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# **BavSonic™ E&M Telephone Audio**

## **Testing & Debugging**

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### **Wal-Mart Applications**

**E. F. Bavis & Associates, Inc.**

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# Testing & Debugging

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## **Overview:**

The Drive-thru Telephone Audio System allows the intercom system used in the drive-thru equipment to come into the pharmacy as an incoming call. The audio intercom system is connected to the telephone system through the Telephone Audio Interface. This interface connects to the telephone switch by way of an E&M Tie Line card, which is installed inside the telephone switch cabinet. Connections between the cabinet and components are made by way of punch block with field wiring consisting of CAT 5 cable and RJ45 connectors.

## **Purpose of this Document:**

The purpose of this document is to provide a guide in the testing and debugging of the Bavis Drive-thru Telephone Audio System. While this document provides basic information, more detailed information is available in the BavSonic™ Telephone Audio Installation and Service Manual, which is available from E. F. Bavis and Associates, Inc. and is included with each device. This document supplements the installation and service manual; it is not intended to replace it.

## **The Testing Procedure:**

It is recommended that you read the entire document before proceeding with any testing. The Telephone Audio System is designed to be a “plug and play device”. In other words, it is hoped that by properly hooking up the device and plugging it into the E&M Tie Lines, the system will operate as designed. If this is not the case the following procedure should be followed:

1. Test the intercom and telephone interface. If the unit passes this test, continue with step #2. If the system does not pass the test contact E. F. Bavis and Associates, Inc at 1-800-937-3322 and describe what you observed.
2. Test the telephone connections and system. If the telephone system passes this test the system should operate properly. If both the interface and telephone system passes the test and the system does not work, contact Bavis at the telephone number cited in step #1 above. If the telephone system does not pass this test, contact the Wal-Mart Telecommunications Department, describe what was found and they will provide you instructions on how to proceed.

## Testing the Intercom and Telephone Interface:

Once the intercom and Telephone Audio Interface has been installed, the unit can be fully tested without being connected to the telephone system through the use of the Telephone Audio Interface Test Plug. This device is an RJ45 connector to which components have been added. The plug and components are then shrink wrapped together as a single unit. On early models this plug is separate from the machine. Later models have this plug connected permanently to the board of the interface.



Test Plug used to test the intercom and Telephone Audio Interface

Below are the directions to fully test the Telephone Audio Interface, the Audio boards, call buttons, speakers and microphones:

1. Disconnect the window patch cord, (red) which runs from the Telephone Audio Interface to the wall jack. At the Telephone Audio Interface, plug the Test Plug into the interface.
2. Go outside to the window lane and press the call button. If the interface is functioning properly the following should happen:
  - a. Sounds entering from the outside microphone should loop back and be heard coming out of the outside speaker<sup>1</sup>.
  - b. On the inside check the two LED's, one above the Test Plug and one below the Test Plug should be illuminated.
3. If the any of the above does not occur, contact E. F. Bavis and Associates to discuss remedies.
4. Disconnect test plug and insert the red plug that was removed in step 1.
5. Repeat the process for the remote lane that is color-coded blue.



Telephone Audio Interface with test plug installed in the RED or Window Lane

If the Telephone Audio Interface is functioning properly, the next step is to test the signals generated by the E&M Tie Line.

## Telephone Connections

The Telephone Audio Interface is connected to the "TIE LINE" by way of CAT 5 wire and RJ45 connectors. The Tie Line Card in the telephone system is located in the electrical equipment room. **Note that all of the DIP switches on the E&M Tie Line card need to be set to the "ON" position.** When the "TIE LINES" are in a normal condition (no one talking) there

<sup>1</sup> The sound coming out of the speaker when testing the audio with the test plug has been cut to ½ of actual volume. Do not attempt to adjust audio volume using the test plug.

should be no LED's lit on this card. Lit LED's indicate that there is some sort of problem under this condition.

The connections to the telephone use standard CAT 5 wiring. The termination is a type 568B. There is an alternative way to use 568A; see the manual for details. The connectors are RJ45. The E&M connections to the Lucent system are referenced to the system ground. The telephone system ground is attached to an earth ground. The system ground is not connected in the TIE LINE port of the telephone system. To insure that a reliable system ground is connected to the Telephone Audio System, the system ground has to be connected to both conductors of the 4<sup>th</sup> pair of wires on the RJ45 that the interface is plugged into. This is the brown and white with brown striped wires. **Note that the telephone intercom will not function without the system ground connection.** There are color-coded 14' patch cables supplied to make the connection from the RJ45 jack to the telephone interface.

### **Telephone Diagnostics at TB1 & TB2**

The WHITE /GREEN STRIPE (E2) wire is referenced to the BROWN (E1) wire. The normal voltage is 56Vdc with the BROWN wire being positive. After the call button is depressed, the voltage will be less than 1Vdc. This indicates that the intercom is connected to the interface. This is the "E Lead" sensing. There is a LED for each lane to indicate that the intercom is connected to the interface.

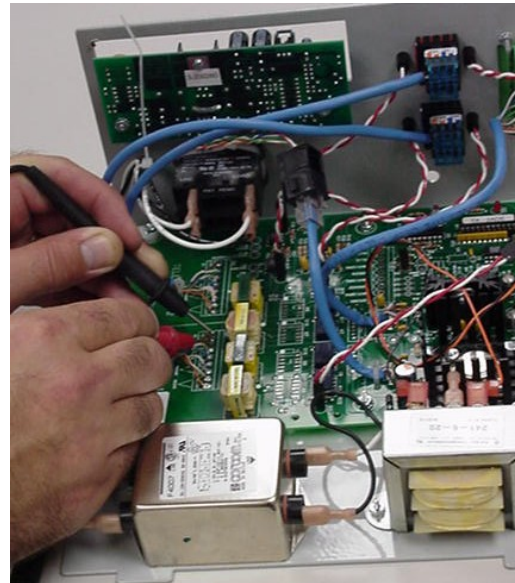
The GREEN (M1) wire is referenced to the WHITE/BROWN STRIPE (M2) wire. The normal voltage is 5Vdc with the GREEN wire being negative. The voltage is less than 1Vdc when the telephone is connected to the interface. This is the "M Lead" sensing. There is a LED for each lane to indicate that the telephone is connected to the interface.

The BLUE, WHITE/BLUE STRIPE (TRANSMIT) wires are the audio signal coming from the telephone transmitter going to the intercom speaker. With the lane selected and someone talking, the audio signal is approximately .848Vp-p as measured on an oscilloscope or .3Vrms as measured on a true rms digital multimeter.

The ORANGE, WHITE/ORANGE STRIPE (RECEIVE) wires are the audio signal coming from the intercom microphone to the telephone receiver. With the lane selected and someone talking the audio signal is approximately .848Vp-p as measured on an oscilloscope or .3Vrms as measured on a true rms digital multimeter.

### **Special Note When Using Lucent (AVIA) Phone Systems**

There is a potential failure mode of the telephone audio system when used in conjunction with the Lucent (AVIA) telephone system. The Lucent system does not use isolated "E" & "M" signal lines. Both signal lines are referenced to system ground that is tied directly to earth ground



Testing the E1 and E2 lines inside the Telephone Audio Interface

in the telephone equipment room. If any of the intercom speaker, microphone or call button leads get shorted to earth ground the Tie Lines of the Lucent telephone system will not connect to the interface. Simply removing the ground fault on the intercom will allow the telephone system to work properly. *Note that this situation may show up as an intermittent problem.*

If the system checks out with the test plug the next test should be performed. If there is not a meter available a process of elimination is an alternative. The process of elimination is to remove one intercom connection at a time from the telephone audio interface. After each connection is removed, retry the system. If the telephone connected LED's lights, then this indicates a connected condition meaning that one or both intercom connections removed was causing a ground fault.

If by plugging the intercom connection back in and the fault comes back proceed testing by connecting the intercom and unplugging the speaker, microphone and call button leads one at time while testing for a connection with the telephone system. If one of these devices is disconnected, and the telephone will connect, this device or the wiring to it has a short to ground. Correct the shorted device or wiring to restore the system to proper operation.

If a meter is available, disconnect the intercom from the telephone interface and connect one lead of the meter to the screw attaching the LM1875 device to the printed wiring board. With the meter on ohms, place the other lead on the chassis or earth ground. There should be infinite resistance. If there is a low resistance remove the speaker, microphone and call button connectors from the board, one at a time, until the resistance goes back to infinite. When this happens that device or its wiring is shorted to ground. Correct the shorted device or wiring to restore the system to proper operation.

### **Shorting Test**

#### **Testing at wall jack:**

If the system is wired 568B, Connect White/Green to Brown  
If the system is wired 568A, Connect White/Orange to Brown

If the telephone rings after connecting the wires the system is ok.  
If the telephone doesn't ring there is a problem with the telephone system.

#### **Testing at Telephone Interface:**

If the system is wired 568B, Connect Green to White/Brown  
If the system is wired 568A, Connect Orange to White/Brown

If both LED's light up on the Interface, the Interface is ok.  
If they do not light up, the Interface is bad.

#### **Testing using an Amplified Butt Set:**

While the wires are connected to test the Interface you can also listen to the incoming signal from the outside microphone by connecting the Butt Set to the White/Orange & Orange wires.

**Testing using a Toner:**

While the wires are connected to test the Interface you can check the outside speaker by connecting a Toner to the White/Blue & Blue wires, and listening for the outside speaker.

If you need further assistance please consult with the factory.