ISP TESTER

DAIRYLAND
ELECTRICAL INDUSTRIES

INTRODUCTION

The ISP Tester is an automated test device for performing in-circuit analysis of an Isolator/Surge Protector (ISP) as manufactured by Dairyland Electrical Industries. The ISP is typically connected between the casing of a power utility pipe-type transmission cable or sheath of a lead sheath cable system and the substation grounding system. Performing the functions of DC isolation and AC grounding for the transmission casing/sheath, an ISP is not easily removed from the system for the purpose of testing, therefore the ISP Tester performs an important role in analyzing an in-service ISP to determine its health.

The ISP Tester will automatically analyze the as-found condition of an ISP, as well as apply signals that simulate AC fault conditions to assure that the ISP switches to the shorted mode ("turns on") and then returns to the normal mode of blocking DC (from stray sources or from cathodic protection systems) and conducting any induced or coupled AC to ground.

An ISP Tester can also be used on an ISP that is disconnected from the system.

OVERVIEW OF OPERATION:

The ISP tester is initially configured via a simple touch panel interface. Following configuration, an automated test sequence is initiated by the operator. During the automated portion of the testing the ISP is subjected to a multi-step test sequence controlled entirely by an on board microprocessor. The sequence consists of various observational phases followed by two injections of a high current, short duration pulse which creates a temporary "fault" condition. During the test the ISP is observed to verify that it properly triggers at either the 12.5 volt or 20.0 volt settings as initially selected on the touch panel and that the ISP properly recovers from a triggered condition. The brief high energy pulse causes the ISP to trigger only for a matter of several milliseconds, and a shorting system is applied to the external terminals to limit any influence on the external system. However, operators of the ISP Tester should avoid contact with the exposed terminals of the ISP under test. Once initiated, the full test sequence requires approximately five minutes to complete. At the conclusion of the automated test sequence informational data is combined with the actual test results and logged to a USB data drive.

Dairyland ISP

⚠ WARNING

ISPs are normally part of a high current, high voltage utility electrical transmission system, therefore operators of the ISP Tester should be familiar with safety practices and precautions associated with the respective utility's work rules and environment.

The operator is required to read and understand this manual before using the ISP Tester, or interacting with installed Isolator/Surge Protectors.

ISP Tester use does not require disconnection of the Isolator/Surge Protector from the circuit. Do not disconnect the cables from Isolator/Surge Protector terminals for the purpose of regular testing, unless removal is needed for ISP repair. If any connection changes are to be made, operators must employ all applicable utility safety practices and precautions to assure safety grounding for the transmission sheath/pipe, and to assure that personnel step and touch voltage issues have been addressed, in coordination with other applicable personnel.
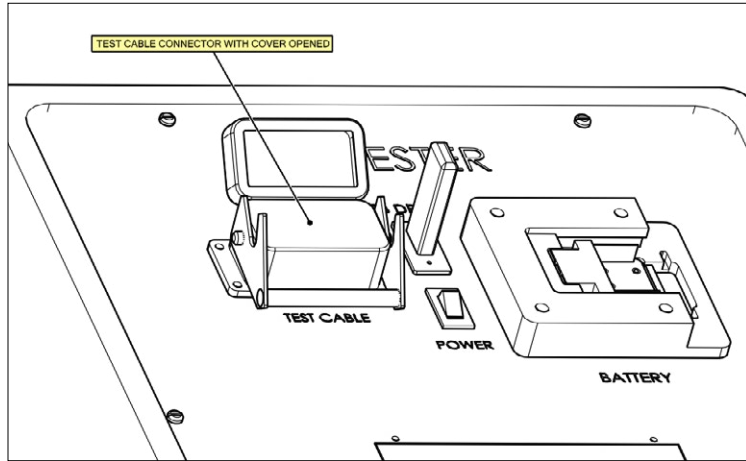
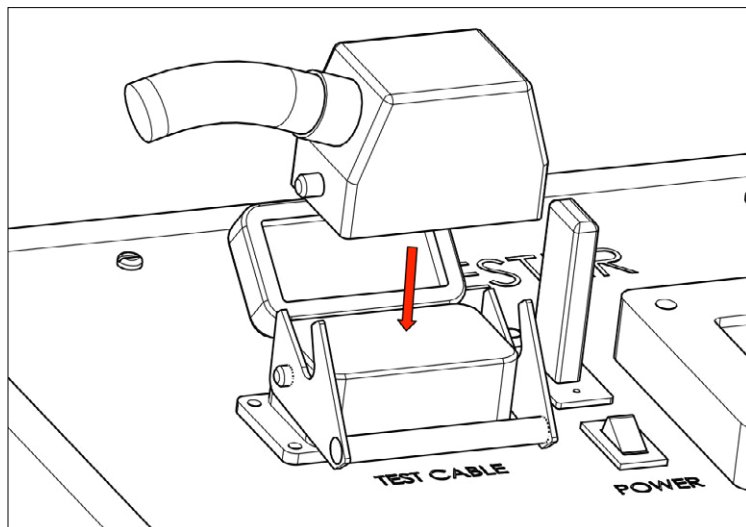Do not open the ISP Tester source unit.

CONNECTING TEST CABLE TO ISP TESTER

1) Remove the test cable from the accessory shipping case. Remove the protective caps from connectors on both ends.
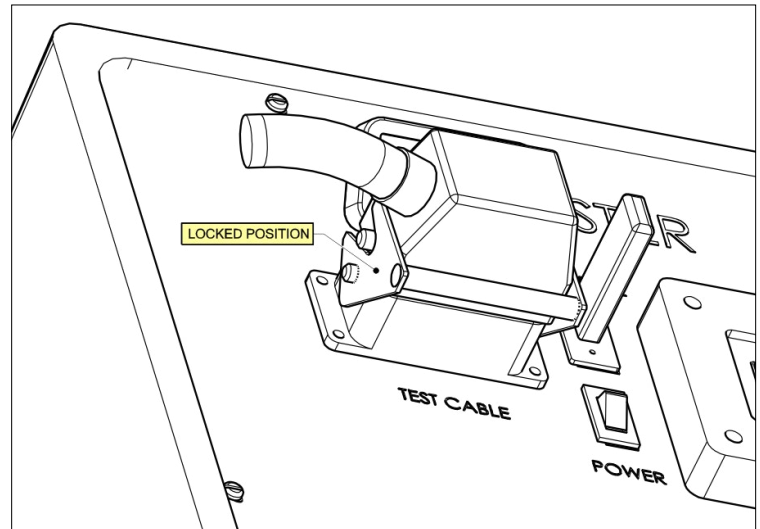
2) Open the bail lever


4) Rotate the bail to the locked position.

3) Insert the rectangular connector of the test cable into the mating socket on the ISP tester with the cable extending to the left (away from the ISP Tester).


5) Remove the protective cover from the Test Point on the front panel of the ISP. Proceed to insert the remaining end of the test cable assembly into the ISP Test Point. Note the keying boss at the 6 o'clock position which must align with the test plug mating keying locator. It is best to support the cable with one hand and guide the connector onto the test point with the other while rotating and tightening the knurled portion of the connector. Be careful to not cross thread the connector. A combination of turning and pushing/wiggling the connector into the fully mated position works best. Make sure the connector is fully seated or the test results may be problematic.
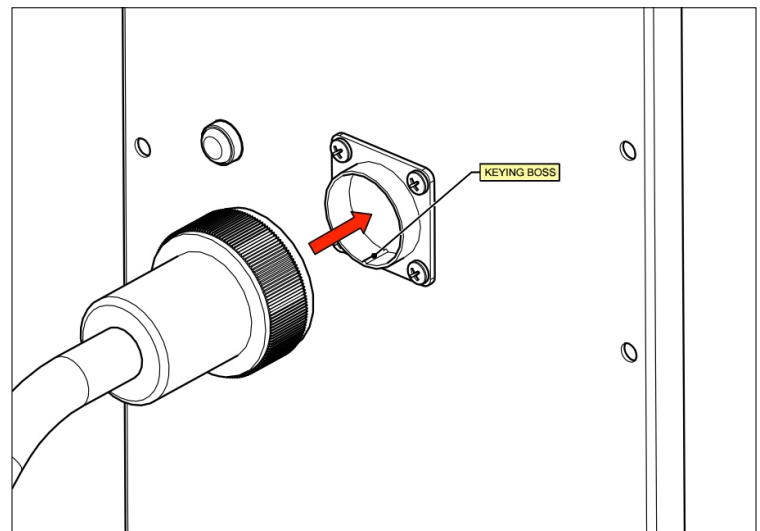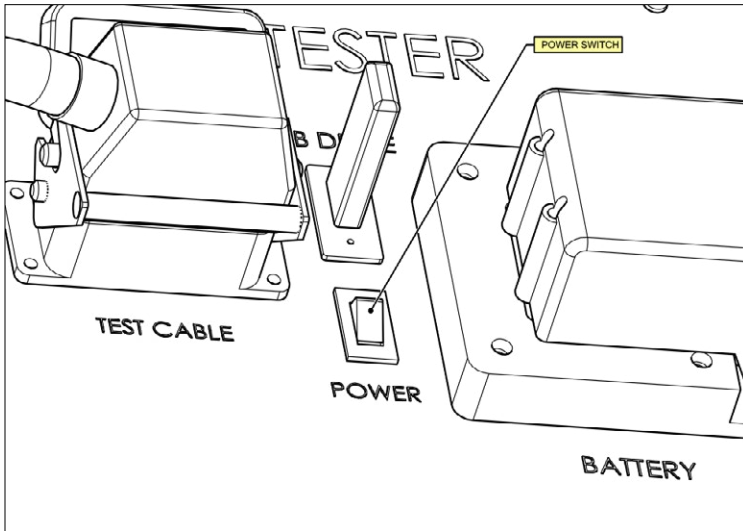
INSERTING BATTERY PACK

Slide the battery pack in from the right side until it latches into position. To remove, pull up on latch mechanism and slide right.
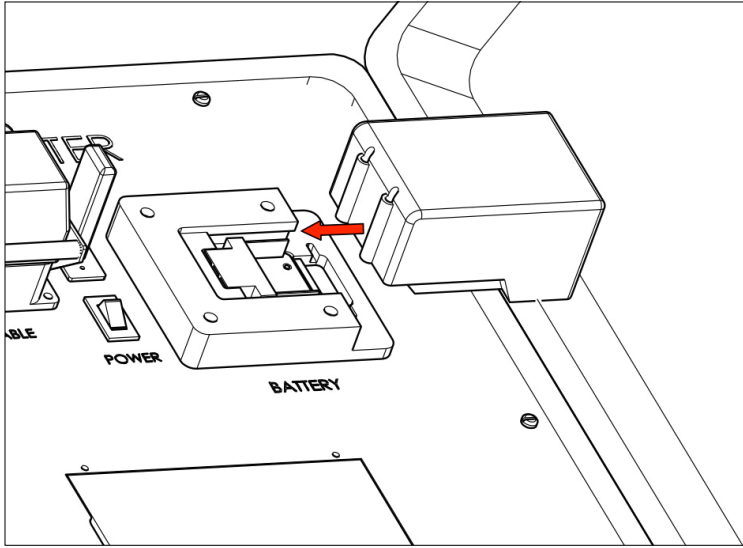

TURNING ON MAIN POWER

Turn on the main power switch by depressing the power switch to the ON position.

USING THE TOUCH PANEL TO ENTER TEST DATA

When the ISP Tester is initially powered up the operator touch panel will require the user to acknowledge they have read this manual and understand the operating principle of the tester. The tester will then present the test screen or "home" screen for entry of data and controlling the start of the automated test sequence. Note the battery indicator in the lower left of the home screen which shows remaining battery pack power. About 28 complete tests can be performed on a freshly charged battery in new condition.

When first powered up, the data for the various pieces of test information default to "Enter" which is shown here and drawn on the home screen as blue colored text. Normally an operator will modify this value by touching the individual data fields, which will call up a keyboard screen for entry of new data.
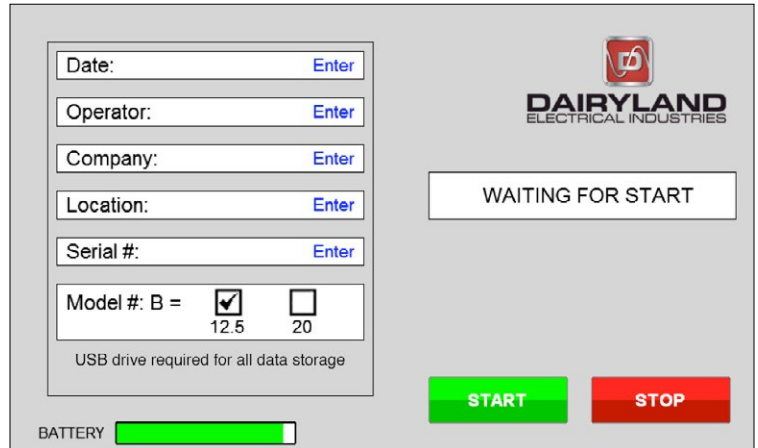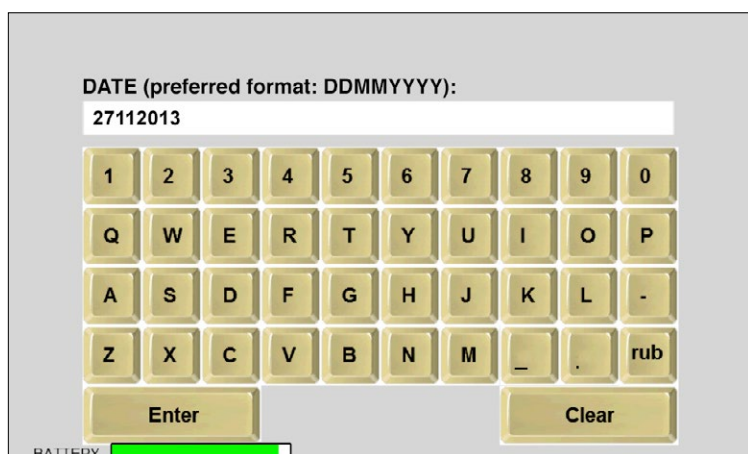
Here is a sample keyboard screen showing a date of "27112013" as entered by the operator. Note that the "Rub" key eliminates one character and the "Clear" key clears the entire line of characters. All data entries are free form in that any combination of available characters can be used. However, the preferred date format is "DDMMYYYY" without any dashes or other characters. As an example, date entry "27112013" is November 27, 2013. Information from date field is extracted and used as part of the data file naming convention, therefore the format is important.

The serial number of the ISP can be found on the upper mounting flange of the ISP for earlier models or on the nameplate for more recent models. Only enter the four digits of the serial number in the serial number field, as this data is used in the file naming convention.

Once the data has been entered, pressing the "Enter" key returns the display to the home page.

Here is a sample of a home page that has been entirely filled out by the operator.

The modification of any data field from the initial value of "Enter" is entirely optional and in fact can be left as-is for purposes of running a quick test without having to modify the information. Note that a blank or clear data field is not acceptable and the automated test sequence cannot commence until some data has been entered in every field. The selection of a 12.5 or 20 volt ISP is done by touching the appropriate test voltage on the touch screen. The display will toggle between one of the two possible voltages. Note that the selected voltage must agree with the actual model of the ISP under test. No harm will be done to the ISP if the wrong value is selected but the ISP will be reported as having failed the test since its actual trigger voltage under test will not match the voltage as selected on the touch panel screen.

Here is a complete sample model number for a 12.5 volt ISP as displayed on a data nameplate.

ISP-75-12.5-118-120-NS-TP-Rev2-40L.

The "B" field as called out in our technical literature indicates a 12.5 volt trigger voltage and must match the selected value on the touch panel screen. Your ISP model numbers may vary from the example shown. The ISP Tester has been designed to address all ISP variations.
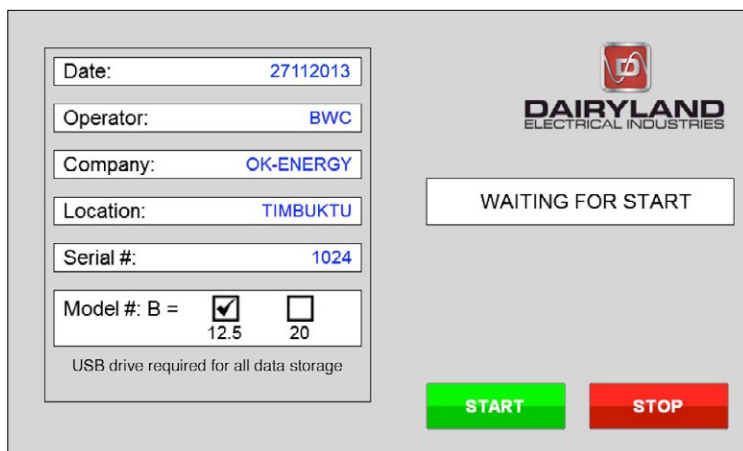
USB DATA PORT

If an operator desires to capture the touch screen data as well as the results of an automated test then it is necessary to insert a USB data storage drive into the "USB DRIVE" slot on the front panel of the ISP Tester before the automated test sequence is initiated. A fixed message on the screen reminds the user that a USB drive is necessary for data storage. At the conclusion of the test sequence, a file with the format "DATA.csv" is created after first performed test. Each additional test result is appended to this file in sequential order. The system will check for this file on the USB drive and append automatically or create file if it does not exist on USB drive. All information is extracted from data fields that are entered by operator on the home screen.

The data is stored on the drive in a comma delimited format. This allows an operator to later open the file using spreadsheet software such as "Excel." To view test data, open "DATA.csv" file. The user will see date, operator, company, location, serial number, voltage setting and test result, with a sample shown below. The test results will be discussed more in a later section of this manual.

|	A	B	C	D	E	F	G
1	17122014	TONY	DEI	STOUGHTON-WI	1234	12.5	Passed All Tests
2							

Note that the use of a USB data storage device is optional and doesn't affect the actual testing if one is not inserted in the USB DRIVE slot, but data from any particular test will be lost at the conclusion of the automated test sequence. In addition, a second file called "MASTVOLT.TXT" is created. This is a diagnostics file for Dairyland technical support purposes. It is recommended that this file not be deleted but rather saved with the test files, as it can be sent to Dairyland for analysis in situations where unexpected results were found.
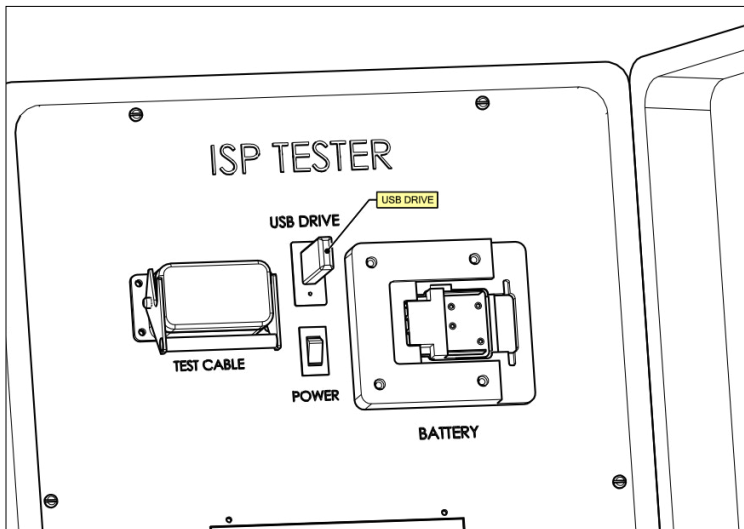
STARTING THE AUTOMATED TEST

An automated test sequence can be invoked at any time when the message "WAITING FOR START" is displayed in the status window of the home screen. As indicated earlier the default data value of "Enter" in each field is sufficient to start a test without actually entering data although generally an operator will desire to modify these data fields.

Once the home screen has been filled out with the desired information, automated testing of the ISP can be initiated by touching the "START" push-button. As outlined previously a multi-step automated test sequence is now initiated and indicated by the grey "START" push-button. The status of the test sequence will be indicated in the status window including what function the ISP tester is currently performing. All test functions that take more than a few moments to perform will also display a progress bar that indicates percentage completion of a particular test. Here is a screen shot showing the progress bar during one of the observational tests of the ISP.
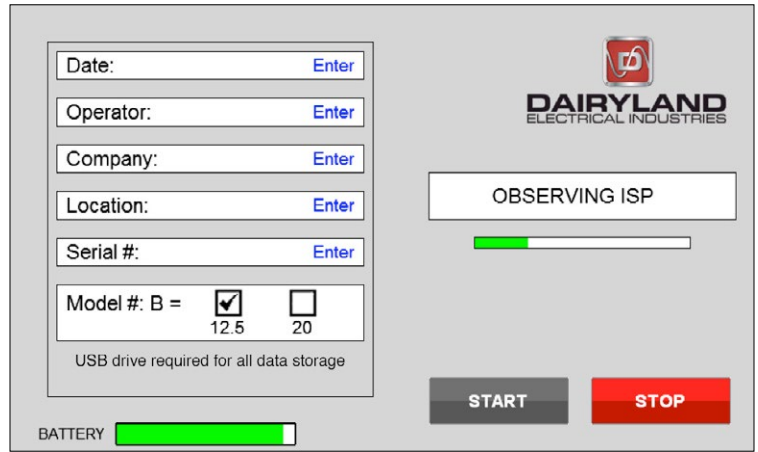
The ISP Tester will perform numerous different tests of the ISP, checking its functionality and trigger voltages during an induced fault condition. Various messages will be displayed during the test sequence indicated by the current tester status. The user will hear contractors operating and other switching functions, which is normal. At the point where the ISP Tester triggers the ISP the user will notice a very brief flash of the LED on the front panel of the ISP if you have the optional front panel LED. At the conclusion of the test if all tests pass successfully the home screen will appear as follows:

At this point the USB drive file "DATA.csv" is created, or appended to, with the results of the test if a USB drive is inserted in the USB DRIVE slot. The ISP tester will then go through a period of initializations to be ready for another test if desired, as indicated by the Start button appearing in green. Every test is recorded, including any abbreviated failed test and any manual stop to a test.

TERMINATING AN AUTOMATED TEST:

If an operator desires to cancel a test that is in progress, this can be done at any time by depressing the "STOP" push-button. There is no impact on the ISP under test and the ISP tester internally sequences through the proper steps to interrupt the testing sequence and safely discharge any internal sources. If another test is desired the operator can proceed as usual.

TEST RESULTS:

If the ISP tester detects a problem during testing it will report the results in the home screen status box and abort any additional testing. There are fourteen possible failures and three successful results reported to the operator.

Test Result	Explanation
ENTER MISSING DATA	Blank data field/s. Enter data on corresponding field/s.
CABLE DISCONNECTED	Test cable must be connected or reseated. Retest after connection.
FAIL, ISP TRIGGERING	Thyristors already triggering during observational period, steady-state conditions are beyond ISP ratings. Check for excessive steady-state AC current or excessive DC voltage present, causing triggering.
FAIL, NO ISP TRIGGER	Thyristors do not trigger during observational period when steady-state voltage present is above ISP voltage threshold and should have caused ISP to trigger.
FAIL, ISP CAPS OPEN	ISP capacitors detected to be open during observational period based on excessive voltage rise.
TEST STOPPED, EXTERNAL ISP SHORT	A short external to the ISP detected. Clear external short then retest.
TEST STOPPED, SHORTED THYRISTOR	Permanent short of ISP thyristor detected. Retest to verify.
TEST STOPPED, SHORTED SLAVE THYR	Only on ISP rated "118kA," Permanent short of ISP's slave thyristor detected. Retest to verify.
TEST MANUALLY STOPPED	Operator terminated testing manually using Stop button
TEST STOPPED, LOW BATTERY	Battery Pack Requires Recharging
FAIL, NO POS TRIGGER	Positive trigger of thyristors didn't occur or didn't occur at correct voltage. Retest.
FAIL, NO NEG TRIGGER	Negative trigger of thyristors didn't occur, or didn't occur at correct voltage. Retest.
FAIL, POS THYRISTOR STUCK	ISP triggered but thyristor remained conducting after test. Retest.
FAIL, NEG THYRISTOR STUCK	ISP triggered but thyristor remained conducting after test. Retest.
SUCCESS, BUT ISP NOT RESET	All tests pass, but thyristor remained conducting. Retest. May be due to transient stray sources holding thyristor in conduction.
SUCCESS, BUT ISP TRIGGER IS OUT OF RANGE	All tests pass and ISP is functional, but ISP triggered below or above voltage threshold range. Retest. ISP still performs DC isolation/AC continuity and over-voltage protection.
PASS, ALL TESTS NORMAL	All tests pass successfully.

If the operator experiences a test failure it is recommended that a retest be performed. It is a good idea to remove and then reset the test cable on the ISP unit to verify a good connection. Also examine the pins at the ISP test point to verify they are corrosion free and in good condition. There is the remote possibility that a fault condition was experienced during a testing sequence and retesting would eliminate this possibility. If there are two subsequent test failures in a row, there is likely a problem with the ISP itself and it is recommended the user contact tech support at Dairyland directly for a discussion of the reported failure condition and send the "MASTVOLT.TXT" file to Dairyland at techsupport@dairyland.com.

TEST REPORTING:

At the conclusion of any test sequence a status box is drawn on the home screen to reflect the results of a previous test. This eliminates the need for an operator to continuously monitor a test for results and allows them to see the results of a previous test if they need to step away from the ISP Tester.

Here is the home screen after a successful test and following initialization of the ISP Tester. At this point another test can be initiated or the tester can be powered down for movement to another location.

CONCLUDING TESTING

If adjacent ISPs are to be tested at the same facility it is preferable to first power the tester completely down and then move the test cable to the next ISP to be tested. The computer boot sequence is very short so this should not cause any significant time delay in testing. Note that the lid of the tester cannot be closed with the battery in place so remove it as well if the lid is to be closed. When completely done with testing first power the tester down and then remove the test cable taking care to replace the protective caps on the cable and on the ISP being tested as well. Remove the battery pack and USB drive and secure in the accessory case. Tester shutdown will erase data fields on screen. If the ISP Tester will remain powered when moving to the next ISP within a station, then be sure to change the serial number and any other needed information in the data fields.

SOFTWARE UPDATES

The ISP tester has a built-in boot loader used for software updates. This makes updating software in the field possible via USB drive preloaded with new software from Dairyland. To update software, place the USB data storage drive provided by Dairyland into the "USB DRIVE" slot. Turn the main power switch to the ON position. The tester will automatically detect the new software update and start the update process. The status of the update will be indicated via a green status bar on the screen. Turn the power switch OFF and then ON upon successful completion, to use the ISP Tester with the new software.

SUPPORT AND SERVICE

For technical assistance, contact Dairyland at 608-877-9900, or techsupport@dairyland.com. If a return of equipment is needed, only do so after a Return Material Authorization (RMA) has been issued by Dairyland.

Do not attempt to service the ISP Tester by opening the source unit. Contact Dairyland regarding any performance or repair issues.