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The AutoMate Family

The AutoMate family is a complete line of programmable logic controllers (PLCs) capable of a wide range of control applications. Each individual AutoMate processor supports certain common features which are used throughout the entire product line. The AutoMate processors are identified by model numbers ranging from 15 to 40 with the AutoMate 40 series being the most capable machine. All of the lower model processors share a subset of a common software language found in the AutoMate 40E. The “E” designation is used to denote an enhanced version of the basic model. Each processor in the AutoMate family comes as a base or as an enhanced version.

A Common I/O Structure

All AutoMates share a common I/O structure. The structure is unique in that all digital I/O modules contain two I/O points for greater flexibility, lower cost and robust features. Up to eight cards or 16 electronically isolated points can be mounted on a “rail” which allows for wire terminations and a heatsink for head dissipation. The rail I/O structure is unique in the PLC industry and offers the greatest number of features found in any system available today.

A Common Instruction Set

A common software language is used in all of the AutoMate controllers. The AutoMate Programming System software is used to program any AutoMate controller. Each controller model utilizes a subset of the instructions found in the AutoMate 40E.

A Common Network

All AutoMate processors are capable of communicating over R-Net, the peer-to-peer industrial network capable of tying up to 32 stations or nodes together on a single coaxial cable. The R-Net is also used to allow computers or other devices to communicate to AutoMate controllers through serial gateways and computer bus cards that allow full speed data transfer at 800KBaud.
The following pages will provide you detailed information on the AutoMate processors, I/O, networks and peripheral operator interface products available through Custom Classics.

The AutoMate 15/15E

The AutoMate 15 is a small programmable controller with exceptional speed, functionality and reliability. Competitively priced, it includes standard features found on much larger, more expensive PLCs.

The AutoMate 20/20E

The AutoMate 20 is an expanded small controller based on the proven AutoMate 15 controller design. In addition to larger I/O and memory capacity, it features powerful enhanced functions readily programmable without computer expertise.

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AutoMate - Programmable Logic Controllers

Power for Today

The AutoMate 15/15E and the AutoMate 20/20E controllers are primarily intended as relay replacers in smaller electromechanical control systems. The AutoMate 15 controller may be economically installed to replace as few as eight relays, up to its maximum I/O capacity of 64 channels.

The AutoMate 15E controller adds the capability of interfacing to analog signals as well as handling four function math to the AutoMate 15 controller. It can handle up to 64 digital or 16 analog I/O, or some combination.

The AutoMate 20 controller, through the use of Local I/O Heads and expanded memory, can address up to 256 digital or 64 analog I/O, or some combination. It offers four function math, logic, data conversion, table handling, flow-of-control instructions, and drum controller functions – as well as relay replacement.

The AutoMate 20E controller has the memory and capability to perform PID control, a feature that previously was only available within the framework of large PLCs. It is ideally suited for distributed process control applications which require analog signal interface, sequence control and the communication ability provided by the R-Net industrial network.

AutoMate 15

- 64 Digital I/O
- 64 Internal Coils
- 56 Registers
- 1K x 16 Non-volatile Memory – no battery required
- 4 milliseconds/K Ladder Element Execution Speed
- Host Computer Interface Capability
- Ladder Diagram Language
- Programmed via an IBM compatible personal computer or hand-held Mini Programmer
- User-friendly Programming Tools include Off-and-On-line Programming
- Extensive Diagnostics
- Rugged Industrial Packaging
- Communications via the R-NET Industrial Network (available)

AutoMate 15E

Same features as the AutoMate 15 controller except as noted:

- 2K x 16 Non-volatile memory – no battery required
- 64 Digital/16 analog/ or a combination
- Enhanced Ladder Diagram Language with powerful Instruction Blocks.
- 736 Internal Coils
- 512 Registers

AutoMate 20

- 256 Digital/64 Analog/combination
- 736 Internal Coils
- 512 Registers
- 2k x 16 Non-volatile memory – no battery required
- 10 Milliseconds/K Ladder Element Execution Speed
- Host Computer Interface Capability (1200/9600 Baud)
- Enhanced Ladder Diagram Language with powerful Instruction Blocks
- Programmed via an IBM compatible personal computer or hand-held Mini Programmer
- User-friendly Programming Tools include Off-and-On-line Programming
- Extensive Diagnostics
- Rugged Industrial Packaging
- Remote I/O Mounting Capability
- Communications via the R-NET Industrial Network (available)

AutoMate 20E

Same features as the AutoMate 20 controller except as noted:

- 4k x 16 Non-volatile Memory – no battery required
- Capacity to handle up to 20 PID loops

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Flexibility for Tomorrow

While the AutoMate 15 and AutoMate 20 controllers are designed for smaller applications, this doesn't mean that they must be replaced if your system grows. The AutoMate 15 and AutoMate 20 are members of Reliance Electric's AutoMate family of controllers – all of which share a common architecture and all of which are built from a common set of control building blocks.

The Rail-mounted digital I/O hardware used for the AutoMate 15 and AutoMate 20 is the same digital I/O used by the larger AutoMate 30 and AutoMate 40 controllers. All Reliance Electric AutoMate PLCs have the capability to communicate over the R-NET Industrial Network. So if your control needs to grow, so can your AutoMate PLC System.

You can network several AutoMate 15 or AutoMate 20 PLCs together to implement distributed control. Or, you can upgrade to a larger AutoMate controller without disturbing the field wiring and digital I/O already in place. You get ease of expansion and control flexibility – without fear of obsolescence.

Built-in diagnostics

The AutoMate 15 and AutoMate 20 controllers include built-in diagnostics and LED indicators to signal controller status. A CPU diagnostic is made up of a scan loss detector circuit and the software that drives it. The CPU must service the scan loss detector every 100 milliseconds, or the detector will time out, the CPU READY relay will drop out and its contacts will open, and the CPU READY LED on the face of the processor will be extinguished. The normally open CPU READY contacts can also be programmed by the user to indicate other abnormal conditions.

The AutoMate 15 and AutoMate 20 Controllers also include an on-line diagnostic that checks communication between the AutoMate processor and the I/O Rails. During each I/O update, data is sent to the rail for updating the outputs, and then read back for updating the inputs. Two error detection bits are added to the normal I/O data, and these bits are used to determine if communications is taking place properly. If a fault is detected, the RAIL FAULT LED on the face of the processor is illuminated and the fail fault coil is energized. Also, the function of the COM DATA LED and the FORCING LED change to indicate on which rail the fault was detected. The rail fault coil can be used to take whatever action is desired; such as using it in conjunction with the programmable fault coil to drop out the READY contacts.

Non-volatile R/W memory – without battery backup

The AutoMate 15 and the AutoMate 20 processors combine three memory technologies to provide true non-volatile memory – without batteries and their inherent problems. The AutoMate family memory system uses a CMOS read/write (R/W) memory to store application programs. The program is executed, and any changes are made from the R/W. As changes occur, program execution is affected immediately.

The EEPROM stores a copy of the R/W application program. Each time a change is made to the R/W, the same change is also made in the EEPROM. If there is a power failure, the program is lost in the R/W, but is still available in EEPROM. On power-up, the contents of EEPROM are transferred to the R/W and the program is run. The EEPROM serves as an off-line backup memory.

NVRAM (non-volatile random access memory) is a truly non-volatile read/write memory. It serves two purposes in the AutoMate memory system. First, it saves the status of the retentive variables, both I/O points and registers, so the contents of these variables are not lost. Second, it is used to temporarily save program changes during transfer from R/W to EEPROM.

When a change is made in the R/W, the change is also stored in the NVRAM. The contents of the R/W are then transferred to the EEPROM. Due to the slow write times of EEPROM, the process takes some time, and it is possible for a power failure to occur during the transfers. If this were to happen, the program would be lost. With the incremental change stored in NVRAM, however, the program can be reconstructed on power-up regardless of when power failed; thus providing a totally non-volatile read/write memory.

The processor unit is the main component of the AutoMate 15 system. It integrates the power supply, the CPU with memory, and the R-NET communication interface (on those processors with R-NET capability). The processor unit is available in four versions: 120/240 VAC power supply, 24VDC, 120/240 VAC with R-NET, and 24VDC with R-NET.

The Power supply provides all voltages necessary to power the other sections of the processor unit, the I/O modules, and the Mini Programmer, when connected.

The processor contains the Intel 801 microprocessor that executes the user program and communicates with the I/O system and programming devices. The processor also contains the application memory and the AutoMate 15 executive.

The executive program is stored in memory and the user program is stored in the non-volatile application memory described in the Introduction Section.

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AutoMate - Programmable Logic Controllers

Communication with the programming devices or host computer is facilitated via an optically isolated serial RS-232 communications channel. This port defaults to 9600, but can be set to 1200 baud from software (AutoMate 15E/20/20E only) for remote communications applications. A standard DB25 connector is provided on the face of the processor unit for this purpose.

The optional R-NET industrial network communication interface – with standard coaxial connector – allows the AutoMate PLC to communicate with other AutoMate controllers and other micro-processor based devices. R-NET is available as an option on all models of AutoMate.

- STATUS INDICATORS
  - RUN - Application program is being executed
  - POWEER - Logic voltages are within the specified range.
  - CPU READY - Processor is working properly within limits of internal error detector.
  - COM DATA - Data is being sent or received
  - FORCING - Status of an input or coil is being overridden by forcing function.
  - RAIL FAULT - Communication between the processor and rail has been disrupted. (Binary patter of FORCE and COM DATA LED's indicates which of the four rails is involved).



- R-NET Connector (optional)
- COMMUNICATIONS PORT - For programmer connection
- USER-REPLACEABLE FUSE
- I/O RAIL CONNECTIONS
- INPUT POWER CONNECTIONS:
  - 120 VAC, 50-60 Hz
  - 240 VAC, 50-60 Hz
  - (24 VDC available on some models)
- READY CONTACT - Opens if internal diagnostic test fails. Can be used for emergency shutdown.

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Processor Unit Executive Software

The AutoMate 15/20 processor contain an executive software program which is a subset of the Enhanced Ladder Diagram language used in the larger AutoMate 30 and AutoMate 40 processor. As you progress up the AutoMate line of PLCs, from the AutoMate 15 through the AutoMate 40E, each model adds additional software features.

This makes it easy to select the AutoMate controller which is ideally suited to your application. Because all AutoMates use subsets of the same programming language it is very easy for the programmer to move between AutoMate models. Once the Enhanced Ladder Diagram Language is learned you know how to program the full AutoMate family.

All AutoMates share a common ReSource Programming Executive software package which runs on an IBM compatible personal computer. Details of this programming system are contained in section IV of this product summary.

Table of Software Functions

	15	15E	20	20E
Master Control Relay Coils	X	X	X	X
N.C. and N.O. Contacts	X	X	X	X
Internal Coils	X	X	X	X
Timer Coils	X	X	X	X
Counter Coils	X	X	X	X
Shift Register Coils	X	X	X	X
Retentive Memory Coils	X	X	X	X
System Coils	X	X	X	X
Global Coils	X	X	X	X
Transitional Contacts	X	X	X	X
4-Function Math		X	X	X
Logical Functions		X	X	X
Data Tables		X	X	X
Data conversion		X	X	X
Flow of Control		X	X	X
Drum Controllers		X	X	X
Network Functions		X	X	X
Analog In/Out		X		X
PID				X
Scaling Functions				X
Square Root				X
Timed Loops				X

Programming Software

Model Number	Description
45C130	APX 4.0 - Programming Executive
45C134	APS Programming Executive
45C140	APX 4.0 - Programming Executive Upgrade

Rail Input/Output System

The I/O system of the AutoMate 15, 15E, 20 and 20E controller has been designed to withstand typical conditions within the industrial environment, meet specific application requirements, and provide maximum industrial control flexibility. AutoMate programmable controllers can be matched with a Digital Rail I/O system or the new Analog Rail I/O (not available with the AutoMate 15 controller) which is ideally suited for process and sequence control applications. For situations that require a cost-effective method of displaying and entering data, a number of optional, special purpose I/O methods are also available.

AutoMate 15/15E

Each AutoMate digital I/O rail can support eight two-point I/O modules and can connect directly to an AutoMate 15 Processor unit I/O port via an I/O rail interconnect cable.

The AutoMate 15 CPU can address up to 64 digital I/O and includes four I/O ports on the face plate to accommodate four 16-channel rails. Rails may be mounted in any arrangement to suit application requirements (within the limits of 42-inch interconnect cables). Input and output modules may be used in any combination to eliminate “wasted” I/O.

The AutoMate 15E has the added flexibility of interfacing to analog Rail I/O modules as well as the digital rail I/O used on the AutoMate 15 controller. It can address up to 64 digital, 16 analog, or some combination through its four faceplate-mounted rail ports.

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Digital I/O Rail 45C1

Typical industrial PLC Input/Output systems are mounted on a panel or to a cabinet and wired to an intermediate terminal strip. The Reliance Electric I/O system eliminates the need for this costly wiring method.

By incorporating an industrial quality terminal strip – with all the standard terminal strip features – into the I/O rail itself, the intermediate wiring, and the cost of the added labor are eliminated.

1. Modular Design – The modular design of the AutoMate I/O allows the system to be closely tailored to the actual requirements.
2. Mounting Flexibility – The I/O rails and processor may be mounted in a vertical column to fully emulate a terminal strip, or they may be mounted side-by-side or in other arrangements to suit the available space.
3. Standard Screw Terminals – The terminal strip uses standard self-lifting pressure plate wire terminals that allow two #12 gauge stranded wires to be fastened to each terminal.
4. Two Screw Terminals Per Channel – Each I/O channel or point is provided with two screw terminals, thus allowing separate electrical commons. If the application requires the commons to be tied together, an optional jumper strip is available.



Digital I/O Modules

The design and construction of the AutoMate I/O Modules is a direct response to PLC users who have found that many currently available I/O systems and components do not stand up to industrial service. Industrial applications hold many hazards for electronic devices, such as high temperatures, high humidity, high current loading (output circuits), electrical noise, and vibration.

Outputs Rated 2 Amps @ 60˚C. Voltage levels include:

M/N	Description
*45C60	115 VAC
*45C62	230 VAC
*45C63	24 VDC
*45C65	24 VAC
*45C66	Hi Pwr Contact, N.O.
*45C166	Hi Pwr Contact, N.C.
*45C67	24 VAC
*45C68	250 VDC (0.5 amps)
*45C69	Low Power Contact

Each output circuit is electrically isolated and each output module is built to endure an inrush of 20 amps for 0.1 second.

Optically Isolated Inputs

All input logic level circuits are optically isolated from field signals. These high threshold circuits will not energize until a pre-determined voltage is reached, to prevent triggering by false signals from external interference. Input module voltage ratings include:

M/N	Description
*45C40	115 VAC/DC
*45C42(1)	Dual Electronic Input
*45C43	230 VAC/DC
*45C44	24 VAC/DC
*45C46	Voltage Comparator*

*Voltage Comparator Module

This module compares two analog voltage signals and sends the logical results to the processor. It can also compare an external voltage to a preset reference voltage determined by the user. Both greater-than and less than comparisons are made.

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Analog Rail I/O

The Analog Rail modules plug into the I/O connections on the face of the AutoMate 15E/20/20E controllers or on the local head. Analog rail modules may be intermixed in the system with digital and special purpose I/O to give a great degree of flexibility in a small PLC system.

Features

- 12-bit resolution for precision measurement and control
- 4 channels per module
- Available in 0-10V, 4-20 mA versions
- Faceplate accessible fuse
- Operates on 115 VAC or 24VDC
- Panel mounted
- Easy connection to the controller with rail cable
- Pull-apart terminal boards
- May be addressed as a local head or as a rail.

2 Channel In 2 Channel Out	4 Channel Analog Input	4 Channel Analog Output	Range
61C350	61C346	61C366	0-10 VDC
61C351	61C345	61C365	4-20 mA

The Analog Rail can plug into the I/O port of an A20, A30, A40, LIOP (45C200B), and Remote Head (45C37, 45C38 or 57C330). When plugged into a processor direct port, a local head can also be used where the analog value is multiplexed through one I/O register.

Thumbwheel Switch Interface – 45C630

The TWS Interface Module is configured as a rail in the AutoMate 15E, 20/20E, 30, and 40 processor, or can be treated as numerical I/O when used with the AutoMate 30 or 40 processor. The data read from the TWS is binary coded decimal and displayed in 4 data input digits.



LED Interface Module – 45C631

Reliance Electric's Model 45C631 LED Interface displays numerical data from the AutoMate family of programmable controllers (except AutoMate 15). These devices convert BCD information from the AutoMate programmable controller into a seven-segment digital display. Digits on the LED Display are 0.43 inches high, and are covered with a transparent red lens.

Features

- 7-Segment LED Display
- Easy to read 0.43 inch high characters
- Decimal point is switch selectable
- Easy to mount, no wiring

Local Head – 61C22

The Local I/O heads used with the AutoMate 20/20E I/O system are built around a custom LSI chip to insure reliability and increase speed. They are communications multiplexers that allow four I/O to communicate to I/O communication ports on the AutoMate 20/20E processor unit. A Local Head also includes a power supply capable of supplying capable of supplying power to four full rails (64 points) of digital I/O modules.

Communication takes place between the processor and Local Heads at 250K baud over the 10-foor cable supplied. Parity is used to insure data integrity.

LED STATUS INDICATORS

- POWER – Incoming power is supplied to the power supply within specified ranges.
- COM – Communication is taking place between the processor and local head.
- RAIL FAULT 0 – Communication between the local head and Rail 0 has been disrupted.
- RAIL FAULT 1,2,3
- INPUT COMMUNICATIONS PORT – Communicates to processor
- I/O COMMUNICATIONS PORTS – Communicate to up to four I/O rails

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AutoMate 20/20E Remotely Mounted I/O

In some applications, it is necessary or desirable to mount the AutoMate Processor Unit at some distance from the field devices it controls. With the AutoMate 20/20E, it is possible to mount the digital I/O rails close to the field devices to minimize field wiring, yet be able to communicate with the processor unit mounted up to 1000 feet away. This is facilitated through the use of the AutoBus Interface Head and the AutoRail Interface. The AutoBus Interface Head is used in place of a Local Head and will support up to four digital I/O rails (64 I/O) connected directly to the four I/O COM ports on its face.

Two twisted-pair wires – up to 1000 ft. long – connect the AutoBus Head to an AutoRail Interface. The AutoRail Interface, in turn, is connected via the 42-inch I/O rail interconnect cable to one of the four communications ports on the AutoMate 20/20E Processor Unit.

Enhanced Memory Module – 45C98

The Enhanced Memory Module is a portable memory retention device that can be used with the Reliance Electric AutoMate programmable controllers and programming devices.

It allows the user to copy and store programs from the AutoMate PLCs and the programming devices. It retains the program as written, without battery backup. It permits downloading of the program to an AutoMate for execution, or to a programming device for editing, storage or documentation.

The compact size and simple operation of the Enhanced Memory Module make the program transfer as easy as pushing a button. There are no cables to connect, no special equipment to carry. A 25-pin D-shell connector on the unit connects to the serial communications port of AutoMate PLCs or the related programming devices.

The EEROM non-volatile memory is large enough to copy an AutoMate application program. Program integrity is preserved indefinitely when a program is stored in the Enhanced Memory Module.

To use an Enhanced Memory Module with an AutoMate programmable controller, connect the EMM to the PLC's serial communications port. To enter a program from the EMM into the AutoMate PLC, press the "Load" button on the EMM. Pressing the "Load" button a second time transfers communications parameters and places the AutoMate controller into RUN mode. To save a program from an AutoMate PLC, press the "Save" button on the EMM. Program transfer operations are indicated by the illumination of the COM DATA indicator on the AutoMate front panel. Program transfer takes approximately 10 seconds. The COM DATA light will go out when transfer is complete. To transfer a "saved" program from the EMM into a programmer, connect the EMM to the serial programming port and enter the standard "Save from AutoMate" command. The program is now available in the programmer memory for editing, documentation or storage on a disk. The program is also retained in the EMM. To load a program into the EMM that has been created or edited in the programmer, the standard "Load AutoMate" command of the programmer is used.

The Enhanced Memory Module connected to IBM PC creates an off-line programming system. The programming operation in this mode is exactly as if the computer were connected to an AutoMate PLC. Sequences can be created, inserted, deleted and modified in the EMM. The search, force, memory usage, clear memory and set R-NET address functions are also available. Once programmed, the EMM is ready for storage or loading into an AutoMate PLC. A separate power supply, Model 45C93, is required when operating the Enhanced Memory Module with the computer.



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AutoMate Programming Peripherals

Model Number	Description
45C98*	Enhanced Memory Module*
45C93*	Mini Programmer Power Supply
45C94*	Mini Programmer

For use with AutoMate 15, 20 and 30 only.

The 45C94 Mini Programmer is supplied with one 45C101 Programmer Interconnect Cable.

The Mini Programmer cannot be used to program the Enhanced AutoMate 30 (45C305A or 45C307A) or the AutoMate 40 but does not permit point and register monitoring/loading and supervisory functions (RUN, STOP, etc.).

The 45C93 Power Supply is required only when using the Mini Programmer or AutoMate Programming Executive and Enhanced Memory Module together as an off-line programming system.



R-NET – Industrial Network

As programmable controllers have become more cost effective and more powerful, a strong need has arisen for a simple, cost-effective means of communication between programmable controllers.

R-NET, Reliance Electric's Industrial Network, meets this need. The R-NET network provides a real time communications scheme for distributed control and centralized data gathering applications. The R-NET network allows 32 AutoMate PLCs and/or other special purpose devices to communicate with each other. The R-NET system is a baseband coaxial cable arranged in a multi-drop configuration. The R-NET network connects devices up to 6000 feet apart, easily accommodating typical industrial control applications.

Utilizing a token passing scheme, each network node controls the network node controls the network in turn and transmits for a certain maximum time. When the transaction is complete, the token is passed to the next node in sequence (specified by card front switches).

Because of the deterministic nature of the token passing scheme and a data rate of 800K baud, the R-NET network has the speed that is required to handle real-time control applications. An IBM compatible personal computer can be connected anywhere along the network to program/monitor any AutoMate PLC on the R-NET network using the R-NET link card.

Interfacing the AutoMate 30/40 to the R-NET network is as simple as plugging an R-NET network processor (45C202) card into the rack and connecting the network cable to it. The R-NET processor handles all network communications, thus freeing the AutoMate processor to perform other tasks. Data transfer between the processors occurs directly over Multibus module – not serially. The R-NET system is, therefore, superior to networks utilizing programming ports for serial communication between PLCs and network processors. Interfacing other devices (minicomputers, color graphics terminals, etc.) to R-NET is accomplished using available Reliance gateways. The R-NET gateway interface head (45C27) is a stand-alone communications processor that connects to foreign devices via RS-232, RS-422, or 20mA current loop. Messages to or from the foreign device are buffered and translated to R-NET protocol by the gateway.

The Process Control Gateway (45C29) is a communication processor that uses "MODBUS" protocol and provides a standard RS-232 interface.

The R-NET PC Link card (45C124) plugs into any IBM-AT compatible computer and allows many operator interface or programming terminal functions to be executed at network speed without RS232 bottlenecks.

The AutoMate Cable Redundancy Module (45C31) allows either the R-NET network or Remote I/O coax cables to be split into two separate paths to allow for possible cable breakage with no loss of communication.

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AutoMate - Programmable Logic Controllers

The AutoMate 30

A mid-size programmable controller with the power, flexibility, technology and architecture of much larger – and more expensive – controllers.

The AutoMate 40

AutoMate 40 is the large programmable controller with extra power to handle any control needs.

Power for Today

The AutoMate 30 controller is designed for use in applications ranging from simple relay replacement to complex control functions, including closed-loop control, ASCII message handling, and sophisticated data manipulation. The AutoMate 30 controller can be used to replace as few as 20 relays or as many as 40 analog PID loop controllers.

The AutoMate 40 provides additional I/O, memory, and processing power for even the most demanding situations. Typical AutoMate PC applications include material handling, machine tools and robotics, automated packaging and assembly machines, wood and paper processing, injection molding, welding machines and chemical/ petrochemical processing.

Flexibility for tomorrow

With the Automate 30 and AutoMate 40 controllers, you don't have to worry about running out of capacity to handle your control needs. The AutoMate 30 and 40 are members of the AutoMate Family of controllers – all of which share a common architecture, and which are built from a common set of control building blocks. And all of which communicate together over the R-NET Industrial Network. So if your control needs grow, so can your AutoMate PLC. You can plug in more processors to utilize multi-processing. You can network several AutoMate PLCs together to utilize distributed control. Or you can simply replace an AutoMate 30 processor with the larger AutoMate 40 processor. Ease of expansion and control flexibility – without fear of obsolescence.

State-of-the-art technology delivers state-of-the-art performance

The AutoMate 30 and AutoMate 40 controllers incorporate state-of-the-art technology to achieve a price/performance ratio and a standard of reliability far better than those of any PLC available in today's market.

Our unique multiprocessing architecture – based on the Intel Multibus* standard provides power and flexibility never before achieved in a programmable controller.

Four custom LSI integrated circuits have been designed specifically for use in the AutoMate PLC to increase performance and reliability.

The Motorola 68000* family of microprocessors has been used in time critical areas to maximize system speed.

The latest E2ROM and non-volatile RAM memory technologies have been incorporated to provide ease of use and insure reliable operation. State-of-the-art power semiconductor technology has been used in the I/O to achieve unmatched specifications.

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Diagnostics

The AutoMate 30 and 40 controllers have been designed around the philosophy of single point failure analysis, and therefore include the most complete set of internal self diagnostics available today. This philosophy states that "Any single point failure will not affect the operation of more than one output, or the failure will be detected and the system shut down."

The diagnostics included in the AutoMate 30 and 40 controllers are listed below:

Memory Checks

- On-Line Parity
- On-Line Background Checksums
- On-Line Background Pattern Test
- Power-Up Checksums
- Power-Up Diagnostic
- Off-Line User-Initiated Diagnostics

Bus Checks

- On-Line Checkerboard Patterns Test all Bus Lines

Processor Checks

- Watchdog Timer
- On-Line Logic Check Program

Communications Checks

- 6-Bit CRC Checksums on R-NET and Remote I/O
- Parity on Local I/O

The unique bus checking technique detects and traps any address or data bus line failures, data incorrectly written to more than one card, improper addressing, or most other difficult-to-detect bus failures.

AutoMate System Components

The AutoMate 30/40 system consists of the following basic components:

- Card Rack
- Power Supply
- Processor
- Local Digital I/O
- Local Numerical I/O
- Remote I/O
- Special Purpose I/O

Card Rack

The card rack is the basic unit always required in any AutoMate 30/40 system configuration. Populated with the correct cards, the assembly can stand alone as a controller, be located at a remote location and serve as a remote I/O subsystem, or become part of a network and communicate via the R-NET industrial network to other AutoMate PCs.

Maximum flexibility in system configuration is accommodated via the availability of seven card rack sizes as shown below:

Model Number	Description
45C310	6 Card Slots *
45C311	8 Card Slots *
45C312	10 Card Slots *
45C313	13 Card Slots ** (Panel Mounted)
45C314	13 Card Slots ** (Rack Mounted)
45C315	16 Card Slots **
45C316	19 Card Slots **

* These racks will accept N minus 2 cards if a 2-slot power supply is used or N minus 3 cards if a 3-slot power supply is used.

** These racks will accept N minus 3 cards if a 2 or 3 slot power supply is used.

N = Total number of available card rack slots.

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AutoMate - Programmable Logic Controllers

Power Supply

The power supply is a single plug-in circuit board, enclosed in a plated steel and black anodized aluminum (heatsink) housing. This unit provides all of the voltages necessary to power the logic circuitry contained on the cards that may be inserted into the card rack. In addition, voltages are provided to power the module logic circuitry in any directly connected rails. A terminal strip is included on the card faceplate for ease of input power wiring.

Power supplies are available to accommodate various current requirements as shown below:

Model Number	Description
45C321	20 amps 120/240V 50/60 Hz (2 card slots)
45C322	50 amps 120/240V 50/60 Hz (3 card slots)

Power Supply Features

- Overvoltage Protection
- Overcurrent Protection
- Power Up/Down Sequencing Logic to ensure proper controller operation
- LED STATUS INDICATORS
  - AC POWER ON – Incoming power is supplied to the power supply within specified ranges.
  - POWER SUPPLY READY – The power supply is producing all required voltages within specified ranges.
  - SYSTEM READY – No faults have been detected on any card within the system. Works in conjunction with Ready Relay.
- THREE POSITION KEYSWITCH
  - RUN – The program or status cannot be modified.
  - PROGRAM – The program and status can be changed. Variable data can be modified.
  - SETUP – The program or status cannot be changed. Variable data can be modified.
- TERMINAL STRIP
  - Ready Relay Contacts (N.O. and N.C.) – Drop out whenever a system error is detected.
  - 120/240 Selection Jumper
  - L1, L2 120/240 VAC Input Power
- Fuse
  - Type AGC

AutoMate Manuals

Model Number	Description
J-3016	AutoMate 15 User's Manual
J-3693	AutoMate 15E User's Manual
J-3120	AutoMate 20 User's Manual
J-3150	AutoMate 30/40 Programming Reference Manual
J-3110	AutoMate Hardware Reference Manual
J-3063	AutoMate Programming Executive (APX)
J-3674	AutoMate Documentation Executive
J2-3006	Rail I/O Manual
J2-3007	MultiBus I/O Hardware AutoMax/AutoMate
J2-3041	AutoMate Programming System

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AutoMate 30 Processor Card

The processor card is the key to the power, speed, and flexibility of the AutoMate 30 controller. When it is plugged into a rack with power supply and I/O, a stand-alone controller is created.

Three processor card variations are available, allowing the user to select the power and features required for the specific application.

Model Number	Description
45C301	4K X 16 Application Memory – Standard Software
45C305	4K X 16 Application Memory – Enhanced Software
45C307	8K X 16 Application Memory – Enhanced Software

The standard software executive provides for ladder diagram functions as well as the additional capabilities of five-function math, logical instructions, data manipulation, numerical I/O, subroutines, and table handling for advanced control tasks.

The enhanced software executive includes additional special purpose instructions for more sophisticated tasks such as file handling, ASCII communication, interprocessor communication, remote numerical I/O and PID control.

The AutoMate 30 Processor can communicate directly to four I/O ports for up to 64 digital or 16 analog I/O, or to four local heads for up to 256 digital or 64 analog I/O, or to any mix of I/O rails and local heads. Communications take place at 250K baud and the data integrity is insured using parity.

All versions of the processor card include the following features:

- Capability to Address
  - 512 Digital I/O, or 128 analog, or combinations
  - 512 Internal Coils
  - 1024 Registers
  - 128 Numerical I/O
  - 4K or 8K Non-volatile R/W Application Memory as described earlier
  - Truly Non-volatile R/W Memory for Variable Storage
  - 2.0 microseconds per ladder Instruction Execution Speed
  - Extensive On-Line Diagnostics as described earlier
  - Motorola MC 68008 Microprocessor solves advanced functions
  - Custom LSI Boolean Processor solves ladder diagrams at high speed
  - Intel Multibus Compatible
- STATUS INDICATORS
  - RUN – Application program is being executed
  - FORCING – Status of an input or coil is being overridden by the forcing function
  - READY – Processor is working properly within the limits of internal diagnostics.
  - RAIL FAULT – Communication between the processor card and an I/O Rail (or local head) has been disrupted.
  - COMM DATA – Data is being sent or received through the RS-232 communication port.
- RS-232 COMMUNICATION PORT
  - Programmer or host computer interconnection
  - 9600 baud, 8 data bits, no parity
  - Isolated from logic
  - On-Board power supply
  - DB25 Connector
- I/O COMMUNICATION PORTS
  - Connect up to 64 Digital or 16 analog I/O using I/O rails
  - Connect up to 256 digital or 64 analog I/O using local heads

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AutoMate - Programmable Logic Controllers

AutoMate 40 Processor Card

The added power of the AutoMate 40 controller requires two processor cards. The Standard AutoMate 40 controller consists of the 45C400 Logic Processor and the 45C410 Control Processor and will support up to 2048 digital I/O. The Enhanced AutoMate 40 controller (40E) is made up of the 45C400 Logic Processor and the 45C411 Enhanced Control Processor and will address up to 8192 digital I/O. For smaller complex applications, the AutoMate 40X consists of the 45C400 Logic Processor and the 45C409 Control Processor and will address up to 1024 digital I/O. All processor sets have 8K x 16 non-volatile application memory. Each processor set can be expanded to a maximum of 104K x 16 non-volatile application memory with the addition of up to two memory expansion cards.

All of the AutoMate 40 Processor sets have identical software programming features. These features include all software functions of the Enhanced AutoMate 30 controller plus additional instruction blocks for improved ASCII communications and string handling capabilities. The AutoMate 40 controller is capable of interrupt servicing. This permits the processors to leave the main application program scan to respond to real-time inputs.

Logic Processor

The 45C400 Logic Processor uses dedicated logic to solve ladder functions at extremely high speed. This processor has 4 I/O ports to communicate directly to four rails for up to 64 digital or 16 analog I/O, or to four local heads for up to 256 digital or 64 analog I/O, or to any mix of I/O rails and local heads.

Communications take place at 250K baud and data integrity is insured using parity. LED's are used for status indication.

Control Processors

The 45C409, 45C410 and the 45C411 Control Processors all use the Motorola 68000 microprocessors to perform the advanced software functions such as mathematics, data conversion, program flow control, ASCII communications and more. All Control Processors have an RS-232 communications port and LED status lights.

Memory Expansion Cards

Four sizes of memory expansion cards are available: .

Model Number	Description
45C270	8K Memory Expansion
45C271	16K Memory Expansion
45C272	32K Memory Expansion
45C273	48K Memory Expansion

One or two memory expansion cards of any mix can be used per AutoMate 40 Processor set to increase non-volatile application memory to a maximum of 104K x 16 (32K x 16 max with the 40X).

Local Rail I/O System

The AutoMate digital and analog rail I/O can be locally mounted at the processor rack or remotely mounted where needed on the machine or process. The AutoMate 30/40 controller utilize the field proven rail I/O hardware introduced with an AutoMate 15 controller and include the features that have made this I/O system the standard in the industry for cost effective, industrially rugged, highly reliable performance.

Local I/O Processor – 45C200

The local I/O Processor, also utilizing a custom LSI chip, allows up to 256 additional digital I/O to be connected to an AutoMate 30/40 master rack or remote I/O rack.

The Local I/O Processor can communicate directly to four I/O rails for up to 64 digital or 16 analog I/O or to a maximum of four Local Heads for up to 256 digital I/O, or to any mix of I/O rails and Local Heads. Communication takes place at 250K baud, and data integrity is insured using parity. The Local I/O Processor handles all the communications protocol and error checking, then makes the data available on MultiBus. Therefore these tasks are unloaded from the AutoMate 30/40 Processor – another example of multiprocessing.

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Analog Input Modules:

Current - 61C540 Voltage - 61C542

Analog inputs are wired to a separate termination panel (DIN rail or flat panel mounted). The termination panel communicates over a five foot cable to the Multibus input module. Cables are supplied with termination panels. All 16 channels of analog input can be accommodated on a single termination panel.

These modules can be mounted in either local or remote racks. An external power supply is required to supply the 4-20 mA transmitters on the current input card.

The cards feature:
- 16 channels of either voltage or current input
- Broken wire detection
- Running average 1-60 samples
- Square root extraction
- Scale or unscaled
- 4 alarm set points per channel (low low, low, high, high, high)
- 13 bit resolution plus sign
- Automatic calibration
- and can be used in local or remote racks.

Analog Output Cards

Analog cards are available to interface to a wide variety of signals.

45C360 – 4-20 mA
45C361 – 0 to 5 VDC
45C362 – 0 to 10 VDC
45C363 – +/- 5 VDC
45C364 – +/- 10 VDC

All cards feature:
- Eight Channels
- Electrical Isolation Analog to Logic
- 12-Bit resolution
- On-board Power Supply – Analog power can be supplied internally or externally
- 20-Terminal Removable Connector
- Internal Span & Zero Adjustment for each Channel
- Protective Housings

Register input/output cards

The register input and output cards available for interfacing to LED outputs, thumbwheel switch inputs, or other parallel binary/BCD logic signals. The cards can also be used where large numbers of low level digital I/O signals are required.

The card Model Numbers are:

45C380 – Register Input 45C381 – Register Output

All cards feature the following:

- Single channel direct or six-channel multiplexed (6 strobe signals)
- 16-Bit Data
- On-Board Power Supply
- Electrical Isolation Signal to Logic
- 24-Terminal Removable Connector
- Protective Housing
- TTL to 24 VDC logic levels
- Input interrupt available

Special Purpose I/O

Microprocessor-based I/O cards are another example of multiprocessing in the AutoMate 30/40 system. These special purpose cards solve dedicated control problems independently of the AutoMate processor. By removing the control tasks from the main processor and solving them in parallel, system scan time is reduced significantly.

Serial Communication Processor – 45C203

The Serial Communication Processor allows the AutoMate 30/40 controllers to interface to various peripheral devices such as CRTs, printers, host computers or other serial RS-232 or 20 mA asynchronous devices.

There are two modes of operation for the Serial Communications Processor. In the host computer mode, a terminal device can communicate to the AutoMate 30/40 processors and read or write I/O points, registers, memory, or controller status. In the program control mode, the AutoMate 30/40 controllers can send or receive ASCII messages under control of the user's application program.

The Card features:

- 3 Serial Communication Channels
- RS-232 or 20mA Signals
- Software Selectable Communication Parameters, Baud Rate, Parity, Etc.
- DB25 Connectors
- On-Board Power Supply
- Electrical Isolation – Signals to Logic

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Toledo Scale Communications – 45C207

The Toledo Scale Communications module is a microprocessor controlled, 3-channel serial communications device that allows the AutoMate 30 or 40 Programmable Controllers to access weight data from a Toledo Scale digital indicator. The 45C207 is compatible with the following Toledo Scale digital indicators:

- Model 8132
- Model 8140
- Model 8142
- Model 8530

In addition to being used for Toledo Scale communications the module can be used as a general-purpose serial interface as well.

Thermocouple Input Card – 61C605

The Thermocouple Input Card is an 8-channel analog A/D board for measuring temperatures. The board provides isolation, linearization, and cold junction compensation to up to 8 analog input signals. The features of the board include programmable registers for A/D converter, jumper-selectable cold junction compensation circuit and self-test capability with error messages.

Input Signal: Thermocouple

Type: J, K, T, S, B, E, R

RTD Input Module – 61C544

The sixteen pairs of measurement inputs are multiplexed to an instrumentation amplifier which drives a fourteen-bit A/D converter. This configuration measures the voltage drop across the selected RTD element. The RTD may be used in either local or remote racks. No external power supply is required for the RTDs.

The Card Features:

- 16 Channels of 100 Ohm platinum RTD input
- Converts to degrees Fahrenheit or Celsius
- 2-3-4 wire RTDs
- Broken wire detection
- Automatic calibration
- Local or remote racks
- No external power supply required
- Running average 1-60 samples
- 4 alarm setpoints per channel
- 12 bit resolution plus sign

Analog/Thermocouple Input Module – 61C613

The analog input module features 16 individually-isolated analog inputs capable of multiplexing signals from any combination of thermocouples and low or high level voltages. It must be used in conjunction with the 61C614 Thermocouple/Voltage Termination Panel.

The module provides automatic linearization and cold junction compensation for type B, E, J, K, R, and T thermocouples. Thermocouples may be read in either degrees Centigrade or Fahrenheit. Thermocouple inputs can be read as often as once every 110 msec. Thermocouple inputs require the use of the 61C614 Thermocouple/ Voltage Termination Panel.

Each analog input channel has 200 volt channel-to-channel isolation and 1000 volt isolation to logic common. Each channel may be independently configured to accept voltage ranges from +/- 12.5 mVolts through +10.0 Volts.

- Sixteen input channels
- Thermocouple, low level analog, or combination
- Automatic linearization and cold junction compensation
- Offset and span compensation for each channel
- 12-bit or 14-bit resolution (software selectable)
- Dual slope integrating A/D converter
- 200 Volt channel to channel isolation

Thermocouple/Analog Termination Panel - 61C614

The 61C614 Termination Panel contains the cold junction compensation circuits used for thermocouple readings into the 61C613 Analog input module. The panel offers a convenient terminal strip for direct thermocouple terminations as well as for analog signals. The 19” panel includes two 6 foot ribbon cables for connection to the analog input card.

64K Data Memory – 45C610

The 45C610 memory card allows the user storage of data register information. The card also features a real time clock and status indicators.

5 Channel Counter – 45C601

The 45C601 is a five-channel, high speed counter with up to 100 KHz frequency input. Applications include event counting, frequency counting and period measurement. A debounce circuit is provided on the inputs for contact closure inputs. Each channel is optically isolated.

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Remote I/O

The AutoMate 30/40 system includes the capability of remotely mounting digital or numerical I/O. This allows the I/O to be mounted wherever needed on the machine or process, thus eliminating wiring and saving money. Up to 12 remote subsystems can be connected to an AutoMate 30 controller and up to four groups of 32 remote subsystems (with a maximum of 80 total digital I/O drops) can be connected to an AutoMate 40 controller in a master/slave multi-drop configuration. Communication takes place at 800K baud standard coaxial cable. The maximum distance (up to 6000 ft.) allowed is determined by the type of cable used.

Remote I/O Processor – 45C201

The Remote I/O Processor provides the means for communicating to remotely mounted I/O. When placed in the AutoMate card rack, the Remote I/O Processor serves as the master in the remote I/O communication scheme. The card receives data from devices on MultiBus, transmits it to the proper remote subsystems, receives the response data, and makes that data available to devices on module. All communications protocol and error checking are handled by the card so that the AutoMate 30/40 processor is not burdened with remote I/O update.

The Remote I/O Processor can also serve as a slave, when placed in a rack that does not contain an Automate 30/40 processor. This rack then serves as a remote I/O subsystem. The various numerical I/O cards previously described can be placed in the remote rack to achieve remote numerical I/O. A local I/O Processor can be used along with rails and modules for remote digital I/O. In this mode the card receives data from the master, updates the output cards in the rack, and send the data from the input cards back to the master.

Remote I/O Interface – 45C37

The Remote I/O Interface (or remote I/O head) is used in conjunction with I/O rails and digital I/O modules to create a digital I/O subsystem. A maximum of four I/O rails can be connected to a remote head for up to 64 digital I/O, or a maximum of four local heads can be connected if up to 256 digital I/O are required. The remote head receives data from the remote I/O processor in the master rack, updates the modules in the I/O rails, and then transmits the data back to the master.
The remote head also includes a power supply capable of supplying power to four full ports of digital I/O modules. Two versions of the head are available based on the input power supplied: 45C37 for 120/240 VAC operation or 45C38 for 24 VDC operation.

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AutoMate - Programmable Logic Controllers

Model Number	Description	List Price
*45C1	I/O RAIL	(1)
45C124	R-NET PC LINK	(1)
45C130	AUTOMATE PROGRAMMING EXECUTIVE – VERSION 4.0	(1)
45C134	AUTOMATE PROGRAMMING SYSTEM – APS	(1)
45C140	AUTOMATE PROGRAMMING EXECUTIVE – VERSION 4.0 UPGRADE	(1)
45C15	AUTOMATE 15 120/240 VAC	(1)
45C16	AUTOMATE 24/48 VDC	(1)
*45C166	DUAL CONTACT OUTPUT MODULE (N.O)	(1)
45C17	AUTOMATE 15 WITH R-NET 120/240 VAC	(1)
*45C175	8 TERMINAL CONNECTOR	(1)
*45C176	20 TERMINAL CONNECTOR	(1)
*45C2	I/O RAIL MOTHERBOARD	(1)
45C20	AUTOMATE 20 120/240 VAC	(1)
45C200	LOCAL I/O PROCESSR	(1)
45C201	REMOTE I/O PROCESSOR	(1)
45C202	R-NET PROCESSOR	(1)
45C203	SERIAL COMMUNICATIONS PROCESSOR	(1)
45C204	REDUNDANCY PROCESSOR	(1)
45C207	TOLEDO SCALE COMMUNICATION CARD	(1)
45C220	AUTOMATE 20 WITH R-NET 120/240 VAC	(1)
45C224	AUTOMATE 20E 120/240 VAC	(1)
45C225	AUTOMATE 20E WITH R-NET 120/240 VAC	(1)
45C233	AUTOMATE 15E WITH R-NET 24/48 VDC	(1)
45C27	R-NET GATEWAY INTERFACE, 120/240 VAC	(1)
45C270	8K MEMORY EXPANSION	(1)
45C271	16K MEMORY EXPANSION	(1)
45C272	32K MEMORY EXPANSION	(1)
45C273	48K MEMORY EXPANSION	(1)
45C29	PROCESS CONTROL GATEWAY HEAD, 120/240 VAC	(1)
*45C3	I/O RAIL JUMPER BAR KIT	(1)
45C301	STANDARD PROCESSOR – 4K MEMORY	(1)
45C305	ENHANCED PROCESSOR – 4K MEMORY	(1)
45C307	ENHANCED PROCESSOR – 8K MEMORY	(1)
45C310	6 SLOT AUTOMATE RACK	(1)
45C311	8 SLOT AUTOMATE RACK	(1)
45C312	10 SLOT AUTOMATE RACK	(1)
45C313	13 SLOT AUTOMATE RACK	(1)
45C314	13 SLOT AUTOMATE RACK – CABINET MOUNT	(1)
45C315	16 SLOT AUTOMATE	(1)
45C316	19 SLOT AUTOMATE RACK	(1)
45C321	20 AMP AUTOMATE POWER SUPPLY	(1)
45C322	50 AMP AUTOMATE POWER SUPPLY	(1)
45C33	DCS REMOTE HEAD	(1)
45C330	FAN KIT – 6 SLOT RACK	(1)
45C331	FAN KIT – 8 SLOT RACK	(1)
45C332	FAN KIT – 10 SLOT RACK	(1)
45C333	FAN KIT – 13 SLOT RACK	(1)
45C334	FAN KIT – 13 SLOT RACK – CABINET MOUNT	(1)
45C335	FAN KIT – 16 SLOT RACK	(1)
45C336	FAN KIT – 19 SLOT RACK	(1)
45C340	8 CHANNEL ANALOG INPUT 4-20 MA	(1)
45C341	8 CHANNEL ANALOG INPUT 0-5 VDC	(1)
45C342	8 CHANNEL ANALOG INPUT 0-10 VDC	(1)
45C344	8 CHANNEL ANALOG INPUT ± 10 VDC	(1)
45C35	AUTOBUS INTERFACE HEAD, 120/240 VAC	(1)
45C360	4-20 MA ANALOG OUTPUT – 8 CHANNEL	(1)
45C361	0-5 VDC ANALOG OUTPUT – 8 CHANNEL	(1)
45C362	0-10 VDC ANALOG OUTPUT – 8 CHANNEL	(1)
45C363	± 5 VDC ANALOG OUTPUT – 8 CHANNEL	(1)

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Model Number	Description	List Price
45C364	± 10 VDC ANALOG OUTPUT – 8 CHANNEL	(1)
45C37	REMOTE I/O HEAD, 120/240 VAC	(1)
45C380	REGISTER INPUT CARD – 16 BIT	(1)
45C381	REGISTER OUTPUT CARD – 16 BIT	(1)
*45C4	I/O RAIL CABLING CHANNEL KIT	(1)
*45C40	DUAL 115 VAC/DC INPUT MODULE	(1)
*45C42	DUAL ELECTRONIC INPUT MODULE	(1)
*45C43	DUAL 230 VAC/DC INPUT MODULE	(1)
*45C44	DUAL 24 VAC/DC INPUT MODULE	(1)
*45C46	VOLTAGE COMPARATOR INPUT MODULE	(1)
45C400	LOGIC PROCESSOR	(1)
45C409	A40X CONTROL PROCESSOR	(1)
45C410	A40 CONTROL PROCESSOR	(1)
45C411	ENHANCED CONTROL PROCESSOR	(1)
*45C5	I/O RAIL INTERCONNECT CABLE	(1)
*45C60	DUAL 115 VAC, 2A OUTPUT MODULE	(1)
*45C62	DUAL 230 VAC, 2A OUTPUT MODULE	(1)
*45C63	DUAL 24 VDC, 2A OUTPUT MODULE	(1)
*45C65	DUAL 115 VDC, 2A OUTPUT MODULE	(1)
*45C66	DUAL CONTACT OUTPUT MODULE (N.O.)	(1)
*45C67	DUAL 24 VAC, 2A OUTPUT MODULE	(1)
*45C68	DUAL 250 VAD, 0.5A OUTPUT MODULE	(1)
*45C69	DUAL DRY CONTACT OUTPUT MODULE (N.O.)	(1)
45C601	5 CHANNEL COUNTER	(1)
45C610	64K DATA MEMORY	(1)
*45C630	TWS INPUT MODULE	(1)
*45C631	LED OUTPUT MODULE	(1)
*45C70	COAX BNC TEE CONECTOR (2 PER PACKAGE)	(1)
*45C71	COAX BNC 75 OHM TERMINATING LOAD (2 PER PACKAGE)	(1)
*45C72	COAX BNC MALE CONNECTOR (5 PER PACKAGE)	(1)
*45C8	LOCAL HEAD INTERCONNECT CABLE	(1)
45C94	MINI PROGRAMMER	(1)
45C95	MONITOR/LOADER PANEL	(1)
45C97	AUTORAIL INTERFACE	(1)
45C98	ENHANCED MEMORY MODULE	(1)
45C99	TOLEDO SCALE EMM	(1)
*61C22	LOCAL HEAD 115 VAC	(1)
61C23	LOCAL HEAD VDC	(1)
61C326	I/O SAVER – RAIL I/O TO PLC INTERFACE	(1)
*61C345	4-20 MADC ANALOG RAIL, 4 INPUT CHANNELS	(1)
*61C346	0-10 VDC ANALOG RAIL, 4 INPUT CHANNELS	(1)
*61C350	0-10 VDC ANALOG RAIL, 2 IN/2 OUT CHANNELS	(1)
*61C351	4-20 MADC ANALOG RAIL, 2 IN/2 OUT CHANNELS	(1)
*61C365	4-20 MADC ANALOG RAIL, 4 OUTPUT CHANNELS	(1)
*61C366	0-10 VDC ANALOG RAIL, 4 OUTPUT CHANNELS	(1)
*61C540	4-20 MADC ANALOG INPUT MODULE, 16 CHANNEL, (REQUIRES *61C549 OR *61C550)	(1)
*61C542	+/- 10 VDC ANALOG INPUT MODULE, 16 CHANNEL, (REQUIRES *61C547 OR *61C548)	(1)
*61C544	RTD ANALOG INPUT MODULE, 16 CHANNEL, (REQUIRES 2 EACH *61C545 OR *61C546)	(1)
*61C545	RTD CONNECTOR/TERMINAL, 8 CHANNEL, PANEL MOUNTED WITH 60 CABLE	(1)
*61C546	RTD CONNECTOR/TERMINAL, 8 CHANNEL, DIN RAIL MOUNTED WITH 60 CABLE	(1)
*61C547	+/-10 VDC CONNECTOR/TERMINAL, 16 CHANNEL, PANEL MOUNTED WITH 60 CABLE	(1)
*61C548	+/-10 VDC CONNECTOR/TERMINAL, 16 CHANNEL, DIN RAIL MOUNTED W/60 CABLE	(1)
*61C549	4-20 MADC CONNECTOR/TERMINAL, 16 CHANNEL, PANEL MOUNT WITH 60 CABLE	(1)
*61C550	4-20 MADC CONNECTOR/TERMINAL, 16 CHANNEL, DIN RAIL MOUNT W/ 60 CABLE	(1)
*61C605	THERMOCOUPLE INPUT MODULE, 8 CHANNEL	(1)
*61C613	16 CHANNEL LOW LEVEL ANALOG INPUT MODULE, (REQUIRES *61C614)	(1)
*61C614	THERMOCOUPLE/LOW LEVEL VOLTAGE TERMINATION PANEL, 16 CHANNEL	(1)

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