

CHAPTER 22, ALARM DIALERS.

22.A Alarm Dialers with Voice Telemetry.

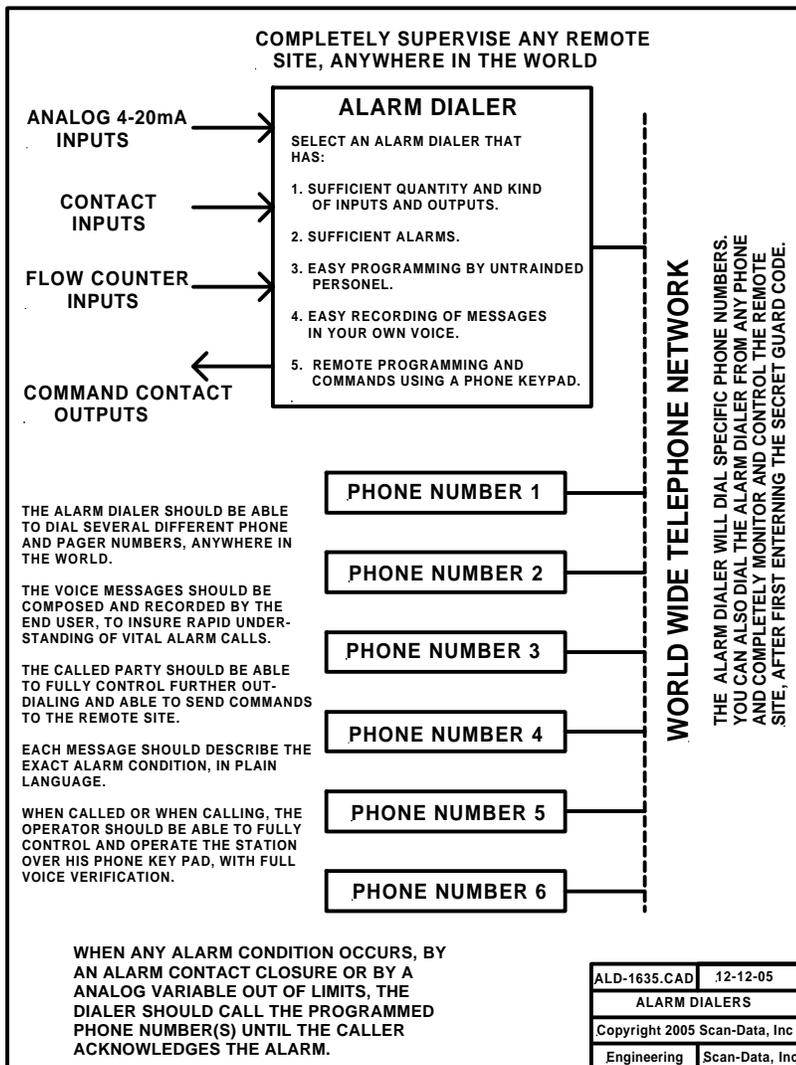
An Alarm Dialer and Voice Telemetry Supervisor allows remote supervision and control of virtually any remote industrial installation. Installing an Alarm Dialer

eliminates sending persons out to remote sites to take measurements, to read counters and meters and to start and stop pumps, open and close valves, etc.

Using Alarm Dialers is a very effective method of monitoring and supervising industrial installations such as pump stations, reservoirs, tank farms, pipe lines, generators, etc.

The following features make Alarm Dialers very attractive for remote supervision of any remote industrial site:

- No special equipment needed, other than a phone or cellphone connection at the site.
- Can be accessed using any phone or cellphone, from anywhere in the world.
- No special training needed to program the unit.
- No special training needed to operate the unit.



22.B What should the Alarm Dialer do?

An Alarm Dialer will let you:

- 1) Supervise and Control any remote site over any phone or cellphone.
- 2) Receive Alarms and Engineering Reports in your own voice from the remote site.
- 3) Save on operating costs by eliminating visits to remote installations.
- 4) Let you send relay closure and opening commands to the remote site by pressing the keys on your phone.
- 5) Selectively acknowledge all incoming alarm calls with simple key presses.

A capable Alarm Dialer can also:

- 1) Connect directly to up to two or more analog (4-20mA) level, flow, volume and other sensors. Span and zero for each sensor should be programmed in and the Alarm Dialer should automatically calculate and report correct engineering values from the sensor inputs. High and low alarm limits for each analog value should also be reported in and the Alarm Dialer should dial out an alarm when these alarm limits are exceeded. Additional analog input alarm limits can be created with the SPG or XPC 4-20mA to relay closure controllers.
- 2) Connect directly to up to 16 alarm (dry contact) sensors. These alarm status inputs should be equipped so that only a sustained 'ON' condition triggers the alarm report.
- 3) Connect directly to a pulsing flow meter. The Alarm Dialer should have a pulse accumulator, with at least five digits and automatic rollover without losing a single metering pulse.
- 4) Connect directly to up to 8 command inputs.
- 5) Have LEDs that indicate all 16 alarm status conditions, all 8 command output conditions, POWER ON and OFF HOOK conditions.
- 6) Connect to any phone or any cellphone cradle RJ-11 jack.
- 7) Record the voice phrases you wish the Alarm Dialer to use.
- 8) Accept the keyed in phone numbers to be dialed
- 9) Accept the keyed in 4-20mA spans and offsets, used to create engineering reports.
- 10) Accept all keyed in numerical values needed for operation.
- 11) Deliver voice readback of all recorded voice phrases and keyed in numbers.

22.C How do Alarm Dialers operate?

The best way to describe how an Alarm Dialer works is to imagine that you have an employee, instead of an Alarm Dialer, sitting in a control room at a remote site.

When alarms light up on the panel, the employee dials the phone numbers that correspond to each alarm, each phone number in turn.

When the called party answers, the employee reads off the alarm message that corresponds to the alarm. The employee can be instructed to re-dial certain numbers several times, if there was no answer on the first call or if the line was busy.

Only when the employee reaches the calling party, delivers the voice alarm message and gets an acknowledgement will he strike this phone number off the list., and make no more calls to this number.

The employee can also answer incoming calls, giving the caller the name of the remote station. The caller should be able to tell the employee to perform commands. to start or stop pumps, open or close valves, etc. The employee responds by executing the command and by verifying to the caller that the command was executed.

This is what a responsible employee would do. And this is exactly what a good Alarm Dialer, like the Scan-Data VBX Voice Box Supervisor, will do.

The VBX, of course, does not take breaks or go to the washroom and the VBX works 24 hours a day, with no vacations. And charges no salary.

22.D How does the Alarm Dialer place each call?

The time it takes to dial and deliver each alarm message does not depend on the employee or on the Alarm Dialer. It depends entirely on the time it takes to place the call and to get an answer over the phone or cellphone network.

The employee (or the Alarm Dialer) has to lift the handset (go off hook), check the dial tone, dial the number and wait for a number of rings to give the called party time to answer. If there is no answer after a certain number of rings, the employee (or the Alarm Dialer) hangs up and queues the number to be re-dialed for a certain amount of times. After the call is answered and the alarm voice message delivered, the employee (or the Alarm Dialer) waits for an acknowledgement. If there is none, the number is queued for re-dial.

It is important for the employee or the Alarm Dialer to know when an alarm call has been received, understood and acknowledged by the answering party.

When the employee or the Alarm Dialer makes a call and it is answered, the alarm message is delivered, for example: "Water tank #6 is empty."

The called party then gives the employee or the Alarm Dialer instructions, such as:

- 1) OK, I received the alarm. Don't call me anymore, but continue with the other calls on your list for this alarm.
- 2) OK, I received the alarm. Don't call me or call anyone else on your list for this alarm.
- 3) OK, I received the alarm. Now open bypass valve #6.

When the Alarm Dialer calls with an alarm message, you answer by pressing the number keys on your phone. Instructions #1 and #2 are simply given by two key presses, using the star key or the number key. Instruction #3 is given by pressing the key code for the command you wish to execute, as detailed in the Alarm Dialer's programming manual.

22.E How many calls can an Alarm Dialer make?

Adding too many alarm points to Alarm Dialers can cause unacceptable delays in transmitting alarm messages. It may work fine for a few routine alarms but when a disaster strikes and most (if not all) of the alarms activate, and you really need the alarm messages delivered, the dialer can become overloaded. The long queue of alarm calls may take an unacceptable long time to get through.

The Alarm Dialer Loading (ADL) number is the total number of calls that an Alarm Dialer has to make, should all the alarms activate. The higher the ADL, the longer it will take for the alarm dialer to get all the calls out. The Scan-Data VBX is capable of handling an ADL of 120, which means that it can place up to 120 alarm calls in its alarm queue.

The VBX can deliver 20 alarm messages 6 different phone numbers. This results in an ADL of $6 \times 20 = 120$. This means that 120 phone or cellphone calls will be made in a worst case emergency. The average time it takes for an alarm call is about 30 seconds, accounting for some re-dialing and waiting for answers. Dialing 120 calls will therefore take 1 hour.

An ADL of 120 with a one hour delay in delivering the last alarm may be unacceptable in most installations. Lowering the ADL lowers the alarm delivery delay. Nuclear power plants, for instance, where timely delivery of alarms is of prime importance, use ADLs of 25 or less.

You can lower the ADL and transmit timely alarm messages by using more than one alarm dialer.

22.F What needs to be programmed into the Alarm Dialer?

You have to program (or teach) the Alarm Dialer a number of things, for instance:

- 1) The alarm messages, the numbers and other phrases to be used in the voice reports.
- 2) The phone numbers to dial.
- 3) What alarm should be dialed to what telephone numbers.
- 4) What alarms should be activated.
- 5) What the high and low 4-20mA analog alarm values are.
- 6) The secret access code, which eliminates accepting commands from unauthorized callers. Normally set with rotary switches on the Dialer.
- 7) The decimal point positions for the analog reports. Normally set with rotary switches on the Dialer.

The easy way is to program in all this information is by using a regular phone, plugged into the Alarm Dialer's programming jack.

Follow the instructions in the programming manual to read in phrases and key in the numbers that the Alarm Dialer needs.

Note that the secret access code and analog report decimal positions are set over rotary switches on the Alarm Dialer.

22.G How do I install Alarm Dialers?

Make sure that the Alarm Dialer is operating correctly by connecting power to it and accessing it (either locally or remotely) with a telephone. The report you hear should be correct. Simulate alarms by shorting the different status and alarm inputs. You should hear a proper alarm message response in the report.

You can use a 4-20 mA calibrator such as the CAL 4-20 to calibrate and verify the 4-20 mA analog inputs.

Connect the analog 4-20 mA inputs from the sensors, the pulse dry contact input, the status and alarm dry contact inputs and the outputs from the eight relay drivers. Connect the AC or DC power and plug the phone line into the RJ-11 jack.

Make sure the LINE/LOCAL switch is in 'LINE' position.

The Alarm Dialer is now ready to run. Call it from your cellphone or from any phone to verify correct operation. You can also make the Alarm Dialer dial out by shorting any one of the digital alarm inputs that is keyed into telephone numbers and activated.

22.H How do I test Alarm Dialers?

You can call the Alarm Dialer from any location in the world by dialing its phone number, just as you dial any other phone number. The Alarm Dialer will answer with the opening message you recorded, say 'WILD ROSE RESERVOIR'. You can then enter the secret access code and then key in any command.

After you are on line and have entered the secret access code, you can operate the Alarm Dialer as if you had it in front of you on your bench. Among the values you can read and check remotely are:

- 1) Hear any one of the pre-recorded phrases.
- 2) Hear the alarm phone numbers that it will dial.
- 3) Hear what alarms are linked to which telephone number.
- 4) Set and hear the span and offset for the analog inputs.
- 5) Set and hear the high and low alarm limits for the analog alarms.

You verify all the phrases and numbers programmed into the unit by asking for a voice readback of each one.

The Alarm Dialer will stay on line as long as you keep entering commands. It will hang up after 30 seconds of silence. The Alarm Dialer will then be ready to initiate calls to up to six telephone numbers when alarm condition(s) occur.

The called party will hear the alarm message when answering his/her phone. Further alarm dialing can be prevented if the called party presses the correct keys on his/her keypad to acknowledge that the alarm has been received.

Pressing** (pressing the star key twice) means don't call me anymore with this particular alarm. Pressing ## (pressing the pound key twice) means: Don't call me nor any one else with this alarm.

The active alarm(s) will again cause dialing after the programmable Inter Call Delay (ICD) period has passed unless the alarm(s) has been cleared with one of the keypresses above shown above.

22.I Which Alarm Dialer should I buy?

When selecting an Alarm Dialer, it is important that you select one with the features and reliability you need. Twenty years of experience have gone into the design of the Scan-Data Alarm Dialer and Voice Telemetry unit. It has been approved for installation with many utilities and nuclear power plants.

It may be instructive to compare the VBX with other dialers, as follows:

Comparing the Scan-Data VBX with the Chatterbox.

Features:	Scan-Data VBX:	Raco Chatterbox CB-8:
Digital inputs	Sixteen with indicating LEDs	Eight with no LEDs
4-20 mA analog inputs	Two, individually adjustable.	Optional at added cost
Flowmeter pulse count reporting	One five digit pulse flow counter with automatic roll-over	None
Digital command outputs	Eight with indicating LEDs	None
Programming the end user's words and phrases	Use a phone to read in the 40 phrases the VBX needs.	Not available
Phrase & time remaining counter	A 3-digit LED counter shows you the phrase you are recording and also the recording time remaining.	Not available
Phrase readback	You can selectively listen to any one of the 40 phrases recorded and also listen to all of them	Not available
Access code settable on the circuit board.	Four rotary switches lets you set any access code from 0001 to 9999	Not available
Easy verification of all programmed parameters	Use a regular phone plugged into the 'LOCAL' jack to hear and verify all programmed parameters	Not available
Alarm call capacity	20 alarm conditions selectively tied to 6 phone numbers. $20 \times 6 = 120$ alarm call capacity. See below	8 alarm conditions tied to 8 phone numbers. Capacity $8 \times 8 = 64$
Selective alarm acknowledgement	Pressing STAR STAR stops dialing you and pressing POUND POUND stops all dialing on this alarm	Not available
Calculating engineering values from the 4-20mA inputs	Easy conversion to engineering values by entering span and offset for the two 4-20mA analog inputs.	Not available
Setting low and high alarm setpoints for the two 4-20 mA analog inputs	Simply enter the low and high alarm points for the two 4-20mA inputs to trigger these alarm points.	Not available
Programming numbers and phrases in any language	The numbers and phrases you program in over the phone will be used by the AERG	Not available
Automatic engineering report generator, AERG	The AERG composes a complete voice engineering report, in your own voice, in any language.	Not available
Dual phone jacks for line and local operation	One jack is for phone or cellphone connections, the other a local jack for programming and verification	Not available
Local testing of all functions	Plug in a regular phone to program and listen to any function	Not available
Heavy coating to protect all components.	2-part epoxy coated board for service in harsh environments	Not available
Price	\$1,590.00	\$1,795.00

Alarm call capacity: CCITT recommends a maximum dialed alarm capacity of 125. Nuclear power plants use a much smaller number. See ADL-1363

22.J Adding 4-20mA analog alarm reports to the Alarm Dialer:

22.J.1 How does analog alarm reporting work?

Before going into details on how to add 4-20mA analog alarms to the VBX, it may be well to review how the 4-20mA analog alarm points are generated, treated and reported in the VBX Alarm Dialer.

The VBX Alarm Dialer has two 4-20 mA analog inputs. Both of these inputs are converted to engineering values by the VBX, and reported with voice reports. The conversion numbers (span and offset) needed to convert the 4-20mA analog values to engineering values are programmed in with telephone key presses as described above and in the manual.

Each analog value also has a low alarm limit and a high alarm limit. These four limit values are also programmed in with telephone key presses as described above and in the manual.

The VBX treats these four trip points (one high and one low for each of the two analog inputs) as if they were alarm contact inputs. When any of these four alarm points turn on, the VBX places alarm call(s) to the telephone number(s) that are keyed to the alarm point, delivering the voice message(s) that correspond to each alarm point

Sending out voice alarm reports when, for instance, a tank level, a temperature, a pressure or a flow is above or below limits is a very rapid and practical way of managing remote industrial installations.

These voice alarm messages are easily understood, even by untrained personnel.

Should more than two analog alarms be needed, adding up to 16 more 4-20mA analog alarm points is easy. Section 22.J.3 below shows how to do it.

22.J.2 Testing the analog alarms.

Using the CAL 4/20 4-20mA calibrator to test the analog alarms makes this test easy to perform. Make sure that the alarm limits are entered and that the analog alarms are activated to one or more telephone number(s).

Adjust the calibrator to a value inside the alarm limits and connect it to the analog alarm input you wish to test. Make sure that the transducer or other device, like an XMT 4-20mA simulator, also set inside the alarm limits, is connected to the second analog input (else the VBX will dial out the alarm). Make sure that none of the 16 alarm inputs are shorted. Set the switches to 'OPERATE' and to 'LINE'. The VBX will now be ready to accept incoming calls, and will not try to dial, as no alarms are active.

Move the CAL 4/20 into an alarm condition value, either high or low. The VBX OFF HOOK light will go on, indicating that the VBX is dialing out the alarm.

For a complete test, you can use a second phone line with a phone or a cellphone to receive and listen to the alarm message.

22.J.3 Adding additional 4-20mA analog alarms:

Use the SPG-4 controller to add 4-20mA alarms to the VBX.

To make sure that there will be no ground errors, it is best to use an isolated 24V DC power supply to power the SPG-4. One end of the transducer or sensor generating the 4-20mA signal may be grounded or one end of the transducer power supply may be grounded. This is often done to get better lightning protection.

Use a Cal 4/20 calibrator temporarily connected to the SPG-4 4-20mA analog input.

Adjust the level and deadband potentiometers with a screwdriver to set the relay closures at the desired alarm levels of the 4-20mA current, as shown in the SPG-4 manual. The corresponding LED on the SPG-4 will turn on and off at the selected level.

Set the low alarm level potentiometer to go on and off at the desired low alarm level. Switching the CAL 4/20 to read in percent makes this procedure easy.

Set the high alarm point potentiometer to go on and off at the desired high alarm level in a similar manner.

Also set the dead band potentiometer for the desired dead band. You should set it to slightly more than zero deadband, to avoid relay chatter when the 4-20mA signal is exactly at the level trip point.

Two more level alarms are available on the SPG-4, if you need detailed alarm reporting. See the example below

Connect the input of the SPG-4 to the 4-20mA transducer loop from which you wish to create alarms. You will now have up to four contact openings and closings, all at different values of the 4-20mA input current.

These contacts can be wired directly into the alarm contact inputs of the VBX. Depending on how you want the alarms to operate, wire either the NO (normally open) contact pair or the NC (normally closed) contact pair to the desired VBX alarm input.

Make sure that the voice message for each contact matches the analog level contact at which the SPG-4 is set. For instance, a low level alarm from a tank level transducer may say: "Low level fuel feed tank #6".

You can use all four contact pairs on the SPG-4 to make the VBX deliver very detailed alarm reports, for instance:

At a 5% level of the 4-20mA current: "Emergency low level in main feed tank, 500 gallon".

At a 15% level of the 4-20mA current: "Low level in main feed tank, 1,500 gallon".

At an 85% level of the 4-20mA current: "High level in main feed tank, 8,500 gallon".

At a 95% level of the 4-20mA current: "Emergency high level in main feed tank, 9,500 gallon".

You can, of course, record any numbers you wish in these alarm messages.

22.K How to get more Information:

The Alarm Dialer WEB page has very useful information and links to detailed literature:

www.alarm-dialer.com

Hundreds of helpful descriptions and application notes are also available on our literature page on the WEB, among them:

The VBX fact sheet, **VBXC0929**.

The VBX programming instructions, **VBX-0934**.

Dimensioning Alarm Dialers, **ADL-1363**.

All our WEB sites have click on blue buttons to get you to our literature page.

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