Installation Instructions

TMS EZ Radio Frequency Control System for Bennett 3K Dispensers

Read This Book

This book has important information for safe installation and operation of this equipment. Read and understand this book before applying power. Keep this book and tell all service personnel to read this book. If you do not follow the instructions, you can cause damage to the equipment, injury, or death.

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Contents

I. *Dangers, Warnings and Precautions*

FOR THE SAFE INSTALLATION, MAINTENANCE, AND OPERATION OF THIS CONSOLE AND RELATED EQUIPMENT, READ AND UNDERSTAND ALL WARNINGS AND CAUTIONS.

"DANGER": means: If you do not follow the instructions, severe injury or death will occur.

"WARNING": means: If you do not follow the instructions, severe injury or death can occur.

"CAUTION": means: If you do not follow the instructions, damage can occur to the equipment.

"DANGER" : Disconnect all power to this equipment and associated dispensers equipment during installation, service or any maintenance. Failure to do so can cause injury or damage equipment.

"WARNING": Maintenance and repairs must be done by **QUALIFIED/TRAINED** personnel.

"WARNING": To prevent electric shock, keep the electrical parts of the console dry.

"WARNING": You must have training in the installation and service of fuel dispensing equipment before working on this system.

"WARNING": Make sure this equipment is correctly grounded. Failure to do so can cause injury or damage equipment.

"CAUTION": Electronic components are static sensitive. Use proper static precautions (static straps) before working on the equipment.

"WARNING": Failure to properly ground all equipment can cause injury or damage equipment.

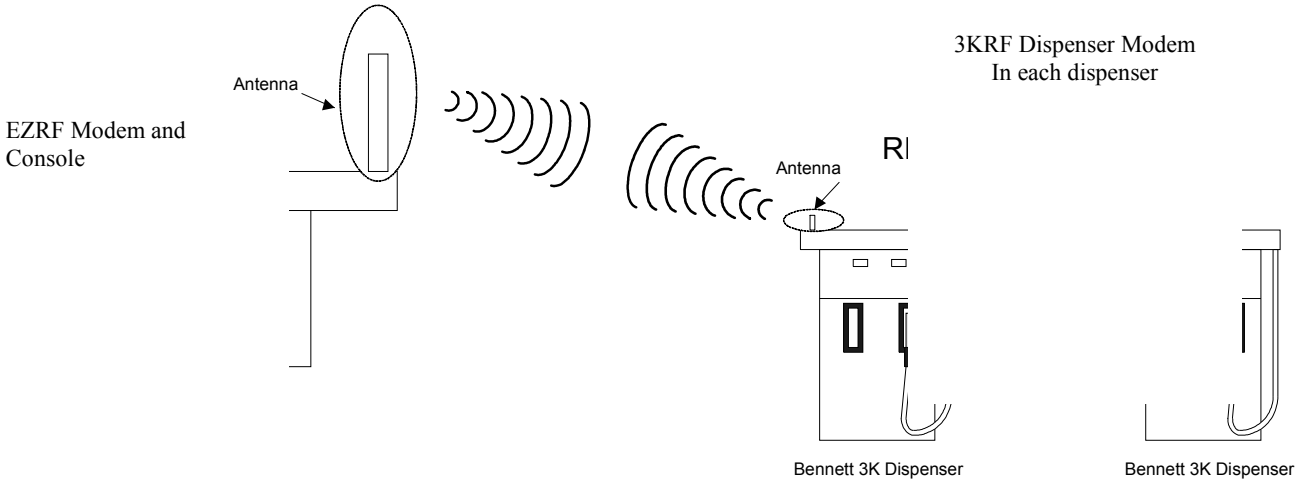
"WARNING": Installation must comply with National Code (NFPA #70), Automotive and Marine Service Code (NFPA #30A), Federal, State and local codes.

"CAUTION": This equipment generates and uses radio frequency energy. If not installed and used properly, i.e., in strict accordance with the instructions in this manual, it may cause interference to radio communications. The console was tested and found to comply with the limits for a Class A computing device in accordance with Sub-part J of Part 15 of the FCC Rules. A Class A computing device is designed to provide reasonable protection against interference when operated in commercial environment.

"CAUTION": Follow proper grounding procedures to reduce radio frequency interference (RFI). Ground each piece of equipment connected to, or controlled by, the console to the electrical service panel ground.

"CAUTION": Each dispenser must have a 12 gauge or larger green stranded ground wire connected from the grounding lug of the junction box to the main electrical service panel ground. (National Electrical Code, Article 514-7). It is unacceptable to rely on the conduit for this grounding requirement.

II. ***System Setup***



EZRF – Connects the EZ console to the 3K Bennett dispensers using RF technology.

3KRF- Connects the 3KBennett dispenser with the RF communication network.

The TMS systems uses well recognized components representing the latest radio frequency (RF) technology which is in wide spread use. TMS has adapted the RF technology through the development of proprietary software that operates the TMS EZ console and interfaces to the Bennett 3K dispenser line. The overall communication scheme uses a RS-485 communication serial interface at the 3K Bennett dispenser end and a RS-422 communication serial interface at the TMS EZ console end.

Up to sixteen hoses can be connected to the system with the limit being the number of hose positions available on the standard TMS EZ console. Addressing of the dispensers is automatically determined when the 3K dispenser is set up using the standard Bennett procedure. The standard TMS EZ dispenser interface box that is present with all other TMS fuel control systems is not used with the RF system.

The TMS system comes with a 2.1 dBi high gain antenna for the EZ console and a 3dBi high gain antenna for the remote dispenser modules. For the vast majority of applications the RF signals will go through multiple walls (cinder block & metal framing) for distances well beyond those normally encountered in a refueling scenario. Be aware that the communication signal will become attenuated once the pathway becomes obstructed with buildings, equipment, etc.

Note: It is not necessary to have a transmitter for every hose. If there are one or more 3K dispensers (single hose and MPD's), where the communication ports can be daisy-chained, only one 3K transmitter modem is required per daisy-chained group of dispensers.

III. *TMS-EZRF Console Module*

Before connecting any cables/wires between any and all console and dispenser equipment, turn off all power

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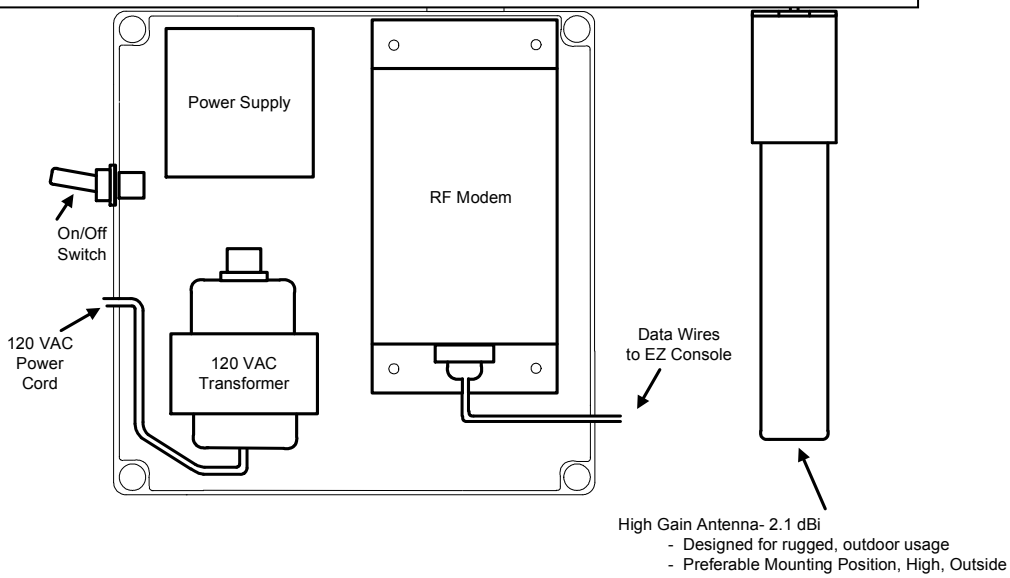
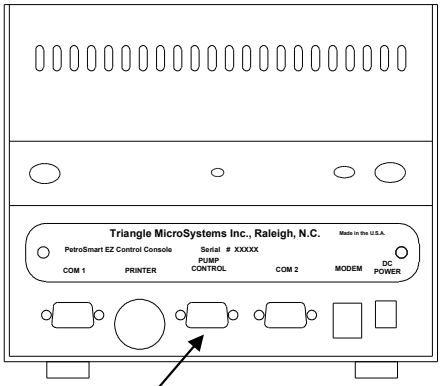
odem.



The standard antenna supplied with this system for mounting on the retail facility is a high gain antenna that has been selected to maximize communications at a busy fueling location where there are many types of vehicles. While it is highly likely that the antenna would perform satisfactorily while located next to the console the preferred mounting location is a high location on the facility overlooking the dispensers.

TMS EZ Console (Rear View)

With the power shut off connect the EZRF module communication wire to the EZ console shown.

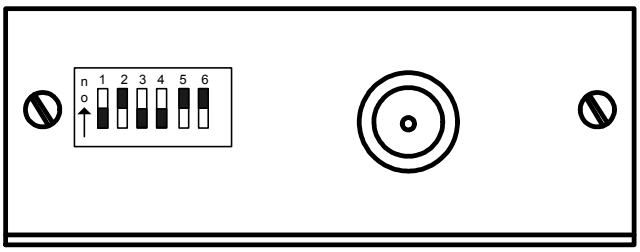


Attach the communication wire from the EZRF module to the "PUMP CONTROL" connection.

There are two RF mod EZRF and 1 in the 3KRF module. Howev ch modem has different settings. For ROGRAMMED IN THE FACTORY and e to be adjusted onsite. A reference cha as follows:

Serial
Termination (switches 3, off & 4, off)- None
TX/RX Mode (switches 5, on & 6, on)- User Defined

The dip switches are located on one end of the modem. All the optional dip switch setting options are listed on the bottom of the modem. Note, the modem must be removed to view the setting options.



Dip Switch settings on the EZRF modem.

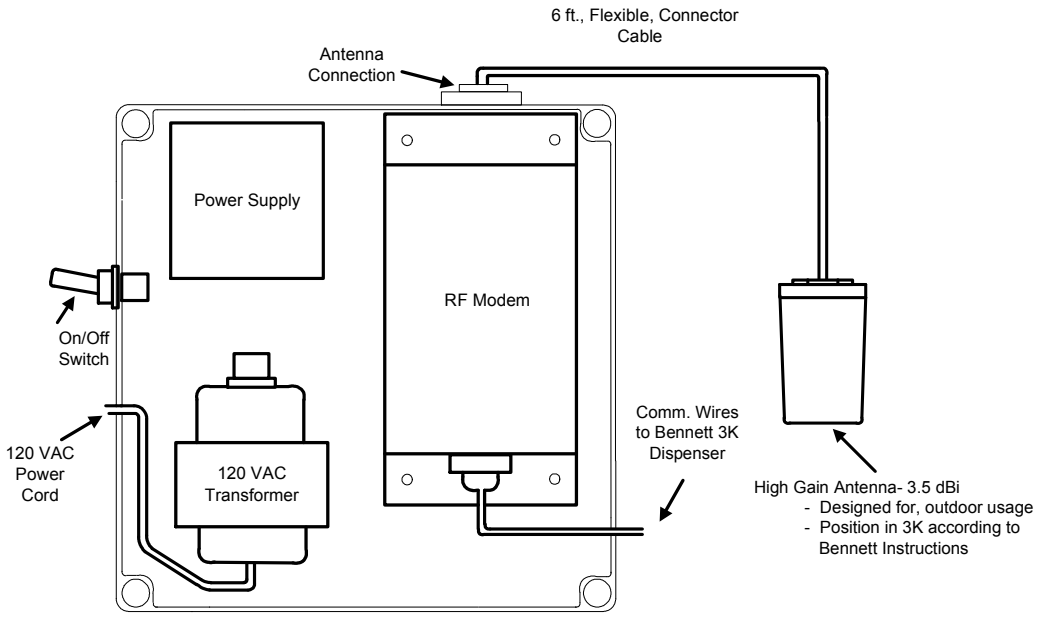
IV. *TMS-3KRF Dispenser Module*

Connecting the power cable to the 3KRF module

CAUTION!!!!!!!!!!!!CAUTION!!!!!!!!!!!!!

Make sure that all the power is turned off to the 3Kdispenser and the ON/OFF switch on the 3KRF module is in the OFF position

The 3KRF, which connects to the Bennett 3K dispenser, comes with a POWER CORD for attachment to the dispenser's 120 VAC power supply. The high gain antenna is attached to the 3K Bennett dispenser on top of the chimney wall. The Bennett antenna mounting procedures must be followed and are outlined below.

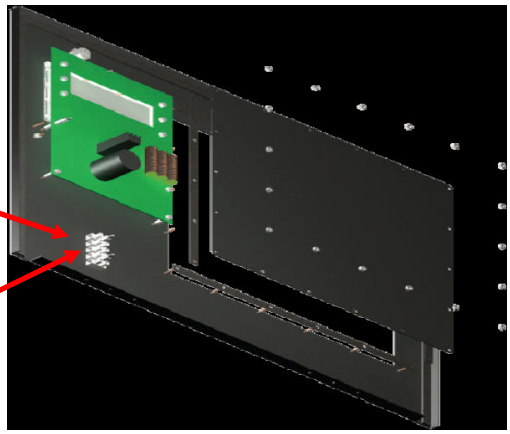


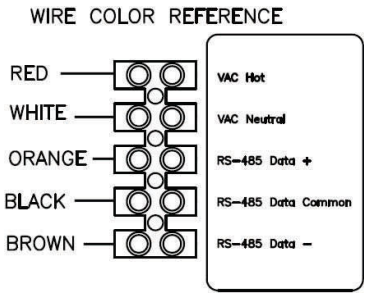
3KRF Components

Step #1 Turn off all power.

Step #2 Locate the 3K power strip on the inside of the cabinet door. Some 3K dispensers don't have the power strip shown. Therefore use the main power strip for supply power.

Power strip.





You must contact Bennett Customer Support (1-800-423-6638) if the wire colors on the 3K do not match.

Step #3 Cut an strip the black power wire from the 3KRF module and connect according to the above "WIRE COLOR REFERENCE".

The terminals on the side without the label will be factory installed. *Do Not change any of these connections!!!*

You must locate the wires for VAC Hot and VAC Neutral from the 3KRF module and apply them to the terminals on the labeled side.

- The VAC Hot will be applied to the "VAC Hot" terminal (on the labeled side).

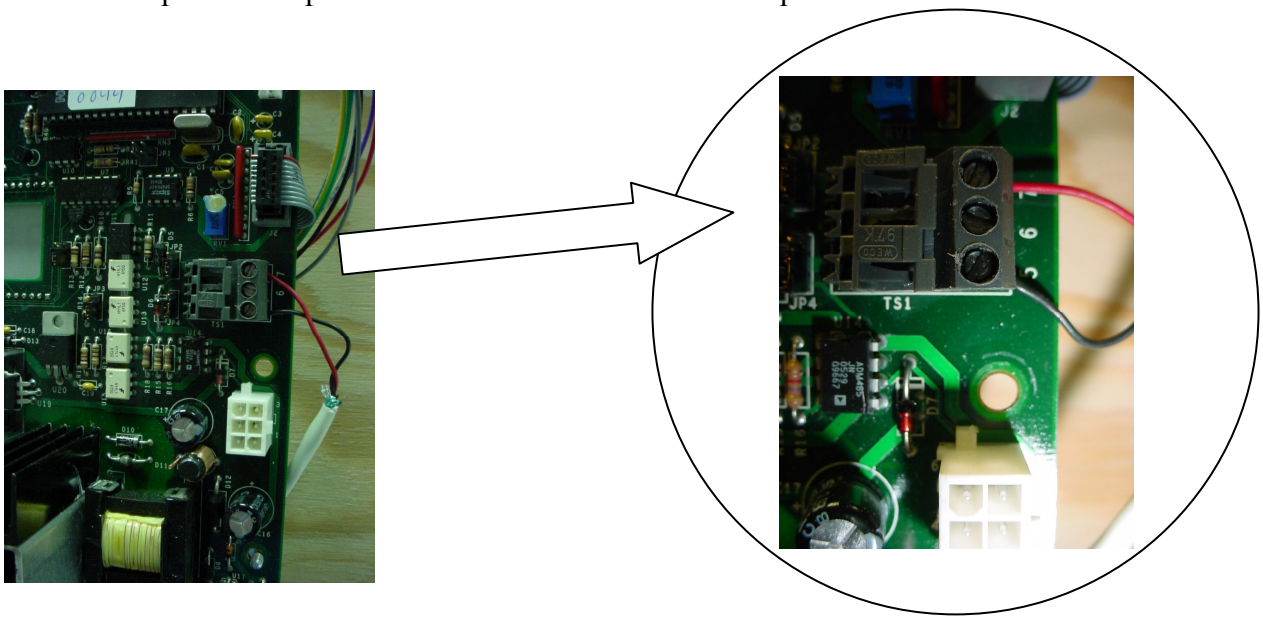
- The VAC Neutral will be applied to the "VAC Neutral" terminal (on the labeled side).

Connecting the communication cable to the 3KRF module

1. Make sure the ON/OFF switch is in the OFF position.

2. Trim the excess length of the white cable coming from the TMS 3KRF module and bare the red and black wire approx. ¼ in.

3. Connect the white communication wire to the 3K as shown below with the red wire on top in the #7 position and the black wire in the #5 position.



3. The 3KRF module is now ready to communicate with the 3K Bennett, RS-485 interface.

V. *TMS 3KRF Modem Module Setup*

Bennett 3K Dispenser Setup

The Bennett 3K dispenser has to setup for RS 485 communications for each dispenser. Consult the Bennett on how to properly setup each dispenser

Both the console modems and the dispenser modems come setup from the factory with the proper, external dip switch settings. In addition the internal software settings in each modem have also been pre-programmed and only under unusual circumstances will this operation have to be reset in the field. The factory pre-programming covers 2 primary areas:

- Modem VID (location designation, prevents interference with other modem systems in the area)
- AES-64 bit encryption (code set by factory)

If the modems have to be reprogrammed they should be returned to TMS for reprogramming.

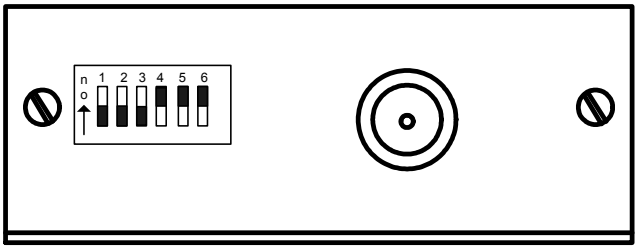
The only testing during initial installation that should be performed is the communication strength between modems using the loopback adapter supplied with each system. Refer to the loopback test instructions on page # .

Though the modem settings will NOT have to be adjusted a reference chart is located on the bottom of the modem. The settings are as follows:

The modem settings are as follows:

Serial Interface (switches 1, off, & 2, off)- 2 wire RS-485
Termination (switches 3, off & 4, on)- 2 wire RS-485
TX/RX Mode (switches 5, on & 6, on)- User Defined

The dip switches are located on one end of the modem. All the optional dip switch setting options are listed on the bottom of the modem. Note, the modem must be removed to view the setting options.



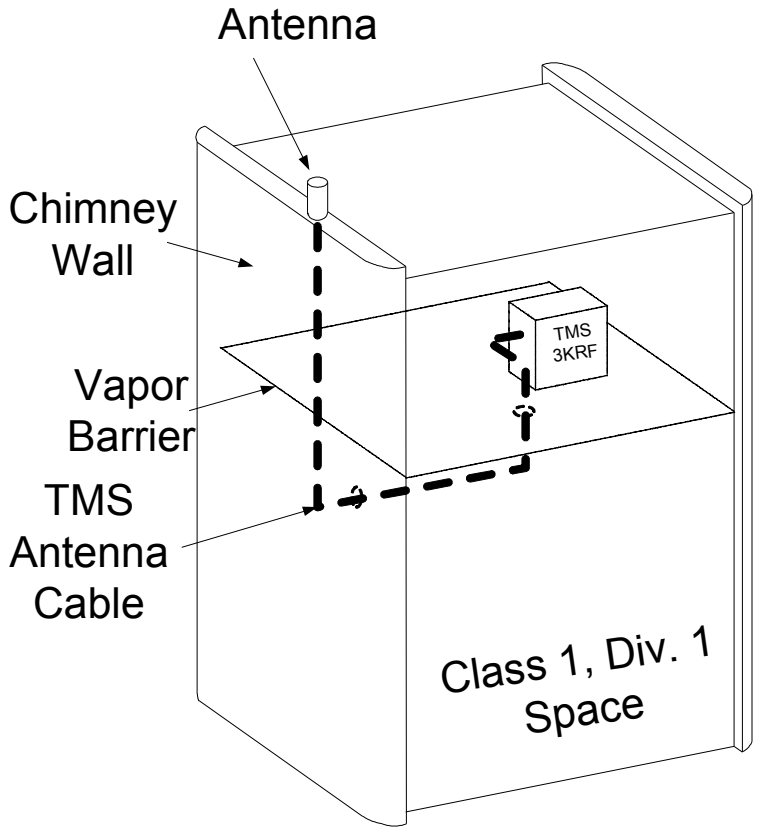
Dip Switch settings for the 3KRF modem.

VI. *Connecting the Bennett 3K antenna to the 3KRF module*

Whether the dispenser is a HIGH hose or LOW hose the Bennett recommendation for attaching an external antenna is to locate the antenna on top of the chimney wall. Following the Bennett antenna mounting procedure, position the antenna such that there is some slack in the cable allowing the 3KRF housing to sit securely in the dispenser.

The communication cable is a custom design meant for RF communications and should not be altered in any way (i.e; splices, cuts, additions). Excess lengths should be coiled inside the 3K cabinet.

Bennett 3K Dispenser



Antenna Cable Routing

The following installation instructions are the Bennett recommended procedures for mounting an external antenna to the 3K dispenser and must be followed to provide a safe and properly working RF system and to not void the dispenser warranty.

BPC Recommended Procedure for Mounting RF or WiFi Antennas to the top of Our 3700 Commercial and 3800 Retail Electronic Models

IMPORTANT NOTE: *It is Bennett Pump Company's position that the only exit out of our upper electronic head area for Antenna Mounting is* ***DOWN*** *through our horizontal vapor barrier deck.* ***Any other exit penetration point(s)/method(s) will VOID ALL FACTORY WARRANTIES.***

We currently provide with our FMS Option (-F) one (1) plug on our horizontal vapor deck that when removed provides a factory penetration opening through our vapor barrier deck. In addition with the FMS Option (-F), we provide one (1) stub conduit, two (2) washers and two (2) nuts to be used on both sides of our vapor deck plate to provide a vapor tight seal around this point of penetration.

You must route your antenna wiring from the FMS Field Retrofit Kit, through this factory opening (stub conduit) DOWN into the lower Hydraulic cabinet area (Class I, Div 1 location) in explosion-proof conduit(s) and fitting(s). Be sure to pot/seal-off this stub conduit per the FMS Field Retrofit Kit instructions.

Once inside the lower Hydraulic cabinet area, if you route your conduit(s) over to either of our side walls (although opposite of Hose Outlet fitting is recommended in a single hose model), you can then turn up and route through our outer side wall (we call it our chimney). Continue on up the side wall chimney through the top black plastic cap cover of the side wall at the top of the cabinet. The FMS Field Retrofit Kit may provide a piece of sheet metal shaped to fit under this black plastic cap to give the plastic cap rigidity. If so, it will be a part in the FMS Field Retrofit Kit for mounting their RF or WiFi Antenna(s).

With this arrangement, you have the highest point on our dispenser cabinet at your disposal for Antenna mounting. Also, you have not done any field drilling of holes inside our upper electronics metal cabinet area and, therefore, no metal shavings have found their way into our electronic boards.

This is the cleanest method possible, which should lend nicely to both our electronics and the FMS Field Retrofit Kit's electronics continued reliability.

We realized two things in making this recommendation:
1. You can not mount the FMS Antenna(s) INSIDE our upper electronic area because the entire upper electronics area is metal and would not allow the antenna to perform efficiently.
2. You require one antenna per FMS Field Retrofit Kit and, as such, mounting on the top of our cabinet is a great advantage to you. Recommending routing to a common Area Light Pole or Canopy Column really isn't practical and, therefore, would not be adhered to in the field.

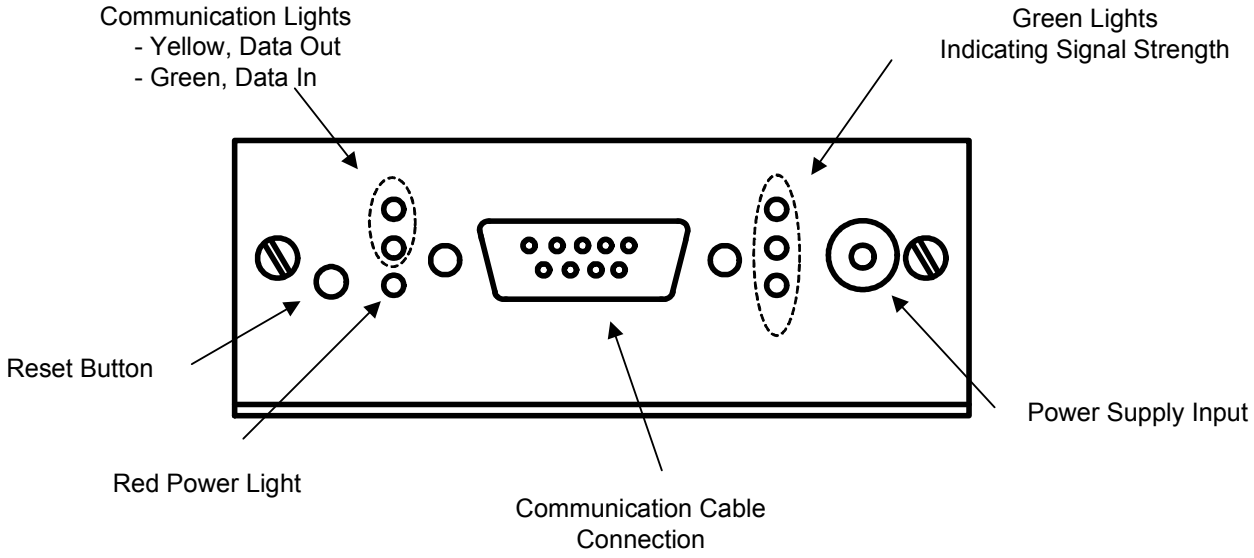
Call Bennett TechHelp with questions: 800/423-6638.

VII. *Activating the RF system*

1. With all the components properly connected turn the main power ON. Then turn the power ON to the EZRF and the 3KRF

2. Remove the cover to the TMS modules and observe that the RED power light should be ON.

3. On the end of the modem there are two sets of lights on either side of the communication cable connection. On the right side there are three vertical green lights that indicate the strength of the incoming signal from the remote modem. If all three green lights are on, that indicates maximum signal strength is present. The system will still communicate with less than three green lights.



4. On the left side of the modem there are three vertical colored lights. The red light indicates that the power is ON and the green and yellow lights indicate that there is ongoing communication. ***Unless the 3K Bennett dispenser has been programmed to communicate using the RS-485 protocol*** the GREEN and YELLOW communication lights will not be ON.

   Yellow Light - Data Out
   Green Light - Data In

   Under normal operation the yellow and green lights will continually blink showing communications are in progress.

5 If the GREEN signal strength lights or the Yellow and Green data communication lights do not come on then proceed to the loop communication test procedure in the next section.

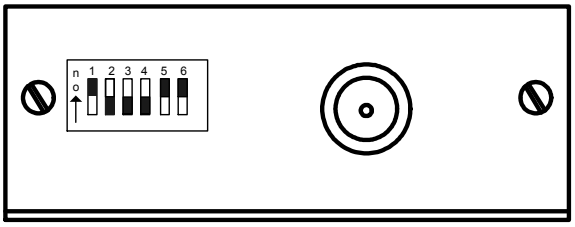
VIII. *Loopback Communication Test*

NOTE: Under normal operating environments this test does not have to be initiated, because high gain antennas have been used that will normally overcome the majority of obstacles encountered in the convenience store environment.

Once the system is setup a loopback test can be run between each dispenser and the EZ console to quantitatively test the communication strength between the modems. To set up the system initiate the following procedures.

EZRF Console Modem Loopback Test Setup

1. Load the MaxStream software onto your laptop computer.
2. Turn the power off to the console modem.
3. Set the console EZRF modem settings, using the dip switch settings, for RS 232 communications as follows:



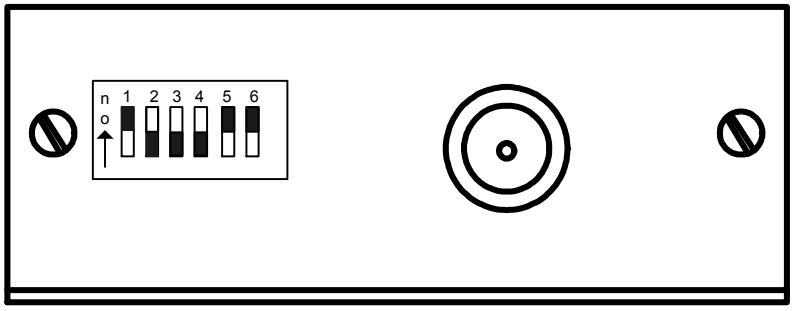
Note: The modem does not have to be removed from the case to adjust the dipswitch settings.

4. Connect a serial cable between the modem and the USB port on the computer.
5. Turn the power to the EZRF modem ON.

3KRF Remote Modem Loopback Test Setup

1. Turn the power off to the remote modem.

2. Set the console 3KRF modem settings, using the dip switch settings, for RS 232 communications as follows:



Note: The modem does not have to be removed from the case to adjust the dipswitch settings.

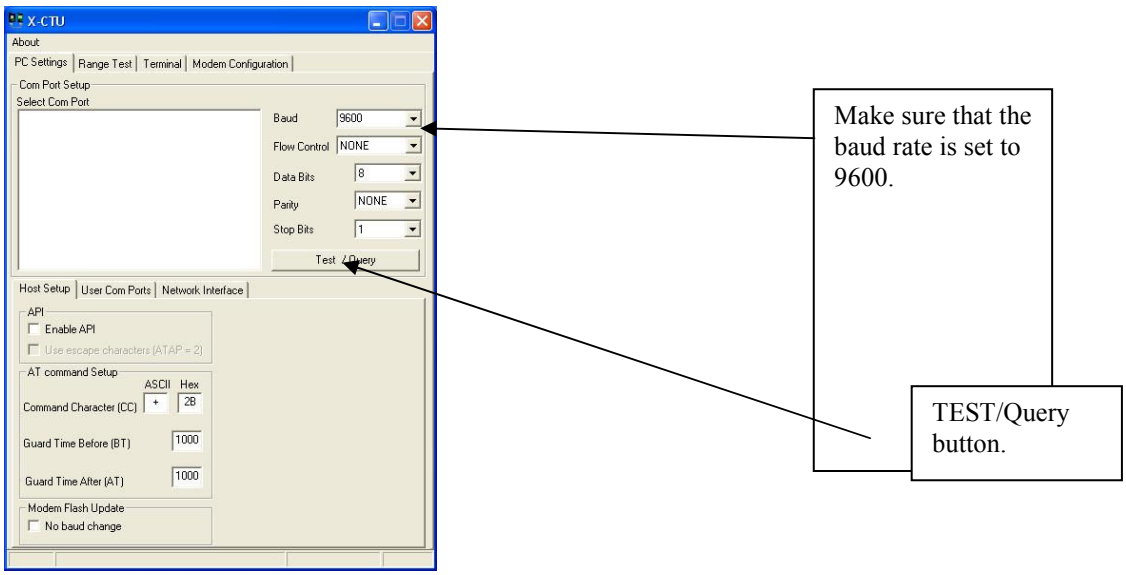
3. Connect the RED loopback connector to the communication cable connector on the side of the housing.

4. Turn the power to the 3KRF modem ON.

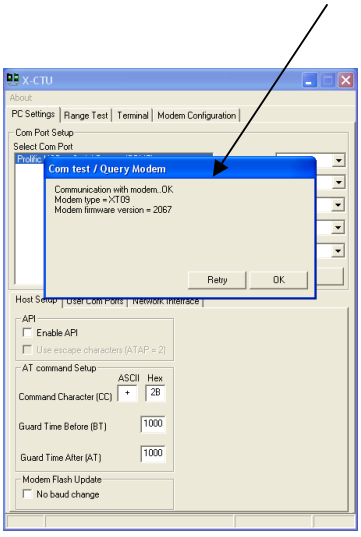
Perform the Loopback Communications Test

1. Click the Digi MaxStream icon 

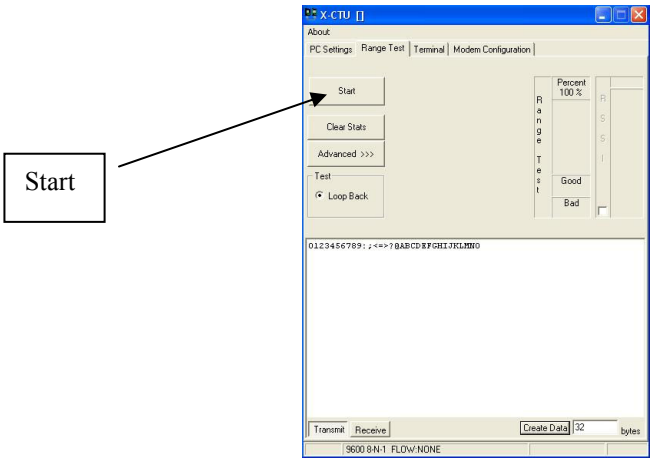
start the program and the following screen will appear.



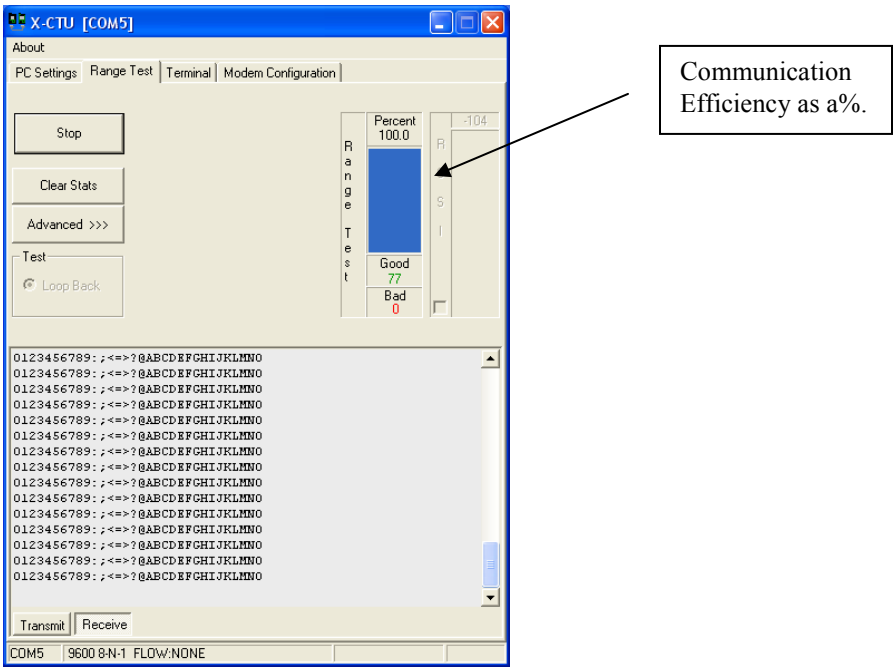
2. Press the Test, Query button and note that if all the modem settings are correct that it will indicate that the communications are OK.



3. Press the OK button. Then click the “RANGE TEST” tab at the top of the page and the following screen will appear



4. Press the "Start" button and the modem will start communicating and numbers will start accumulating in the "Good" and "Bad" windows and the percent good is also shown on the top of the window. The communication efficiency should be in excess of 75%. If the application results in communication efficiencies less than 55% the antenna gain might have to be increased by using a different antenna on the console modem.



5. After each test remove the red loopback connector and return the modem to the original settings out lined on page 10 and reconnect the communication cable to the RS-485 port on the 3K Bennett dispenser with the modem.

6. . Repeat for each of the other remote modems if necessary.