of each test.

All files are saved in XML format. The following files are part of the distribution.

| Standard | Nom. DC Volt | XML File Name |
|---|---|---|
| KS C 9610-4-29 | 24V | KS_C_9610-4-29_Dips_24V_40%_70%_1P |
| | 24V | KS_C_9610-4-29_Short_Interruptions_24V_0%_High_Imp_1P |
| | 24V | KS_C_9610-4-29_Short_Interruptions_24V_0%_Low_Imp_1P |

*Table 8-3: KS C 9610-4-29 Dips and Interruption Test Sequences for 24Vdc EUTs*

| Standard | Nom. DC Volt | XML File Name |
|---|---|---|
| KS C 9610-4-29 | 48V | KS_C_9610-4-29_Dips_48V_40%_70%_1P |
| | 48V | KS_C_9610-4-29_Short_Interruptions_48V_0%_High_Imp_1P |
| | 48V | KS_C_9610-4-29_Short_Interruptions_48V_0%_Low_Imp_1P |

*Table 8-4: KS C 9610-4-29 Dips and Interruption Test Sequences for 48Vdc EUTs*

**Note:** Always make sure the voltage selected matches that of the EUT

**Note:** If a test sequence file for one KS C 9610 test standard is selected while a different test standard is selected on the setup screen, an error message will be displayed and the sequence file will not be loaded.

## 8.5 Voltage Variations Tab

### 8.5.1 Preface

The voltage variations tab may be used to run the optional IEC 61000-4-29 voltage variations test. In this mode, the EPTS-3-XX transfer switch is not being used. Instead, all voltage variations are performed by the AFX Series programmable DC power source, which is controlled by the Epts GUI. The EPTS-3-XX switch is placed in BYPASS mode.

The operation of this test is similar to those for IEC 61000-4-11 and IEC 61000-4-34 testing. Refer to Section 6 for loading of test sequences, execution, editing test sequences, saving test sequences and generating test reports.

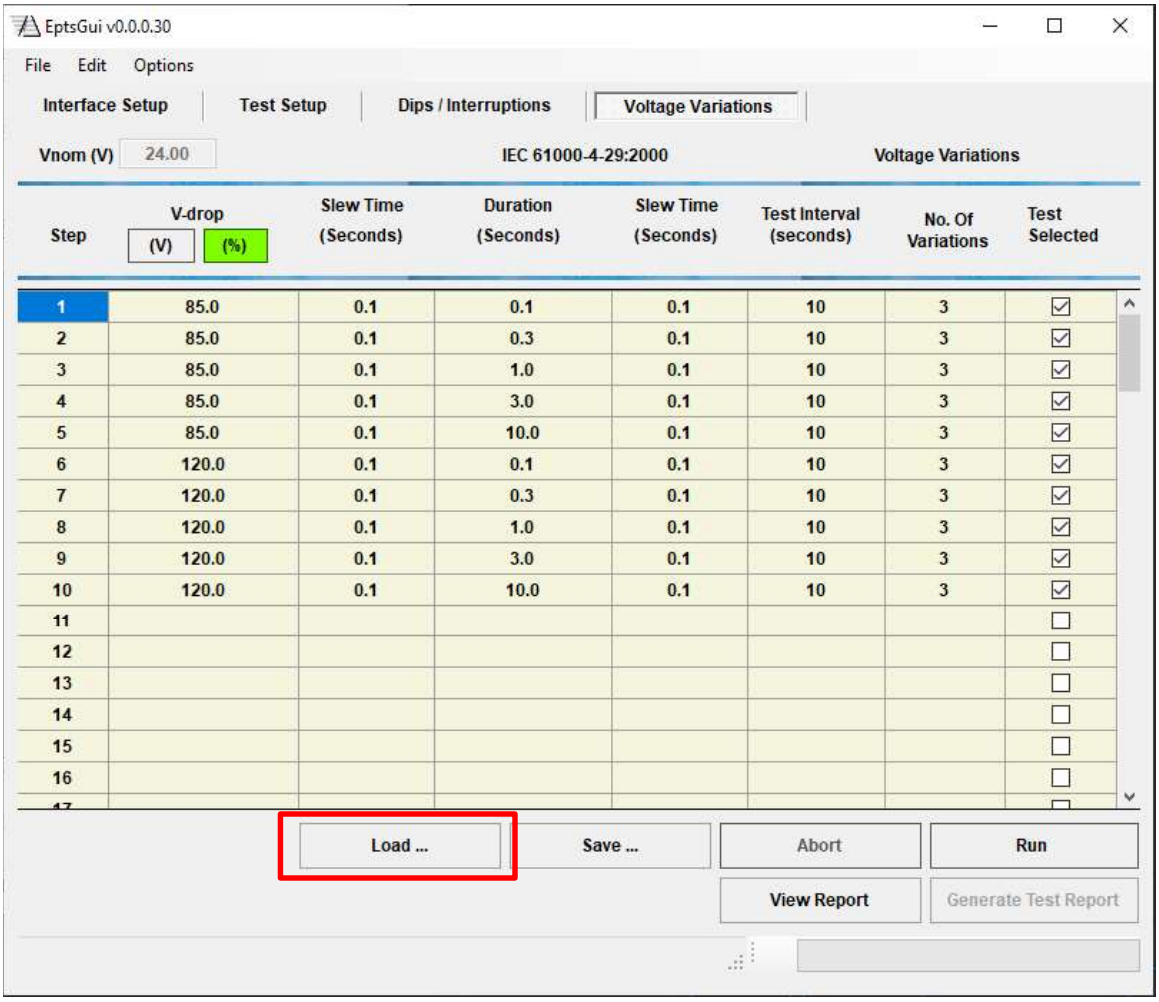



*Figure 8-3: IEC 61000-4-29 Voltage Variations Screen*

Predefined IEC 61000-4-29 voltage variations test sequence files in accordance with the IEC standard are provided with the program. These can be loaded using the **Load…** button.

Note: Voltage slew times for rising and falling voltage edge are not defined in the IEC test standards, only the duration. The EpstGui uses a default value of 0.1 sec (100 msec). This value may be changed by the user as desired.

### 8.5.2 Loading DC Test Sequences

A library of DC test sequences is distributed with the Epts GUI software for customer use but can only be run in pre-compliance mode. Sequences can be edited and saved in this tab as needed to implement alternative types of voltage variations:

**C:\Pacific Power Source\Epts\Test Sequences\IEC61000-4-29\Voltage Variations**

There are two subdirectories, one for 24V and one for 48V. For other nominal DC voltages, the user can either copy and paste, then edit the voltage settings or create an new DC test file inside the GUI.

All files are saved in XML format. The following files are part of the distribution.

| Standard | Nom. DC Volt | XML File Name |
|---|---|---|
| **IEC 61000-4-29** | 24V | IEC61000-4-29_Ed1.0_Voltage_Variation_80-120%_24V_Table1c_1P |
| | 24V | IEC61000-4-29_Ed1.0_Voltage_Variation_85-120%_24V_Table1c_1P |

*Table 8-5: Voltage Variations Test Sequences for 24Vdc EUTs*

| Standard | Nom. DC Volt | XML File Name |
|---|---|---|
| **IEC 61000-4-29** | 48V | IEC61000-4-29_Ed1.0_Voltage_Variation_80-120%_48V_Table1c_1P |
| | 48V | IEC61000-4-29_Ed1.0_Voltage_Variation_85-120%_48V_Table1c_1P |

*Table 8-6: Voltage Variations Test Sequences for 48Vdc EUTs*

To load any test sequences from the library, click the "Load…" button **(13)** at the lower left of the screen. Using the file open dialog, select the C:\Pacific Power Source\Epts\Test Sequences directory and then either \50Hz or \60Hz and select the desired file. Once opened, the contents of the data entry grid will show the settings from this test sequence file.

**Note:** Always make sure the frequency and voltage selected matches that of the local utility grid.

**Note:** If a test sequence file for one IEC 61000 test standard is selected while a different test standard is selected on the setup screen, an error message will be displayed and the sequence file will not be loaded.

## 8.6 Test Reports

Test reports are generated by the EptsGui software in Rich Text Format to support documenting EUT compliance. This report format is easily converted to other common file formats like MS Word or PDF using MS Word or a similar word processor application. Reports can be generated **after** completion of a test.

Report generation and handling is similar as for IEC 61000-4-11 and IEC 61000-4-34 AC tests.

Refer to Section 6 for generating test reports.

# 9 Software Installation Instructions

## 9.1 Preface

This section describes the required software installation steps in detail. The EPTS-3-XX does not have any front panel controls, only indicators so all operation is done using the included Windows Epts GUI software. Control is accomplished using USB so the USB driver and a USB device cable between the controlling PC and the EPTS-3-XX unit must be connected.

The same GUI software also needs to interface to the AFX Series AC & DC Power source used. This can be done using either USB or LAN connection.

Note: Both the EPTS-3-XX switch unit and the AC power source must be connected to the controlling Windows PC to be able to perform any IEC 61000-4-11 or IEC 61000-4-34 tests.

## 9.2 Windows Operating Systems Supported

Recommended operating system for all EPTS units is Microsoft Windows 10 and Windows 11.

## 9.3 Installing the USB Driver

The required USB interface driver for Windows must be installed on the controlling PC to operate the EPTS-3-XX unit. This section walks the user through the process of installing the EPTS's virtual COM port driver for use with a USB equipped Windows PC.

### 9.3.1 Supported Windows versions

This device driver provided is compatible with Windows 10 & Windows 11. Both 32 bit and 64 bit versions are available. The driver installation program can be downloaded from the Pacific Power Source Technical Resources page ( https://tr.pacificpower.com/ ). A login in required using an email address which will grant access.

### 9.3.2 Extracting setup files

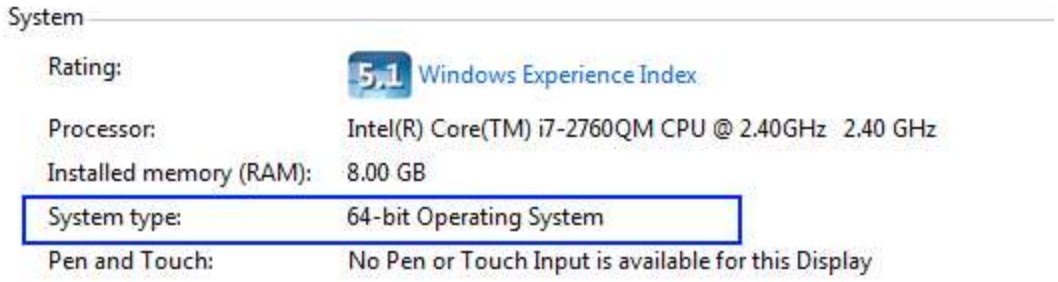
The driver is distributed in archived form (ZIP extension). Before installation, the files contained in the zip archive must be extracted to a temporary folder. Once extracted, the setup executable can be run to start the installation from the USB_VCP Installation directory that was extracted.

For Windows 10 version 1804 or older, the CP210x_Windows_Drivers_10_22_2022_v6.7.6 can be used.

For Windows 10 versions higher than 1804 and Windows 11 PC's, use the universal CP210x_Universal_Windows_Driver_10_22_2022_v11.2.0

### 9.3.3 Install the VCP USB Driver

To install CP210x_VCP driver, run the file “CP210xVCPInstaller_x64.exe” for 64 bit Windows OS or “CP210xVCPInstaller_x86.exe” for 32 bit Windows OS. If you are not sure what Windows version is installed on your PC, open the Windows Control Panel and select “System”. The System type field will show this information. For Windows 11, install the Universal Driver, see section 9.3.5, “Install the Universal USB Driver” instead.




Double click or run the relevant setup file to start the installation process.

### 9.3.4 Dialog Screens

The first screen displayed is the driver installer welcome dialog. Click Next to continue.


The next screen is the License Agreement screen. Read the license and select accept if you agree. Then click on the Next button to continue. If you do not accept the license agreement, the installation will be terminated.

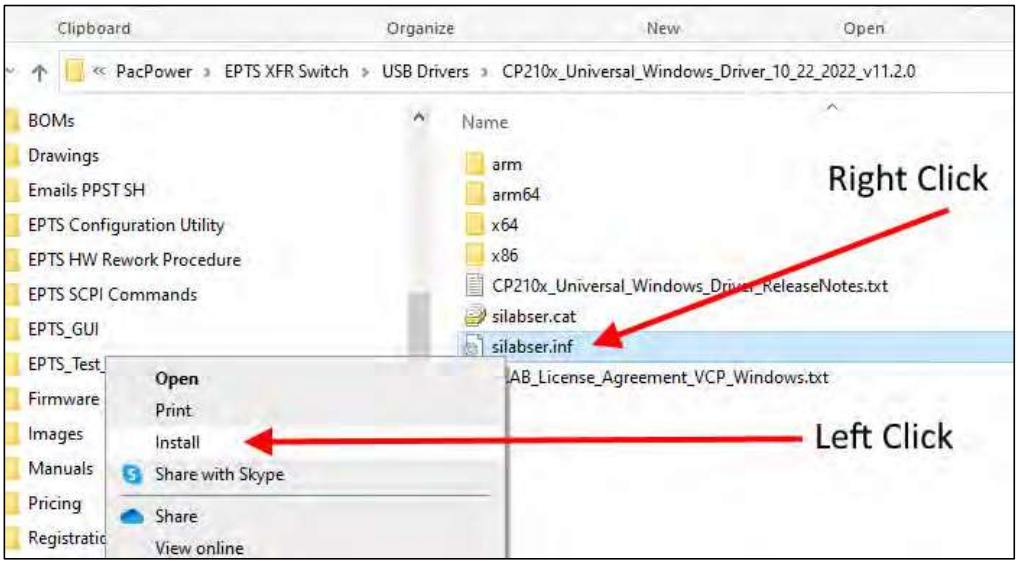

The driver installation will not run and when completed, display the result of the installation as shown below.


Click on the finish button to complete and close the installer program. Your drive is now ready to be used.

### 9.3.5 Install the Universal USB Driver

The Universal USB driver is distrubed as an zip archive file anmed "CP210x_Universal_Windows_Driver_10_22_2022_v11.2.0.zip"

Unzip the file to a temporarty directory. There is no exectable install program for this driver. Instead, locate the file named "silabser.inf" in the temporary directory. Right click on this file and select the "Install" enry that should be visible. See figure below.




The driver is now installed.

### 9.3.6 USB Detection and COM Port Number

The virtual com port will not be visible in the Windows Device Manager unless an EPTS unit is plugged into one of the PC's USB ports. When it is, a COM port have a device address higher than 4 will be visible in the Windows Device manager. Use this COM port number to connect using the Epts_Gui application program.

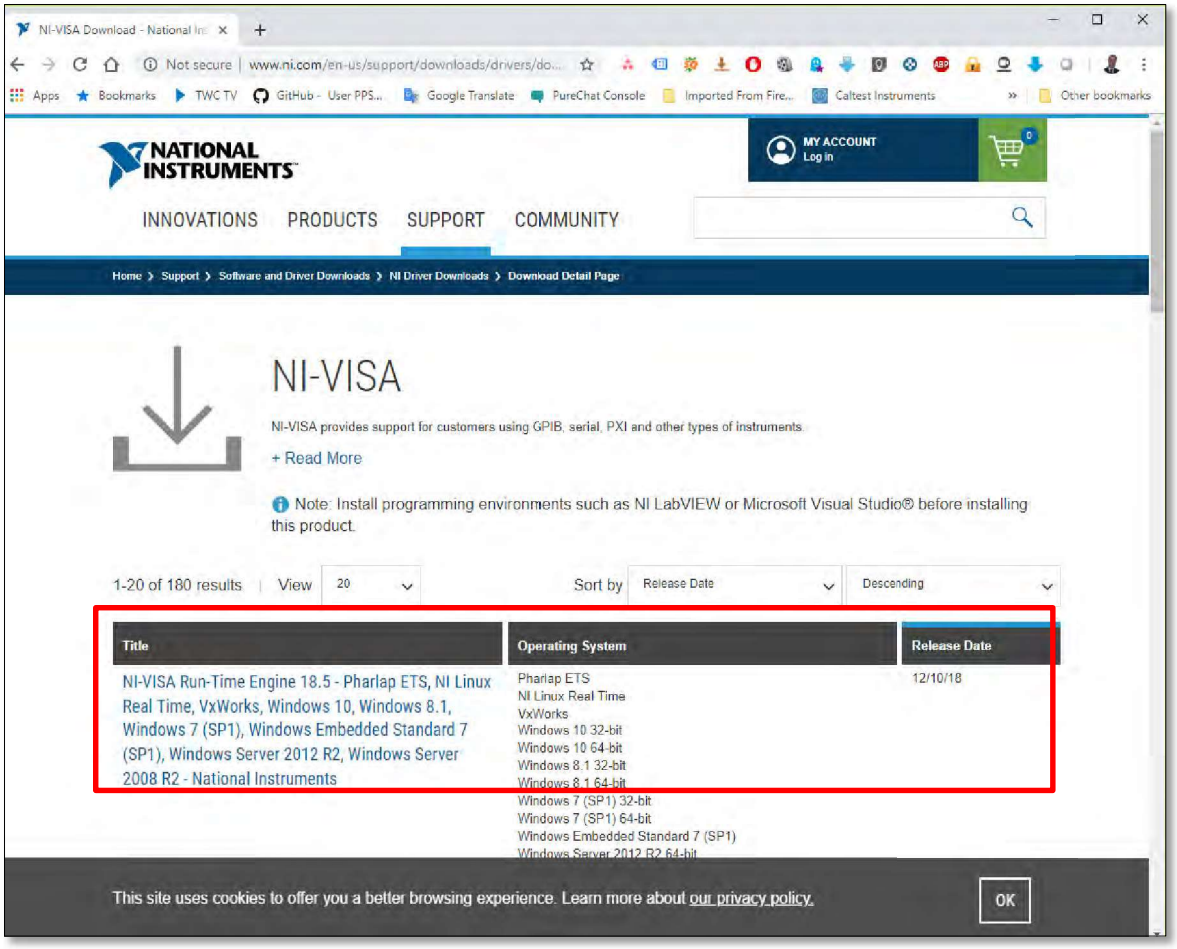
Note: If needed, the COM port number can be edited using Windows Device Manager, or you can use the default assigned com number.

## 9.4 Installing NI VISA® Software

The communication between the controlling Windows PC, the EPTS unit and the AC power source relies on NI VISA interface software to support LAN, GPIB and RS232/LAN. If you do not already have NI VISA[1] installed, you will need to download and install the NI VISA Runtime Engine version 18.5 or newer for the Windows OS you have on the controlling PC. Do so before using the EptsGui program.

The NI VISA Runtime Engine can be downloaded from the ni.com website at:

http://www.ni.com/en-us/support/downloads/drivers/download.ni-visa.html




**Note:** Once VISA has been installed, the AC Power source must be setup as a VISA resource using the NI-MAX utility.

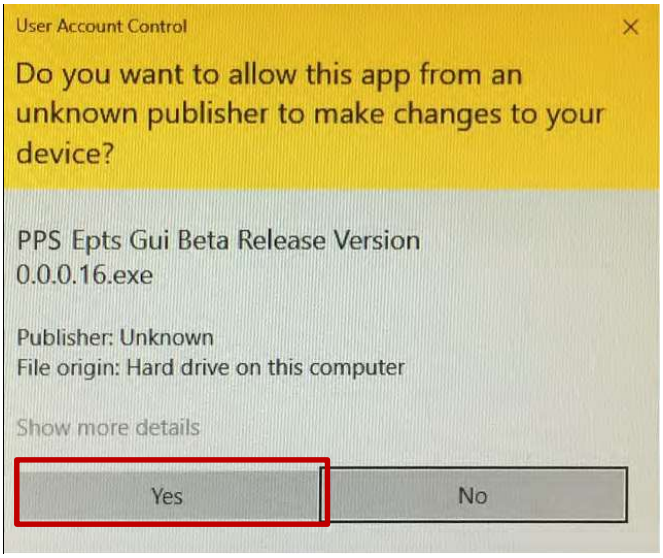
[1] NI VISA is a registered trademark of National Instruments, Inc.

## 9.5 Installing the EPTS Software Suite

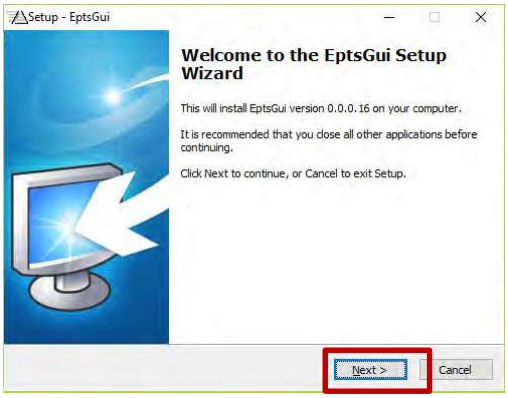
The software CD that comes with the EPTS-1, includes an install executable, called;

**PPS Epts Gui Release Version 0.0.x.x.exe**

where the “x.x” indentify the software version no. Running the executable will result in a number of pop-up windows. Depending on your Windows version, you may need to allow the install program to make changes to your PC. The User Account Control dialog below will be displayed.

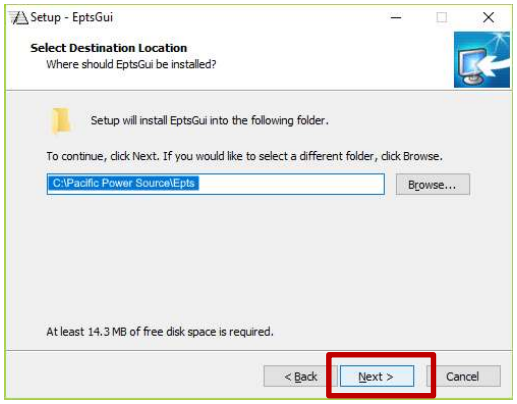


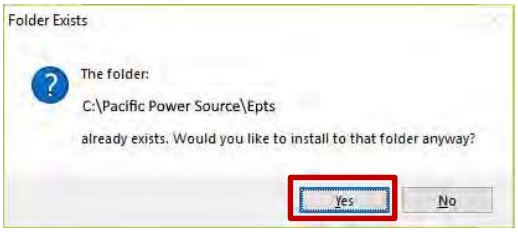

Click “Yes to proceed with the installation, then the Setup Wizard window will pop up. Clik on the “Next >” button to proceed.





Read the Software License Agreement and acknowledge, by selection the “Accept the agreement” radio button, the click the “Next >” button to proceed.

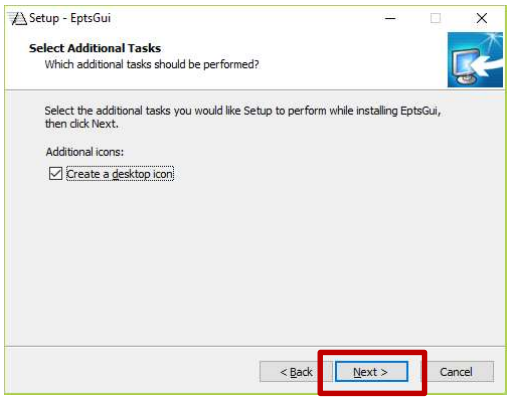


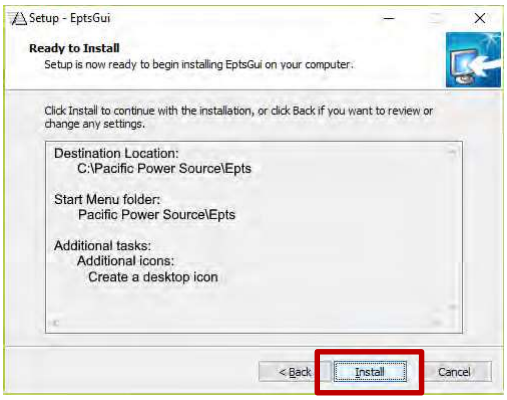




The default installation directory is "C:\Pacific Power Source\EptsGui". You can chose a different location using the "Browse…" button if desired. Accept the selected destination directory by clicking the "Next >" button.

If you are installing a new version of the EptsGui program, it will overwrite any older version already present. This is normal so click on the "Yes" button if this dialog appears.

The first of several setup wizard dialogs will appear. Click the "Next >" button to proceed with installation.




When the installation is complete, you click on "Finish" and this will launch the program. A progress bar will appear as the necessary files are being installed. Once complete, the final dialog box will appear as shown below.


Click the "Finish" button to exit the installation program.

## 9.6 Software Registration Process

The EPTS Gui Software represents a significant amount of engineering development to ensure compliance to all relevant IEC 61000-4 test standards. As such, its use is licensed for a specific measurement system only and each copy of the EPTS Gui software has to be registered in order to operate.

Since the EPTS Gui Software program can be used for either full compliance test mode when the EPTS hardware is present and connected or in pre-compliance mode if the EPTS hardware was not purchased, there are two different software license codes:

- Full Compliance operation with EPTS Hardware license
- Pre-compliance operation only. (no EPTS Hardware)

### 9.6.1 Full Compliance EPTS Gui Software Registration Code.

The full compliance registration code for your instance the EPTS Gui software can be requested by sending an email to Pacific Power's Customer Support department at support@pacificpower.com and include the EPTS hardware serial number.

Include the EPTS Chassis serial number in your email request. The serial number of your switch unit can be obtained by connecting the EPTS unit via USB to your laptop or PC and launching the EPTS Gui program. Then select the "Interface Setup" tab (first tab on the left) and use the Search button to find the correct resource name. Select the resource name and use the Write/Query button to send the default *IDN? Query command. The image below shows the serial number, in this case "20001".

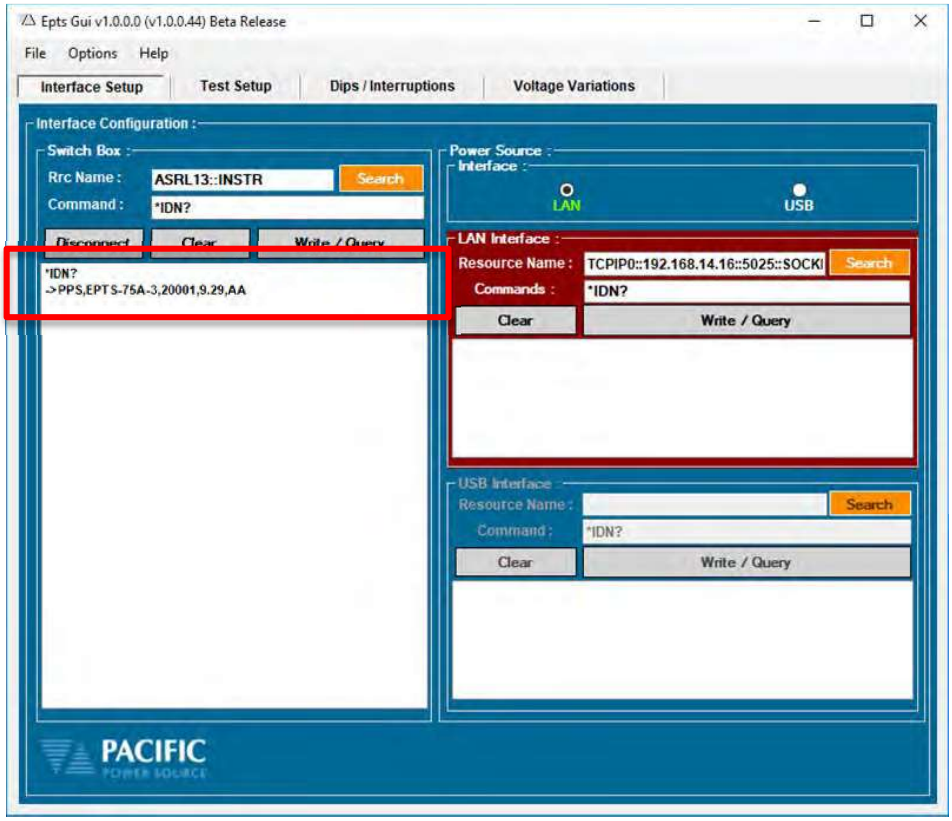



*Figure 9-1: EPTS Gui Software Registration EPTS Serial Number Location*

**Note:** The EPTS unit must be connected to the Laptop or PC used or the serial number cannot be queried with the Write/Query button.

### 9.6.2 Pre-compliance EPTS Gui Software Registration Code

To use the EPTS Gui software without an EPTS hardware unit, obtain the serial number of the programmable AC power source that is part of the PPS ECTS EMC Test System by connecting the GUI to the power source in the upper right hand corner of the Interface Setup Tab and sending the *IDN? Query command to obtain the serial number of the AC power source.

The pre-compliance only registration code for your instance the EPTS Gui software can be requested by sending an email to Pacific Power's Customer Support department at support@pacificpower.com and include the AC power source serial number.

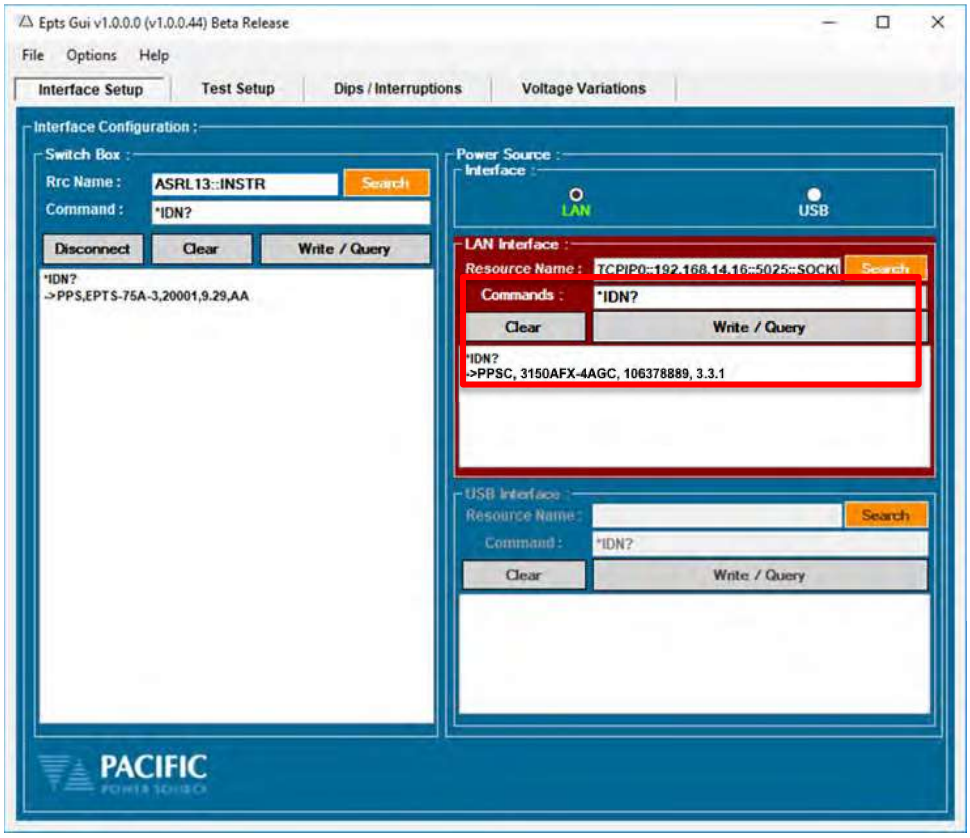


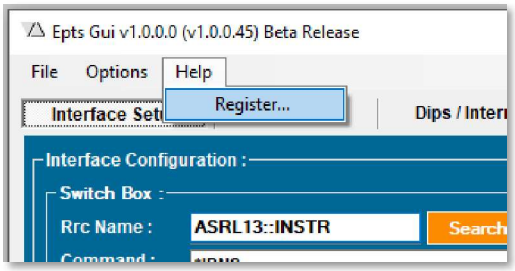

*Figure 9-2: EPTS Gui Software Registration AC Source Serial Number Location*

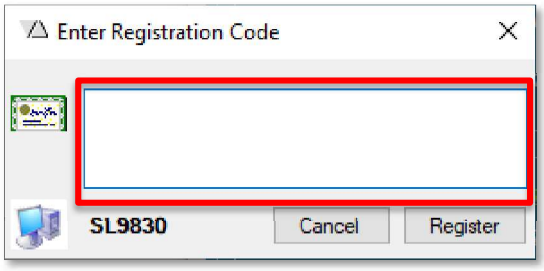
### 9.6.3 Entering your Registration Code

If the serial number you provided in your email is valid, you will receive a reply within 24 hours with the relevant registration code. The registration code consist of a six character string, for example “Y2F7J1”.

To activate your software registration, proceed as follows:

1. Launch the EPTS Gui program after installation.
2. From the main menu, select the Help, Register menu entry. This will display the dialog box shown below.




3. Copy the registration code from the email you received and paste it in the text box indicated above.
4. Click on the “Register” button in the lower right corner of the dialog box to complete the registration.

Your EPTS Gui software is now ready for use.

# 10 Calibration Information

## 10.1 Preface

This section covers system calibration of the EPTS-3-XX unit. Normally, annual calibration is recommended.

## 10.2 EPTS Software Calibration

When starting a test, you may see this “Missing Calibration File” dialog.

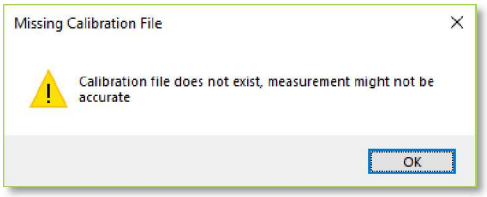
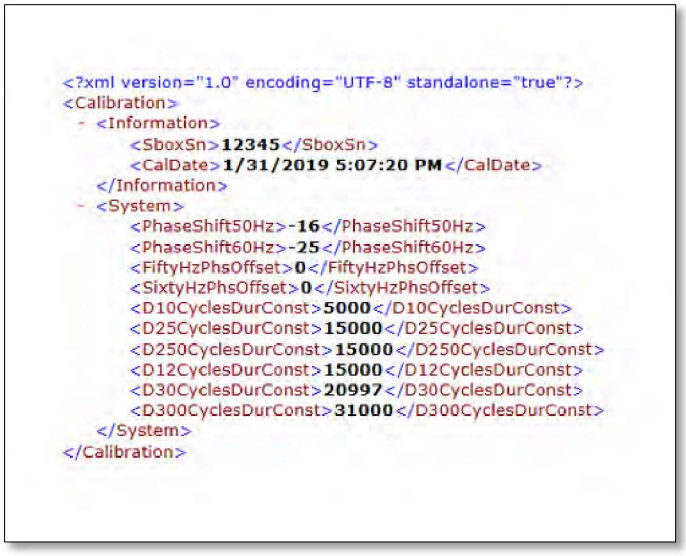



*Figure 10-1: Missing Calibration File Message*

This means the required calibration file for the EPTS-3-XX unit is missing. Without it, tests cannot be run. Follow the procedure in this section to perform the required voltage and phase alignment calibration.

The EptsGui uses a calibration file called “Epts_Calibration.xml”. At the time of shipment, a system calibration is performed and this xml file will be generated. Also, when the user calibrates the system again, this file will be updated.

Sample content of the EPST calibration file is shown here.



```
<?xml version="1.0" encoding="UTF-8" standalone="true"?>
<Calibration>
  - <Information>
      <SboxSn>12345</SboxSn>
      <CalDate>1/31/2019 5:07:20 PM</CalDate>
    </Information>
  - <System>
      <PhaseShift50Hz>-16</PhaseShift50Hz>
      <PhaseShift60Hz>-25</PhaseShift60Hz>
      <FiftyHzPhsOffset>0</FiftyHzPhsOffset>
      <SixtyHzPhsOffset>0</SixtyHzPhsOffset>
      <D10CyclesDurConst>5000</D10CyclesDurConst>
      <D25CyclesDurConst>15000</D25CyclesDurConst>
      <D250CyclesDurConst>15000</D250CyclesDurConst>
      <D12CyclesDurConst>15000</D12CyclesDurConst>
      <D30CyclesDurConst>20997</D30CyclesDurConst>
      <D300CyclesDurConst>31000</D300CyclesDurConst>
    </System>
</Calibration>
```

*Figure 10-2: Calibration File Sample*

### 10.2.1 Calibration Equipment

To do this, you should first arrange for an external reference voltage measurement method. This requires a 6 ½ Digit DMM to measure voltage and a precise Digital Storage scope to measure time periods and phase angles.

*Figure 10-3: VDT100R Load*

Suggested Equipment is listed in the table below.

| Instrument | Manufacturer | Model |
|---|---|---|
| **Digital Storage Scope** | Rigol | DS4024 or equivalent |
| **Digital Multimeter, 6 ½ Digit** | Keysight | 34460A or equivalent |
| **Low Inductance 100 Ω Power Resistor** | PPS | VDT100R |

*Table 10-1: Calibration Equipment List*

The required calibration setup is shown in the drawing below.

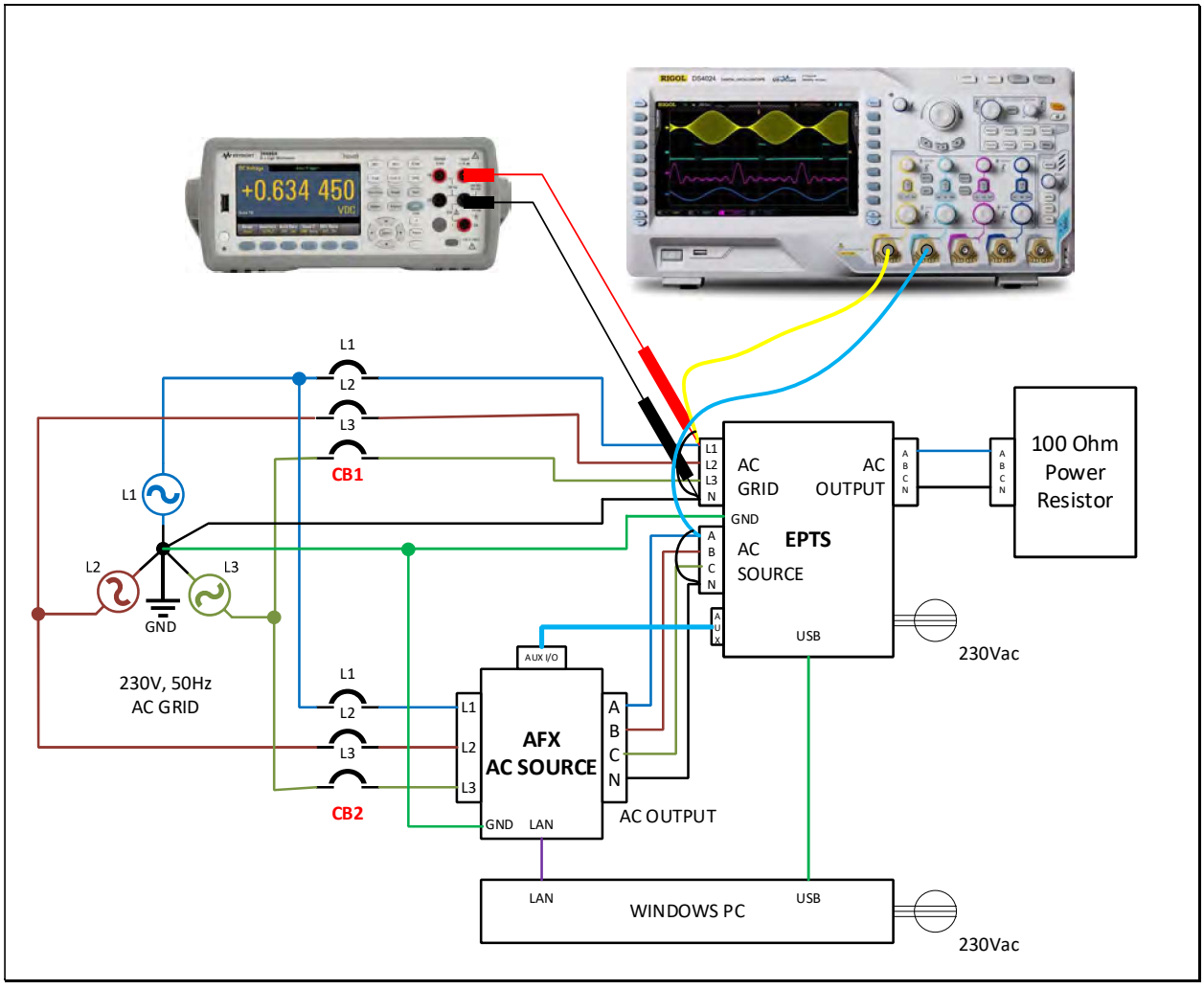
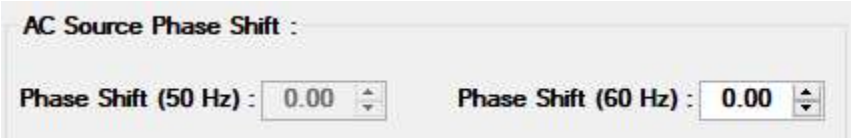



*Figure 10-4: Calibration Equipment Setup*

## 10.3 EPTS Hardware Calibration

The are two types of calibration that must be done on newly installed systems. Calibration may be repeated at least once a year or any time the Mains connection or AC power source is changed.

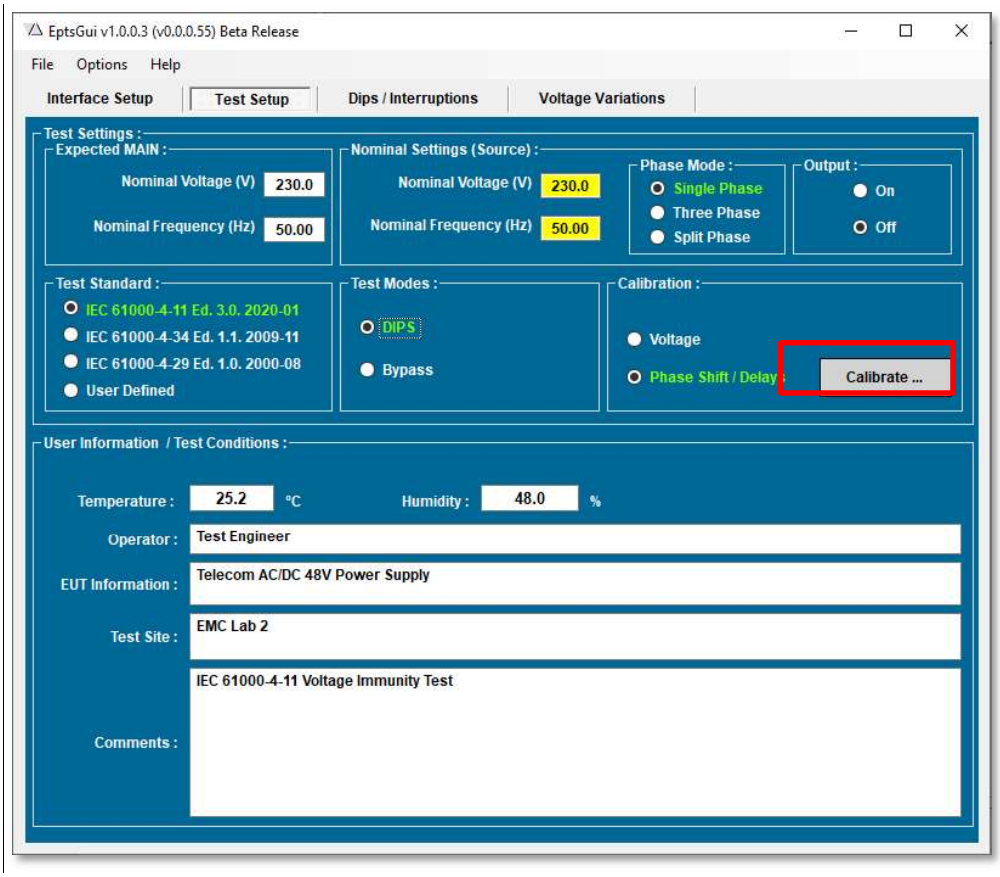
### 10.3.1 AC Source to Mains Sync Calibration




The AC power source is synchronized to phase A of the AC Mains input side of the EPTS and it is imperative that the phase difference between the Mains Phase A (L1) L-N voltage and the AC power source output in SYNCED mode is as close to zero degrees as possible. (zero phase shift between the two. This requires the use of a two channel digital scope.

Once the equipment is connected per *Figure 10-3*, proceed as follows:

1. Connect Phase A (L1) and Neutral to Channel 1 of the DSO
2. Connect Phase A output of the AC power source to Channel 2 of the DSO.
3. Select the **Test Setup** Tab and make sure the Phase Shifts / Delay radio button is selected.
4. Click on the "**Calibrate**" button on the right.



This will display the Calibration Screen. A password dialog may pop-up. This feature is not used in the EptsGui and clicking on the Ok button will display the calibration screen shown below.


There are sync offset calibration coefficients for both 50Hz and 60Hz Mains applications. Make sure you adjust the coefficient for the correct Mains frequency.

When un-calibrated, there is likely a phase difference between Mains L1 and the AC Source phase A output. This is illustrated in the figure on the left marked **Before**.

5. While observing the Scope image, adjust the cal coefficient for the relevant Mains frequency up or down to adjust the position of the AC Source output voltage waveform. Do this until both waveforms are on top of each other. This is illustrated by the image on the right marked as **After**.


6. When complete, save the new coefficient by clicking the “Save” button. The AC Source Phase Shift calibration coefficient will be used to set the AC Source phase setting for Phase A when in line sync mode.

This calibration must be completed for each Mains frequency setting that is used. (50Hz, 60Hz) If only one is used, the other mains frequency calibration can be skipped.

### 10.3.2 EPTS Dips Phase Angle Offset Calibration


These two calibration coefficients are used to provide optimal phase angle drop positions for either 50Hz or 60Hz testing. Each frequency mode has its own independent coefficient. This calibration was performed at the factory and the calibration file provided with the EPTS must be copied to the user's PC so the correct coefficients are loaded when the EptsGui is opened.

The calibration can be performed by the user if needed. To do so, follow these steps:

1. Connect the DSO to phase A of the EPTS output. Make sure the Mains voltage is present and the AC source is set to the MAINS voltage and frequency and is SYNCED.
2. Load a simple voltage dip sequence with a 90° drop angle.
3. Run the voltage dip and determine the drop phase angle using the DSO. If the drop angle is not at 90°, open the calibration screen as explained before and adjust the 50Hz or 60Hz Phase Offset coefficient value up or down (more or less delay). Change only by 1 or 2 counts at a time.
4. Save the new coefficient value and run the same Voltage dip again to check. If the drop angle moved in the wrong direction, return to the calibration screen and change the value in the opposite direction.
5. Repeat steps 3 and 4 as needed until the dip phase angle is correct. Make sure to Save a change value before closing the Calibration screen each time or the change will not take effect.

### 10.3.3 EPTS AC Dips Duration Calibration


These two calibration coefficients are used to provide optimal voltage dip and interruption duration times for either 50Hz or 60Hz testing. Each frequency mode has its own independent coefficient. This calibration was performed at the factory and the calibration file provided with the EPTS must be copied to the user's PC so the correct coefficients are loaded when the EptsGui is opened.

The calibration can be performed by the user if needed. To do so, follow these steps:

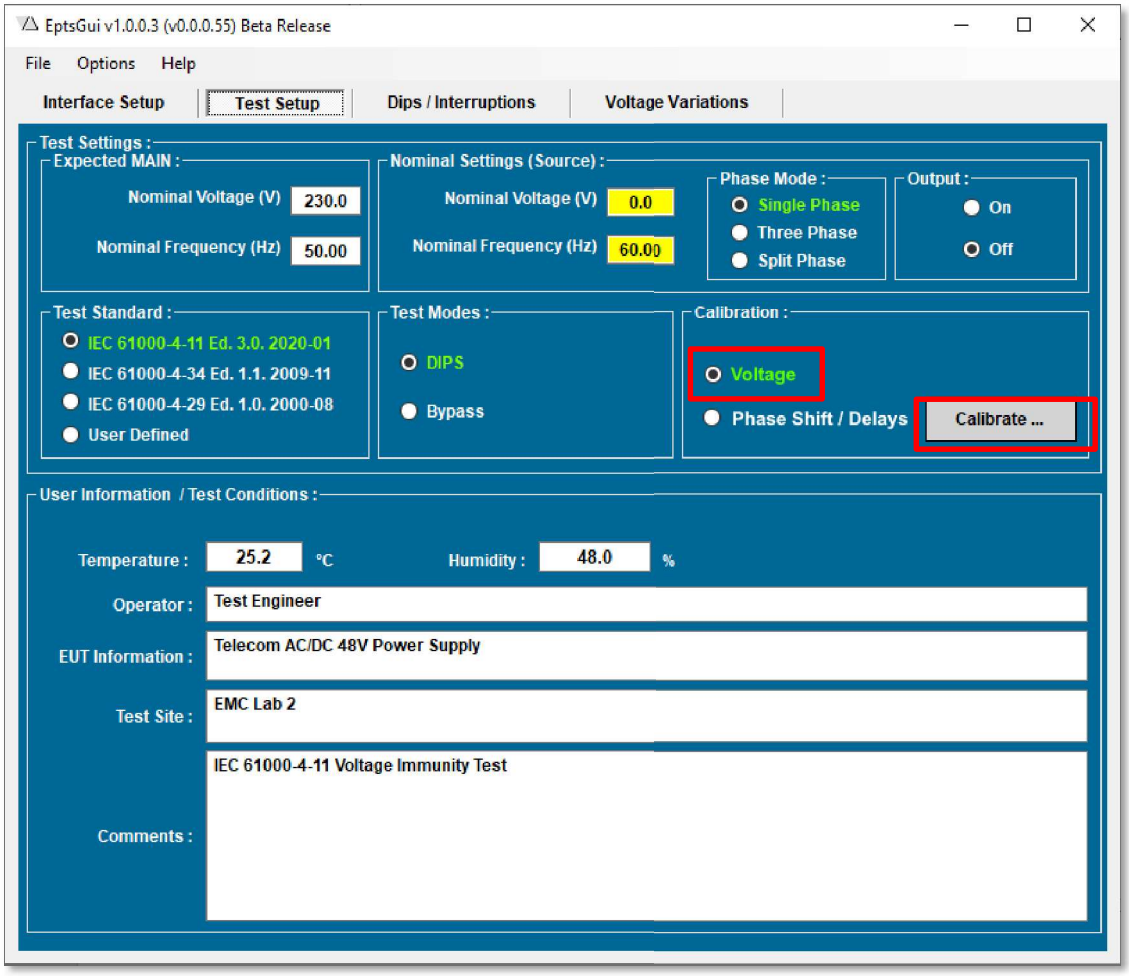
1. Connect the DSO to phase A of the EPTS output. Make sure the Mains voltage is present and the AC source is set to the MAINS voltage and frequency and is SYNCED.
2. Load a simple voltage dip sequence with a 90° drop angle
   For 50Hz 10 cycles, 25 cycles, 250 cycles.
   For 60Hz; 12 cycles, 30 cycles, 300 cycles.
3. Run the voltage dip and determine the drop phase angle using the DSO. If the drop angle is not at 90°, open the calibration screen as explained before and adjust the 50Hz or 60Hz Phase Offset coefficient value up or down (more or less delay). Change only by 1 or 2 counts at a time.
4. Save the new coefficient value and run the same Voltage dip again to check. If the drop angle moved in the wrong direction, return to the calibration screen and change the value in the opposite direction.
5. Repeat steps 2 through 4 as needed until the dip period time is correct and do this for each of the six **Duration Coefficients**. Make sure to Save a change value before closing the Calibration screen each time or the change will not take effect.

### 10.3.4 EPTS Voltage Measurement Calibration

The EPTS unit measures the incoming Mains voltage on all three phases to make sure it is within acceptable range for IEC 61000-4-11/-4-34 test requirements. This measurement calibration was performed at the factory and the calibration file provided with the EPTS must be copied to the user's PC so the correct coefficients are loaded when the EptsGui is opened.

The calibration can be performed by the user if needed. To do so, follow these steps:

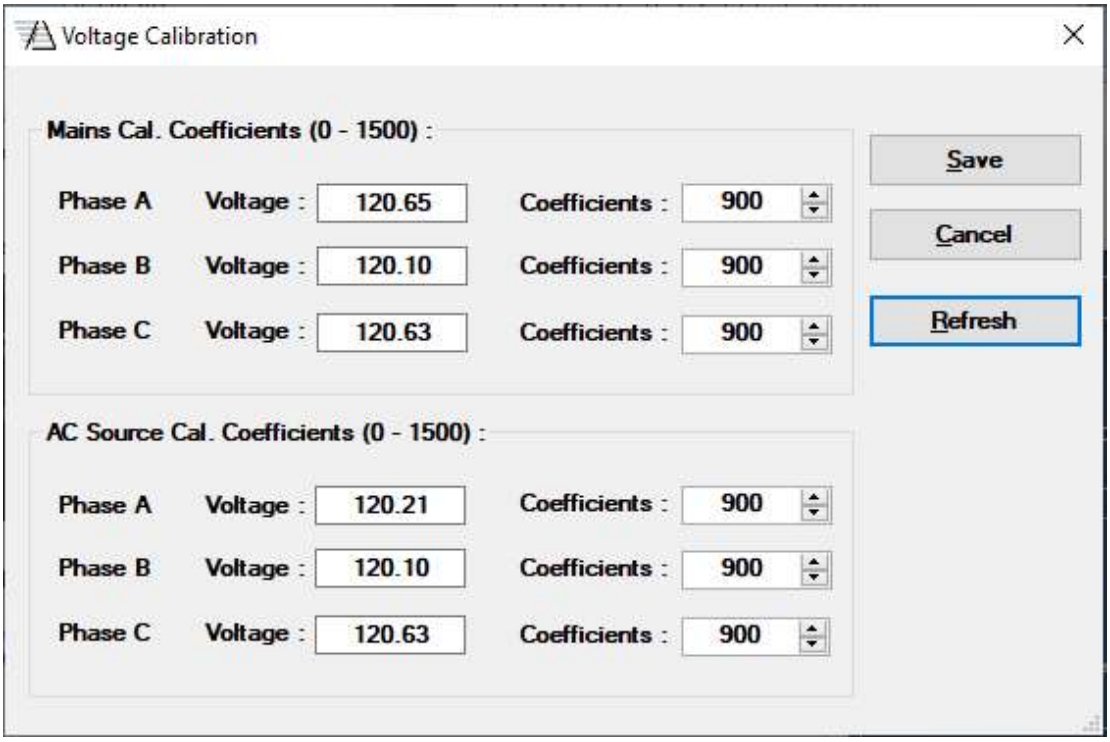
1. Select the **Test Setup** tab and make sure the Voltage radio button is selected in the Calibration frame on the right as shown below.




2. Click on the "**Calibrate**" button to right.

This will display the Calibration Screen. A password dialog may pop-up. This feature is not used in the EptsGui and clicking on the Ok button will display the calibration screen shown below.

**Note:** Before proceeding with calibration, make sure both the Mains voltage and AC Source output voltage is present at their respective AC input terminals on the EPTS unit. Also make sure the EPTS displays **SYNCED** status and NO ERROR Lights are on.




3. For each available Mains input phase, measure the Phase Line to Neutral voltage using the DMM. The expected voltage should match the actual Mains voltage at your location.
4. Click the “Refresh” button to update all six measurements displayed on the left. This action always updates all six readings. It is permissible to adjust all six coefficients between refresh clicks but the DMM lead will have to be moved to check each one so doing one at a time may be more expedient.
5. Adjust the **Mains Cal Coefficient** for each phase until the displayed measured value matches that of the external DMM. Increasing the coefficient will increase the EPTS unit measurement value, decreasing the coefficient will decrease the measurement value. The available coefficient range is 0 through 1500.
6. Move the DMM probe to the next phase and repeat the above step.
7. Once completed for the Mains, perform the same calibration four the AC Source input channel measurement function on the bottom part of the calibration screen. The process is the same but the DMM test leads must be moved to the AC Source Input
8. Adjust the **AC Source Cal Coefficient** for each phase until the displayed measured value matches that of the external DMM.
9. Move the DMM probe to the next phase and repeat the above step.
10. Once all Mains and AC Source phase voltage measurements have been adjusted, click the “Save” button to save the new calibration coefficient values to the calibration xml file.

# 11 Service & Maintenance

## 11.1 Authorized Service Centers

There are NO end-user serviceable parts in this product. In case of a problem or malfunction, DO NOT ATTEMPT TO REPAIR! Instead, contact one of Pacific Power Source's authorized service centers or your local Pacific Power Source distributor. For a list of authorized service centers, refer to section 1, "Contact Information".

# 12 Declaration of Conformity

The Manufacturer hereby declares that the products:

**Product Name:** EPTS Electronic Power Transfer Switch, All Models in Series

Conforms to the following standards or other normative documents:

**RoHS (DIRECTIVE 2011/65/EU)**

Standard applied — EN 50581:2012

**SAFETY (DIRECTIVE 2014/35/EC):**

Standard applied — EN 61010–1: 2010; ED3/A1:2019

**EMC (DIRECTIVE 2014/30/EU):**

Standard applied — EN 61326-1: 2013

**Reference Standards:**

**ELECTROMAGNETIC IMMUNITY**:

| | | |
|---|---|---|
| RF Electromagnetic Field | IEC 61000-4-3:2020<br>1 kHz sinewave (80% AM) | 80 – 1000 MHz, 3 V/m<br>1.4 – 2 GHz, 3 V/m<br>2.0 – 2.7 GHz, 1 V/m |
| Conducted RF Immunity | IEC 61000-4-6:2013<br>1 kHz sinewave (80% AM) | 0.15-80 MHz, 3 V emf |
| Electrostatic Discharge | IEC 61000-4-2:2008 | ± 4 kV contact discharge<br>± 4 kV air discharge |
| Electrical Fast Transient/Burst | IEC 61000-4-4:2012 | AC or DC power ports, ± 1.0 kV<br>Signal and I/O ports, ± 0.5 kV |
| Surge | IEC 61000-4-5:2014+A1:2017 | Input AC: 0.5kV L-L, 1.0kV L to Earth<br>Input DC: 0.5kV Line to Earth<br>Signal & Telecom: 1.0kV to Earth |
| Voltage Dips and Interruptions | IEC 61000-4-11:2020 | Dips > 95% @ 0.5 Periods, Criterion B<br>30% @ 25 Periods, Criterion C<br>Inter. > 95% @250 Periods, Criterion C |
| Conducted Disturbance at Mains | CISPR 11:2015+A1:2016+A2:2019 | 10-25MHz, < 60dBµV |
| Radiated Disturbance below 1GHz | CISPR 11:2015+A1:2016+A2:2019 | 30-200MHz, < 50 dBµV/m<br>201-1GHz, < 57 dBµV/m |

**Supplemental Information:**

**When and Where Issued** — May 14, 2019
Irvine, California, USA

**Authorized Signatory**

Mitchel Orr,
Quality Manager, acting
Pacific Power Source

**Responsible Person** — Joe Abranko,
Pacific Power Source, Inc.
17692 Fitch, Irvine CA, 92614

**Mark of Compliance**

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# Index