

Badger Alarm and Control,



THE 481A ALARM AND CONTROL SUPERVISORY SYSTEM

The 481A Alarm monitoring and control systems are the culmination of over 30 years experience in the design and production of automated telecommunications maintenance systems. The 481A Series of Supervisory Systems provide rapid and continuous monitoring of network status through remotely located Remote Terminal Units, reporting to a centrally located master station.

The 481A Master may communicate with the 481 Series Remote Terminal Units (RTU) over dedicated RS-232, RS-422 or FSK or Bell 202 communications facilities. On dedicated facilities, polling is automatic. When addressed, the remote stations report any change in status at all alarm points. The master continuously checks each remote to verify system integrity

The 481A Master provides continuous and automatic monitoring of up to 254 remote units, each with a maximum of 32 alarm status points and 16 control outputs. When an alarm condition occurs, fault data is transmitted from the remote unit to the master station operator. The master maintains a COS (change of Status) screen for automatic display of all alarm activity by user-assigned priority. In addition, the operator may selectively scan any specified remote for alarm conditions and measured analog voltage.

Both momentary and latching remote controls may be executed from the master station for the immediate correction of many fault conditions. By operator selection, any control point may be operated in either the momentary or latching mode. The operator may read the condition of remote controls at will.

A menu system allows simple configuration of data base information to specify alarm point names and priorities, analog threshold values, and control point names. Once configured, the 481A Master automatically provides reliable, rapid monitoring of network fault conditions.

Typical Monitoring Applications

The 481A Series Systems can address a wide range of both public and private network supervisory applications. These flexible, field-expandable systems meet a variety of needs in many fields such as ILEX/IOCs, pipeline, transportation, private networks and water and electric utilities. With the appropriate transducers, the 481A-system monitors and controls transmission and switching parameters, environmental conditions, intrusion and security, and remote site support systems such as station battery and generators.

REPORTS

In addition to automatically updated change-of-status information, the operator can request by menu or by function key. Reports are available as both screen display and printed copy.

The reports available include the following:

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- * Listing of all "standing" alarms
- * History of recent alarm activity (80 events)
- * Status of all alarm and control points at a specified remote station
- * Master Station configuration
- * Configuration of alarm and control points at any remote station.

Available operational modes of the 481A Master Station are:

- * COS - Change of Status, two line report for both Analog and Bistate COSs.
- * Status - The operator may choose to camp-on a selected remote station to observe status changes in real-time.
- * Cutout - The operator may selectively disable reporting of alarm conditions at remotes and monitoring points at a remote station.
- * Control - After password entry, the operator may set up and execute up to 16 remote control relays at a selected remote station. The current control status is read from the remote and displayed at the master. Upon execution of remote controls, a verification signal is displayed.

Features of the 481A include:

- * Automatic and continuous polling of up to 254 remote stations to ensure uninterrupted collection of all alarm conditions as they occur.
- * Compatible with all Badger 481 series remote units and all 400 Series master stations on a common network.
- * Flexible communications including FSK and RS232 for applications in analog and digital networks.
- * Ideal as a stand-alone monitoring system for small networks, or as a subsystem within larger network management applications.
- * Download of Remote (M001785 only) Station Parameters.
- * Easy to use

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- * Password protected access to remote control functions.
- * Printer included for hard copy output of alarm and control activity.
- * Camp-on (single station) real time status monitoring - at operator selected remote station.
- * Four Level Alarm Priority assignments - on a point-by-point basis.
- * Audible alarm produces distinct tones on major and minor alarms.
- * Operator selectable cutouts - to disable remote station(s) and individual alarm points.
- * Measured voltages - from analog monitoring points are displayed.

The 001785, 481 Analog Remote Terminal Unit

Regardless of the type of communications facility used, the RTUs perform remote data acquisition through three types of "alarm inputs". With the basic 001785, both Bi-state (contact closure) and analog inputs are available. The base 001785 includes 16 alarm inputs that are individually user-assigned as either bi-state or analog input types. Additional 16 bi-state inputs may be added, as may either 8 or 16 control outputs.

Analog alarm inputs are ideal for both housekeeping and transmission status monitoring on both cable and radio networks. When these inputs are designated as bi-state, any contact closure activation will cause a Change-of-State indication. When designated as "analog" inputs, actual voltages are measured at the desired monitoring point. Both upper and lower threshold limits are set by the system user to define normal and off-normal conditions. When the measured voltage exceeds the threshold, an alarm indication is generated. A level of alarm filtering is provided at the RTU through the use of "alarm delays". For each alarm input, a delay may be set (0ms to 20min) to filter out transient alarm indications. When the threshold is exceeded, an alarm indication will be generated at the RTU, but transmission of an alarm message to the master station will not occur unless the out-of-limits condition persists beyond the preset alarm delay time. When the message is transmitted, the alarm indication, along with the actual voltage measured is available to the system user at the master station.

Control relays may be activated remotely from the master station to provide a first level of maintenance without the need for repair personnel on-site. When the user selects the remote control function, the master first reads the current status of control relays at the RTU. After entry of password, the user may elect to set-up and execute additional controls.

To ensure that no false controls are sent, the master requires verification of the user's intention to activate controls before actual execution. Control relays may be assigned by the user as either momentary or latching activation, depending on the application. All relays are from C and

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magnetically latching to ensure that the relays will remain in a known state even in the event of a power source failure at the RTU.

Field Expansion Capabilities

The modular design of the 001785 RTU allows the supervisory system to grow easily as network management needs expand. The base unit is a 1-3/4" H X 19" W shelf that contains the shelf processor and power supply, communications card, alarm cards in increments of 16 inputs, and control relays in increments of 8. Addition of alarm inputs or control relays within a shelf is a simple matter of plugging in additional cards as required. If monitoring demands at a site are greater than the capacity of a single shelf, up to 7 additional shelves may be added to the base unit, and share a single communications facility. This provides a total of 256 alarm inputs and 128 control outputs from a single base unit. Of course, if even more monitoring and control points are required, additional base units and expansion shelves may be installed.

RTU-to-Master Communications

Communications between the master and the RTU utilizes a highly secure protocol to ensure that no false alarms will be generated. The protocol provides Cyclic Redundancy Check (CRC) and Longitudinal Redundancy Check (LRC) as well as parity checks. Individual addressing ensures that each remote will transmit alarm data only when appropriate.

Polling

The master station transmits a "command" message to the installed network of remote stations. All remote stations hear all commands (called a "party line"), but only one remote station address is transmitted for each poll cycle, one at a time. The database of the master station contains the addresses of all remote stations the user has installed and stored. The master uses this poll list to determine which remote stations to poll/ignore and in what order (priority). The user has the option of removing an RTU(s) from the poll list by the "Cutout" command in the master database. Each time a station is addressed, the master command message is asking two questions of the remote:

- "Are you there?" if no response is received within a particular period of time; a station failure is displayed at the master. User entries in the database define the number of times the remote is polled for a response before a failure is determined.
- "Do you have any Changes of State for transmission?" The transmission of the remote address and possible alarm activity to the master from the remote is called a "response". The polled remote station responds to the master, indicating whether or not a COS has occurred since the last poll and if so, the alarm data is transmitted to the master station.

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The automatic/continuous polling of the remote stations is the normal (default) mode of a 481A Master Station alarm and supervisory system. The master sequentially in accordance with the user entered database parameters polls the remote stations.

If a particular remote station has an abundance of alarm activity, the "Select Scan" mode continues to report real-time status of that particular remote between polling the rest of the RTU network at the ratio of 1:1.

Optional Derived Alarms and Automatic Controls

Also, provided at the 001785 RTU is a means of generating a higher level of status indications using the "derived alarms" technique. The user may configure equations consisting of physical data from monitoring points (bi-state or analog) as operands with Boolean operators. When the specified conditions are present on the monitoring inputs for a predetermined length of time in the specified combination, a "virtual" alarm message will be generated. This virtual message may be assigned any description by the user to indicate that the pre-selected combination of events has occurred on the network. Associated with each message may be recommended action to be performed by the operator or by the supervisory system.

When virtual or physical alarm inputs indicate that a pre-specified condition has occurred, automatic control activation can be effected. The user may program a set of conditions under which control relays may be activated.

Both derived alarms and closed-loop control is implemented at the 001785 RTU. For derived alarms, network conditions will be analyzed within a single RTU. Automatic Controls also are activated on a single RTU basis. The single RTU may activate a control based on data it has acquired even in the event of a communications break with, or failure of, the master.

Derived Alarms gives the supervisory system a higher level of intelligence on network conditions, and allow for the filtering of acquired data before transmission to the master. Automatic Controls provides an automatic system response for applications such as switching in alternate transmission elements or activating support systems.

Both derived alarm descriptions and closed loop control parameters are stored in the RTU. Loading these definitions into the RTU is accomplished from the Master station. In this arrangement, the system manager is able to configure the RTU with the conditions of the site and immediately verify the RTU operation.

Derived alarms and Closed loop control although a function of the 1785 RTU; it requires a download from either the 481A Master Station or the NetManager Station to enable these functions.

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