TEST REPORT

Report Number: 3038984-37-1-1
Project Number: 3038984
July 8, 2003

Testing performed on the
Wall Mount Programmable Thermostat
Model Number: WMT

to

FCC Part 15.231 / RSS210

For Acumen, Inc.

Test Performed by:	**Test Authorized by:**
Intertek ETL Semko	Acumen, Inc.
1950 Evergreen Blvd, Suite 100	101A Executive Drive, Suite 200
Duluth, GA 30096	Sterling, VA 20166

Prepared by: _____ Date: 7/8/03
Jeremy C. Pickens

Reviewed by: _____ Date: 7/9/03
David J. Schramm

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1 Summary of Tests

MODEL: WMT
FCC ID: EPKWMT05TX

TEST	REFERENCE	RESULTS
Radiated Emission	15.231(b)	Complies
Out of Band Radiated Emission	15.231(b)	Complies
AC Conducted Emission	15.207	Not Required
20 dB Bandwidth	15.231(c)	Complies
Frequency Tolerance	15.231(d)	Complies
Antenna Requirement	15.203	Complies

Jeremy O. Pickens, Senior Project Engineer — Date: 7/8/03

David J. Schramm, EMC Team Leader — Date: 7/9/03

2 General Description

2.1 Product Description

The test results in this report pertain only to the item(s) tested.

The following description of the Wall Mount Programmable Thermostat was supplied by Acumen, Inc.:

Overview of the EUT

Applicant	Acumen, Inc. 101A Executive Drive, Suite 200 Sterling, VA 20166
Trade Name & Model No.	Wall Mount Programmable Thermostat / WMT
FCC Identifier	EPKWMT05TX
Use of product	Programmable Thermostat
Transmitter activation	[x] Manual and automatically deactivate within 5 seconds of being released [ ] Periodic transmissions
Frequency Range (MHz)	350.1
Antenna Requirement	The EUT uses a permanently connected antenna.
Manufacturer name & address	Acumen, Inc. 101A Executive Drive, Suite 200 Sterling, VA 20166
EUT type	Production
EUT received date:	March 27, 2003
Operating condition:	Good

2.2 Related Submittal(s) Grants

This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application.

2.3 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4 (1992). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Data Sheet"** of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

The Duluth 10-meter chamber site is located at 1950 Evergreen Blvd., Suite 100, Duluth, Georgia. The test site is a 10-meter semi-anechoic chamber. The site meets the characteristics of CISPR 16-1: 1993 and ANSI C63.4: 1992. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

The A2LA accreditation code for this site is 121624 under certificate number 1455.01.

The Industry Canada file number for this site is IC 2077.

3 System Test Configuration

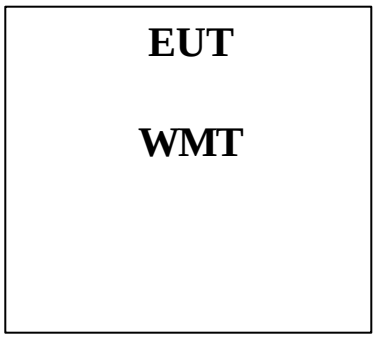
3.1 Support Equipment

No support equipment was needed for this evaluation.

3.2 Cabling

No cables were needed for this evaluation.

3.3 Block Diagram of Test Setup



3.4 Justification

For emissions testing, the test procedures described in American National Standards Institute C63.4-1992 were employed. The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it).

The EUT was configured to transmit full power.

3.5 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. For emissions testing, the units were setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

3.6 Mode of Operation During Test

The EUT was set to transmit continuously during testing.

3.7 Modifications Required for Compliance

No modifications were installed by Intertek during compliance testing in order to bring the product into compliance (Please note that this does not include changes made specifically by Acumen, Inc. prior to compliance testing)

3.8 Additions, deviations and exclusions from standards

No additions, deviations or exclusions from the standard were made.

4 Measurement Results

4.1 Radiated Emission
FCC Rule 15.231(b)

4.1.1 Procedure

For radiated emission measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable. The signal is maximized through rotation and placement in the three orthogonal axes.

During the test the EUT is rotated and the antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance.

Radiated emission measurements were performed from 30 MHz to 4500 MHz.
Analyzer resolution is:
100 kHz or greater for frequencies 1000 MHz and below,
1 MHz for frequencies above 1000 MHz.

The Peak value of the Field Strength was measured. The Average value was obtained from the Peak by subtracting the Duty Cycle Correction Factor.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

4.1.2 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follows:
FS = RA + AF + CF - AG
Where FS = Field Strength in dB (µV/m)
RA = Receiver Amplitude (including preamplifier) in dB (µV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB(1/m)
AG = Amplifier Gain in dB

4.1.3 Test Result

The following data list the significant emission frequencies, the limit and the margin of compliance. The EUT was scanned from 30 MHz to 5 GHz. There were no other radiated emissions within 20 dB of the limit.

Table 4-1: Radiated Emissions - Fundamental

Company:	**Acumen Inc.**	Tested by:	Matthew Van Steen
Model:	**WMT-06**	Location:	Duluth
Project No.:	**3038984**	Detector:	HP8546
Date:	06/13/03	Antenna:	Chase 2622
Standard:	FCC15	PreAmp:	None
Class:	A Group: None	Cable(s):	Cable TW3 Cable N2
Notes:		Distance:	**3**

Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Average Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB
V	350.000	58.8	14.4	3.8	0.0	4.2	72.8	77.5	-4.7
H	349.965	56.6	14.4	3.8	0.0	4.2	70.6	77.5	-6.9

Table 4-2: Radiated Emissions – Spurious Emissions

Company:	**Acumen Inc.**	Tested by:	Matthew Van Steen
Model:	**WMT-06**	Location:	Duluth
Project No.:	**3038984**	Detector:	HP8546
Date:	06/13/03	Antenna:	EMCO 3115
Standard:	FCC15	PreAmp:	HP8449B
Class:	A Group: None	Cable(s):	HS7000 N-SM
Notes:		Distance:	**3**

Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB
V	1049.000	42.0	25.4	2.5	37.2	0.0	32.6	54.0	-21.4
H	1049.000	39.9	25.4	2.5	37.2	0.0	30.5	54.0	-23.5

4.2 AC Line Conducted Emission
FCC Rule 15.207

4.2.1 Measurement Procedure
Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4: 1992

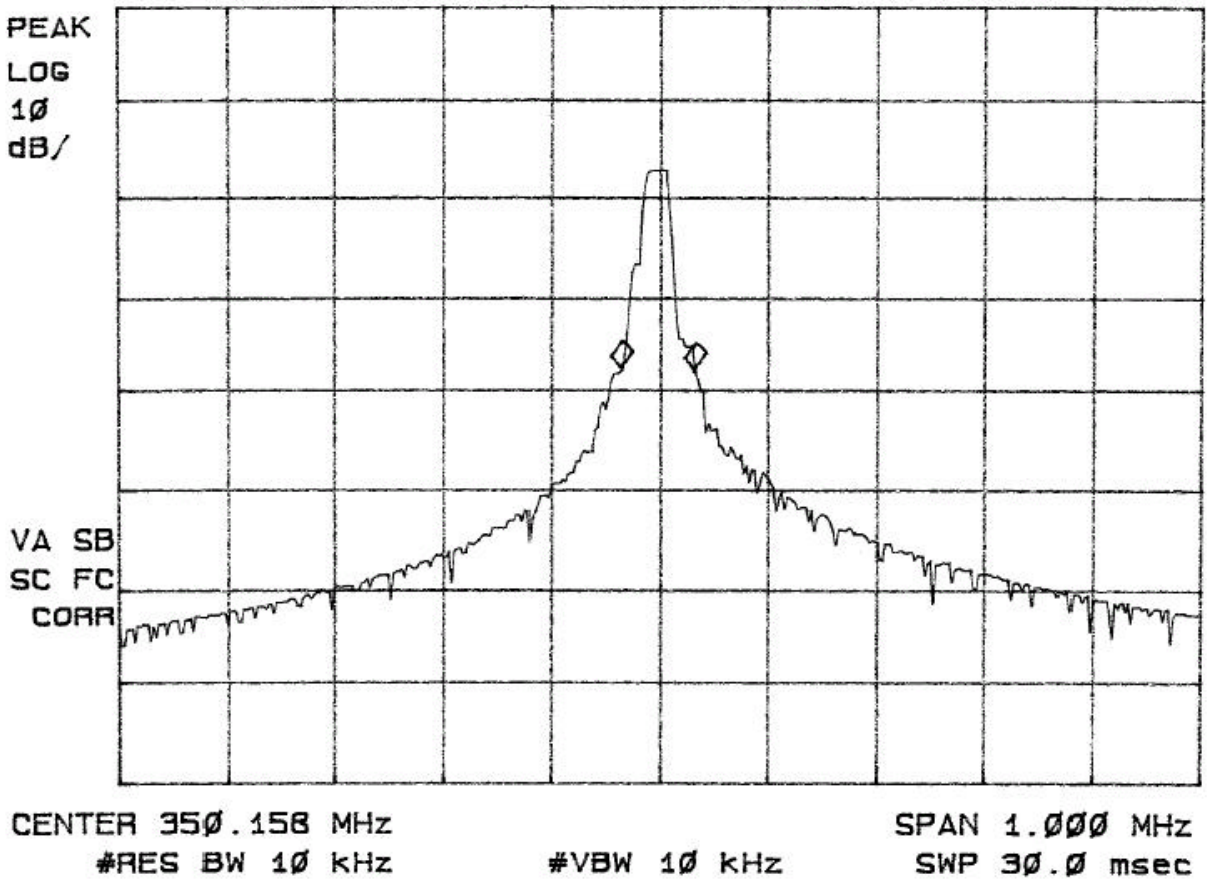
4.2.2 Test Result

This test was not required as the EUT is battery powered and does not connect to the ac mains.

4.3 Occupied Bandwidth Plot

The following plots show the occupied bandwidth the transmitter. The widest occupied bandwidth at 20 dBc is 68 kHz, which is 0.0002% of the fundamental frequency.

Figure 4-1: Bandwidth plot



4.4 Transmitter Duty Cycle Calculation and Measurements

The following plots show the Duty Cycle (DC) of the transmission signal. The Duty Cycle Correction Factor is 4.2 dB.

Duty Cycle is defined as the maximum ON time in a 100 millisecond period divided by 100.

Duty Cycle Correction Factor, dB = 20 * log(DC)

Figure 4-2: Output – 5 seconds

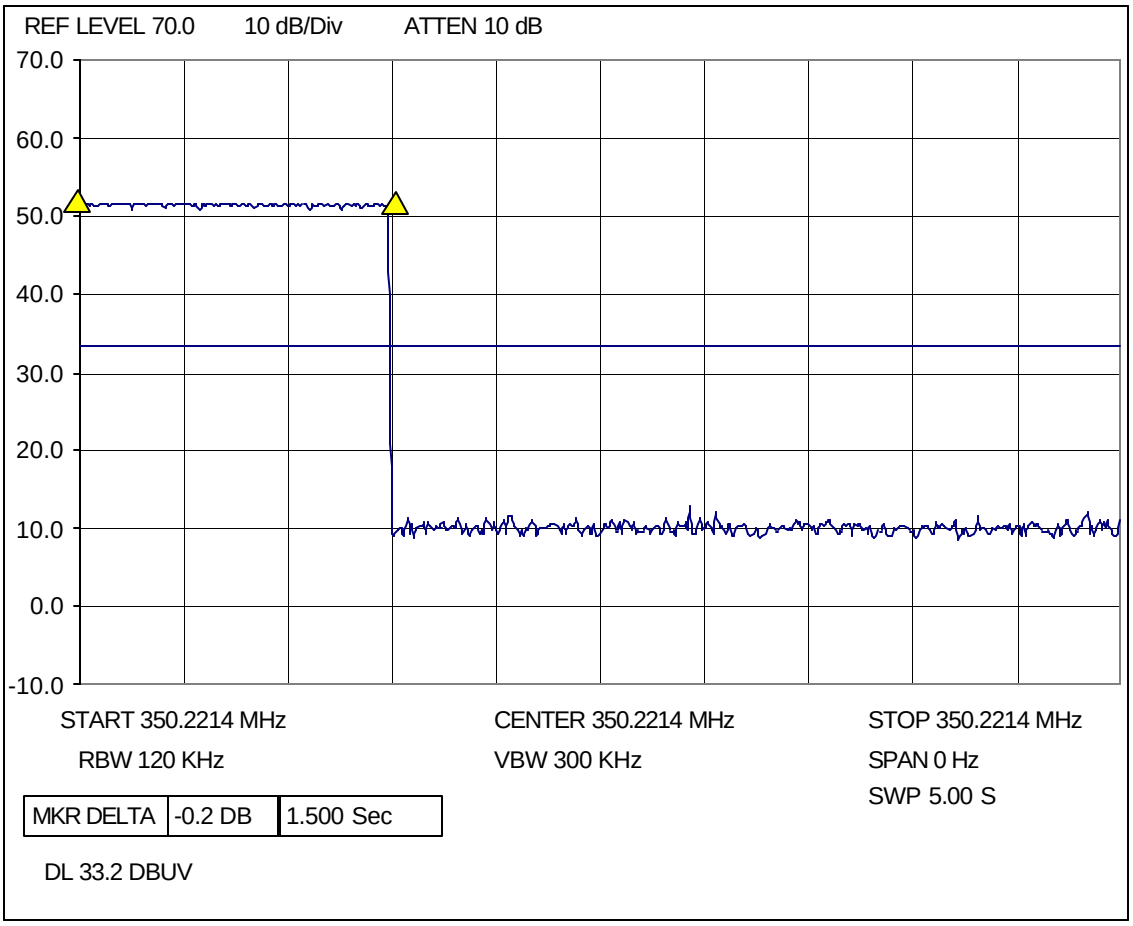


Figure 4-3: Output – 100 milliseconds

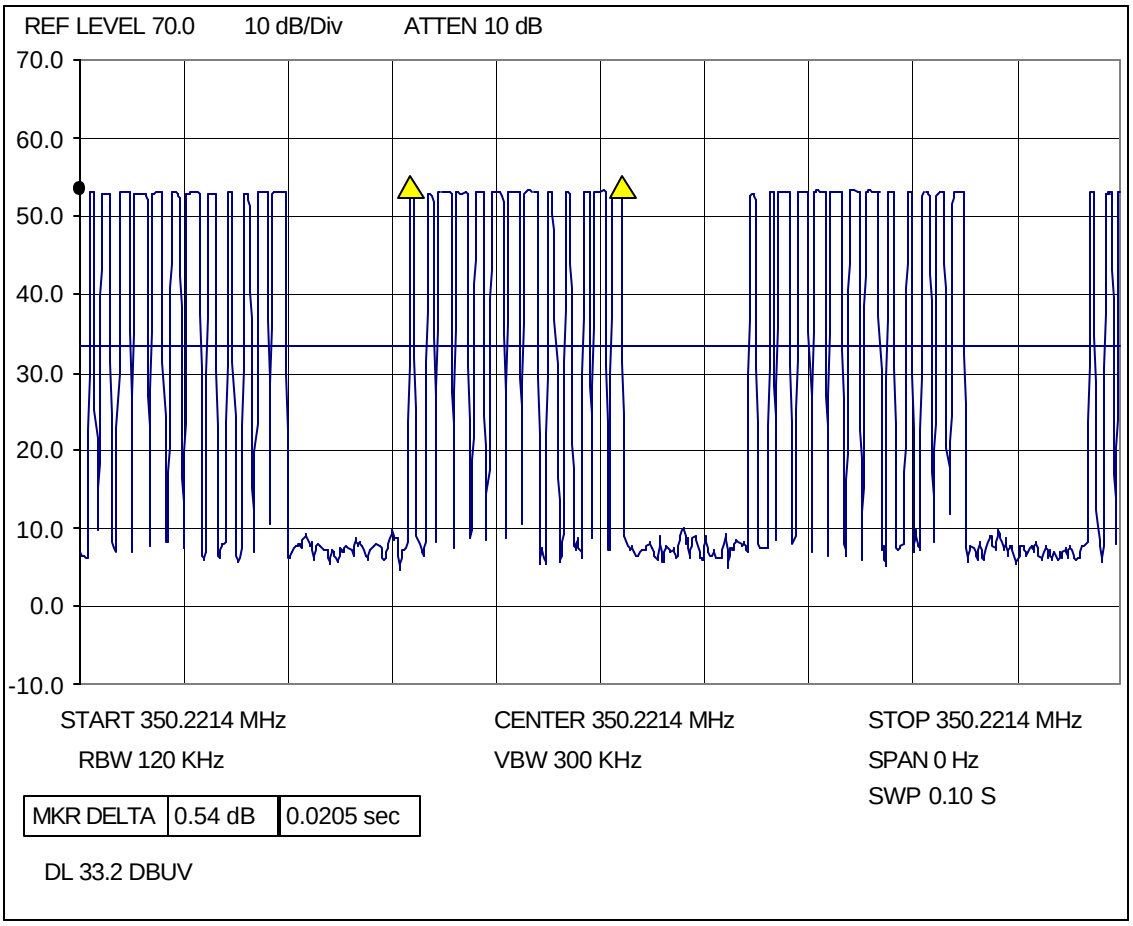
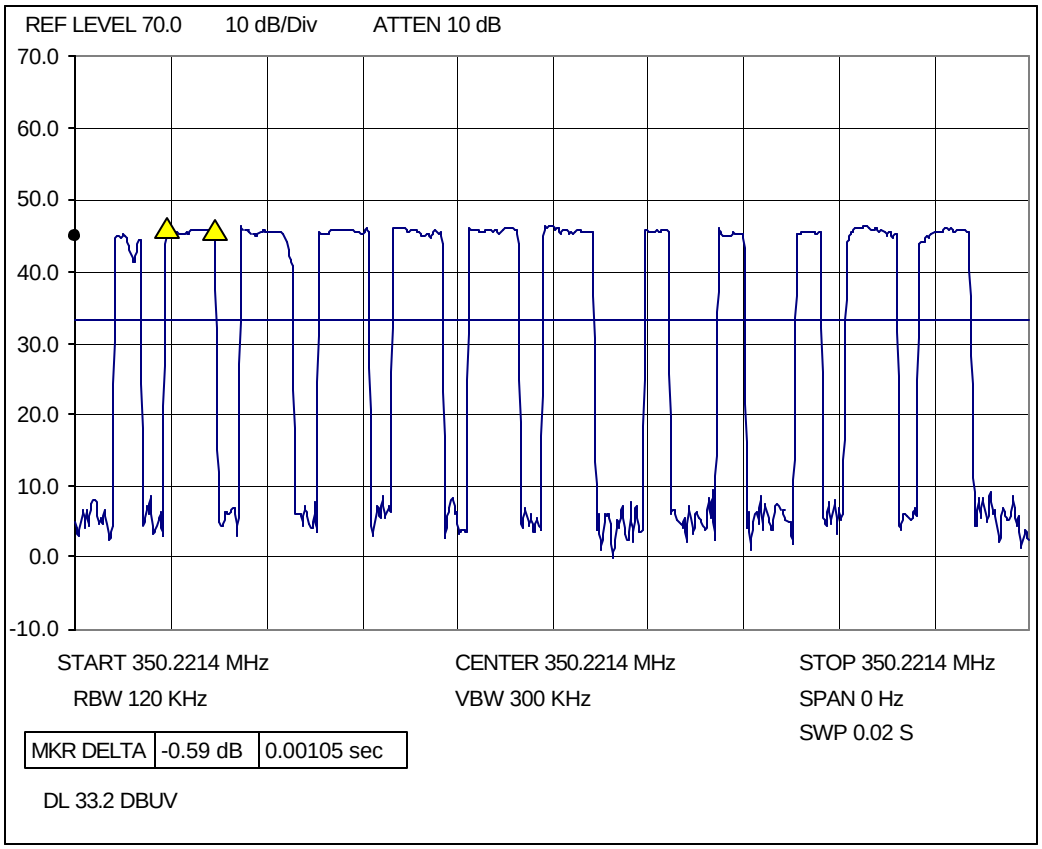


Figure 4-4: Output – 20 milliseconds



5 Antenna Requirement

X	The transmitter uses a permanently connected antenna.
	The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but does NOT use a standard antenna jack or electrical connector.
	The EUT requires professional installation.

Please refer to the attached documentation for details.

6 List of test equipment

Equipment	Manufacturer	Model Number	Serial Number	Cal. Interval	Cal. Due
EMI Receiver	Hewlett-Packard	8546A	3410A00173	1 yr	4/2/04
RF Filter Section	Hewlett-Packard	85460A	3448A00203	1 yr	4/2/04
Amplifier	Hewlett-Packard	8447D	2648A04926	1 yr	4/2/04
Pre-Amplifier	Hewlett-Packard	8449B	3008A00989	1 yr	4/2/04
Antenna	Schnaffner-Chase	CBL6112B	2622	1 yr	8/26/03
Horn Antenna	A.H. Systems	SAS-200/571	246	1 yr	1/31/04
Cable	N/A	CableTW2	ITS#211411	6 mo	8/1/03
Cable	N/A	CableN2	ITS#211999a2	6 mo	8/1/03

7 Document History

Report Number	Writer Initials	Date	Change
3038984-37-1-0	JOP	July 8, 2003	Original document
3038984-37-1-1	DJS	July 8, 2003	Deleted incorrect reference to panic button. Changed EUT name from WMT-06 to WMT.