PCMT-2600
Conflict Monitor Tester

User's Manual

Revision 1.1

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Overview

PCMT 2600

Automated, Accurate, Conflict Monitor Testing

The PCMT 2600 will provide input conditions to NEMA and 170/2070 type Conflict Monitors. With the appropriate cables, virtually all of the functionality specified by the NEMA and FHWA/Caltrans Standards may be tested.

The following monitor types are supported :

- NEMA TS1 3, 6, 12 18 Channel
- NEMA TS2 (MMUs) 12 or 16 Channel Mode
- NEMA TS2 MMU 8 Channel (Canada)
- System 170 Type 210 16 or 18 Channel
- System 2070 Type 2010 16 Channel
- Type 208 Ramp Monitors

The PCMT requires the use of an IBM compatible personal computer (PC) with Microsoft Windows 2000 or XP Professional. The PC sends commands to the PCMT to run the different tests required by the user's setup selections and compiles the test report.

The PCMT may be used as a bench-top unit, or it may be mounted in a standard 19" rackmount enclosure. For multi-unit systems, one computer can control multiple PCMTs to enable simultaneous testing of many monitors.

An optional carrying case is also available for those users who must perform field testing of monitors.

Before You Test : Precautions

Testing Known Bad Monitors

Monitors which have been subjected to lightning strikes or other severe electrical stress could cause damage to the PCMT. If you suspect a monitor has been subjected to a lightning strike or similar electrical stress, it is recommended that you first check the monitor out in the shop, in a simulated signal environment or on a manual tester. In this test setup, internal monitor shorts will merely blow fuses - on the PCMT it could result in internal tester damage which will necessitate returning the tester to ATSI for repairs.

Non-NEMA Monitors

If you are performing NEMA tests, be certain that the monitor is NEMA-compatible. Some non-NEMA monitors use a NEMA-type connector, with non-NEMA wiring. This could cause damage to the tester or to the monitor itself when power is applied. It is also essential that power be provided to the monitor only through its front panel MS3116 connector and not through any auxiliary rear connector.

Serial Cable Connection

The use of an "A/B" switch in the serial cable from the PC to the tester should also be avoided. The "A/B" switch introduces an increase in inductance on the signal lines that may cause damage to the PCMT that would not be covered by the manufacturer’s warranty.

Setting Up the PCMT

To setup the PCMT for testing :

1. Put the On / Off switch located on the front of the PCMT in the Off position.

2. Connect the male end of the DB9 serial cable to the connector labeled "Serial Port" on the front of the PCMT.

3. Connect the female end of the DB9 serial cable to your computer serial port.

4. Connect the monitor cable connectors to the correspondingly labeled female connectors on the front of the PCMT.

5. DO NOT turn the On / Off switch to the On position until the monitor connectors are connected to the monitor. See Preparing the Monitor to Test.

Preparing the Monitor to Test

On both NEMA TS1 and NEMA TS2 monitors, insure that the program card is blank when running a basic Certification test. Refer to Monitor Switch Settings for additional help with the conflict monitor's extended feature switches.

System 170 Model 210 monitors should not have any diodes cut (permissives) or Yellow inhibits on the programming board for Certification Testing. If your agency inhibits the Yellow monitoring function for walk signals or for all channels, you should still test the monitor with a "clean" programming card for Certification Testing. This will result in a record that all monitor functions described in the standard were working on all channels at the time of the test.

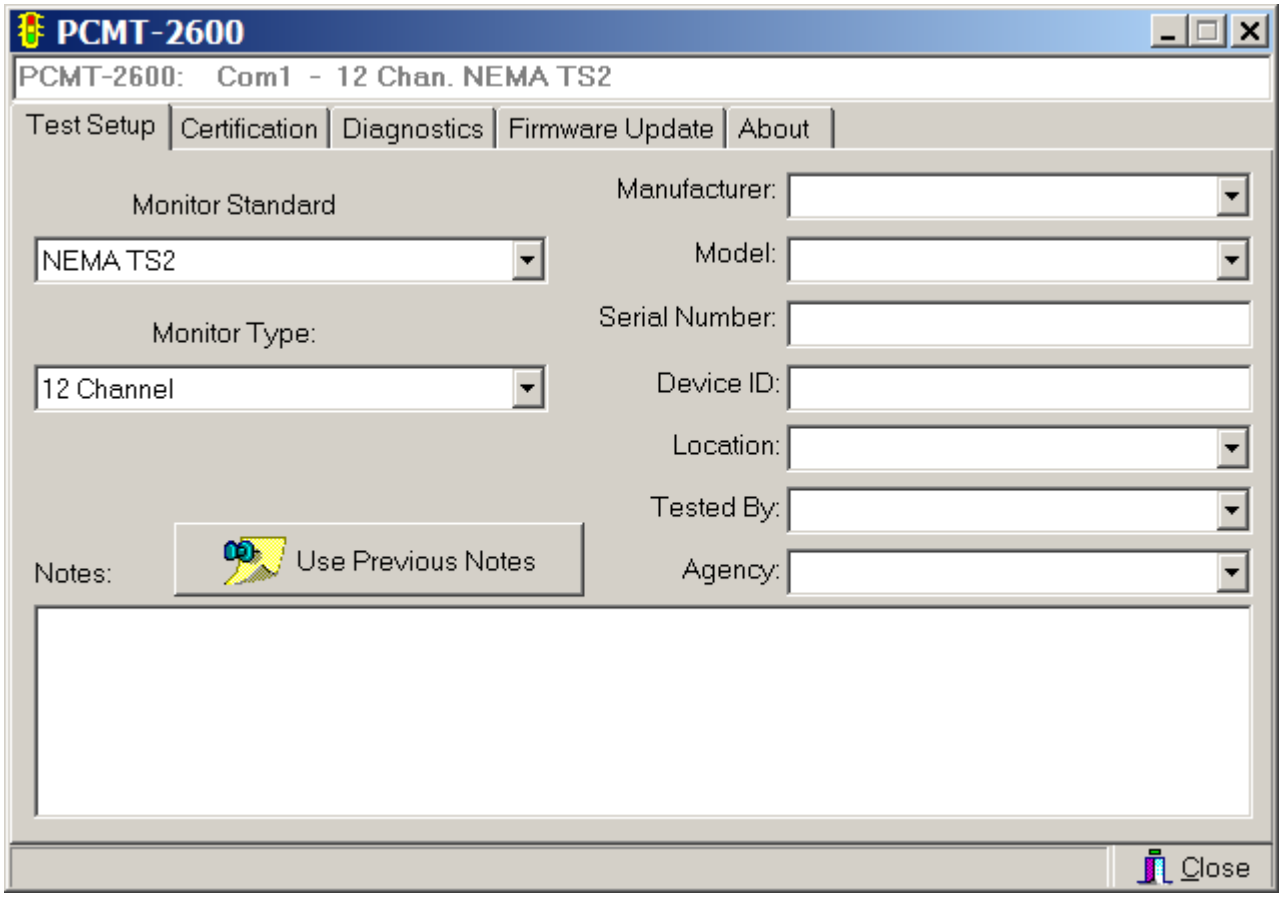
For all monitor types, if you choose to run the optional Permissive Tests to verify a programmed intersection card, you will be prompted by the software to change the card at the beginning of the tests.

Once you have verified that the monitor settings are correct, plug the monitor cable circular MS style connectors into the corresponding connector on the monitor (NEMA monitors) or insert the monitor into the monitor cable edge card connector (210, 2010 monitors). Finally, verify that the PCMT has been setup as described in Setting Up the PCMT and then you may turn the On / Off switch located on the front of the PCMT to the On position. At this point, you should hear three beeps from the PCMT and then the sound of a small motor moving for about 10 seconds. You are now ready to begin testing. See PCMT-2600 Software Operation.

Note : If you do not hear three beeps and the sound of a motor moving for about 10 seconds when the PCMT is power is turned on, there may be a problem with the unit. Refer to Troubleshooting.

Test Setup

The Test Setup screen is the opening screen you will see when you start the software. This screen allows you to choose and enter information for the monitor to be tested.



Monitor Standard

Click on the drop-down arrow to select the proper conflict monitor standard for the equipment you wish to test. This selection will determine what tests will be available for you to choose from .

Monitor Type

Based on the selection you made in the Monitor Standard option, choose the type of monitor you are testing from the drop-down menu. For instance, if you choose NEMA TS1 from the Monitor Standard option, your choices for the Monitor Type will be: 12 Channel, 6 Channel, 3 Channel, or 18 Channel.

Manufacturer

Choose the Manufacturer of the monitor to be tested from the drop-down menu. If the Manufacturer's name is not listed in the menu, simply type in the Manufacturer's name. The new name will be saved at the conclusion of the test and presented in the menu the next time it is used.

Model

Type in the Model number of the monitor to be tested. This information is also saved in a menu similar to the Manufacturer name described above.

Serial Number

Type in the Serial number of the monitor to be tested. If performing a Certification Test, this or the Device ID is a required field.

Device ID

This could be any reference number such as a cabinet number or your city or DOT's inventory tag number. If performing a Certification Test, this or the Serial Number is a required field.

Location

Type or select from the drop-down menu the intersection name, cabinet number, or location where this monitor is used.

Tested By

Type in or select from the drop down menu your name, initials, employee number, etc.

Agency

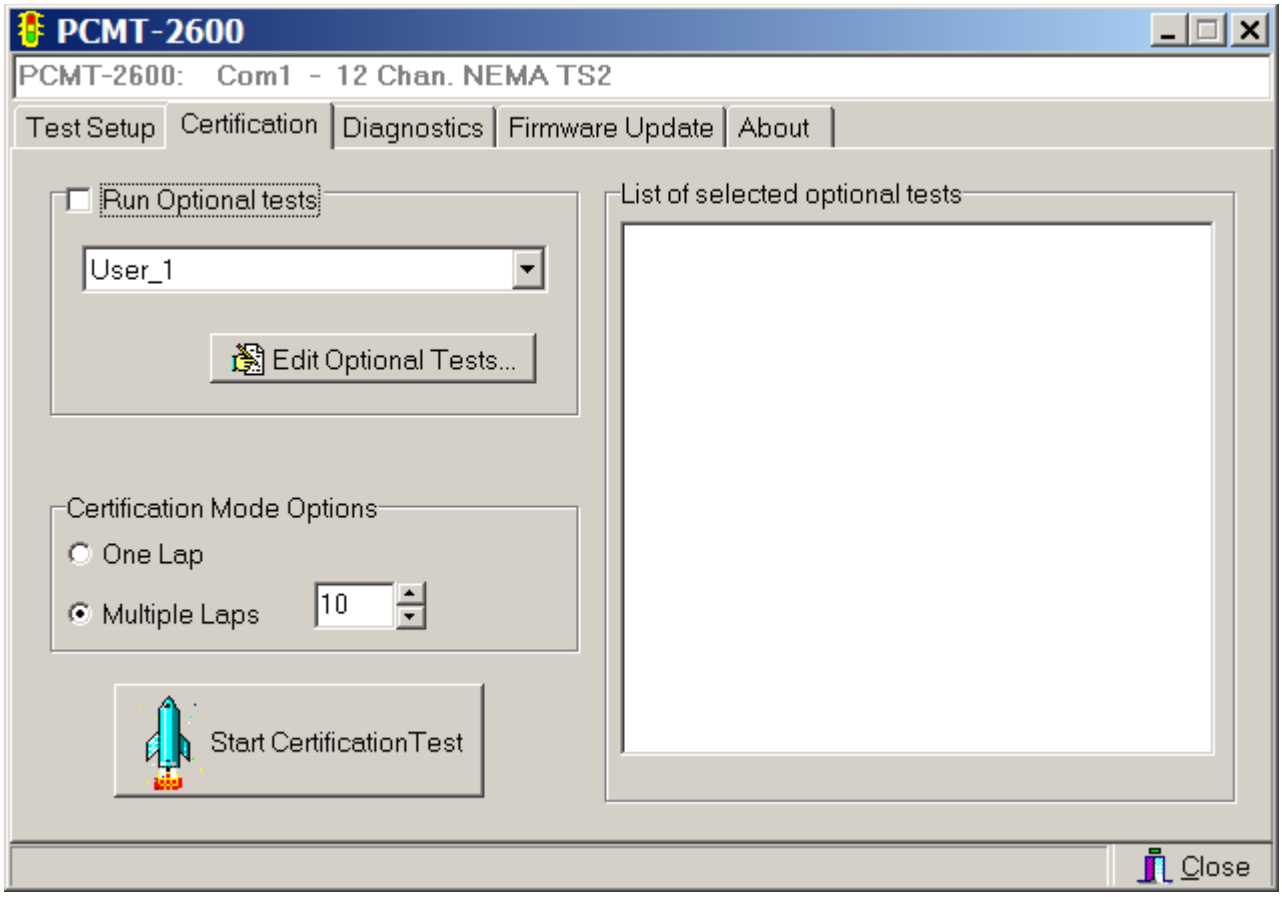
You should only have to enter your Agency name the initial time you use the tester. After the first test, the software will display your Agency name every time unless you clear the field. This is a required field for a Certification Test.

Notes

Enter any related notes that you want to appear on the test report. For instance, "This is a follow up verification test of this monitor after an accident that took place on Monday July 1, 2001." If you click the "Use Previous Notes" button, the text that was last entered will be inserted in the Notes field. This is helpful if you are performing annual certification tests on a number of monitors, and you want the notes to be the same for several tests in a row.

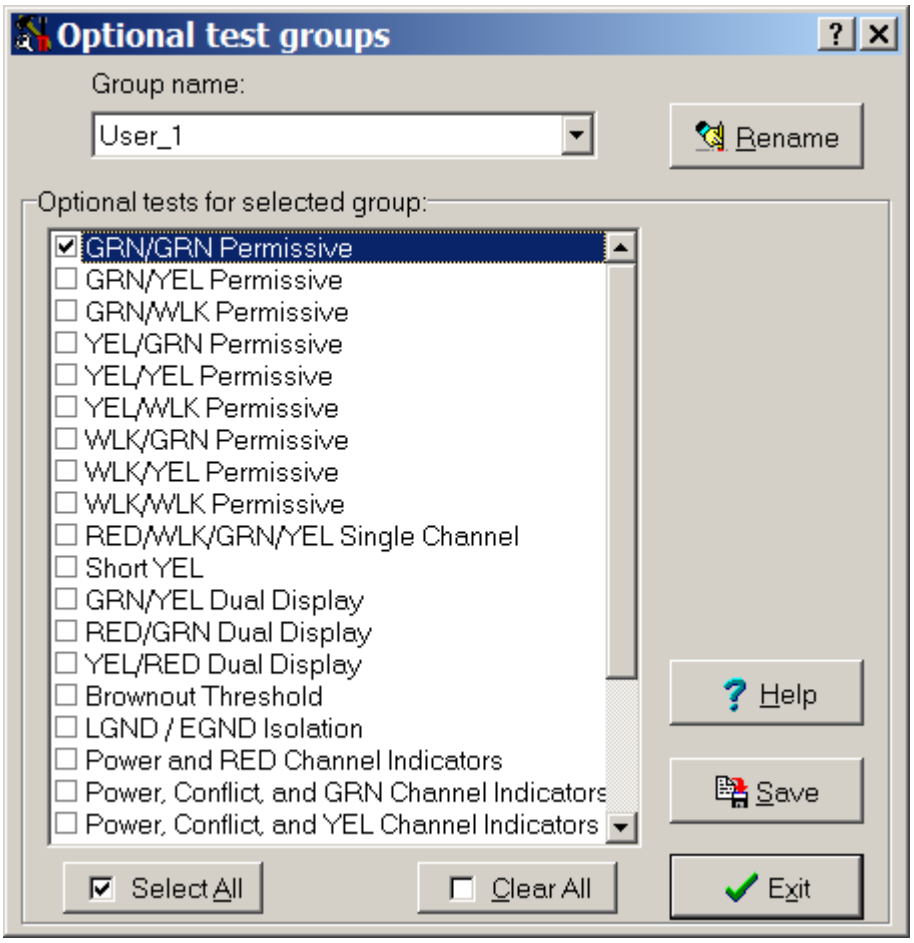
Certification

Clicking on the Certification Test Tab brings you to the screen shown below. This screen is where you set up and begin a Certification Test on the conflict monitor that was described on the Test Setup screen. The Certification Test specified by ATSI is the minimum number of tests required to check the monitor against the published standard. If your agency determines additional tests are required beyond the tests provided in the basic Certification Test, you can select additional Optional Tests to be run as a part of your Certification Test.



Edit Optional Tests

The Optional Test groups window allows you to select the Optional tests that you want to run by clicking on the appropriate check box. Once you select a group of tests you may give the group a unique name by typing it in the Group Name field, or you may use the default name.

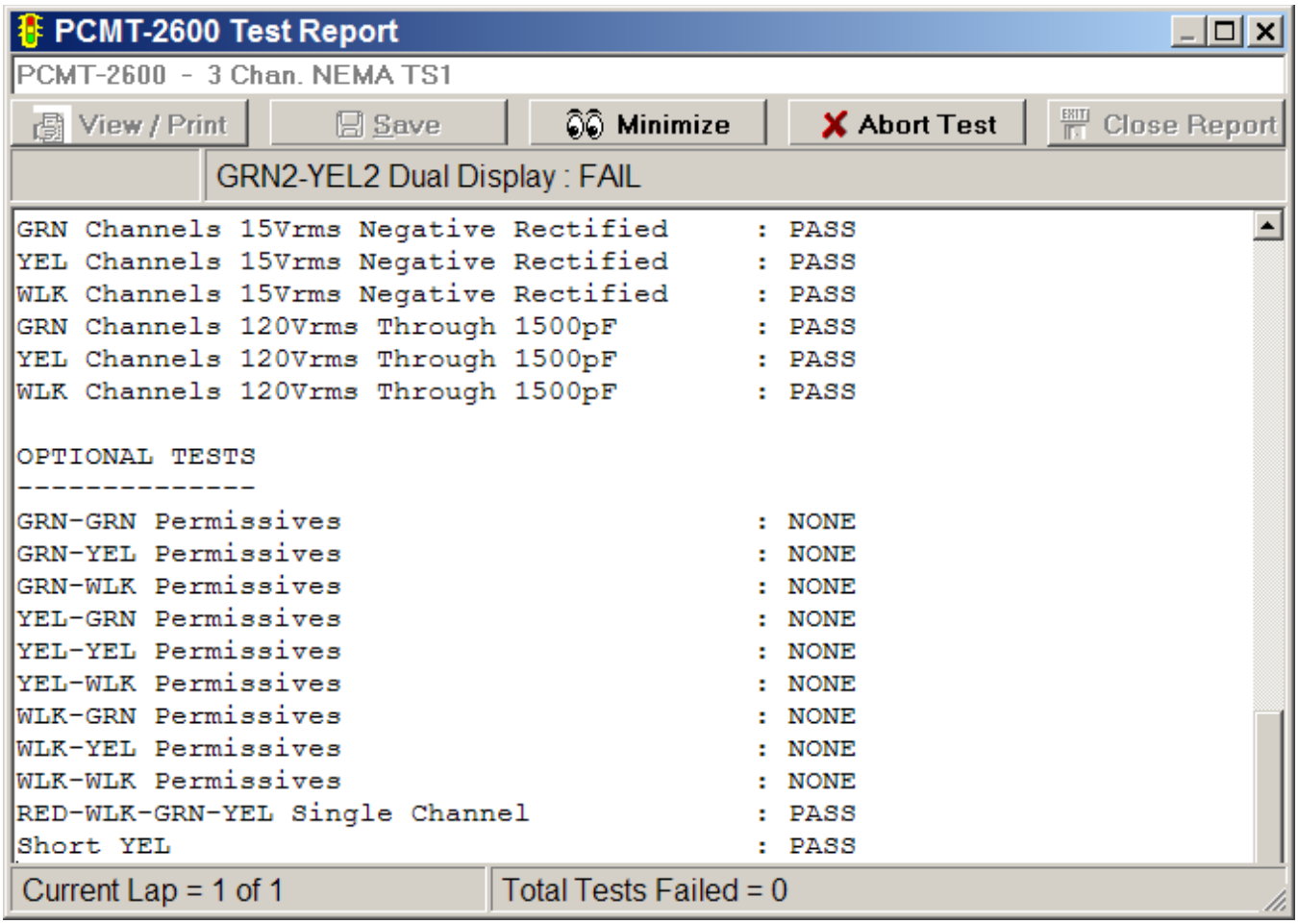


Start Certification Test

When you click the "Start Certification Test" button, the Test Report viewer is displayed. The Test Report is updated with the result of each test as it is completed. Also, the test details are shown in the status bar at the top of the screen as the test proceeds.

When the test is complete, click on the Save button to save the report. The report will be assigned a default name which you may change if you wish.

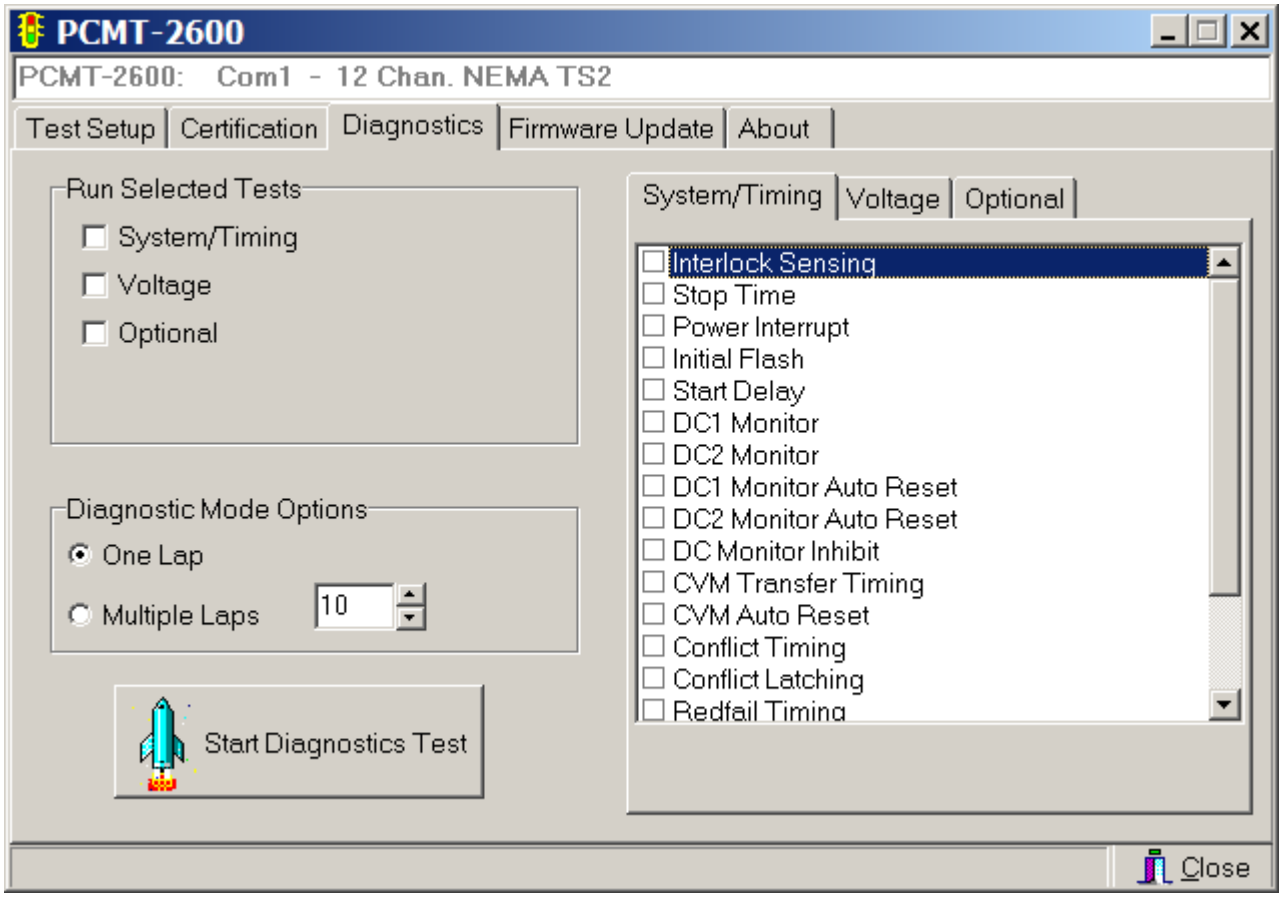
The reports are saved in Adobe Acrobat PDF format. Click on the View / Print button to open thereport and print it. (Note : Adobe Acrobat reader must be installed on your computer).



Diagnostics

Clicking on the Diagnostics Tab will bring you to the screen shown below. This screen allows you to set up and perform a Diagnostics test of the monitor that is tailored to your needs.

You select individual tests to run on the System/Timing, Voltage, or Optional tabs on the sub-window on the right side. You can activate each category of tests one at a time by checking the boxes on the left in the Selected Tests area.



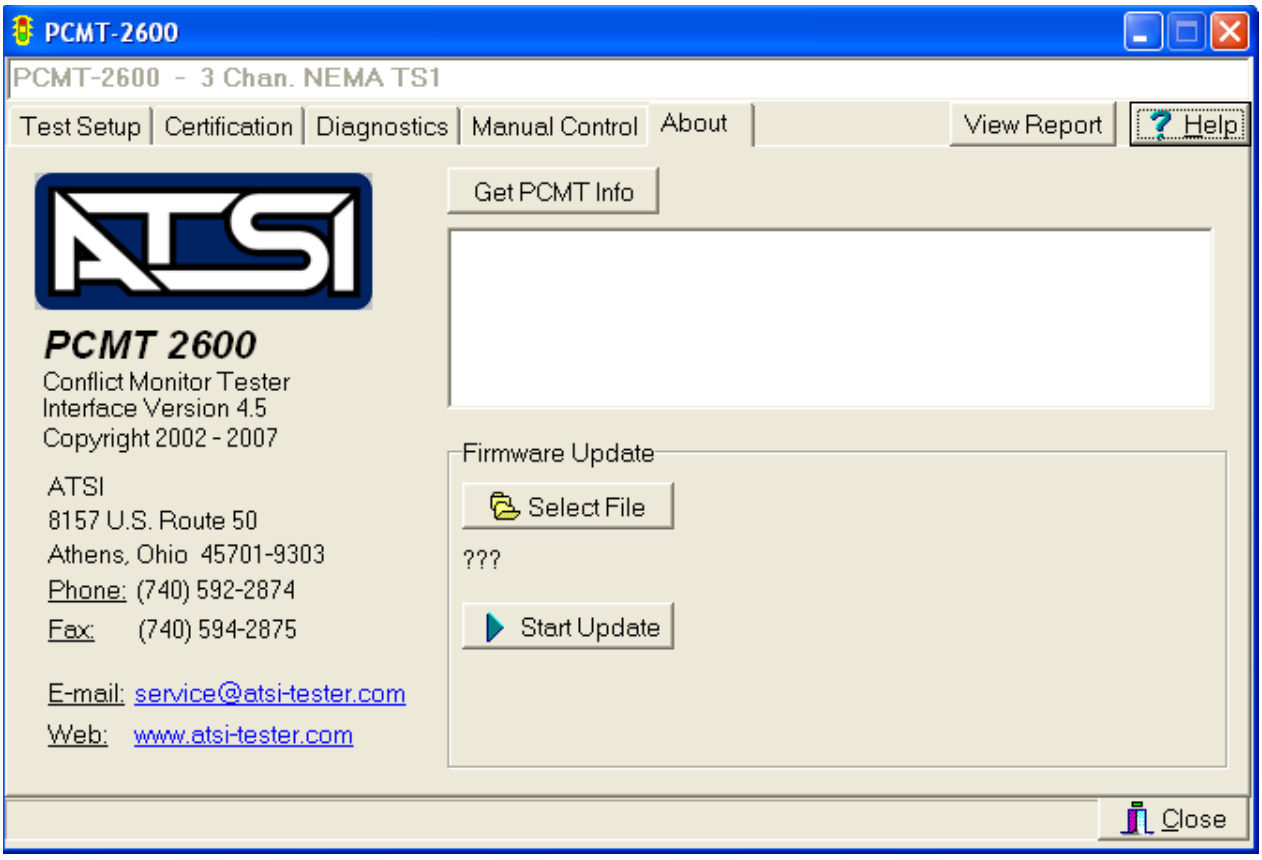
About

The about screen shows the software version number as well as the ATSI contact information. You may also click on the "Get PCMT info" button to read the PCMT serial number, firmware version, last calibration date, and error code. This is a good way to check communications between your computer and the PCMT.

Firmware Update

When new features, improvements, or tests are developed for your PCMT, they may be installed by doing a firmware update. Click on the "Select File" button to select the firmware update file. The latest firmware may be downloaded at www.atsi-tester.com.

Once the file is selected, click the "Start Update" button and follow the instructions given in the pop-up dialog.



NEMA TS1 PCMT-2600 Test Descriptions

Monitor Preliminary Tests

Short Circuit Test

Test Description :
Test for short circuits inside of the monitor. (i.e. Input channels shorted to AC line voltage.)

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. The PCMT variable voltage source is turned off.
3. Each RED, GRN, YEL and WLK channel is turned on.
4. The PCMT measures it's variable voltage source.

Monitor Response to PASS :
The PCMT should measure negligible voltage after each channel is turned on.

Probable Cause(s) of Failure :
Component failure or short circuit in monitor.
Note : Testing will be aborted if this test fails.

Reset Test

Test Description :
Verify that the monitor reset input is working.

Test Sequence :
1. Monitor is powered up in the quiescent condition.
2. Reset input is activated for 250ms.
3. Delay 500ms
4. Check Transfer state.

Monitor Response to PASS :
Monitor NOT in transfer state.

Probable Cause(s) of Failure :
Transfer Relay contacts faulty.
Blown power fuse in monitor.
Note : Testing will be aborted if this test fails.

System / Timing Tests

Interlock Sensing

Test Description :
Verify that the Interlock input is working.

Test Sequence :
1. Interlock input set at 24V.
2. Check Interlock output.
3. Interlock input set at 0V.
4. Check Interlock output.

Monitor Response to PASS :
State of Interlock output identical to Interlock input.

Probable Cause(s) of Failure :
Interlock wiring on monitor is faulty.

Output Relay

Test Description :
Verify that the open and closed contacts function properly on Output Relay 1 and 2.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Check status of relay contacts.
3. A conflict is created with GRN1 and GRN2.
4. Check status of relay contacts.
5. Conflict is removed.
6. Monitor is reset.
7. Check status of relay contacts.

Monitor Response to PASS :
The open contacts must be open and the closed contacts must be closed at (2).
The open contacts must be closed and the closed contacts must be open at (4).
The open contacts must be open and the closed contacts must be closed at (7).

Probable Cause(s) of Failure :
Faulty output transfer relay.

Power Interrupt

Test Description :
Verify the monitor ignores an AC power interrupt lasting less than 450ms and recognizes an AC power interrupt lasting more than 500ms.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Monitor AC power is turned off and then back on.
3. Transfer state is checked.
4. Increment off time and repeat 2 and 3 until monitor is found in the transfer state.

Monitor Response to PASS :
Loss of AC power for less than 450ms must NOT cause transfer. Loss of AC power for greater than 500ms must cause transfer.

Probable Cause(s) of Failure :
Faulty power supply or timing circuit.

Initial Flash

Test Description :
Verify that the initial flash time setting of the monitor is within the limits.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC power is removed for 5 seconds.
3. AC power is reapplied.
4. The monitor Initial Flash (transfer state) time is measured.

Monitor Response to PASS :
Initial Flash time is rounded to the nearest second and must be greater than or equal to 4 seconds and less than or equal to 11 seconds.

Probable Cause(s) of Failure :
Faulty minimum flash circuit or minimum flash not enabled on the monitor.

Start Delay

Test Description :
Verify that the Start Delay output is active when power is initially applied to the monitor.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC power is removed for 5 seconds.
3. AC power is reapplied.
4. The active time of the Start Delay output is measured.

Monitor Response to PASS :
Start Delay output active for greater than or equal to 1.5 seconds and less than or equal to 3.5 seconds.

Probable Cause(s) of Failure :
Faulty minimum flash circuit or minimum flash not enabled on the monitor.

DC1 Monitor

Test Description :
Verify that the monitor recognizes a loss of DC1.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC1 (24V) power is removed.
3. Transfer state is checked.

Monitor Response to PASS :
Monitor in transfer when DC1 (24V) is removed.

Probable Cause(s) of Failure :
Faulty DC1 sensing circuit.

DC2 Monitor

Test Description :
Verify that the monitor recognizes a loss of DC2.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC2 (24V) power is removed.
3. Transfer state is checked.

Monitor Response to PASS :
Monitor in transfer when DC2 (24V) is removed.

Probable Cause(s) of Failure :
Faulty DC2 sensing circuit.

DC1 Monitor Auto Reset

Test Description :
Verify that the monitor goes into the Transfer state when DC1 is removed, and then auto resets when DC1 is reapplied.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC1 is turned off.
3. DC1 is turned back on.

Monitor Response to PASS :
When DC1 is turned off, monitor goes to transfer state. When DC1 is turned back on, monitor auto reset (not be in transfer) within 10 seconds.

Probable Cause(s) of Failure :
Faulty DC1 logic circuit.
Monitor may be programmed to latch a DC fault.

DC2 Monitor Auto Reset

Test Description :
Verify that the monitor goes into the Transfer state when DC2 is removed, and then auto resets when DC2 is reapplied.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC2 is turned off.
3. DC2 is turned back on.

Monitor Response to PASS :
When DC2 is turned off, monitor goes to transfer state. When DC2 is turned back on, monitor auto reset (not be in transfer) within 10 seconds.

Probable Cause(s) of Failure :
Faulty DC2 logic circuit.
Monitor may be programmed to latch a DC fault.

DC Monitor Inhibit

Test Description :
Verify that the monitor ignores a loss of DC1 and DC2 when the DC monitor inhibit input is active.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC Monitor Inhibit input is activated.
3. DC1 and DC2 are turned off.

Monitor Response to PASS :
Monitor not found in transfer state when DC1 and DC2 are turned off.

Probable Cause(s) of Failure :
Faulty DC Monitor Inhibit logic circuitry.

CVM Transfer Timing

Test Description :
Verify that the monitor goes into the Transfer state when the CVM input is turned off.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. CVM input is turned off.

Monitor Response to PASS :
Monitor found in transfer state when CVM is turned off.

Probable Cause(s) of Failure :
Faulty CVM logic circuit.

CVM Auto Reset

Test Description :
Verify that the monitor goes into the Transfer state when CVM is turned off, and then auto resets when CVM is turned back on.

Test Sequence :
1. Monitor is powered up in quiescent state.
2. CVM is turned off.
3. CVM is turned back on.

Monitor Response to PASS :
When CVM is turned off, monitor must go to transfer state. When CVM is turned back on, monitor must auto reset (not be in transfer) within 10 seconds.

Probable Cause(s) of Failure :
Faulty CVM logic circuit.
Monitor may be programmed to latch a CVM fault.

Conflict Timing

Test Description :
Verify that the monitor ignores a conflict lasting less than 200ms and recognizes a conflict lasting more than 450ms.

Test Sequence :
1. Monitor is powered up in quiescent state.
2. Conflict is created on GRN1 and GRN 2.
3. Delay.
4. Conflict is removed.
5. After 250ms delay, check for transfer state.
6. Increase Delay and repeat 3,4 and 5 until monitor is found in transfer.
7. Record Delay time.

Monitor Response to PASS :
For conflict lasting less than 200ms, monitor not found in transfer state. For conflict lasting greater 450ms, monitor must be in transfer state.

Probable Cause(s) of Failure :
Faulty conflict timing circuitry.
Permissive programmed for GRN1 and GRN2.

Conflict Latching

Test Description :
Verify the detection of a conflict is latched through an AC power loss.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A conflict is created with GRN1 and GRN2.
3. AC power is removed.
4. Conflict condition is removed.
5. Delay 5 seconds.
6. AC power is reapplied.

Monitor Response to PASS :
Monitor must still be in transfer state when AC power is reapplied.

Probable Cause(s) of Failure :
Faulty latching relay.

Redfail Timing

Test Description :
Verify that Redfail lasting less than 700ms is ignored Redfail lasting more than 1000ms causes transfer

Test Sequence :
1. Monitor is powered up in quiescent state.
2. All RED channels are at AC line voltage.
3. RED1 is turned off for less than 700ms.
4. Check for transfer state.
5. RED1 is turned off for incrementally longer periods until transfer state is found.
6. RED1 off time is recorded.

Monitor Response to PASS :
RED1 off for less than 700ms must not cause transfer. RED1 off for greater than 1000ms must cause transfer.

Probable Cause(s) of Failure :
Faulty Redfail timing circuitry or faulty Redenable input.

Redfail Latching

Test Description :
Verify that a Redfail condition is latched through an AC power failure.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at AC line voltage.
3. A Redfail fault is created with RED1.
4. AC power is removed for 5 seconds.
5. RED1 is turned back on.
6. AC power is reapplied.

Monitor Response to PASS :
Monitor must go to transfer state on Redfail fault. Monitor must still be found in transfer state after AC power is removed, RED1 turned back on, and AC power is reapplied. (Redfail fault must be latched through power failure.)

Probable Cause(s) of Failure :
Faulty latching relay.

Voltage Tests

RED 70Vrms Sine Wave

Test Description :
Verify that a sine wave greater than 70Vrms is recognized as being "on" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is activated.
3. A sine wave greater than 70Vrms is applied to each RED channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer state.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

RED 50Vrms Sine Wave

Test Description :
Verify that a sign wave less than 50Vrms is recognized as being "off" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at AC line voltage.
3. Redenable input is activated.
4. A sine wave less than 50Vrms is applied to each RED channel one at a time.
5. Transfer state is checked for each channel.

Monitor Response to PASS :
50Vrms on any RED channel must cause monitor to go into transfer state (Redfail fault).

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, WLK 25Vrms Sine Wave

Test Description :
Verify the monitor recognizes a sign wave greater than 25Vrms as being "on" for every GYW channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A sine wave greater than 25Vrms is applied to each GYW channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must go to transfer state when 25Vrms is applied to any GYW channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, WLK 25Vrms Positive Rectified

Test Description :
Verify that the monitor recognizes a positive rectified sign wave greater than 25Vrms as being "on" for every GYW channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A positive rectified sine wave greater than 25Vrms is applied to each GYW channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must go to transfer state when 25Vrms is applied to any GYW channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, WLK 25Vrms Negative Rectified

Test Description :
Verify that the monitor recognizes a negative rectified sign wave greater than 25Vrms as being "on" for every GYW channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A negative rectified sine wave greater than 25Vrms is applied to each GYW channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must go to transfer state when 25Vrms is applied to any GYW channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, WLK 1500pF

Test Description :
Verify that the monitor recognizes AC line voltage through a 1500pF capacitor as being "off" for every GYW channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC line voltage through a 1500pF capacitor is applied to each GYW channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must NOT go to transfer state when AC line voltage through a 1500pF capacitor is applied to any channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

Optional Tests

GRN/GRN, GRN/YEL, GRN/WLK, YEL/GRN, YEL/YEL, YEL/WLK, WLK/GRN, WLK/YEL, WLK/WLK Permissive (Non-Programmed Card)

Test Description :
Run this test with a "clean" (non-programmed) card to verify that there are no hidden permissives.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Conflicting GRN, YEL, or WLK signals are presented to each channel pair.

Note : This test should be done with a "clean" programming card in the monitor (no permissives programmed

Monitor Response to PASS :
Each channel pair must put monitor into transfer state when the conflict is presented.

Probable Cause(s) of Failure :
Faulty monitor measurement circuitry or programming card has permissives programmed.

RED/WLK/GRN/YEL Single Channel

Test Description :
Line voltage is applied to each RED, WLK, GRN, and YEL input one at a time to verify that a single input will not cause the monitor to go into the transfer state.

Test Sequence :

1. Monitor is powered up in the quiescent state.
2. AC line voltage is applied to RED1 for 750ms.
3. AC line voltage is applied to WLK1 for 750ms.
4. AC line voltage is applied to GRN1 for 750ms.
5. AC line voltage is applied to YEL1 for 3600ms.
6. AC line voltage is applied to RED1.
7. Repeat 2 through 6 for each channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer.

Probable Cause(s) of Failure :
Monitor input(s) shorted together.

YEL Plus RED Interval

Test Description :
Verify that the monitor will go into the transfer state if the Yellow change plus Red Clearance interval between the end of an active Green and the next conflicting Green is less than 2.6 seconds.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC line voltage is applied to GRN1 for 2 sec.
3. Turn off GRN1
4. AC line voltage is applied to YEL1 for 2 sec.
5. Turn off YEL1
6. AC line voltage is applied to RED1.
7. Delay 100ms.
8. Turn on an opposing GRN
9. Wait 2 sec.
10. Check transfer state.
11. Reset the monitor.
12. Repeat 2 through 7 for all channels

Monitor Response to PASS :
Monitor must be found in transfer on every channel.

Probable Cause(s) of Failure :
Monitor timing circuitry not functioning correctly.

GRN/YEL Dual Display

Test Description :
Verify that the Dual Display detection feature is working for each channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at 120Vac.
4. Turn off RED1.
5. Turn on GRN1.
6. Turn on YEL1
7. Check for transfer.
8. Turn off GRN1
9. Turn off YEL1
10. Turn on RED1
11. Reset monitor.
12. Repeat 4 through 11 for all channels.

Monitor Response to PASS :
Monitor must be found in transfer state for every channel.

Probable Cause(s) of Failure :
Monitor dual display circuitry not functioning correctly

RED/GRN Dual Display

Test Description :
Verify that the Dual Display detection feature is working for each channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at 120Vac.
4. Turn on GRN1.
5. Check for transfer.
6. Turn off GRN1.
7. Reset monitor.
8. Repeat 4 through 7 for all channels.

Monitor Response to PASS :
Monitor must be found in transfer state for every channel.

Probable Cause(s) of Failure :
Monitor dual display circuitry not functioning correctly

YEL/RED Dual Display

Test Description :
Verify that the Dual Display detection feature is working for each channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at 120Vac.
4. Turn on YEL1.
5. Check for transfer.
6. Turn off YEL1.
7. Reset monitor.
8. Repeat 4 through 7 for all channels.

Monitor Response to PASS :
Monitor must be found in transfer state for every channel.

Probable Cause(s) of Failure :
Monitor dual display circuitry not functioning correctly

LGND/EGND Isolation

Test Description :
Verify that LGND and EGND are NOT shorted together inside of the monitor.

Test Sequence :
No inputs are provided to the monitor. The PCMT tests for a short circuit between the monitor Logic ground and Earth ground pins.

Monitor Response to PASS :
Logic ground and Earth ground must not be shorted together in the monitor.

Probable Cause(s) of Failure :
Logic ground and Earth ground are connected inside of the monitor.

120 Flashes Per min, In-phase, GRN Conflict (Canadian TS1 Fast Flash only)

Test Description :
Verify that the monitor will go into the transfer state when presented with conflicting signals, flashing in-phase, at a rate of 120 flashes per minute.

Test Sequence :
1. Monitor is powered up in the quiescent state
2. GRN1 and GRN2 are "on" (120Vrms) for 250ms
3. GRN1 and GRN2 are "off" for 250ms
4. Steps 2 and 3 are repeated until the monitor is found in transfer or until a maximum of 30 times.

Monitor Response to PASS :
The PCMT will report the number of flashes it took to detect a transfer or that no transfer was detected after 30 flashes. The user must click on PASS or FAIL.

120 Flashes Per min, Out-of-phase, GRN Conflict (Canadian TS1 Fast Flash only)

Test Description :
Verify that the monitor will go into the transfer state when presented with conflicting signals, flashing out-of-phase, at a rate of 120 flashes per minute.

Test Sequence :
1. Monitor is powered up in the quiescent state
2. GRN1 and GRN2 are "on" (120Vrms) for 250ms
3. GRN1 and GRN2 are "off" for 250ms
4. Steps 2 and 3 are repeated until the monitor is found in transfer or until a maximum of 30 times.

Monitor Response to PASS :
The PCMT will report the number of flashes it took to detect a transfer or that no transfer was detected after 30 flashes. The user must click on PASS or FAIL.

180 Flashes Per min, In-phase, GRN Conflict (Canadian TS1 Fast Flash only)

Test Description :
Verify that the monitor will go into the transfer state when presented with conflicting signals, flashing in-phase, at a rate of 180 flashes per minute.

Test Sequence :
1. Monitor is powered up in the quiescent state
2. GRN1 and GRN2 are "on" (120Vrms) for 166ms
3. GRN1 and GRN2 are "off" for 166ms
4. Steps 2 and 3 are repeated until the monitor is found in transfer or until a maximum of 30 times.

Monitor Response to PASS :
The PCMT will report the number of flashes it took to detect a transfer or that no transfer was detected after 30 flashes. The user must click on PASS or FAIL.

180 Flashes Per min, Out-of-phase, GRN Conflict (Canadian TS1 Fast Flash only)

Test Description :
Verify that the monitor will go into the transfer state when presented with conflicting signals, flashing out-of-phase, at a rate of 180 flashes per minute.

Test Sequence :
1. Monitor is powered up in the quiescent state
2. GRN1 and GRN2 are "on" (120Vrms) for 166ms
3. GRN1 and GRN2 are "off" for 166ms
4. Steps 2 and 3 are repeated until the monitor is found in transfer or until a maximum of 30 times.

Monitor Response to PASS :
The PCMT will report the number of flashes it took to detect a transfer or that no transfer was detected after 30 flashes. The user must click on PASS or FAIL.

Power and RED Channel Indicators

Test Description :
Verify that the Power and RED channel indicators are working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are on.

Monitor Response to PASS :
Power and RED channel indicators must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Power, Conflict and GRN Channel Indicators

Test Description :
Verify that the Power, Conflict, and GRN channel indicators are working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All GRN channels are on.

Monitor Response to PASS :
Power, Conflict and GRN channel indicators must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Power, Conflict and YEL Channel Indicators

Test Description :
Verify that the Power, Conflict, and YEL channel indicators are working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All YEL channels are on.

Monitor Response to PASS :
Power, Conflict and YEL channel indicators must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Dual Display Indicator

Test Description :
Verify that the Dual Display indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. RED1 and GRN1 are on.

Monitor Response to PASS :
Dual Display Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Redfail Indicator

Test Description :
Verify that the Redfail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at AC line.
4. RED1 is turned off.

Monitor Response to PASS :
Redfail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Short YEL Indicator

Test Description :
Verify that the Short Yellow indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at 120Vac.
3. RED1 is turned off.
4. GRN1 is turned on.
5. Delay 2 sec.
6. GRN1 is turned off.
7. YEL1 is turned on.
8. Delay 2 sec.
9. YEL1 is turned off.
10. RED1 is turned on.

Monitor Response to PASS :
Short Yellow (clearance) Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

DC1 (24V1) Fail Indicator

Test Description :
Verify that the DC1 Fail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC1 voltage is removed.

Monitor Response to PASS :
DC1 (24V) Fail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

DC2 (24V2) Fail Indicator

Test Description :
Verify that the DC2 Fail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC2 voltage is removed.

Monitor Response to PASS :
DC2 (24V) Fail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Watchdog Fail Indicator

Test Description :
Verify that the Watchdog Fail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Watchdog signal is removed.

Monitor Response to PASS :
Watchdog Fail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

GRN/GRN, GRN/YEL, GRN/WLK, YEL/GRN, YEL/YEL, YEL/WLK, WLK/GRN, WLK/YEL, WLK/WLK Permissive (Programmed Card)

Test Description :
This test is ran with a programmed intersection card. It is intended to verify the programmed permissives.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Conflicting GYW signals are presented to each channel pair.

Monitor Response to PASS :
The permissives found during the test must match what is programmed on the card.

Probable Cause(s) of Failure :
Faulty monitor measurement circuitry.
Bad connections on programming card.

NEMA TS2 PCMT-2600 Test Descriptions

Monitor Preliminary Tests

Short Circuit Test

Test Description :
Test for short circuits inside of the monitor. (i.e. Input channels shorted to AC line voltage.)

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. The PCMT variable voltage source is turned off.
3. Each RED, GRN, YEL and WLK channel is turned on.
4. The PCMT measures it's variable voltage source.

Monitor Response to PASS :
The PCMT should measure negligible voltage after each channel is turned on.

Probable Cause(s) of Failure :
Component failure or short circuit in monitor.
Note : Testing will be aborted if this test fails.

Reset Test

Test Description :
Verify that the monitor reset input is working.

Test Sequence :
1. Monitor is powered up in the quiescent condition.
2. Reset input is activated for 250ms.
3. Delay 500ms
4. Check Transfer state.

Monitor Response to PASS :
Monitor NOT in transfer state.

Probable Cause(s) of Failure :
Transfer Relay contacts faulty or blown power fuse in monitor.
Note : Testing will be aborted if this test fails.

System / Timing Tests

Interlock Sensing

Test Description :
Verify that the Interlock input is working.

Test Sequence :
1. Interlock input set at 24V.
2. Check Interlock output.
3. Interlock input set at 0V.
4. Check Interlock output.

Monitor Response to PASS :
State of Interlock output identical to Interlock input.

Probable Cause(s) of Failure :
Interlock wiring on monitor is faulty.

Output Relay

Test Description :
Verify that the open and closed contacts function properly on Output Relay 1 and 2.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Check status of relay contacts.
3. A conflict is created with GRN1 and GRN2.
4. Check status of relay contacts.
5. Conflict is removed.
6. Monitor is reset.
7. Check status of relay contacts.

Monitor Response to PASS :
The open contacts must be open and the closed contacts must be closed at (2).
The open contacts must be closed and the closed contacts must be open at (4).
The open contacts must be open and the closed contacts must be closed at (7).

Probable Cause(s) of Failure :
Faulty output transfer relay.

Power Interrupt

Test Description :
Verify the monitor ignores an AC power interrupt lasting less than 450ms and recognizes an AC power interrupt lasting more than 500ms.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Monitor AC power is turned off and then back on.
3. Transfer state is checked.
4. Increment off time and repeat 2 and 3 until monitor is found in the transfer state.

Monitor Response to PASS :
Loss of AC power for less than 450ms must NOT cause transfer. Loss of AC power for greater than 500ms must cause transfer.

Probable Cause(s) of Failure :
Faulty power supply or timing circuit.

Initial Flash

Test Description :
Verify that the initial flash time setting of the monitor is within the limits.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC power is removed for 5 seconds.
3. AC power is reapplied.
4. The monitor Initial Flash (transfer state) time is measured.

Monitor Response to PASS :
Initial Flash time is rounded to the nearest second and must be greater than or equal to 6 seconds and less than or equal to 16 seconds.

Probable Cause(s) of Failure :
Faulty minimum flash circuit or minimum flash not enabled on the monitor.

Start Delay

Test Description :
Verify that the Start Delay output is active when power is initially applied to the monitor.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC power is removed for 5 seconds.
3. AC power is reapplied.
4. The active time of the Start Delay output is measured.

Monitor Response to PASS :
Start Delay output active for greater than or equal to 1.5 seconds and less than or equal to 2.5 seconds.

Probable Cause(s) of Failure :
Faulty minimum flash circuit or minimum flash not enabled on the monitor.

DC1 Monitor

Test Description :
Verify that the monitor recognizes a loss of DC1.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC1 (24V) is turned off for less than 125ms.
3. Delay 250ms.
4. Transfer state is checked.
5. If monitor in Transfer state, test is over.
6. Increase the DC1 off time.
7. Repeat 3 through 6.

Monitor Response to PASS :
Loss of DC1 for less than 125ms must NOT cause the monitor to go into the Transfer state. Loss of DC1 for more than 175ms must cause the monitor to go into the Transfer state.

Probable Cause(s) of Failure :
Faulty DC1 sensing circuit.

DC2 Monitor

Test Description :
Verify that the monitor recognizes a loss of DC2.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC2 (24V) is turned off for less than 125ms.
3. Delay 250ms.
4. Transfer state is checked.
5. If monitor in Transfer state, test is over.
6. Increase the DC2 off time.
7. Repeat 3 through 6.

Monitor Response to PASS :
Loss of DC2 for less than 125ms must NOT cause the monitor to go into the Transfer state. Loss of DC2 for more than 175ms must cause the monitor to go into the Transfer state.

Probable Cause(s) of Failure :
Faulty DC2 sensing circuit.

DC1 Monitor Auto Reset

Test Description :
Verify that the monitor goes into the Transfer state when DC1 is removed, and then auto resets when DC1 is reapplied.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC1 is turned off.
3. DC1 is turned back on.

Monitor Response to PASS :
When DC1 is turned off, monitor goes to transfer state. When DC1 is turned back on, monitor auto reset (not be in transfer) within 10 seconds.

Probable Cause(s) of Failure :
Faulty DC1 logic circuit.
Monitor may be programmed to latch a DC fault.

DC2 Monitor Auto Reset

Test Description :
Verify that the monitor goes into the Transfer state when DC2 is removed, and then auto resets when DC2 is reapplied.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC2 is turned off.
3. DC2 is turned back on.

Monitor Response to PASS :
When DC2 is turned off, monitor goes to transfer state. When DC2 is turned back on, monitor auto reset (not be in transfer) within 10 seconds.

Probable Cause(s) of Failure :
Faulty DC2 logic circuit.
Monitor may be programmed to latch a DC fault.

DC Monitor Inhibit

Test Description :
Verify that the monitor ignores a loss of DC1 and DC2 when the DC monitor inhibit input is active.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC Monitor Inhibit input is activated.
3. DC1 and DC2 are turned off.

Monitor Response to PASS :
Monitor not found in transfer state when DC1 and DC2 are turned off.

Probable Cause(s) of Failure :
Faulty DC Monitor Inhibit logic circuitry.

CVM Transfer Timing

Test Description :
Verify that the monitor recognizes a loss of CVM input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. CVM is turned off for less than 125ms.
3. Delay 250ms.
4. Transfer state is checked.
5. If monitor in Transfer state, test is over.
6. Increase the CVM off time.
7. Repeat 3 through 6.

Monitor Response to PASS :
Loss of CVM for less than 125ms must NOT cause the monitor to go into the Transfer state. Loss of CVM for more than 175ms must cause the monitor to go into the Transfer state.

Probable Cause(s) of Failure :
Faulty CVM sensing circuit.

CVM Auto Reset

Test Description :
Verify that the monitor goes into the Transfer state when CVM is turned off, and then auto resets when CVM is turned back on.

Test Sequence :
1. Monitor is powered up in quiescent state.
2. CVM is turned off.
3. CVM is turned back on.

Monitor Response to PASS :
When CVM is turned off, monitor must go to transfer state. When CVM is turned back on, monitor must auto reset (not be in transfer) within 10 seconds.

Probable Cause(s) of Failure :
Faulty CVM logic circuit.
Monitor may be programmed to latch a CVM fault.

Conflict Timing

Test Description :
Verify that the monitor ignores a conflict lasting less than 200ms and recognizes a conflict lasting more than 450ms.

Test Sequence :
1. Monitor is powered up in quiescent state.
2. Conflict is created on GRN1 and GRN 2.
3. Delay.
4. Conflict is removed.
5. After 250ms delay, check for transfer state.
6. Increase Delay and repeat 3,4 and 5 until monitor is found in transfer.
7. Record Delay time.

Monitor Response to PASS :
For conflict lasting less than 200ms, monitor not found in transfer state. For conflict lasting greater 450ms, monitor must be in transfer state.

Probable Cause(s) of Failure :
Faulty conflict timing circuitry or Permissive programmed for GRN1 and GRN2.

Conflict Latching

Test Description :
Verify the detection of a conflict is latched through an AC power loss.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A conflict is created with GRN1 and GRN2.
3. AC power is removed.
4. Conflict condition is removed.
5. Delay 5 seconds.
6. AC power is reapplied.

Monitor Response to PASS :
Monitor must still be in transfer state when AC power is reapplied.

Probable Cause(s) of Failure :
Faulty latching relay.

Redfail Timing

Test Description :
Verify that Redfail lasting less than 700ms is ignored Redfail lasting more than 1000ms causes transfer

Test Sequence :
1. Monitor is powered up in quiescent state.
2. All RED channels are at AC line voltage.
3. RED1 is turned off for less than 700ms.
4. Check for transfer state.
5. RED1 is turned off for incrementally longer periods until transfer state is found.
6. RED1 off time is recorded.

Monitor Response to PASS :
RED1 off for less than 700ms must not cause transfer. RED1 off for greater than 1000ms must cause transfer.

Probable Cause(s) of Failure :
Faulty Redfail timing circuitry or faulty Redenable input.

Redfail Latching

Test Description :
Verify that a Redfail condition is latched through an AC power failure.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at AC line voltage.
3. A Redfail fault is created with RED1.
4. AC power is removed for 5 seconds.
5. RED1 is turned back on.
6. AC power is reapplied.

Monitor Response to PASS :
Monitor must go to transfer state on Redfail fault. Monitor must still be found in transfer state after AC power is removed, RED1 turned back on, and AC power is reapplied. (Redfail fault must be latched through power failure.)

Probable Cause(s) of Failure :
Faulty latching relay.

Redenable 89Vrms

Test Description :
Verify that the Redenable input is functioning properly.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Apply a voltage greater than 89Vrms to Redenable input.
3. Turn off all RED inputs.
4. Check Transfer state.

Monitor Response to PASS :
Monitor must be found in the Transfer state when RED inputs are turned off.

Probable Cause(s) of Failure :
Faulty Redenable threshold circuitry or monitor not calibrated to measure "true RMS".

Redenable 70Vrms

Test Description :
Verify that the Redenable input is functioning properly.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Apply a voltage less than 70Vrms to Redenable input.
3. Turn off all RED inputs.
4. Check Transfer state.

Monitor Response to PASS :
Monitor must NOT be found in the Transfer state when RED inputs are turned off.

Probable Cause(s) of Failure :
Faulty Redenable threshold circuitry.
Monitor not calibrated to measure "true RMS".

Voltage Tests

RED 70Vrms Sine Wave

Test Description :
Verify that a sine wave greater than 70Vrms is recognized as being "on" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is activated.
3. A sine wave greater than 70Vrms is applied to each RED channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer state.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

RED 70Vrms Positive Rectified

Test Description :
Verify that a positive rectified sine wave greater than 70Vrms is recognized as being "on" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is activated.
3. A positive rectified sine wave greater than 70Vrms is applied to each RED channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer state.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

RED 70Vrms Negative Rectified

Test Description :
Verify that a negative rectified sine wave greater than 70Vrms is recognized as being "on" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is activated.
3. A negative rectified sine wave greater than 70Vrms is applied to each RED channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer state.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

RED 50Vrms Sine Wave

Test Description :
Verify that a sign wave less than 50Vrms is recognized as being "off" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at AC line voltage.
3. Redenable input is activated.
4. A sine wave less than 50Vrms is applied to each RED channel one at a time.
5. Transfer state is checked for each channel.

Monitor Response to PASS :
50Vrms on any RED channel must cause monitor to go into transfer state (Redfail fault).

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

RED 50Vrms Positive Rectified

Test Description :
Verify that a positive rectified sign wave less than 50Vrms is recognized as being "off" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at AC line voltage.
3. Redenable input is activated.
4. A positive rectified sine wave less than 50Vrms is applied to each RED channel one at a time.
5. Transfer state is checked for each channel.

Monitor Response to PASS :
50Vrms on any RED channel must cause monitor to go into transfer state (Redfail fault).

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

RED 50Vrms Negative Rectified

Test Description :
Verify that a negative rectified sign wave less than 50Vrms is recognized as being "off" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at AC line voltage.
3. Redenable input is activated.
4. A negative rectified sine wave less than 50Vrms is applied to each RED channel one at a time.
5. Transfer state is checked for each channel.

Monitor Response to PASS :
50Vrms on any RED channel must cause monitor to go into transfer state (Redfail fault).

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, WLK 25Vrms Sine Wave

Test Description :
Verify the monitor recognizes a sign wave greater than 25Vrms as being "on" for every GYW channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A sine wave greater than 25Vrms is applied to each GYW channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must go to transfer state when 25Vrms is applied to any GYW channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, WLK 25Vrms Positive Rectified

Test Description :
Verify that the monitor recognizes a positive rectified sign wave greater than 25Vrms as being "on" for every GYW channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A positive rectified sine wave greater than 25Vrms is applied to each GYW channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must go to transfer state when 25Vrms is applied to any GYW channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, WLK 25Vrms Negative Rectified

Test Description :
Verify that the monitor recognizes a negative rectified sign wave greater than 25Vrms as being "on" for every GYW channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A negative rectified sine wave greater than 25Vrms is applied to each GYW channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must go to transfer state when 25Vrms is applied to any GYW channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, WLK 1500pF

Test Description :
Verify that the monitor recognizes AC line voltage through a 1500pF capacitor as being "off" for every GYW channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC line voltage through a 1500pF capacitor is applied to each GYW channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must NOT go to transfer state when AC line voltage through a 1500pF capacitor is applied to any channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

Short YEL

Test Description :
Apply the GRN, YEL, RED sequence to each channel with a 2 second YEL to verify that the monitor will go into the Transfer state.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC line voltage is applied to GRN1 for 2 sec.
3. AC line voltage is applied to YEL1 for 2 sec.
4. AC line voltage is applied to RED1.
5. Wait 2 sec.
6. Check transfer state.
7. Reset the monitor.
8. Repeat 2 through 7 for all channels

Monitor Response to PASS :
Monitor must be found in transfer on every channel.

Probable Cause(s) of Failure :
Monitor timing circuitry not functioning correctly.

YEL Plus RED Interval

Test Description :
Verify that the monitor will go into the transfer state if the Yellow change plus Red Clearance interval between the end of an active Green and the next conflicting Green is less than 2.6 seconds.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC line voltage is applied to GRN1 for 2 sec.
3. Turn off GRN1
4. AC line voltage is applied to YEL1 for 2 sec.
5. Turn off YEL1
6. AC line voltage is applied to RED1.
7. Delay 100ms.
8. Turn on an opposing GRN
9. Wait 2 sec.
10. Check transfer state.
11. Reset the monitor.
12. Repeat 2 through 7 for all channels

Monitor Response to PASS :
Monitor must be found in transfer on every channel.

Probable Cause(s) of Failure :
Monitor timing circuitry not functioning correctly.

Optional Tests

GRN/GRN, GRN/YEL, GRN/WLK, YEL/GRN, YEL/YEL, YEL/WLK, WLK/GRN, WLK/YEL, WLK/WLK Permissive (Non-Programmed Card)

Test Description :
Run this test with a "clean" (non-programmed) card to verify that there are no hidden permissives.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Conflicting GRN, YEL, or WLK signals are presented to each channel pair.

Note : This test should be done with a "clean" programming card in the monitor (no permissives programmed

Monitor Response to PASS :
Each channel pair must put monitor into transfer state when the conflict is presented.

Probable Cause(s) of Failure :
Faulty monitor measurement circuitry or programming card has permissives programmed.

RED/WLK/GRN/YEL Single Channel

Test Description :
Line voltage is applied to each RED, WLK, GRN, and YEL input one at a time to verify that a single input will not cause the monitor to go into the transfer state.

Test Sequence :

1. Monitor is powered up in the quiescent state.
2. AC line voltage is applied to RED1 for 750ms.
3. AC line voltage is applied to WLK1 for 750ms.
4. AC line voltage is applied to GRN1 for 750ms.
5. AC line voltage is applied to YEL1 for 3600ms.
6. AC line voltage is applied to RED1.
7. Repeat 2 through 6 for each channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer.

Probable Cause(s) of Failure :
Monitor input(s) shorted together.

GRN/YEL Dual Display

Test Description :
Verify that the Dual Display detection feature is working for each channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at 120Vac.
4. Turn off RED1.
5. Turn on GRN1.
6. Turn on YEL1
7. Check for transfer.
8. Turn off GRN1
9. Turn off YEL1
10. Turn on RED1
11. Reset monitor.
12. Repeat 4 through 11 for all channels.

Monitor Response to PASS :
Monitor must be found in transfer state for every channel.

Probable Cause(s) of Failure :
Monitor dual display circuitry not functioning correctly

RED/GRN Dual Display

Test Description :
Verify that the Dual Display detection feature is working for each channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at 120Vac.
4. Turn on GRN1.
5. Check for transfer.
6. Turn off GRN1.
7. Reset monitor.
8. Repeat 4 through 7 for all channels.

Monitor Response to PASS :
Monitor must be found in transfer state for every channel.

Probable Cause(s) of Failure :
Monitor dual display circuitry not functioning correctly

YEL/RED Dual Display

Test Description :
Verify that the Dual Display detection feature is working for each channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at 120Vac.
4. Turn on YEL1.
5. Check for transfer.
6. Turn off YEL1.
7. Reset monitor.
8. Repeat 4 through 7 for all channels.

Monitor Response to PASS :
Monitor must be found in transfer state for every channel.

Probable Cause(s) of Failure :
Monitor dual display circuitry not functioning correctly

LGND/EGND Isolation

Test Description :
Verify that LGND and EGND are NOT shorted together inside of the monitor.

Test Sequence :
No inputs are provided to the monitor. The PCMT tests for a short circuit between the monitor Logic ground and Earth ground pins.

Monitor Response to PASS :
Logic ground and Earth ground must not be shorted together in the monitor.

Probable Cause(s) of Failure :
Logic ground and Earth ground are connected inside of the monitor.

120 Flashes Per min, In-phase, GRN Conflict (Canadian TS2 Fast Flash only)

Test Description :
Verify that the monitor will go into the transfer state when presented with conflicting signals, flashing in-phase, at a rate of 120 flashes per minute.

Test Sequence :
1. Monitor is powered up in the quiescent state
2. GRN1 and GRN2 are "on" (120Vrms) for 250ms
3. GRN1 and GRN2 are "off" for 250ms
4. Steps 2 and 3 are repeated until the monitor is found in transfer or until a maximum of 30 times.

Monitor Response to PASS :
The PCMT will report the number of flashes it took to detect a transfer or that no transfer was detected after 30 flashes. The user must click on PASS or FAIL.

120 Flashes Per min, Out-of-phase, GRN Conflict (Canadian TS2 Fast Flash only)

Test Description :
Verify that the monitor will go into the transfer state when presented with conflicting signals, flashing out-of-phase, at a rate of 120 flashes per minute.

Test Sequence :
1. Monitor is powered up in the quiescent state
2. GRN1 and GRN2 are "on" (120Vrms) for 250ms
3. GRN1 and GRN2 are "off" for 250ms
4. Steps 2 and 3 are repeated until the monitor is found in transfer or until a maximum of 30 times.

Monitor Response to PASS :
The PCMT will report the number of flashes it took to detect a transfer or that no transfer was detected after 30 flashes. The user must click on PASS or FAIL.

180 Flashes Per min, In-phase, GRN Conflict (Canadian TS2 Fast Flash only)

Test Description :
Verify that the monitor will go into the transfer state when presented with conflicting signals, flashing in-phase, at a rate of 180 flashes per minute.

Test Sequence :
1. Monitor is powered up in the quiescent state
2. GRN1 and GRN2 are "on" (120Vrms) for 166ms
3. GRN1 and GRN2 are "off" for 166ms
4. Steps 2 and 3 are repeated until the monitor is found in transfer or until a maximum of 30 times.

Monitor Response to PASS :
The PCMT will report the number of flashes it took to detect a transfer or that no transfer was detected after 30 flashes. The user must click on PASS or FAIL.

180 Flashes Per min, Out-of-phase, GRN Conflict (Canadian TS2 Fast Flash only)

Test Description :
Verify that the monitor will go into the transfer state when presented with conflicting signals, flashing out-of-phase, at a rate of 180 flashes per minute.

Test Sequence :
1. Monitor is powered up in the quiescent state
2. GRN1 and GRN2 are "on" (120Vrms) for 166ms
3. GRN1 and GRN2 are "off" for 166ms
4. Steps 2 and 3 are repeated until the monitor is found in transfer or until a maximum of 30 times.

Monitor Response to PASS :
The PCMT will report the number of flashes it took to detect a transfer or that no transfer was detected after 30 flashes. The user must click on PASS or FAIL.

AC Power Failure Threshold

Test Description :
Verify that the monitor low AC line dropout and restore voltages are within the standard limits.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Monitor AC line power is at 105Vrms.
3. AC line power is slowly decreased until monitor is found in the Transfer state.
4. The AC line dropout voltage is recorded.
5. AC line power is slowly increased until monitor is NOT found in the Transfer state.
6. The AC line restore voltage is recorded.
7. The difference between the restore and dropout voltage is recorded (hysteresis)

Note : In step 5 there is a 16.5 second delay after each incremental increase in voltage because of the monitor initial flash time.

Monitor Response to PASS :
AC line voltage will be considered "on" if the voltage level is greater than 98Vrms. AC line voltage will be considered "off" if the voltage is less than 89Vrms. The hysteresis value must be greater than or equal to 3 volts.

Probable Cause(s) of Failure :
Faulty line sensing circuitry or monitor not calibrated to measure "true RMS".

Power and RED Channel Indicators

Test Description :
Verify that the Power and RED channel indicators are working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are on.

Monitor Response to PASS :
Power and RED channel indicators must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Power, Conflict and GRN Channel Indicators

Test Description :
Verify that the Power, Conflict, and GRN channel indicators are working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All GRN channels are on.

Monitor Response to PASS :
Power, Conflict and GRN channel indicators must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Power, Conflict and YEL Channel Indicators

Test Description :
Verify that the Power, Conflict, and YEL channel indicators are working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All YEL channels are on.

Monitor Response to PASS :
Power, Conflict and YEL channel indicators must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Dual Display Indicator

Test Description :
Verify that the Dual Display indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. RED1 and GRN1 are on.

Monitor Response to PASS :
Dual Display Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Redfail Indicator

Test Description :
Verify that the Redfail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at AC line.
4. RED1 is turned off.

Monitor Response to PASS :
Redfail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Short YEL Indicator

Test Description :
Verify that the Short Yellow indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at 120Vac.
3. RED1 is turned off.
4. GRN1 is turned on.
5. Delay 2 sec.
6. GRN1 is turned off.
7. YEL1 is turned on.
8. Delay 2 sec.
9. YEL1 is turned off.
10. RED1 is turned on.

Monitor Response to PASS :
Short Yellow (clearance) Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

DC1 (24V1) Fail Indicator

Test Description :
Verify that the DC1 Fail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC1 voltage is removed.

Monitor Response to PASS :
DC1 (24V) Fail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

DC2 (24V2) Fail Indicator

Test Description :
Verify that the DC2 Fail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC2 voltage is removed.

Monitor Response to PASS :
DC2 (24V) Fail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Watchdog Fail Indicator

Test Description :
Verify that the Watchdog Fail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Watchdog signal is removed.

Monitor Response to PASS :
Watchdog Fail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

GRN/GRN, GRN/YEL, GRN/WLK, YEL/GRN, YEL/YEL, YEL/WLK, WLK/GRN, WLK/YEL, WLK/WLK Permissive (Programmed Card)

Test Description :
This test is ran with a programmed intersection card. It is intended to verify the programmed permissives.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Conflicting GYW signals are presented to each channel pair.

Monitor Response to PASS :
The permissives found during the test must match what is programmed on the card.

Probable Cause(s) of Failure :
Faulty monitor measurement circuitry.
Bad connections on programming card.

System 170 Type 210 PCMT-2600 Test Descriptions

Note : All tests relating to RED monitoring are only applicable if CalTrans Model 210 with Reds is selected as the monitor standard.

Monitor Preliminary Tests

Short Circuit Test

Test Description :
Test for short circuits inside of the monitor. (i.e. Input channels shorted to AC line voltage.)

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. The PCMT variable voltage source is turned off.
3. Each RED, GRN, YEL and WLK channel is turned on.
4. The PCMT measures it's variable voltage source.

Monitor Response to PASS :
The PCMT should measure negligible voltage after each channel is turned on.

Probable Cause(s) of Failure :
Component failure or short circuit in monitor.
Note : Testing will be aborted if this test fails.

Reset Test

Test Description :
Verify that the monitor reset input is working.

Test Sequence :
1. Monitor is powered up in the quiescent condition.
2. Reset input is activated for 250ms.
3. Delay 500ms
4. Check Transfer state.

Monitor Response to PASS :
Monitor NOT in transfer state.

Probable Cause(s) of Failure :
Transfer Relay contacts faulty.
Blown power fuse in monitor.
Note : Testing will be aborted if this test fails.

System / Timing Tests

Interlock Sensing

Test Description :
Verify that the Interlock input is working.

Test Sequence :
1. Interlock input set at 24V.
2. Check Interlock output.
3. Interlock input set at 0V.
4. Check Interlock output.

Monitor Response to PASS :
State of Interlock output identical to Interlock input.

Probable Cause(s) of Failure :
Interlock wiring on monitor is faulty.
Dirty socket connector.

Stop Time

Test Description :
Verify that the Stop Time contacts follow the "A" relay contacts.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Conflict is created on GRN1, and GRN2.
3. Delay
4. Check Stop Time contacts.
5. Remove conflict
6. Reset monitor.

Monitor Response to PASS :
Stop Time Open contacts closed on conflict.
Stop Time Open contacts open with no conflict.

Probable Cause(s) of Failure :
Faulty relay

24VDC Low Timing

Test Description :
Verify that the monitor ignores a loss of 24VDC power lasting 200ms and detects a loss of 24VDC lasting 500ms.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Set the DC power to 17V.
3. Delay 200ms.
4. Set DC power back to 24V.
5. Delay 200ms.
6. Check transfer state.
7. Set the DC power to 17V.
8. Delay 500ms.
9. Set DC power back to 24V.
10. Delay 200ms.
11. Check transfer state.

Monitor Response to PASS :
Transfer state NOT detected at (6).
Transfer state detected at (11).

Probable Cause(s) of Failure :
Faulty DC measurement circuitry.

24VDC Reset

Test Description :
Verify that a DC power fault is latched through a loss of AC power.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Set DC Voltage to 0 VDC
3. Delay.
4. Turn off monitor AC power.
5. Delay 1 sec.
6. Turn on monitor AC power.
7. Delay 500ms.
8. Check transfer state.

Monitor Response to PASS :
Transfer state detected at (8).

Probable Cause(s) of Failure :
Faulty DC measurement circuitry.

Constant Reset

Test Description :
Verify that a constant reset input to the monitor will not reset the transfer state.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC power is set to 17 VDC.
3. Transfer state is checked.
4. Monitor reset input is activated continuously.
5. Transfer is checked for 120 seconds maximum.

Monitor Response to PASS :
Monitor must be in transfer state at (3). Monitor must be found in transfer at (5) within 120 seconds.

Probable Cause(s) of Failure :
Faulty or failed reset logic or hardware.

Watchdog Timing

Test Description :
Verify that the monitor detects a loss of the Watchdog signal lasting between 900 and 1100ms or 1400 and 1600ms.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Watchdog signal is turned off for 883ms.
3. Delay 250ms.
4. Check transfer state.
5. Watchdog signal is turned off for 900ms.
6. Transfer state is checked.
7. If not in transfer, off time is incremented.
8. If transfer is found, test is over.
9. Steps 6, 7 and 8 are repeated until off time is greater than 1100ms.
10. Watchdog signal is turned off for 1400ms.
11. Transfer state is checked.
12. If not in transfer, off time is incremented.
13. If transfer is found, test is over.
14. Steps 11, 12 and 13 are repeated until off time is greater than 1600ms.

Monitor Response to PASS :
Monitor must NOT be found in transfer state at (4). Watchdog off time of 900-1100ms or 1400-1600ms must cause a transfer state.

Probable Cause(s) of Failure :
Faulty Watchdog timing circuit, or Watchdog inhibit switch is on.

Conflict Timing

Test Description :
Verify that the monitor ignores a conflict lasting less than 200ms and recognizes a conflict lasting more than 500ms. (Conflicts lasting between 200 and 500ms may or may not be recognized.)

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A GRN-GRN conflict is created for 183ms.
3. Delay 250ms.
4. Check transfer state.
5. GRN-GRN conflict is created for 200ms.
6. Delay 250ms.
7. Check transfer state.
8. If no transfer is found, conflict time is incremented.
9. Repeat steps 6, 7, and 8 until transfer state is found OR conflict time is greater than 500ms.

Monitor Response to PASS :
Monitor must NOT be found in transfer state at (4). Conflict times between 200 and 500ms MAY cause the monitor to go into transfer. Conflicts lasting greater than 500ms MUST cause the monitor to go into transfer.

Probable Cause(s) of Failure :
Faulty conflict timing circuit, or permissive programmed into monitor.

Conflict Latching Reset

Test Description :
Verify that a conflict is latched through the loss of AC power.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A GRN-GRN conflict is created.
3. Delay.
4. Check transfer state.
5. Remove conflict.
6. Delay.
7. Turn off monitor AC power for 1 second.
8. Turn monitor AC power back on.
9. Delay.
10. Check transfer state.

Monitor Response to PASS :
Montior must be found in transfer at (4). Monitor must be found in transfer at (10).

Probable Cause(s) of Failure :
Faulty latching relay circuitry.

Redfail Timing

Test Description :
Verify that the monitor detects a Redfail condition lasting between 700 and 1000ms or 1200 and 1500ms.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redfail is created for 683ms.
3. Delay 250ms.
4. Check transfer state.
5. Redfail is created for 700ms.
6. Transfer state is checked.
7. If not in transfer, Redfail time is incremented.
8. If transfer is found, test is over.
9. Steps 6, 7 and 8 are repeated until Redfail time is greater than 1000ms.
10. Redfail is created for 1200ms.
11. Transfer state is checked.
12. If not in transfer, Redfail time is incremented.
13. If transfer is found, test is over.
14. Steps 11, 12 and 13 are repeated until Redfail time is greater than 1500ms.

Monitor Response to PASS :
Monitor must NOT be found in transfer state at (4). Redfail time of 700-1000ms or 1200-1500ms must cause a transfer state.

Probable Cause(s) of Failure :
Faulty Red Fail timing circuit, or Red Enable not active.

Redfail Latching

Test Description :
Verify that a Redfail is latched through the loss of AC power.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A Redfail is created.
3. Delay.
4. Check transfer state.
5. Remove Redfail.
6. Delay.
7. Turn off monitor AC power for 1 second.
8. Turn monitor AC power back on.
9. Delay.
10. Check transfer state.

Monitor Response to PASS :
Montior must be found in transfer at (4). Monitor must be found in transfer at (10).

Probable Cause(s) of Failure :
Faulty latching relay circuitry.

Redenable

Test Description :
Verify that the monitor ignores a Redfail condition when Redenable is turned off.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable is turned off.
3. Delay.
4. A Redfail condition is created.
5. Delay.
6. Check transfer state.

Monitor Response to PASS :
Monitor must be found in transfer at (6).

Probable Cause(s) of Failure :
Faulty Redenable circuitry.

50ms Power Interrupt

Test Description :
Verify that the monitor ignores a 50ms AC power loss.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC power is removed for 50ms.
3. Delay.
4. Check transfer state.

Monitor Response to PASS :
Monitor must NOT be found in transfer at (4).

Probable Cause(s) of Failure :
Faulty line sensing or timing circuitry

Voltage Tests

RED 70Vrms Sine Wave

Test Description :
Verify that a sine wave greater than 70Vrms is recognized as being "on" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is activated.
3. A sine wave greater than 70Vrms is applied to each RED channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer state.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

RED 50Vrms Sine Wave

Test Description :
Verify that a sign wave less than 50Vrms is recognized as being "off" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at AC line voltage.
3. Redenable input is activated.
4. A sine wave less than 50Vrms is applied to each RED channel one at a time.
5. Transfer state is checked for each channel.

Monitor Response to PASS :
50Vrms on any RED channel must cause monitor to go into transfer state (Redfail fault).

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, 25Vrms Sine Wave

Test Description :
Verify the monitor recognizes a sign wave greater than 25Vrms as being "on" for every GY channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A sine wave greater than 25Vrms is applied to each GY channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must go to transfer state when 25Vrms is applied to any GY channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, 25Vrms Positive Rectified

Test Description :
Verify that the monitor recognizes a positive rectified sign wave greater than 25Vrms as being "on" for every GY channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A positive rectified sine wave greater than 25Vrms is applied to each GY channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must go to transfer state when 25Vrms is applied to any GY channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, 25Vrms Negative Rectified

Test Description :
Verify that the monitor recognizes a negative rectified sign wave greater than 25Vrms as being "on" for every GY channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A negative rectified sine wave greater than 25Vrms is applied to each GY channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must go to transfer state when 25Vrms is applied to any GY channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

Optional Tests

GRN/GRN, GRN/YEL, YEL/GRN, YEL/YEL, Permissive (Non-Programmed Card)

Test Description :
Run this test with a "clean" (non-programmed) card to verify that there are no hidden permissives.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Conflicting GRN or YEL signals are presented to each channel pair.

Note : This test should be done with a "clean" programming card in the monitor (no permissives programmed

Monitor Response to PASS :
Each channel pair must put monitor into transfer state when the conflict is presented.

Probable Cause(s) of Failure :
Faulty monitor measurement circuitry or programming card has permissives programmed.

Watchdog Enable

Test Description :
Verify that the monitor disables the Watchdog detection circuitry when the AC line voltage drops below 98 +/- 2 Vrms and re-enables the Watchdog circuitry when the AC line voltage rises above 103 +/- 2 Vrms. Also, the hysteresis between the disable and re-enable voltages must be a minimum of 3 Vrms.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Monitor AC line set to just above 100Vrms
3. PCMT Watchdog signal is turned off.
4. Delay.
5. Check for monitor transfer state.
6. Monitor AC line is set to greater than 105Vrms.
7. PCMT Watchdog signal is turned on.
8. Monitor is reset.
9. Monitor AC line is set to 100.5 Vrms.
10. Monitor AC line is decreased by approximately 0.25Vrms.
11. PCMT Watchdog signal is turned off.
12. Delay.
13. Check for monitor transfer state.
14. If monitor is found in transfer continue, else go to step (20).
15. Increase AC line voltage by 15Vrms.
16. PCMT Watchdog signal is turned on.
17. Reset the monitor.
18. Decrease AC line voltage by 15Vrms.
19. Go to step (10). Repeat until AC line is less than 96Vrms.
20. Record the AC line voltage.
21. PCMT Watchdog signal is turned off.
22. Increase AC line voltage by approximately 0.25Vrms.
23. Delay.
24. Check for monitor transfer state.
25. If monitor found in transfer or if AC line is greater than 115Vrms continue, else go to step (22).
26. Record the AC line voltage

Monitor Response to PASS :
AC line voltage at (20) must be between 96 and 100Vrms. AC line voltage at (26) must be between 101 and 105Vrms. The difference between the voltage at (26) and (20) must be a minimum of 3 Vrms.

Probable Cause(s) of Failure :
Monitor Watchdog circuitry not functioning properly. Monitor is not calibrated to measure "true RMS".

RED/GRN/YEL Single Channel

Test Description :
Line voltage is applied to each RED, GRN, and YEL input one at a time to verify that a single input will not cause the monitor to go into the transfer state.

Test Sequence :

1. Monitor is powered up in the quiescent state.
2. AC line voltage is applied to RED1 for 750ms.
3. AC line voltage is applied to GRN1 for 750ms.
4. AC line voltage is applied to YEL1 for 3600ms.
5. AC line voltage is applied to RED1.
6. Repeat 2 through 5 for each channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer.

Probable Cause(s) of Failure :
Monitor input(s) shorted together.

GRN/YEL Single Channel

Test Description :
Line voltage is applied to each, GRN, and YEL input one at a time to verify that a single input will not cause the monitor to go into the transfer state.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC line voltage is applied to GRN1 for 750ms.
3. AC line voltage is applied to YEL1 for 3600ms.
4. Repeat 2 through 3 for each channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer.

Probable Cause(s) of Failure :
Monitor input(s) shorted together.

Short YEL

Test Description :
Apply the GRN, YEL, RED sequence to each channel with a 2 second YEL to verify that the monitor will go into the Transfer state.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC line voltage is applied to GRN1 for 2 sec.
3. AC line voltage is applied to YEL1 for 2 sec.
4. AC line voltage is applied to RED1.
5. Wait 2 sec.
6. Check transfer state.
7. Reset the monitor.
8. Repeat 2 through 7 for all channels

Monitor Response to PASS :
Monitor must be found in transfer on every channel.

Probable Cause(s) of Failure :
Monitor timing circuitry not functioning correctly.

GRN/YEL Dual Display

Test Description :
Verify that the Dual Display detection feature is working for each channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at 120Vac.
4. Turn off RED1.
5. Turn on GRN1.
6. Turn on YEL1
7. Check for transfer.
8. Turn off GRN1
9. Turn off YEL1
10. Turn on RED1
11. Reset monitor.
12. Repeat 4 through 11 for all channels.

Monitor Response to PASS :
Monitor must be found in transfer state for every channel.

Probable Cause(s) of Failure :
Monitor dual display circuitry not functioning correctly

RED/GRN Dual Display

Test Description :
Verify that the Dual Display detection feature is working for each channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at 120Vac.
4. Turn on GRN1.
5. Check for transfer.
6. Turn off GRN1.
7. Reset monitor.
8. Repeat 4 through 7 for all channels.

Monitor Response to PASS :
Monitor must be found in transfer state for every channel.

Probable Cause(s) of Failure :
Monitor dual display circuitry not functioning correctly

YEL/RED Dual Display

Test Description :
Verify that the Dual Display detection feature is working for each channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at 120Vac.
4. Turn on YEL1.
5. Check for transfer.
6. Turn off YEL1.
7. Reset monitor.
8. Repeat 4 through 7 for all channels.

Monitor Response to PASS :
Monitor must be found in transfer state for every channel.

Probable Cause(s) of Failure :
Monitor dual display circuitry not functioning correctly

LGND/EGND Isolation

Test Description :
Verify that LGND and EGND are NOT shorted together inside of the monitor.

Test Sequence :
No inputs are provided to the monitor. The PCMT tests for a short circuit between the monitor Logic ground and Earth ground pins.

Monitor Response to PASS :
Logic ground and Earth ground must not be shorted together in the monitor.

Probable Cause(s) of Failure :
Logic ground and Earth ground are connected inside of the monitor.

Power and RED Channel Indicators

Test Description :
Verify that the Power and RED channel indicators are working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are on.

Monitor Response to PASS :
Power and RED channel indicators must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Power, Conflict and GRN Channel Indicators

Test Description :
Verify that the Power, Conflict, and GRN channel indicators are working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All GRN channels are on.

Monitor Response to PASS :
Power, Conflict and GRN channel indicators must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Power, Conflict and YEL Channel Indicators

Test Description :
Verify that the Power, Conflict, and YEL channel indicators are working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All YEL channels are on.

Monitor Response to PASS :
Power, Conflict and YEL channel indicators must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Dual Display Indicator

Test Description :
Verify that the Dual Display indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. RED1 and GRN1 are on.

Monitor Response to PASS :
Dual Display Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Redfail Indicator

Test Description :
Verify that the Redfail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at AC line.
4. RED1 is turned off.

Monitor Response to PASS :
Redfail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Short YEL Indicator

Test Description :
Verify that the Short Yellow indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at 120Vac.
3. RED1 is turned off.
4. GRN1 is turned on.
5. Delay 2 sec.
6. GRN1 is turned off.
7. YEL1 is turned on.
8. Delay 2 sec.
9. YEL1 is turned off.
10. RED1 is turned on.

Monitor Response to PASS :
Short Yellow (clearance) Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

DC1 (24V1) Fail Indicator

Test Description :
Verify that the DC1 Fail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC1 voltage is removed.

Monitor Response to PASS :
DC1 (24V) Fail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Watchdog Fail Indicator

Test Description :
Verify that the Watchdog Fail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Watchdog signal is removed.

Monitor Response to PASS :
Watchdog Fail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

GRN/GRN, GRN/YEL, YEL/GRN, YEL/YEL, Permissive (Programmed Card)

Test Description :
This test is ran with a programmed intersection card. It is intended to verify the programmed permissives.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Conflicting GYW signals are presented to each channel pair.

Monitor Response to PASS :
The permissives found during the test must match what is programmed on the card.

Probable Cause(s) of Failure :
Faulty monitor measurement circuitry.
Bad connections on programming card.

System 270 Type 2010 PCMT-2600 Test Descriptions

Monitor Preliminary Tests

Short Circuit Test

Test Description :
Test for short circuits inside of the monitor. (i.e. Input channels shorted to AC line voltage.)

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. The PCMT variable voltage source is turned off.
3. Each RED, GRN, YEL and WLK channel is turned on.
4. The PCMT measures it's variable voltage source.

Monitor Response to PASS :
The PCMT should measure negligible voltage after each channel is turned on.

Probable Cause(s) of Failure :
Component failure or short circuit in monitor.
Note : Testing will be aborted if this test fails.

Reset Test

Test Description :
Verify that the monitor reset input is working.

Test Sequence :
1. Monitor is powered up in the quiescent condition.
2. Reset input is activated for 250ms.
3. Delay 500ms
4. Check Transfer state.

Monitor Response to PASS :
Monitor NOT in transfer state.

Probable Cause(s) of Failure :
Transfer Relay contacts faulty.
Blown power fuse in monitor.
Note : Testing will be aborted if this test fails.

System / Timing Tests

Interlock Sensing

Test Description :
Verify that the Interlock input is working.

Test Sequence :
1. Interlock input set at 24V.
2. Check Interlock output.
3. Interlock input set at 0V.
4. Check Interlock output.

Monitor Response to PASS :
State of Interlock output identical to Interlock input.

Probable Cause(s) of Failure :
Interlock wiring on monitor is faulty.
Dirty socket connector.

Stop Time

Test Description :
Verify that the Stop Time contacts follow the "A" relay contacts.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Conflict is created on GRN1, and GRN2.
3. Delay
4. Check Stop Time contacts.
5. Remove conflict
6. Reset monitor.

Monitor Response to PASS :
Stop Time Open contacts closed on conflict.
Stop Time Open contacts open with no conflict.

Probable Cause(s) of Failure :
Faulty relay

24VDC Low Timing

Test Description :
Verify that the monitor ignores a loss of 24VDC power lasting 200ms and detects a loss of 24VDC lasting 500ms.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Set the DC power to 17V.
3. Delay 200ms.
4. Set DC power back to 24V.
5. Delay 200ms.
6. Check transfer state.
7. Set the DC power to 17V.
8. Delay 500ms.
9. Set DC power back to 24V.
10. Delay 200ms.
11. Check transfer state.

Monitor Response to PASS :
Transfer state NOT detected at (6).
Transfer state detected at (11).

Probable Cause(s) of Failure :
Faulty DC measurement circuitry.

24VDC Reset

Test Description :
Verify that a DC power fault is latched through a loss of AC power.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Set DC Voltage to 0 VDC
3. Delay.
4. Turn off monitor AC power.
5. Delay 1 sec.
6. Turn on monitor AC power.
7. Delay 500ms.
8. Check transfer state.

Monitor Response to PASS :
Transfer state detected at (8).

Probable Cause(s) of Failure :
Faulty DC measurement circuitry.

Constant Reset

Test Description :
Verify that a constant reset input to the monitor will not reset the transfer state.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC power is set to 17 VDC.
3. Transfer state is checked.
4. Monitor reset input is activated continuously.
5. Transfer is checked for 120 seconds maximum.

Monitor Response to PASS :
Monitor must be in transfer state at (3). Monitor must be found in transfer at (5) within 120 seconds.

Probable Cause(s) of Failure :
Faulty or failed reset logic or hardware.

Watchdog Timing

Test Description :
Verify that the monitor detects a loss of the Watchdog signal lasting between 900 and 1100ms or 1400 and 1600ms.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Watchdog signal is turned off for 883ms.
3. Delay 250ms.
4. Check transfer state.
5. Watchdog signal is turned off for 900ms.
6. Transfer state is checked.
7. If not in transfer, off time is incremented.
8. If transfer is found, test is over.
9. Steps 6, 7 and 8 are repeated until off time is greater than 1100ms.
10. Watchdog signal is turned off for 1400ms.
11. Transfer state is checked.
12. If not in transfer, off time is incremented.
13. If transfer is found, test is over.
14. Steps 11, 12 and 13 are repeated until off time is greater than 1600ms.

Monitor Response to PASS :
Monitor must NOT be found in transfer state at (4). Watchdog off time of 900-1100ms or 1400-1600ms must cause a transfer state.

Probable Cause(s) of Failure :
Faulty Watchdog timing circuit, or Watchdog inhibit switch is on.

Conflict Timing

Test Description :
Verify that the monitor ignores a conflict lasting less than 200ms and recognizes a conflict lasting more than 500ms. (Conflicts lasting between 200 and 500ms may or may not be recognized.)

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A GRN-GRN conflict is created for 183ms.
3. Delay 250ms.
4. Check transfer state.
5. GRN-GRN conflict is created for 200ms.
6. Delay 250ms.
7. Check transfer state.
8. If no transfer is found, conflict time is incremented.
9. Repeat steps 6, 7, and 8 until transfer state is found OR conflict time is greater than 500ms.

Monitor Response to PASS :
Monitor must NOT be found in transfer state at (4). Conflict times between 200 and 500ms MAY cause the monitor to go into transfer. Conflicts lasting greater than 500ms MUST cause the monitor to go into transfer.

Probable Cause(s) of Failure :
Faulty conflict timing circuit, or permissive programmed into monitor.

Conflict Latching Reset

Test Description :
Verify that a conflict is latched through the loss of AC power.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A GRN-GRN conflict is created.
3. Delay.
4. Check transfer state.
5. Remove conflict.
6. Delay.
7. Turn off monitor AC power for 1 second.
8. Turn monitor AC power back on.
9. Delay.
10. Check transfer state.

Monitor Response to PASS :
Montior must be found in transfer at (4). Monitor must be found in transfer at (10).

Probable Cause(s) of Failure :
Faulty latching relay circuitry.

Redfail Timing

Test Description :
Verify that the monitor detects a Redfail condition lasting between 700 and 1000ms or 1200 and 1500ms.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redfail is created for 683ms.
3. Delay 250ms.
4. Check transfer state.
5. Redfail is created for 700ms.
6. Transfer state is checked.
7. If not in transfer, Redfail time is incremented.
8. If transfer is found, test is over.
9. Steps 6, 7 and 8 are repeated until Redfail time is greater than 1000ms.
10. Redfail is created for 1200ms.
11. Transfer state is checked.
12. If not in transfer, Redfail time is incremented.
13. If transfer is found, test is over.
14. Steps 11, 12 and 13 are repeated until Redfail time is greater than 1500ms.

Monitor Response to PASS :
Monitor must NOT be found in transfer state at (4). Redfail time of 700-1000ms or 1200-1500ms must cause a transfer state.

Probable Cause(s) of Failure :
Faulty Red Fail timing circuit, or Red Enable not active.

Redfail Latching

Test Description :
Verify that a Redfail is latched through the loss of AC power.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A Redfail is created.
3. Delay.
4. Check transfer state.
5. Remove Redfail.
6. Delay.
7. Turn off monitor AC power for 1 second.
8. Turn monitor AC power back on.
9. Delay.
10. Check transfer state.

Monitor Response to PASS :
Montior must be found in transfer at (4). Monitor must be found in transfer at (10).

Probable Cause(s) of Failure :
Faulty latching relay circuitry.

Redenable at 71Vrms

Test Description :
Verify that the monitor can detect a Redfail condition when the Redenable input is at 71 Vrms.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable is set to 71Vrms.
3. Delay.
4. All Red channels are turned off.
5. Delay.
6. Check transfer state.

Monitor Response to PASS :
Monitor must be found in transfer at (6).

Probable Cause(s) of Failure :
Faulty Redenable monitoring circuitry.
Monitor not calibrated to measure "true RMS".

Redenable at 49Vrms

Test Description :
Verify that the monitor ignores a Redfail condition when the Redenable input is at 49 Vrms.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable is set to 49 Vrms.
3. Delay.
4. All Red channels are turned off.
5. Delay.
6. Check transfer state.

Monitor Response to PASS :
Monitor must NOT be found in transfer at (6).

Probable Cause(s) of Failure :
Faulty Redenable monitoring circuitry.
Monitor not calibrated to measure "true RMS".

Voltage Tests

RED 70Vrms Sine Wave

Test Description :
Verify that a sine wave greater than 70Vrms is recognized as being "on" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is activated.
3. A sine wave greater than 70Vrms is applied to each RED channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer state.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

RED 70Vrms Positive Rectified

Test Description :
Verify that a positive rectified sine wave greater than 70Vrms is recognized as being "on" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is activated.
3. A positive rectified sine wave greater than 70Vrms is applied to each RED channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer state.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

RED 70Vrms Negative Rectified

Test Description :
Verify that a negative rectified sine wave greater than 70Vrms is recognized as being "on" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is activated.
3. A negative rectified sine wave greater than 70Vrms is applied to each RED channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer state.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

RED 50Vrms Sine Wave

Test Description :
Verify that a sign wave less than 50Vrms is recognized as being "off" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at AC line voltage.
3. Redenable input is activated.
4. A sine wave less than 50Vrms is applied to each RED channel one at a time.
5. Transfer state is checked for each channel.

Monitor Response to PASS :
50Vrms on any RED channel must cause monitor to go into transfer state (Redfail fault).

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

RED 50Vrms Positive Rectified

Test Description :
Verify that a positive rectified sign wave less than 50Vrms is recognized as being "off" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at AC line voltage.
3. Redenable input is activated.
4. A positive rectified sine wave less than 50Vrms is applied to each RED channel one at a time.
5. Transfer state is checked for each channel.

Monitor Response to PASS :
50Vrms on any RED channel must cause monitor to go into transfer state (Redfail fault).

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

RED 50Vrms Negative Rectified

Test Description :
Verify that a negative rectified sign wave less than 50Vrms is recognized as being "off" for every RED channel input.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at AC line voltage.
3. Redenable input is activated.
4. A negative rectified sine wave less than 50Vrms is applied to each RED channel one at a time.
5. Transfer state is checked for each channel.

Monitor Response to PASS :
50Vrms on any RED channel must cause monitor to go into transfer state (Redfail fault).

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, 25Vrms Sine Wave

Test Description :
Verify the monitor recognizes a sign wave greater than 25Vrms as being "on" for every GY channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A sine wave greater than 25Vrms is applied to each GY channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must go to transfer state when 25Vrms is applied to any GY channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, 25Vrms Positive Rectified

Test Description :
Verify that the monitor recognizes a positive rectified sign wave greater than 25Vrms as being "on" for every GY channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A positive rectified sine wave greater than 25Vrms is applied to each GY channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must go to transfer state when 25Vrms is applied to any GY channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

GRN, YEL, 25Vrms Negative Rectified

Test Description :
Verify that the monitor recognizes a negative rectified sign wave greater than 25Vrms as being "on" for every GY channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. A negative rectified sine wave greater than 25Vrms is applied to each GY channel one at a time while GRN1 or GRN2 is at AC line voltage.
3. Transfer state is checked for each channel.

Monitor Response to PASS :
Monitor must go to transfer state when 25Vrms is applied to any GY channel.

Probable Cause(s) of Failure :
Faulty measurement circuitry or monitor is not calibrated to measure "true RMS".

Optional Tests

GRN/GRN, GRN/YEL, YEL/GRN, YEL/YEL, Permissive (Non-Programmed Card)

Test Description :
Run this test with a "clean" (non-programmed) card to verify that there are no hidden permissives.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Conflicting GRN or YEL signals are presented to each channel pair.

Note : This test should be done with a "clean" programming card in the monitor (no permissives programmed

Monitor Response to PASS :
Each channel pair must put monitor into transfer state when the conflict is presented.

Probable Cause(s) of Failure :
Faulty monitor measurement circuitry or programming card has permissives programmed.

RED/GRN/YEL Single Channel

Test Description :
Line voltage is applied to each RED, GRN, and YEL input one at a time to verify that a single input will not cause the monitor to go into the transfer state.

Test Sequence :

1. Monitor is powered up in the quiescent state.
2. AC line voltage is applied to RED1 for 750ms.
3. AC line voltage is applied to GRN1 for 750ms.
4. AC line voltage is applied to YEL1 for 3600ms.
5. AC line voltage is applied to RED1.
6. Repeat 2 through 5 for each channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer.

Probable Cause(s) of Failure :
Monitor input(s) shorted together.

GRN/YEL Single Channel

Test Description :
Line voltage is applied to each, GRN, and YEL input one at a time to verify that a single input will not cause the monitor to go into the transfer state.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC line voltage is applied to GRN1 for 750ms.
3. AC line voltage is applied to YEL1 for 3600ms.
4. Repeat 2 through 3 for each channel.

Monitor Response to PASS :
Monitor must NOT be found in transfer.

Probable Cause(s) of Failure :
Monitor input(s) shorted together.

Short YEL

Test Description :
Apply the GRN, YEL, RED sequence to each channel with a 2 second YEL to verify that the monitor will go into the Transfer state.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC line voltage is applied to GRN1 for 2 sec.
3. AC line voltage is applied to YEL1 for 2 sec.
4. AC line voltage is applied to RED1.
5. Wait 2 sec.
6. Check transfer state.
7. Reset the monitor.
8. Repeat 2 through 7 for all channels

Monitor Response to PASS :
Monitor must be found in transfer on every channel.

Probable Cause(s) of Failure :
Monitor timing circuitry not functioning correctly.

GRN/YEL Dual Display

Test Description :
Verify that the Dual Display detection feature is working for each channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at 120Vac.
4. Turn off RED1.
5. Turn on GRN1.
6. Turn on YEL1
7. Check for transfer.
8. Turn off GRN1
9. Turn off YEL1
10. Turn on RED1
11. Reset monitor.
12. Repeat 4 through 11 for all channels.

Monitor Response to PASS :
Monitor must be found in transfer state for every channel.

Probable Cause(s) of Failure :
Monitor dual display circuitry not functioning correctly

RED/GRN Dual Display

Test Description :
Verify that the Dual Display detection feature is working for each channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at 120Vac.
4. Turn on GRN1.
5. Check for transfer.
6. Turn off GRN1.
7. Reset monitor.
8. Repeat 4 through 7 for all channels.

Monitor Response to PASS :
Monitor must be found in transfer state for every channel.

Probable Cause(s) of Failure :
Monitor dual display circuitry not functioning correctly

YEL/RED Dual Display

Test Description :
Verify that the Dual Display detection feature is working for each channel.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at 120Vac.
4. Turn on YEL1.
5. Check for transfer.
6. Turn off YEL1.
7. Reset monitor.
8. Repeat 4 through 7 for all channels.

Monitor Response to PASS :
Monitor must be found in transfer state for every channel.

Probable Cause(s) of Failure :
Monitor dual display circuitry not functioning correctly

LGND/EGND Isolation

Test Description :
Verify that LGND and EGND are NOT shorted together inside of the monitor.

Test Sequence :
No inputs are provided to the monitor. The PCMT tests for a short circuit between the monitor Logic ground and Earth ground pins.

Monitor Response to PASS :
Logic ground and Earth ground must not be shorted together in the monitor.

Probable Cause(s) of Failure :
Logic ground and Earth ground are connected inside of the monitor.

AC Line Brownout

Test Description :
Verify that the monitor can recognize AC line brownout and restore voltages.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. AC power is set to 100.75 Vrms.
3. Transfer state is checked.
4. AC power is set to 95.5 Vrms.
5. Transfer state is checked.
6. AC power is set to 105.5 Vrms.
7. Delay.
8. Transfer state is checked.

Monitor Response to PASS :
Monitor must NOT be in transfer at (3). Monitor must be in transfer at (5). Monitor must NOT be in transfer at (8).

Probable Cause(s) of Failure
Faulty AC measurement circuitry. Monitor not calibrated to measure "true RMS".

NYC AC Power Failure Threshold

NOTE : This test is for New York City Only.

Test Description :
Verify that the monitor low AC line dropout and restore voltages are within the standard limits.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Monitor AC line power is at 105Vrms.
3. AC line power is slowly decreased until monitor
is found in the Transfer state.
4. The AC line dropout voltage is recorded.
5. AC line power is slowly increased until monitor is NOT found in the Transfer state.
6. The AC line restore voltage is recorded.
7. The difference between the restore and dropout voltage is recorded (hysteresis)

Note : In step 5 there is a 16.5 second delay after each incremental increase in voltage because of the monitor initial flash time.

Monitor Response to PASS :
AC Line dropout voltage must be greater than or equal to 89Vrms and less than or equal to 93Vrms. The AC Line restore voltage must be greater than or equal to 92Vrms and less than 96Vrms. The hysteresis value between dropout and restore must be greater than or equal to 1.5Vrms.

Probable Cause(s) of Failure :
Faulty line sensing circuitry.
Monitor not calibrated to measure "true RMS".

Power and RED Channel Indicators

Test Description :
Verify that the Power and RED channel indicators are working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are on.

Monitor Response to PASS :
Power and RED channel indicators must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Power, Conflict and GRN Channel Indicators

Test Description :
Verify that the Power, Conflict, and GRN channel indicators are working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All GRN channels are on.

Monitor Response to PASS :
Power, Conflict and GRN channel indicators must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Power, Conflict and YEL Channel Indicators

Test Description :
Verify that the Power, Conflict, and YEL channel indicators are working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All YEL channels are on.

Monitor Response to PASS :
Power, Conflict and YEL channel indicators must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Dual Display Indicator

Test Description :
Verify that the Dual Display indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. RED1 and GRN1 are on.

Monitor Response to PASS :
Dual Display Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Redfail Indicator

Test Description :
Verify that the Redfail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Redenable input is active.
3. All RED channels are at AC line.
4. RED1 is turned off.

Monitor Response to PASS :
Redfail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Short YEL Indicator

Test Description :
Verify that the Short Yellow indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. All RED channels are at 120Vac.
3. RED1 is turned off.
4. GRN1 is turned on.
5. Delay 2 sec.
6. GRN1 is turned off.
7. YEL1 is turned on.
8. Delay 2 sec.
9. YEL1 is turned off.
10. RED1 is turned on.

Monitor Response to PASS :
Short Yellow (clearance) Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

DC1 (24V1) Fail Indicator

Test Description :
Verify that the DC1 Fail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. DC1 voltage is removed.

Monitor Response to PASS :
DC1 (24V) Fail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

Watchdog Fail Indicator

Test Description :
Verify that the Watchdog Fail indicator is working.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Watchdog signal is removed.

Monitor Response to PASS :
Watchdog Fail Indicator must be illuminated. The user must verify by clicking yes in the pop-up window.

Probable Cause(s) of Failure :
Indicator light burnt out.

GRN/GRN, GRN/YEL, YEL/GRN, YEL/YEL, Permissive (Programmed Card)

Test Description :
This test is ran with a programmed intersection card. It is intended to verify the programmed permissives.

Test Sequence :
1. Monitor is powered up in the quiescent state.
2. Conflicting GYW signals are presented to each channel pair.

Monitor Response to PASS :
The permissives found during the test must match what is programmed on the card.

Probable Cause(s) of Failure :
Faulty monitor measurement circuitry.
Bad connections on programming card.

Monitor Switch Settings

ATSI recommends using the following guidelines for testing your conflict monitors. Please refer to your monitor's manual for instructions on how to change the settings on your particular monitor. The settings in this section are just guidelines. The switches may be labeled differently from manufacturer to manufacturer. Not all monitors are capable of running all of the optional tests. Please refer to your monitor's manual to find out if your monitors are capable of running the optional tests.

210 Standard

Watch Dog Enable = ON
All SSM or Field Check Enables = ON
BND Disable = ON
GY Enable = ON

2010 Standard

Watch Dog Enable = ON
RF 2010 = ON
GY Enable = ON
All SSM or Field Check Enables = ON

TS1 Standard

Minimum Flash between 4 and 11 seconds
GY Enable = ON
BND Disable = ON
Dual Enable = ON
SSM or Channel Enables = ON

TS2 Standard

GY Enable = ON
RP Disable = ON
Field Check / Dual Enable = ON

TS1 Canadian Standard

Minimum Flash between 4 and 11 seconds
GY Enable = ON
BND Disable = ON
Dual Enable = ON
SSM or Channel Enables = ON
Fast Flash Enable = ON

TS2 Canadian Standard

GY Enable = ON
RP Disable = ON
Field Check / Dual Enable = ON
Fast Flash Enable = ON

Troubleshooting

PCMT is not responding.

The following are the most common causes :

1. PCMT AC power cord is not plugged in.
2. The power switch on the front of the PCMT is in the OFF position.
3. The male end of the DB9 serial cable is not plugged into the PCMT.
4. The female end of the DB9 serial cable is not plugged into the computer.
5. Another software program is trying to use the computer's com port (i.e Hyperterminal, PDA, etc..)
6. The computer has an infrared port and it is interfering - make sure it is disabled.

If you a sure that nothing on the above list is causing the problem, try turning the PCMT off and then back on. You should hear three beeps and the sound of a motor turning for about 10 seconds. After the motor stops, try again to establish communications.

I do not hear three beeps when the PCMT is turned on.

1. Have you recently updated the PCMT firmware ?

Yes - The firmware update may not have been successful. Try to do it again.
No - The PCMT may be damaged. Contact ATSI.

I hear three beeps when the PCMT is turned on, but I do not hear the motor turning.

There may be an internal error in the PCMT
1. From the About screen, click on "Get PCMT Info".
2. Record any errors that are reported and contact ATSI.

I did a firmware update, and now my PCMT doesn't work.

The firmware update was probably not successful. This could have been caused by a loss of power, or a cable coming unplugged. Try to do the firmware update again.

I keep getting failures in my Test Report and I know that the monitor is good.

The following are the most common causes :
1. Wrong Monitor Standard selected on the Test Setup screen.
2. The Conflict Monitor switch settings are incorrect. See Monitor Switch Settings.
3. The wrong Conflict Monitor cables are being used.
4. The C and D connectors (if applicable) are reversed.
5. The monitor is not calibrated to measure "true RMS" voltage.

I am testing 16 Channel TS2 monitors and channels 11 and 12 always fail the voltage tests.

Your C and D conflict monitor cables are probably reversed.

Calibration

ATSI recommends having your PCMT-2600 calibrated annually.

To insure that your PCMT continues to operate within the manufacturer's specifications, it is important to have it calibrated once per year.

The calibration service runs a special test program on your PCMT to permit measurement of its voltage outputs, timing accuracy, and functional responses to verify proper operation. Any departures from current production standards are corrected back to new-product tolerances.

A detailed calibration report documenting all of these tests is returned with your calibrated PCMT. The annual calibration certificate compliments your monitor test reports in building a solid case against liability lawsuits. Be sure to keep all of your calibration certificates in a safe place for easy retrieval If someone brings legal action against your agency.

As a part of the calibration service, a copy of the newest software is provided for each of the owner's test modules. This assures that any new program enhancements will be provided, so that new-product performance is assured when your PCMT is returned.

ATSI is aware that many jurisdictions are reluctant to lose access to their tester for any extended period of time. For this reason, we attend promptly to testers returned for calibration, and return them in the shortest time consistent with accurate calibration followed by a continuous test run of at least 24 hours.

Please visit www.atsi-tester.com for the latest pricing of calibration services and extended maintenance plans.

Packing Your PCMT for Shipment

When shipping your PCMT back to ATSI, either for annual calibration or repairs, proper packing will help insure that the tester arrives without damage.

What to send ?

- PCMT-2600 Tester **with cables**.
- If a computer is sent, be sure to include the power supply cord and, if applicable, any external disk drives.

How to Pack

- It is preferable to use the original box and foam that your PCMT was shipped to you in.
- If the original packing materials are not available, place the PCMT inside of a large cardboard box with at least two inches of cushioning on all sides.
- Appropriate cushioning materials are foam, bubble wrap, or foam plastic "peanuts".
- UPS recommends a MINIMUM of two inches of cushioning on all sides of the box. If UPS determines the package was insufficiently packed, they will not pay for damages.
- If you are shipping a computer, follow the same packing guidelines given for the PCMT. Again, it is preferable to ship the computer in the original packaging materials if they are available.

Return Merchandise Form

- In order for ATSI to process your PCMT as quickly as possible, please fill out the Return Merchandise Form and include it with your shipment.

Return Merchandise Form

Agency: _____

Contact Person: _____

E-mail Address: _____

Phone & Fax Number: _____

Return Shipping Address: **Bill To:**

_____ _____

_____ _____

_____ _____

_____ _____

Tester Model # and Serial #: _____

Service Requested: _____

Method of Payment: _____

Purchase Order / Credit Card #: _____

Credit Card Expiration Date: _____ **Card Holder Name:** _____

Description of Problem or Special Instructions (if any): _____

_____

_____

_____

_____

NOTE :
Please send all of the testing cables back with your PCMT when sending it in for calibration or repair.

If you choose to send in your notebook with your PCMT, be sure to secure the computer within the PCMT case so that it does not shift around during shipment. Place the PCMT in between the foam inserts in the cardboard box the PMCT was originally shipped in. If the original box and foam is not available for return shipping, place the PCMT inside a large cardboard box with **at least two inches of cushioning on all sides of the contents** of the box.