DØ CRYO SYSTEM

CONTROL SYSTEM AUTODIALER

ENGINEERING NOTE
3740.512-EN-249

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17 April 90

DO CRYO CONTROL SYSTEM AUTODIALER

OVERVIEW:

The DO cryogenic system is controlled by a TI565 - PLC based control system. This allows the system to be unmanned when in steady state operation. System experts will need to be contacted when system parameters exceed normal operating points and reach alarm setpoints. The labwide FIRUS system provides one alarm monitor and communication link. An autodialer provides a second and more flexible alarm monitor and communication link. The autodialer monitors contact points in the control system and after receiving indication of an alarm accesses a list of experts which it calls until it receives an acknowledgement. There are several manufacturers and distributors of autodialer systems. This EN explains the search process the DO cryo group used to find an autodialer system that fit the cryo system's needs and includes information and specs for the unit we chose.

AUTODIALER SEARCH:

The labwide FIRUS system has been the traditional communication link between an unmanned lab system and the experts that must be in contact with the around the clock operation of that system. Normally the FIRUS system is an adequate link. But the FIRUS system's primary function and highest priority is monitoring fire and security alarm systems. Operational alarms are a lower priority and during peak volumes of labwide alarms, ie. during a labwide power outage, operational alarms can be overlooked. For monitoring critical systems a stand alone system, such as an autodialer, provides more dependability and more flexibility.

We looked at units from several autodialer manufacturers. Omega and RACO market units that were judged unacceptable due to limited options. The Seekirk and Kaye Instrument companies have several lines of autodialers. All but one of each companies' units were judged unacceptable. The Seekirk A1800 and the ADAS 3000 were then compared on paper and by demos from manufacturer's representatives at Fermilab. The ADAS 3000 stood out as the most versatile unit. User

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programmability, expandability, more standard options and compatability with pager systems made the ADAS 3000 the first choice.

The Antel Corporation, which reps the ADAS 3000, provided us with a reference to call and ask questions about the autodialer's performance. The ITT Corporation is contracted by the U.S. Air Force to provide and maintain remote alarm monitoring and autodialer equipment at the DEW line radar sites near the Artic Circle. I spoke with the ITT person in Alaska who is responsible for the system of twelve ADAS 3000s. He told me he is generally pleased with the equipment and finds them very dependable. He has had them online for two years with no problems. His only criticism was an awkwardness when changing input cards that sometimes disrupted performance of cards in adjacent slots. The manufacturer was informed and made improvements. When questioned concerning the digital voice output, he stated that the clarity and pronunciation is very good. He spoke with the person who set up his library of words to assure the correct pronunciation of words, especially unusual technical jargon.

The comparison of the Seekirk A1800 and ADAS 3000 and the general specifications of the ADAS 3000 have been included in this note.

DØ CRYO AUTODIALER CONTROL SYSTEM COMPARISON

FEATURES	SEEKIRK A1800	ADAS SERIES 3000
PHONE #'S	16	8 PRIORITIZED LISTS OF 8
CONTACT INPUTS	GROUPS OF 8 TO 128	GROUPS OF 8 TO 64
ANALOG INPUTS	NO	GROUPS OF 8 TO 64
STATUS ONLY INPUTS	YES	YES
OUTPUTS	8	32
DIALING FORMAT	TT OR PULSE	TT OR PULSE
REMOTE ACCESS FOR STATUS	YES	YES
PRINTER PORT	CUSTOM OPTION	OPTION
RS-232 PORT	CUSTOM OPTION	OPTION
SPEECH FORM	40 WORD+CUSTOM LIBRARY	300 WORD+CUSTOM LIBRARY
BATTERY BACKUP	24 HR	8HR
24-HR CLOCK/DATE	CUSTOM OPTION	YES
RING COUNT BEFORE ANSWER	CUSTOM OPTION	PROGRAMMABLE 0-99
MSG REPEAT COUNT	NO	PROGRAMMABLE 1-99
INTERCALL DELAY	10-15 SEC	PROGRAMMABLE 0-9,999MIN.
BYPASS/RUN DELAY	NO	PROGRAMMABLE O-99HRS.
ALARM ACKNOWLEDGEMENT	LOCAL OR BY TELEPHONE	LOCAL OR BY TELEPHONE
LOCAL ANNOUNCEMENT	YES	YES
ACCESS CODE	FACTORY PROGRAMMED	USER PROGRAMMABLE
STATION I.D. PHRASE	FACTORY PROGRAMMED	USER PROGRAMMABLE
ALARM/STATUS MESSAGES	FACTORY PROGRAMMED	USER PROGRAMMABLE
PAGER COMPATABLE	UNCLEAR	YES

ADAS SERIES 3000
Automatic Dialing Alarm System
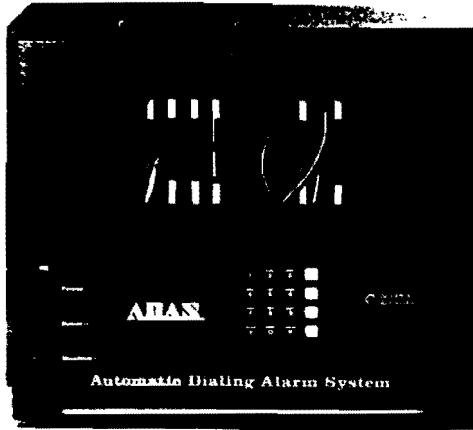
- System Can Be Customized for Specific Requirements

- Specific Messages Delivered for Each Alarm

- Alarm Messages Can Be Changed in the Field

- Discrete and Analog Inputs Can Be Combined

- System Communicates by Telephone, Radio, or Both

The ADAS 3000 is a member of the Automatic Dialing Alarm System family by Acurex Corporation. It combines many of the features found individually on other ADAS products and is ideally suited for applications involving a diverse set of monitoring, control, and notification requirements. With over 35 user programmable functions, the ADAS 3000 can be configured use as a highly sophisticated monitoring and data acquisition system.

Features
- 35 User Programmable Features
- Computer Digitized Voice
- 64 Channel Input/Output Capacity
- Field Programmable Messages
- Internal 300 Word Vocabulary
- 64 Telephone Number Capacity
- Local or Remote Operation

Operation
The ADAS 3000 continually monitors its inputs. When sensing a change in the status of one of its discrete inputs or when a signal falls outside the specified limits of one of its analog inputs, the system will respond by beginning its notification sequence. This sequence is user programmable and can vary depending on the duration of the alarm, the current time of day, the specific alarm, and the telephone number assigned.

When an alarm notification is required, the ADAS 3000 begins dialing a set of pre-programmed telephone numbers to notify emergency personnel of the alarm condition. Using high quality digitized voice technology, alarm messages are recited over standard telephone lines, radio frequency, or public address.

Using Acurex's field programmable speech, the user can construct a descriptive message of up to 20 words for each alarm channel. Unique words pertaining to the user's specific application can be added to the internal library of over 300 words. For use in pager applications, the 3000 can also generate Touch-Tones (DTMF) as part of the alarm message.

Messages can also provide information obtained from several inputs. For example, in the case of a high water alarm, the message could also include the status of the pump as in "High water level at Main Street Pumping Station. The pump is on."

The internal clock maintains the current time and date status for use in system operations and documentation of alarm conditions by the optional system printer and automatic activation and deactivation of the system.
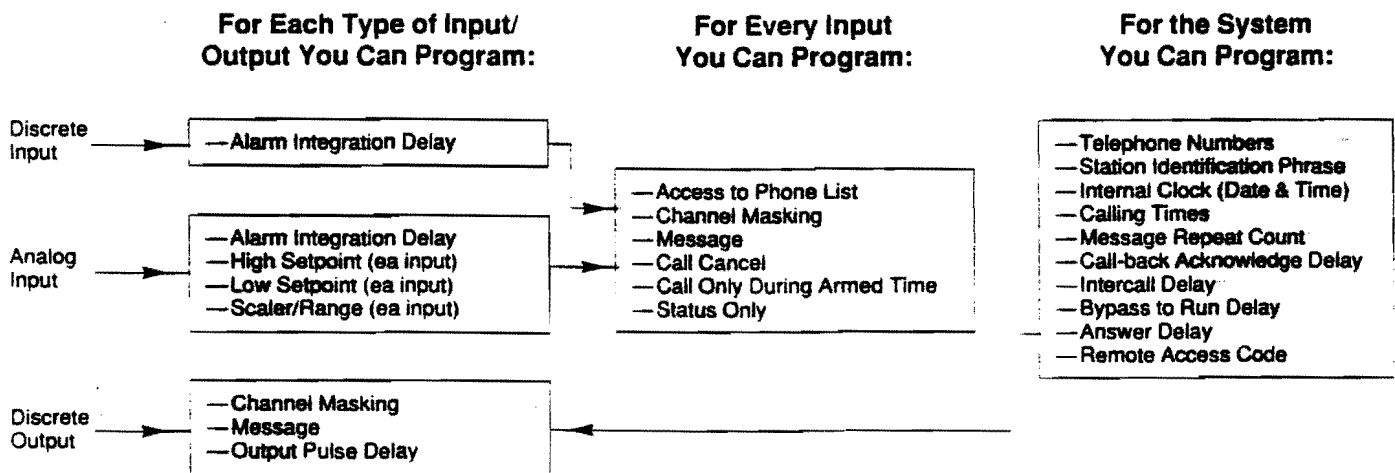
In addition to operation from the front panel keypad or the keypad of a remote telephone, the ADAS 3000 can be operated from a terminal which can be connected either directly to the ADAS 3000 or through a modem link. The terminal operation is particularly useful for situations where the ADAS 3000 is used for a constantly changing set of applications that require the user to frequently reprogram the ADAS 3000. If the terminal is also the user's computer, alarm and status data can also be captured by user developed programs for later analysis.

The versatility of the ADAS 3000 provides the user with the capability to program a total of 35 different functions. These functions include:

- Discrete and Analog, 20 words for each input channel

- Station Identification, 20 words

- Control output messages, 20 words each output channel

- Alarm Telephone List Assignment

- Answer Delay (Telephone Ring Count)

- Date and Time of Internal Clock

- Message Repeat Count

- Intercall Delay

- Bypass to Run Delay

- Call Back Acknowledgment Delay

- Selective Calling/Non-Calling Times for Alarm Messages

- Selective Masking of Alarm Channels

- Remote Access Code

- Fault Integration Delay

- Analog and Totalizer Alarm Set Points

- Analog Scaling and Scale Offset

- Momentary Output Contact Closure

- Call Cancel (allows intermittent alarm to continue call-out until acknowledged)

For a complete description of specifications and features, please contact your Acurex Corporation representative and/or consult the ADAS 3000 Product Specification.

User Programmable Features

For Each Type of Input/ Output You Can Program:	For Every Input You Can Program:	For the System You Can Program:

Discrete Input →
— Alarm Integration Delay

Analog Input →
— Alarm Integration Delay
— High Setpoint (ea input)
— Low Setpoint (ea input)
— Scaler/Range (ea input)

Discrete Output →
— Channel Masking
— Message
— Output Pulse Delay

— Access to Phone List
— Channel Masking
— Message
— Call Cancel
— Call Only During Armed Time
— Status Only

— Telephone Numbers
— Station Identification Phrase
— Internal Clock (Date & Time)
— Calling Times
— Message Repeat Count
— Call-back Acknowledge Delay
— Intercall Delay
— Bypass to Run Delay
— Answer Delay
— Remote Access Code

Options

Input/Output

The ADAS 3000 can be equipped with a combination of input and output channels up to a maximum of 64 channels.

Discrete Input
A discrete input is a dry contact that can be considered to be either "normally open" or "normally closed." This status is user selectable for each channel.

Analog Input
The analog input accepts a standard 4–20 mA signaling circuit and can enunciate the reading in engineering units specific to their application. The input range can be divided into equal parts to correlate the measured data to a unit of measure in which the data

is to be reported. The data will be expressed in four significant digits. Low and high alarm points can be programmed to cause the call-out sequence to commense when an input falls outside the specified limits. The beginning point of the analog scale and the range offset are also programmable.

Discrete Output
Used in conjunction with the Remote Access or Terminal Interface options you can start or stop equipment, turn switches ON or OFF, and control other activities on equipment from any remote location. During the same call, the ADAS can confirm that the controlled activity has taken place and that the equipment is functioning properly. The outputs will operate in either a pulse or latched mode. The time duration for the pulse mode is programmable.

Communication

Touch-Tone* Dialing Option
Some telephone installations require the use of Touch-tone* or DTMF (Dual Tone, Multi-Frequency) dialing only. In these situations, the addition of a Touch-tone* card gives the ADAS the ability to call out when DTMF tones are required. The Touch-tone* card also gives the system the capability of reaching outside services (i.e., paging systems, etc.).

Radio Interface
This option allows the ADAS 3000 to connect to an external radio transmitter or public address system in addition to telephone lines. This feature is activated by a special code which is programmed as one of the telephone numbers. Once activated, a transmitter is keyed and the alarm message is broadcast over the radio system. This option also includes a momentary contact closure which will operate upon acknowledgment of an alarm.

Remote Access
This Touch-Tone decode option provides the capability to operate the ADAS 3000 from a remote location using the keypad of a standard Touch-tone* telephone. All of the programming, verifying, and control functions can be performed. Activation of the Remote Access is by means of a user programmable access code.

Terminal Interface
In addition to operating the ADAS 3000 from the front panel keypad or the keypad of a remote telephone, the system also can be operated from a terminal or a computer which emulates a terminal. This terminal may be connected either directly to the ADAS 3000 or remotely connected through the modem option.

Printer
The printer provides complete documentation for the location being monitored. Detailed data regarding alarms and call-out alarms and call-out activity is generated. The call-out data includes date, time, telephone numbers called, and acknowledgments received. The printer also records data retrieved during verification of input parameter settings.

Programmable Word List

Alarm, status, and station identification messages are developed using the internal library of over 300 words. User specified vocabulary can be added to the library furthering the ADAS 3000's ability to accurately describe monitored functions.

ZERO	ALL	CONDITION	FUEL	LIMIT	P	RUN	TONE
ONE	ANALOG	CONNECT		LINE	PAGE	RURAL	TOWER
TWO	AND	CONTACT	G	LIQUID	PASS		TREATMENT
THREE	ANSWER	CONTROL	GAS	LIST	PER	S	TROUBLE
FOUR	APPROACH	COOLING	GATE	LOCAL	PERCENT	SAFE	TURN
FIVE	AREA	COUNT	GET	LOCATION	PERSONNEL	SAFETY	
SIX	AT	COUNTER	GO	LOCK	PIPE	SANITARY	U
SEVEN	AUTOMATIC	CRITICAL	GOOD	LOW	PLANT	SCALE	UNDER
EIGHT	AUXILIARY		GREEN	LOWER	PLEASE	SECONDARY	UNIT
NINE		D			PLUS	SECONDS	UNLOCK
TEN	B	DAMAGE	H	M	POINT	SECURITY	UNTIL
ELEVEN	BASE	DANGER	HAVE	MACHINE	POSSIBLE	SELECT	UP
TWELVE	BELOW	DATE	HELP	MANUAL	POWER	SEPARATOR	USE
THIRTEEN	BETWEEN	DECREASE	HIGH	MAXIMUM	PRESENT	SERVICE	V
FOURTEEN	BISTABLE	DELAY	HOLD	MESSAGE	PRESSURE	SET	VALVE
FIFTEEN	BLOCK	DEVICE	HOT	METER	PREVENT	SETPOINT	VERIFY
SIXTEEN	BOOSTER	DIRECTION	HOURS	MINIMUM	PRIMARY	SEVERE	VIOLATION
SEVENTEEN	BREAK	DISTRICT		MINUS	PROGRAM	SEWAGE	VOLTAGE
EIGHTEEN	BUILDING	DO	I	MINUTES	PROPER	SHUT	VOLTS
NINETEEN	BYE	DOOR	ILLEGAL	MOTOR	PULL	SIDE	
TWENTY		DOWN	IMMEDIATELY	MUNICIPAL	PUMP	SITE	W
THIRTY	C		IN		PUSH	SLOW	WAIT
FORTY	CALL	E	INCREASE	N		SMOKE	WASTE
FIFTY	CALLING	EAST	INITIATE	NEAR	Q	SOUTH	WATER
SIXTY	CANCEL	EMERGENCY	INSERT	NO		SPARE	WELL
SEVENTY	CAUTION	ENTER	INTRUDER	NORTH	R	SPEED	WET
EIGHTY	CEILING	ENTRY	IS	NOT	RADIO	STAND	WITH
NINTY	CENTER	ERROR		NOTIFY	RAISE	START	WRONG
HUNDRED	CHANGE	ESCAPE	J	NUMBER	RANGE	STATION	
THOUSAND	CHANNEL	EVACUATE			READING	STOP	X
	CHECK	EXIT	K	O	READY	SYSTEM	
A	CHEMICAL		KEY	OF	RED		Y
ABORT	CIRCUIT	F		OFF	REMOTE	T	YELLOW
ACCESS	CLARIFIER	FAILURE	L	OIL	REMOVE	TANK	
ACKNOWLEDGE	CLEAR	FAULT	LEAK	ON	REPAIR	TELEPHONE	Z
ACTUATE	CLEARANCE	FEET	LEAVE	OPEN	REPEAT	TEMPERATURE	ZONE
ADD	CLOSED	FILTER	LEFT	OPERATOR	REPORT	TEST	
ADJUST	CODE	FIRE	LESS	OTHER	REQUIRES	THE	
AIR	COLD	FLOW	LEVEL	OUT	RESERVOIR	THIS	
ALARM	COMPLETE	FOR	LIFT	OUTPUT	RIGHT	TIME	
ALERT	COMPRESSOR	FROM	LIGHT	OVER	RING	TO	

INPUT/OUTPUT CHANNELS

Discrete Input
Increments of 8 channels
Normally closed or normally open state is field
  selectable

Analog Input
Increments of 8 channels
4–20 mA signaling circuit

Discrete Output
Increments of 4 channels
Normally open

OPERATIONAL

Telephone numbers
64 number capacity (8 lists of 8 numbers each)
1 to 32 digits

Speech
LPC type synthesis
300+ word internal library

Power
110 VAC, 50-60 Hz, 100W maximum
12 VDC Battery backup (internal)
Transient protection exceeds ANSI C37.90a

Telephone Interface
Standard dial up line
RJ11C connector
FCC Registration number G5P-3JK-17141-AL-R
Ringer Equivalence 0.1B
Pulse Dialing (Touch-tone* optional)

Radio Interface
600 ohm balanced audio
Normally open, dry contact closure keying circuit

Physical
Temperature Range, 0 to 55°C
Humidity, 0 to 99% non-condensing
Dimensions 14" H X 16" W X 6" D
Weight, 42 pounds maximum
Enclosure is welded steel, NEMA 12 rating
Other NEMA enclosures optionally available.

*Trademark of American Telephone & Telegraph

Ordering Information

B8	8 channel, discrete input
A8	8 channel, analog input, 4-20 mA
N4	4 channel discrete output

A maximum of 8 Input/Output options is allowed.

COMMUNICATION OPTIONS

RF	Radio Interface
TT	Touch-tone* Dialing
RA	Remote Access (Touch-tone* control)
F1	Printer
F2	Terminal Interface (RS-232-C)

SPEECH OPTIONS

MCV	Male voice, programmable vocabulary
FCV	Female voice, programmable vocabulary

SAMPLE ORDER

The following is a sample order request for an ADAS 3000 with 16 discrete inputs, 8 analog inputs, 4 discrete outputs, remote access, radio interface, female vocabulary, and one user specified vocabulary word.

ADAS 3000 B16/A8/N4/RA/RF/FCV "Getty"

ADAS 3000 is represented by:

PURCHASE REQUISITION
(SEE INSTRUCTION N REVERSE SIDE)

Fermilab

DATE DESIRED _ASAP_ (OPTIONAL)

REQUESTED BY	EMPLOYEE NO	EXT	ORGANIZATION UNIT	MAIL STATION FOR PAPERWORK	REQUESTORS IDENTIFIER	REQUISITION DATE
John Urbin	3269	2638	RD/CRYO	357		6 APR 90

SUGGESTED VENDOR	PHONE NO 887-8910	PROJECT DESCRIPTION	PREVIOUS P O (IF KNOWN)	APPROVALS	EMPLOYEE NO

ATTN: ROBERT B. MANNING

ANTEL CORPORATION
669 EXECUTIVE DRIVE
WILLOWBROOK, ILLINOIS 60521

PROJECT DESCRIPTION: DØ Cryo Control System Alarm Autodialer

DELIVER TO (INCLUDE NAME & BUILDING NO.)
DAN MARKLEY
DAB

BUS OFC

DIR OFC

QUANTITY	ITEM DESCRIPTION	ESTIMATED UNIT PRICE	DO NOT USE
1	ADAS 3000/TT/RA (AUTOMATIC DIALING ALARM SYSTEM) =	$ 3670.00	
	WITH 4 - 8 CHANNEL INPUT BOARDS @ 265.00 ea. =	1060.00	
	PRINTER WITH CABLE =	520.00	
	FEMALE VOCABULARY + 20 USER WORDS @ 15.00 ea =	300.00	
	TOTAL =	$ 5,550.00	
	ORDERING CODE: ADAS 3000/TT/RA/B32/FI/FCV		
	USER SPECIFIED WORDS: ARGON, BLOWER, CALORIMETER, CHASE, CONDENSER,		
	CRYOSTAT, DEWAR, DUCT, HYDRAULIC, INSTRUMENT		
	LADDER, LOOP, NITROGEN, RELIEF, RESET		
	SUMP, VACUUM, VAPOR, VAPORIZER, VENTILATION		

BUDGET CODE	PROJECT CODE	PERCENTAGE	DOLLAR AMOUNT (LEAVE BLANK)	DIVISION APPROVAL STAMP

VENDOR CODE:	BUYER - DATE PLACED	FOB	TERMS
SHIP VIA:	REPORTING CODE	REQUISITION NO	P O NO

FL-29 REV 1/20/86