

# Internet Gateway Processor Software

# ADSP-21mod870-110

#### FEATURES

ISDN B-Channel HDLC **DATA Modulations** CCITT V.90 (30k-56k) K56Flex<sup>™</sup> (30k-56k) ITU-T V.34: 33600 Bits/s-2400 Bits/s CCITT V.32bis: 14400 Bits/s-7200 Bits/s CCITT V.32: 9600 Bits/s, 4800 Bits/s CCITT V.23 CCITT V.22/V.22bis: 2400, 1200, 600 Bits/s CCITT V.21: 300 Bits/s Bell 212A: 1200 Bits/s Bell 103: 300 Bits/s Start-Up Procedures: **ITU-T V.8 Error Correction and Data Compression:** CCITT V.42 Error Correction (LAPM and MNP2-4) **CCITT V.42bis Data and MNP Class 5 Compression** FAX Modem V.17/V.29/V.27ter/V.21 Channel 2 T.30 Protocol V.120 V.110 PPP Asynchronous Framing Support (RFC 1662) Low Power 80 mW Typical Active Low Power and Sleep Modes **High Density** 100-Lead LQFP Package **On-Chip DS0/DS1 Interface Full Function DMA Port** No External Memory Required 0.4 Square Inch per Complete Modem Port 3.3 V Supply Fully Upgradable RAM-Based Architecture Fast Download Full Image in 5 ms High Speed 16-Bit Port Link Bus Provides Simple Interface Between Host and Modem Pool

#### INTRODUCTION

The ADSP-21mod870-110 is a complete single chip. All datapump and controller functions are implemented on a single 0.4 square-inch chip. This modem package allows the highest modem port density, while achieving the lowest power consumption in a software upgradable platform.

The ADSP-21mod870-110 is designed for high density systems such as remote access servers (see Figure 1). Its high performance DSP core, large on-chip SRAM, TDM serials port and 16-bit DMA port provide efficient control and data communication with minimal chip count. The modem software provides a number of data modulations, such as V.34, 56K bps PCM, and ISDN with a software upgrade path to future standards, and new applications, such as voice over network. The host interface allows system access to modem statistics such as call progress, connect speed and modulation parameters such as retrain count and symbol rate.

#### **ON-CHIP SRAM**

The ADSP-21mod870-110 processor integrates 160K bytes of on-chip memory. The modem datapump and controller software, as well as data storage, are contained in the on-chip SRAM. The SRAM cells are designed by Analog Devices. These cells are optimized for high speed digital signal processing and low power consumption. You can dynamically configure the ADSP-21mod870 with software through the 16-bit DMA interface.

#### DMA INTERFACE

The 16-bit internal DMA port (IDMA port) provides transparent, direct access to the on-chip RAM of the ADSP-21mod870 processor. This high speed access to on-chip memory simplifies control and data communication and system debug. Use the 16-bit DMA interface to dynamically configure the ADSP-21mod870 with software.

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#### REV.0

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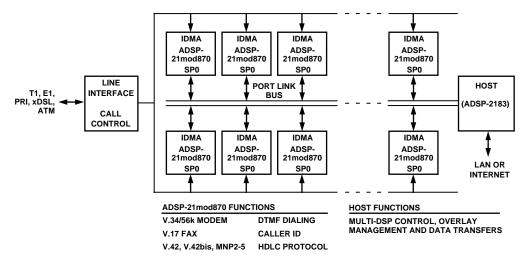


Figure 1. ADSP-21mod870 Network Access System

#### SERIAL PORTS

The ADSP-21mod870 processor incorporates two complete synchronous, double-buffered serial ports for serial communications. The serial ports interface directly to a time-division multiplexed (TDM) 1544 kbps (T1) or 2048 kbps (E1) serial stream, to an 8K sample/s data stream, or to an 8-bit companded (64 kb/s) data stream (DS0). The serial ports operate under modem software control.

#### SUPPORTED SYSTEM ARCHITECTURES

The ADSP-21mod870-110 Internet Gateway Processor Software supports two system architectures: *serial Telco PCM TDM data stream and parallel Telco PCM data stream*. The two architectures are differentiated by the method of proving Telco PCM data to the DSP Modem.

#### Serial Telco PCM TDM Data Stream Architecture

The serial Telco PCM TDM data stream architecture, shown in Figure 2, is the most common architecture. In this architecture, the modem pool may have a local Telco interface that provides a serial TDM data stream of Telco PCM data to the DSP through the DSP's Serial Port. You can connect up to 24/32 DSPs, through the Serial Port, to a 24/32 channel serial TDM data stream.

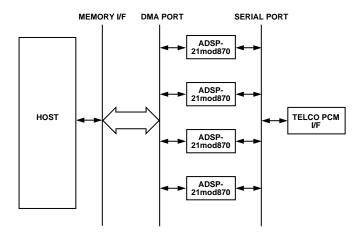


Figure 2. Serial Telco PCM TDM Data Stream Architecture

#### Parallel Telco PCM Data Stream Architecture

The parallel Telco PCM data stream architecture, shown in Figure 3, provides a single bus interface for all data and control. In this architecture, the modem pool may have a remote Telco interface that provides a parallel data stream of Telco PCM data to the DSP through the DSP's DMA Port. An arbitrary number of DSPs can be connected, through the DMA Port, to a Host that provides the parallel data stream.

Note: The number of parallel DSPs is limited only by the software loading constraints on the Host.

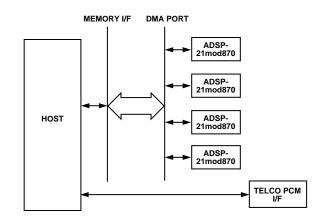


Figure 3. Parallel Telco PCM Data Stream Architecture

#### SOFTWARE INTERFACE

Analog Devices provides sample C code for the software interface to the ADSP-21mod870-110. The software interface encompasses the following four areas—download, control interface, data interface and modem statistics.

#### Download

The IDMA port on the ADSP-21mod870-110 contains an autoincrementing address generator. The host writes the starting address of the transfer and then writes the first word of data. After the first write, the IDMA address generator automatically increments; the host writes the next data word and the IDMA transfers that word to the next location in ADSP-21mod870-110 memory.

The executable image contains code and data that must be loaded into program and data memory. Program memory on the ADSP-21mod870-110 is 24 bits wide, therefore two transfers are used to load each word of program memory.

The host begins the download by asserting the  $\overline{\text{RESET}}$  pin of the ADSP-21mod870-110. The host then transfers all code and data. All internal memory can be loaded in 5 ms.

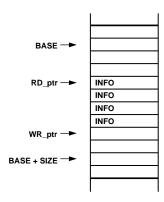
#### **Control Interface**

The ADSP-21mod870-110 is controlled through two FIFOs in DSP memory. The host sends a control event by writing to the *host-to-modem* FIFO. The ADSP-21mod870-110 posts events to the host by writing into the *modem-to-host* FIFO.

#### **Data Interface**

All data transferred to and from the ADSP-21mod870-110 passes through word FIFOs located in internal memory on the ADSP-21mod870. The FIFOs are accessed through a control structure that contains a pointer to the start of the FIFO in memory, the length of the FIFO in 16-bit words, a pointer to the next address to be read, and a pointer to the next address to be written. The transmit and receive FIFOs are 1024 bytes deep. Example code providing primitives for accessing the byte-FIFOs is available from Analog Devices. Table I shows an example of a data FIFO.

Table I.	FIFO	Example
1 4010 11	<b>.</b>	Linumpie



#### **Modem Statistics**

Several modem statistics can be gathered through the IDMA port. These statistics include call status, modulation in use, connect rate, transmit and receive data rate, symbol rate, retrain count, rate renegotiation count and others. Table II and Table IV contain a complete listing of available modem statistics.

#### **Modem Configuration**

The modem is configured by programming various parameters through the IDMA port. Table III and Table V contain complete lists of modem configuration parameters.

	Table	II.	Shell	Status
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Reference #	Function
<b>SS</b> . 0	Product Number
SS. 1	Application Version
SS. 2	Application Type
SS. 3	Programmable Flag Data

#### Table III. Shell Parameters

Reference #	Function
SP. 0	Serial Port Tx Time Slot
SP. 1	Serial Port Rx Time Slot
SP. 2	Serial Port Configuration
SP. 3	Programmable Flag Control
SP. 4	Programmable Flag Data
SP. 5	Host Interrupt Count

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Table IV. Modem Status

Table V. Modem Parameters

	Table IV. Modem Status		
Reference #	Function	Reference #	Function
MS. 0	Data Modulation State	MP. 0	Omc Data Modulation Originate Enable
MS. 1	SNR MSE Measure	MP. 1	Dial Billing Delay Duration
MS. 2	Rx Level dBm	MP. 2	Omc Data Modulation/Data Protocol
MS. 3	Tx Level dBm		Maximum Start-Up Duration
MS. 4	Tx V.34 Symbol Rate	MP. 3	Data Protocol Start Delay
MS. 5	Rx V.34 Symbol Rate	MP. 4	Data Protocol Allowed Mask
MS. 6	Round Trip Delay	MP. 5	Data Protocol Preferred Mask
MS. 7	Telemetry Data Update	MP. 6	Data Protocol Auto-Select Mask
MS. 8	Constellation X	MP. 7	Data Protocol Compression Mask
MS. 9	Constellation Y	MP. 8	Data Protocol Cmn Binary Enable
MS. 10	Variable 2 X Pointer	MP. 9	Data Protocol Cmn HDLC Enable
MS. 11	Variable 2 Y Pointer	MP. 10	Data Protocol LAPM to Sync
MS. 12	Variable 3 X Pointer	MP. 11	Data Protocol MNP Block Mode Enable
MS. 13	Variable 3 Y Pointer	MP. 12	Data Protocol MNP Data Compression Select
MS. 14	Variable 4 X Pointer	MP. 13	Data Protocol MNP Header Optimize Enable
MS. 15	Variable 4 Y Pointer	MP. 14	Data Protocol MNP Maximum Data Size
MS. 16	Data Modulation Monitor Retrain Local Count	MP. 15	Data Protocol MNP Service Class
MS. 17	Data Modulation Monitor Retrain Remote Count	MP. 16	Data Protocol Disconnect Management Mode
MS. 18	Data Modulation Monitor Retrain Auto Count	MP. 17	Data Protocol Disconnect Management
MS. 19	Data Modulation Monitor Renegotiate Local		Duration
	Count	MP. 18	Digital Data Modes
MS. 20	Data Modulation Monitor Renegotiate Remote	MP. 19	Pump Data Modes
	Count	MP. 20	Pump Tone Transmit Level
MS. 21	Data Modulation Monitor Renegotiate Auto	MP. 21	Pump Transmit Level
	Count	MP. 22	Pump V.34 Transmit Level
MS. 22	Omc Carrier Family	MP. 23	Data Modulation Carrier Detect Duration
MS. 23	Omc Disconnect Reason	MP. 24	Data Modulation Carrier Loss Disconnect
MS. 24	Omc State		Timer Duration
MS. 25	Omc Time	MP. 25	Data Modulation Line Quality Monitor Mode
MS. 26	Omc Idle Time Start	MP. 26	Data Modulation Options Mask
MS. 27	Omc Data Protocol Time Start	MP. 27	Data Modulation V.32 Rate Enable Mask
MS. 28	Omc Initial Rx Data Rate	MP. 28	Data Modulation V.34 Data Rate Mask
MS. 29	Omc Current Rx Data Rate	MP. 29	V.PCM Maximum Power
MS. 30	Omc Initial Tx Data Rate	MP. 30	V.PCM Reference Point
MS. 31	Omc Current Tx Data Rate	MP. 31	K56 RBS Maximum
MS. 32	Data Protocol	MP. 32	K56 Tx Data Rate Maximum
MS. 33	Data Protocol Compression	MP. 33	K56 Tx Data Rate Minimum
MS. 34	Data Protocol Rx HDLC Error Frame Count	MP. 34	DTE Interface Big Endian
MS. 35	Data Protocol Rx HDLC Frame Count	MP. 35	PPP Rx Mode Enable
MS. 36	Data Protocol Tx HDLC Frame Count	MP. 36	PPP Tx Mode Enable
MS. 37	Data Protocol Tx Data Frame Count	MP. 37	f <sub>P</sub> PPP Detect Enable
MS. 38	Data Protocol Tx Data Frame Retransmit Count	MP. 38	f <sub>P</sub> PPP Rx ACCM
MS. 39	Data Protocol Rx Data Frame Count	MP. 39	f <sub>P</sub> PPP Tx ACCM
MS. 40	Data Protocol Rx Data Frame Missing Count		I
MS. 41	Data Modulation Monitor Retrain Remote		
	Count		
MS. 42	Data Protocol Call Tx Data Compressibility		
	Metric		
MS. 43	Data Protocol Call Rx Data Compressibility Metric		
MS. 44	Data Protocol Call Tx Data Metric		
MS. 45	Data Protocol Call Rx Data Metric		
MS. 46	V.PCM Digital Attenuation		
MS. 47	V.PCM Robbed Bit Mask		

MS. 47 V.PCM Robbed Bit Mask MS. 48 V.PCM Coding Law

## ADSP-21mod870-110

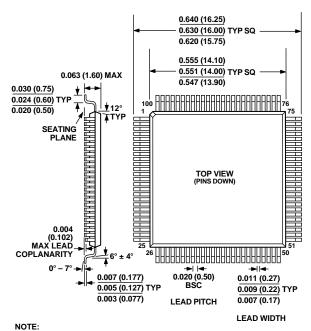
#### **ORDERING GUIDE**

Part Number	Description	Instruction Rate MHz	Package Description	Package Option
ADSP-21mod870-110	52 MIPS DSP with Modem Software Unit License	52.0	100-Lead LQFP	ST-100

#### **OUTLINE DIMENSIONS**

Dimensions shown in inches and (mm).

#### 100-Lead Metric Thin Plastic Quad Flatpack (LQFP) (ST-100)



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