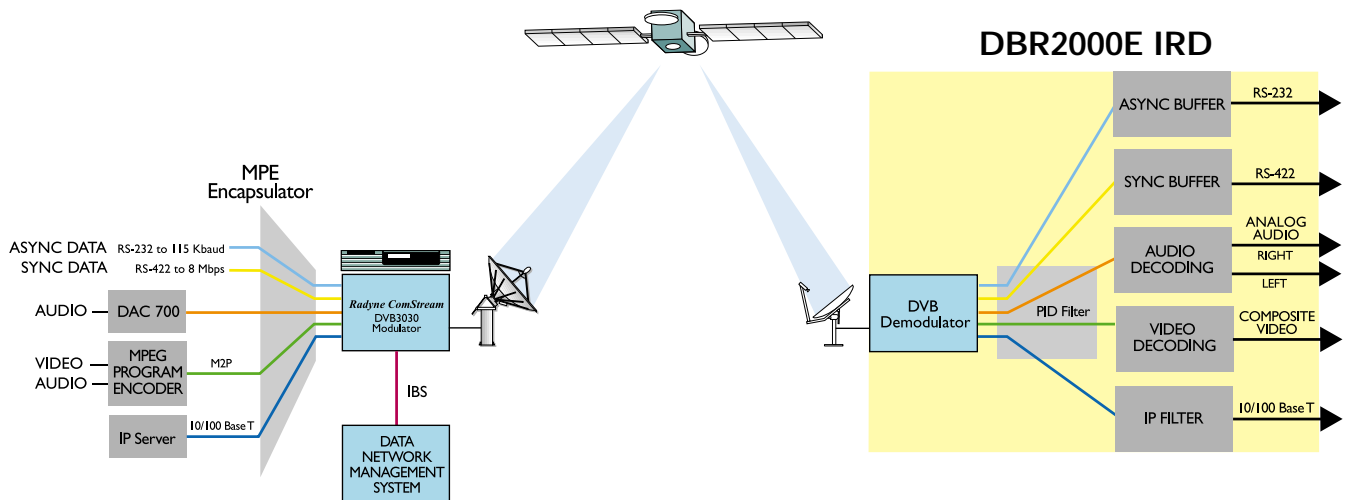


SATELLITE BROADCAST OF INTERNET PROTOCOL (IP) DATA USING DBR2000E AND IBR.45 NETWORKS

RELIABLE IP DATA / AUDIO / VIDEO

DBR2000E NETWORK



INTRODUCTION

This Application Note describes the methods and benefits of Radyne ComStream's DBR2000E and IBR.45 Broadcast Satellite Receivers for broadcast of IP-based data across satellite networks. For further information contact Radyne ComStream Customer Service at (858) 657-5454 phone, (858) 657-5455 FAX, or Email customerservice@radynecomstream.com.

BACKGROUND

With the rapid and widespread acceptance of the Internet and Ethernet-based Local Area Networks (LANs), Internet Protocol (IP) has become the network protocol of choice for a tremendous number of commercial and consumer applications. With hardware prices declining and the number of applications increasing exponentially, demand for reliable IP delivery systems is swelling. Applications like text or graphics file transfer, real-time financial data delivery, Web caching, and IP-based video and audio all share the common thread of requiring a fast, reliable and secure transmission technology. Radyne ComStream is now weaving our expertise in satellite broadcast technology with the power and economics of IP and Ethernet into a complete, reliable broadcast system based around the DBR2000E and the IBR.45 receivers.

SYSTEM OVERVIEW

The DBR2000E and the IBR.45 Systems follow the classic satellite broadcast topology with two new, important layers added: Multi-Protocol Encapsulation and MPEG Transport Multiplexing. The addition of these features, in combination with strict adherence to International DVB and IEC standards, guarantees a reliable, open network topology with a scalable set of features to meet future system requirements. A wide selection of data inputs is also available to support the broadcast of digitized audio, MPEG2 encoded audio and video programs, as well as unformatted data in either synchronous or asynchronous formats. This combination also supports data streams from legacy satellite networks, helping satellite operators and service providers augment current offerings with added data services, rich in multimedia content.

A block diagram of the IBR.45 system is shown in Figure 1 on the next page.



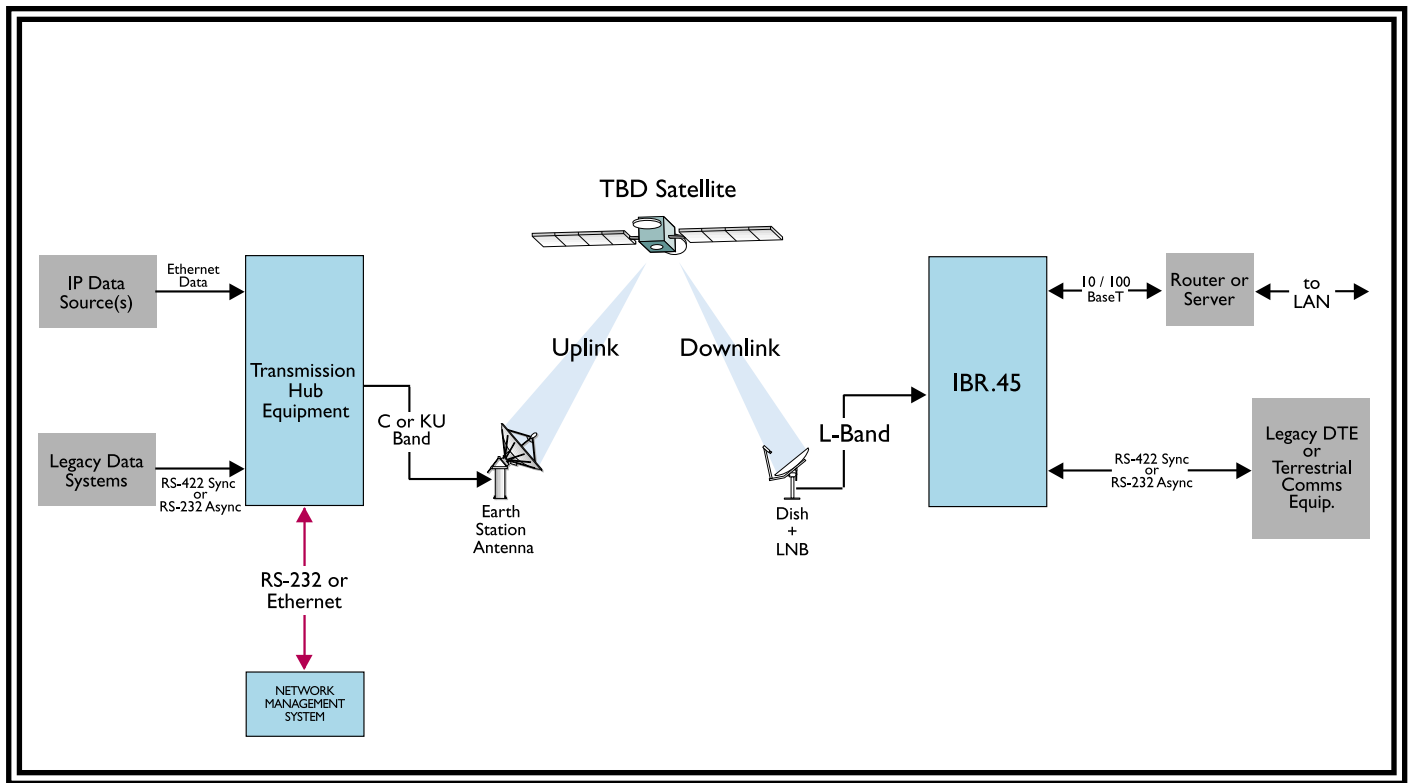


Figure 1 System Block Diagram

The Transmission Hub accepts IP datagrams via a standard IEEE 802.3u compliant 10/100 BaseTX Ethernet interface from Network Server Equipment using standard broadcast network protocols, including UDP/IP, IP Multicast, and others. No protocol spoofing is provided.

Incoming IP packets are encapsulated into MPEG data sections per the Multi-Protocol Encapsulation (MPE) standard, defined in EN 301 192. The resulting data sections are placed into MPEG transport packets per ISO/IEC 13818-1 (MPEG Systems) and multiplexed together into an aggregate transport stream. MPEG Program Identifiers (PIDs) may be assigned to individual IP addresses or to groups of IP addresses. The IP Encapsulator (IPE) also packetizes and multiplexes unformatted RS-232 async data and RS-422 sync clock and data into the transport stream as private data. In-Band Signaling commands from Radyne ComStream Network

Management Software may be multiplexed into the transport either at the RS-232 level (using Radyne ComStream standard SCC cards for backward compatibility) or via a standard Ethernet interface to the IPE.

The transport stream is encoded and modulated onto a 52-88 MHz IF carrier in accordance with the DVB-S standard, ETS 300 421. The IF carrier is passed to C-Band or Ku-Band Upconverter units to upconvert the IF carrier in frequency and amplify it sufficiently for transmission to a standard geosynchronous satellite. Radyne ComStream will provide a satellite link budget, if desired, to assist in satellite selection as well as satellite power and bandwidth requirements based on particular system throughput and availability requirements.

Very Small Aperture Terminal (VSAT) receive-only antennas at the remote sites receive the downlink from the satellite. The C-Band or Ku-Band downlink carrier is downconverted to L-Band by a Low-Noise Block downconverter (LNB) mounted on the VSAT antenna. Typical

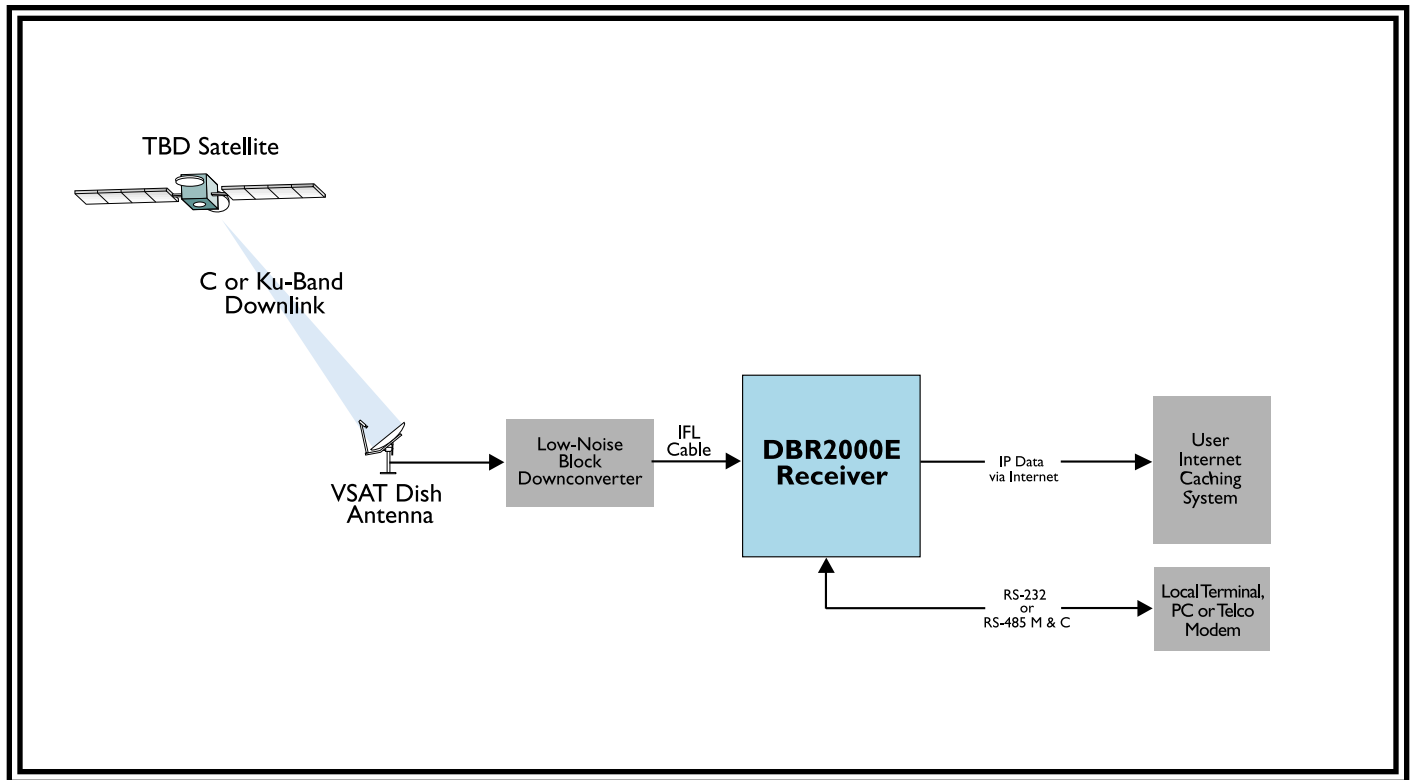


Figure 2 Typical Remote Site Block Diagram

antenna sizes range from 0.8 to 2.0 meters, depending on the remote location and the link budget for the particular satellite selected. The LNB output is passed through an Interfacility Link (IFL) coaxial cable to the DBR2000E or IBR.45 remote receivers. If desired, Radyne ComStream will also help in the selection of qualified terminal installation technicians to install and select IFL cables and to determine the need for line amplifiers at a given location. Figure 2 shows a remote site block diagram.

The receiver demodulates the carrier and corrects errors to BER thresholds defined in the DVB-S standard to recover the aggregate MPEG Transport Stream. The Transport Stream is filtered at the MPEG PID level to demultiplex the In-Band Signaling commands and block unauthorized data sections. Sections suitable for output are re-mapped to Ethernet data packets and output to the physical 10/100 BaseTX interface to user supplied Routers, Switches, or directly to the users LAN.

BACKWARD COMPATIBILITY

The DBR2000E provides backward compatibility with most configurations of Radyne ComStream DBR401VR and DBR801 receivers. With the added functionality of the MPEG transport demultiplexer and IP level data processing, an existing network may be upgraded systematically over time with minimal user disruption. A one-time switchover enables the new, value-added services provided by IP data and MPEG program delivery. Best of all, the demonstrated quality and customer support that Radyne ComStream is so well known for are built-in to every unit.

Satellite Broadcast of Internet Protocol (IP) Data Using DBR2000E and IBR.45 Networks

KEY SYSTEM SPECIFICATIONS

Aggregate Data Rates:	Variable in 1 bps steps from 64kbps to 8448kbps (DBR2000E) 1.5 — 45 Mbps (IBR .45) front end options available soon
Forward Error Correction:	Sequential rate 1/2 or 3/4 (to 2048kbps) (DBR200E only) Viterbi rate 1/2, 2/3, 3/4, 5/6, or 7/8 Concatenated Viterbi and Reed-Solomon rate 188/204 (DVB compliant)
Modulation:	BPSK or QPSK (DVB compliant)
Hub Monitor and Control:	Hub Equipment uses RS-485 async bus via Data Network Management System (DNMS)
Remote Site Management:	Locally via RS-232 or RS-485 async terminal or over-the-air via multiplexed DNMS In-Band Signaling channel SNMP agent available soon
Multiplexers:	MPE Encapsulation into MPEG Transport Stream DVB Compliant
Multiplexer Data Interfaces:	10/100BaseTX Ethernet standard, RS-232 Async, RS-422 Sync, and M2P Transport Stream inputs also available
Remote Data Interfaces:	10/100BaseTX Ethernet standard, RS-232 Async, RS-422 Sync, Analog audio and composite NTSC and PAL video outputs also available (DBR200E only)
Environmental:	Operating: 0 to 50° C and 5 to 85% RH non-condensing, 10,000 feet altitude Non-operating: -20 to 70° C and 0 to 100% RH non-condensing.
Regulatory:	Safety: EN 60950, CUL 950 Emissions: FCC Part 15B Class A EN55022 Class B Susceptibility: EN61000-4 for ITE equipment
Hub Power Requirements:	110 VAC or 220 VAC options available
Remote Receiver Power:	85 VAC to 265 VAC, 47 to 63 Hz, autoranging



Radyne ComStream is a DVB-compliant equipment provider

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