

CHAPTER 16, SPECIAL RTU APPLICATIONS

16.A SUMMARY:

The flexibility of the modern RTU designs and the availability of special and custom RTUs and software packages have made it possible to tailor RTUs to meet a wide variety of special requirements.

This chapter deals with some of the different specialized RTUs applications that are available.

16.B USING VOICE TELEMETRY RTUs INSTEAD OF ASCII OR BINARY RTUs.

Some of the advantages of using voice telemetry are:

- C You can call the RTU from anywhere in the world.**
- C The RTU speaks to you, using your own pre-recorded phrases**
- C No special equipment needed; just use your regular telephone.**
- C The RTU can call you (and several other numbers) when an alarm condition occurs.**
- C You can remotely program the RTU over your phone keypad.**
- C You can open and close the RTU relays over your phone keypad.**
- C All access to the RTU is protected by a secret password.**

16.B.1 THE VBX-7 VOICE TELEMETRY AND ALARM DIALER RTU

The ScanData VBX-7 is a combined voice telemetry and alarm dialer unit. It is designed to be installed in harsh environments at industrial sites. It will automatically dial up to six telephone numbers with alarm messages, should any alarm(s) occur.

When the VBX-7 is dialed, from anywhere in the world, it will deliver a complete engineering report on its readings. It reports, in your own voice, on up to twenty alarm conditions, two 4-20 mA analog inputs such as pressures, flows, levels, temperatures, etc., and on one pulse (flow) accumulated count. You can also remotely open and close two relays at the site from your telephone key pad.

The VBX-7 complements ScanData's large selection of computer compatible monitoring stations, giving the user the widest possible choice of remote monitoring systems.

The VBX-7 offers a very cost effective method of monitoring and supervising industrial installations such as pump stations, reservoirs, tank farms, pipe lines, generators, etc. It requires no special equipment other than a regular keypad telephone and in requires no training for its programming and operation.

If an alarm occurs at the monitored station, such as fire, a power failure, illegal entry, low tank level, tank overflow, etc., the VBX-7 will dial up to six different telephone numbers and report, from your pre-recorded phrases in a clear voice, the cause of the alarm. You can then inhibit further alarm dialing by pressing '*' or '#' on your telephone key pad. See the programming manual for details.

Entering a report request on your keypad causes the VBX-7 to send you a full report, provided you send the secret guard code with your request.

You can also call the VBX-7 at any time, from anywhere in the world, to request a complete engineering report or to open and close the two command relays.

16.B.2 A SUMMARY OF THE VBX-7 OPERATION

You record the 40 phrases the VBX-7 needs for its operation using a regular telephone. The phrases the VBX-7 uses to identify each parameter in its report are:

Station identifier (Blue Hill pumping station, say)	1 phrase
Analog input names (level, pressure, etc.)	2 phrases
Analog input units (gallons, pounds, etc.)	2 phrases
Analog high and low alarm conditions (low level main tank, high pressure booster pump, etc.)	4 phrases
Good bye phrase (communication terminated, say)	1 phrase
Numbers 0-1 & decimal points	11 phrases
Pause	1 phrase
Pulse counter name (total wastewater accumulated flow, say)	1 phrase
Pulse counter units (thousand gallons, say)	1 phrase
Status and alarm conditions	16 phrases

These phrases are automatically inserted by the VBX-7 into the proper places in the message. The method of recording these phrases into the VBX-7 is very straight forward. Use the switches on the board and record each phrase using a telephone. Each phrase can be quite long, as there is ample room in the solid state memory. A local LED read out tells you which phrase you are recording and also the total memory time remaining. You can listen to and re-record any phrase.

In addition to the voice phrases, the VBX-7 can be programmed over the phone's regular key pad with the following parameters:

- C Phone numbers to dial.**
- C Activate any alarm condition and connect to any phone number.**
- C Enter the secret access code. (This code is set over four rotary switches on the VBX-7 board).**
- C Enter InterCall delay and Message Start delays.**
- C Enter analog zero and span values for calculating engineering values.**
- C Enter analog low and high setpoints.**
- C Open and close two relays.**
- C Set the VBX-7 to use tone or pulse dialing.**
- C Read the pulse (flow) counter.**
- C Read back any phrase or register.**

The VBX-7 manual contains detailed instructions on how to perform these and other operations. The VBX-7 voice phrases should be recorded with the unit in front of you. The keypad programmed parameters can be programmed in locally or remotely (using the secret pass word).

An on board battery keeps the programmed voice phrases and key pressed program parameters alive for several weeks. This battery automatically re-charges as soon as the VBX-7 is connected to AC power. An on board charger allows charging an optional standby 12V battery.

16.C USING TWO RTUS TO TRANSMIT PULSE TRAINS FROM ONE LOCATION TO ANOTHER

Shell Oil built a co-generating plant near Bakersfield, Ca, a few miles away from the Pacific Gas and Electric's electric power delivery site.

Analog, status and command information and metering pulse trains had to be transmitted back and forth between the sites, with a high degree of security and without distortion.

The particularly difficult requirement was the transmission of metering pulses. All pulses input at one end had to be output as a equal amount of pulses at the other, without loosing a single pulse.

Two ScanData M-systems, working back to back in Mode-C, were installed, one at each end of a 4-wire cable running between the two sites. This system has now been in service for several years without loosing a single metering pulse and without failures.

16.D USING TWO RTUS TO TRANSMIT ANALOG AND DIGITAL INFORMATION BETWEEN EACH OTHER OVER THE DIALING NETWORK

A petrochemical company in Louisiana needed to transmit analog and digital signals from a small tank farm to a control location many miles away.

It was not possible to connect the two sites over continuous cables or radio.

Two M-systems, each with the necessary analog and digital input and output boards, were installed at each site. Both were connected to the dial up phone line over standard RJ-11 jacks.

The control location M-system was programmed to dial the tank farm M-system every hour and transfer the analog and digital information from one RTU to the other.

In this manner, all analog and digital inputs at one RTU were transferred as analog and digital outputs at the other RTU, and vice versa. This update took place every hour, when one RTU dialed the other.

In addition, both RTUs were equipped with '**UPDATE**' push buttons. When this button was pressed, at any RTU, the RTU would immediately dial the far end RTU and transfer all analog and digital signals.

16.E PERIODICALLY DIALING SEVERAL RTUS FROM A CENTRAL STATION

Kerr McGee in Henderson, Nevada, needed to control one large pump station with six pumps by Lake Mead and two reservoirs. The old cable connecting the sites was installed with the pipe line during World War two and no longer reliable.

Installing new cables was too costly. Radio was impractical because of intervening high hills.

The company installed three ScanData M-systems at each site, all connected to the dialing telephone line, and a PC computer at their office with the ScadaMaster(tm) software.

The software was programmed to dial each RTU four times an hour, to show the information from the RTU on the computer's color screen and to archive the information onto disk.

In addition, the program checked the level at each reservoir and automatically

started one or more pumps until the reservoirs were filled, after which the pumps were shut down.

Pump sequencing is programmable by the operator. An operator's archive retrieval program was also supplied.

This system has been running for several years without failures and is saving the company money by automatically maintaining the reservoir levels.

16.F USING AN RTU TO AUTOMATICALLY CONTROL A GAS COMPRESSOR BY FLOW DEMAND.

Northern Natural Gas in Omaha, Nebraska, needed to control their main natural gas compressor station in Starks, Louisiana. The only possibility was to use a dialing RTU over this long distance. The problem was that Starks was served by a rural telephone company with sometimes questionable service.

There was a great reluctance in the beginning to entrust the control of a 2,000 pound per square inch major turbine compressor station over this rural telephone network.

The ScanData error checking protocol (7 levels deep) was demonstrated and NNG installed an M-system gas flow calculating RTU in the compressor station. It has these major features:

- C Gas flow calculations every two seconds.**
- C Compares actual flow against desired flow and ramps the compressors up and down accordingly.**
- C Calls Omaha every morning with a comprehensive gas flow report.**
- C Omaha can dial the RTU at any time for a gas flow report.**
- C Omaha can dial the RTU and request a specific flow rate which the RTU will deliver by controlling the compressors.**

There has never been a missed command or a faulty transmission of values over many years of operation.

16.G USING AN RTU TO CALCULATE 19 SIMULTANEOUS GAS FLOWS

EXXON needed a gas flow calculator at their HONDO platform underwater oil well in the Pacific Ocean by Santa Barbara, California.

The gas flow calculator was needed to regulate the gas lift of crude oil from the well.

The problem was that there were nineteen orifice metered gas flows that had to be calculated simultaneously.

An M-system RTU was installed at the platform. As with all ScanData RTUs, the M-system modules were completely HardCoat(tm) epoxy coated for service in harsh environments. Analog I/O modules with enough 4-20 mA inputs to handle the delta pressure, pipe pressure and temperature inputs for all nineteen flows were installed.

The ScanData gas flow computer software was installed in the RTU, with the proprietary fast assembly language nine digit floating point math package. This package calculates all nineteen gas flow equations and sums all nineteen instantaneous flow rates for a total instantaneous corrected flow rate and a corrected accumulated flow total that is used by EXXON for their gas lift operation management.

16.H USING AN RTU TO CALCULATE GAS FLOW AND TO HANDLE CORROSION INHIBITOR INJECTION AT AN OFFSHORE GAS WELL.

Texas Eastern needed a gas flow calculator RTU for their offshore platforms in the Gulf of Mexico. The RTU had to calculate gas flow, to communicate over the cellular phone system and to automatically inject a corrosion inhibitor liquid into the gas delivery pipe line.

Texas Eastern had certain special requirements for this RTU. The corrosion inhibitor liquid injection was to offset the sour gas corrosive effect on the pipe line. This liquid had to be injected in direct proportion to the flow of gas.

Another requirement was to check the quality of the corrosion inhibitor liquid. Having water enter into the pipe line would be disastrous. Sometimes the supplier delivered some water mixed in with the liquid to the tank on the offshore platform. A water sensor was installed in the liquid injection line.

A special RTU software package was written for the ScanData SMR flow computing RTU with the following features:

- C A complete gas flow calculation software package.**
- C Ability to dial the RTU at any time, from any phone, to obtain a complete gas flow engineering report in English, using a special pass word.**
- C Corrosion liquid injection pulses proportional to the gas flow.**
- C Calculations of volume remaining in the circular cross section corrosive inhibitor liquid tank based on a linear reading of liquid column.**

- C **Stopping the flow of inhibitor liquid if the water sensor turned on.**
- C **Automatic outdialing of alarms and reports.**
- C **Complete local and remote programmability of all operating parameters, such as gas flow composition, transducer calibration, gas flow equation parameters, phone numbers to be dialed, etc.**

The customer tested RTUs from different manufacturers for this project. The ScanData SMR RTU was the only one that worked, 'right out of the box' to quote the customer. It also passed all customer tests 'with flying colors' (in the customer's own words.)

The SMR RTU was, like all ScanData RTUs, designed for service in harsh and corrosive environment with HardCoat(tm) two part epoxy coating and surge protection.

16.I USING SEVERAL RTUS TO TRANSMIT CUSTODY TRANSFER METERING PULSES

Getty Oil Company needed a system to transmit flow metering (custody transfer) pulses for their pipe line north of Bakersfield, California.

The main pipe line had a leak detect system installed which compared the flow input to the pipe line at one end and the flow output from the pipe line at the other. Discrepancies meant that there was a leak and the leak detect system would alarm and shut the pipe line down.

New custody transfer units were added, delivering crude into the pipe line at different points.

A system was needed to gather the flow metering pulses from all the custody transfer units, add these pulses and present them to the leak detect system as a new flow input at the pipe line input end.

These custody transfer units were in different locations. Communication to and from these custody transfer units had to be over splinter frequency radio with a very questionable transmission quality.

Eight ScanData M-system RTUs were installed at each custody transfer location and an M-system central station at the pipe line input end.

The central station M-system continuously polls the eight RTUs over the splinter frequency VHF radio. Flow pulse counts are sent from each RTU to the central RTU over a proprietary ScanData software package which ignores faulty transmissions. The central RTU adds these pulses and outputs this sum to the pipe line leak detect system which now has flows that match from one end to the other.

In many years of operation, over a radio system where only 3/4 of the transmissions are usable, there has been no record of any missing flow pulses.

16.J CONCLUSION

Using the ScanData building block RTUs and diversified software packages can simplify many Telemetry and SCADA projects. The RTUs are compatible with most software packages over the CAP and MODBUS protocols.

In addition to special RTU applications and specialized RTU software, ScanData manufactures a wide selection of helpful system accessories, among them:

- C **2-wire and 4-wire continuous transmission modems, amplifiers, splitters, conditioners and 4-wire to 2-wire converters.**
- C **Cost effective 150/450 MHz and license free data radios.**
- C **Accessories such as flow pulse dividers, power supplies and converters, RTU data concentrators and protocol converters and other equipment.**
- C **Specialized RTU telemetry test equipment.**

For more information on these and other products, contact ScanData, Inc. Detailed technical descriptions and unit pricing is available for all ScanData products.

WHERE CAN I GET MORE INFORMATION?

Literature reference:

pri-0901.pdf	Design Guide and Price List.
vbxc0929.pdf	VBX Voice Box Supervisor and Alarm Dialer RTU.
vbx-0934.pdf	VBX programming instructions.
adl-1363pdf	Alarm dialer loading
smrc1120.pdf	SMR Flow Computer RTU with modem.
smr-1145.pdf	SMR technical manual.

An easy way to get the latest and most recently updated versions of these descriptions is to go on our WEB site:

www.scan-data.com

When you are there, click on the blue button near the bottom of the WEB page that says **Technical Information**. Then click on the description # you need.

A good source for information on alarm dialers is:

www.alarm-dialer.com