THE EASTERN SPECIALTY COMPANY

OPERATIONS MANUAL

Three Phase Meter Test, Engineering and Qualification Boards

Models:

MTS-3050

MTB-XX

MEB3-XX

MQB3-30

TUG-MTBX-2019 Revision: V1.0.0

TESCO – The Eastern Specialty Company

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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 shows 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:

- Is used for the specific purpose for which it was intended;
- Is operated in accordance with instructions, if any, supplied by TESCO;
- Has not been modified, neglected, altered, tampered with, vandalized, abused or misused, or subjected to accident, fire, flood or other casualties;
- Has not been repaired by unauthorized persons;
- Has not had its serial number altered, defaced or removed;
- 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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2.1. System Configurations

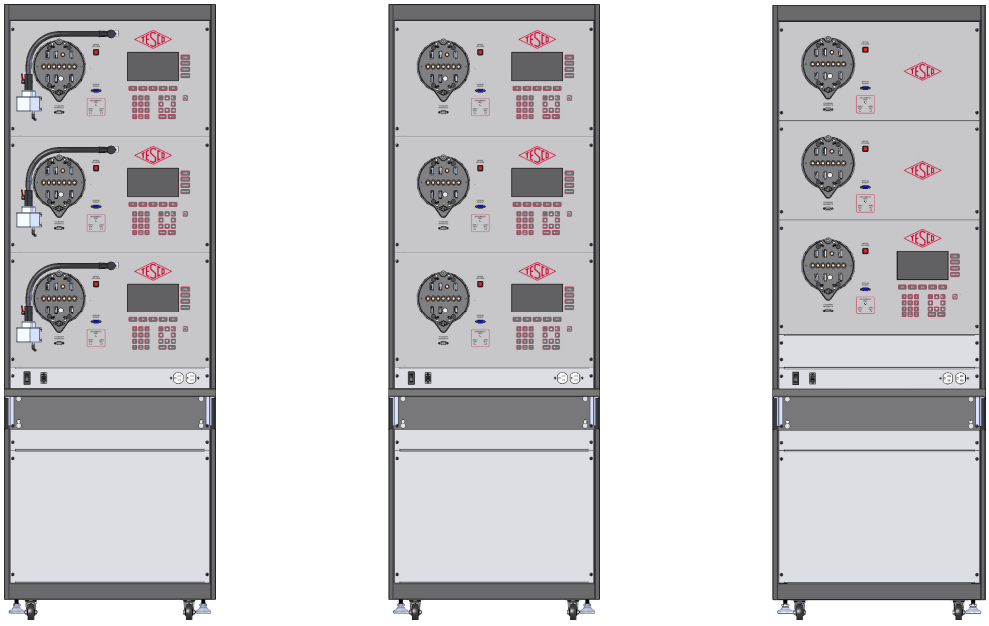

Figure 2.1 - TESCO NextGen configurations. (l to r) MTB3-30, MEB3-30/MQB3-30, MQB3-12.

As described in §2.2, there are several configurations of the TESCO NextGen line. The chart below shows the features available to each model.

2.2. Specifications

Feature	MTB3-30	MEB3-30	MQB3-30	MQB3-12
Function	TEST BOARD	ENGINEERING BOARD	QUALIFICATION BOARD	QUALIFICATION BOARD
Master	3	3	3	1
Slave	0	0	0	2
Dual Probe Arm	YES	NO	NO	NO
Sequence Testing	YES	YES	NO	NO

3. INSTALLATION

3.1. Uncrate, Inspect & Set in Place

TESCO's Next Generation Meter Boards are shipped in packaging designed specifically for these units in order to prevent damage during shipping and ease of removal from the crate.

Each rack in a unit is a completely self-contained unit shipped on a separate pallet. The Operator Shelf, Power Cord, Bypass Covers (if applicable) and Optical Pickups are shipped in a separate box and assembled to the Unit at Installation.

Please contact the TESCO factory or your Regional Sales Manager of any damage or shortage in the shipment.

Once the system is de-palletized and all rack enclosures have been bolted together and the work surfaces attached, inspect internal wiring connections to verify that nothing has come loose in shipment.

Each unit is equipped with four casters and four adjustable leveling feet. Once the unit is in place, lower the feet to level the unit.

Note: These units contain large switching power supplies with high inrush currents. A minimum of 12 inches should be allowed behind the rack(s) for proper ventilation.

Each rack has an independent power entry. The power entry panel of each rack has a NEMA L5-15P connector. A 12 foot long cord set with NEMA L5-15P plug on one end and a NEMA L5-15R receptacle on the other is supplied for each rack unit.

3.2. Multi-Rack Configurations

If a system was ordered configured in a multi-rack configuration the units will be joined on site. The only internal wiring between units is an Ethernet cable to each rack. Each rack has an independent power entry. Each power cable should be connected to a SEPARATE 20A supply.

3.3. Unit Description

TESCO's NextGen Meter Test Boards (MTB) and Meter test Stations (MTS) deliver outstanding performance and ease of operation. The Test Boards can be configured in many different ways to meet the specific needs of a wide range of customer applications. Larger systems are configured from standard modular racks with every rack module being a completely self-contained unit. Multiple rack modules can be connected at installation to create as large as a system as desired.

New Each Master Chassis comes equipped with a dual, mechanical and pulse pickup mounted to the face of the chassis.

TESCO MTBs apply true three phase voltage and current to electric meters so that they can be energized, enabling them to be checked out by meter technicians. An internal reference standard enables meter engineers to perform more in-depth testing of meters.

The TESCO 3 Phase MTB performs Qualification, Disconnect, Communication and Advanced Functional Tests. With basic metrology (0.1% accuracy) the MEB can also be used as a demand board or run time board, as part of meter certification, or to meet regulatory testing requirements. The TESCO MEB is a versatile Lab unit performing High Volume Meter shop functions as well as tests performed by Meter Shop Engineers.

Each MTB comes with a PC program that can be loaded onto a customer's computer connected to the MTB3's ethernet port to replicate the functionality of the display and keyboard on multiple chassis.

4. INTERFACE

4.1. FRONT PANEL

Figure 4.1 - TESCO NextGen front panel

The front panel of the TESCO NextGen has consists of the following devices and interfaces.

- TESCO patented auto socket assembly
- Probe Arm (Only available on MTB3)
- Standard Interface port
- Meter Release button
- Optical Pickup port
- Disconnect Test Indicators
- Interface Screen (Not available on slave units)
- Power Switch
- RJ45 Network Port
- Duplex Utility Receptacle
- Soft touch tactile buttons - (Not available on slave units) - Refer to §Table 4-1 for additional information

KEY	FUNCTION
	POWER ON/OFF—Press to enable or disable power to local unit.
FORM	FORM – Press this button to select the meter form selection box on the display, if visible. To change displayed form, press Up/ Down Arrows or enter the desired form
VOLTAGE	VOLTAGE – Press this button to select the voltage selection box on the display, if visible. Multiple presses will shift between all available voltage selections. To change displayed voltage, press Up/ Down Arrows or enter the desired voltage using
CURRENT	CURRENT – Press this button to select the current (amperage) selection box on the display, if visible. Multiple presses will shift between all available current selections. To change displayed current, press Up/ Down Arrows or enter the desired
DIRECTION	DIRECTION – Press this button to select the direction selection box on the display, if visible. Multiple presses will shift between all available direction selections. To change displayed direction, press Up/ Down Arrows or enter the desired voltage
←	BACKSPACE – Press this button to delete last character.
1	NUMERICS – Press these keys to enter numeric data into selected field.
F1	FUNCTION KEYS, F1 thru F5 – Press for screen navigation. Function key is associated to menu button on screen directly above function key, if displayed. If menu item is
0 SPC	0/SPC – Press this button enter 'zero' into the selected data field.
▲ ▼	UP/DOWN - Press these keys to navigate drop down menus and to make incremental adjustments to numeric values.
◀ ▶	LEFT/RIGHT – Not used.
⇤ ⇥	LEFT/RIGHT TAB – Press these keys to navigate between data entry fields.
↵	RETURN – Press this button to navigate back to the last screen.
ENTER	ENTER – Press this button to enter a changed value within a data entry window.

Table 4-1 - Soft key functions

4.2. REAR PANEL

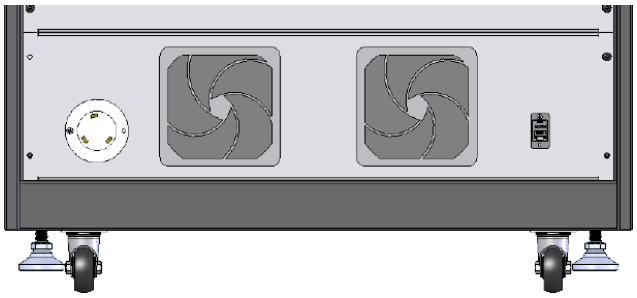

Figure 4.2 - Rear Panel view

The rear panel of the TESCO NextGen has consists of the following devices and interfaces.

- Power Inlet Port as described in §3.3
- RJ45 Network Port

4.3. DISPLAY SCREENS

Display screens on this device consist of the following types of interface:

- Drop Down Menus –Press arrow buttons to change selection.
- Text Input Boxes – Use numeric entry keys 1 to change data then press ENTER to store value.
- Selection Boxes – Press ENTER to select/deselect check box.
- Function Buttons – Press function key F1 directly below screen menu to enter that selection.

To navigate between drop down menus, text boxes and selection boxes, use left and right tab arrow keys.

4.3.1. MAIN MENU

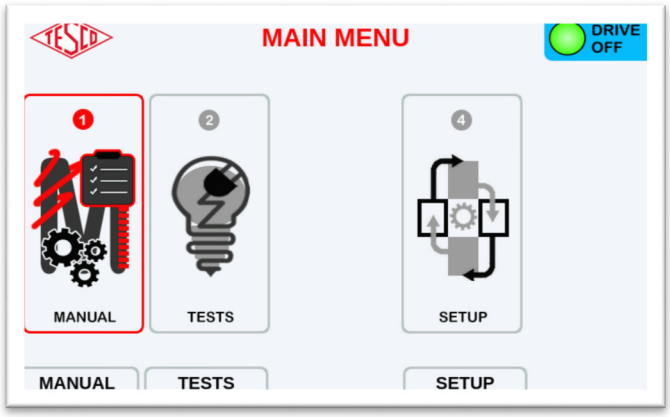

Figure 4.3 - MAIN MENU screen

The MAIN MENU screen consists of the following function buttons: MANUAL, TESTS & SETUP. These buttons are described in the next subsection.

4.3.1.1. MANUAL

The MANUAL menu option is for manual operation of the board and setup of single tests. Press F1 to enter DRIVE SETUP screen. Refer to §0 for additional information.

4.3.1.2. TESTS

TEST menu option is for setup of sequence testing, PLC testing and disconnect testing. Press F2 to enter TEST SELECTION screen. Refer to §0 for additional information.

4.3.1.3. SETUP

SETUP menu option is for setup of device parameters. This is not related to meter info or any type of test. Press F1 to enter SETUP MENU screen. Refer to §XXX for additional info.

4.3.1.3.1. DRIVE SETUP

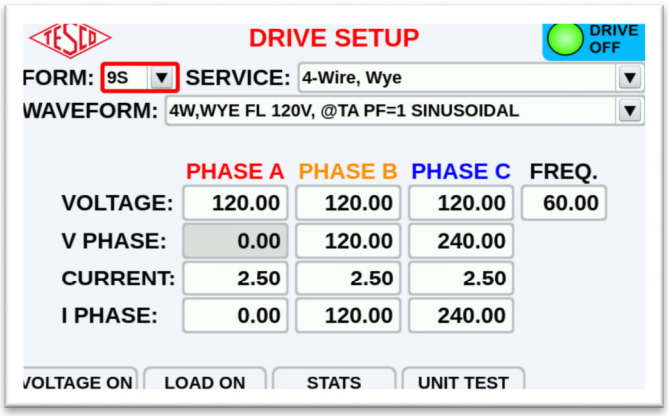

Figure 4.4 - DRIVE SETUP screen

DRIVE SETUP screen consists of the following drop down menus, text input boxes and function buttons:

- *DROP DOWN MENUS:* FORM, SERVICE & WAVEFORM.
- *DATA ENTRY FIELDS:* VOLTAGE(S), V PHASE(S), CURRENT(S) & I PHASE(S). *NOTE: Multiple voltage and current fields will be available with respect to the selected meter form.*
- *FUNCTION BUTTONS:*
    - VOLTAGE ON – Press this to enable potentials to the line side of the meter.
    - LOAD ON – Press this to enable current flow from line to load.
    - STATS/TEMPERATURE (TEMP accessible from STATS screen). Press STATS to display statistical information of device under test, DUT. Press TEMPERATURE to display temperature information on the control circuitry. Temperature information is used for diagnostic purposes.
    - UNIT TEST – Press this to enter METER INFO. SOCKET 1 screen.

WARNING: If either VOLTAGE ON or LOAD ON is enabled, the DRIVE OFF *indicator will change to* DRIVE ACTIVE*. This indicates there is potential and or/ current present at the meter terminals.*

4.3.1.3.2. METER INFO. SOCKET 1

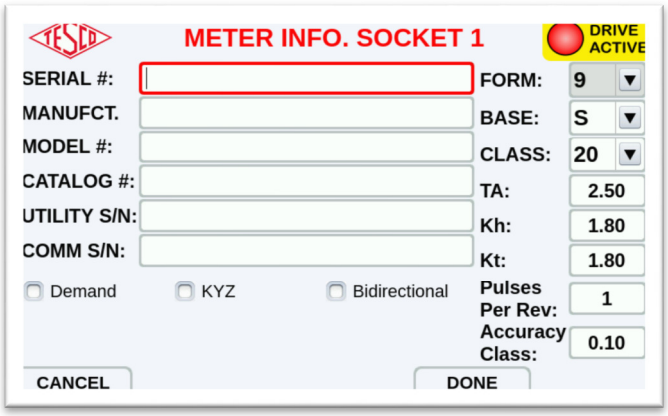

Figure 4.5 - METER INFO. SOCKET 1 screen

METER SOCKET INFO. 1 screen consists of the following drop down menus, text input boxes, selection boxes and function buttons. This screen enables the input of meter information to be linked test being conducted.

- *DROP DOWN BOXES:* FORM & CLASS
- *DATA ENTRY FIELDS:* SERIAL, MANUFCT., MODEL #, CATALOG #, UTILITY S/N, COMM S/N, BASE, TA, Kh, Kt, Pulses Per Rev, & Accuracy Class.
- *SELECTION BOXES:* DEMAND, KYZ & BIDIRECTIONAL.
- *FUNCTION BUTTONS:*
    - CANCEL – Press to return to DRIVE SETUP screen.
    - DONE – Press this button to enter SINGLE TEST SETUP Screen.

4.3.1.3.3. SINGLE TEST SETUP

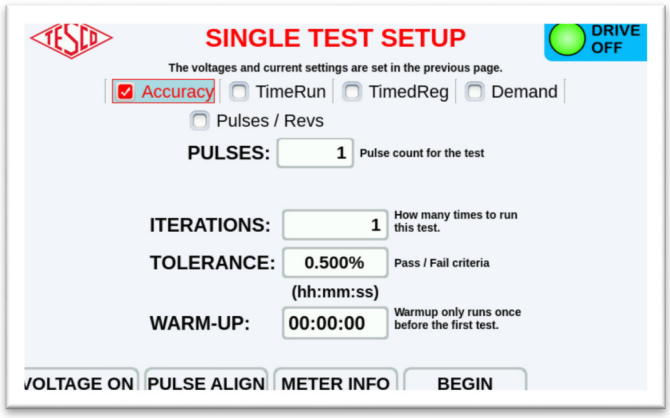

Figure 4.6 - SINGLE TEST SETUP screen

SINGLE TEST SETUP enables the configuration of the desired single test to be conducted. This screen contains the following drop down menus, text input boxes, selection boxes and function buttons.

- *SELECTION BOXES:* ACCURACY, TIMERUN, TIMEDREG & DEMAND
- *TEXT INPUT BOXES:* ITERATIONS, TOLERANCE & WARMUP
- *FUNCTION BUTTONS:*
  - VOLTAGE ON – Press this to enable potentials to the line side of the meter.
  - PULSE ALIGN – ELABORATE HERE
  - METER INFO – Press this button to open meter information entry screen. Refer to §0 for additional information.
  - BEGIN – Press BEGIN to enable the desired test. SEQUENCE ACTIVE screen will appear.

WARNING: If VOLTAGE ON is enabled, the 

indicator will change to 

. This indicates there is potential and or/ current present at the meter terminals.

4.3.1.3.4. SEQUENCE ACTIVE

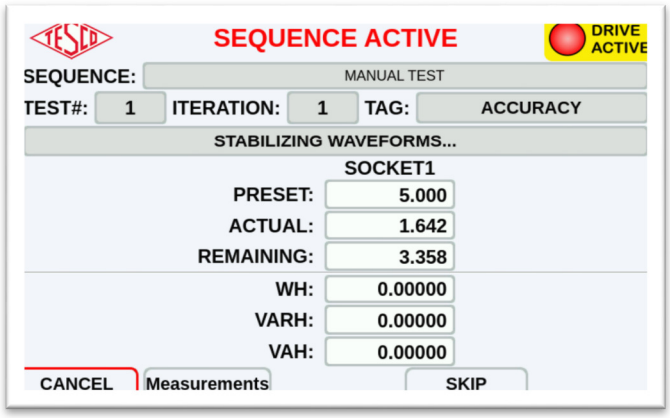

Figure 4.7 - SEQUENCE ACTIVE screen

SEQUENCE ACTIVE displays the following function buttons. Once the test has completed, the TEST RESULTS screen will appear.

- *FUNCTION BUTTONS:*
  - CANCEL – Press this button to cancel current sequence.
  - Measurements – Press this to display live test parameters (VOLTAGE, CURRENT & PHASE) on DUT.
  - POWER – Press this to display live test parameters (PRESET, ACTUAL, REMAINING, kW, kVAR & kVA).
  - SKIP – Press this button to cancel current sequence and return to TEST SETUP screen.

4.3.1.3.5. TEST RESULTS

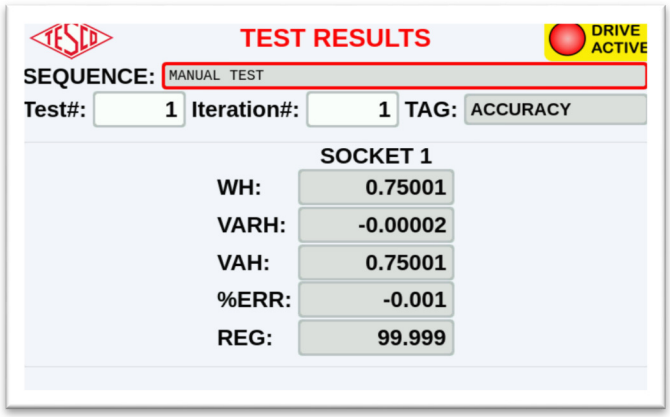

Figure 4.8 - TEST RESULTS screen

This screen will appear once the desired sequence is complete. It displays the results of the desired test. Press  to return to SINGLE TEST SETUP screen.

4.3.1.3.6. TEST SELECTION

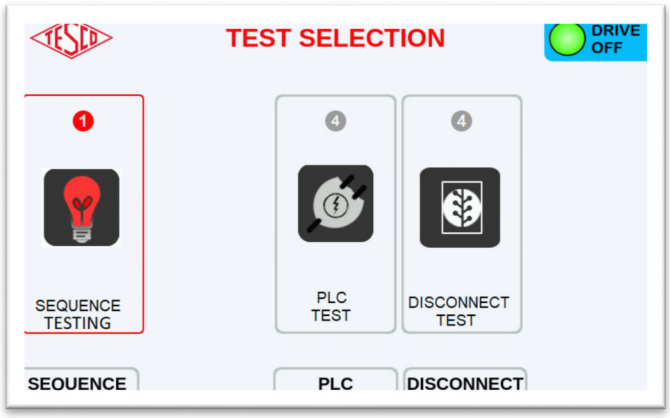

Figure 4.9 - TEST SELECTION screen

- *FUNCITON BUTTONS:*
    - SEQUENCE – Press F1 to configure the desired sequence test. Refer to §4.3.1.3.7 for additional information.
    - PLC – Press F3 to enter PLC TEST setup screen. Refer to § for additional info.
    - DISCONNECT – Press F4 to enter DISCONNECT TEST setup screen. Refer to §XXX for additional info.

4.3.1.3.7. SEQUENCE

Selecting test sequence begins with meter data setup info. Refer to §0 for information on METER INFO SOCKET 1 screen.

- *FUNCTION BUTTONS:*
    - CANCEL – Press to return to TEST SELECTION screen.
    - DONE – Press this button to enter SEQUENCE SETUP Screen.

4.3.1.3.8. SEQUENCE SETUP

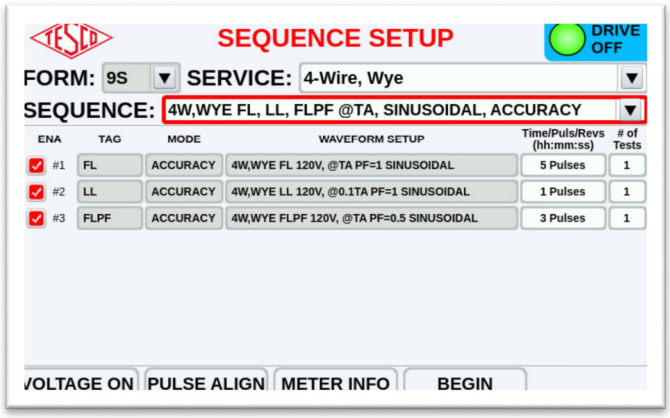

Figure 4.10 - SEQUENCE SETUP screen

This screen enables the configuration of the desired sequence test to be conducted. Use  to navigate between data fields.

- *DROP DOWN MENUS:* FORM, SERVICE & SEQUENCE.
- *FUNCTION BUTTONS:*
  - VOLTAGE ON – Press this to enable potentials to the line side of the meter socket.
  - PULSE ALIGN - ADD DESCRIPTION HERE
  - METER INFO – Press this button to return to meter information entry screen. Refer to §0 for additional information.
  - BEGIN – Press BEGIN to enable the desired test. SEQUENCE ACTIVE screen will appear. Refer to §0 for additional info.

WARNING: If VOLTAGE ON is enabled, the 

indicator will change to 

. This indicates there is potential and or/ current present at the meter terminals.

4.3.1.3.9. SEQUENCE ACTIVE

Refer to §0 for additional information.

4.3.1.3.10. TEST RESULTS

Refer to §4.3.1.3.5 for additional information.

4.3.1.3.11. PLC TEST (POWERLINE CARRIER TEST)

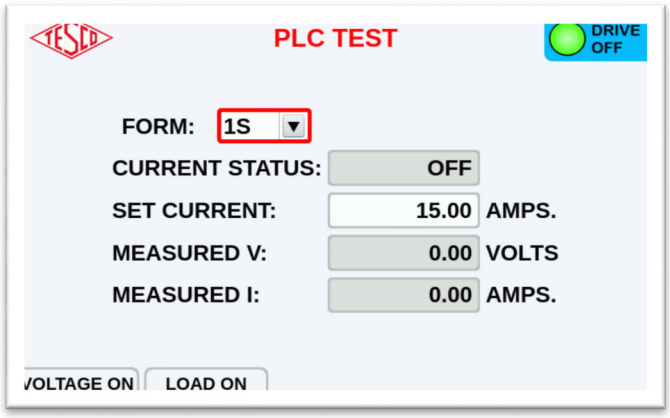

Figure 4.11 - PLC TEST screen

PLC TEST bypasses the internal voltage and generation circuits. The meter socket is connected to the line voltage powering the unit.

- *DROP DOWN MENUS:* FORM
- *TEXT INPUT BOXES:* SET CURRENT
- *MENU BUTTONS:*
  - VOLTAGE ON – Press this to enable potentials to the line side of the meter.
  - LOAD ON – Press this to enable current thru the meter.

WARNING: If either VOLTAGE ON or LOAD ON is enabled, the DRIVE OFF *indicator will change to* DRIVE ACTIVE. *This indicates there is potential and or/ current present at the meter terminals.*

4.3.1.3.12. DISCONNECT TEST

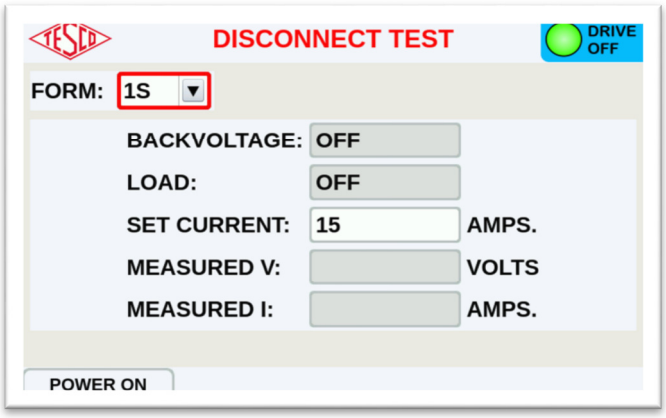

Figure 4.12-DISCONNECT TEST screen

DISCONNECT TEST bypasses the internal voltage and generation circuits. The meter socket is connected to the line voltage powering the unit via isolation transformer.

- *DROP DOWN MENUS:* FORM
- *TEXT INPUT BOXES:* SET CURRENT
- *MENU BUTTONS:*
  - VOLTAGE ON – Press this to enable potentials to the line side of the meter.
  - LOAD ON – Press this to enable current thru the meter.

WARNING: If either VOLTAGE ON or LOAD ON is enabled, the DRIVE OFF *indicator will change to* DRIVE ACTIVE. *This indicates there is potential and or/ current present at the meter terminals.*

4.3.1.3.13. SETUP MENU

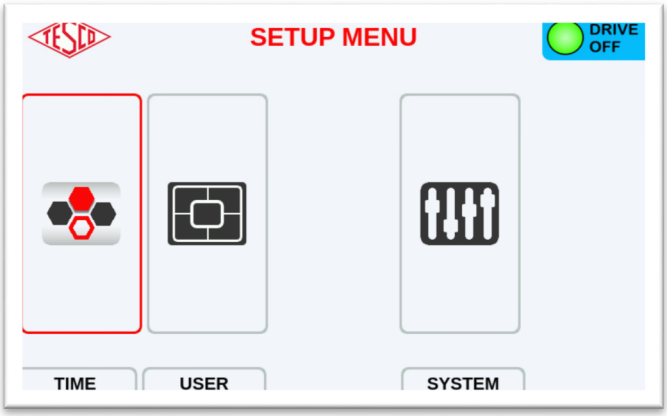

Figure 4.13 - SETUP MENU screen

- *FUNCTION BUTTONS:*
  - TIME – Shows time, date & time zone which is set in the microcontroller. Refer to §4.3.1.3.14
  - USER – Shows user information which is currently applied to processor. Refer to §4.3.1.3.15
  - SYSTEM – Displays SYSTEM INFORMATION Screen. Refer to §0

4.3.1.3.14. TIME

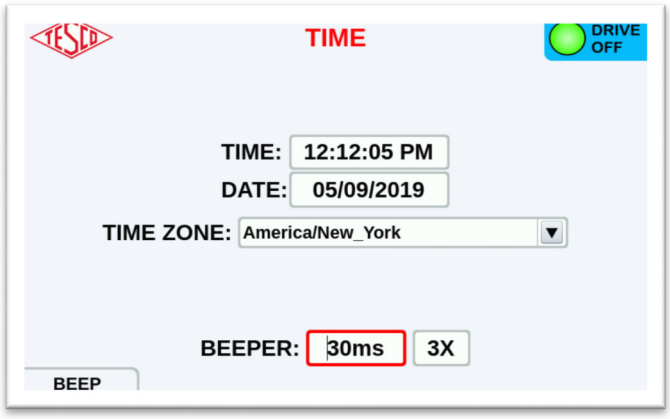

Figure 4.14 - TIME screen

- *FUNCTION BUTTONS*

BEEP – This button has no function.

4.3.1.3.15. USER INFORMATION

Figure 4.15 - USER INFORMATION screen

4.3.1.3.16. SYSTEM INFORMATION

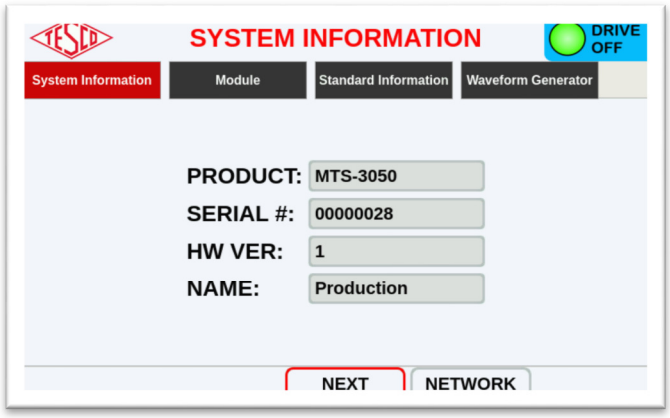

Figure 4.16 - SYSTEM INFORMATION screen

- *FUNCTION BUTTONS*
  - NEXT – Press to cycle thru the available submenus.
  - NETWORK - Press to display network port settings pop up.
  - NEXT SCREEN TABS
    - System Information – Displays product details.
    - Module – Displays module firmware details.
    - Standard Information – Displays board level firmware details.
    - Waveform Generator – Displays firmware details of waveform generator.

5. OPERATIONS

5.1. Unit Power Up

To power up the unit, plug power cord into the twist lock port on the rear panel of the unit. Plug cord into any standard receptacle. Enable power switch on front panel then press  to enable power to local rack unit. After startup sequence, the MAIN MENU screen will be displayed. (FIGURE REF)

5.2. Meter Insertion/Extraction

To load a meter into socket, ensure meter is oriented as desired. Then insert meter into socket keeping the meter weight fully supported. The unit will automatically clamp to the jaws of the meter. When the METER RELEASE light is illuminated, the meter is fully supported. Align optical pickup to meter prior to testing. (MTB model includes a laser pickup to be used with mechanical meters)

To remove the meter from the socket, ensure optical pickup is removed from the face of the meter then support the meter shell with one hand. Press the METER RELEASE button. Once the METER RELEASE indicator unlit, the meter is safe for removal from the socket.

5.3. Optical Pickup alignment

MTB/MEB/MQB - When a meter is successfully inserted into socket, attach magnetic optical pickup to optical port of meter. To remove, hold pickup by the body and gently pull away from the meter.

MQB only – MQB also includes a flexible swing arm with optical and laser sensors. To make adjustments to the flexible arm, twist the small red lever at the base of the arm. The flexible portion will slacken.

For electronic meters, note small notches on the sides of the optical sensor body. Using those notches, align the sensor to the optical port of the meter. Reset the red lever to stiffen the flexible arm.

For mechanical meters, align the laser sensor to the meter by adjusting the flexible arm in same manner described above.

If alignment is difficult to achieve, the PULSE ALIGN feature is available to assist with alignment. Refer to §0 for additional information.

5.4. Manual Test

To begin a manual test, press  until MAIN MENU is visible. Press  to enter DRIVE SETUP screen. Configure parameters for desired test. Note: FORM represents the form factor which the service and waveforms will operate as, not the form of the meter being tested.

Press  to transit to METER INFO. SOCKET 1 screen. Enter preferred parameters for desired test. Note: Here, FORM represents the form factor of the meter being tested.

Press  to enter the SINGLE TEST SETUP screen. Enter preferred parameters for desired test.

Press  to commence test. Once test completes, TEST RESULTS screen will appear. Press [BACK] to return to SINGLE TEST SETUP screen. If the running test needs to be aborted, press [F4] to skip current test and return to SINGLE TEST SETUP screen.

5.5. Sequence Test

To begin a sequence test, press [back] until MAIN MENU is visible. Press [F1] to enter TEST SELECTION screen. Press [F1] to enter METER INFO SOCKET 1 screen.

Configure parameters for desired test. Note: FORM represents the form factor which the service and waveforms will operate as, not the form of the meter being tested.

Press [F4] to transit to METER INFO. SOCKET 1 screen. Enter preferred parameters for desired test.

Press [F4] to begin test. Once test completes, TEST RESULTS screen will appear. If the running test needs to be aborted, press [F4] to skip current test and begin next sequence.

5.6. PLC Test (Powerline Carrier Test)

To begin a PLC test, press [back] until MAIN MENU is visible. Press [F3] to enter TEST SELECTION screen. Press [F4] to enter PLC TEST screen.

Configure parameters for desired test then press [F1] to enable voltage and current to the meter to allow for disconnect testing.

5.7. Disconnect Test

To begin a Disconnect test, press [back] until MAIN MENU is visible. Press [F4] to enter TEST SELECTION screen. Press [F4] to enter DISCONNECT screen.

Configure parameters for desired test then press [F1] to enable voltage and current to the meter to allow for disconnect testing.

6. TROUBLESHOOTING

6.1. No Power-Check

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

6.2. Test won't be able to proceed.

Check if correct meter form is selected