Exhibit D
Product Description

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1 Exhibit D – Product Description

1.1 Overview

The High Speed data Transceiver (HST), type numbers HST-2110B and HST-2120B are additional units designed to work with the SRT-2100B Satellite Data Unit (SDU). A complete SATCOM system consists of the following components:

Table 1 - List of Equipment

Type Number	Name	Manufacturer	FCC ID
SRT-2100B (3 channel version)	Satellite Data Unit	Rockwell Collins	AJK8221785
High Gain Antenna System	n/a	various	n/a
HST-2110B or HST-2120B	High Speed Data Transceiver	EMS	AJK8222232 or AJK8222234

The SRT-2100B requires software and High Power Amplifier modifications to support the addition of the HST-2110B or HST-2120B. These modifications will result in changes that affect previously submitted test data for SRT-2100. The SRT-2100B will require FCC Certification as a result of these changes.

The changes necessary to add an HST-2110B or HST-2120B to the existing SRT-2100 System are highlighted in the outlined area of Figure 1 below:
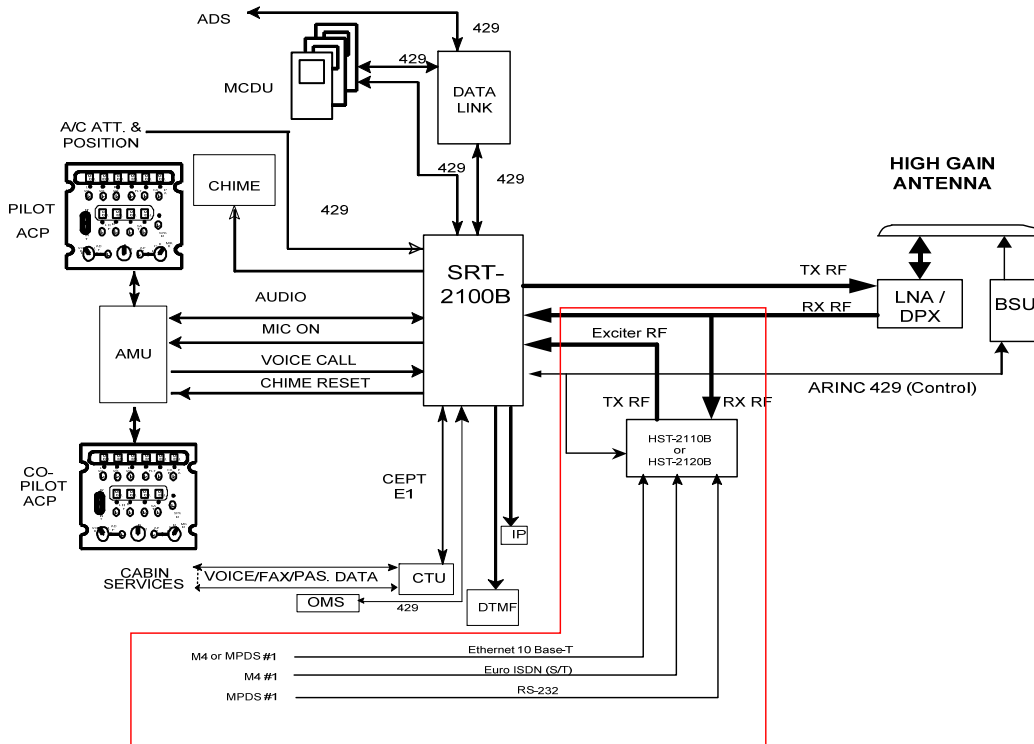
Figure 1 - SRT-2100B System with HST 21X0B

The HST-2110B or HST-2120B will add the INMARSAT SwiftBroadband service to the existing INMARSAT aeronautical services and Swift64 high speed service already supported by the SRT-2100 system.

By incorporating the SwiftBroadband service from INMARSAT, the HST High-Speed Transceiver will provide up to 432 kilobits per second connectivity using the SAT-2100B antenna and high-power amplifier. The HST-2110B and HST-2120B transmit low level L-band signal to the SRT-2100B, which has a secondary input to its internal High Power Amplifier (HPA). The HPA is a broadband linear amplifier which simultaneously amplifies the classic Aero-H carriers generated internally to the SRT-2100B, as well as the L-band carrier(s) generated by the HST-2110B or HST-2120B. The HST-2110B and HST-2120B receivers are independent of the SRT-2100B. The output of the LNA/Diplexer typically passes through a passive L-band RF splitter and is routed to both the SRT-2100B and HST-2110B (or HST-2120B) receiver inputs.

The HST supplies interfaces to Ethernet, ISDN and RS-232 which will provide real time passenger e-mail and Internet access as well as the high speed data applications such as real time cabin surveillance to the ground, file server, SwiftBroadband, Swift 64 and integrated information systems cockpit applications.

1.2 HST-2110B and HST-2120B Equipment Specifications

Table 2 - Equipment Specifications

CHARACTERISTIC	SPECIFICATION
Digital interface	
Crosstalk Bus	High-speed ARINC 429 input and output
Ethernet User Interface	10 Base T input and output
ISDN User Interface	64 kbps ISDN Euro input and output (HST-2110B) 128 kbps ISDN Euro input and output (HST-2120B)
RS-232 User MPDS Interface	115.2 kbps RS -232 input and output
RS-232 Data Loader Port	115.2 kbps RS -232 input and output
Input characteristics	
Frequency range	1525.0 to 1559.0 MHz
Impedance	50 Ω nominal
VSWR	2.0:1 max
Signal input level	-100 dBm to -60 dBm
Output characteristics	
Frequency range	1626.5 to 1660.5 MHz
Impedance	50 Ω nominal
Load VSWR	2.0:1 operational, infinite, survival
Output power	-6.5 dBm to 22 dBm in 0.5 dB increments

1.3 HST Hardware Overview

The HST product line consists of the following LRUs:

- The HST-2110B, Collins Part Number 822-2232-020. This unit is designed to operate primary power of 115 VAC, 400Hz power source. It is similar to the previously Type Certified HST-2110 except that it contains new software that supports both Swift 64 and SwiftBroadband services.

- The HST-2110B, Collins Part Number 822-2232-010. This unit is designed to operate with 28V DC power source. It is similar to the previously Type Certified HST-2110 except that it contains new software that supports both Swift 64 and SwiftBroadband services.

- The HST-2120B, Collins Part Number 822-2234-010. This unit is designed to operate with 28V DC power source. It is similar to the previously Type Certified HST-2120 except that it contains new software that supports both Swift 64 and SwiftBroadband services
  This unit supports two simultaneous channels of Swift64 or one channel of SwiftBroadband.

Figure 2 shows the major functional blocks of the HST-2110B (single channel), Figure 3 shows the major functional blocks of the HST-2120B (dual channel).
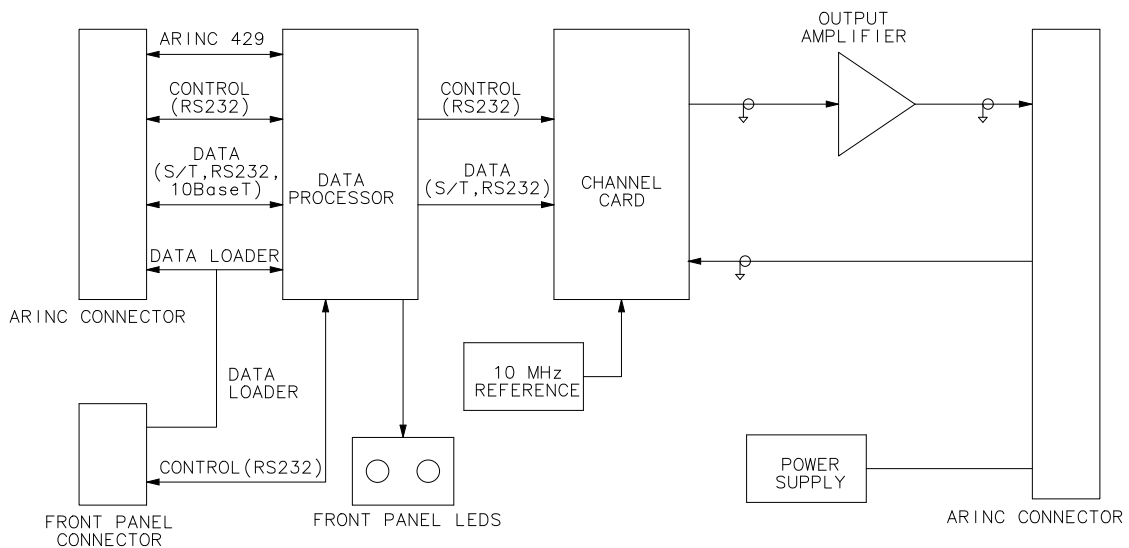

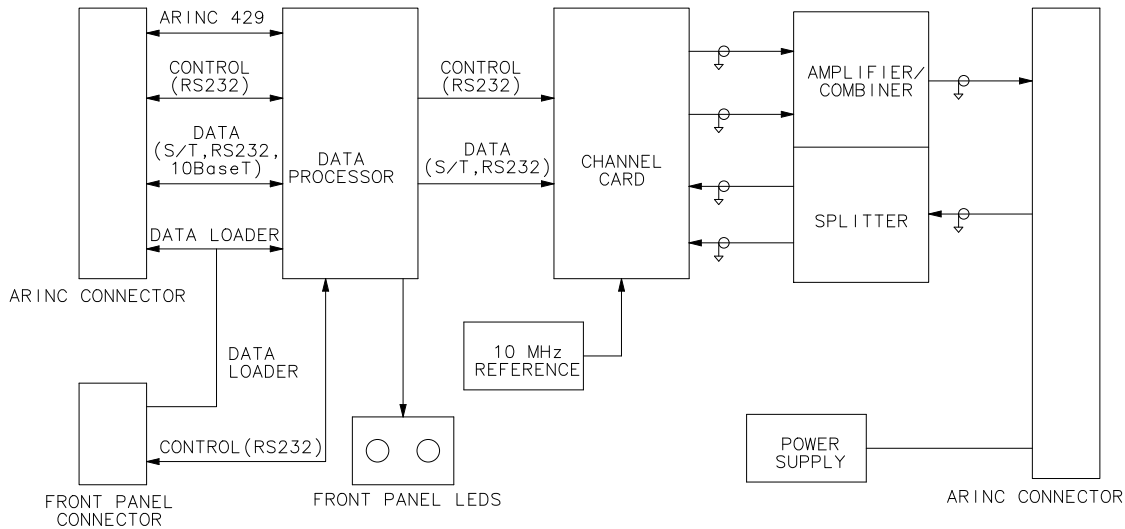**Figure 2 - HST-2110B Block Diagram**

Figure 3 - HST-2120B Block Diagram

1.4 Mechanical

Both the HST-2110B and HST-2120B are housed in a 2-MCU-size unit with mounting requirements according to the ARINC 600 specification. The HST chassis is designed for either forced air or convection cooling. The front panel contains a data loader connector used to upload data to the HST and a set of LEDs to indicate unit status. It also contains a "self-test" button and corresponding LED indicators for active operator maintenance. A backplane assembly interfaces the ARINC 600 connector with the power supply, channel card, data processor card, and output amplifier. The HST also contains an ovenized high stability crystal oscillator to provide a stable 10 MHz reference to the channel card.

1.5 Channel Card

The Channel Card contains the physical layer L band interface and is responsible for implementing the Swift64 and SwiftBroadband network protocols. In addition to the Inmarsat MISDN and MPDS protocol functionality, the Channel Card interfaces with the Data Processor for command and control functions. The Interfaces between the Channel Card and the Data Processor fall into the broad categories of Operational, BITE, Maintenance, and Test and Approval. Data interfaces to the Channel Card are ISDN BRI S/T for circuit switched data and RS-232 for packet data (MPDS). Analog voice services are not be supported.

1.6 Data Processor

The purpose of the Data Processor is twofold:

1.6.1 Control

The Data Processor shall mediate between the Channel Card and the SDU, performing protocol conversion as required ensuring proper control of the HST. It shall also provide configuration and testing capabilities.

1.6.2 User Data

The Data Processor shall provide data conversion between the ISDN and RS232 on the Channel Card and other interfaces as required (i.e. 10BaseT Ethernet). This may include providing OSI Layer 2 and Layer 3 services.

1.7 Power Supply

The Power Supply provides regulated power to the Channel Card, 10 MHz Reference, Output Amplifier and Data Processor.

1.8 10 MHz Reference

The 10 MHz Reference provides a high stability 10 MHz reference signal to the Channel Card.

1.9 Output Amplifier

The Output Amplifier increases the power of the RF signal from the Channel Card to the required level.

1.10 Backplane

The Backplane is a passive module that provides interconnection between all other modules of the HST and to the outside world.