



TESCO METERING

OPERATIONS MANUAL



FIELD METER TEST STATION

CATALOG NO. FTS-2990

FIELD METER TEST STATION OPERATIONS MANUAL FTS-2990



TESCO METERING

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LIMITED WARRANTY & LIMITATION OF LIABILITY

TESCO warrants to the original purchaser that it will correct all defects in material and/or workmanship in the instrument, test equipment or software covered by this warranty (herein called "**PRODUCT**"), provided that TESCO is notified of such defect within the warranty period (set forth below) in accordance with paragraph four of this warranty.

WARRANTY PERIOD. The warranty period shall begin on the date of shipment of the **PRODUCT** or the date of the issuance of this warranty certificate, whichever is later. If no warranty period is specified below and signed by an authorized **DISTRIBUTOR** of TESCO, the warranty period shall be one (1) year. In no event shall this warranty remain in effect for more than the stated warranty period plus two (2) months after the date of shipment. TESCO's sole obligation and the purchaser's sole remedy under this warranty is limited to repair or replacement, at TESCO's option, free of charge, F.O.B. TESCO's factory at Bristol, PA of any workmanship and/or part which in TESCO's sole judgment displays evidence of defect. On-site warranty repairs will be made when in TESCO's judgment the **PRODUCT** cannot practically be shipped to TESCO's factory. Any modifications, additions or upgrades made to the **PRODUCT** or control software after this warranty becomes effective shall not extend the term of this warranty.

COVERAGE. The warranty set forth above shall be applicable only if the **PRODUCT**:

1. Is used for the specific purpose for which it was intended;
2. Is operated in accordance with instructions, if any, supplied by TESCO;
3. Has not been modified, neglected, altered, tampered with, vandalized, abused or misused, or subjected to accident, fire, flood or other casualties;
4. Has not been repaired by unauthorized persons;
5. Has not had its serial number altered, defaced or removed;
6. Has not been connected, installed or adjusted other than in accordance with the instructions, if any, furnished by TESCO.

The warranty set forth herein DOES NOT APPLY to defects resulting from ordinary wear, tear and usage, or any cause, similar or dissimilar, not resulting solely from defective material and/or workmanship.

The warranty set forth herein shall NOT be effective unless:

1. Notice of defect is given to TESCO by phone, fax, email, or mail as soon as the defect is discovered.
2. Notice of defect contains the following information: PRODUCT serial number, PRODUCT model number, date of original installation, and an accurate and complete description of the defect including the exact circumstances leading to the defect.
3. The defective PRODUCT or part is returned only upon authorization from TESCO as evidenced by the issuing of a Return Merchandise Authorization (RMA) number, and that the transportation charges are prepaid (except that TESCO may, at its option, appoint a qualified DISTRIBUTOR to make field inspections of the PRODUCT for which purpose the purchaser shall permit such DISTRIBUTOR to enter upon its premises and examine the PRODUCT).
4. The Return Merchandise Authorization (RMA) number is written on the shipping label and all paperwork defective PRODUCT or part.
5. The defective PRODUCT or part is returned in the original packing or packing approved by TESCO

TESCO is not responsible for drayage charges, damages, or labor costs incurred in conjunction with failure, removal, or reinstallation of any PRODUCT, all of which shall be at the purchaser's expense. TESCO is not responsible for special, incidental, or consequential damages, whether resulting from breach of warranty, negligence, or any other reason.

TESCO manufactured parts will be available for a minimum period of at least two years after the manufacture of a PRODUCT has been discontinued.

TESCO will provide original purchaser during the warranty period, unlimited telephone consulting time for the purpose of PRODUCT trouble shooting/servicing and for the first thirty (30) days of the warranty period, unlimited telephone consulting time for the purpose of PRODUCT/software application.

THE WARRANTY CONTAINED HEREIN IS IN LIEU OF ALL OTHER WARRANTIES AND TESCO MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OR CONDITION, DESIGN, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER MATTER.

No other warranty, express or implied, is authorized by TESCO, and no DISTRIBUTOR of TESCO or any other person has any authority to amend, extend, modify, enlarge, or otherwise alter the foregoing warranty and disclaimers in any way whatsoever, except as provided for in an Extended Limited PRODUCT warranty agreement.

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1.1 Introduction

State-of-the-Art Meter Accuracy Testing in an Affordable Mobile Configuration!

Tired of waiting for access to a production test board? Need flexibility, state-of-the-art performance, and ease of use? If so, then TESCO's revolutionary 2990 Field Meter Test Station (FTS-2990) is the answer to your needs!

The 2990 revolutionizes meter testing by providing full series parallel meter testing in a small, budget-friendly mobile package.

A fully ANSI compliant test board, it offers complete testing of all meters under the widest range of test conditions. It can perform Manual Testing and Sequence Testing for meters with a wide array of forms. It has a database for storing and viewing of the test data.

The new waveform generator has all waveforms called out in ANSI C12.20-2015 (pub. 4/2017). All common electromechanical and solid-state meters up to 50 amps can be tested with the 2990 using the single voltage and three isolated current sources.

For more than 120 years customers have trusted TESCO for accuracy and reliability. When you think metering, think TESCO.

FTS-2990 will be referred to as "Instrument" all throughout the operational manual.

1.2 Contacting TESCO

For Technical Support or Calibration/Repair, please call 215.228.0500.

You can also send an email to support@tescometering.com with any questions.

To view, print, or download the latest manual supplement, visit tescometering.com.

1.3 General Safety Summary

This manual contains information and warnings that must be observed to ensure safe operation and keep the Instrument in a safe condition. Operation or service in conditions or in a manner other than specified could compromise safety. For the correct and safe use of this device, it is essential that both operating and service personnel follow accepted safety procedures in addition to the safety precautions specified.

In this manual, a **WARNING** identifies conditions and actions that pose hazard(s) to the user, while a **CAUTION** identifies conditions and actions that may damage the Instrument or the test equipment.

WARNING

To avoid electrical shock, personal injury, or fire hazard:

- The device must not be switched ON if it is damaged or suspected to be faulty.
- Do not operate the device in wet, condensing, or explosive gas conditions.
- If the equipment is used in a manner not specified in this manual, the protection provided by the Instrument may be impaired.
- Whenever it is likely that safety protection has been impaired, the device must be made inoperative and be secured against any unintended operation. Inform qualified maintenance or repair personnel.
- Safety protection is likely to be impaired if, for example, the Instrument displays visible damage or fails to operate normally.

1.4 Description of Safety-related Icons

ICONS	DESCRIPTION
	Risk of danger. Important information. See manual.
	Hazardous voltage. Risk of electrical shock.

1.5 Product Features

1.5.1 Key Features

- **Precise Measurement Accuracy for Voltage, Current & Power**
 - Simultaneous time and frequency domain measurements
- **Accurate Voltage and Current Setting**
- **Digital Waveform Generator**
 - Voltage Drive: 30-350V RMS, 490V PK (line to neutral)

- Current Drive: 0.01A to 50A RMS, 75A PK
 - Arbitrary harmonically defined waveforms
 - Automatic Generation of all ANSI C12.20-2015 waveforms
- **True ZERO insertion force socket with automatic closure on meter insertion**
- **Powerful, multi-core, 32-bit processors**
- **Phase Fully adjustable as phase or power factor**
- **Built in, one voltage, three current reference standards traceable back to NIST**
- **Demand, time-run, and timed registration test capabilities**
- **Dropped cycle testing on request**
- **Wide input voltage range**

1.5.2 Standard Features

- **GRAPHICAL USER INTERFACE (GUI)**
Displayed on a 7" 1024x600, full color TFT LCD screen.
- **ETHERNET CONNECTIVITY**
100 BaseT with support for: Web Services, Remote Control, Database Access. 7" RJ45 standard (blue) and crossover (red) cables are provided.
- **INTEGRATED CONTROL KEYPAD**
The keypad is embedded in the front panel.
- **METER FORMS SUPPORT** (*Please inquire for adding any other meter forms*)
1S-6S, 8S-17S, 25S, 26S, 29S, 35S, 36S, 45S, 46S, 56S, 66S, 76S
- **TESCO DEVICE MANAGER (TDM) INTEGRATION**
Computer control software package to enable full control of the board and test data storage via external PC.
- **OPTICAL PICKUP**
The Instrument comes with an optical pickup (1037-DTS).

1.5.3 Optional Accessories

- A-Base Test Board Adapter
- A power cable with 120VAC plug
- A power cable with dolphin clips
- 1180 K-Base Test Board Adapter
- Adapter for calibrating the unit
- Diamond Support with Calibration Service
- Stand-alone calibration of the unit

1.6 General Specifications

1.6.1 Input Characteristics

PARAMETERS	DATA
Power Supply	120-480+ - 10%
Supply Frequency	45-65Hz

1.6.2 Dimensions

PARAMETERS	DATA
Height	10.6" (26.90 cm)
Width	21.2" (53.80 cm)
Depth	16.00" (40.60 cm)
Weight	60 lbs (27.22 kg)

1.6.3 Measurements Accuracy

Valid for 50Hz/60Hz and Current of 0.2A to 50A.

PARAMETERS	DATA
Voltage Measurement Accuracy	±0.02%
Current Measurement Accuracy	±0.02%
Power Measurements Accuracy (Watts / VA / VAR)	±0.04%
Energy Measurements Accuracy (WHrs / VAHrs / VARHrs)	±0.04%

1.8 About this Operations Manual

This manual provides complete information for installing and operating the Instrument. This document instructs the user on the following operations of the FTS-2990:

- Installation
- Front Panel Features
- Graphical User Interface (GUI)
- How to set up the machine for remote operation using PC Application
- Instrument Maintenance

2.0 INSTALLATION

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2.1 Introduction

This chapter provides instructions for unpacking and installing the Instrument. Read this chapter before you operate the Instrument. Instructions for cable connections can be found in this section.

2.2 Unpacking and Inspection

The Instrument is shipped in a container designed to prevent damage during shipping.

Inspect the Instrument carefully for damage and immediately report any damage to the shipper. A packing list is included in the packaging. When you unpack the Instrument, check for all the standard equipment listed and check the shipping order for any additional items ordered. Report any shortage to the place of purchase to your distributor or directly to TESCO.

2.3 Set up, Airflow and Cooling Considerations

2.3.1 Setup and Placement

The Instrument is suitable for field use if there is enough space to allow proper ventilation. There are three fans on the top of the unit and one fan on the side. Ensure that these fans are unobstructed.

2.3.2 Airflow

Take note of the Instrument's airflow as seen in the illustrations below (Figure 2.3a and Figure 2.3b). Leave enough space for airflow for all sides with at least half a meter of clearance for effective air circulation.

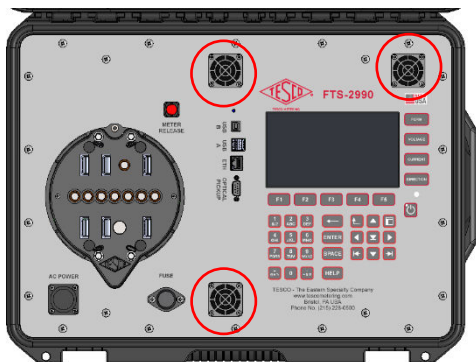


Figure 2.3a The three fans on the front panel interface



Figure 2.3b The fan on the side of the unit

CAUTION

Damage caused by overheating may occur if the area around the air intake is restricted, the air intake is too warm, is interfered, or the air filter becomes clogged.

The inlet and exhaust holes must be clear of obstruction. The air entering the instrument must be between 5 °C and 35 °C. Make sure that exhaust from another instrument is not directed into the fan inlet. Check and clean the air filter every 30 days or more. Refer to §5.3 for additional info.

2.4 Main Power Supply

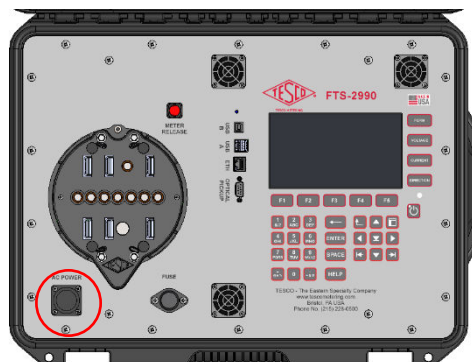
The instrument can be powered by connecting it to a 120 V single-phase AC outlet using the provided AC power cord with NEMA5-15 connector. The Power cable is comprised of Tesco Part No. 921-0209 (NEMA 5-15 adaptor) and 921-0188 (standard cable with Dolphin Test clips). Refer to [Section 5.2 Replacing the Fuse](#).

Match the 4mm banana jack connector colors of the power cable 921-0188 to the 921-0209 NEMA 5-15 AC adapter. Refer to [Section 5.2 Replacing the Fuse](#).

Insert the power cord into the “AC POWER” socket.

Lock the connector by twisting it counterclockwise until it clicks into place.

Ensure the cord is fully secured before plugging into the outlet and turning the instrument on.



2.5 Optional Bus Bar Connection

Power cable 921-0188 is supplied with Alligator style test clips that will be connected to buss bars directly.

Green cable: Must be connected to protective earth (directly bonded to the instrument chassis). Red and black cables: Polarity does not matter, provided the line-to-line voltage is between 120 V and 480 V.

WARNING

- **Voltage Range:** Only connect the instrument to an AC outlet within 120-480 V to prevent damage.
- **Grounding:** Make sure the Green wire is connected to protective earth when using the optional clips or ensure the NEMA5-15 adaptor is color matched to the cable.
- **Emergency Power Control:** Ensure the power outlet supplying the instrument is controlled by an emergency switch so power can be quickly disconnected in case of hazard.

2.6 Utility Meter Insertion/Extraction

The electric meter socket requires **zero insertion force** to mount a meter, as well as to dismount it, upon pressing the meter release button.



WARNING

The meter release button* is only operational when the Instrument is powered up. No meter can be dismounted when the Instrument is powered off.

*When the button lights up glowing red, it can be pressed to dismount a meter.

INSERTION: To load a meter into the socket, ensure the meter is oriented properly. Then insert the meter into socket, keeping the meter weight fully supported. The device will automatically clamp to the jaws of the meter. When the METER RELEASE indicator turns on, the meter is fully supported. Align optical pickup to meter prior to testing.

EXTRACTION: To remove the meter from the socket, ensure optical pickup is removed from the face of the meter. Support the meter shell then press the METER RELEASE button. Once the METER RELEASE indicator turns off, the meter is safe for removal from the socket.

NOTE: The socket cannot be powered unless a meter is installed, and if the release button is pressed, power to the socket will be shut off.

3.0 FTS-2990

FUNCTIONALITIES

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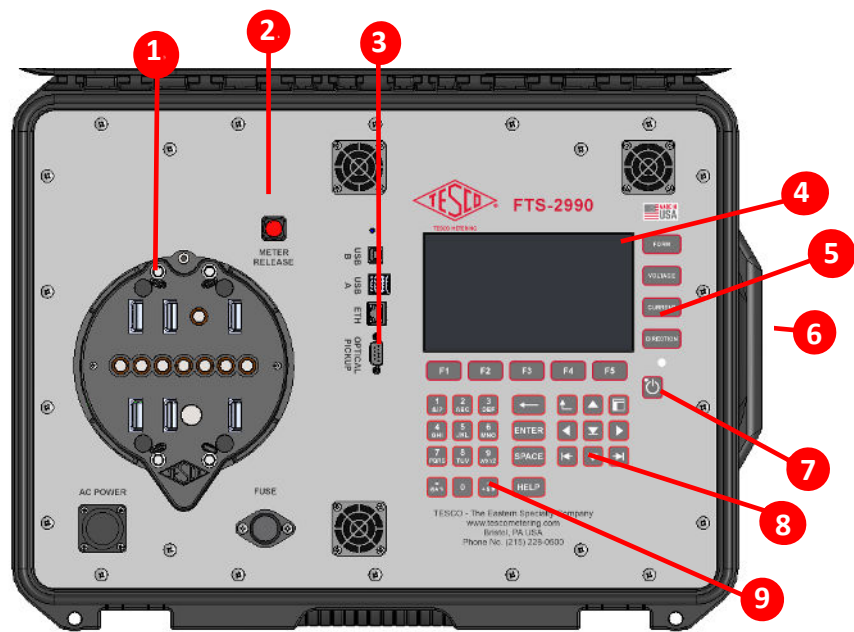
3.1 Introduction

This chapter is a reference for the functions and locations of the Instrument’s front panel features and provides brief descriptions of each feature for quick access. **Please read this information before operating the Instrument.** Front panel operating instructions for the Instrument are provided in this chapter and Remote Operating instructions are in [Chapter 4](#).

3.2 Front Panel Features

Front panel features (including all controls, displays, indicators, and terminals) are shown in Figure 3.2.1a. Each front panel feature is briefly described in Table 3.2.1.

3.2.1 Front Panel Sections



NUMBER	DESCRIPTION
1	Meter Socket
2	Meter release button
3	Optical Pickup port
4	LCD screen
5	Function Keys
6	Air Inlet
7	Power button
8	Navigation Buttons
9	Keypad

Table 3.2.1. FTS-2990 Front Panel Sections

Figure 3.2.1a FTS-2990 Front Panel View

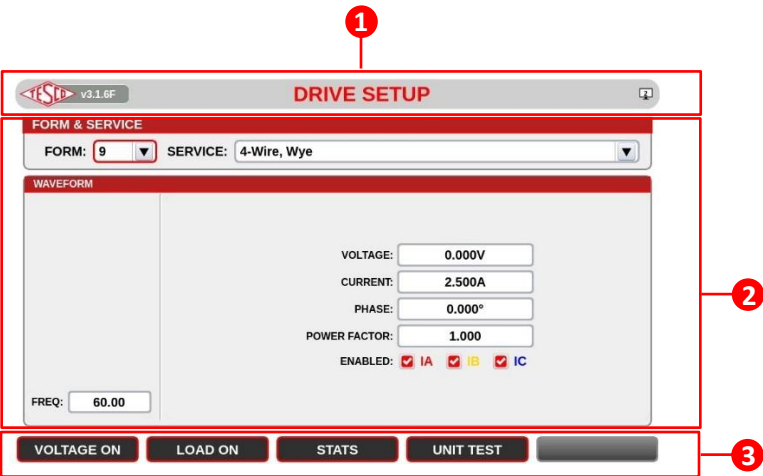
3.2.2 Navigation Keys

Symbol	Description
 or 	Functions any of the following: - Selects the NEXT or PREVIOUS MENU item. - Moves the SELECTED LINE UP or DOWN - Select an Item from a dropdown menu
 or 	Functions any of the following: - Moves the cursor left/right of the current character in text boxes. - Moves the selection left/right of the current selected cell in tables.
 or 	Selects the NEXT or PREVIOUS TAB item.
	Press to highlight the form entry list box. A form can be selected from the list by using the UP or DOWN ARROWS or directly entered using the numeric keypad.
	Press to highlight the voltage entry text box. Any voltage between 30.00 to 350.00 volts can be entered.
	Press to highlight the current entry text box. Any current between 0.1 and 50.00 amps can be entered.
	Press to highlight the phase entry box. When reverse is selected, it has the effect of adding 180 degrees to the current vector.
	Deletes the previous character
	Returns to the previous screen
   	Function Keys
	Power button
	Selects a response
	Inserts a space
	Goes to the HELP menu

3.3 The Graphical User Interface (GUI)

3.3.1 Graphical User Interface (GUI) Screens

The user interface is divided into four three sections. In the screen, any field that is grayed out cannot be changed or accessed by the user.



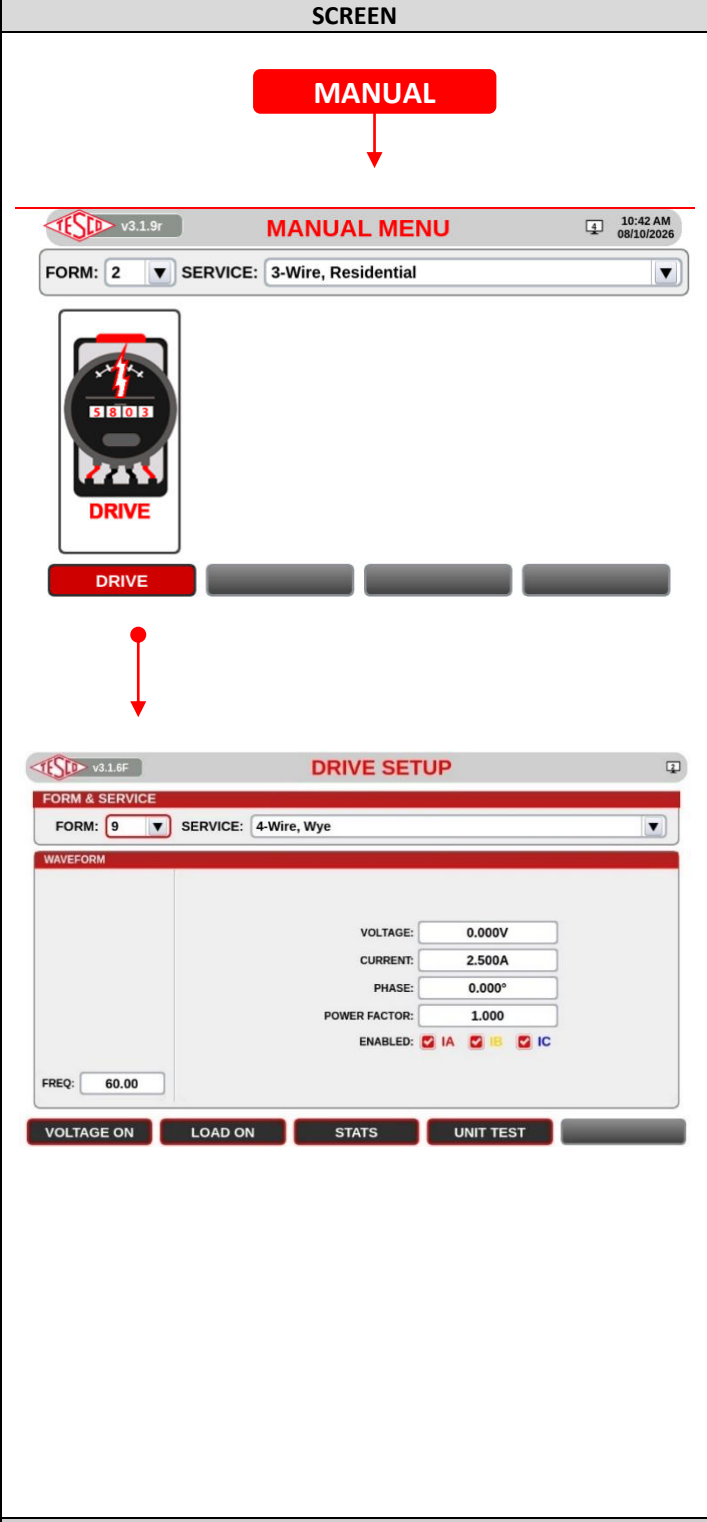
NUMBER	DESCRIPTION
1	Screen Title
2	Screen Data
3	Function Buttons

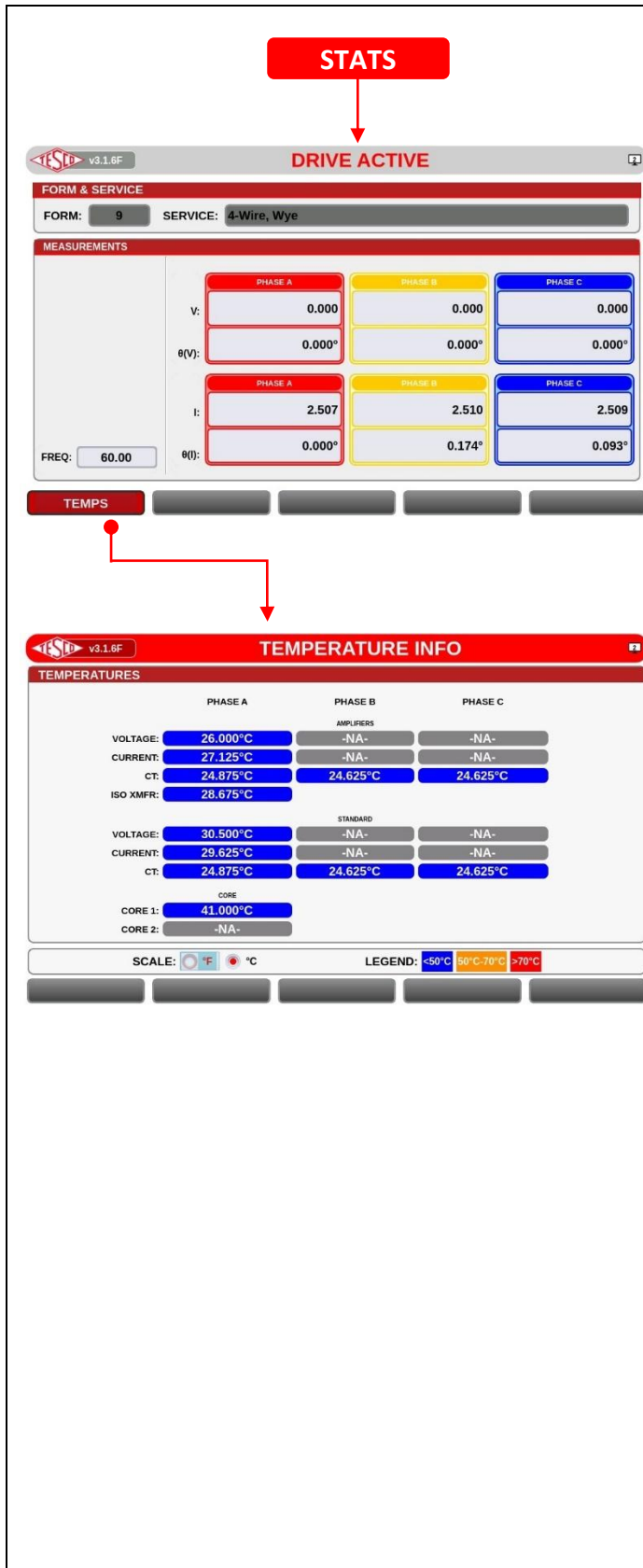
Table 3.3.1. FTS-2990
GUI Sections

3.3.2 MAIN MENU

SCREEN	DESCRIPTION						
A screenshot of the 'MAIN MENU' screen. At the top, it shows 'v3.1.9r' and '10:40 AM 08/10/2026'. Below is 'FORM: 2' and 'SERVICE: 3-Wire, Residential'. The main area has three large icons: 'MANUAL' (gear and wrench), 'SEQUENCE' (gear and circuit board), and 'SETTINGS' (gear and checklist). Below each icon is a button labeled 'MANUAL', 'SEQUENCE', and 'SETTINGS' respectively. Red arrows point from the icons to their respective buttons. At the bottom, there are three red buttons labeled 'MANUAL', 'SEQUENCE', and 'SETTINGS'.	3.3.2.1 MANUAL MENU The MAIN MENU screen consists of the following function buttons: MANUAL, SEQUENCE, & SETTINGS. Press the arrow keys to navigate through the main menu or directly press the function keys. KEYPAD & FUNCTION KEYS <table><tr><td>MANUAL</td><td>Press to perform MANUAL TEST</td></tr><tr><td>SEQUENCE</td><td>Press to perform SEQUENCE TEST</td></tr><tr><td>SETTINGS</td><td>Press to open the SETTINGS screen</td></tr></table> To return to the previous screen press at any time.	MANUAL	Press to perform MANUAL TEST	SEQUENCE	Press to perform SEQUENCE TEST	SETTINGS	Press to open the SETTINGS screen
MANUAL	Press to perform MANUAL TEST						
SEQUENCE	Press to perform SEQUENCE TEST						
SETTINGS	Press to open the SETTINGS screen						

3.3.3 MANUAL TEST

SCREEN	DESCRIPTION																								
	3.3.3.1 MANUAL MENU KEYPAD & FUNCTION KEYS <table border="1"> <tr> <td>DRIVE</td><td>Press to open the DRIVE SETUP screen</td></tr> </table> 3.3.3.2 DRIVE SETUP MENU DRIVE SETUP is for manual setup of the waveform generator. Once manual setup is configured to the desired test, run a single test by pressing the UNIT TEST button. KEYPAD & FUNCTION KEYS <table border="1"> <tr> <td>VOLTAGE ON</td><td>Press to enable service voltage only to the socket</td></tr> <tr> <td>LOAD ON</td><td>Press to enable service voltage & load current to the socket</td></tr> <tr> <td>STATS</td><td>Press to display live voltage and current data on DRIVE ACTIVE screen</td></tr> <tr> <td>UNIT TEST</td><td>Press to open to the UNIT TEST SETUP screen</td></tr> </table> DATA (DRIVE SETUP) <table border="1"> <tr> <td>FORM</td><td>Form number of the meter (auto-populates the default Kh in the Kh field)</td></tr> <tr> <td>SERVICE</td><td>Services available for selected meter form</td></tr> <tr> <td>FREQ.</td><td>Frequency (Hz) of generated waveform</td></tr> <tr> <td>VOLTAGE</td><td>Voltage generated by Instrument</td></tr> <tr> <td>CURRENT</td><td>Current generated by Instrument</td></tr> <tr> <td>PHASE</td><td>Current phase angle with respect to A phase voltage</td></tr> <tr> <td>POWER FACTOR</td><td>The cosine of the phase angle that lies between the voltage and current waveforms</td></tr> </table> WARNING: If either VOLTAGE ON or LOAD ON is enabled, the Screen Title will blink in red. This indicates there is potential and $I_{or}f$ current present at the meter terminals. 	DRIVE	Press to open the DRIVE SETUP screen	VOLTAGE ON	Press to enable service voltage only to the socket	LOAD ON	Press to enable service voltage & load current to the socket	STATS	Press to display live voltage and current data on DRIVE ACTIVE screen	UNIT TEST	Press to open to the UNIT TEST SETUP screen	FORM	Form number of the meter (auto-populates the default Kh in the Kh field)	SERVICE	Services available for selected meter form	FREQ.	Frequency (Hz) of generated waveform	VOLTAGE	Voltage generated by Instrument	CURRENT	Current generated by Instrument	PHASE	Current phase angle with respect to A phase voltage	POWER FACTOR	The cosine of the phase angle that lies between the voltage and current waveforms
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PHASE	Current phase angle with respect to A phase voltage																								
POWER FACTOR	The cosine of the phase angle that lies between the voltage and current waveforms																								
SCREEN	DESCRIPTION																								



3.3.3.3 DRIVE ACTIVE

This screen displays the operational statistics of the test being conducted.

KEYPAD & FUNCTION KEYS

TEMPS	Press to open the TEMPERATURES screen
--------------	---------------------------------------

DATA

FORM	Voltage measured by the Instrument
SERVICE	Services available for the selected meter form
FREQ.	Frequency (Hz) of the generated waveform
VOLTAGE	Voltage measured by Instrument
VOLTAGE PHASE θ(V)	Voltage phase angle with respect to the reference frame
CURRENT	Current measured by the Instrument
CURRENT PHASE θ(I)	Current phase angle with respect to A phase voltage

3.3.3.4 TEMPERATURE DURING TEST

This screen displays temperatures of internal circuit boards.

DATA (TEMPERATURE INFO)

PHASE A	Displays data for PHASE A
PHASE B	Displays data for PHASE B
PHASE C	Displays data for PHASE C
AMPLIFIERS	Displays the information for Amplifiers
STANDARD	Displays the information for Standard
CORE	Displays the information for the core
VOLTAGE	Displays the voltage temperature
CURRENT	Displays the current temperature
CT	Displays the CT temperature
ISO XMFR	Displays the Isolation Transformer temperature
CORE 1	Displays the temperature of core 1
CORE 2	Displays the temperature of core 2
SCALE	Select to display the temperature in °F or °C

3.3.4 UNIT (SINGLE) TEST

SCREEN	DESCRIPTION																																																		
UNIT TEST METER INFO METER INFORMATION SERIAL #: TESCO FORM: 9 BASE: S UTILITY S/N: TESCO KH: 1.800 KT: 1.800 COMM S/N: TESCO TA: 2.50 CLASS: 20 MFG: Sample Meter MULT: 0.00 VOLTAGE: 120 MODEL: ACCURACY CLASS: 1.0 CATALOG #: FUNC. CODE: ☐ BIDIRECTION ☐ KYZ ☐ DEMAND ☐ VECTORIAL ARITHMATIC CANCEL NEXT UNIT TEST SETUP TEST INFO TEST TYPE ☒ ACCURACY ☐ TIMED RUN ☐ TIMED REG ☐ ENERGY ☐ DEMAND ALL PARAMETERS APPLY TO TEST TYPE SELECTED PULSES: 1 NO. OF PULSES TOLERANCE: 0.50% PASS OR FAIL CRITERIA MEASURE TYPE: WH TARGET ENERGY TYPE ITERATIONS: 1 NO. OF TEST REPETITIONS WARM-UP TIME: 00:00:00 (hh:mm:ss) VOLTAGE ON PULSE ALIGN START VOLTAGE ON PULSE ALIGN START	3.3.4.1 METER INFORMATION This screen allows the user to enter new meter information. NOTE: Data entry is available only when the meter is inserted in socket. KEYPAD & FUNCTION KEYS <table> <tr> <td>CANCEL</td><td>Returns to the previous screen</td></tr> <tr> <td>NEXT</td><td>Saves changes and proceeds to UNIT TEST SETUP TEST INFO screen</td></tr> </table> DATA (METER INFO) <table> <tr> <td>SERIAL #</td><td>Serial number of the meter</td></tr> <tr> <td>UTILITY S/N</td><td>Serial number provided by Utility (if applicable)</td></tr> <tr> <td>COMM S/N</td><td>Serial number of communication device (if applicable)</td></tr> <tr> <td>MFG.</td><td>Manufacturer's name</td></tr> <tr> <td>MODEL</td><td>Model number of the meter</td></tr> <tr> <td>CATALOG</td><td>Catalog # of the meter</td></tr> <tr> <td>FORM</td><td>Form number of the meter (auto-populates the default Kh in the Kh field)</td></tr> <tr> <td>BASE</td><td>Meter base (S, K, A, etc...)</td></tr> <tr> <td>KH</td><td>Watt hours per revolution of disk</td></tr> <tr> <td>KT</td><td>Watt hours per pulse</td></tr> <tr> <td>TA</td><td>Test Amps (RMS of a full load test)</td></tr> <tr> <td>CLASS</td><td>Meter class (determines maximum current and auto-populates the default test amps in TA field)</td></tr> <tr> <td>MULT</td><td>Multiplier</td></tr> <tr> <td>VOLTAGE</td><td>Displays the voltage</td></tr> <tr> <td>ACCURACY CLASS</td><td>Accuracy of the meter</td></tr> <tr> <td>FUNC. CODE</td><td>Functional code specified by the user</td></tr> <tr> <td>BIDIRECTIONAL</td><td>Select if meter has bidirectionality functionality</td></tr> <tr> <td>KYZ</td><td>Select if meter has KYZ functionality</td></tr> <tr> <td>DEMAND</td><td>Select if meter has demand functionality</td></tr> <tr> <td>VECTORIAL ARITHMATIC</td><td>Calculation of the vector</td></tr> </table> 3.3.4.2 UNIT TEST SETUP This enables the configuration of the desired single test to be conducted. KEYPAD & FUNCTION KEYS <table> <tr> <td>VOLTAGE ON</td><td>Press to enable service voltage to the socket</td></tr> <tr> <td>PULSE ALIGN</td><td>Press to align optical pickup. Refer to §3.4 for additional information on this feature</td></tr> <tr> <td>START</td><td>Press to start UNIT TEST</td></tr> </table>	CANCEL	Returns to the previous screen	NEXT	Saves changes and proceeds to UNIT TEST SETUP TEST INFO screen	SERIAL #	Serial number of the meter	UTILITY S/N	Serial number provided by Utility (if applicable)	COMM S/N	Serial number of communication device (if applicable)	MFG.	Manufacturer's name	MODEL	Model number of the meter	CATALOG	Catalog # of the meter	FORM	Form number of the meter (auto-populates the default Kh in the Kh field)	BASE	Meter base (S, K, A, etc...)	KH	Watt hours per revolution of disk	KT	Watt hours per pulse	TA	Test Amps (RMS of a full load test)	CLASS	Meter class (determines maximum current and auto-populates the default test amps in TA field)	MULT	Multiplier	VOLTAGE	Displays the voltage	ACCURACY CLASS	Accuracy of the meter	FUNC. CODE	Functional code specified by the user	BIDIRECTIONAL	Select if meter has bidirectionality functionality	KYZ	Select if meter has KYZ functionality	DEMAND	Select if meter has demand functionality	VECTORIAL ARITHMATIC	Calculation of the vector	VOLTAGE ON	Press to enable service voltage to the socket	PULSE ALIGN	Press to align optical pickup. Refer to §3.4 for additional information on this feature	START	Press to start UNIT TEST
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TEST STARTED

UNIT TEST SETUP v3.1.6F

TEST INFO

TEST TYPE

☒ ACCURACY ☐ TIMED RUN ☐ TIMED REG ☐ ENERGY ☐ DEMAND

ALL PARAMETERS APPLY TO TEST TYPE SELECTED

PULSES: 1
NO. OF PULSES

TOLERANCE: 0.50%
PASS OR FAIL CRITERIA

MEASURE TYPE: WH
TARGET ENERGY TYPE

ITERATIONS: 1
NO. OF TEST REPETITIONS

WARM-UP TIME: 00:00:00
(hh:mm:ss)

VOLTAGE ON PULSE ALIGN START

DATA (UNIT TEST SETUP)

TEST TYPE	ACCURACY	Performs accuracy test
	TIMED RUN	Performs test with a predefined duration
	TIME REG	Prompts the user for the meter's measured register, runs a test for a predefined duration. Then prompts the user for the meter register again and uses that as meter's measured power
	ENERGY	Energy delivery test
	DEMAND	Runs a demand test
PULSES		Number of pulses
TOLERANCE		Tolerance needed for pass/fail criteria
MEASURE TYPE		Target energy type
ITERATIONS		Number of times the test will be repeated
WARM-UP TIME		Period of time for meter to stabilize prior to test execution

WARNING: If either VOLTAGE ON or LOAD ON is enabled, the Screen Title will blink in red. This indicates there is potential and/or current present at the meter terminals.

METER TEST RESULT v3.1.6F

START

METER TEST RESULT

TEST PARAMETERS
TAG: ADV ACC ITERATION: 1 TEST STATUS: Stabilizing...
PULSES: 1 PRESET CURRENT REMAINING 0 1 WHrs: 0.000

MEASUREMENTS

	PHASE A	PHASE B	PHASE C
V:	119.997	119.997	119.997
θ(V):	0.000°	0.000°	0.000°
I:	2.347	2.350	2.348
θ(I):	359.691°	359.858°	359.776°

FREQ: 60.00

STATUS CANCEL

SEQUENCE STATUS

TEST RESULTS

INDEX	TAG	STATUS	%ERR
1-1	ADV ACC	RUNNING	

CANCEL

TEST FINISHED

METER TEST RESULT

TEST PARAMETERS
TAG: ADV ACC ITERATION: 1 TEST STATUS: Test Finished
PULSES: 1 pulse %ERR: -0.129% ACCUMULATED: 1.802 Wh PASS

MEASUREMENTS

	PHASE A	PHASE B	PHASE C
V:	119.987	119.987	119.987
θ(V):	0.000°	0.000°	0.000°
I:	2.503	2.506	2.504
θ(I):	0.001°	0.116°	0.029°

FREQ: 60.00

CONTINUE

SEQUENCE SUMMARY

TEST RESULTS

INDEX	LOAD	TEST	PASS/FAIL	%ERR	PARAM
1-1	ADV	ACC	PASS	-0.149%	1 pulse
	AF	AL			
FL	-0.149%	-0.149%			
LL					
PF					

REDO REVIEW DONE

3.3.4.3 UNIT TESTING

This screen shows the user the on-going tests and the results.

NOTE: Data entry is available only when meter is inserted in socket.
TEST IN PROGRESS – test results are live actual measured values.
TEST FINISHED – test results are averaged measured values.

KEYPAD & FUNCTION KEYS

STATUS	Proceeds to test SEQUENCE STATUS
CANCEL	Cancels the TESTING PROCESS
CONTINUE	Continues a completed test
DONE	Closes the test results and returns to UNIT TEST SETUP screen

DATA (SEQUENCE STATUS)

INDEX	Test index (first digit) and iteration index (second digit)
TAG	Alias or brief description of the test
STATUS	Status of the test
%ERR	Percentage error

DATA (METER TEST RESULT)

TAG	Alias or brief description of the test
ITERATION	Current repeat of test number
TEST STATUS	The current status of the test
PRESET	Pulse required
CURRENT	Pulse count
REMAINING	Pulse remaining
WHrs	Measured real energy
PULSES	Number of pulses
%ERR	Percentage error
ACCUMULATED	Accumulated Wh
FREQ.	Frequency (Hz) of generated waveform
VOLTAGE	Voltage measured by Instrument
VOLTAGE PHASE θ(V)	Voltage phase angle with respect to reference frame
CURRENT	Current measured by Instrument
CURRENT PHASE θ(I)	Current phase angle with respect to A phase voltage

DATA (SEQUENCE SUMMARY)

INDEX	Test index (first digit) and iteration index (second digit)
LOAD	Load test type (FL/LL/ADV, etc.)
TEST	Meter test type
PASS / FAIL	Shows if the test passed or failed
%ERR	Percentage error
PARAM	Parameters specified depending on test type

WARNING: If either VOLTAGE ON or LOAD ON is enabled, the Screen Title will blink in red. This indicates there is potential and/or current present at the meter terminals.



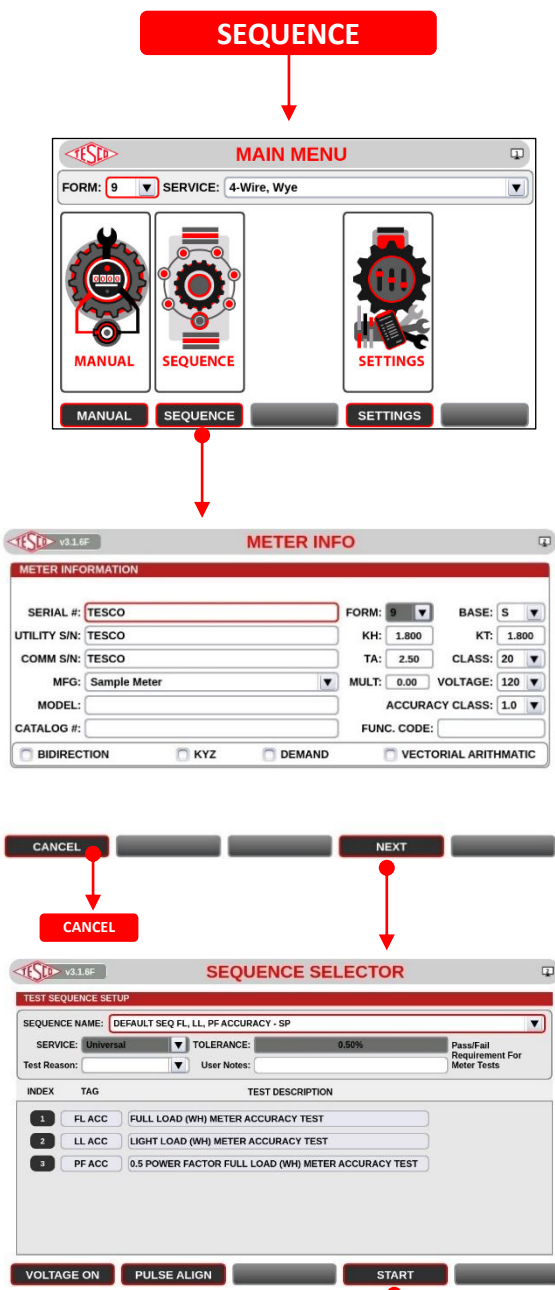
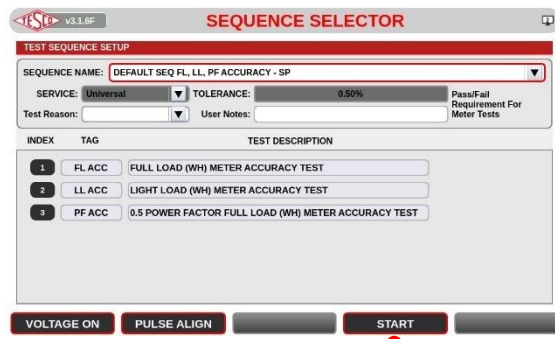
3.3.4.4 CANCEL TEST

This pop-up will appear if the cancel button is pressed during a test or sequence. Navigate the popup using the arrow keys and the “ENTER” key to select an option.

KEYPAD & FUNCTION KEYS

SKIP TEST	Skips the TEST being performed
CANCEL SEQUENCE	Cancels the SEQUENCE Test
CLOSE POPUP	Closes the POP-UP

3.3.5 SEQUENCE TESTING

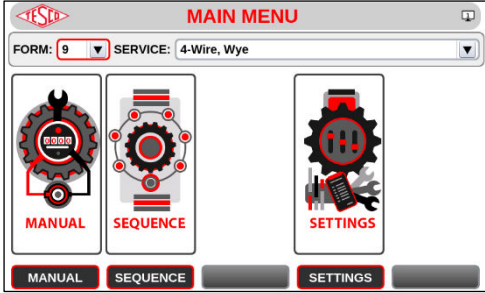
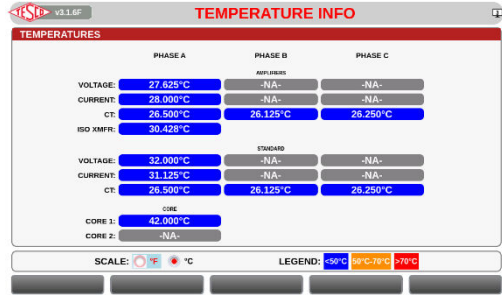
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SEQUENCE  SEQUENCE SELECTOR  Show on following page with the title "SEQUENCE TEST"	3.3.5.1 SEQUENCE SELECTOR METER INFORMATION This screen allows the user to enter new meter information. NOTE: Data entry is available only when meter is inserted in socket. KEYPAD & FUNCTION KEYS <table border="1"> <tr> <td>CANCEL</td><td>Cancels the TESTING PROCESS</td></tr> <tr> <td>NEXT</td><td>Saves the Meter Information and continues to the Sequence Selector Test</td></tr> </table> DATA (METER INFO) <table border="1"> <tr> <td>SERIAL #</td><td>Serial number of the meter</td></tr> <tr> <td>UTILITY S/N</td><td>Serial number provided by Utility (if applicable)</td></tr> <tr> <td>COMM S/N</td><td>Serial number of the communication device (if applicable)</td></tr> <tr> <td>MFG.</td><td>Manufacturer's name</td></tr> <tr> <td>MODEL</td><td>Model number of the meter</td></tr> <tr> <td>CATALOG</td><td>Catalog # of the meter</td></tr> <tr> <td>FORM</td><td>Form number of the meter (auto-populates the default Kh in the Kh field)</td></tr> <tr> <td>BASE</td><td>Meter base (S, K, A, etc...)</td></tr> <tr> <td>KH</td><td>Watt hours per revolution of disk</td></tr> <tr> <td>KT</td><td>Watt hours per pulse</td></tr> <tr> <td>TA</td><td>Test Amps (RMS of a full load test)</td></tr> <tr> <td>CLASS</td><td>Meter class (determines max current and auto-populates the default test amps in TA field)</td></tr> <tr> <td>VOLTAGE</td><td>Displays the voltage</td></tr> <tr> <td>MULT</td><td>Multiplier</td></tr> <tr> <td>ACCURACY CLASS</td><td>Accuracy of the meter</td></tr> <tr> <td>FUNC. CODE</td><td>Functional code specified by the user</td></tr> <tr> <td>BIDIRECTIONAL</td><td>Select if meter has bidirectionality functionality</td></tr> <tr> <td>KYZ</td><td>Select if meter has KYZ functionality</td></tr> <tr> <td>DEMAND</td><td>Select if meter has demand functionality</td></tr> <tr> <td>VECTORIAL ARITHMATIC</td><td>Calculation of the vector</td></tr> </table> NOTE: Test results will not be saved if the Meter Serial Number is left blank. KEYPAD & FUNCTION KEYS <table border="1"> <tr> <td>VOLTAGE ON</td><td>Press to enable service voltage to the socket</td></tr> <tr> <td>PULSE ALIGN</td><td>Press to enter pulse alignment mode and show the number of pulses from the meter</td></tr> <tr> <td>START</td><td>Starts the sequence test</td></tr> </table> DATA (SEQUENCE SELECTOR) <table border="1"> <tr> <td>SEQUENCE NAME</td><td>Sequences available for selected meter form</td></tr> <tr> <td>SERVICE</td><td>Services available for selected meter form</td></tr> <tr> <td>TOLERANCE</td><td>Pass/Fail tolerance requirements for Meter Tests</td></tr> <tr> <td>Test Reason</td><td>Reason for generating the test</td></tr> <tr> <td>User Notes</td><td>User generated notes for the test</td></tr> <tr> <td>TAG</td><td>Alias or brief description of the test</td></tr> <tr> <td>TEST DESCRIPTION</td><td>Description of the TESTS performed</td></tr> </table>	CANCEL	Cancels the TESTING PROCESS	NEXT	Saves the Meter Information and continues to the Sequence Selector Test	SERIAL #	Serial number of the meter	UTILITY S/N	Serial number provided by Utility (if applicable)	COMM S/N	Serial number of the communication device (if applicable)	MFG.	Manufacturer's name	MODEL	Model number of the meter	CATALOG	Catalog # of the meter	FORM	Form number of the meter (auto-populates the default Kh in the Kh field)	BASE	Meter base (S, K, A, etc...)	KH	Watt hours per revolution of disk	KT	Watt hours per pulse	TA	Test Amps (RMS of a full load test)	CLASS	Meter class (determines max current and auto-populates the default test amps in TA field)	VOLTAGE	Displays the voltage	MULT	Multiplier	ACCURACY CLASS	Accuracy of the meter	FUNC. CODE	Functional code specified by the user	BIDIRECTIONAL	Select if meter has bidirectionality functionality	KYZ	Select if meter has KYZ functionality	DEMAND	Select if meter has demand functionality	VECTORIAL ARITHMATIC	Calculation of the vector	VOLTAGE ON	Press to enable service voltage to the socket	PULSE ALIGN	Press to enter pulse alignment mode and show the number of pulses from the meter	START	Starts the sequence test	SEQUENCE NAME	Sequences available for selected meter form	SERVICE	Services available for selected meter form	TOLERANCE	Pass/Fail tolerance requirements for Meter Tests	Test Reason	Reason for generating the test	User Notes	User generated notes for the test	TAG	Alias or brief description of the test	TEST DESCRIPTION	Description of the TESTS performed
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FL	-0.031%	-0.031%																																																																																																																													
LL	-0.025%	-0.025%																																																																																																																													
PF	-0.002%	-0.002%																																																																																																																													
STATUS	Proceeds to test SEQUENCE STATUS																																																																																																																														
CANCEL	Cancels the TESTING PROCESS																																																																																																																														
CONTINUE	Continues a completed test																																																																																																																														
DONE	Closes the test results and returns to UNIT TEST SETUP screen																																																																																																																														
REDO	Repeats a test																																																																																																																														
REVIEW	Reviews the test results																																																																																																																														
INDEX	Test index (first digit) and iteration index (second digit)																																																																																																																														
TAG	Alias or brief description of the test																																																																																																																														
STATUS	Status of the test																																																																																																																														
%ERR	Percentage error formula																																																																																																																														
TAG	Alias or brief description of the test																																																																																																																														
ITERATION	Current repeat of test number																																																																																																																														
TEST STATUS	The current status of the test																																																																																																																														
PRESET	Pulse required																																																																																																																														
CURRENT	Pulse count																																																																																																																														
REMAINING	Pulse remaining																																																																																																																														
WHrs	Measured real energy																																																																																																																														
FREQ.	Frequency (Hz) of generated waveform																																																																																																																														
VOLTAGE	Voltage measured by Instrument																																																																																																																														
VOLTAGE PHASE θ(V)	Voltage phase angle with respect to reference frame																																																																																																																														
CURRENT	Current measured by Instrument																																																																																																																														
CURRENT PHASE θ(I)	Current phase angle with respect to A phase voltage																																																																																																																														
INDEX	Test index (first digit) and iteration index (second digit)																																																																																																																														
LOAD	Load test type (FL/LL/ADV, etc.)																																																																																																																														
TEST	Meter test type																																																																																																																														
PASS / FAIL	Shows if the test passed or failed																																																																																																																														
%ERR	Percentage error formula																																																																																																																														
PARAM	Parameters specified depending on test type																																																																																																																														

3.3.6 DATE, TIME, AND NETWORK

SCREEN	DESCRIPTION																						
	3.3.6.1 SETUP MENU Navigate the SETTINGS menu with the function keys. KEYPAD & FUNCTION KEYS <table> <tr> <td>SETTINGS</td><td>Proceeds to the SETTINGS Menu</td></tr> <tr> <td>PREFS</td><td>Proceeds to the GENERAL OPTIONS Menu</td></tr> </table> 3.3.6.2 GENERAL OPTIONS Navigate the GENERAL OPTIONS menu with the keypad. KEYPAD & FUNCTION KEYS <table> <tr> <td>NETWORK</td><td>Proceeds to the NETWORK Menu</td></tr> </table> DATA (GENERAL OPTIONS) <table> <tr> <td>TIMEZONE</td><td>Select for user specified IP address</td></tr> <tr> <td>TIME</td><td>Displays the time</td></tr> <tr> <td>DATE</td><td>Displays the date in MM/DD/YYYY format</td></tr> <tr> <td>LANGUAGE</td><td>Use this to change the language displayed</td></tr> </table> 3.3.6.3 NETWORK SETUP Display and edit required network settings. KEYPAD & FUNCTION KEYS <table> <tr> <td>APPLY</td><td>Applies network settings</td></tr> <tr> <td>CLOSE</td><td>Closes the dialog box and returns to the DATE and TIME</td></tr> </table> DATA (NETWORK SETUP) <table> <tr> <td>DHCP</td><td>Select for network assigned IP address</td></tr> <tr> <td>STATIC IP</td><td>Select for user specified IP address</td></tr> </table>	SETTINGS	Proceeds to the SETTINGS Menu	PREFS	Proceeds to the GENERAL OPTIONS Menu	NETWORK	Proceeds to the NETWORK Menu	TIMEZONE	Select for user specified IP address	TIME	Displays the time	DATE	Displays the date in MM/DD/YYYY format	LANGUAGE	Use this to change the language displayed	APPLY	Applies network settings	CLOSE	Closes the dialog box and returns to the DATE and TIME	DHCP	Select for network assigned IP address	STATIC IP	Select for user specified IP address
SETTINGS	Proceeds to the SETTINGS Menu																						
PREFS	Proceeds to the GENERAL OPTIONS Menu																						
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DATE	Displays the date in MM/DD/YYYY format																						
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APPLY	Applies network settings																						
CLOSE	Closes the dialog box and returns to the DATE and TIME																						
DHCP	Select for network assigned IP address																						
STATIC IP	Select for user specified IP address																						

3.3.7 TEMPERATURE, CONFIGURATION, AND CALIBRATION

SCREEN	DESCRIPTION																																				
SETUP  SETTINGS MENU  SYSTEM MENU  TEMPERATURE INFO 	3.3.7.1 SETUP MENU Navigate the SETTINGS menu with the function keys. KEYPAD & FUNCTION KEYS <table> <tr> <td>SETTINGS</td><td>Proceeds to the SETTINGS Menu</td></tr> <tr> <td>SYSTEM</td><td>Proceeds to the SYSTEM Menu</td></tr> <tr> <td>TEMPS</td><td>Proceeds to the TEMPS Menu</td></tr> <tr> <td>CONFIG</td><td>Proceeds to the CONFIG Menu</td></tr> <tr> <td>CAL</td><td>Proceeds to the CAL Menu</td></tr> </table> 3.3.7.2 TEMPERATURE INFO MENU DATA (TEMPERATURE INFO) <table> <tr> <td>PHASE A</td><td>Displays data for PHASE A</td></tr> <tr> <td>PHASE B</td><td>Displays data for PHASE B</td></tr> <tr> <td>PHASE C</td><td>Displays data for PHASE C</td></tr> <tr> <td>AMPLIFIERS</td><td>Displays the information for Amplifiers</td></tr> <tr> <td>STANDARD</td><td>Displays the information for Standard</td></tr> <tr> <td>CORE</td><td>Displays the information for the core</td></tr> <tr> <td>VOLTAGE</td><td>Displays the voltage temperature</td></tr> <tr> <td>CURRENT</td><td>Displays the current temperature</td></tr> <tr> <td>CT</td><td>Displays the CT temperature</td></tr> <tr> <td>ISO XMFR</td><td>Displays the Isolation Transformer temperature</td></tr> <tr> <td>CORE 1</td><td>Displays the temperature of core 1</td></tr> <tr> <td>CORE 2</td><td>Displays the temperature of core 2</td></tr> <tr> <td>SCALE</td><td>Select to display the temperature in °F or °C</td></tr> </table>	SETTINGS	Proceeds to the SETTINGS Menu	SYSTEM	Proceeds to the SYSTEM Menu	TEMPS	Proceeds to the TEMPS Menu	CONFIG	Proceeds to the CONFIG Menu	CAL	Proceeds to the CAL Menu	PHASE A	Displays data for PHASE A	PHASE B	Displays data for PHASE B	PHASE C	Displays data for PHASE C	AMPLIFIERS	Displays the information for Amplifiers	STANDARD	Displays the information for Standard	CORE	Displays the information for the core	VOLTAGE	Displays the voltage temperature	CURRENT	Displays the current temperature	CT	Displays the CT temperature	ISO XMFR	Displays the Isolation Transformer temperature	CORE 1	Displays the temperature of core 1	CORE 2	Displays the temperature of core 2	SCALE	Select to display the temperature in °F or °C
SETTINGS	Proceeds to the SETTINGS Menu																																				
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CORE 2	Displays the temperature of core 2																																				
SCALE	Select to display the temperature in °F or °C																																				

CONFIGURATION INFO

SYS/MOD INFO | MAIN BOARD | MC DEVICES | OTHERS

SYSTEM | MODULE

MODEL: FTS-2990 | FTS-2990

SERIAL #: 00003 | 00005

HW REV: 1 | 1

PREV | NEXT

CONFIGURATION INFO

SYS/MOD INFO | **MAIN BOARD** | MC DEVICES | OTHERS

SW REV: 3.1.6F

BOARD: F1300

PART #: 912-0546-0000-0D04

SERIAL #: 62525-01-0005

FPGA VERSION: 2.0.0F

LINUX VERSION: 4.9.144-rt94_TescoV2

PREV | NEXT

CONFIGURATION INFO

SYS/MOD INFO | MAIN BOARD | **MC DEVICES** | OTHERS

SOCKET 1:

FTS-00003 | VRM-MA_1.0.32r

912-0030-0002-0A01 | 73968-01-0016

PREV | NEXT

CONFIGURATION INFO

SYS/MOD INFO | MAIN BOARD | MC DEVICES | **OTHERS**

DB SCHEMA: 4.1.9r

THERMAL CUTOFF: 70.00°C

THERMAL RESTORE: 50.00°C

ETHERNET MAC ADDRESS: 00:14:2D:E0:A6:39

PREV | NEXT

3.3.7.3 CONFIGURATION INFO MENU

Navigate the SETTINGS menu with the function keys.

KEYPAD & FUNCTION KEYS

CONFIG	Proceeds to the CONFIG Menu
PREV	Goes back to the SYSTEM Menu
NEXT	Proceeds to the configuration info screens

DATA (SYS/MOD INFO)

SYSTEM	Displays information for the system
MODULE	Displays information for the module
MODEL	Displays the model name
SERIAL #	Displays the serial number
HW REV	Displays the hardware revision

DATA (MAIN BOARD)

SW REV	Displays the software revision
BOARD	Displays the board model
PART #	Displays the board part identifier
SERIAL #	Displays the serial number
FPGA VERSION	Displays the version of the FPGA
LINUX VERSION	Displays the version of the Linux distribution

DATA (MC DEVICES BOARD)

SOCKET 1	Displays information for the components of the socket
-----------------	---

DATA (OTHERS)

DB SCHEMA	Displays the schema of the database
THERMAL CUTOFF	Displays the thermal cutoff temperature in °C
THERMAL RESTORE	Displays the thermal restoration temperature in °C
ETHERNET MAC ADDRESS	Displays the Ethernet Mac Address

TESCOM v3.1.6F

CALIBRATION INFO

METROLOGY

DATE CALIBRATED:

10/18/2024

CALIBRATION DUE DATE:

10/18/2025

MODEL:

FTS-2990

SERIAL NUMBER:

00005

RESET DATE

3.3.7.4 CONFIGURATION INFO MENU

Navigate the SETTINGS menu with the function keys.

KEYPAD & FUNCTION KEYS

CAL	Proceeds to the CONFIG Menu
RESET DATE	Resets the calibration date

DATA (METROLOGY)

DATE CALIBRATED	Displays the date the unit was calibrated
CALIBRATION DUE DATE	Displays the due date for the next calibration
MODEL	Displays the model name of the unit
SERIAL NUMBER	Displays the serial number of the unit

3.4 Optical Pickup Alignment

Plug the optical pickup into the OPTICAL PICKUP port. Mount the meter into the socket and attach magnetic optical pickup to optical port of meter. For meter insertion and extraction, refer to section **§2.5 Utility Meter Insertion/Extraction**.

To remove the optical pickup, hold it by the body and gently pull away from the meter. There is an indicator light showing that the pickup has power. If alignment is difficult to achieve, the PULSE ALIGN feature is available to assist with alignment.

4.0 REMOTE OPERATIONS

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4.2 Installation..... 28

4.3 Network Configuration..... 28

4.1 Introduction

This chapter provides a brief introduction on how to remotely operate the Instrument, conduct test, and manage information using TESCO DEVICE MANAGER (TDM). Additional information can be found on certain sections in the TDM Operations Manual.

4.2 Installation

In the installation, **TescoDeviceManager_Setup.exe** is needed. Please refer to Section **§1.2 The Installation** in the TDM Operations Manual for instructions.

4.3 Network Configuration

Remote access requires establishing the connection between the Instrument and TDM. Please refer to Section **§1.3 Configuring the TDM Software** in the TDM Operations Manual for instructions.

For setting the network connections on the Instrument, refer to **§3.3.6.3**.

5.0 MAINTENANCE

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5.3 Cleaning the Air Filters	Error! Bookmark not defined.
5.4 Cleaning the Instrument External Surface	31

5.1 Introduction

This chapter explains how to perform the routine user maintenance required to keep the Instrument in optimal operating condition.

The topics covered in this chapter include:

- Replacing the Fuse
- Cleaning the Air Filter
- Cleaning the Instrument External Surface

5.2 Replacing the Fuse

The power fuse is accessible from the Instrument's rear panel. See Figure 5.2a.



Figure 5.2a FTS-2990 Fuse Location

WARNING

To avoid electrical shock or personal injury, ensure that the Instrument is switched off and disconnected by removing the line power cord from the power input socket before attempting to access the power fuse.

To access & replace the fuse, proceed as follows:

1. Disconnect the line power.
2. Pull the fuse holder and replace the defective fuse. Use below the recommended fuse ratings and manufacturer in Table 5.2.
3. Return the fuse holder by pushing down the cap until it completely closes.

Description	MFR Part ID	Part ID	Where used
Fuse Cartridge 5A 600V Ceramic 3AB/3AG 1/4" x 1-1/4"	OADAC5000-BE	300-1086	Part of the 921-0188 cable
UL Class CC Fast-Acting Midget Fuse, 10A	KTK-R-10	KTK-R-10	Part of the face panel

Table 5.2b Recommended Fuse Replacement

5.2.1 Power Cables

The FTS-2990 uses a custom power cable assembly (Part No. 921-0188) to supply input power to the Instrument. The line conductors include inline fuse holders containing 5 A cartridge fuses for overcurrent protection. The protective ground conductor is not fused and provides the safety ground connection. The cable assembly includes integrated banana connectors for connection to the Instrument input terminals.

Red Power Cable (1) Fused line conductor used to supply input power to the Instrument. **Green Power Cable (2)** Protective earth ground connection. This conductor is not fused and provides safety ground for the Instrument. **Black Power Cable (3)** Fused line conductor used as the return path for the power input.

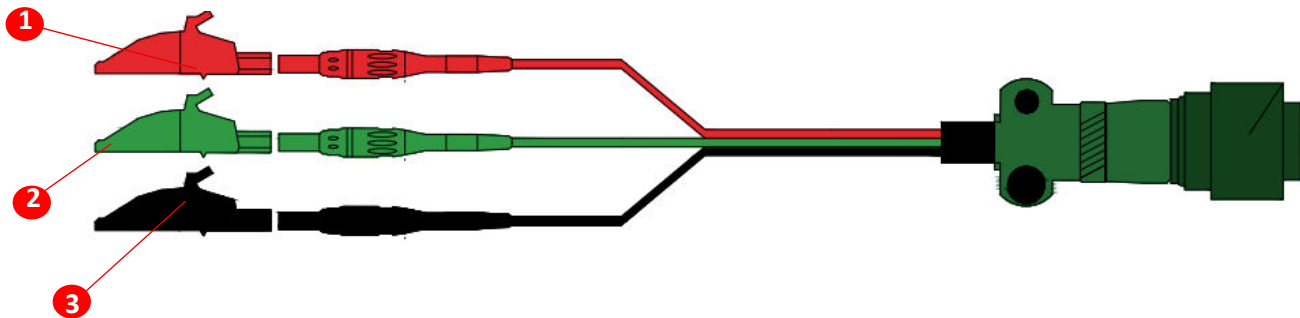


Figure 5.2.1a Power Cables

5.3 Cleaning the Air Filters

To access and clean the air filters, proceed as follows:

1. Disconnect line power.
2. Remove the filter retainer by holding its two upper corners or two lower corners and pulling it outward until it disengages from the fan guard.
3. Remove the air filter that is between the Filter Retainer and Fan Guard. See **Figure 5.3c**.
4. Clean the filter by washing it in soapy water. Rinse and dry it thoroughly before reinstalling.
5. Place the filter at the back of the retainer.
6. Reinstall the retainer in the fan guard. The retainer is snapped on the four sides for the fan guard.

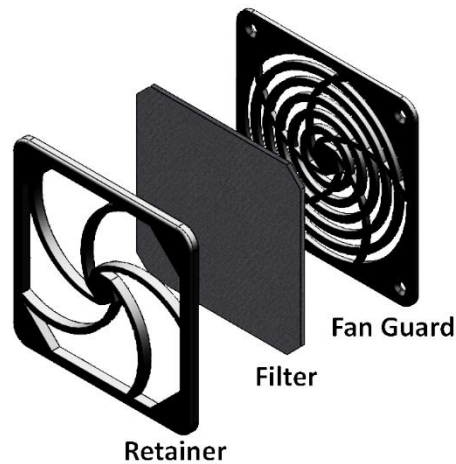


Figure 5.3c: FTS-2990 Fan Filter Assembly

5.4 Cleaning the Instrument External Surface

Clean the exterior of the instrument using a soft cloth slightly dampened with either water or a non-abrasive mild cleaning solution that is not harmful to plastics.



Do not use hydrocarbons or chlorinated solvents for cleaning. They can damage the plastic materials used in the Instrument.

6.0 FREQUENTLY ASKED QUESTIONS

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6.4 Hardware	34

6.1 Introduction

This section aims to answer frequently asked questions when operating the Instrument. Some of these answers refer to certain sections in this manual to provide more information.

6.2 Test

1. Is it possible to perform multiple types of test simultaneously?

Only one type of test can be executed at a time.

2. How many repetitions can I set for a test?

The limit for test repetitions is 99.

3. What meter forms can be tested?

The device can test 1S-6S, 8S-17S, 25S, 26S, 29S, 35S, 36S, 45S, 46S, 56S, 66S, 76S. For a complete list of the forms, see section §1.6.2 Standard Features.

6.3 Software

1. How can I obtain the firmware update file?

You can directly contact TESCO through phone or email. For the contact details, see Section §1.2 Contacting TESCO.

2. When should I update the software?

Updates are managed by TESCO. For contact details, see section §1.2 Contacting TESCO.

3. How frequent are the updates?

Updates are managed by TESCO. For contact details, see section §1.2 Contacting TESCO.

6.4 Hardware

1. Where/Who can I ask for replacement parts?

For repair concerns, please contact TESCO. See section §1.2 Contacting TESCO.

2. Are there any tests I can perform to check hardware performance?

For maintenance concerns, please contact TESCO. See section §1.2 Contacting TESCO.

7.0 Troubleshooting

7.1 TROUBLESHOOTING

7.1 Troubleshooting

1. No Power-Check.

Make sure the power cord is plugged into the outlet. Check the power outlet or circuit breaker.

2. Test can't proceed.

Check if the correct meter form is selected.

3. I inserted a meter, but when I try to start a test, the unit prompts me to insert a meter.

The meter may not be fully seated. Press the METER RELEASE button, remove the meter, and reinsert the meter into the socket. Make sure you hold the meter in place until the METER RELEASE indicator light turns on.

For more information on troubleshooting, please contact TESCO. See section §1.2 **Contacting TESCO** for contact details.