Gould
Micro 84 Programmable Controller

USER'S MANUAL

SUBJECT: Description of the MICRO 84 Programmable Controller and the information necessary to configure, install, and program a control system.

SPECIAL INSTRUCTIONS: This manual supercedes the version dated August, 1984.

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Gould Inc.
Industrial Automation Systems Group
1 High Street
North Andover, MA 01845

PREFACE

This manual contains instructions for installing and programming the Micro 84 Programmable Controller. Section 2 describes the system components: controller, input/output modules, and programming devices. Installation is outlined in Section 3. System checkout is described in Section 4. Section 5 details the theory of operations. The P370 Programmer is described in Section 6 and programming procedures are given in Section 7. The P371 Program Pack, a device for transferring user programs is described, in Section 8. Four appendices, A through D, list error codes, supply programming examples, define terms, and give information on I/O modules.

RELATED PUBLICATIONS

ML-M84A-REF	Reference Card
PI-M84A-001	Programming Guide /P190
PI-J375-002	J375 Modbus Interface
PI-J378-002	J378 Modem

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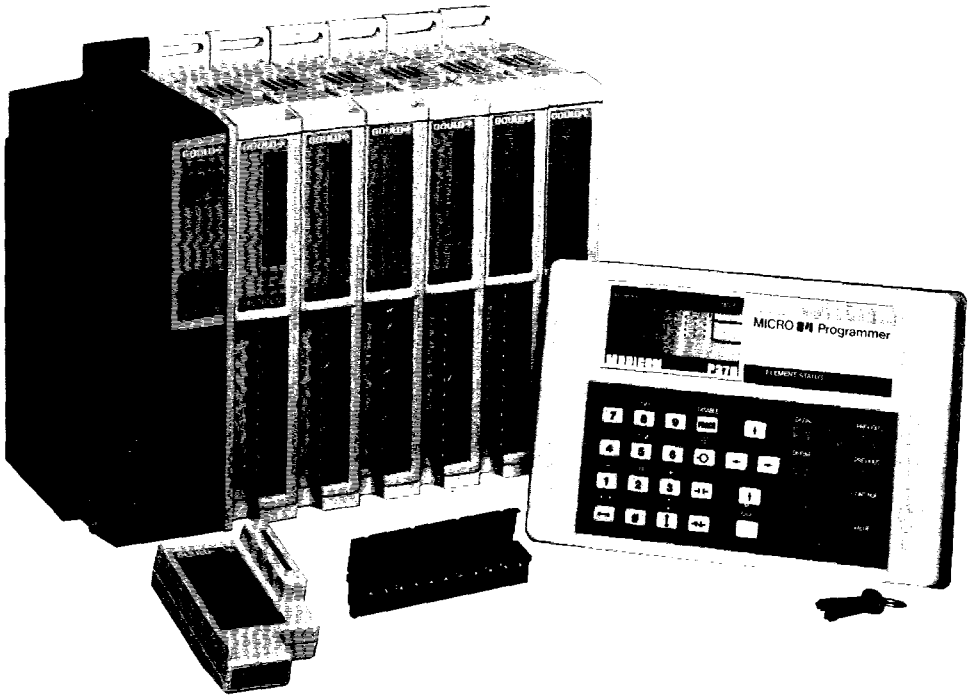

In an industrial environment, relays and solid-state electronic devices are used to provide the necessary control signals for control system applications. A relay can be either an electro-mechanical device or a solid-state electronic device that is "hardwired" to perform a particular function. When the application in which an electro-mechanical device is used is changed, the device must be modified (from normally closed to normally open, for example). In the case of a "hardwired" device, it must be replaced with one that is tailored to the application.

A programmable controller (PC) is a solid-state device that directly replaces the relays and "hardwired" electronic circuitry. A programmable controller can be quickly modified to adapt to a new or changed application. Gould introduced programmable controllers in the late 1960's. The first user was the automobile industry. Programmable controllers allowed them to avoid the time and expense of rewiring relay control systems at model changeover. Since then, the use of programmable controllers has expanded to cover a wide variety of industrial control system applications. Typical control system applications include machines used in cutting, grinding, and welding metals; equipment for assembling, packaging, and testing components and finished products; machinery for weighing, transferring, and otherwise handling materials; and systems for processing chemicals and foods.

The MICRO 84 is a microprocessor-based programmable controller designed to replace relay control systems that require 6 to 60 relays. In addition, the MICRO 84 provides the following benefits:

- Less expensive than an equivalent relay network
- Easily programmed using simple relay ladder diagrams
- Small—fits in an 8" deep NEMA 12 enclosure
- Simple to install
- Easy to use and maintain
- Designed for use in an industrial environment
- User program remains intact even if power fails
- Non-volatile memory (no battery required)

SECTION 2
SYSTEM CONFIGURATION

A typical programmable controller is divided into three components as shown in Figure 2-1. These components are the controller, the input/output modules, and a programming device. The programming device is the interface between the user and the programmable controller. The user program, located in the controller's memory, is entered using the programming device.

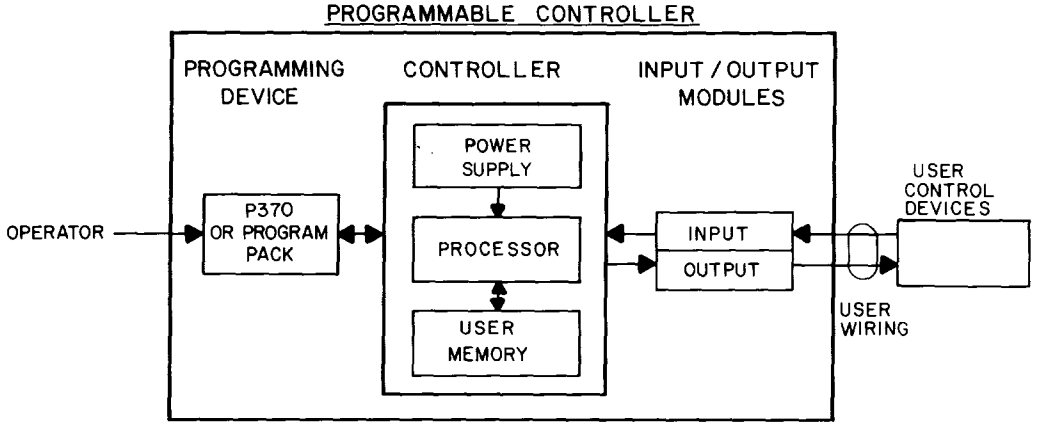

Figure 2-1. Programmable Controller, System Basic Block Diagram

2.1 CONTROLLER

The controller of the MICRO 84 system contains the processor, user memory, and the power supply.

2.1.1 Processor

The processor, the "brain" of the system, is a microprocessor-based system designed to replace relays, counters, timers, and sequencers. The main purpose of the processor is to use the user program and continuously monitor the status of all input signals from the control devices and to change the output signal to a device, if required. The processor can also perform arithmetic computations (addition and subtraction).

2.1.2 User Memory

A portion of the processor is designated for use by the user's logic program. It is in this area that the relay ladder diagram logic is stored. Once the ladder diagram program is entered into memory, it remains there until deliberately changed by the user. The program is not altered by power failure or power off conditions. The P370 Programming Panel is attached, through a cable, to a connector on the controller housing. This allows entry of instructions and data and also permits previously entered information to be monitored and changed.

2.1.3 Power Supply

The Micro 84 can include either an AC or DC power supply. The options are listed below by controller part number:

AS-M84A-001 or -002	M84A with AC Power Supply
AS-M84A-101 or -102	M84A with DC Power Supply

The AC power supply operates on 115 VAC, or 220 VAC, 50/60 Hz. The appropriate voltage is jumper selectable (see Section 3). The DC power supply operates on 24 VDC. No adjustment or maintenance of the power supply is required. A lamp indicates power-ready status. No external cooling is required; however, free air circulation must be provided. The power supply has sufficient capacity to operate the P370 Programming Panel, the input/output modules, and the processor.

2.2 INPUT/OUTPUT (I/O) MODULES

A MICRO 84 Programmable Controller can communicate with up to 112 input and output points. I/O modules are either input or output and are discrete, register or analog. Each module can be connected to eight I/O points. The controller can handle a maximum of fourteen I/O modules. (See the configuration rules listed below for basic and expanded systems.) The input modules contain the circuitry required to convert incoming voltages to signal levels compatible with the processor. The output modules contain the circuitry required to convert processor signal levels to levels compatible with the devices being controlled. All input and output module circuits are optically isolated from the internal controller circuitry and therefore can withstand severe voltage transients without damage to the controller.

2.2.1 Module Characteristics

The simplicity of interlocking the I/O modules together represents a major savings in time for both the assembly and programming of the system when compared to competitive systems. A wide variety of I/O modules are offered. Each is designed to be an output driving or an input handling circuit.

The controller and I/O units are designed to operate in an industrial environment; they operate in locations where electromagnetic noise, high temperature, humidity, corrosive elements, and mechanical shock are prevalent.

2.2.2 Module Addressing

The terminal connections on the front of the I/O modules are associated with both an address in the processor (the reference number) and a specific piece of user equipment. To communicate, the processor selects the module address needed during operation. The proper addressing order is accomplished internally by the processor according to the module type and its physical location. The closer to the processor, the lower the module circuit address. This allows the installation of additional modules without repositioning the existing modules.

2.2.3 I/O Configuration Rules

Before configuring the I/O module portion of your Micro 84 PC system, refer to the serial number of the PC. If the PC serial number ends with "A", it is an expanded system. Follow the configuration rules in Section 2.2.3.2. If the PC serial number does not have an "A" suffix, it is a basic system. For basic systems, follow the configuration rules in Section 2.2.3.1. Contact your distributor or local sales office for information on upgrades.

2.2.3.1 I/O Configuration Rules - Basic System

A Micro 84 Basic System has either 13 mixed I/O modules or 8 discrete I/O modules. The 13 mixed modules can be discrete, register, and analog modules, according to the following limitations.

a) A maximum of four B370 BCD Register Output **or** B374 4-20mA Analog Output Modules may be installed on one system.

b) A maximum of one B371 BCD Register Input, one B373 0-10VDC Analog Input, **or** one B375 4-20mA Analog Input Module may be installed on a system.

c) A maximum of 4 discrete input and 4 discrete output modules may be installed in one system.

2.2.3.2 I/O Configuration Rules - Expanded System

A Micro 84 Expanded System supports up to fourteen 300 Series I/O Modules, subject to the following configuration rules.

a) The maximum number of discrete inputs and outputs combined cannot exceed 112.

b) A maximum of 14 discrete modules may be installed in one system. A maximum of eight discrete input or eight discrete output modules is allowed.

c) A maximum of 2 analog or register input modules may be installed on one system.

d) A maximum of 4 analog or register output modules may be installed on one system.

e) Analog or register modules must be physically mounted to the right of all discrete modules (see Figure 2.2).

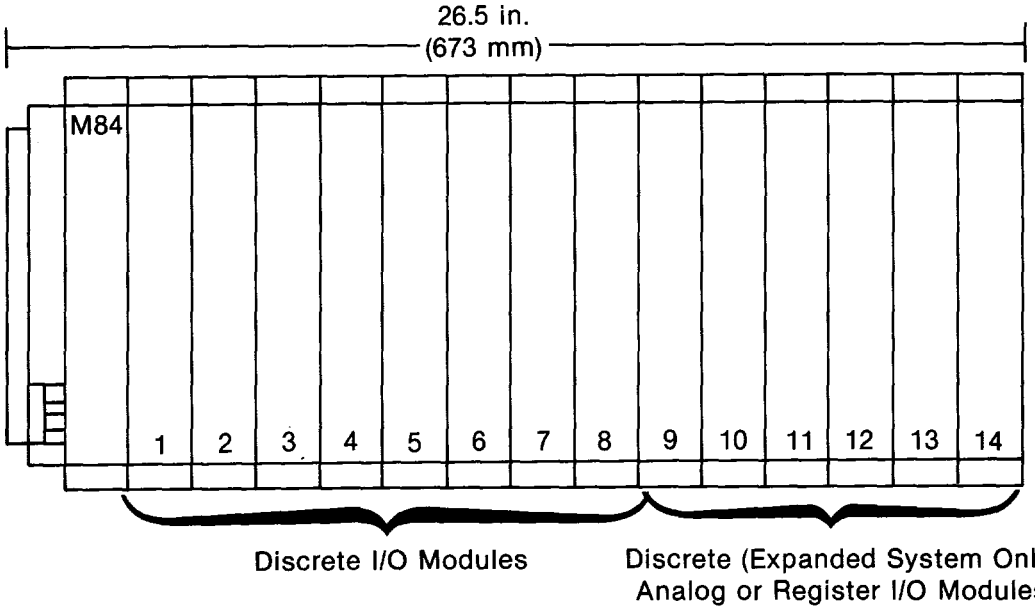

Figure 2-2. Expanded System Configuration Diagram

Surge withstand specifications for a configuration with more than 8 modules of any type is 1000 VRMS. If a system has 8 or less modules which are mixed discrete and register, the surge withstand rating is 1500 VRMS. Systems having a configuration with 8 or less discrete modules have a surge withstand rating of 2500 VRMS (IEEE 472-1974, ANSI C37.90a).

NOTE

When recording and then reloading a program into the same controller, remove the P371 Program Pack and then reinsert it before loading the program. This procedure prevents the occurence of false error conditions.

2.3 PROGRAMMING DEVICES

The principal peripheral devices which allow the user to interface with the MICRO 84 Programmable Controller are the P370 Programming Panel and the P371 MICRO 84 Program Pack.

2.3.1 P370 Programming Panel

The P370 Programming Panel incorporates a function keypad and a liquid crystal display (LCD) in a rugged, compact case. This facilitates hand-held operation at the controller site. The programming panel connects to the MICRO 84 Controller and provides a simple method of programming the user memory from a ladder diagram. The "language" used to program the controller utilizes familiar relay symbols; there is no requirement to learn a programming language. In addition, the LCD readout allows rapid and easy system checkout and maintenance. See Section 6.

2.3.2 P371 Program Pack

The program pack incorporates a memory identical to the user's portion of the controller memory. Once a program is loaded into user memory, a copy of that program can be loaded into the program pack for storage. The program in user memory is left intact. Once the program pack is loaded with a program, that program can be reloaded into the same MICRO 84 or another one that is to perform the same functions. Loading a program into the program pack is controlled using the P370 Programming Panel. Loading a program into a MICRO 84 is controlled from the programming pack. See Section 8.

NOTE

When recording and then reloading a program into the same controller, remove the P371 Program Pack and then reinsert it before loading the program. This procedure prevents the occurence of false error conditions.