



Memo

Confidential

To: Chris Byleckie, EC Labs

From: Charles Bolton

CC: to files

Date: 03/03/99

Re: Description Whisper Base Station Products Submitted to FCC for approval.

The Base Station products submitted for FCC approval consist of the following devices: Base Station Master, Base Station Repeaters, Backup Battery Enclosures used by Base Stations and the Base Station Concentrator.

The FCC has previously granted certification for the Base Station Repeater which uses the same radio as all the above devices under FCC ID NVC BSR-0001.

This FCC filing is to obtain FCC certification of modifications to the radio approved under FCC ID NVC BSR-0001 as well as extend the certification to new base station models. The modifications include:

- Re-design of the radio from a two board package to a design using a single board.
- Re-designed power supply.
- Addition of an Ampro PC 104 CPU/Processor Board for select base station models(Base Station master and Base Station Concentrator)
- Addition of an Aprtek PC-104 Modem (FCC G4LUSA-73282-DT-E) for select base station models. (Base Station master and Base Station Concentrator)
- Increase of RF output power from 0.891 watts to 1.0 watts

Overview Base Station Master-Base Station Repeater System:

Two types of base stations are used in this deployment. A Base Station Master (BSM) supports up to 30 Base Station Repeaters (BSR) with each BSR supporting up to 540 metering endpoint radios (Remote Meter Interfaces (RMI)) (This application only includes the Base Station products. The RMI devices were previously reviewed and approved by the FCC.)

1. Base Station Master (BSM):
 - One 6 dB, 23 inch, double coil antenna mounted on N Type female bulkhead connector.
 - Base Station Case drilled for Power, battery, antenna and phone modem connector cable thru holes.
 - Ampro or WinSystems PC 104 CPU/Processor Board.
 - Aprrotek PC-104 Modem (FCC G4LUSA-73282-DT-E)
 - Updated Whisper Power Supply.
 - Whisper Radio (FCC NVC-BSR-0001)

2. Base Station Repeater(BSR):
 - One 6 dB, 23 inch, double coil Vertical antenna mounted on N Connector. This Antenna is used for communications to the BSM as well as communication to Remote Meter Interfaces over the Whisper Spread Spectrum, Frequency Hopping RF protocol.
 - Base Station Case drilled for Power, battery, and one antenna connector/cable thru holes.
 - Updated Whisper Power Supply.
 - Whisper Radio (FCC NVC-BSR-0001)

3. System Operation:

The Base Station Repeaters are deployed to provide two way, spread spectrum frequency hopping communications between 1 to 540 metering endpoints (gas, electric or water subscriber meters). Outbound RF communications between the BSR and the RMIs are for programming and data interrogations. Inbound communications from RMIs to the BSR include meter reading reports and responses to BSR data interrogations. BSR to RMI communications are supported by a Whisper RF Protocol that uses 128 Spread Spectrum, Frequency Hopping channels in the 903.42 to 926.28 Megahertz range governed by FCC Part 15 regulations. The transmitter is limited to +20 dB output.

The Base Station Master is connected to a WAN interface (POTS modem or other Wide Area Network Node) and communicates inbound and outbound with the BSR. Typically, the BSM is connected to a central utility

computer used for collecting and analyzing metering data for billing and research/planning purposes.

Outbound RF communications from the BSM to the BSR are for programming, scheduling and configuration. Inbound communications from the BSR to the BSM consist of the collection of RMI meter readings and responses to data interrogations. The BSM to BSR communications are supported by a Whisper protocol that uses 162 Spread Spectrum, Frequency Hopping channels in the 902.08 to 927.84 Megahertz range and is governed by FCC Part 15. Maximum transmit power is + 30 dB.

BSC	BSM	BSR
CPU Board/Processor	CPU Board/Processor	None
Standard Power Supply Updated Design	Standard Power Supply Updated Design	Standard Power Supply Updated Design
Whisper Transceiver FCC:NVC-BSR-0001	Whisper Transceiver FCC:NVC-BSR-0001	Whisper Transceiver FCC:NVC-BSR-0001
Modem (FCC G4LUSA73282-DT-E)	Modem (FCC G4LUSA73282-DT-E)	None
One 6dB 23 inch Whip w/2 Coils	One 6dB 23 inch Whip w/2 Coils	One 6dB 23 inch Whip w/2 Coils
Standard Whisper Case	Standard Whisper Case	Standard Whisper Case

Overview Base Station Concentrator System:

The Base Station Concentrator (BSC) is used in stand alone deployments in which a Base Station Concentrator supports up to 600 metering endpoint radios (Remote Meter Interfaces (RMI)). The BSC performs the functions of both a BSM and BSR in a single device.

1. Base Station Concentrator (BSC):
 - One 6 dB, 23 inch, double coil antenna mounted on N Connector.
 - Base Station Case drilled for Power, battery, antenna and phone modem connector cable thru holes.
 - Ampro or WinSystems PC 104 CPU/Processor Board.
 - Aprtek PC-104 Modem (FCC G4LUSA-73282-DT-E)
 - Updated Whisper Power Supply.
 - Whisper Radio (FCC NVC-BSR-0001)
 - Updated Power Supply.

2. Operation: The BSC is connected directly to a WAN and linked to a Utility computer for billing or research. The BSC supports two way communications between the BSC and the RMI units.). Outbound communications between the BSC and the RMIs are for programming and data interrogations. Inbound communications from RMIs to the BSC include meter reading reports and responses to BSC data interrogations. Inbound and outbound RF communications between the BSC and the RMI devices use the 128 channel Whisper RF protocol. The BSC communicates to Host/Controller computer using a direct serial connection or a POTS modem. The Base Station concentrator provides the same functionality of both a BSM and a BSR in a single package. The radio only operates in Whisper mode.

Whisper Transceiver Specifications:

1. Frequency: Spread Spectrum Frequency Hopping BSR-BSM protocol	Freq: 902.08MHz - 927.84MHz Channels: 162 Channels Channel Spacing: 160 KHz
2 Frequency: Spread Spectrum Frequency Hopping BSR/BSC - RMI protocol	Freq: 903.42MHz – 926.28MHz Channels: 128 Channels Channel Spacing: 180 KHz Additional tuning steps: 200 Hz steps. Provided by Baseband DSP
Power Output: Max software setting <ul style="list-style-type: none"> • BSR-BSM RF Link: • RMI-BSR/BSC RF Link: 	+30 dBm nominal into the antenna <ul style="list-style-type: none"> • +30dBm • +20dBm
4. Modulation Scheme BSR-BSM protocol	FSK, +/- 35 KHz Deviation
5. Modulation Scheme BSR/BSC-RMI protocol	FSK, +/- 5 KHz Deviation
6. Synthesizer Lock:	< 1 millisecond
7. Frequency Accuracy:	+/- 2.5 ppm across temperature range.
8. BSR to BSM Transmission Rate (BSR-BSM protocol)	100,000 bps peak data rate
9. BSR to RMI Transmission Rate (BSR/BSC-RMI protocol)	To RMI: 1953bps From RMI: 3906bps

10. Antenna Characteristics: Straight Whip	Omni-directional azimuth performance of +3 dBi or better vertical mount. Gain: 6dBi Height: 23" No. Coils: 2 Connectors: Type N Ground Plane and Mounting Brackets
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