Aeroflex 3920

XTS®/XTL™ Mobile and Portable Automated Test and Alignment

Operational Requirements

- ▼ **Aeroflex 3920**
- ▼ **Option 061 – Tracking Generator**
- ▼ **Option 200 – P25 Conventional Operation**
- ▼ **Option 218 – Auto-Test II for P25**
- ▼ **Option 600 – Motorola XTS/XTL Series Auto-Test and Alignment**
  - – **Option 602 – Motorola XTL Power Alignment**
  - – **AC24011 – 10 AMP Current Shunt 0.01 Ohm (for Mobile Power Alignment)**
- ▼ **Power Supply**
- ▼ **Battery Eliminator (for portables)**
- ▼ **Test Cable (Low Loss Phase Stable recommended for best accuracy)**
- ▼ **Reference Cable (Short 6")**
  - – **3 dB Pad (Optional but recommended for best accuracy)**
- ▼ **Connector Adapters**
- ▼ **For best accuracy an external high accuracy rubidium time base should be used for frequency test and alignment.**
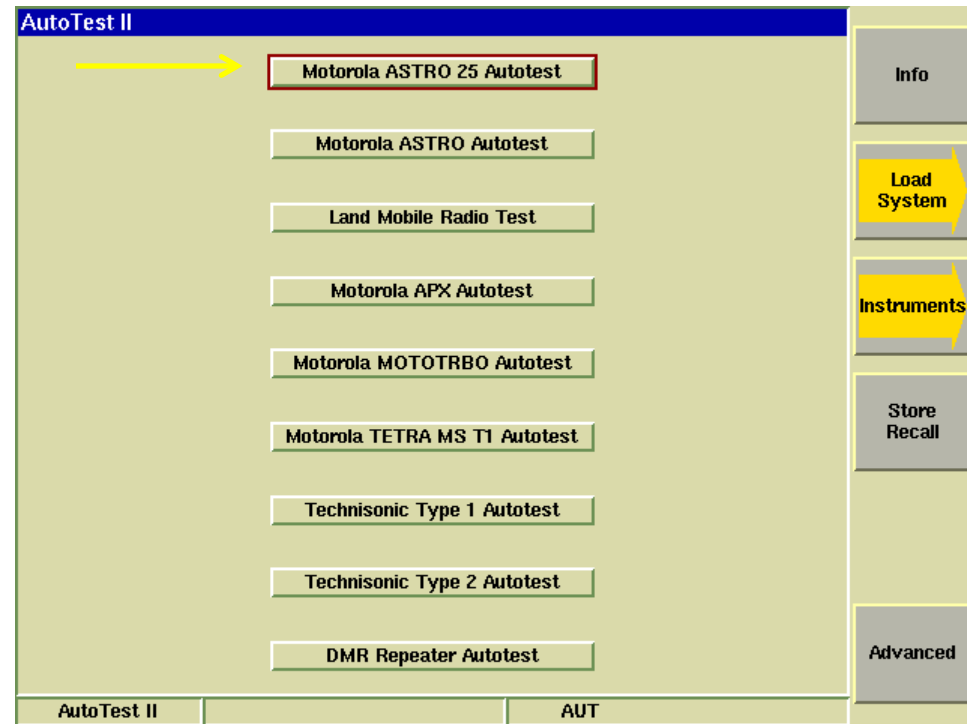
Access to the Application and System through Auto-Test II

Auto-Test II Menu

The Auto-Test II Menu can be accessed by:

➢ **Right click with mouse and select Auto-Test II.**

➢ **Select Auto-Test II from the system menu. Access to this menu can be accomplished by selecting the CONFIG key twice to access the system menu.**

Select Motorola ASTRO® 25 Auto-Test from the Auto-Test II menu.

ASTRO 25 Primary Test Screen

Function Keys

F1 – Test

Start testing the radio. No alignments will be made. Only a test report of pass/fail results. Radio model will be automatically identified and appropriate specification table will be used for testing.

F2 – Align

All selected items that are capable of being aligned will be aligned. Performance tests will also be performed to validate the alignment. (Aeroflex Recommended)

F3 – Test and Align

All selected tests will be tested. Any failed item will be aligned and then re-tested after alignment.

F4 – Edit Specs

Only required when initially setting up the system for a specific model of radio. Must be reviewed prior to testing a new model of radio or when changing test cables.

F5 – View Results

Allows access to the test results display. Test results may be viewed, recalled or backed up to a USB memory device.

F6 – More

Access to Radio Connect diagrams and special features.

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ASTRO 25 Primary Test Screen

Test Selections

Allows any combination of tests or alignments to be performed on any single or multiple bands.

Everything can be selected and the application will not attempt to perform invalid operations on the radio.

Select All Tests

This will enable all tests.

Reset Test Menu

This will disable all tests.

View Results while testing

The application will stay on this screen and show only current status Testing/Passed/Failed if not selected. When selected and the test or alignment function has been executed, the screen will change and all testing can be viewed as it occurs.

Beep at end of test

The 3920 will produce an audible beep at the completion of the test to draw attention to the operator that the test or alignment is done.

Enable long format logging

Diagnostic mode that shows all adjustments to soft pot values.

Enable USB Cable

Must be selected if using a USB Programming cable. If not selected, a USB to Serial adapter must be plugged into one of the 3920's USB ports and the RS-232 programming cable must be used.

ASTRO 25 Primary Test Screen

Test Selections

Ask/SAVE/Print/Save and Print/Skip selections

ASK – At the completion of a test, the operator will have the opportunity to Print, Save or do nothing.

SAVE - At the completion of a test, the test results will automatically be saved as a file with the filename automatically created based on a time/date stamp, model and serial number. Each time a radio is tested, a unique file is created. The file is saved on the 3920's internal hard drive.

Print – At the completion of a test, the test results will automatically be printed to the configured printer.

Save and Print - At the completion of a test, the test results will be saved and printed.

Skip - At the completion of a test, no action will be taken. The file will not be saved or printed.

AutoTest II

Motorola ASTRO 25 Alignment 3.8.8
3900 Software Version 3.1.0

| Select All Tests | | Reset Test Menu |

■ PA Bias (Mobile)	Not Tested
■ Reference Oscillator	Not Tested
■ Rx Front End (Align)	Not Tested
■ Broadband Power	Not Tested
■ Deviation Balance	Not Tested
■ Deviation Limiting	Not Tested
■ P25 TX Tests	Not Tested
■ Rx BER Test	Not Tested

■ View results while testing   □ Enable long format logging
□ Beep at end of test   ■ Enable USB Cable
Save   Results at end of test

P25   AUT   INT

Test | Align | Test and Align | Edit Specs | View Results | More | Return

ASTRO 25 Edit Specs Screen

Function Keys

F1 – Save As

> Save all modifications to specifications to a user specified file.

F2 – Save

> Save all modifications to specifications to the currently loaded specification configuration file.

F3 – Recall

> Recall a different specification file.

F4 – Recall Current Radio

> Interrogate the connected radio for model number and show the specifications for that radio.

F5 – Cable Loss

> Access to the cable loss measurement application. Note: This is one of the first things that should be done prior to testing a radio.

F6 – Restore Defaults

> Resets all of the specifications to all of the radios from memory. This the factory default specifications. Note, these values are not permanently stored unless you answer yes to update the currently loaded specification file when you exit this screen by pressing the Return key.

Specification Entries

Model Selection button

> This is used to access the specifications for supported models. Note that the specifications used when testing a radio are automatically determined after the radio model has been identified at the beginning of a test sequence.
>
> Manually choose model from menu to view specifications or assign a cable sweep.

Info Lines 1-6

> Anything can be entered here and it will appear on the test report.

Offset

> Manually enter a negative value for a fixed compensation for a cable or external attenuator. This value will correct the power meter and generator level by the amount entered. Or choose a cable sweep that has been created through use of the Cable Loss function. Both can be used.

Power Specifications

For Portables

> These are the power levels that the radio will be tested or aligned to.

For Mobiles

> The user must enter values that are programmed in the radio. CPS software must be used to obtain this information.

Enable XTL Low Power

> Save time by not testing or aligning Low power if it is not used.

Enable All Levels and Frequencies (HH only)

> This will adjust all three power level settings even if the Mid power setting is not available in user mode.

Specifications are NOT to be used as acceptance tests for new radios as this application is meant to replace the Tuner application. These tolerances are Alignment tolerances which are tighter.

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Specification Entries

Reference Oscillator Specifications

Default values are for acceptance testing. For test and align mode, alignment will not happen unless the test result exceeds these values. Any time an alignment is made, the alignment adjusts for minimum frequency error.

BER Specifications

The BER Frames setting is the number of frames that will be averaged for the reading.

The BER Level is the RF Injection level in dBm for the BER Test. The BER Must be 5% or less at this test level.

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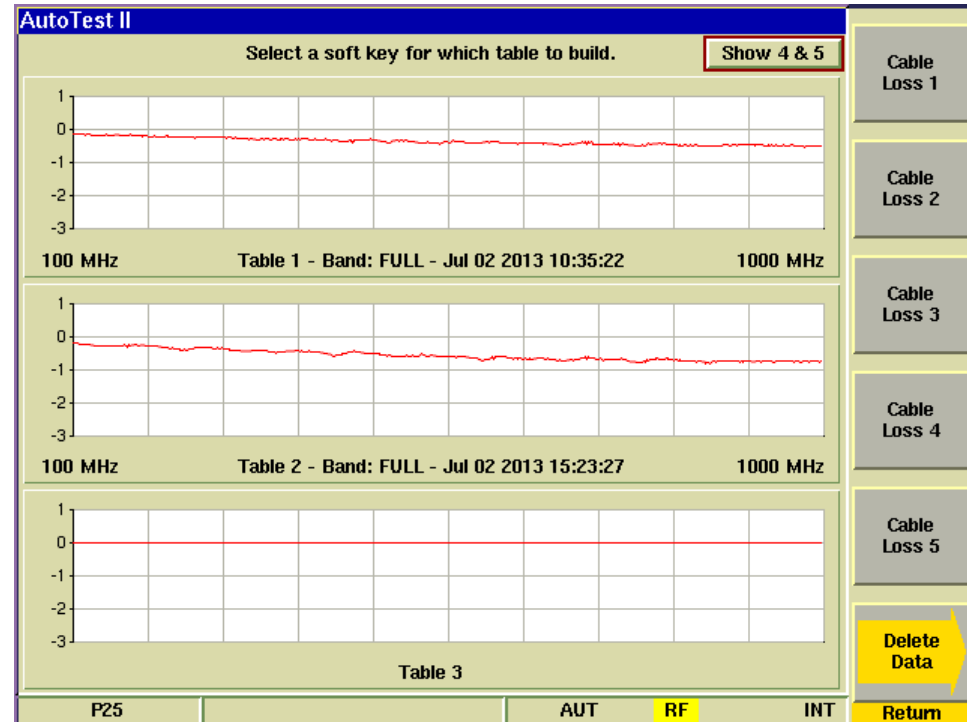
ASTRO 25 Cable Loss

Function Keys

Cable 1 - 5

Choose up to 5 different cable plots. These are initially flat with no calibration. After making a selection, prompts will be provided for cable connection and the cable insertion loss will be measured.

Delete Data

Allows deletion of a cable sweep.

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ASTRO 25 Cable Loss

Test Cable Calibration

Reference Cable

The 3920 will use it's spectrum analyzer and tracking generator to sweep this reference cable and will establish this sweep as a zero reference.

This cable is used ONLY for calibration purposes and will not be used for testing the radio.

Getting more accurate results

To obtain better results from this process, use a 3 dB pad at the end of the reference cable that is connected to the TR port of the 3920. This will improve the VSWR of the cable for when it is connected to the Radio Testing Cable.

Reference Sweep

Gen port -> Reference Cable -> 3 dB Pad ->TR port

Radio Testing Cable Sweep

After the Reference cable sweep has been completed, you will be prompted to connect the Radio Testing Cable in line with the Reference cable. The 3920 will again use it's spectrum analyzer and tracking generator to sweep the combined cables and will plot the difference between the two sweeps as the insertion loss of the cable that was added.

Radio Testing Sweep

Gen port -> Reference Cable -> 3 dB Pad -> Adapter -> Radio Testing Cable -> TR port

NOTE: The on screen instructions make no mention of the use of an external pad for this calibration.

3 dB Pad

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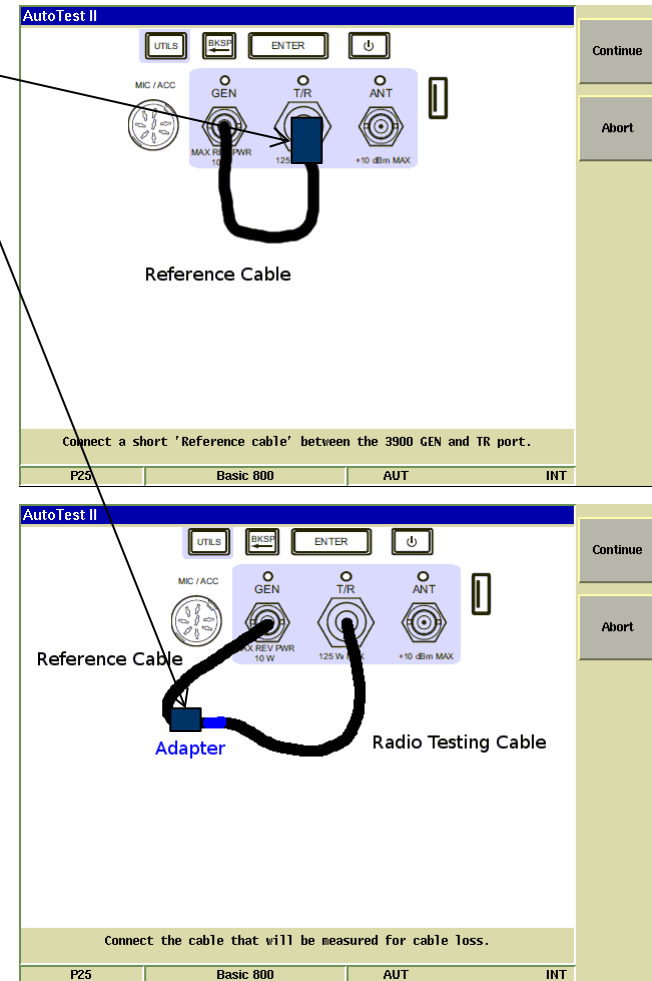
Results of cable calibration

Trace 1

> This calibration was done as directed without the use of the 3 dB external attenuator.

Trace 2

> This calibration was done with the same Radio Test Cable but a 3 dB attenuator was used when calibrating the Reference cable.

Trace 3

> This calibration is done with the external 3 dB attenuator and a high quality, low loss, phase stable cable.

The Difference

> Results will vary depending on the quality and length of the test cable. This test was done with a 3ft RG-58 test cable.
>
> Notice that Trace 1 is not as flat as trace two. These waves are caused by a VSWR mismatch at the point where the cables are connected together. Use of the 3 dB pad at this junction improves the VSWR and minimizes some of these standing waves.

The Impact

> When calibrating the transmitter power, even small amounts of error in the insertion loss measurement can cause the radio to fail the test. An insertion loss of 0.4 dB that is not accounted for can cause up to a 10% error in power measurement.
>
> With Dual Band radios, it is important to note that the insertion loss at low frequencies is less than the insertion loss at higher frequencies so one fixed entry for cable loss will not correct the power meter in both bands correctly.

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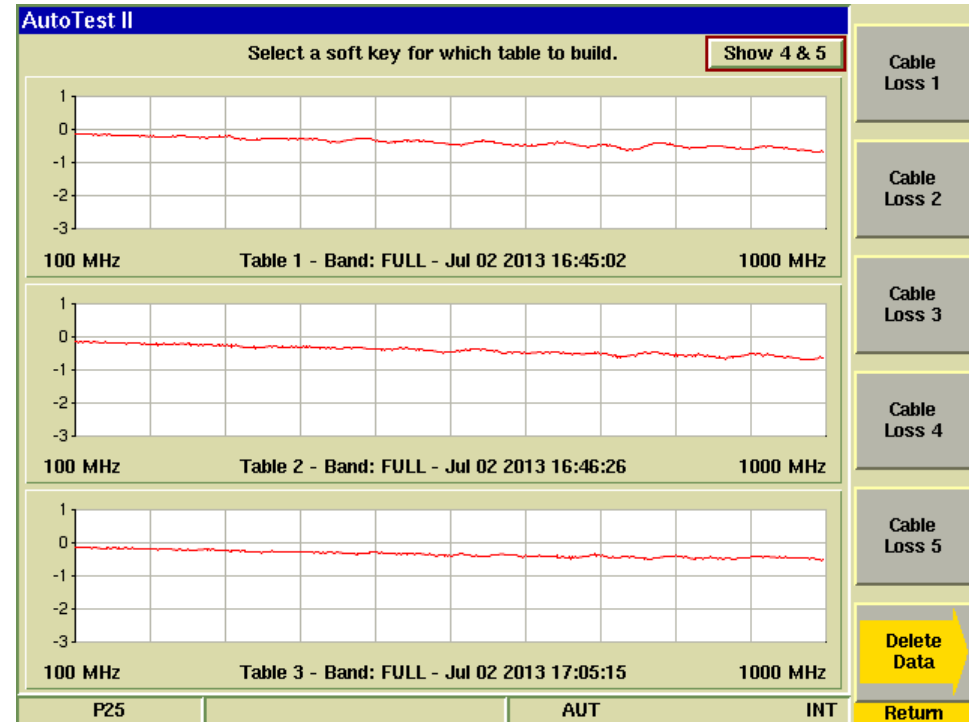
Administration

Create a Password
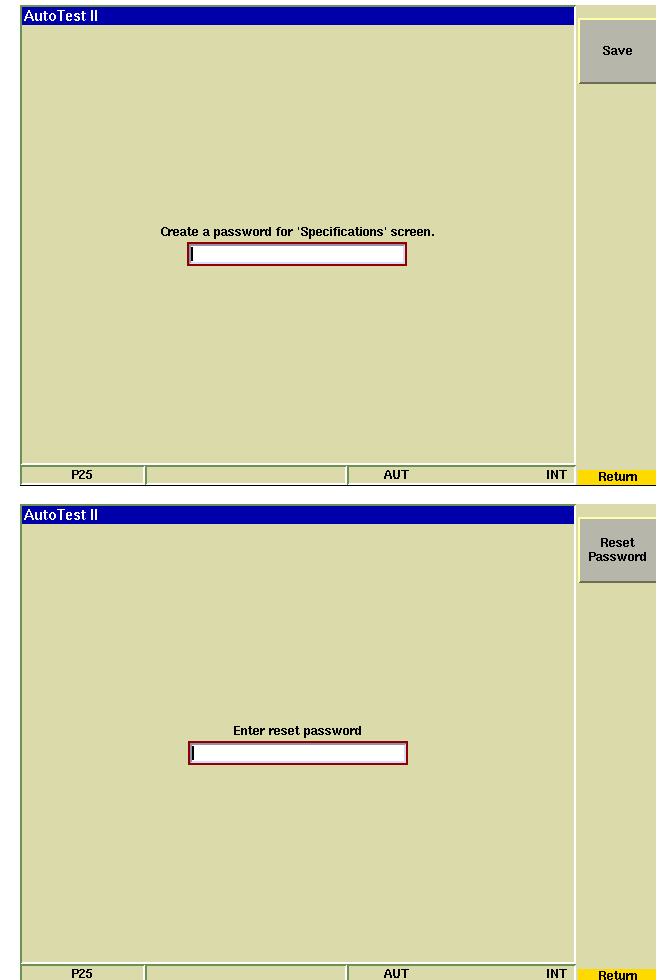
Allows entry of a password for access to the Edit Specs screen. If users are not allowed to make changes to the radio test specifications, a password may be entered here and must be entered to gain access to the Edit Specs screen.

Reset Password

After a password has been entered, the only way to remove it is to enter the following Reset Password value:

85856767

After this value has been entered, press the Reset Password button and the password protection will be removed and a new password may be entered if desired.

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ASTRO 25 Radio Interconnect Diagrams

## Radio Connections to the 3920

Interconnect for Portable Radio

1. The Portable radio requires a USB connection from the radio to one of the Aeroflex 3920 USB ports.

2. Requires an RF Cable connection from the 3920 TR port to the radio ANT port.

3. Recommended connection to a battery eliminator and power supply.

Interconnect for Mobile Radio

1. The Mobile radio requires a USB connection from the radio to one of the Aeroflex 3920 USB ports. The radio may be connected through the connector on the radios rear section or to the radios control head.

2. The AC24011 current shunt must be used and connected as the diagram indicates only for Power alignment. The current shunt is not required for power testing.

3. The power supply should be capable of supplying the required amount of current and the current limiting should not be set too low. Proper gauge wires should also be used.

4. For connection to the current shunt, the positive wire must be cut and connected to the current shunt as indicated in the drawing. The current shunt is connected to the 3920's V/ohm and COM connectors on the DMM.

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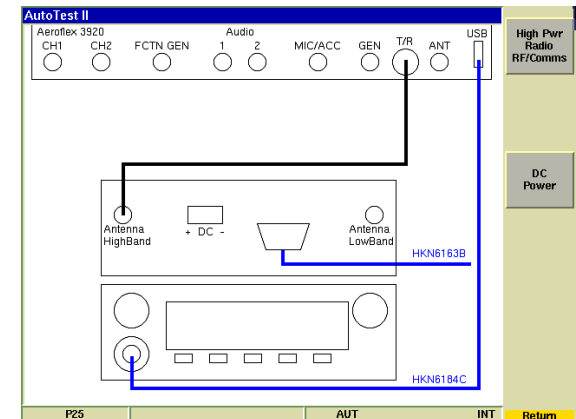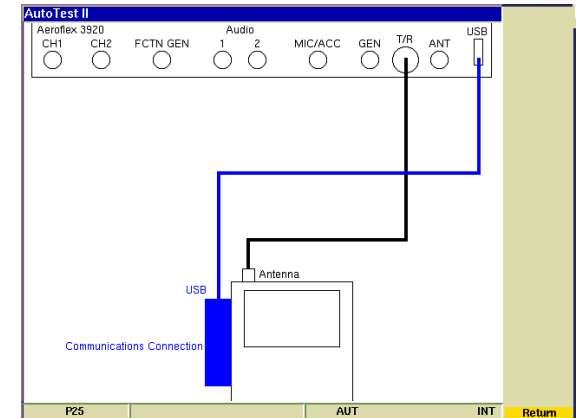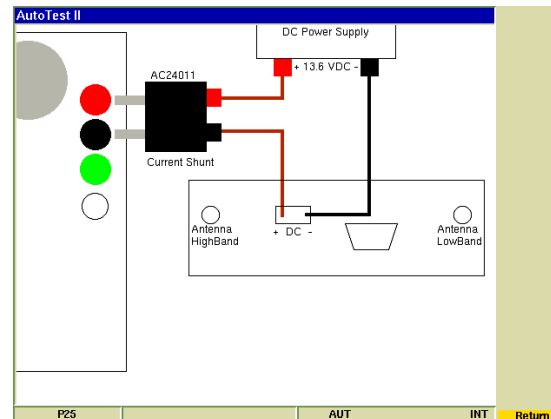
ASTRO 25 Test Results

Radio Test screen

Test Results Screen

Shows Time Date stamp along with the 3920's serial number and version information for both the system and the application.

Shows radio model, serial number along with radio software versions and configurations.

Shows the Flash Code

Load File

Allows a different test results file to be loaded and displayed.

Print Results

Prints the test results to a printer that is connected to the 3920 or a network printer if configured for this in the systems printer configuration screen.

Clear

Clears the currently displayed results from the screen.

Copy Results to USB

Copies ALL test result files from the 3920's hard drive to a connected USB memory stick.

Clear Results Data

Deletes all test results files from the 3920's hard drive.

Test Results

As tests are performed, the results along with pass/fail information is provided.


```
AutoTest II
                        Aeroflex Automatic Test System
-------------------------------------------------------------------------
Motorola ASTRO 25 Alignment Software -- Version: 3.8.7 :    Align
-------------------------------------------------------------------------
My Radio Test
Tech 147

Date/Time         : 06-27-2013 14:01

3900 Serial Num : 299002288
3900 Version      : 3.0.0

Power Up          : No fatal errors        Synth Lock       : Detected

Model Number      : H18QDH9PW7AN           Host SW Version : R12.00.17
Serial Number     : 123AER0002             DSP  SW Version : R12.00.05
                                           UCM  SW Version : R050503

Encrypt Alg       : 'DES OFB' 'DES XL'

FlashZap          : R03.50.00
Tuning            : C524
CPS               : 0020
Security          : 0003
IP Address        : 192.168.128.1

Frequency Band    : 380 to 470 MHz UHFL
Channel Spacing   : Variable
Power Level       : 4.0 to 5.0 W

Packages          : Full Keypad, With Display
Pri Operation     : Programable
Pri System Type : Programable

  P25                                    AUT      RF         INT
```

Buttons: Load File | Print Results | Clear | Copy Results to USB | Clear Results Data | Return

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Thank You

Aeroflex 3920

XTS/XTL Mobile and Portable Automated Test and Alignment