PTS-2 Full Function Instruction Manual

1. Introduction:

The *PTS-2* is a portable secondary injection test set designed to allow qualified individuals to field test ETC trip units. The test set is used to perform testing on trip devices before or after they are installed on the circuit breaker. The breaker must be removed from service before any tests are performed.

Secondary injection is a quick and useful test to verify the operation of the electronic trip unit, the flux trip device, and the basic mechanical operation of the breaker. Secondary injection is NOT capable of checking the following:

- Accuracy and functionality of the current transformers.
- Integrity of the electrical insulation between phases and between phases and ground.
- Contact resistance.
- Functionality of breaker accessories such as close coils, charging motors, shunt trips, UV or OV coils or other similar accessories.
- Speed and mechanical integrity of the operating mechanism or other moving parts of the breaker.

The test set works by injecting a single-phase current that simulates the output of the breaker's current transformers. The magnitude of this current is adjustable, and can be steered into each of the *ETC* phase inputs.

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2. Compatibility:

The *ETC-PTS-2* is compatible with several generations of *Satin American / ETC Technologies* trip units. Table 1 details compatibility and limitations.

Table 1, Test Set Compatibility	
Trip Device	**Notes**
ETC-11	Compatible
ETC-11R	Compatible
ETC-11D	Can be used with special considerations. Refer to section 6.4
ETC-21, ETC-21R, ETC-21D	Not compatible. *Westinghouse Amptector* test set can be used. Note that some test sets may have difficulty driving higher currents into these devices and short-time / instantaneous tests may have to be performed and reduced pickups.
ETC-31, ETC-31R, ETC-31D	Not compatible.
ETC-12, ETC-12A, ETC-12G ETC-12E, ETC-12S	Compatible. All tests performed with test set configured at 200mA regardless of how trip device is applied in field. One additional test is performed to verify current scaling. Refer to section 6.5.
ETC-12Q.series	Compatible. Test port cable or DB-25 adapter is required.

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WARNING!!:

TO PREVENT ELECTIRCAL SHOCK OR INJURY, DISCONNECT THE BREAKER FROM ALL PRIMARY AND SECONDARY POWER SOURCES.

ON DRAWOUT EQUIPMENT, VERIFY THAT THE BREAKER IS TRIPPED AND RACK THE BREAKER TO ITS DISCONNECTED POSITION.

DO NOT ATTEMPT TO SECONDARY INJECTION TEST AN ENERGIZED BREAKER

REFER TO NFPA-70E FOR COMPREHENSIVE ELECTRICAL SAFETY GUIDELINES

3. Connectors and Controls

Figure 1 shows a view of the left side of the PTS-2 connectors. Figure 2 is a view of the front panel of the test set. The functions of identified features are detailed in table 2.

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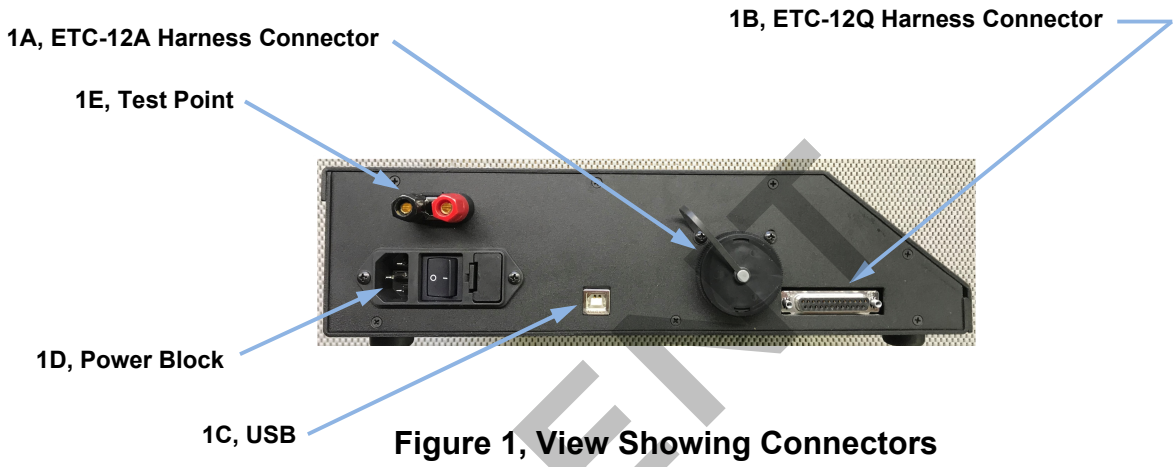

Figure 1, View Showing Connectors

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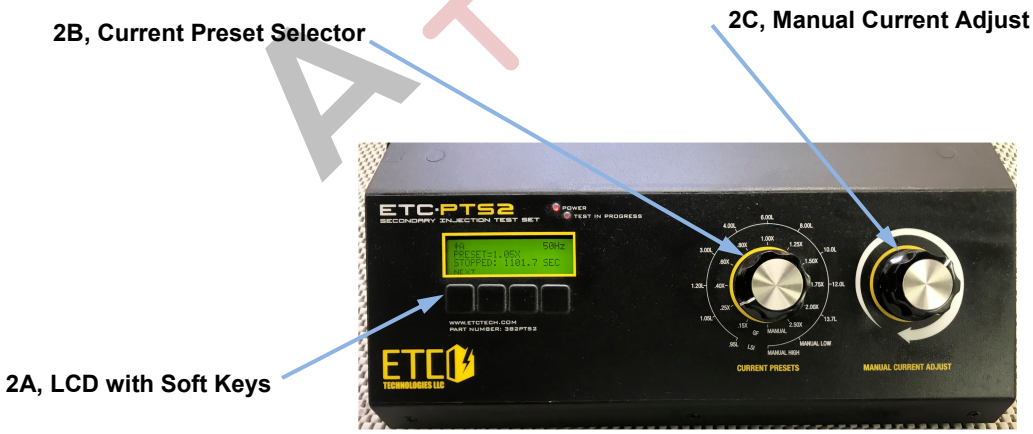

Figure 2, View of Front Panel

Table 2, CONNECTORS AND CONTROLS		
DESIGNATION	**ITEM**	**FUNCTION / NOTES**
1A	ETC-12A Connector	Mating connector for ETC-12A test harness to test legacy ETC-12A.series, ETC-12E.series, ETC-12G.series and ETC-12S.series. This harness can also be used to test legacy ETC-11, ETC-11R and ETC-11D devices.
1B	ETC-12Q Connector	Mating connector for ETC-12Q test harness.
1C	USB	USB connector intended for future use.
1D	Power Block	IEC C13 connector for mains power. 100-240V AC 50/60 Hz T1-AL250V fuse
1E	Test Point	Test point for external meter.
2A	LCD	4 line display with 4 soft keys for user input. Function of keys are shown on the display
2B	Current Preset	Selector for preset test currents. The two furthest clockwise positions are low range manual and high range manual. When selector is in one of these positions, test current is adjusted with the manual adjust knob (2C). Different preset test currents are available when the test set is configured for ground fault testing. The furthest clockwise position allows knob (2C) to manually adjust test current.

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4. Test Harnesses

Figure 3 shows the *ETC-12A* test harness. This mates to port 1A on the test set as shown in figure 1. The opposite end of this harness has two 36-pin rectangular connectors.

When using the *ETC-12A* test harness, the breaker wiring that mates with the ETC being tested is disconnected. The rectangular female connector on the *ETC-12A* harness is mated with the trip unit being tested. The rectangular male connector is mated with the breaker wiring harness.

Figure 3, ETC-12A Test Harness

Figure 4 shows the *ETC-12Q* test harness. This harness mates to port 1B on the test set as shown in figure 1. The opposite end of the harness connects to the test port on the *ETC-12Q.series.* The harness connecting the *ETC-12Q.seires* to the breaker do not need to be disconnected for testing.

Figure 4, ETC-12Q Test Harness

5. Setup and Modes of Operation

Before turning on the test set, the user needs to connect the power cable and the test cable. When the PTS-2 is first energized, a screen similar to the one shown in figure 5 is displayed. This screen displays the firmware version. Pressing *NEXT* will load the main test screen as shown in figure 6.

```
ETC TECHNOLOGIES

VER:  01.01.00.00.008
NEXT
```

FIGURE 5, FIRMWARE VERSION NUMBER

The main test screen allows the user to either:

1. Start a test
2. Change the phase where the test current will be injected
3. Enter the *SETUP* menu
4. Execute pre-programmed tests (available only when testing certain trip devices)

```
ØA                    60Hz
PRESET = 5.00X

START    Ø    SETUP    TESTS
```

FIGURE 6, MAIN TEST SCREEN

Pressing the *SETUP* button displays the setup screen shown in figure 7. Table 3 details the setup configurations that can be made through this screen.

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ON TRIP:  TRIP BREAKER
LTP:   1.00X
SEC:   0.1 AMPS
DONE     TIME     SEC     MORE
```

FIGURE 7, SETUP SCREEN

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TABLE 3, TEST SET SETUP MENU SELECTIONS AND FUNCTIONS		
SOFTKEY	**FUNCTION**	**FUNCTION / NOTES**
DONE	Saves configuration and returns to *Main Test Screen*.	Configurations survive power down of the PTS-2.
TIME	Toggles between *TRIP BREAKER* and *TIMER ONLY.* The selection will appear at the top of the screen.	If configured to *TRIP BREAKER* the *ETC-12Q.series* under test will fire the breakers *MTOP* coil and trip the breaker. If *TIMER ONLY* is selected, when *ETC-12Q.series* calls for a trip, it will stop the timer on the test set but not actually open the breaker.
SEC	Configures the output current of the *PTS-2.* This setting should match the secondary current on the breaker's current transformer.	Allows selection of 0.1, 0.2, .4, .5 and 1.0A at full scale. The .2A setting should be used for testing all ETC versions except for the ETC-12Q. See section 6.5 for notes on testing ETC-12 units configured for secondary inputs other than .2A. For the *ETC-12Q*, the 0.1 setting should be selected.
MORE	Scrolls for additional selections.	---
BACK	Scrolls back to previous selections.	---
LTP	Allows user to configure long-time pickup rating.	This value should be set to match that of the *ETC* under test.
FREQ	Configures output frequency.	Selections of 50 and 60 Hz are available.

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6. Testing

Functionality of *ETC* trip units is verified through two basic tests. These tests are *pickup tests* and *delay tests*. Pickup tests confirm that the *ETC* under test properly measures current and the device is prepared to trip the breaker at preset levels. Delay tests verify that the trip delay timing functions are operating within specification limits.

These basic tests are repeated on each phase for each protection band**.

**When testing protections bands other than ground fault, the ground fault band must be temporarily defeated as this band will trip at low current levels because the test set injects single phase current.

Refer to the particular trip units *Section II* and time-current curves for information on configuring the unit as well as test tolerances.

6.1 Pickup Tests

Pickup tests are performed as follows:

1. Configure test set to inject current into the desired phase.
2. Set the *Current Preset Selector* on the test set to either “Manual Low” or “Manual High”, as appropriate.
3. Press the “Start” button on the test set.
4. Using the *Manual Current Adjust* control, ramp up the test current. Confirm that the *ETC* being tested enters pickup within specification limits. For the long time protection band, this is usually determined by the *Pickup* LED on the *ETC* glowing red. Pickup on other protection bands is usually determined by the *ETC* tripping.

NOTE: When checking long-time pickup, it is expedient to set the *Current Preset Selector* to .95L then press “Start”. While the test set is running, the *Current Preset Selector* can then be moved to 1.05L. By confirming that the *ETC* is not in pickup at .95L and is in pickup at 1.05L, it can be ascertained that pickup is operating properly for the phase being tested.

6.2 Delay Tests

Delay tests are performed as follows:

1. Preset test current to a value that is solidly above the pickup point. Typically, delay tests are performed at least 130% of the pickup value. The test set can be preset either by moving the *Current Preset Selector* to an appropriate value or by moving it to a *Manual* position and using the *Manual Current Adjust* control to set the desired current.
2. Press “Start” on the test set. Confirm that the *ETC* being tested trips at a delay that is within specification limits.

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6.3 Current Transformer (CT) and Flux Resistance

When configured with the *ETC-12A* harness, the *PTS-2* test set can measure the resistance of the CTs and flux trip devices that are wired to the breaker harness. This feature is not available when testing through the *ETC-12Q* test port or when testing any variants of the *ETC* trip unit that have a front panel test port.

The resistance test is performed as follows:

1. From *PTS-2 Main Test Screen,* press the "TESTS" button. The screen shown in figure 8 will be displayed.
2. Press "SELECT".

```
AUTOMATIC TESTS
DC RESISTANCE OF
CT's AND FLUX
BACK      SELECT
```

FIGURE 8, RESISTANCE TEST SCREEN

NOTE: Throughout its production history, the *ETC* trip device included various CTs and flux devices. It is not possible to publish tolerance limits on all configurations. The DC resistance check performed by the *ETC PTS-2* is intended for reference purposes only. If a large discrepancy between the resistance of CTs on the same breaker is observed, primary injection or ratio testing is recommended before returning the breaker to service.

6.4 Testing Instantaneous on *ETC-11D*

The *ETC PTS-2* is not fully compatible with the *Satin American ETC-11D* which was discontinued in 2007. It is possible to modify the process to overcome the compatibility issue and effectively use the *ETC PTS-2* to field test the *ETC-11D.*

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The modified process is as follows:

1. Disable the instantaneous protection band when testing all other bands.
2. Perform pickup and delay tests for all other bands as usual.
3. Configure short-time pickup to match the “as-found” instantaneous pickup. If the as-found instantaneous pickup was above 10L, configure the short-time pickup to 10L.
4. Preform a short time pickup test with the unit configured as above. This will confirm that the *ETC-11D* accurately measures current at higher levels.
5. Reconfigure the *ETC-11D* to as found settings.
6. Perform instantaneous delay test and verify that the device trips in accordance to specifications.

6.5 Testing *ETC-12* with CT secondaries configured to other that .2A

The *ETC-12* can be configured to function with CTs having various secondary ratings. This is achieved by the device applying a scaling factor to the input current.

Because the *ETC-PTS-2* has a limited current output, its range may be insufficient to test the full spectrum of settings on *ETC-12* units configured for higher inputs.

It is recommended that such units be tested as follows:

1. Using the “SEC” key in the setup screen, configure the test set for 200mA operation.
2. Preform full secondary injection test.
3. To confirm that *ETC-12* being tested properly applies the scaling factor, use the *SEC* key in the test set setup menu to select the secondary rating of the CT on the breaker. The *ETC-12* will automatically configure itself to this value once it is connected to the test set.
4. Preform the abbreviated long-time pickup test detailed in the note in section 6.1, above. Confirm that the *ETC-12* being tested properly displays current.

NOTE: When switching the test set secondary as directed in step 1 and 3 the *ETC-12* must be completely powered down. The easiest way to accomplish this is to disconnect the cable that connects the *ETD* display to the *ETC-12* control module.

If the unit is switched with a powered display, it is possible for it to perform an incorrect self-calibration. This issue can be corrected by powering down then restarting the *ETC-12.*

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