

1303 System Test Set

Application & Operation



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1. ABBREVIATIONS

Ω	Ohms
k Ω	kilo Ohms (thousands)
AC.....	Alternating Current
ACU.....	Alarm Circuit Unit
BCT.....	Branch Cable Termination
CMS.....	Cable Management System (2000 or 4200)
CO.....	Central Office
DC.....	Direct Current
IVF.....	Induced Voltage Filter
LED.....	Light Emitting Diode
LPU.....	Line Protection Unit
LTU.....	Line Termination Unit
mA.....	milliAmps
MDT.....	Moisture Detection Tape
MTM.....	Multi-Tone Module
SGU.....	Sheath Grounding Unit
SSU.....	Splice Sensor Unit
STS.....	System Test Set
STU.....	Sequenced Termination Unit
TSU.....	Termination Sensor Unit

2. SPECIFICATIONS

Power Source	8 "D" Cells (1.5V) (Alkaline, NiMh or NiCad)
Battery Life	20 hours (approx.)
Max. AC input rejection	12 V AC _{rms}
Max. Input Voltage on V AC, V DC range	350 V
Max. Input Current on 2000, 200 mA range.....	2 A
Max. Input Current on 20, 2 mA range.....	200 mA
Accuracy on V DC (all ranges).....	+/- 1 %
Accuracy on A DC (all ranges).....	+/- 4 %
Accuracy on V AC (all ranges).....	+/- 2 %
Accuracy on A AC (range 2 & 20)	+/- 4 %
Accuracy on A AC (range 200 & 2000)	+/- 8 %
Accuracy on k Ω (all ranges).....	+/- 1 %
Accuracy on mA DC and mA AC range	+/- 2 %
Operating Temperature Range.....	5 to 30 °C
Auto shutdown period.....	5 minutes
Fuse - F1	200mA Buss GDA
Fuse - F2	2A Buss GDA
Fuse - F3	1A Buss GDA
Max. range to detect & decode SSU, STU or TSU	20 km (3 baud - xx04 series) 20 km (10 baud - xx05 series) 10 km (32 baud - xx06 series)

3. DESCRIPTION

The 1303 System Test Set (STS) is a battery operated, field rugged measurement system used to test cable armor, copper pairs, moisture detection tape and all Norscan sensor units. It is also used for the alignment of 2000 Alarm Circuit Units (ACUs). The set is both a specialized test system for testing sensors and a noise immune auto-ranging multimeter.

The 1303 STS is required for the installation and maintenance of all Norscan Cable Management System field components.

The 1303 STS functions are:

- AC & DC voltage and current measurements.
- Resistance measurements.
- Sensor testing and address decoding.
- Termination Sensor Unit (TSU) remote testing.

During cable installation and splicing, the 1303 STS is used to verify proper operation of the sensors, measure AC and DC voltage & current and test cable pairs and armor for faults.

The 1303 System Test Set is housed in a field rugged water resistant case. The set is supplied with two sets of test leads which are stored in a pouch mounted to the inside cover. One set of leads is fitted with multi-function alligator clips for general use. The other set of leads is fitted with tip plugs that mate with the tip jack test points on the 2000 ACU.

Warning!

Potential for electrical shock exists when handling cables. Always take DC and AC measurements using a Norscan 1303 System Test Set to determine what AC or DC voltages are present before handling the cable. If induced AC voltage levels exceed 16 V rms, install addition induced voltage filtering products to bring levels below 16 V rms. Always keep sheath grounding products connected to the cable armor to ensure adequate protection against transient voltage activity.

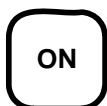
4. OPERATION

This section describes the general operation of the 1303 System Test Set. Refer to Figure 1 while reading the instructions for measurement.



Figure 1: 1303 System Test Set – top view

WARNING: *Even low-level voltages and currents can cause injury or even death from electrical shock. Do not use this or any piece of test equipment without proper training.*



4.1 Power On

Press the ON key to power up the set. The set will beep and start up in the AUTO VDC range. The 1303 STS has an auto power-down feature that will automatically turn the set off after 5 minutes. Press the ON key to resume operation should the set power down during use.

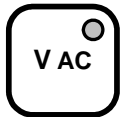


4.2 DC Voltage Measurement

To select the DC volts measurement function, press the VDC key once. The set will beep and the LED on the key will illuminate. The test set will automatically select Auto-Range.

Connect the blue lead to the circuit being measured and the white lead to common or ground. The STS will display the voltage at the blue lead with respect to the white lead in volts.

To stop the Auto-Range operation, press a range key once for desired range (2, 20, 200 or 2000). If the measured voltage is greater than the selected range, the display will indicate "OL".



4.3 AC Voltage Measurement

To select the AC volts measurement function, press the VAC key once. The set will beep and the LED on the key will illuminate. The test set will automatically select Auto-Range.

Connect the blue lead to the circuit being measured and the white lead to common or ground. The STS will display the voltage at the blue lead with respect to the white lead in volts.

To stop the Auto-Range operation, press a range key once for desired range (2, 20, 200 or 2000). If the measured voltage is greater than the selected range, the display will indicate "OL".



4.4 DC Current Measurement

NOTE: Extreme over current can blow the protection fuses or damage the set - disconnect the test leads immediately if "E1 or E2" readings appear in the display.

To select the DC milliamps measurement function, press the mA DC key once. The set will beep and the LED on the key will illuminate. To prevent damage from over-current, the test set does not Auto-Range in the current mode. The highest range (2000 mA) will be selected automatically.

Connect the test leads to the conductors to be measured. The STS will display the current measurement in milliamps.

To read current with the greatest resolution, select a lower range starting at 200 and work down range to a reading that does not overdrive the unit. If the measured current is greater than the selected range, the display will indicate "OL".



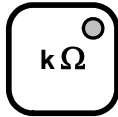
4.5 AC Current Measurement

NOTE: Extreme over current can blow the protection fuses or damage the set - disconnect the test leads immediately if "E1 or E2" readings appear in the display.

To select the AC milliamps measurement function, press the mA AC key once. The set will beep and the LED on the key will illuminate. To prevent damage from over-current, the test set does not Auto-Range in the current mode. The highest range (2000 mA) will be selected automatically.

Connect the test leads to the conductors to be measured. The STS will display the current measurement in milliamps.

To read the current with the greatest resolution, select a lower range starting at 200 and work down range to a reading that does not overdrive the unit. If the measured current is greater than the selected range, the display will indicate "OL".



4.6 Resistance Measurement

To select standard resistance measurement, press the kΩ twice within two seconds. The set will beep and the LED on the kΩ key will illuminate. The test set will start in the Auto-Range mode and continuously update the display.

Connect the test leads to the conductors to be measured.

The test set will Auto-Range down to the lowest suitable range within the unknown resistance value and display the result in kΩ.

NOTE: *The 1303 STS measures resistance in kΩ, a display reading, for example, of .104 would indicate a value of 104 Ω*

To stop the Auto-Range operation, press a range key for desired range (2, 20, 200 or 2000). If the measured resistance is greater than the selected range, the display will indicate "OL".



4.7 Armor to Ground Resistance Measurement

The 1303 STS performs the armor-to-ground resistance measurement automatically. To eliminate errors caused by DC offsets or noise, the test set applies both positive and negative polarity measurement currents to the line and then calculates and displays the resulting average resistance value.

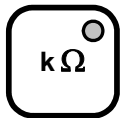
Prior to measuring the armor-to-ground resistance on a cable section, be certain that the section is isolated from both the Central Office equipment and the termination units (TSU or BCT). The Central Office equipment can be removed from the cable section by turning the ACU and MTM off.

NOTE: An STU, IVF, SGU, LTU or LPU at the termination will not affect the resistance measurement since these units are an 'open circuit'. Only the TSU or BCT will affect the measurement since they have a 100 kΩ input resistance.

Connect the blue test lead to the shield and the white lead to ground. Select the armor-to-ground resistance measurement by pressing the kΩ key once.

During the measurement, the set will beep in one-second intervals. When the measurement is complete, a long tone beep will sound and the result will be displayed in kΩ.

To repeat the measurement, press the kΩ key or a range key once again.



4.8 Armor to Ground Resistance Measurement - alternate method

When it is not possible to isolate the termination units from the cable end, proceed as follows:

Prior to measuring the armor-to-ground resistance on a cable section, be certain that the section is isolated from the Central Office equipment by turning off the ACU and MTM.

When measuring armor-to-ground resistances be certain to place the blue lead to the armor and the white lead to ground.

Press the kΩ key twice within two seconds. The set will beep and the LED on the kΩ key will illuminate. The test set will start in the Auto-Range mode and continuously update the measurement.

NOTE: If you turn on the Armor to Ground Resistance mode by pressing the kΩ key only once, the TSU will activate since the voltage polarity is flipped during this mode. If a TSU is connected, be sure to press the kΩ key twice.

The test set will Auto-Range down to the lowest suitable range within the unknown resistance value and display the result in kΩ.

Each TSU or BCT on the line will place a 100 kΩ resistance in parallel across the armor to ground. The resulting measured resistance will be a parallel combination of the termination units and the armor-to-ground resistance (Figure 2).

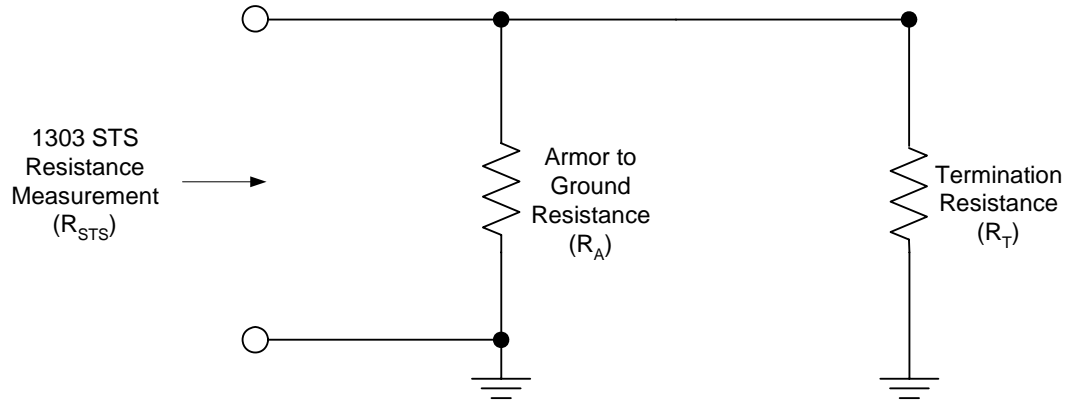


Figure 2: Armor to Ground resistance schematic

The armor-to ground resistance can be calculated as follows:

$$R_A = (R_{STS} \times R_T) / (R_T - R_{STS})$$

Where: R_{STS} = Test Set armor-to-ground resistance reading
 R_T = 100 k Ω / (number of termination units)
 R_A = True armor-to-ground fault resistance in k Ω (unknown)

Example: A 1303 STS resistance measurement from armor to ground is 37.5 k Ω . There is a Termination Sensor Unit and a Branch Circuit Termination so the number of termination units is 2.

The true armor-to-ground resistance is:

$$\begin{aligned} R_A &= (37.5 \text{ k}\Omega \times (100 \text{ k}\Omega / 2)) / ((100 \text{ k}\Omega / 2) - 37.5 \text{ k}\Omega) \\ &= (37.5 \times 50) / (50 - 37.5) \\ &= 150 \text{ k}\Omega \end{aligned}$$



4.9 SSU and STU Test

The SSU test function is used to check for proper operation of the Splice Sensor Unit (SSU). This is typically done prior to closing a splice during installation or after a splice repair. Under favorable conditions, the 1303 STS will detect and decode a triggered Norscan sensor unit at distances of up to 30 km for the 1104 series (3 baud), 20 km for the 1105 series (10 baud), and 10 km for the 1106 series (32 baud).

An STU has the same MDT functionality as the SSU and both sensors can be tested with the SSU test function on the STS. To fully test the STU, however, use the CMS shelf to initiate a termination test.

Before proceeding, disconnect the monitoring and toning voltages by turning off the ACU and MTM.

Connect the test set across the output leads of the sensor - blue-to-blue and white-to-white.

Press the SSU key to select the sensor test function. The set will beep once and the LED on the SSU key will illuminate.

NOTE: If a resistive fault of 250k Ω or less is present, the STS will have a continuous tone before the sensor is triggered. A ground fault below 5k Ω may prevent the sensor code from being displayed.

Trigger the sensor by momentarily shorting the MDT leads together. A pulsing tone will be heard after several seconds and the sensor code will be displayed.

If the set remains quiet or if no regular pulsing is heard then the sensor is not triggered. Make sure the blue lead is disconnected from the cable network and the MDT leads are momentarily shorted together.



4.10 TSU Test

The TSU test function is used to check for proper operation of the Termination Sensor Unit during installation or when the CMS shelf is unavailable. During the TSU test, the 1303 STS applies a reverse polarity test voltage that triggers the TSU and causes it to transmit its identification code. Under favorable conditions, the 1303 STS will detect and decode a TSU at distances of up to 30 km for the 2204 series (3 baud), 20 km for the 2205 series (10 baud) and 10 km for the 2206 series (32 baud).

Before proceeding, disconnect the Central Office equipment from the line by turning off the ACU and MTM.

Connect the test set across the output leads of the TSU – blue-to-blue and white-to-white.

To select the TSU test function, press the TSU key once. The set will beep once and the LED on the key will illuminate.

A pulsing tone will be heard and the sensor identification code of the TSU will appear in the display.



4.11 CAL Test

The CAL test function is used to perform a general operational check of the 1303 STS. Pressing the CAL key once will initiate the following test sequence:

- a) All segments of the display are driven and should be visible.
- b) The LED on each key lights up momentarily in sequence.
- c) The display shows the software version.
- d) The set returns to the VDC measurement mode.

5. MAINTENANCE

5.1 Battery Replacement

The 1303 STS is powered by eight 1.5 V alkaline "D" cells. The batteries should be changed when the LO BAT warning appears in the display. The battery holder clips are mounted on the underside of the front panel (Figure 3).

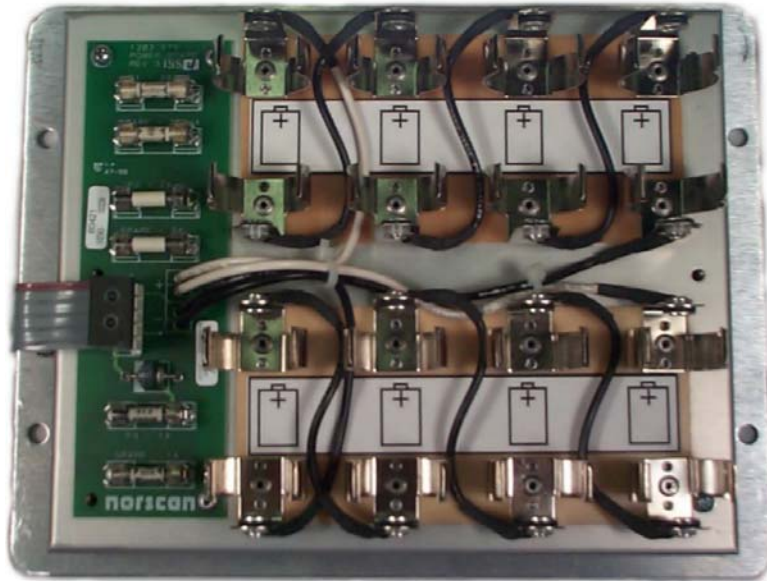


Figure 3: Battery and fuse holders

- a) Remove the four front panel screws and lift the front panel and chassis out of the bottom case.
- b) Place the chassis with the front panel facing down on a soft cloth.
- c) Observe polarity and replace the batteries with 1.5 V "D" cells (Alkaline, NiMh or NiCad).
- d) Place the chassis into the bottom case and replace the four front panel screws.

5.2 Fuse Replacement

A fuse panel is located on the left side of the rear chassis (Figure 3). There are three fuses mounted in fuse clips. A spare fuse is placed in a clip below each main fuse.

- a) Remove the four front panel screws and lift the front panel and chassis out of the bottom case.
- b) Place the chassis with the front panel facing down on a soft cloth.
- c) Check fuses for continuity with an ohm-meter. Replace any blown fuses with the same type. If the spare fuse is used, order a replacement (see specifications).
- d) Place the chassis into the bottom case and replace the four front panel screws.

5.3 Cleaning

When cleaning is required, use a mild soap solution and soft cloth. Dampen the cloth and carefully clean the front panel and case. Follow with a cloth moistened with clean water. Do not use solvents or abrasives on the front panel.

5.4 Storage

Remove the batteries when storing the test set for long periods of time.

6. TROUBLESHOOTING

Symptom: The LO BAT warning is present on the display.

Cause: The batteries are exhausted.

Action: Replace the batteries with 1.5 V “D” cells (Alkaline, NiMh, NiCad)

Symptom: The set will not power up.

Cause 1: The batteries are dead.

Action: Replace the batteries.

Cause 2: Fuse F3 is blown.

Action: Replace fuse F3.

Cause 3: The set is damaged.

Action: Return for repair.

Symptom: The E1 warning is present in the display when measuring current.

Cause 1: The fuse F1 is blown.

Action: Replace fuse F1.

Cause 2: The input circuit is damaged.

Action: Return for repair.

Symptom: The E2 warning is present in the display when measuring current.

Cause 1: The fuse F2 is blown.

Action: Replace fuse F2.

Cause 2: The input circuit is damaged.

Action: Return for repair.

Symptom: The SSU Test does not decode the sensor (SSU or STU).

Cause 1: A low resistance fault (<5kΩ) exists on the line.

Action: Check the line for resistive faults.

Cause 2: The SSU or STU is not triggered.

Action: Short the MDT leads of the sensor.

Cause 3: The SSU or STU is too far away.

Action: Limits are: 30km – 3 baud, 20km – 10 baud, 10 km – 32 baud

Cause 4: The STU is not coded x99.

Action: Due to the sequenced action of the STU, an STU coded for x97 will only be decoded after enough time has passed for the x98 and x99 STUs to be received (3 minutes per STU).

Cause 5: SSU is defective.

Action: Replace SSU.

Cause 6: Test set is defective.

Action: Check with known good SSU. If no response, return for repair.

Symptom: **The TSU Test does not decode the termination sensor.**

Cause 1: A short or low resistance fault exists on the line.

Action: Check the line for resistive faults.

Cause 2: TSU is defective.

Action: Replace TSU.

Cause 3: Test set is defective.

Action: Check with known good TSU. If no response, return for repair.

Symptom: **The CAL Test does not perform as specified.**

Cause: The test set is damaged.

Action: Return for repair.

If you need further assistance please call

(204) 233-9138

email: support@norscan.com

web: www.norscan.com