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RACO DATA ACQUISITION SYSTEM SPECIFICATIONS

December 1. 1993

Overall System Equipment and Operating Description:

The overall system shall consist of one or more Verbatim voice/data RTU s (see separate RTU specifications), and a Central Station Computer with Raco system software, modem and printer. The RTU s shall communicate with the Central Station Computer, and in voice mode with personnel, using ordinary dial-up telephone lines. Systems requiring leased dedicated or specially conditioned phone lines shall not be accepted. The RTU shall be capable of functioning as an alarm system independent of the operation of the Central Station Computer.

In operation, the Central Station Computer shall call each RTU at programmable polling intervals to get periodic status reports of all functions being monitored. Additionally, if an alarm condition should occur at any RTU, that RTU shall place an alarm call to the Central Station and send an alarm status report. If the Central Station is manned when an alarm call is received the operator may elect to acknowledge the alarm. The Central Station shall also be programmable to automatically acknowledge the alarm. If the alarm is not acknowledged, the RTU shall go on to place alarm calls to a series of programmed phone numbers, giving the alarm report by digitized voice to personnel. Acknowledgement of the alarm report from the additional phone numbers shall be possible by Touch Tone command or by calling the RTU back.

Personnel may also call the dialer at any time from any phone to get a voice digitized report, or from the computer to get a screen and printed report. All remote dialer keyboard programming may be reviewed and changed from the computer, or from any phone using DTMF Touch Tone commands, except that any desired security access code must be initially established at the dialer keyboard only.

A. Central Station Equipment Specification

General Attributes of Central Station Software Program:

1. The Central Station software program shall provide color graphic screens and pulldown menus. Where practical, the program shall allow operator choices to be achieved by toggling among available choices rather than requiring keyboard typing of choices. Where the user enters values, the screen shall provide popup warnings if the entry does not fall within "legal" parameters.

Central Station Alarm Acknowledgement Settings:

2. The program shall allow convenient toggling between three acknowledgement modes: Central Station automatically acknowledges incoming alarms from RTU s; Central Station provides no acknowledgement; and Central Station allows the operator to directly acknowledge alarms when he is present and chooses to do so.

Naming Central Station, RTUs And Their Individual Input Channels:

3. The program shall provide convenient means for entering appropriate identifying names for the Central Station, for each RTU, and for each individual input channel for each RTU. Once entered, these identifying names shall appear in all screen and printed reports in lieu of generic default notations such as channel 1 .

Polling Operation:

4. The program shall allow entry of the phone numbers for the Central Station to use in calling the various RTU s in the system, and for setting the polling interval. In operation, the time and date and all status information from each polling call shall be automatically printed as well as archived to the computer s fixed disk for later retrieval. Convenient provision shall also be made for special polling calls on operator demand, to either a single specified RTU or to the entire system of RTU s, at the operator s choice.

Summary Reports:

5. The program shall allow the generation of summary reports of past report data archived on the fixed disk, for each RTU. The operator shall be able to specify the beginning and ending time and date span for each report, and whether the report is to include all events, alarms only, or polling reports only. Reports shall appear on the screen as well as being automatically printed.

   The printed reports include the following information:
   Station identification
   Date and time of report
   Calling status; i.e., alarm, polling, self-poll, etc.
   Contact channel alarm status
   Totalizer channel input totals
   Run-time channel input totals

RTU Programming From the Central Station:

6. The program shall allow for programming of each RTU from the Central Station. The starting point for programming operations for the RTU being programmed shall be menu selectable as:
   A. The RTU s current programming, obtained by automatically calling the RTU and uploading its complete current programming
   B. RTU default program values
   C. Programming already entered at the Central Station for the RTU but not yet actually downloaded to the RTU

   With the starting point selected, the program shall allow convenient entry of phone numbers for the RTU to call, alarm criteria or alternate configurations for each input channel (by toggling through available settings), various alarm delays and special programming items for the RTU. With the program entries completed, the Central Station shall on simple keystroke command call the RTU and automatically download the RTU programming changes.

Central Station Equipment Specifications:

7. The Central Station Computer shall be:

For systems with up to 16 RTUs

1 - IBM PS/2 Model 55 SX
    16MHz 803865X CPU
    31 MB Hard Drive
    1.44 MB 3½ Floppy
    VGA display port, IBM dual
    Async Adapter/A
1 - NEC Multisync 2A VGA Monitor
1 - Hayes 1200 Smartmodem
1 - Panasonic KX-P1180 Printer
1 - Cable for printer
1 - Cable for modem

For systems with 17 or more RTUs

1 - IBM PS/2 Model 70-061
    20MHz 80386 CPU
    60 MB Hard Drive
    1.44 MB 3½ Floppy
    VGA display port, IBM Dual
    Async Adapter/A
1 - NEC Multisync 2A VGA Monitor
2 - Hayes 1200 Smartmodem
1 - Panasonic KX-P1180 Printer
1 - Cable for printer
2 - Cable for modem

B. Verbatim RTU Equipment Specifications

Full Data/Voice Independent Dual Operation:

1. The RTU Data/Voice Autodialer shall be a solid state component capable of calling and being called by a Central Station Computer using Raco Data Acquisition Software (or approved equivalent). The same unit, without need for reconfiguration, shall also at any time be capable of calling or being called by personnel, whereupon a voice report shall be issued. In the case of alarm calls placed by the unit, the first number called shall be that of the Central Station Computer. Then, depending on whether the Central Station Computer is programmed to automatically acknowledge the call, follow up voice alarm calls shall placed to personnel. The programming operations described below shall be programmable at the unit s keyboard, from a remote Touch Tone phone, or from the Central Station Computer, at the user s choice. The unit shall be fully functional as an alarm system independent of the functioning of the Central Station Computer.

Communications Format:

2. Communications shall be in the standard Bell 212A format (1200 baud) with automatic fallback to Be1 103 format (300 baud). The RTUs shall be capable of both asynchrounous data and synthesized voice communications. Communication between the Verbatim RTU and the Central Station utilizes a RACO proprietary block mode transmission method with Cyclic Redundancy Checking (CRC-16) and Automatic Repeat Request protocol for error-free transmission.

Special Backup Communications Failure Alarm Function:

3. When the unit calls the Central Station Computer, if it should fail to establish proper connection, it shall terminate the call and make another attempt to reach the same number. If, after a programmed number of attempts no computer connection has been established, the unit shall go on to call personnel with a special Communication Failure Alarm message.

Phone Number Dialing:

4. The unit shall be capable of dialing up to 16 phone numbers, each up to 24 digits in length. Dialing shall be programmable as Rotary Pulse, Touch Tone, or High Speed Tone Dialing. Phone numbers and pauses in the dialing string shall be user programmable via the system s keyboard or Touch Tone phone, or the Central Station Computer. To accommodate PBX s, cellular phones and pager systems, the length of each pause shall also be programmable.

Solid State Voice Message Recording and Playback:

5. The unit shall have two different categories of speech message capability, both implemented with permanent non-volatile solid state circuitry with no mechanical tape mechanisms. The unit shall allow for message recording from a remote telephone as well as from the front panel, and shall at a minimum incorporate the following seven speech message attributes:
   A. User Field Recorded Messages: The user may record and re-record his own voice messages, for each input channel and for the Station ID.
   B. User recorded messages shall be retained intact in permanent, 10-year non-volatile memory in the event of AC or system battery failure or disconnection.
   C. There shall be no limit on the length of any particular message, within the overall available message recording time, which shall be 40 seconds for 4 channel units; 80 seconds for 8 channel units, and 160 seconds for 16 or more channels.
   D. The unit shall allow selective recording of both Normal and Alarm advisory messages for each input channel.
   E. The unit shall provide for automatic setting of the optimum speech memory usage rate for the total set of messages recorded, in order to achieve optimum recording sound quality.
   F. Circuit board switches or jumper straps shall not be acceptable means of manipulating message length or recording rates.
   G. Permanent Resident Non-Recorded Messages: Permanent built-in messages shall be included to support user programming operations, to provide supplemental warning messages such as advising that the alarms have been disabled, and to allow the unit to be fully functional even when the installer has not recorded any messages of his own.

Input Monitoring Functions:

6. The unit shall continuously monitor the presence of AC power and the status of four contact closure inputs. Unit shall optionally be field upgradable to incorporate a total of 8, 16, 24, or 32 dry contact inputs and 1, 4, 8, or 16 analog signals. AC power failure, or violation of the alarm criteria at any input, shall cause the unit to go into alarm status and begin dial-outs. The unit shall, upon a single program entry, automatically accept all the existing input states as the normal non-alarm state, eliminating possible confusion about Normally Open versus Normally Closed inputs. Further, as a diagnostic aid, unit shall have the capability of directly announcing the state of any given input as currently Open Circuit or Closed Circuit , without disturbing any message programming. Each input channel shall also be independently programmable, without need to manipulate circuit board switches or jumpers, as Normally Open or Normally Closed, or for No Alarm (Status Only), or for Pulse Totalizing, or for Run Time Metering, or completely disabled (omitted from all reports).

Run Time Meter Function:

7. Dry contact inputs (up to a total of 8 of the inputs) shall be programmable to accumulate and report the number of hours their respective input circuits have been closed. Any such inputs shall never cause an alarm, but on inquiry shall recite the channel's message according to the status of the input and then report the accumulated closed circuit time to the tenth of an hour. The input shall report up to a total accumulated running time of 99,999.9 hours before rolling over to zero. The initial value of the Run Time Meter shall be programmable to match existing instrumentation. Message recording shall allow customized voice messages of the general form "The lag pump is on. Run time is XXXXX.X hours".

Pulse Totalizer Function:

8. Dry contact inputs (up to a total of 8 of the inputs) shall be programmable to accumulate the number of pulses (momentary contact closures) occurring at the input. An alarm setpoint shall be programmable to create an alarm call upon reaching a particular total value. The input shall accept a pulse rate of up to 100 pulses per second. If the pulse rate exceeds 50 pulses per second, the pulses must have a 50% duty cycle. The Totalizer shall accumulate no less than 4,000,000,000 pulses before rolling over to zero. The initial value of the Pulse Totalizer count shall be programmable to match existing instrumentation. A programmable scale translation factor and voice message recording shall allow completely tailored voice reports in translated spoken units, of the general form "the total main valve water flow is XXXX.X million gallons".

Voice Reports During Inquiry Calls:

9. When personnel call the unit for voice reports, the station ID message plus the messages indicating the status of all input channels shall be spoken by the unit. The word "alert" shall be appended to the message for any channel detecting a violation which has not yet satisfied the Alarm Trip Delay for that channel. If no channels have any alarm status, the preamble "All channels normal" shall be spoken, to avoid the necessity of listening to all the channel reports. The unit shall also on command give a report of only those channels with some alarm status.

Voice Reports During Alarm Calls:

lO. When the unit calls personnel with voice reports, it shall provide the Station ID message plus, the system will report all four classes of active alarm inputs.

A. Unacknowledged Alarm; Input Signal In Alarm Condition - All inputs that have had their alarm criteria met and are actively in alarm status and have not been acknowledged.

B. Unacknowledged Alarm; Input Signal In Normal Condition - All inputs who have had their alarm criteria met and have not been acknowledged, but their input signal has returned to normal prior to acknowledgement.

C. Inputs in Alert; Input Signal In Alarm Condition - All inputs that currently have their alarm criteria violated but not long enough to have met the criteria established and have caused an alarm call.

D. Acknowledged Alarms Inputs; Input Signal Ignored - All inputs that have been in alarm, have been acknowledged, and have not been automatically or manually reset since acknowledgement.

Regular Interval Autocall Function:

11. Unit shall allow user to optionally program the unit to place regular interval status calls to the Central Station Computer. The interval shall be programmable from 0.1 to 99.9 hours.

Acknowledgement and Alarm Reset Timers:

12. Alarm calls placed by the unit shall be automatically acknowledged by the Central Station Computer if it has been programmed to do so, or upon the keystroke command of personnel at the Computer. Otherwise, the unit shall go on to place voice calls to personnel, who may then acknowledge the alarm by entering a Touch Tone "9", or by calling the unit back. Dialing shall rotate indefinitely through the programmed phone number list until acknowledgement, even if the alarm condition has returned to normal. Once acknowledged, dialing shall be suspended for that particular input channel for the duration of the programmed Alarm Reset Time. At the end of the Alarm Reset Time, the Acknowledged Alarm status for that channel shall be cleared, making that channel again ready for new alarms. Meanwhile, emerging alarm conditions on other channels shall cause dialing to resume immediately, with Alarm Reset Timers maintained independently for each input.

Security Access Code:

13. Unit shall allow a security access code up to 8 digits long to be optionally entered at the front panel keyboard only. If such an access code has been programmed, then the unit shall solicit and require the user to enter that code in order for any programming operations to be performed.

Overall Local & Remote Programming Capabilities:

14. All system functions shall be programmable without need to manipulate circuit board switches or jumpers to alter system functions or programming. All programming shall be accomplished via the front panel keyboard or (except for the Security Access Code) remotely from any Touch Tone phone or from the Central Station Computer.

Unit shall at a minimum allow programming of the following items. However, default values shall be provided so that most of these items do not actually require user programming:

- Phone numbers, dialing delays and pulse/tone dialing mode
- Special number callback/call forward
- Station ID message
- Input channel Alarm messages
- Input channel Normal messages
- Message recording rate
- Alarm Criteria for all channels, together or independently
- Channel Run Time Meter, Pulse Totalizer, and disable
- Alarm trip delays, all channels together or independently
- Time between alarm calls
- Alarm reset time
- Ring answer delay
- Number of repeats of voice alarm message
- Autocall on/off and interval
- Security access code
- Arm/disarm alarms
- Exit delay before alarms are armed
- Local listening microphone on/off
- Speaker on/off
- Time and Date

Nonvolatile Program Memory Retention:

15. User-entered programming and voice messages shall be kept intact even during power failures or when all power is removed for up to ten years.

Diagnostics:

16. The unit shall provide a complete voice report of all programmable functions and their programmed values on command from any remote Touch Tone phone. A concise summary report listing only the user-entered, non-default programming shall also be available. The accumulated number of inquiry calls, alarm calls, acknowledged alarms and power failure alarms shall also be available from the unit. Complete programming information shall also be available from the Central Station Computer.

Local Microphone, Speakerphone, Dialout on Command:

17. The unit shall allow a remote caller to activate a built-in microphone in order to hear local sounds. At the front panel, a built-in speaker shall operate with the microphone to achieve speakerphone operation, with synthesized voice and data transmissions suspended. Unit shall also allow the user to dial any arbitrary phone number as commanded, digit by digit, and establish speakerphone connection, without need to reprogram any regular dialout phone numbers. A redial function shall be included. The built-in speaker shall be programmable to be off for all reports except for front panel programming operations.

Call Forward/Call Back Function:

18. To allow callback testing or call forwarding, a special phone number shall be programmable. Upon command the unit shall dial this number and provide a regular voice status report.

Public Address Broadcast:

19. The standard dialer shall provide a mini phone jack for optional connection to a local public address system. If connected to the PA system the dialer shall broadcast all alarm messages over the PA system and the telephone simultaneously.

Local Data Logging:

20. The system shall include a parallel printer interface for local data logging. The local printer will automatically print out, with date and time stamp, each activity that occurs; alarms, acknowledgements, programming entries, inquiry calls, etc.. For the purpose of easy program review the user shall be able to printout on demand all user entered programming.

Battery Backup During AC Power Failures:

21. The unit shall provide at least 16 hours of continuous operation from its automatically recharged gel-cell battery, in the event of AC power failure. The charger shall be a precision controlled-voltage type for maximum battery life and efficiency.

Optional DC Power:

22. The user shall be able to optionally configure the dialer for DC power operation. The standard dialer shall provide a mini phone jack for optional connection to a DC power source.

Phone Line:

23. The dialer is to use a standard pulse or Touch Tone dial-up phone line and is to be F.C.C. Part 68 approved for such connection. Units requiring direct leased lines shall not be accepted.

Integral Surge Protection:

24. All power, phone line, dry contact, and analog signal inputs shall be protected at the circuit board to IEEE Standard 587, category B (6,000 volts open circuit / 3,000 amps closed circuit). Gas tubes followed by solid state protectors shall be integral to the circuit board for each such line. Protectors mounted external to the main circuit board shall not be an acceptable substitute. The installer shall provide a good electrical ground connection point near the unit to maximize the effectiveness of the surge protection.

Additional Features: Sealed switches, LED Indicators, Alarm Disable Warning, Talk Through:

25. All keyboard and front panel switches shall be sealed to prevent contamination. Front panel LED s shall indicate: Normal Operation, Program Mode, Phone Call in Progress, Status for each channel, AC Power Present, AC Power Failure, and Low, Discharging or Recharging Battery. On any Inquiry telephone call or On Site status check, the voice shall provide specific warning if no dialout phone numbers are entered, or if the unit is in the alarm disable mode, or if AC power is off or has been off since last reset. A built-in microphone shall allow anyone at a remote phone to listen to local sounds and have a two-way conversation with personnel at the dialer.

Ambient Temperature and Humidity:

26. Unit shall operate over the ambient temperature range of 32 to 110 degrees F, and 0 to 95% relative humidity (non-condensing).

Warranty:

27. The manufacturer shall repair any defective units returned to the factory at no charge for parts and labor, for a period of three years from the date of shipment, provided that the unit has not been subjected to abuse.

Modular Upgrades:

28. The following options may be ordered with the unit, and may also be modularly added in the field:
    Additional contact input channels, up to 32 total
    Analog Signal Input Option (1, 4, 8, or 16 inputs)
    Remote Supervisory Control, 4 or 8 outputs
    Additional speech recording memory

Special order Items:

29. The following optional items shall be available on units from the factory:
    NEMA 4X Fiberglass Enclosure
    Internal Heater/thermostat (for ambient temperatures below 32 degrees F or for condensation control)
    Local Alarm Relay output (activates during unacknowledged alarms).