PC MICROCONTROLLERS™

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60X0 SERIES

Mulrifunction CPU

PC architecture plus convenience are at the heart of the 60x0 series. In a single palmed–sized card Octagon combines industrial I/O with an AT engine that runs thousands of software programs.

A model for every application

- ❍ Digital I/O for controlling motors, relays, tachometers, etc.
- ❍ Analog I/O for pressure, temperature, etc.
- ❍ Serial I/O to handle bar code readers, weighing machines, protocol translation, etc.
- ❍ Opto–isolated interrupts for harsh electrical environments
- ❍ Small size—truly embeddable
- ❍ Networks up to 32 units in a low–cost network
- ❍ CAMBASIC—your programs run in hours rather than days or weeks
- ❍ Rugged means wide temperature –40° to 85°C operation

No memory to buy

The cards come with 3–5 MB total of DRAM, flash and SRAM. There is no memory to buy or configure. You are ready to run right out of the box.

Cut system costs

A 60x0 card can often replace two or three standard cards while cutting costs, reducing system size and complexity, and increasing reliability.

Flexible mounting options

A 60x0 card can be used without a card rack, or can be combined with other ISA Bus cards in a larger system. The optional MK–10 mounting kit comes with standoffs, screws and a drilling template that make mounting a card to a panel a snap.

When just one or two I/O cards are needed, the MK–20 and MK–30 mounting kits provide all the hardware and flexible backplanes for stacking the cards and maintaining the same small footprint. If a larger system is needed, up to seven expansion cards can be added using an Octagon 527x card cage.

Extensive software included

A 60x0 card comes loaded with software, including DOS 6.22, CAMBASIC™, Pico FA™ flash file software, diagnostic software and a networking kernel in a flash disk. The series is also QNX® compatible.

CAMBASIC—fast and easy to use

Octagon's CAMBASIC is a multitasking, industrial control language that offers you a fast, easy–to–use language. It programs easily like QBASIC® but has a large number of commands tailored to industrial control, data acquisition and data analysis. It's pre–installed, and no professional programmers are needed.

Need to use other compilers or assemblers?

The I/O software routines supplied with a 60x0 card simplify access to I/O. Unlike most industrial computers that offer routines in C or BASIC for specific compilers, Octagon offers you an easy–to–use, generic approach to software support. Since all modern assemblers and compilers support access to the BIOS interrupts, Octagon includes support for interrupt 17 directly in the BIOS. Simply set the routine parameters and call INT 17 to access on–card I/O.

Diagnostic software

The built–in, diagnostic software can verify on–card memory and I/O functions. If a problem occurs, it is identified through a color sequence on a bi–color LED.

LAN software provided

A networking kernel is built into the 60x0 BIOS that allows up to 32 units to communicate over a low cost, RS–485 network. The NIM (Network Interface Module) plugs directly into COM2 and interfaces with the network while providing the safety of opto–isolation.

60X0 COMMON FEATURES SET

- ❍ Full suite of software includes:
  - DOS 6.22 always resident
  - Diagnostics
  - Networking kernel
  - Pico FA™ flash file system
  - CAMBASIC multitasking language
- ❍ QNX® compatible
- ❍ Runs right out of the box—no jumpers to set
- ❍ ±8 kV ESD protection on serial ports
- ❍ Parallel port backdrive protection
- ❍ –40° to 85° C operation
- ❍ Made in USA
- ❍ No memory to buy
- ❍ Reverse and over voltage protection
- ❍ No card cage required
- ❍ Low cost per function
- ❍ Replace 2–3 other cards
- ❍ AT keyboard port
- ❍ Battery–backed, real time clock
- ❍ Stand–alone or ISA Bus operation
- ❍ Opto–isolated interrupts
- ❍ Parallel port also supports floppy disk
- ❍ Pushbutton reset
- ❍ SETUP stored in EEPROM
- ❍ Industrial grade construction
- ❍ Low power mode
- ❍ Economical 5V only operation
- ❍ MTBF > 15 years
- ❍ Register for our *Applications Cookbook*

60X0 I/O COMPARISON CHART

Features:	6010	6020	6030	6040	6050
COM1/2	✔	✔	✔	✔	✔
COM3/4	–	–	✔	–	–
RS–232/485 (NIM)	–	✔	✔	✔	✔
Parallel port, LPT1	✔	✔	✔	✔	✔
EIDE port	✔	–	–	–	–
Floppy port	✔	–	–	–	–
PC/104 expansion	✔	–	–	–	–
DRAM included	4 MB	2 MB	4 MB	2 MB	2 MB
Flash included	1 MB	1 MB	1 MB	1 MB	1 MB
SRAM included	128K	128K	128K	128K	128K
Digital I/O	17	48+ 17	17	24+ 17	24+ 17
High currrent drive	–	–	–	–	8
Analog in/out	–	–	–	8/2	–
Power, full/standby	470/175 mA	490/180 mA	440/175 mA	590/250 mA	435/170 mA

60X0 SERIES MULTIFUNCTIONN CPU

The 60x0 series combines the best features of industrial I/O and PC architecture. Bringing PC software to the industrial world eliminates the need to maintain development systems for different CPU architectures.

In addition, the 60x0 operates in severe environments providing an extra margin of reliability in any application. It comes loaded with a suite of software written for embedded applications. Although DOS 6.22 is included, you can download other operating systems into flash. If you prefer to operate in a high level language, the built–in CAMBASIC gives you a fast, easy–to–use, industrial control language.

Flash includes suite of embedded software

1. A Phoenix BIOS with Octagon industrial extensions.
2. The BIOS is shadowed for fastest operation.
3. DOS 6.22 loads into high memory on powerup allowing more lower memory for data storage and applications programs.
4. CAMBASIC, industrial control language, includes drivers for all on–card hardware.
5. The network kernel allows up to 32 systems to be linked into a RS–485 network.
6. The utility library includes applications examples for C and CAMBASIC.
7. Diagnostic software is included to test the system on powerup.
8. Flash file system makes flash memory appear as hard disk to DOS.

CAMBASIC eliminates writing hardware drivers

CAMBASIC supports all on–card I/O including digital, analog, interrupt, communications, and other functions. Thus, no drivers are needed. You spend your time writing the applications software rather than writing and debugging drivers.

Diagnostic software verifies system integrity automatically

The 60x0 has built–in diagnostic software that can be used to verify on–card I/O and memory functions. On power up a series of tests is performed. If a problem occurs, it can be identified by the color sequence on a bi–color LED. These tests are performed automatically every time the system is reset or powered up. No monitor, keyboard, disks, test fixtures, test equipment or software are required.

Flash memory withstands shock and vibration

The 1–MB flash memory disk contains the software suite in less than 512K, leaving more than 512K available for user programs. The flash memory is seen by software as a hard disk. The flash allows easy installation of software updates. A battery–backed SRAM with 128K capacity is available for data storage.

DRAM memory is fast and rugged

The card comes with surface–mount, fast page–mode DRAM installed. The surface mounting is far more rugged than plug–in memory.

COM1, 2, 3 and 4 serial ports protected against ESD

The serial ports are 16C550 compatible. The 16–byte FIFO buffers minimize processor overhead in high speed, serial communications. Baud rates are programmable to 115K. The serial ports meet the new IEC1000, ESD protection specification with ±8 KV of ESD protection. Backdrive protection is also included. COM2 can be converted to opto–isolated, RS–232/422/485 with the Network Interface Module (NIM), which mounts directly on the 60x0 without a cable or external power supply.

CAMBASIC supports the serial ports with interrupt–driven, 2048–byte input and output buffers that operate in the background. This assures that data is not lost while critical control loops are being executed.

Versatile printer port

The printer port is IEEE 1284A, EPP and ECP mode compatible. This allows much higher speed transfers than with the previous standard. It can be configured in the SETUP menu to be a floppy disk port. The port also features backdrive protection. The data lines have 24 mA of drive. The printer lines are routed through the AUX I/O port. The various applications include:

1. LPT1 for PC compatible printers; or
2. 17 digital I/O lines; or
3. Matrix keypad and
4. Four–line LCD display; or
5. MPB–PC, 16–position opto–module rack; or
6. Floppy disk drive.

Rugged environmental operation

The CPU case temperature may range from –40° to 85° C during operation. The 60x0 was also designed to withstand 20g shock and 2g vibration.

Keypad and LCD display support

The AUX I/O port can be used with a Keypad and Display (KAD) to interface with a 16–key matrix keypad and a 2– or 4–line LCD display in applications where an inexpensive operator interface is needed. The 60x0 is supplied with software that provides keypad scanning and display operation. The KAD interface board has sockets for the display and keypad. DISPLAY and KEYPAD commands in CAMBASIC support these devices.

Floppy and hard disk support

The dual floppy port supports all 3.5–in. and 5.25–in. drives, up to 1.44 Mb. The hard drive interface is a 16–bit IDE controller with a connector for 2.5–in. drives. An adapter is available for 3.5–in. drives (Part #4080).

Flexible system expansion

The 60x0 card can be expanded via an ISA passive backplane with the Octagon 5000 series expansion cards. Or you can use 3M connectors and a flexible cable that allows almost any mounting configuration. It also operates stand–alone.

Watchdog timer adds safety

The watchdog timer resets the system if the program stops unexpectedly. The watchdog is enabled under software control. The time–out is typically 1.6 sec.

Real time clock with battery-backup

The 60x0 has a built–in, AT style, real time clock. An on–card battery powers the clock and SRAM when the 5V supply is removed. An external battery may also be used in parallel with the on–card battery for extended battery life. The clock may be read either through DOS or CAMBASIC.

Advanced hardware protection

The 60x0 includes a number of protective devices that enhance the reliability in the industrial environment and that help prevent accidental damage, especially during system development. These include:

1. The serial ports exceed the IEC 1000, level 3 ESD protection.
2. The serial ports have backdrive protection to limit current when power is off.
3. The printer port has backdrive protection.
4. The 5V power bus is protected against overvoltage and reverse voltage.
5. The external interrupt and reset inputs are opto–isolated.

Power management reduces power by 70%

Power management can reduce power consumption or freeze the state of the program via a power management interrupt. Power consumption can be reduced by about 70 percent, which reduces the heat load and extends battery life in mobile applications. Software examples are provided.

The power management functions include:

1. Suspend/Resume by software (halts CPU);
2. Wakeup through interrupts including external interrupt;
3. Jump to user–defined interrupt service routine.

Opto–isolated interrupt and reset for safety

The interrupt and reset inputs accept voltages from 4.5–6 VDC. The interrupt input is connected to IRQ9. This can be used for emergency stop, power fail, system synchronization or similar functions.

Interrupts used to the maximum

Real time operation often requires many interrupts for high speed response to events. Five of the AT interrupts are connected to the ISA Bus, which adds to the four interrupts used on the card. This provides the best use of the interrupts for demanding applications.

SETUP information stored in EEPROM for high security

To avoid the loss of SETUP data on the 60x0, it is stored in non-volatile EEPROM, which eliminates the problem of depleted batteries. The additional 1,536 bytes of EEPROM are available to the user. A software driver is supplied for accessing the EEPROM.

5V operation lowers system cost

The card operates from a single 5V ±5% supply. A 6.2V, 5W zener diode is placed across the power supply for reverse voltage and limited overvoltage protection. Power is supplied to the card either through the ISA Bus connector or via a terminal block.

Convenient I/O termination

Except for the serial and industrial I/O lines, all other I/O is terminated with a 34–pin IDC connector. This eliminates cable clutter, reduces MTTR and the possibility of cables being plugged into the wrong sockets during installation and maintenance.

TECHNICAL SPECIFICATIONS

CPU
386SX, 25 MHz.

ISA BUS
PC–compatible interface.

BIOS
AT–compatible with industrial extensions.

SOFTWARE
DOS 6.22, CAMBASIC, flash file system, networking kernel, diagnostics, BIOS and utility library included in flash memory.

DRAM
2 or 4 MB supplied.

SSD0
1 MB of flash memory with programmer and Pico FA™ flash file software. 512K available to user.

SSD2
128K SRAM, supplied, with battery backup.

COM
COM1, 2, 3 and 4, 16C550 compatible, 300 to 115 Kbaud; Supports all PC data and handshake lines; RS–232 voltage generated on–card, 8 KV ESD protection.

PARALLEL I/O
Outputs have 24 mA drive levels; IEEE1284 EPP and ECP modes.

INDUSTRIAL I/O
24 I/O lines; 5V inputs or outputs with 15 mA sink/source capability; 10K pull–up/pull–down resistors; bit programmable as input or output.

ANALOG INPUT (6040 ONLY)
8 channels, 12–bit resolution, single–ended, 50K samples/sec.; input impedance >10 MΩ, ±10V, ±5V, 0–5V and 0–10V ranges; inputs protected to ±16.5V.

ANALOG OUTPUT (6040 ONLY)
2 channels, 5 mA drive, ±5V, 0–5V and 0–10V ranges.

KEYBOARD
AT–type keyboard port.

BATTERY
3.6V lithium battery for real time clock and SRAM.

SPEAKER
Drive 8–50 ohm speakers.

EXTERNAL INTERRUPT
1 opto–isolated, 4.5–6V input; 300 VDC of isolation from card; shares common ground with external reset.

EXTERNAL RESET
Same characteristics as internal reset

POWER SPECIFICATIONS
5V ±5%:
6010: 470/175 mA
6020: 490/180 mA
6030: 440/175 mA
6040: 590/250 mA
6050: 435/170 mA

PACKAGING
Stand–alone, Octagon card cage, ISA backplane.

SIZE
4.5 in. x 4.9 in. x 0.75 in.

ENVIRONMENT
–40° to 85° C operating*
–55° to 90° C nonoperating
RH 5% to 95%, noncondensing
*Maximum case temperature; forced air may be required above 60° C.

ORDERING INFORMATION

6010 MULTIFUNCTION CPU

#4735 6010 Multifunction CPU with utilities and User's Manual

#4831 6010 DVK development system kit that includes:
- #4697 BOB breakout board
- #4080 Hard drive cable
- #2746 VTC–9F serial cables (2)
- #4810 CMA–34–18 cable
- #2470 Null modem adapter
- #3447 PC SmartLINK
- #4738 6000 Series Manual

ORDERING INFORMATION

6020 MULTIFUNCTION CPU

#4772 6020 Multifunction CPU with utilities and User's Manual

#4832 6020 DVK development system kit that includes:
- #4697 BOB breakout board
- #2905 STB–26 terminal board
- #4709 FCA–12 cable for 3.5 in. floppy disk
- #2746 VTC–9F serial cables (2)
- #1257 CMA–26–24 cable
- #4810 CMA–34–18 cable
- #2470 Null modem adapter
- #3447 PC SmartLINK
- #4738 6000 Series Manual

ORDERING INFORMATION

6030 MULTIFUNCTION CPU

#4720 6030 Multifunction CPU with utilities and User's Manual

#4833 6030 DVK development system kit that includes:
- #4697 BOB breakout board
- #4709 FCA–12 cable for 3.5 in. floppy disk
- #2746 VTC–9F serial cables (2)
- #4810 CMA–34–18 cable
- #2470 Null modem adapter
- #3447 PC SmartLINK
- #4738 6000 Series Manual

6040 MULTIFUNCTION CPU

#4710 6040 Multifunction CPU with utilities and User's Manual

#4834 6040 DVK development system kit that includes:
- #4697 BOB breakout board
- #2904 STB–20 terminal board
- #2905 STB–26 terminal board
- #4709 FCA–12 cable for 3.5 in. floppy disk
- #2746 VTC–9F serial cables (2)
- #1256 CMA–20–24 cable
- #1257 CMA–26–24 cable
- #4810 CMA–34–18 cable
- #2470 Null modem adapter
- #3447 PC SmartLINK
- #4738 6000 Series Manual

6050 MULTIFUNCTION CPU

#4640 6050 Multifunction CPU with utilities and User's Manual

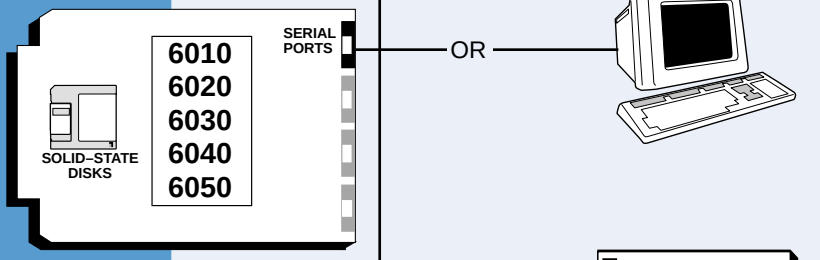
#4835 6050 DVK development system kit which includes:
- #4697 BOB breakout board
- #2905 STB–26 terminal board
- #4809 FCA–12 cable for 3.5 in. floppy disk
- #2746 VTC–9F serial cables (2)
- #1257 CMA–26–24 cable
- #4810 CMA–34–18 cable
- #2470 Null modem adapter
- #3447 PC SmartLINK
- #4738 6000 Series Manual

60X0 SERIES COMPATIBLE ACCESSORIES

#4820 NIM RS–232/422/485 converter; plugs into COM2. (Except 6010)
#4823 KAD keypad and display board
#4697 BOB breakout board
#3210 PC mounting bracket
#4738 6000 Series printed manual

NOTE: DVK components are also available separately

SERIAL I/O CONNECTION DIAGRAM



OR — *Operates with all PC compatible modems. Supports fastest modems available.*

OR — *Communicates with operator interface terminals, including hand–held units.*

OR — *SDA–1 serial display adapter. Drives Octagon vacuum fluorescent displays up to 50 ft. from the computer. Several displays may be driven simultaneously. Part #2493.*

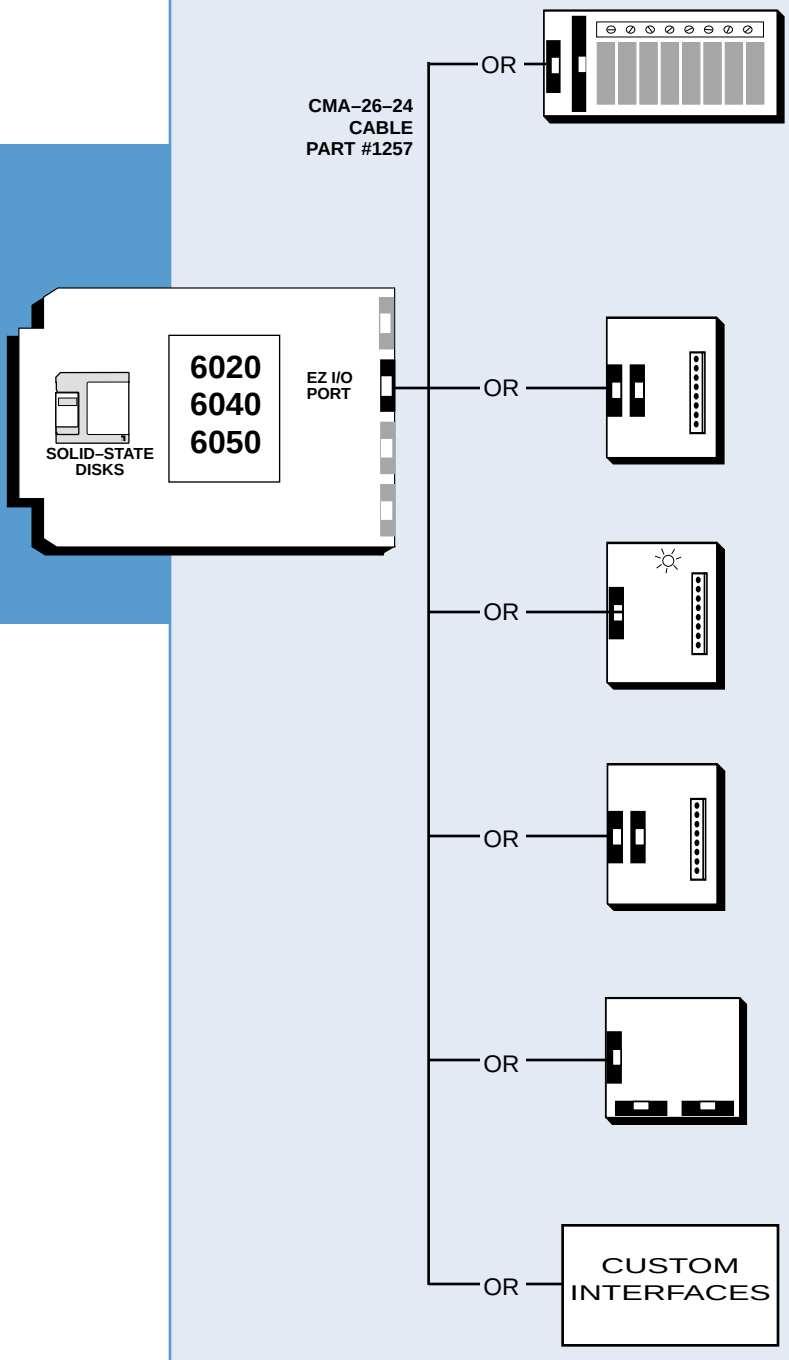
OR — *COM1 is the "console" port used for programming and debugging programs. PC SmartLINK™ (part #3447) makes the job easy.*

OR — SERIAL DEVICES — *Practically any serial device including weighing machines, bar code readers, GPS receivers, etc.*

OR — NIM RS–485 NETWORK — *Network up to 32 similar units.*

- *The 60x0 cards have COM1 and COM2 serial ports. The 6030 also has COM3 and COM4 serial ports. They support the full PC data and signal lines. All ports are programmable to 115 KB. The ports have 16–byte buffers to ensure high speed data is not missed. The ports have RS–232 interfaces. Except for the 6010, the COM2 port on all cards will accept the NIM (Network Interface Module) RS–232 to RS–485 connector for networking or other communications. Connector pinouts are PC compatible. All ports are supported by CAMBASIC.*

EZ I/O CONNECTION DIAGRAM



MPB opto module racks support 8, 16 or 24 modules for driving high voltage/current loads and inputs to 280V and 3A. 2500V of isolation.
MPB–08 Part #2512
MPB–16 Part #2513
MPB–24 Part #2514

The STB–26 terminal board is a low–cost and convenient way to interface field wiring the computer. Accepts 12 to 22 gauge wires. Part #2905

The TBD–100 terminal board is similar to the STB–26 but includes LEDs on all 24 lines to indicate signal status. Part #1183.

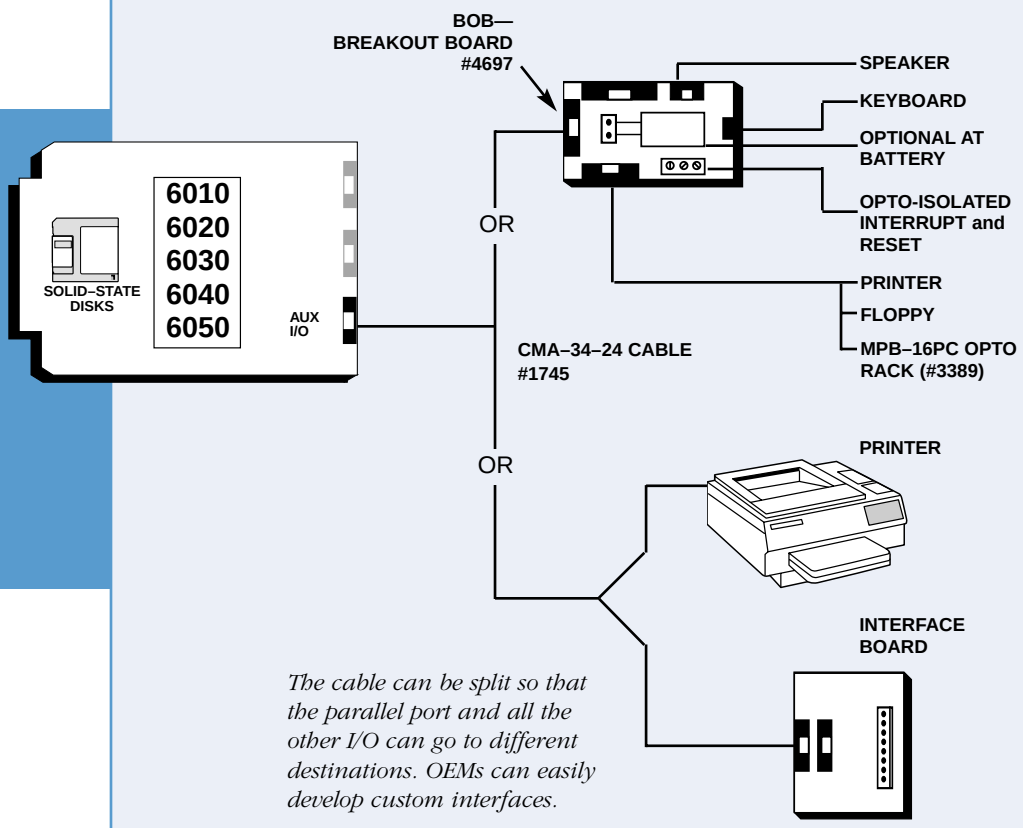
ITB interface translation boards convert 3–24V signals to 5V inputs and increase the drive capacity of the 5V outputs to 50V at 100 mA. Part #3037.

The KAD keypad and display interface accepts 16–position keypads and LCD and vacuum fluorescent displays. Part #4823.

For switch inputs, LEDs, relays and other devices, as well as custom interfaces.

- *The EZ I/O port has 24 digital lines that are individually programmable as either 5V inputs or outputs. They will sink and source 15 mA. The lines have pull–up/pull–down resistors for convenient interfacing to a variety of external devices. The port is supported with both BIOS calls and CAMBASIC. The 6020 has two EZ I/O ports.*

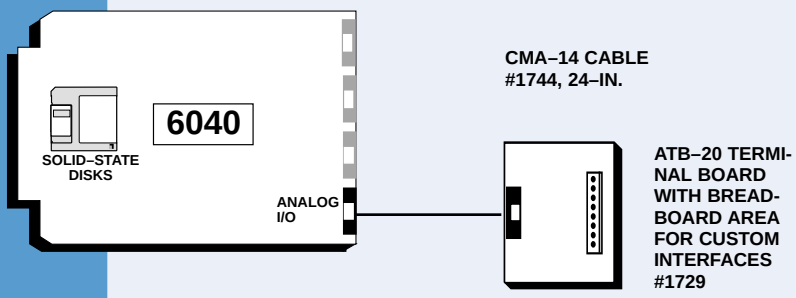
AUXILIARY I/O CONNECTION DIAGRAM



The cable can be split so that the parallel port and all the other I/O can go to different destinations. OEMs can easily develop custom interfaces.

The AUX I/O port interfaces the PC functions of the additional AT battery, keyboard, parallel port, speaker port and opto–isolated interrupt inputs. This clustering of functions saves card space, reduces the number of cables, and makes it easy for the OEM to develop low–cost, custom interfaces. The AT battery operates in parallel with the on–card battery to extend battery life. The 6010 has floppy and hard disk ports on–card.

6040 ANALOG I/O CONNECTION DIAGRAM



Analog I/O: The 6040 has eight, 12–bit analog inputs with software programmable ranges. The two analog voltage outputs have jumper programmable ranges.