



**F2 Labs**  
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## EMC TEST REPORT

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**Manufacturer:** Utility Relay Company  
10100 Queens Way  
Chagrin Falls, Ohio  
United States of America

**Product:** Satin America ETC-12 Trip Unit

**Model:** Q Series

**Testing Commenced:** Dec. 20, 2013

**Testing Ended:** Dec. 20, 2013

**Summary of Test Results:** Page 3

**Directive:** EMC Directive (2004/108/EC)

**Deviations (if applicable):** N/A

**Standard(s):**

- ❖ **ANSI C37.90.2:2004 – IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers**
- ❖ **EN 61000-6-2:2005 - Electromagnetic Compatibility-Generic standards, Part 6-2: Immunity for Industrial Environments**
  - **EN 61000-4-3:2002 - Electromagnetic Compatibility-Part 4: Testing and measurement techniques – Section 3: Radiated, radio-frequency, electromagnetic field immunity test**



Order Number: F2LQ5899

Client: Utility Relay Company  
Model: Satin America ETC-12 Trip  
Unit, Model Q Series

Evaluation Conducted by:

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### GENERAL REPORT SUMMARY

This electromagnetic immunity test report was generated by F2 Labs. The test report is based on testing performed by F2 Labs personnel according to the measurement procedures described in the test specifications given below and in the Test Procedures section of this report.

SECTION	TEST	RESULTS
9	Radiated Immunity	Fail

Note: Pass/Fail criteria are based upon the following condition: Where the results are compared to published test standard or manufacturer specified limits, the PASS or FAIL opinion is considered without applying the laboratory stated measurement uncertainty.

Reports noted as a revision replace all previously issued reports and/or antecedent report revisions issued under this job number.



**1.0 ADMINISTRATIVE DATA**

**1.1 Management of Test Sample**

The test sample was inventoried at the F2 Labs facility and returned to Utility Relay Company, according to the agreement between F2 Labs and the Client.

**1.2 Abbreviations and Acronyms**

The following abbreviations and acronyms may be used in this document.

- AM Amplitude Modulation
- BCI Bulk Current Injection
- CDN Coupling/Decoupling Network
- EFT Electrical Fast Transients
- EMC Electromagnetic Compatibility
- EMIC Electromagnetic Injection Clamp
- EN European Norm
- ESD Electrostatic Discharge
- EUT Equipment Under Test
- GRP Ground Reference Plane
- HCP Horizontal Coupling Plane
- HGP Horizontal Ground Plane
- IEC International Electrotechnical Commission
- kHz kiloHertz
- LISN Line Impedance Stabilization Network
- MHz MegaHertz
- OATS Open Area Test Site
- RF Radio Frequency
- VCP Vertical Coupling Plane

**1.3 Document History**

Document Number	Description	Issue Date	Approved By
F2LQ5899-01E	First Issue	Jan. 13, 2014	K. Littell



## 2.0 PERFORMANCE CRITERIA

### ANSI/IEEE C37.90.2-2004:

#### 6.4 Criteria for acceptance

##### 6.4.1 Application of criteria

The criteria below shall apply to the equipment being directly tested, and any devices linked to the equipment via direct or remote connections. Examples of the connections are current loops and voltage circuits (dc, audio, carrier or microwave). Serial, parallel, optical (fiber or infrared), and radio frequency connections apply as well.

##### 6.4.2 Conditions to be met

The equipment shall be considered to have passed the electromagnetic interference tests if during, or as a result of the tests, all of the conditions below are met for the equipment and the connected devices:

- a) The specified performance of the equipment, including the operating time, does not change, beyond stated tolerances.
- b) No hardware damage occurs.
- c) No change in calibration beyond normal tolerances results.
- d) No loss or corruption of stored memory or data, including active or stored settings, occurs.
- e) "System resets" do not occur, and manual resetting is not required.
- f) Establish communications not affecting protection functions recover within the manufacturer's time period, if disrupted.
- g) Communications errors if they occur, do not jeopardize the protective functions.
- h) No loss of digital pulse synchronization occurs or where the loss of digital pulse synchronization does occur. It shall not produce an out of tolerance condition.
- i) No changes in the states of the electrical, mechanical, or status outputs occur. This includes alarms, status outputs, or targets.
- j) No erroneous, permanent change of state of the visual, audio, or message outputs results. Momentary changes of these outputs during the tests are permitted.
- k) No error outside normal tolerances of the data communication signals (Supervisory Control and Data Acquisitions (SCADA) analogs) occurs.

##### 6.4.3 Equipment functioning

During and after the tests, the equipment and the connected devices shall be completely and accurately functional as designed, for the equipment to be considered as having passed the electromagnetic interference tests.



**EN 61000-6-2:2005:**

SPECIFICATION	PERFORMANCE CRITERION
EN 61000-4-3	A

Performance Criterion A: The apparatus shall continue to operate as intended both during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

Performance Criterion B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

Performance Criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.



### 3.0 MEASUREMENT OF UNCERTAINTY BUDGETS

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data.

MEASUREMENT	EXPANDED UNCERTAINTY
Radiated Immunity	2.12dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .





**4.0 Equipment Under Test (EUT):**

Device	Manufacturer	Model Number	Serial Number
ETC-12 Trip Unit	Satin America	Q Series	S-15513

**4.1 Accessories (Support Equipment):**

Device	Manufacturer	Model Number	Serial Number
Current Source	Multi-Amp	MS-IA	9572

**4.2 Cables:**

Cable Function	Length	Shielded (Yes/No)
Current Supply	>3m	No



## 5.0 MODE OF OPERATION

EUT was set up in a normal testing manner, powered by a current source. EUT was monitoring current flow.

## 6.0 METHOD OF MONITORING

EUT was monitored by front display and tripping function.

## 7.0 IMMUNITY DEGRADATION DEFINITION

The following shall constitute degradation:

- if EUT trips unintentionally,
- if the EUT fails to trip when operator chooses;
- if the EUT loses power;
- if the EUT displays any errors.

## 8.0 REQUIRED MODIFICATIONS

No modifications were made to the EUT.



**9.0 RADIATED IMMUNITY TEST**

**9.1 Radiated Immunity Test Procedure**

The Equipment Under Test (EUT) was placed in a semi-anechoic chamber on a 0.8-meter high non-conductive table. A broadband antenna was placed 1.8 meters from the EUT and was used to radiate RF energy at the EUT in both horizontal and vertical polarities.

The RF energy consisted of a signal that was stepped at 1% increments through the frequency range of 80 MHz to 1000 MHz, 1400 MHz to 2000 MHz and 2000 MHz to 2700 MHz, at a rate slower than the reaction time of the EUT. The signal was 80% AM modulated with a 1 kHz sine wave and had a minimum calibrated field strength of 35.0 volts/meter at the surface of the EUT. The EUT was exposed to the RF energy on four different surfaces (front, rear, left and right sides).

The test setup conformed to EN 61000-4-3 (Note: C37.90.2 refers to EN 61000-4-3 test methods).

**Test Equipment Used:**

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shield Room	0175	Ray Proof	N/A	11645	Aug. 7, 2014
Temp/Hum. Recorder	CL137	Extech	RH520	CH16992	Apr. 17, 2014
Antenna 1-Chamber	0142	ETS/EMCO	3142B	9811-1330	Verified
Amplifier	0171	Instruments for Industry	SMX 100	2158-1096	Verified
Power Meter; Power Sensor	CL148	Agilent Technologies	E4418B; E9300B	MY41294473; MY41496326	May 2, 2014
Signal Generator	0213	Hewlett Packard	8648C	3623A03444	Nov. 26, 2014
Software:	Tile Version 1.0		Software Verified: Dec. 20, 2013		
Amplifier	0185	Ophir	5151F	1001	Verified
Antenna, Horn	0138	ARA	DWG-118/A	1109	Verified



9.2 Radiated Immunity Test Data Sheet

<b>Test Date:</b>	Dec. 20, 2013	<b>Test Engineer:</b>	J. Knepper
<b>Standard:</b>	EN 61000-6-2:2005	<b>Air Temperature:</b>	20.5° C
<b>Minimum Performance Criterion:</b>	C37.90.2 Sections 6.4.2 & 6.4.3; EN 61000-6-2 Criterion A	<b>Relative Humidity:</b>	50%

Side of EUT Exposed to Antenna	Antenna Polarization	Frequency Range (MHz)	Minimum Calibrated RF Field Strength	Achieved Performance Criterion	Pass/Fail
Front	Horizontal	80 to 1000	10.0 V/m	A	Pass
Right Side	Horizontal	80 to 1000	10.0 V/m	C*	Fail
Rear	Horizontal	80 to 1000	10.0 V/m	C*	Fail
Left Side	Horizontal	80 to 1000	10.0 V/m	C*	Fail
Front	Vertical	80 to 1000	10.0 V/m	C*	Fail
Right Side	Vertical	80 to 1000	10.0 V/m	A	Pass
Rear	Vertical	80 to 1000	10.0 V/m	C*	Fail
Left Side	Vertical	80 to 1000	10.0 V/m	C*	Fail

Side of EUT Exposed to Antenna	Antenna Polarization	Frequency Range (MHz)	Minimum Calibrated RF Field Strength	Achieved Performance Criterion	Pass/Fail
Front	Horizontal	1400 to 2000	3.0 V/m	A	Pass
Right Side	Horizontal	1400 to 2000	3.0 V/m	A	Pass
Rear	Horizontal	1400 to 2000	3.0 V/m	A	Pass
Left Side	Horizontal	1400 to 2000	3.0 V/m	A	Pass
Front	Vertical	1400 to 2000	3.0 V/m	A	Pass
Right Side	Vertical	1400 to 2000	3.0 V/m	A	Pass
Rear	Vertical	1400 to 2000	3.0 V/m	A	Pass
Left Side	Vertical	1400 to 2000	3.0 V/m	A	Pass

Side of EUT Exposed to Antenna	Antenna Polarization	Frequency Range (MHz)	Minimum Calibrated RF Field Strength	Achieved Performance Criterion	Pass/Fail
Front	Horizontal	2000 to 2700	1.0 V/m	A	Pass
Right Side	Horizontal	2000 to 2700	1.0 V/m	A	Pass
Rear	Horizontal	2000 to 2700	1.0 V/m	A	Pass
Left Side	Horizontal	2000 to 2700	1.0 V/m	A	Pass
Front	Vertical	2000 to 2700	1.0 V/m	A	Pass
Right Side	Vertical	2000 to 2700	1.0 V/m	A	Pass
Rear	Vertical	2000 to 2700	1.0 V/m	A	Pass
Left Side	Vertical	2000 to 2700	1.0 V/m	A	Pass



Order Number: F2LQ5899

Client: Utility Relay Company  
Model: Satin America ETC-12 Trip  
Unit, Model Q Series

**\*Notes**

Tripped Frequencies @ 10V/m:

- Front Vertical: 80, 80.8, 81.61, 90.14, 93.8 MHz
- Left Vertical: 83.2, 92.8 MHz
- Rear Vertical: 80, 88.3 MHz
- Right Vertical: No trips.
- Right Horizontal: 88.37, 91.05 MHz
- Front Horizontal: No trips.
- Rear Horizontal: 88.3, 89.2 MHz
- Left Horizontal: 86.6, 90.15 MHz



<b>Test Date:</b>	Dec. 20, 2013	<b>Test Engineer:</b>	J. Knepper
<b>Standard:</b>	ANSI/IEEE C37.90.2-2004	<b>Air Temperature:</b>	20.5° C
<b>Minimum Performance Criterion:</b>	C37.90.2 Sections 6.4.2 & 6.4.3; EN 61000-6-2 Criterion A	<b>Relative Humidity:</b>	50%

Side of EUT Exposed to Antenna	Antenna Polarization	Frequency Range (MHz)	Minimum Calibrated RF Field Strength	Achieved Performance Criterion	Pass/Fail
Front	Horizontal	80 to 1000	20.0 V/m	C*	Fail
Right Side	Horizontal	80 to 1000	20.0 V/m	C*	Fail
Rear	Horizontal	80 to 1000	20.0 V/m	C*	Fail
Left Side	Horizontal	80 to 1000	20.0 V/m	C*	Fail
Front	Vertical	80 to 1000	20.0 V/m	C*	Fail
Right Side	Vertical	80 to 1000	20.0 V/m	C*	Fail

**\*Notes**

Tripped Frequencies @ 20V:

- Front Vertical: 80.0-96.65 MHz
- Right Vertical: 80.0, 91.95 MHz
- Right Horizontal: 80, 95.7, 261.4, 266.7, 277.5, 280.3, 283.1, 285.9, 288.7, 322.2, 335.3, 359.4, 363, 366.6, 370 MHz
- Front Horizontal: 80, 94.7, 110, 111.21, 306.5, 318.9, 322.2, 325.4, 328.64, 335.3 MHz
- Rear Horizontal: 315.82, 322.2, 91.05 MHz
- Left Horizontal: 80, 95.68, 300.5, 306.5, 309.6, 318.9 MHz



### 9.3 Photograph(s) of the Radiated Immunity Test Setup

Front View



Left View





Right Side View



Left Side View

