

*MotionPlus<sup>®</sup> Digital Controllers*



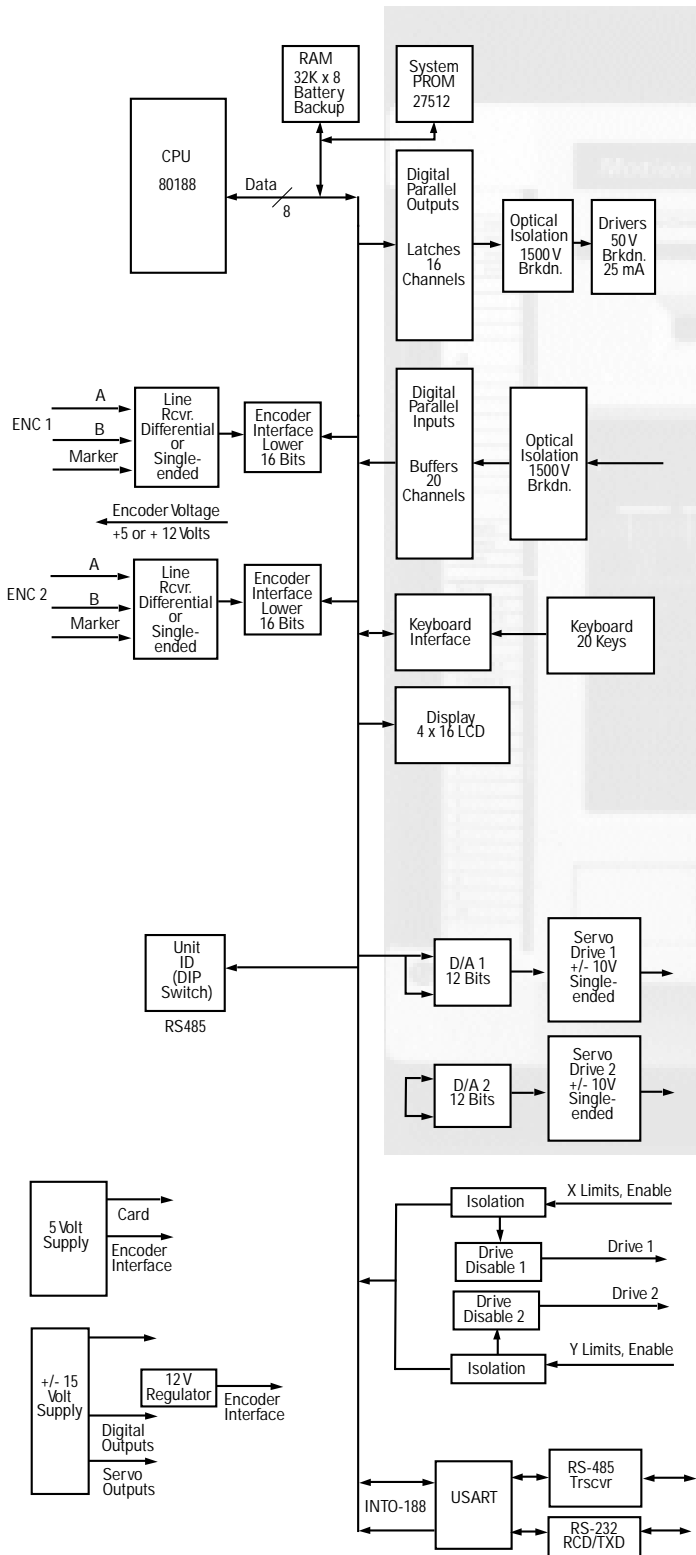
MTS Automation provides a complete line of MotionPlus<sup>®</sup> Digital Controllers engineered to meet your specific application needs. Designed to improve the quality and flexibility of many industrial machines and processes, MotionPlus controllers provide open and closed loop systems, 1 to 28 axes of control, direct digital and distributed microprocessing as well as various plug-in intelligent modules for complex automation projects and overall system flexibility.

**MotionPlus Digital Controllers**

- EDC 100 Encoder Digital Controller
- EDC 200 Encoder Digital Controller
- XDC 700 Multi-axis Digital Controller
- XDC 710 Multi-axis Digital Controller
- XDC 720 Multi-axis Digital Controller

### MotionPlus<sup>®</sup> Digital Controllers

### MotionPlus EDC 100 and EDC 200 Encoder Digital Controllers



#### Features

- Panel-mounted chassis for easy integration into the control system
- Highly accurate digital position control
- 1 to 2 axes of control
- RS-232 or RS-485 serial port
- Coordination of multiple controllers through digital I/O or multi-drop serial communications
- Designed with built-in keypad and LCD screen for operator interface
- 10 digital programmable inputs and 12 digital programmable outputs
- Menu-selected application programs containing readable statements, such as WAIT, REPEAT and RAMP

Figure 1. EDC 200 Block Diagram

**MotionPlus® EDC 100 and EDC 200 Encoder Digital Controllers**

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**Functional Description**

The EDC 100 or 200 is designed as a complete stand-alone unit requiring no additional circuitry to implement one or two axes of encoder feedback servo control.

An integral keypad and LCD display are used to set up control parameters, enter program steps, monitor functions, run programs, or jog an axis directly.

Figure 1 illustrates the functional parts of the EDC 200. For each axis, the EDC 200 provides the following connections:

- An encoder position sensor input interface
- A servo output interface
- Two limit inputs, a drive-enable output, and a fault input
- A Run input, to start a selected program for the axis
- Three Program Select inputs, to select one of eight programs for the axis
- A Ready output, to indicate the axis is ready to run a program

The EDC 100 provides these same connections, but for one axis only. All connections except the AC power input use removable terminal blocks.

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**Operation**

An EDC 100 or EDC 200 Controller unit can be used in the following ways:

- Independently, as a stand-alone control system. In this mode, the EDC Controller is programmed from the keypad. The stored programs are then run from the keypad or by external switch or relay control. In addition, an operator can jog or step an axis directly by pressing keys on the keypad.
- With digital I/O connections to an external PLC (programmable logic controller). In this mode, stored programs are selected and started by the PLC. The PLC can also interact with the running program via the digital inputs and outputs.
- Integrated through the serial interface into a multiple controller system. In this mode, up to eight EDC Controllers can be connected to a host device (such as a personal computer or PLC) for two-way communications.

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**Position Sensor Interface**

Each encoder position sensor interface is designed to work with an incremental quadrature encoder requiring either +5 Vdc or +12 Vdc. The encoder may have either TTL or differential outputs. Each interface provides connections for A+, A-, B+, B-, Marker+, Marker-, +5 Vdc (or +12 Vdc), and a ground for the encoder, all on one terminal strip.

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**Servo Control Interface**

The servo control interface includes the following inputs and outputs:

**X, Y (±) Command Outputs**

The command outputs for Axes X and Y are configured for -10 V to +10 Vdc single-ended voltage output. With jumper changes, they can be configured for the following outputs:

- ±25 mA, 50 mA or ±100 mA current sourcing output (component change required)
- -5 to +5 Vdc single-ended voltage output
- -10 to +10 Vdc differential voltage
- 0 to +10 Vdc differential voltage (component change required)

**X, Y Enable Outputs**

The enable outputs are configured for active low output. With jumper changes, they can be configured for active high or isolated output. Internal or external voltage can also be used to power these outputs.

**X, Y Fault Input**

Fault inputs are current sourcing (pulled low is inactive). The fault sense (HIGH or LOW) can be changed from the keypad. When a drive fault is encountered, the fault input for that axis acts through software to disable the drive and display an error message on the LCD screen.

**X, Y (±) Limit Inputs**

Limit inputs are current sourcing and must be pulled low to eliminate limit faults. These limits also control the enable output, so that exceeding a limit turns off the enable output to disable the axis.

### MotionPlus<sup>®</sup> EDC 100 and EDC 200 Encoder Digital Controllers

#### Serial Communications

The standard RS-232 serial interface allows programs and setup data to be sent to a printer or transferred to or from a personal computer or other external device. Alternatively, the RS-232 interface allows two-way communications with an external host (such as a personal computer or PLC).

The RS-485 serial communications mode (jumper selectable) allows a multi-drop configuration using a host, plus up to eight EDC Controllers (controlling up to 16 axes).

#### Digital I/O

The EDC provides 20 inputs and 15 outputs, which can be operated on internal or external power.

#### Inputs

The EDC provides 20 inputs. The following 10 inputs are dedicated inputs:

Name	Function
Run X	Starts the currently selected program for Axis X.
X Select 1, 2, and 4	Selects a program for Axis X.
Run Y	Starts the currently selected program for Axis Y.
Y Select 1, 2, and 4	Selects a program for Axis Y.
Interlock	If off, stops the running program(s) and disables both axes.
Access	If off, prevents operator access to selected keypad menus. The power-up menu and the access controlled menus are chosen from the setup menu.

The remaining 10 inputs are user programmable. They can be used to tie external events to a running program. For example, if a switch for Axis X is connected to Input 1, then the program instruction WAIT TIL INPUT 1 can be used to make the running program stop at this point and wait for an operator response.

#### Outputs

The EDC provides 15 outputs, including the following:

Name	Function
X Ready	Indicates that the X axis is not running a program and is clear of errors.
Y Ready	Indicates that the Y axis is not running a program and is clear of errors.
Status	Indicates that there are no errors on any axis.

Twelve outputs are user programmable. They can be used to tie external events to a running program. For example, if Output 10 is connected to an LED, then the program instruction OUT 10 ON AT 12.300 in can be used to turn on the LED when the axis is at or beyond the specified position.

#### Programming

```
PROGRAM MODE
AXIS# [ X ]
PROGRAM# 0
COPY EDIT LIST
```

Up to eight programs can be created and stored on the EDC for each available axis. The Program mode is used to:

- COPY an existing program
- EDIT to create a new program or change an existing program
- LIST one or more programs to the printer

Programs are created by selecting the EDIT option, then using menus to enter program instructions.

**MotionPlus® XDC 700 Multi-Axis Digital Controller**

The MotionPlus XDC 700 Controller provides advanced direct digital control for multiple axes using one or more types of feedback devices.

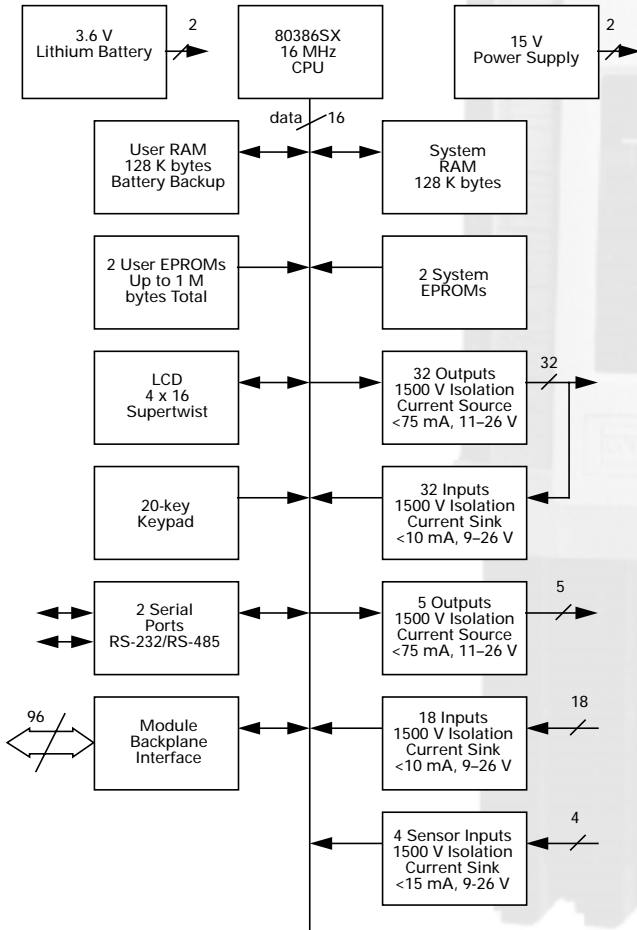


Figure 2. XDC 700 Block Diagram

**Features**

- Designed with built-in keypad and LCD screen
- 32 programmable I/O points that can be configured for Inputs or Outputs
- Application programs written in Borland or Turbo C++
- Application programs also written using XPS interface software

**Functional Description**

The XDC 700 is designed as a complete stand-alone unit with plug-in modules. No other circuitry is required to operate multiple axes of servo control.

An integral keypad and LCD display can support information exchange between the operator and the control system.

Figure 2 illustrates the functional parts of the XDC 700. All connections except the AC power input use removable terminal blocks. The five slots at the bottom accommodate removable axis control modules or special purpose modules.

**Serial Communications**

Two serial interfaces are provided (more can be added with optional modules). Either can be configured independently for RS-232 or RS-485 communications. The standard RS-232 serial interface allows downloading programs from a personal computer for debugging.

The RS-485 serial communications mode (jumper selectable) allows a multi-drop configuration of up to 16 XDC controllers.

**Digital I/O**

The XDC 700 provides the following types of user-programmable digital input/output:

- 5 dedicated outputs
- 18 dedicated inputs
- 32 input/output points which can be configured as inputs or outputs
- 4 high-speed sensor inputs are provided. With a quick response time, these inputs are useful for applications such as registration control.

**MotionPlus® XDC 700 Multi-Axis Digital Controller**

**Slots**

The Controller's five functionally identical slots can accommodate from one to five removable modules. Each slot supports any XDC module, such as the Encoder Servo Module, Temposonics® Servo Module, Dual Stepper/Encoder Module, Universal Module, Quad Encoder Servo Module, Analog I/O Module, Dual Encoder Servo Module, Serial Communications Module, Digital I/O Expansion Module and Digital/Analog I/O Expansion Module.

**Built-in Diagnostics**

A built-in diagnostics package can be accessed at power-up. Using the keypad and LCD screen, the user can check both the Controller and any installed modules.

The diagnostics package can perform a range of hardware checks, including the following:

- Serial port diagnostics, allowing the user to check configuration, to send and receive data at each port
- Serial port loopback test, checking both serial ports at once
- I/O diagnostics, allowing the user to monitor inputs and drive outputs directly
- I/O loopback test, checking all 54 inputs and 37 outputs
- Memory access mode, allowing trained personnel to read and write to internal memory addresses
- Module diagnostics, identifying module types and testing module functions



Figure 3. XDC Programming Software Package

**Software Development Package**

The software development package (not included with the XDC 700) contains:

- The XDC C Functions Library, providing utilities and functions especially designed for the XDC 700
- Cables for connection to an IBM PC or AT compatible computer
- A set of RAM or flash EPROM chips for downloading and developing application programs
- XDC 700 Programmer's Guide

The XDC 700 software development tools combined with the Borland C++ or Turbo C++ software (not included), provide an excellent platform for an experienced C programmer to create and test the application programs required for the XDC 700 Controller. This compiled application program is then installed into the XDC 700 memory which controls the operation of the XDC 700 system firmware.

**Application Program Development**

Install the Custom Servo Motors XDC 700 library with one of the Borland compilers. Write the application program using the XDC 700 library and Borland C++ formats. Compile and link all application software modules. The XDC 700 library contains utilities to Relocate, Download and Split for XDC 700 Controller. Test the application program, and then commit this program to either flash EPROM or standard EPROM.

**XDC Programming Software Package**

The XDC Programming Software package is a simple on-line programming system designed to work with the multi-axis XDC Controller. The XPS Software allows you to tune and run up to 28 axis from the XDC with familiar Windows® 95 menus and windows. Tuning is done directly from the tuning window using industry standard PIDF loop tuning algorithms. The extensive XDC programming library is utilized to allow you to program everything from simple indexing moves to complex camming motion. Simple ratio functions have never been easier to accomplish. The extensive I/O can be tied to any of the programming functions or to whole programs allowing for maximum versatility. Once you have finished the programming of the machine, you can simply disconnect the computer and go on to the next machine.

**MotionPlus® XDC 710 Multi-Axis Digital Controller**

The MotionPlus XDC 710 Controller provides advanced direct digital control for multiple axes using one or more types of feedback devices.

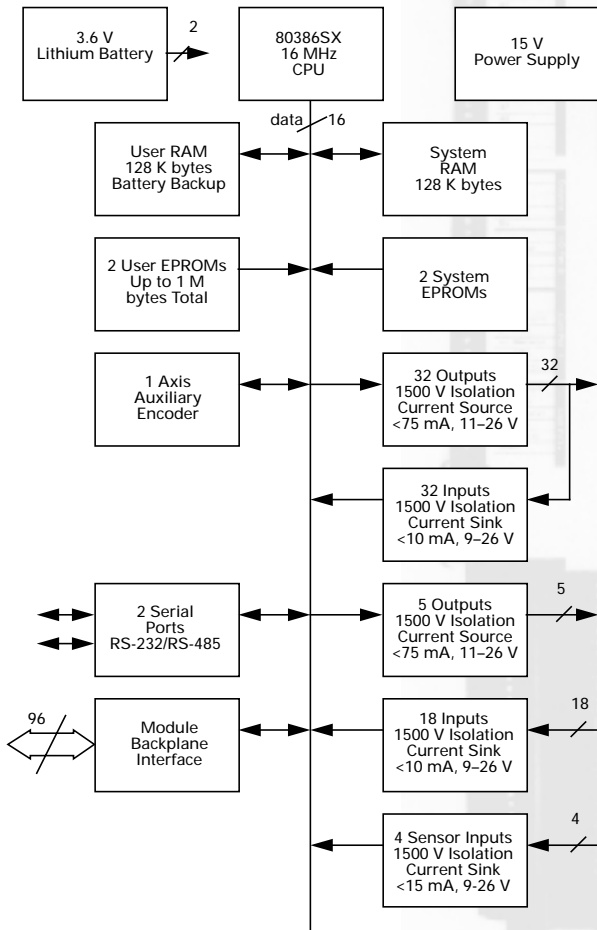


Figure 4. XDC 710 Block Diagram

**Features**

- 32 programmable I/O points that can be configured for Inputs or Outputs
- Application programs written in Borland or Turbo C++
- Application programs also written using XPS interface software

**Functional Description**

The XDC 710 is designed as a complete stand-alone unit with plug-in modules. No other circuitry is required to operate multiple axes of servo control.

An optional remote keypad and LCD display can support information exchange between the operator and the control system via either serial port.

Figure 4 illustrates the functional parts of the XDC 710. All connections except the AC power input use removable terminal blocks. The five slots at the bottom accommodate removable axis control modules or special purpose modules.

**Serial Communications**

Two serial interfaces are provided (more can be added with removable modules). Either can be configured independently for RS-232 or RS-485 communications. The standard RS-232 serial interface allows downloading programs from a personal computer for debugging.

The RS-485 serial communications mode (jumper selectable) allows a multi-drop configuration of up to 16 XDC controllers.

**Digital I/O**

The XDC 710 provides the following types of user-programmable digital input/output:

- 5 dedicated outputs
- 18 dedicated inputs
- 32 input/output points which can be configured as inputs or outputs
- 4 high-speed sensor inputs are provided. With a quick response time, these inputs are useful for applications such as registration control.

**MotionPlus<sup>®</sup> XDC 710 Multi-Axis Digital Controller****Slots**

The Controller's five functionally identical slots can accommodate from one to five removable modules. Each slot supports any XDC module, such as the Encoder Servo Module, Temposonics Servo Module, Dual Stepper/Encoder Module, Universal Module, Quad Encoder Servo Module, Analog I/O Module, Dual Encoder Servo Module, Serial Communications Module, Digital I/O Expansion Module and Digital/Analog I/O Expansion Module.

Multi-axis modules also provide additional high speed sensor inputs dedicated to each axis.

**Built-In Diagnostics**

A built-in diagnostics package can be accessed when an optional remote operator interface is connected to either of the serial ports. The diagnostics package can perform a range of hardware tests, including the following:

- I/O diagnostics, allowing the user to monitor inputs and drive outputs directly
- I/O loopback test checking all 54 inputs and 37 outputs
- Module diagnostics identifying module types and testing module functions

**XDC Programming Software Package**

The XDC Programming Software package is a simple on-line programming system designed to work with the multi-axis XDC Controller. The XPS Software allows you to tune and run up to 28 axis from the XDC with familiar Windows<sup>®</sup> 95 menus and windows. Tuning is done directly from the tuning window using industry standard PIDF loop tuning algorithms. The extensive XDC programming library is utilized to allow you to program everything from simple indexing moves to complex camming motion. Simple ratio functions have never been easier to accomplish. The extensive I/O can be tied to any of the programming functions or to whole programs allowing for maximum

versatility. Once you have finished the programming of the machine, you can simply disconnect the computer and go on to the next machine.

**Software Development Package**

The software development package (not included with the XDC 710) contains:

- The XDC C Functions Library, providing utilities and functions especially designed for the XDC 710
- Cables for connection to an IBM PC or AT compatible computer
- A set of RAM or flash EPROM chips for downloading and developing application programs
- XDC Programmer's Guide

The XDC 710 Software Development tools combined with the Borland C++ or Turbo C++ software (not included), provide an excellent platform for an experienced C programmer to create and test the application programs required for the XDC 710 Controller. This compiled application program is then installed into the XDC 710 memory which controls the operation of the XDC 710 system firmware.

**Application Program Development**

Install the Custom Servo Motors XDC 710 library with one of the Borland compilers. Write the application program using the XDC 710 library and Borland C++ formats. Compile and Link all application software modules. The XDC 710 library contains utilities to Relocate, Download and Split for XDC 710 Controller. Test the application program, and then commit this program to either flash EPROM or standard EPROM.



Figure 5. XDC Programming Software Package

**MotionPlus® XDC 720 Multi-Axis Digital Controller**

The MotionPlus XDC 720 Controller provides advanced direct digital control for multiple axes using one or more types of feedback devices.

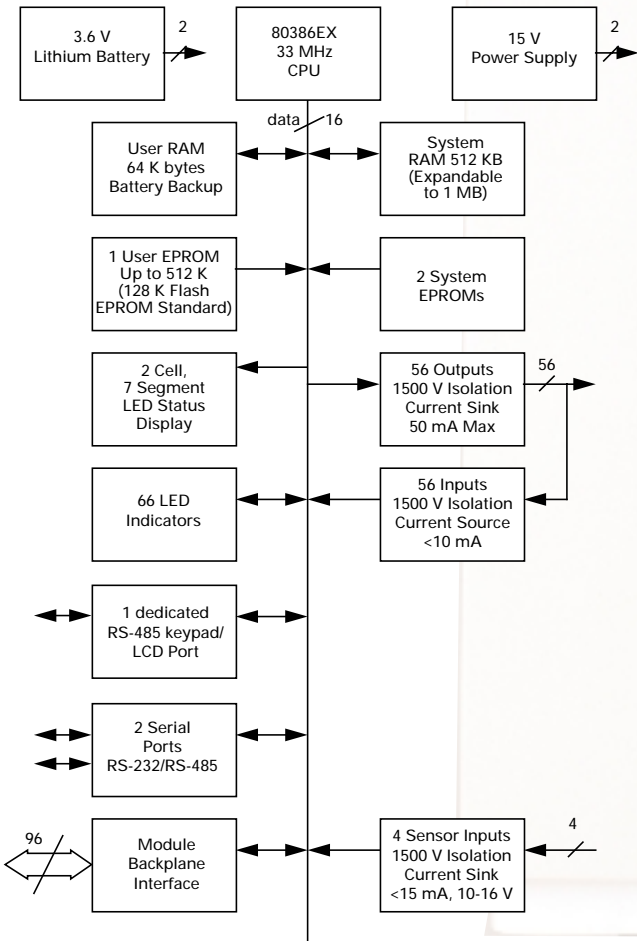


Figure 6. XDC 720 Block Diagram

**Features**

- 56 programmable I/O points that can be configured for Inputs or Outputs
- Application programs written in Borland or Turbo C++
- Application programs also written using XPS interface software

**Functional Description**

The XDC 720 is designed as a complete stand-alone unit that accommodates plug-in modules. No additional circuitry is required to operate multiple axes of servo control.

An optional keypad and LCD display can support information exchange between the operator and the XDC 720 control system.

Figure 6 illustrates the functional parts of the XDC 720. The serial ports and remote interface port use 9 pin, D-shell connectors. Other connections, except the AC power input, use remote mounted (SCSI - 2) cables to remote terminal boards. The seven slots at the bottom accommodate removable axis control modules or special purpose modules.

**Serial Communications**

Two serial interfaces are provided. Either can be configured independently for RS-232 or RS-485 communications and for baud rates up to 115 k. The standard RS-232 serial interface allows downloading programs from a personal computer for debugging.

The third port supports RS-485 serial communications for the remote keypad/LCD option.

**Digital I/O**

The XDC 720 provides the following types of user-programmable digital input/output:

- 56 input/output points which can be used as inputs or outputs
- 4 high-speed sensor inputs are provided. With a quick response time, these inputs are useful for applications such as registration control.

### MotionPlus<sup>®</sup> XDC 720 Multi-Axis Digital Controller

#### LED Indicators

66, front panel, LED lights provide the following indications:

- 56 digital I/O states
- 4 sensor input states
- 5 hardware status states
- 1 programmable error indicator

#### Slots

The Controller's seven functionally identical slots can each accommodate a removable module. Each slot supports any of several XDC modules, such as the Encoder Servo Module, Temposonics Servo Module, Quad Encoder Servo Module, Analog I/O Module, and Digital I/O Module.

#### Built-in Diagnostics

A built-in diagnostics package can be accessed when a remote keypad/LCD is connected to the remote interface port. The diagnostics package performs a range of hardware checks, including the following:

- Serial port diagnostics, allowing the user to send and receive data at each port
- Serial port loopback test, checking both serial ports at once
- I/O diagnostics, allowing the user to monitor inputs and drive outputs directly
- I/O loopback test, checking all 56 digital I/O points
- Memory access mode, allowing trained personnel to read and write to internal memory addresses
- Module diagnostics, identifying module types and testing module functions

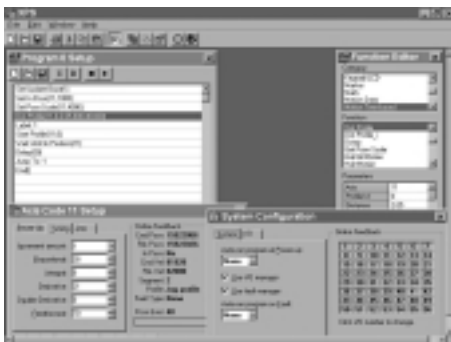


Figure 7. XDC Programming Software Package

#### Software Development Package

The software development package (not included with the XDC 720) contains:

- The XDC C Functions Library, providing utilities and functions especially designed for the XDC Series Controllers
- Cables for connection to an IBM compatible computer
- XDC 700 Series Programmer's Guide

The XDC software development tools combined with the Borland C++ or Turbo C++ software (not included), provide an excellent platform for an experienced C programmer to create the application programs required for the XDC 720 Controller. This compiled application program is transferred to the XDC 720 Controller for test and execution.

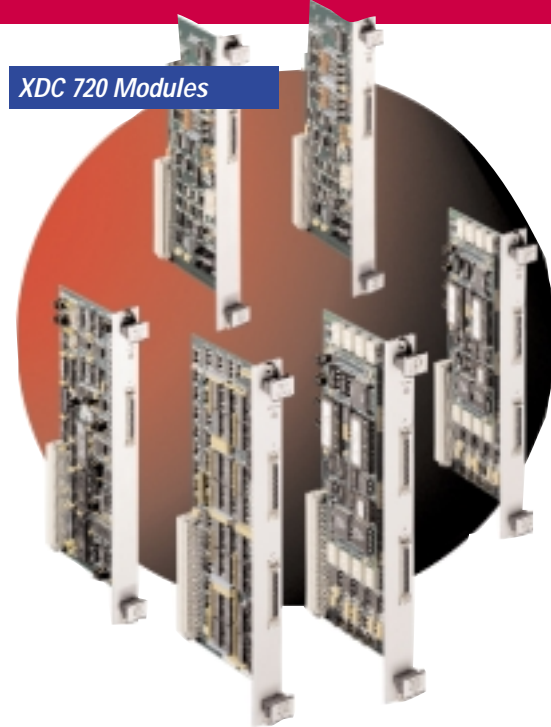
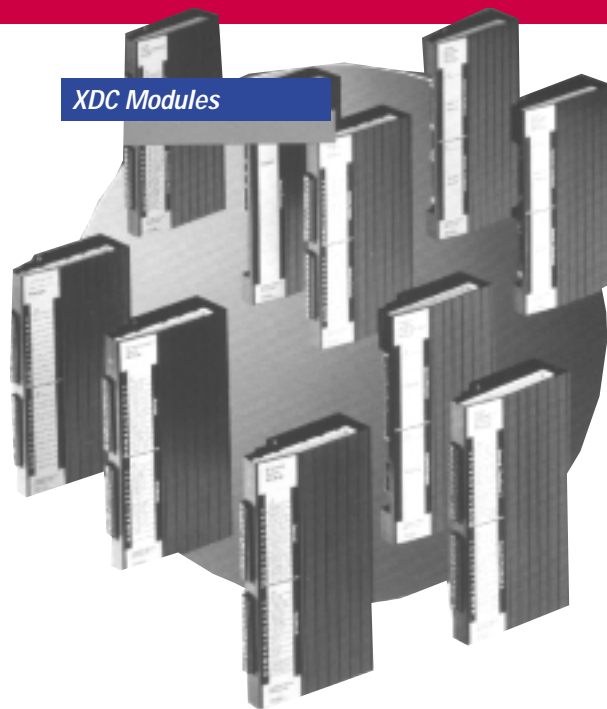
#### Application Program Development

Install the Custom Servo Motors XDC C Functions Library with one of the Borland compilers. Write the application program using functions in the XDC Library and the C Language. Compile and link all application software modules. Use XDC Library utilities to Relocate and Download your program to the XDC 720 Controller. Test the application program, and then commit this program to either flash EPROM or standard EPROM.

#### XDC Programming Software Package

The XDC Programming Software package is a simple on-line programming system designed to work with the multi-axis XDC Controller. The XPS Software allows you to tune and run up to 28 axis from the XDC with familiar Windows<sup>®</sup> 95 menus and windows. Tuning is done directly from the tuning window using industry standard PIDF loop tuning algorithms. The extensive XDC programming library is utilized to allow you to program everything from simple indexing moves to complex camming motion. Simple ratio functions have never been easier to accomplish. The extensive I/O can be tied to any of the programming functions or to whole programs allowing for maximum

versatility. Once you have finished the programming of the machine, you can simply disconnect the computer and go on to the next machine.



You can achieve maximum flexibility for your MotionPlus® XDC 700, XDC 710 and XDC 720 Controllers by using this comprehensive line of XDC modules. Each module is designed to help you adapt your motor control function in a different way, while always allowing you to maintain the same programming software and libraries.

Total flexibility is achieved by simply selecting desired plug-in module. It's one more example of productivity-engineered products from MTS Automation.

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**XDC 720 Modules**

- Single Encoder Servo Module with Analog Reference
- Single/Dual Temposonic® Servo Module
- Quad Encoder Servo Module
- Analog I/O Module
- Digital I/O Module
- Absolute Encoder Module

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**XDC Modules:**

- Encoder Servo Module
- Temposonics® Servo Module
- Dual Stepper/Encoder Module
- Quad Encoder Servo Module
- Analog I/O Module
- Dual Encoder Servo Module
- Serial Communications Module
- Digital I/O Expansion Module
- Digital/Analog I/O Expansion Module
- Universal Module

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At MTS Automation our experienced application engineers are ready to work with you to design motor, amplifier and motion control packages to meet your performance, size and durability requirements exactly. For specific ordering information, please visit our web site at [www.mtsautomation.com](http://www.mtsautomation.com), or call the factory at 1-800-967-1785.

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