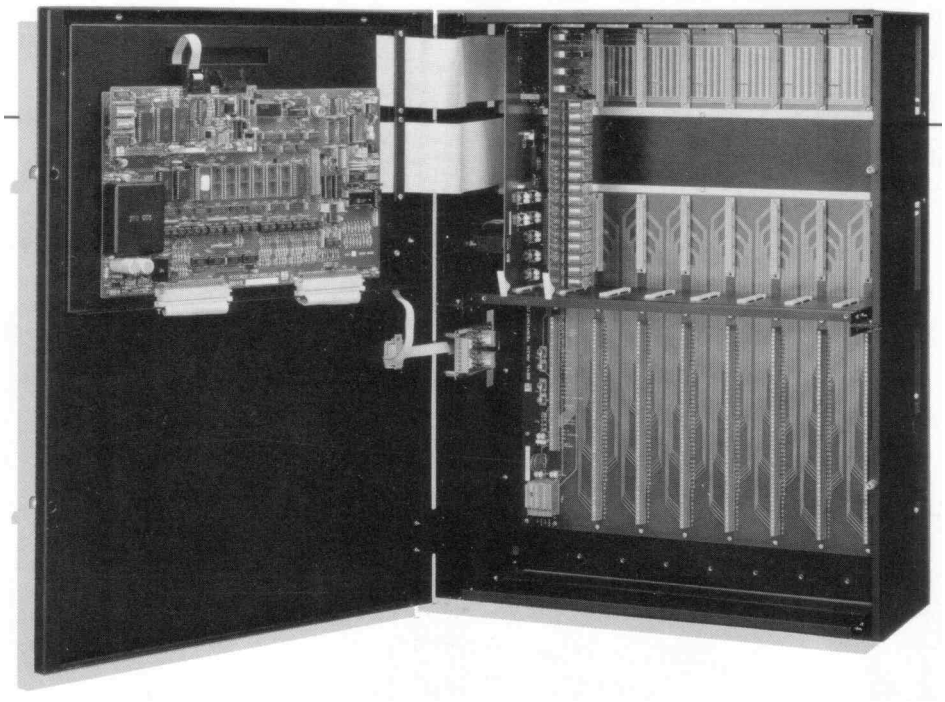
Industrial Microcontroller



ETI Micro's 8641 Industrial Microcontroller is the expanded I/O version of ETI Micro's reliable 8640. The 8641 combines the attributes of programmable controllers with the facilities of classical data acquisition equipment. Known traditionally as a Remote Terminal Unit (RTU), the 8641 has evolved into a far more intelligent device, and offers a vast array of features. With rugged industrial packaging, the 8641 integrates process control algorithms, data acquisition capabilities, communications programmability, and reliability.

The 8641 derives its intelligence from a powerful CMOS 8088 microprocessor kernal and an enhanced RTX™ multi-tasking operating system. The 8641 architecture allows the user to optimally configure the I/0 structure determined by individual requirements. The base 8641 offers a maximum of 120 I/O points, and is expandable to 248 I/O points with the 8641-EXP Expansion Chassis.

COMPUTATION: The 8641 provides processing with an optional 8087 Floating Point Math coprocessor. Throughput for math intensive applications is increased by 500%.

MEMORY: The 8641 can support 128k bytes of RAM and 256K bytes of ROM on-board. It was designed for up to 512k bytes of total memory. If a power failure occurs, the clock/calendar and RAM sockets are backed-up by a lithium battery.

I/O MODULES: The I/O Modules provide for a variety of discrete digital I/O, high-speed accumulators, and analog I/O. They were designed to accommodate both high level and low level industry standard transducers and controllers.

COMMUNICATIONS: The 8641 supports up to 4 serial ports with optional Communications Modules. Most distributed systems are supported in both synchronous and asynchronous environments.

PROTOCOL: ETI Micro's DYNAMIC™ protocol was designed for flexibility using the recommended ISO layering methodology. DYNAMIC has both virtual features for user implementation, and industry desired functions.

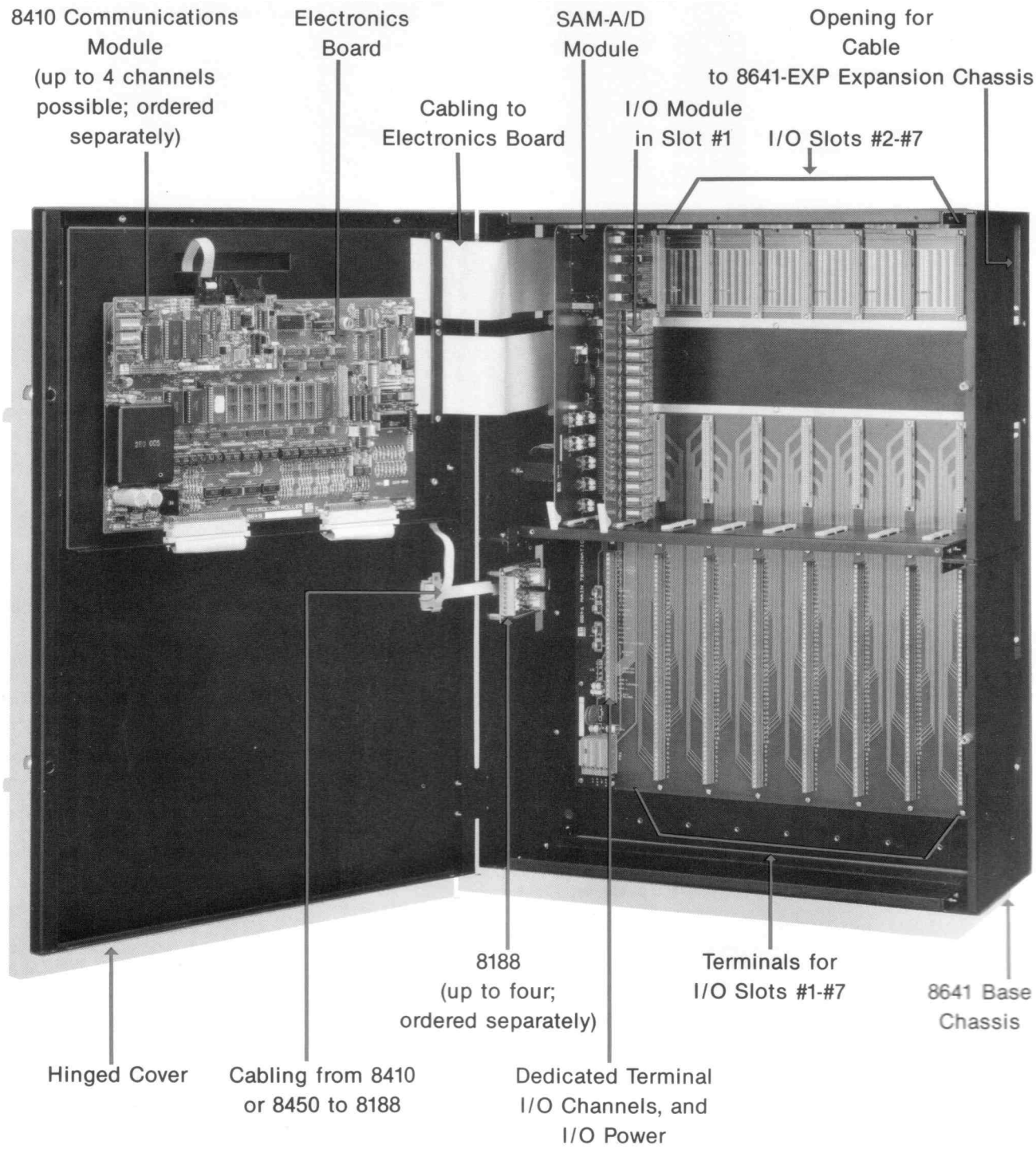
PROGRAMMABILITY: A variety of standard industrial preprocessors can be invoked through communications. In addition, a professional set of IBM-PC development tools is available with callable library routines, special functions, and templates. This allows users to program proprietary tasks in high level languages such as PL/M, "C' Pascal, and Fortran.

FLEXIBILITY: Remote features include telemetry configuration, changing set points, and analog input conditioning. Downloading and uploading capabilities are utilized thru host computers such as IBM PC, DEC. Data General, Hewlett Packard, and Texas Instruments TIWAY™

POWER: The 8641 can be optionally configured for operation from any standard power source. These include 115 Vac, unisolated low voltage dc (+12 to 36 Vdc), isolated -48 Vdc, and isolated +125 Vdc. With the optional low powered dc feature, the addition of a battery is all that is required for an uninterruptible power supply.

RELIABILITY: The 8641 has the ruggedness to work in a wide range of industrial applications. Transient isolation, low power CMOS circuitry, and optional lightning protection ensure trouble free operation in environmental temperatures of -20 to +70 degrees C.

8641 Industrial Design



8641 Base Chassis

The 8641 System

8641 Microcontroller:

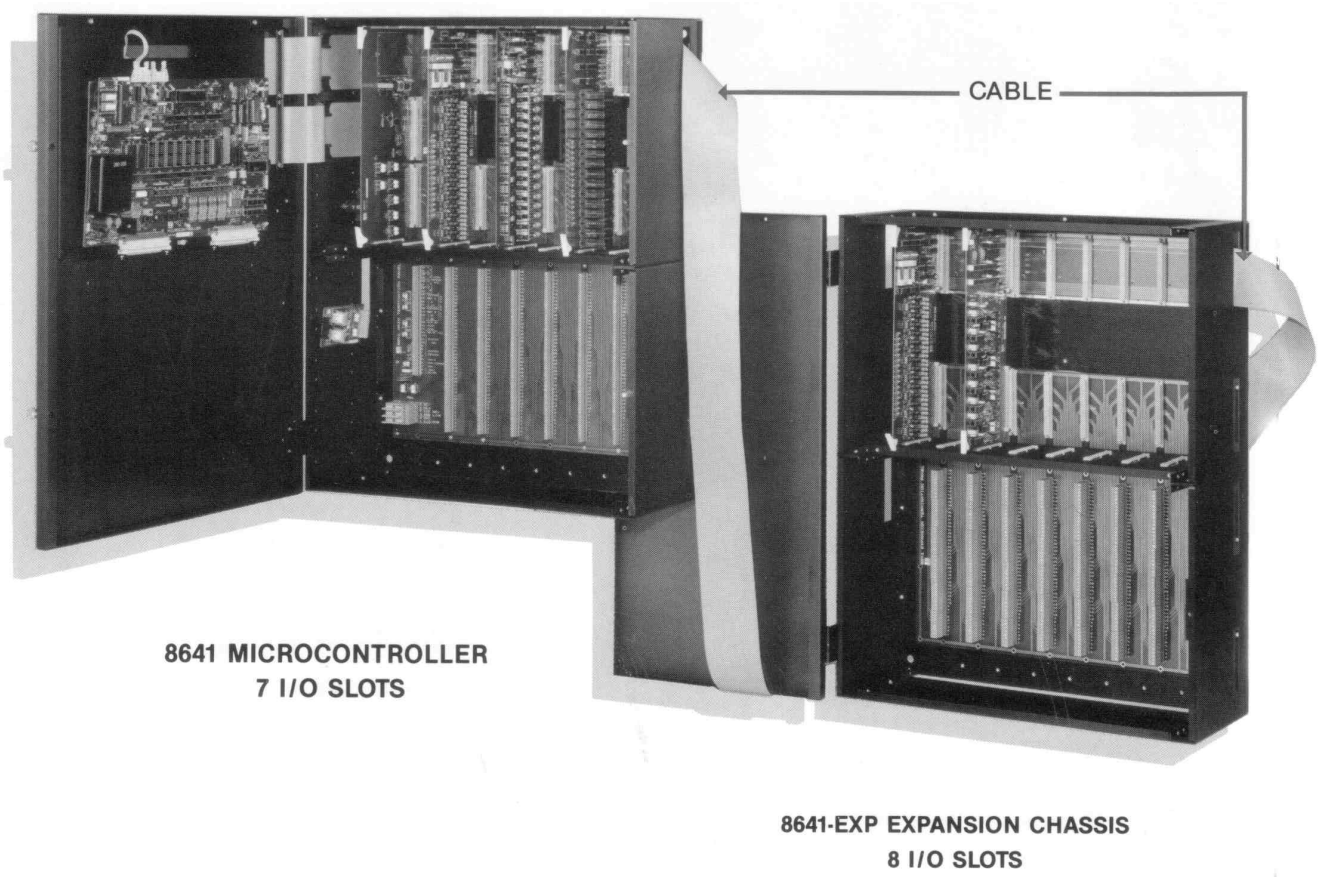
The base 8641 chassis accommodates a maximum of 120 digital or analog I/O points. There are seven generic I/O slots for the installation of the plug-in I/O Modules. The System Auxiliary Module (SAM) interfaces the Electronics Board circuitry to a dedicated termination strip on the Main Termination Panel. This termination strip provides the field wiring for eight pre-assigned I/O channels and I/O power connections. The SAM Module is required and must be ordered separately from the 8641 base chassis for either ac (SAM-A), or dc (SAM-D) power configurations.

The 8641's major subassemblies consists of the Electronics Board (M056), the Main Termination Panel (T071), the Main Backplane (B070), the System Auxiliary Module (SAM-A or SAM-D), and a chassis. The Main Termination Panel, and Main Backplane are mounted in a 27" x 21" x 9.125" chassis with the Electronics Board mounted on the hinged cover.

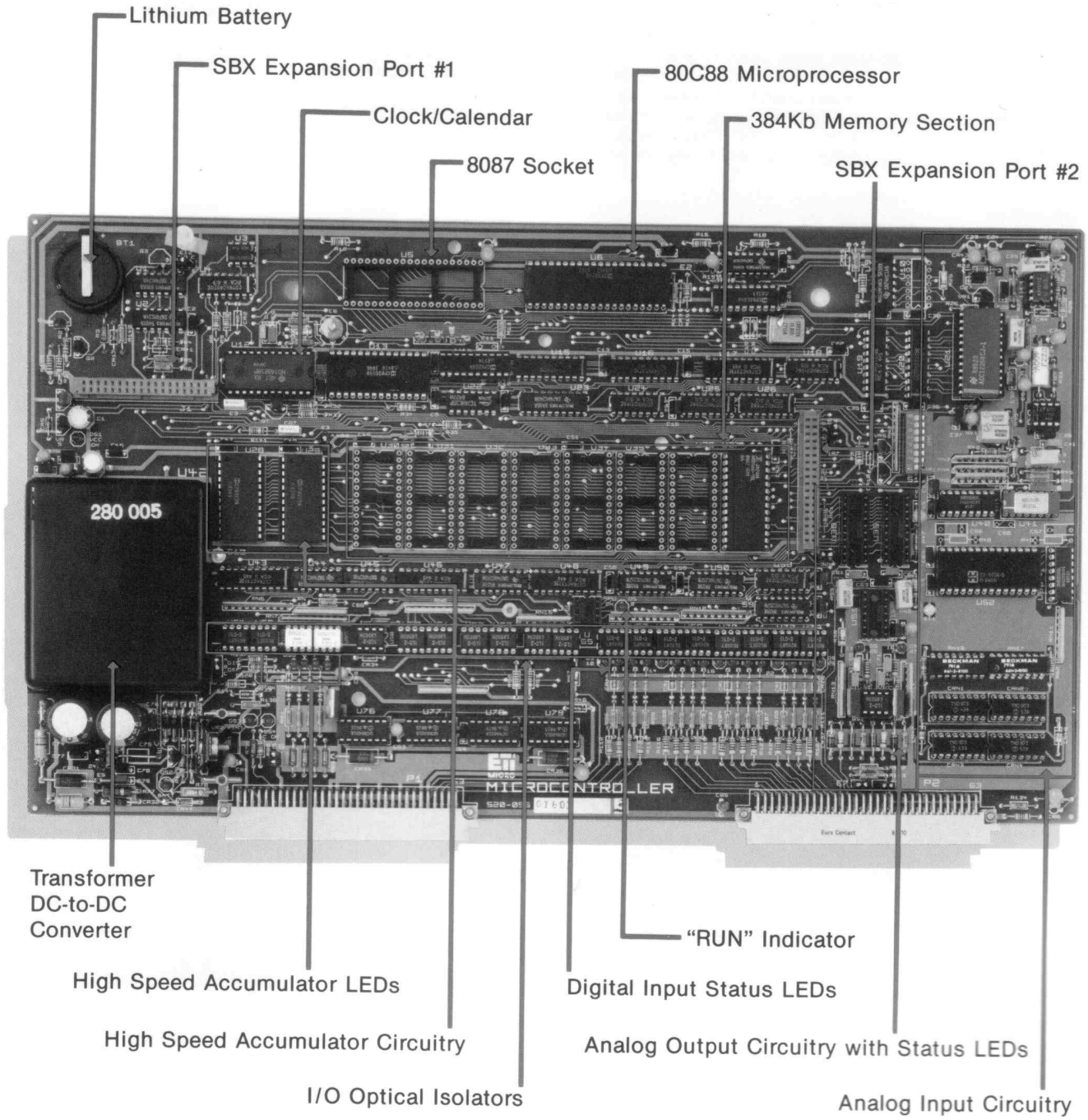
8641-Exp Expansion Chassis:

The 8641-EXP Expansion Chassis has eight I/O slots to support eight additional plug-in I/O Modules. 128 I/O points are available for digital I/O and analog outputs. Analog inputs are supported in the base 8641 chassis only. The Expansion Termination Panel contains the termination strips for field wiring, and DIN connectors for the I/O Modules. The Expansion Backplane provides the "bus" connector for the cable interface from the 8641 Microcontroller, to the I/O Modules.

The 8641-EXP consists of the Expansion Termination Panel (T073), and the Expansion Backplane (B071) mounted in a 27" x 21" x 9.125" chassis. An 8 foot cable is included to interface the 8641-EXP to the 8641 Main Backplane.



Electronics Board



Electronics Board *(Continued)*

The Electronics Board (M056) contains all of the intelligent circuitry for the 8641: CPU, coprocessor, memory, timers, counters, clock/calendar, digital, pulse, and analog I/O circuitry with transient protection.

The 8641 is supplied with 64K bytes of firmware and 32K bytes of RAM (4 x 8K). The unit is physically capable of addressing 512K bytes of memory. Four ROM sockets accept 8K, 16K, 32K, or 64K byte devices for a maximum of 256K bytes. Four RAM sockets accept 8K, or 32K byte devices for a maximum of 128K bytes. Current technology supports a total of 32K bytes of on-board RAM. 128K bytes of off-board RAM is possible with an optional 8700 RAM Expansion Module. Future technology will support 128K bytes of on-board RAM, and an additional 128K bytes of off-board RAM on the 8700 Module.

The 8641's processing power is based on a 16-bit CMOS 8088 processor. An optional 8087 coprocessor can be added creating a powerful multi-processor environment.

The 8087 works simultaneously with the 80C88, handling all high level mathematic calculations. The numeric functions performed are square roots, transcendental functions, logarithms, and floating point algorithms. This maintains system efficiencies during PID control, or gas flow calculations. The power of the 8087 can be accessed in software applications developed independently by the user. It is supported by the operating system and system libraries.

ETI Micro's firmware package operates under a true real time multi-tasking interrupt driven executive. The system includes logical channels, I/O drivers, communications I/O drivers, a monitor/debugger, and data bases accessible through the telemetry channels.

Two expansion ports on the Electronics Board allow the addition of ETI Micro's 84xx series Communications Modules. The expansion ports conform to the pin-out specifications of IEEE-P959 or Intel's SBX port standard.

The M056 contains a clock/calendar that maintains the time of day, day of the week, and date. Tasks can be scheduled to run with the time-of-day alarm feature that generates an interrupt to the CPU.

There are 2 two-stage timers on the M056: System Interval Timer (SIT), and System Integrity Monitor (SIM). The SIT generates a precision 2 millisecond timebase to synchronize the operating system and control the I/O circuitry. SIM is a watchdog timer that monitors the internal operations, and will perform hardware recovery functions if a failure occurs.

Electronics Board Specifications

Microprocessors:
- Type: 80C88 (CMOS 8088) 16-bit
- Clock: 5MHz

Coprocessor: (field installable option)
- Type: 8087 Floating Point Math Unit
- Functions: +,-,/, square root, integer part, change sign, absolute value, tangent, arctangent, and logarithms
- Precision: up to 80 bits (19 decimal digits) IEEE floating point format
- Performance: up to 500 times faster than equivalent functions performed in software (Intel benchmarks)

Memory:
- Supplied: ETI Micro std firmware package; 64K byte EPROM; 32K byte CMOS RAM (4 x 8K devices)
- Maximum Capacity: 256K bytes of PROM/EPROM; 256K bytes RAM (128Kb on, 128Kb off-board)
- Sockets: 8 on-board
- Configuration: JEDEC pin-out byte wide devices
- ROM devices: 4 sockets accept 8K, 16K, 32K, or 64K bytes
- RAM devices: 4 sockets accept 8K or 32K bytes
- Battery back-up: 4 on-board sockets, and 4 off-board sockets
- Off-board RAM: 8700 RAM Expansion Module 128K bytes

Optional Firmware:
- AGA/3: Gas Flow Calculation (field installable)
- PID Control: Proportional Integral Derivative (field installable)

Battery:
- Type: lithium
- Capacity: 160 mA/hr
- Function: sustains the clock/calendar, on-board RAM, and off-board RAM for approximately 800 hours

Transient Protection:
- Designed to meet IEEE-47211974 Surge Withstand Test

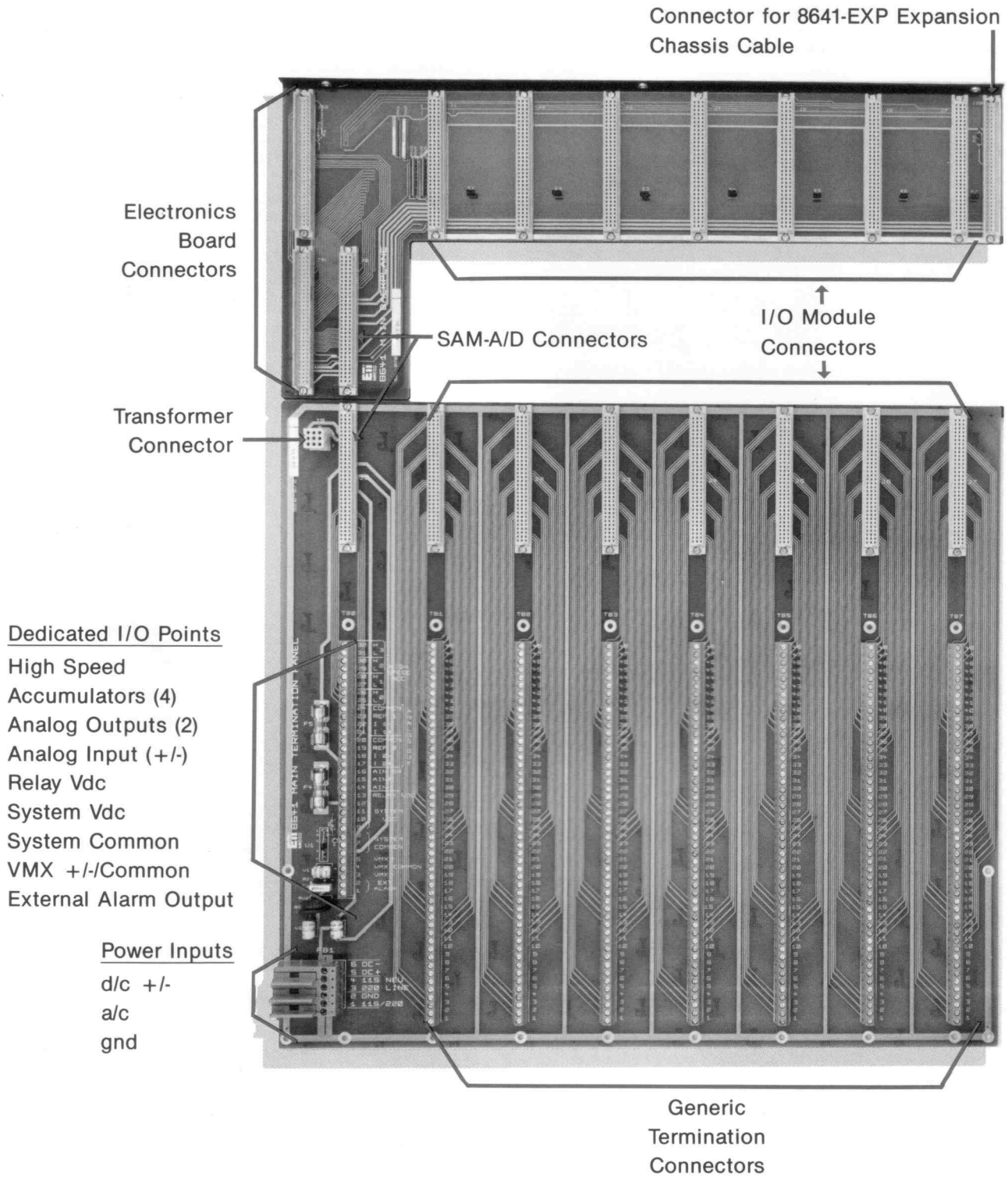
Clock/Calendar:
- Clock: maintains 24 hour (military) time of day
- Calendar: day of week, date, 100 year support
- Interrupt: time of day alarm to one second resolution
- Accuracy: 5 parts/million drift
- Time base: independent adjustable crystal

Expansion Ports:
- Ports: 2
- Type: 36 pin connector, IEEE-P959 pin-compatible in standard Intel SBX 8 bit format with interrupt and wait state supported
- Power: +5 V, 150 mA maximum; +/-12 V, 50 mA maximum

System Integrity Monitor:
- Description: two stage watchdog timer (WDT)
- Soft abort: non-maskable interrupt (NMI) is issued to CPU if WDT is not reset after 625 milliseconds
- Hard abort: system reset is issued if WDT is not reset 31.25 milliseconds after NMI
- Indicators: "RUN" LED - system, and WDT operational; "Vcc ok' - +5V supply present; "battery ok" - external battery charging; "ac power" - ac power present
- Output: External Alarm on Main Termination Panel
- Circuitry: optically isolated TTL compatible signal
- ac output: socket for ac solid state relay (optional)

M056 Board Power Consumption:
- No options: 5 watts maximum
- 8087 option: 7.5 watts maximum
- Communications Modules: 0.1 to 1.5 watts (see 8410 and 8450 specifications)
- RAM Expansion Module: 0.01 watts maximum

8641 Main Termination Panel and Main Backplane



8641 Main Termination Panel & Main Backplane

Main Termination Panel and Main Backplane *(Continued)*

Main Termination Panel:

The 8641 Main Termination Panel (M072) is the field wiring section of the RTU. The M072 provides seven generic I/O module ports, and one dedicated termination port. The ports consist of an elevator clamp pull-apart terminal strip with 48 points each, and a DIN connector for the plug-in I/O Module. The dedicated termination port has eight assigned I/O points consisting of 4 high speed accumulators, 2 analog outputs, 1 analog input +/-, and 1 external alarm output. Four other points are supplied on the board for I/O power connections: Relay Vdc, System Vdc, System Common, and VMX +/-/Common. Fuse/termination blocks are mounted on the board for external power input lines and accommodate standard 115 ac, earth ground, and low voltage dc connections.

Main Backplane:

The Main Backplane in the 8641 interfaces the “bus” from the Electronics Board to the I/O Modules. The B070 provides input and output data lines, timing, interrupt control, power and expansion. High level analog signals are routed discretely from analog multiplexer modules to the M056’s ADC subsystem. The I/O Modules install simultaneously into DIN pin-and-socket connectors on the Main Backplane and Main Termination Panel. This design provides for a secure connection of the plug-in I/O Modules, the cabling from the Electronics Board, and the cabling to an 8641-EXP Expansion Chassis.

Main Termination Panel Specifications

I/O Channels

High Speed Accumulators:

- Channels	4
- Frequency	50 KHz maximum
- Capacity	16-bit counter with 16-bit software overflow extension
- Interface	differential, optically isolated, 750 V

Analog Outputs:

- Channels	2
- Voltage output	0 to 5.12 V adjustable
- Current output	0 to 20.48 mA
- Maximum loop resistance	170 ohms @ Vsystem = 12 V 750 ohms @ Vsystem = 24 V
- Isolation	optically isolated at 750 V between field wiring and electronics circuitry
- Resolution	12 bits
- Accuracy	0.10/0

External Alarm Output:

- Channels	1
- Function	issues output from System Integrity Monitor (watchdog timer)
- Interface	TTL, optically isolated, socket for a solid state relay

Analog Input:

- Reserved by ETI, not available to user

Hardware 8641 and 8641-Exp

Termination Connectors:

- Type	elevator clamp pull-apart terminals
- Points	48 on I/O ports, 32 on dedicated port
- Wire gauge	to 14 AWG

Board Connectors:

- Type	pin and socket
- Model	DIN 41612, 96 pin, 64 pins wired

Power Channels

Relay Vdc:

- Function	power supply input for DOR-1 Module
- Power supply	independent of main power supply
- Voltage input	30 Vdc maximum
- Fuse rating	5 amps

System Vdc:

- Function	excitation voltage for transducers	
- Fuse rating	500 mA	
- Voltage output	ac source input:	+12 Vdc or +24 Vdc (jumper selectable)
	dc source input:	determined by dc source

System Common:

- Function	dc return for System Vdc

VMX +/-/Common:

- Function	input points for optional -48 Vdc, or +125 Vdc chassis mounted isolated power supply

External Power Connections:

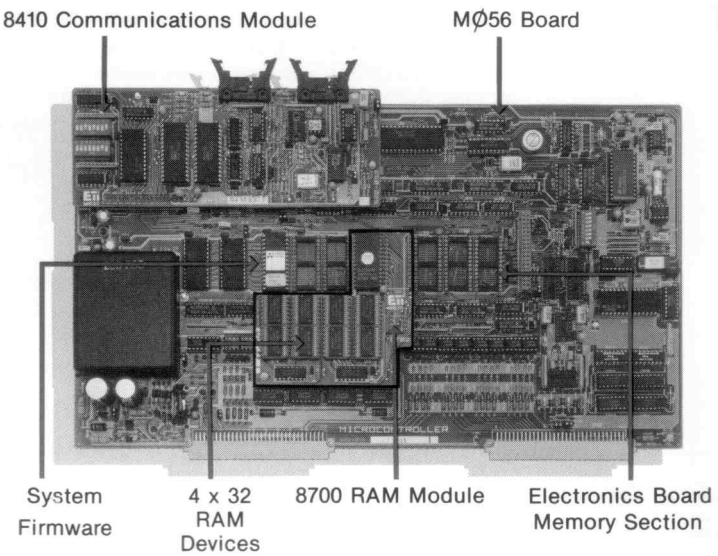
- Type	fuse/termination screw down
- Wire gauge	to 12 AWG
- Inputs	standard 115 ac, ac ground (requires SAM-A) +/- dc voltages, +12 to 36 Vdc (requires SAM-D), -48 Vdc, or +125 Vdc (requires chassis mounted isolated power supply and SAM-A)
- Fuse rating	dc 800 mA ac 250 mA

8700 Ram Expansion Module

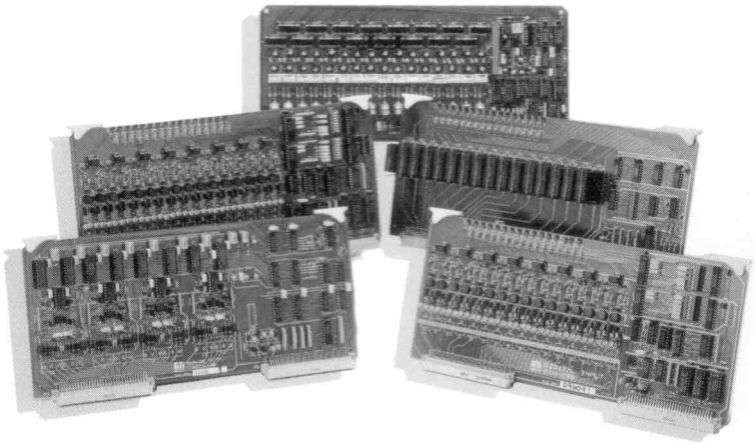
ETI Micro's 8700 RAM Expansion Module expands the RAM memory capacity of the 8641 to an additional 128K bytes. The module plugs into the two center sockets on the Electronics Boards memory section. The 8641 is designed to support 256K bytes of RAM memory. Current technology supports 128K bytes of off-board RAM, or 32K bytes of on-board RAM. Future technology will support a total of 256K bytes of RAM with the combination of both on-board and off-board devices.

8700 RAM EXPANSION MODULE SPECIFICATIONS:

- RAM device	128K bytes (4 x 32K byte)
- Sockets	one 8Kb, 16Kb, 32Kb or 64K byte ROM/PROM one 8Kb or 32K byte RAM (future release)
- Operating voltage	+5 Vdc
- Power consumption	0.01 watts maximum



I/O Modules



The 8641's Input and Output Modules are independently characterized for a specific task of analog or digital applications. The modules provide various circuitry for isolation and signal conditioning. Lightning protection is available for most I/O Modules, and is a field installable option.

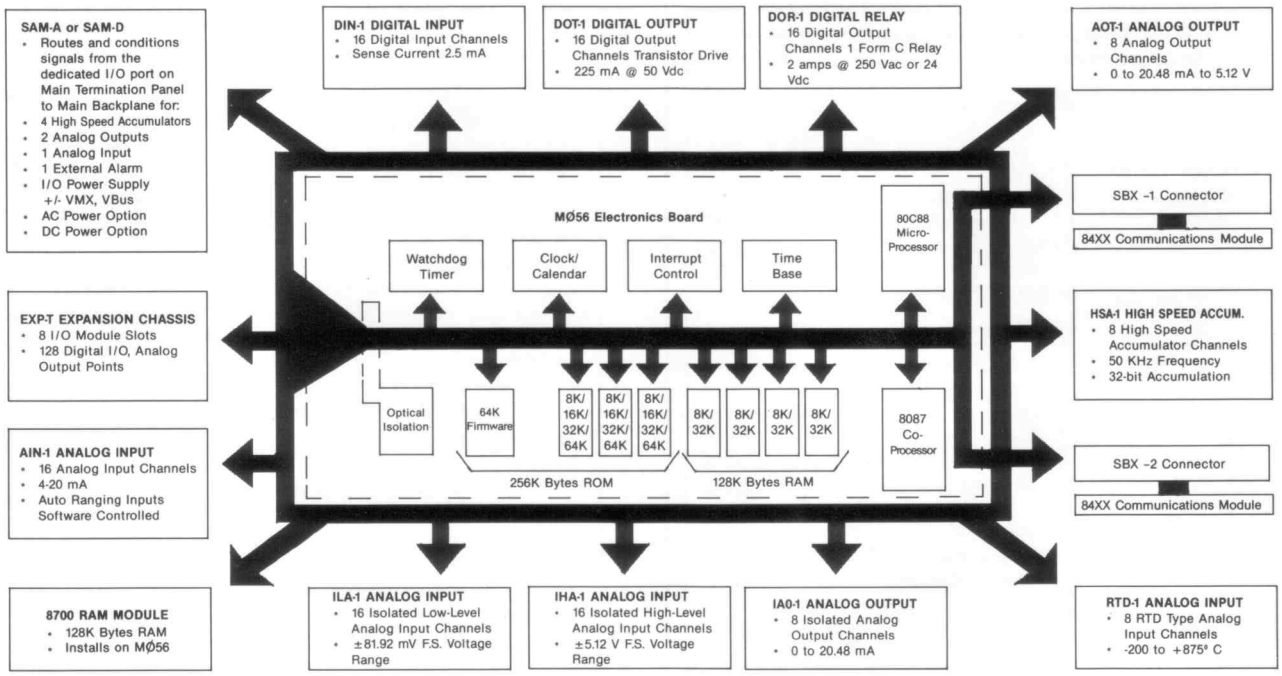
Total number of I/O points possible with the 8641 Microcontroller and an 8641-EXP Expansion Chassis:

8641	(7 slots) =	112	Analog and Digital I/O points
8641	(SAM-AID) =	8	Dedicated I/O points
EXP-T	(8 slots) =	128	Analog Output and Digital I/O points
	Total I/O points	248	

The eight plug-in I/O Modules are:

* Digital Inputs (DIN-1)
* Digital Outputs with Solid State Relays (DOT-1)
* Digital Outputs with Mechanical Relays (DOR-1)
* Analog Outputs (AOT-1)
* Isolated Low Level Analog Inputs (ILA-1)
* Isolated High Level Analog Inputs (IHA-1)
* RTD Inputs (RTD-1)
* High Speed Accumulator Inputs (HSA-1)

I/O Module Specifications



Lightning Protection Option:

- Type — gas tube arrestors (field installable option)
- Conducting voltage — 400 V striking
- Modules — SAM-A, SAM-D, DIN-1, HSA-1, DOT-1, ILA-1, IHA-1, AOT-1, RTD-1, (AIN-1 and IAO-1)

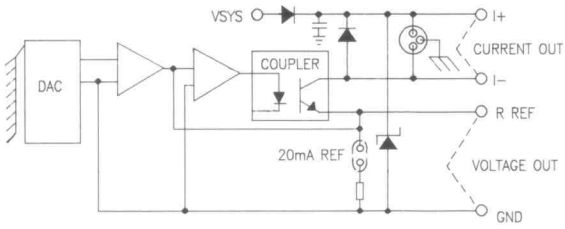
SAM-A or SAM-D: System Auxiliary Module

- Function — routes and conditions signals from eight dedicated I/O points on Main Termination Board to the Main Backplane. Provides bus voltages to the I/O Modules and supports a dc-to-dc converter for dc operation.
- Power supply for I/O — VBus. +/-VMX, ac input SAM-A, or +12 to 36 Vdc dc input SAM-D (dc-dc converter)
- I/O protection — gas tube arrestors (field installable option) for:
  - high speed accumulators
  - analog outputs
  - analog input
  - external alarm output

AOT-1: Analog Output Module

- Analog outputs — 8
- Voltage output — 0 to 5.12 Vdc adjustable
- Current output — 0 to 20.48 mA
- Maximum loop resistance — 170 ohms at Vsystem = 12 V; 750 ohms at Vsystem = 24 V
- Isolation — optically isolated driver with system common referenced output
- Resolution — 12 bits
- Accuracy — 01%
- Power consumption
  - voltage out - VMX @ 10 mA, +VMX @ 30 mA -.75 watts max.
  - current loop - System Vdc @ 165 mA - 5.5 watts max.

Analog Output Circuit

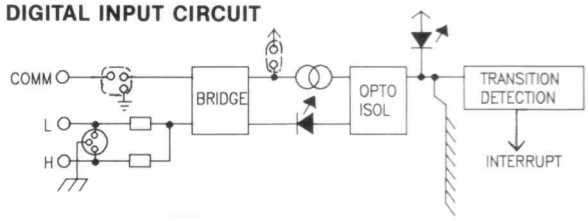


I/O Module Specifications *(Continued)*

DIN-1: Digital Input Module

- Digital inputs	16
- Debounce circuitry	10 mS @ System Vdc = 24 V
- Sense current	2.5 mA
- Indicators	loop and state LEDs for each channel
- Interface	optically isolated, 750 V ac/dc polarity dependent
- Input form	differential or single ended
- Wetting	jumper selectable
- Range	
high level	90 to 160 Vac/dc
low level	12 to 50 Vac/dc
- Threshold	
high level	80 Vrms
low level	6 Vrms
- Firmware	detects, records, and provides pulse accumulation of input transitions
- Power consumption	+VMX @ 40 mA - .75 watts max. internal wetting - 2.0 watts max. VRelay or System Vdc @ 40 mA

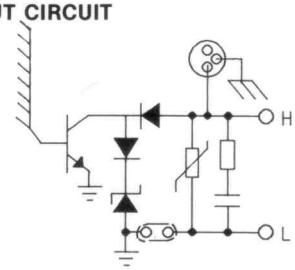
DIGITAL INPUT CIRCUIT



DOT-1: Digital Output Module

- Digital outputs	16
- dc drive	225 mA @ 50 Vdc 60 degrees C
interface	open-collector Darlington transistors
- ac relay	pluggable solid state relays
voltage	5 to 250 Vac
continuous current	1.0 Amps at 40 degrees C 0.85 Amps at 60 degrees C
surge current	30 Amps for 1 cycle
isolation	3500 Vrms minimum
- Power consumption	
standard dc	+VMX @ 10 mA - .2 watts max.
ac/dc isolated	+VMX @ 110 mA - 2.00 watts max.

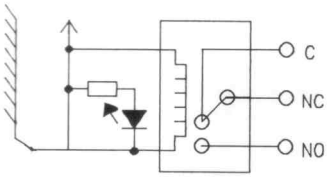
DIGITAL OUTPUT CIRCUIT



DOR-1: Relay Output Module

- Digital relay outputs	16
- Relay type	"RK" type VDE approved
- Contacts	1 form C
- Derated current rating	2 Amps @ 250 Vac or 24 Vdc 500 mA @ 125 Vdc
- Mechanical life	10 million operations
- Power consumption	VRelay or System Vdc @ 400 mA +VMX @ 10 mA - 11 watts max.

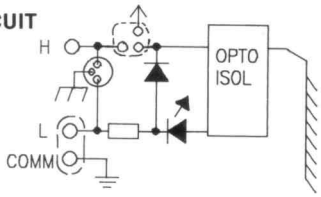
DIGITAL RELAY OUTPUT CIRCUIT



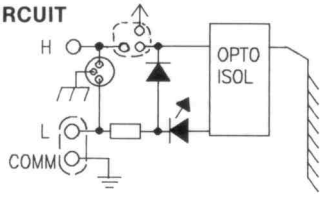
HSA-1: High Speed Accumulator Module

- Channels	8
- Frequency	25 kHz maximum
- Resolution	16-bit counter with 16-bit software overflow extension
- Interface	differential, optically isolated, 750 V
- Power consumption	l.0 watts max.

HSA GATE CIRCUIT



HSA COUNT CIRCUIT



I/O Module Specifications *(continued)*

General Analog Input Specifications:

- The 8641 analog input modules provide multiplexing and buffering of field signals routed to the analog input section of the Electronics Board. The 8641 accommodates a maximum of seven analog input type modules or 112 analog input points. All of the analog input modules must be located in the base 8641 chassis. Currently analog inputs are not supported in the 8641-EXP Expansion Chassis.

- The overall sampling rate is input quantity dependent. The firmware scans one filled analog module in 20 millisecond increments, and has the capability of skipping unconfigured points.

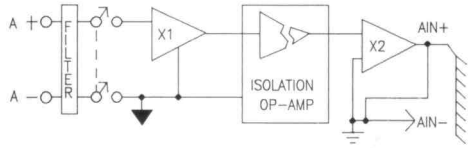
IHA-1: Isolated High-Level Analog Input Module

- Analog inputs	16 external channels
- References	+5.00, ground
- Input filter	fc = 0.3 Hz NMR = -60 db *c*~ 60 Hz Normal Mode Voltage = 25 Vdc max
- Multiplexing	solid state optically isolated 2 form A ch/ch isolation 250 CMV ac/dc ch/ch rejection -60 db
- Impedance	100 megohm
- I/O isolation	750 CMV ac/dc -110 db CMR
- Non-linearity	.05% maximum
- Gain drift	+/- 35 ppm/degrees C
- Long term drift	+/- 50 ppm/khrs
- RSS accuracy	+/- 0.065%
- Ch/Ch matching	**+/-** 0.0250/c
- Firmware preprocessors	offset correction, averaging, autoranging, autocalibration

- Input ranges	gain	full scale	weight
	xl	+1-5.12V	1.28 mV
	x2	+/-2.56V	625 ì V
	x4	+/-1.28V	312.5 ì V

- Power consumption	-VMX @ 7 mA, +VMX @ 30 mA - .7 watts max.

ISOLATED HIGH-LEVEL ANALOG INPUT CIRCUIT



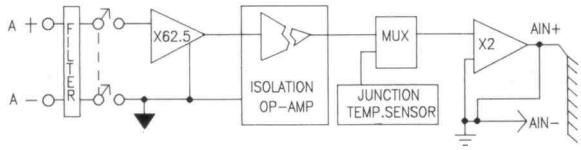
ILA-1: Isolated Low-Level Analog Input Module

- Analog inputs	16 external channels
- References	80.0 mV, ground, and temperature
- Input filter	fc = 0.3 Hz NMR = -60 db @ 60 Hz Normal Mode Voltage = 25 Vdc max
- Multiplexing	solid state optically isolated 2 form A ch/ch isolation 250 CMV ac/dc ch/ch rejection —60 db
- Impedance	100 megohm
- I/O isolation	750 CMV ac/dc -110 db CMR
- Non-linearity	.05% maximum
- Gain drift	+/- 35 ppm/degrees C
- Long term drift	+/- 50 ppm/khrs
- RSS accuracy	**+/-** 0.065%
- Ch/Ch matching	+/- 0.025%
- Firmware preprocessors	offset correction, averaging, thermocouple linearization, autoranging, autocalibration

- Input ranges	gain	full scale	weight
	xl	+/-81.92 mV	20 µV
	x2	+/-40.96 mV	10 µV
	x4	+/-20.48 mV	5 µV

- Power consumption	-VMX @ 7 mA, +VMX @ 30 mA -.7 watts max.

ISOLATED LOW-LEVEL ANALOG INPUT CIRCUIT



RTD-1: RTD Analog Input Module

- Channels	8
- RTD type	100 ohm platinum (DIN-43760)
- Alpha	.00385
- RTD interface	2, 3, or 4-wire
- Excitation	1.0 mA
- Processing	lead, gain, and offset compensation; filtering and linearization
- Temperature range	-200 to +875 degrees C

***Preliminary Specifications Module To Be Released**

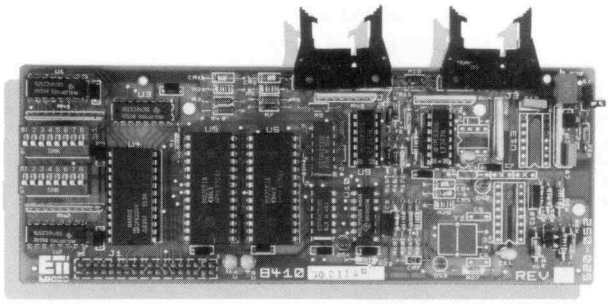
Communications Modules

ETI Micro's 8410 and 8450 Communications Modules, and 8188 Communications Adapter Modules enable the 8641's features to be readily accessed in a distributed network of RTUs.

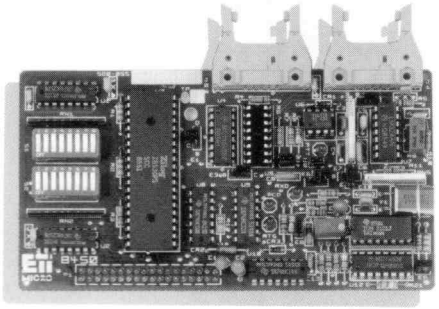
A maximum of 4 communications channels can be assembled on one 8641. Each module consists of two communications ports in standard configurations of Dual RS-232C, and RS-232C - Modem. Two Intel SBX standard expansion port connectors are provided on the Electronics Board for the plug-in Communications Modules.

The 8410 series modules consist of low power CMOS circuitry that consumes less than 0.1 watt. The 8450 series modules provide the standard serial communications channels in synchronous and asynchronous modes.

External devices connect to the modules through 10-pin IDC to DB-25 cables, or can be routed through 8188 Communications Adapter Modules (described below).



8410



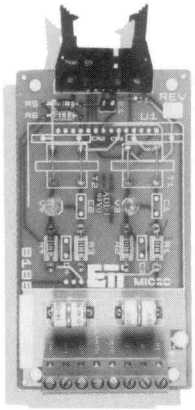
8450

Communications Adapter Modules

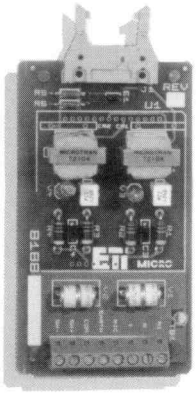
The 8188 Communications Adapter Modules provide a physical termination of incoming communications channels, lightning protection, and specific communications interfaces. The 8188-2 Module modifies input signals from radios and various telephone systems for routing to the modem port on the 8410 or 8450 Communications Modules. The 8188-0 provides a lightning protection interface for an RS-232C channel on the 8410, or 8450 Communications Modules.

Supported communication environments are RS-232C, direct connection of the telephone system (DAA), leased line, private cable, and radio channels.

All of the 110 Modules, SAM-AID Module, 8410 and 8450 Communications Modules, 8700 RAM Expansion Module, and 8641-EXP Expansion Chassis must be ordered separately from the base 8641 Microcontroller.



8188-0



8188-2

Communications Modules Specifications

8410-0

- Channels	1 RS-232C 1 Modem
- Circuitry	CMOS, Intel SBX standard baud rate RS-232C - 300 to 9600 (switch selectable) Modem - 600/1200 Bell 202
- Mode	2 or 4 wire (jumper selectable) asynchronous, full or half duplex
- Board connector	two 10-pin DC (Insulation Displacement Connector)
- USART	Intel 82C51A
- Interface	requires 1310 cable or 8188-0/1 Module
- Operating voltage	+5 V and +/-12 V
- Power consumption	.1 watt maximum

8410-1

- Channels	2 RS-232C
- Circuitry	CMOS, Intel SBX standard
- Baud rate	300 to 9600 (switch selectable)
- Mode	2 or 4 wire (jumper selectable) asynchronous, full or half duplex
- Board connector	two 10-pin DC
- USART	Intel 82C51A
- Interface	requires 1310 cable or 8188-0 Module
- Operating voltage	+5 V and +/-12 V
- Power consumption	.1 watt maximum

8450-0

- Channels	1 RS-232C 1 Modem
- Circuitry	Intel SBX standard
- Baud rate	RS-232C - 300 to 9600 (switch selectable) Modem - 600/1200 Bell 202
- Mode	2 or 4 wire (jumper selectable) synchronous and asynchronous
- Board connector	two 10-pin DC
- USART	Intel 8530
- interface	requires 1310 cable or 8188-0/1 Module
- operating voltage	+5 V and +/-12 V
- power consumption	1.5 watts maximum

8450-1

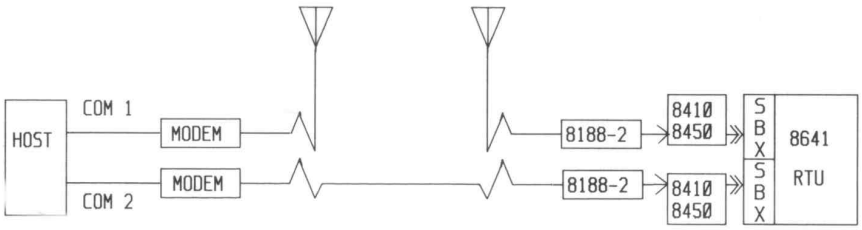
- Channels	2 RS-232C serial ports
- Circuitry	Intel SBX standard
- Baud rate	300 to 9600 (switch selectable)
- Mode	2 or 4 wire (jumper selectable) synchronous and asynchronous
- Board connector	two 10-pin DC
- USART	Intel 8530
- Interface	requires 1310 cable or 8188-1 Module
- Operating voltage	+5 V and +/-12 V
- Power consumption	1.5 watts maximum

8188-0

- Channels	1 RS-232C
- Board connector	one 10-pin DC types private cable
- Field connector	Phoenix insulated screw down clamp type accepts up to 14 gauge wire
- Interface	one 3 foot ribbon cable to RS-232C port on 8410, or 8450 Modules (cable included)
- Lightning protection	400 V striking, gas tube arrestors

8188-2

- Input channel types	radio channel, leased phone line, or private cable
- Isolation	transformers for matching impedance
- Board connector	one 10-pin IDC
- Field connector	insulated screw down clamp type accepts up to 14 gauge wire
- Interface	one 3 foot ribbon cable to modem port on 8410-0, or 8450-0 Modules, accommodates 2 or 4 wire operation (cable included)
- Lightning protection	400 V striking, gas tube arrestors

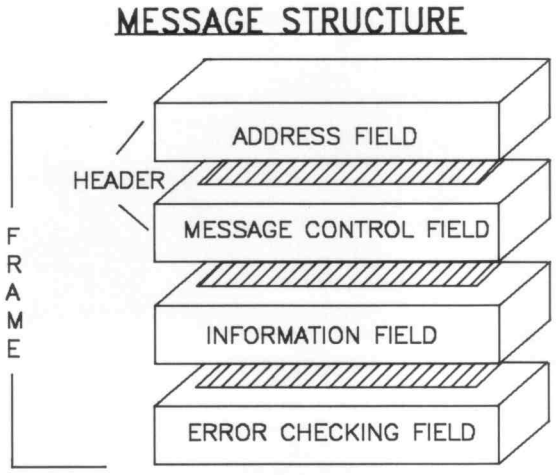


TYPICAL RADIO AND LEASED LINE COMMUNICATIONS CONNECTION

Dynamic Protocol

ETI Micro's DYNAMIC protocol provides a powerful and flexible communications link to a distributed network of RTU's.

- Designed using accepted ISO layering methodology
- Byte orientated, synchronous or asynchronous modes
- Independent of baud rate and physical topology
- Longitudinal parity checks are used to ensure message integrity
- Compatible with HDLC / X.25 implementations
- Star configuration network supports 255 RTU's
- Cluster configuration network supports 32,767 RTU's
- Fast and efficient binary data format
- Logical to physical data point translation performed completely by the RTU after configuration
- Exception reporting of RTU data minimizes mean message size, and delivers a high amount of throughput
- Full transaction sequencing support
- Complete symmetry between input and output message formats



- Supports both direct (immediate) and sequenced (select before operate) output schemes
- Blocks may be transmitted to executing tasks in virtual buffer format

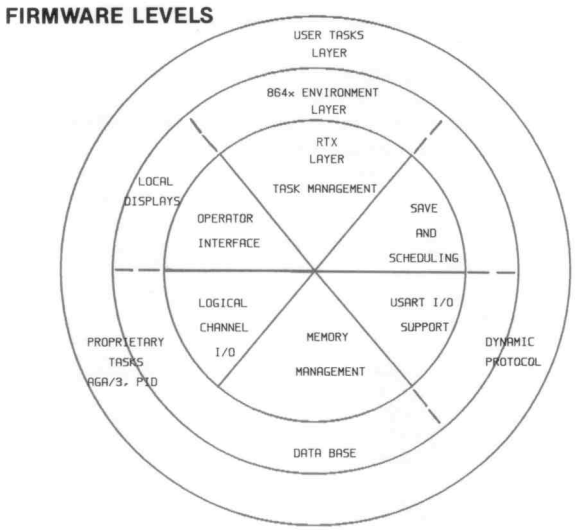
8641 Firmware

The 8641 is supplied with a firmware package specifically designed for the industrial RTU environment. The RTU software is classified into three distinct levels of operation: the RTX operating system, the 864x environment, and user tasks.

RTX maintains hardware functions, and supervises the execution of software tasks. The operating system responds to changing conditions in the outside world through interrupts, and allocates processor time to supporting tasks.

Features of RTX provide:
- A realtime environment
- Multi-tasking capability
- Watchdog timer handler
- Interface mechanism between tasks and external events
- User friendly set of system function calls
- System resource manager for memory and serial I/O
- User assigned, dynamic task priorities
- Monitor/debugger
- Operator interface
- Logical channel manager

The 864x environment supports the RTU database, the DYNAMIC protocol, and proprietary tasks such as AGAI3 or PID. This level of software is functionally independent of RTX, yet utilizes operating system functions like any other task running in the RTU.



The user task level completes the system with an interface for implementing application and development software. Applications tasks typically interact with both RTX and a set of I/O data base manager functions provided in the 864x environment.

ETI Micro has compiled a comprehensive library of routines that allow the high level language user to interact with inner layers. RTX itself utilizes 8088 register orientated parameter passing conventions.

Power Options

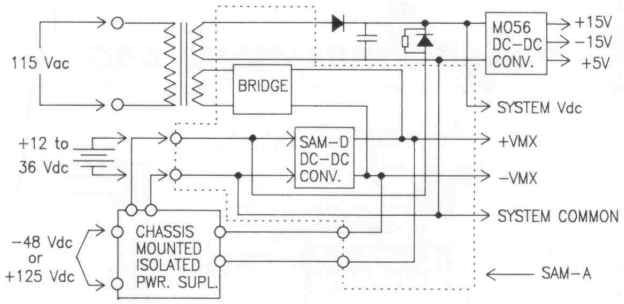
The 8641 can be powered from a variety of sources and voltage ranges due to its low power CMOS circuitry.

The base 8641 requires a power source to supply a minimum of 8 watts (I/O Modules and options not installed). The total power requirement is determined upon individual 110 configurations and options installed on the Electronics Board. A standard 115 Vac transformer is included with the base 8641 and requires the SAM-A Module. The SAM-D Module has a DC-to-DC converter installed for +12 to 36 Vdc battery backed power or dc systems. For power systems supplying -48 Vdc, or +125 Vdc, an optional chassis mounted isolated power supply and the SAM-A Module are required and ordered separately.

Three types of external power sources can power the 8641:

- **ac:** 115 Vac, on-board transformer provides 12 or 24 volts to M~56 DC-to-DC converter

- **External dc:** dc generated +12 to 36 Vdc, -48 Vdc, and +125 Vdc (for +12 volt application consult factory)

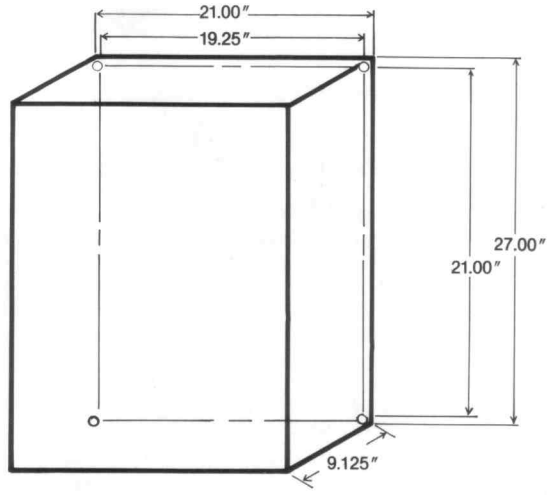


8641 STANDARD AND OPTIONAL POWER CONFIGURATIONS

- battery backed
  Option: two 15 amp-hour, 12 volt rechargeable batteries. Optional venting kit is available for NEMA enclosure.

NOTE: *A trickle charging circuit with an LED indicator is provided with the M056 Board. T072 supplies terminals for connection of a rechargeable battery. Charging voltage is available when ac or external dc is present.*

8641 Dimensions, Enclosures, And Environment Specifications



8641 and 8641-EXP Mounting Pan and Outer Perimeter Dimensions

DIMENSIONS 8841 AND 8841.EXP

- Height	27	inches (68.6 cm)
- Width	21	inches (53.3 cm)
- Depth	9.125	inches (23.18 cm)
- Chassis	black 1/16” steel, with hinged front door	

ENCLOSURES 8641 AND 8641-EXP

- NEMA 12 welded steel, polyurethane finish
  36 x 24 x 10 inches
  (91.44 x 60.96 x 25.4 cm)

ENVIRONMENT 8641 AND 8841-EXP

- Temperature -20 to +70degreesC
- Humidity 0 to 95% non-condensing

GENERAL NOTE: All specifications at ambient temperature of 25 degrees C unless otherwise noted. Specifications are subject to change without notification.

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