CHAPTER 17, UPGRADING EXISTING SYSTEMS

17.A SUMMARY:

Upgrading an existing SCADA or Telemetry system almost always involves buying one or more RTUs. This can create a problem, especially if the system uses older RTUs which are no longer manufactured or RTUs which communicate in a protocol which is no longer supported.

These older system often represent a very considerable investment, yet modern technology and modern Personal Computer developments has made these older systems almost obsolete in many cases. Unfortunately, top level management often feels that their original considerable investment prohibits scrapping any part of the old system. So it may have to be expanded, no matter what the complexity.

This chapter of the Handbook deals with some of the aspects of adding new RTUs to an old system.

Fortunately, modern RTUs can be purchased at a fraction of the cost of older RTUs. Modern RTUs are all micro processor based and are therefore totally programmable. Most of them can also be programmed to communicate in a variety of protocols.

17.B ADDING RTUs TO THE EXISTING SYSTEM:

This approach involves purchasing new RTUs, programmed to communicate in the old existing protocol. There is a one time software charge for programming the RTUs with this approach. It is therefore economical only if a number of RTUs are purchased so that the software charge can be spread out on several RTUs. The drawback with this approach is that you are still purchasing RTUs which communicate in the old, obsolete protocol.

17.C ADDING PROTOCOL CONVERTERS TO THE EXISTING SYSTEM:

This is a more attractive solution. It makes your system start communicating in a modern language. Future expansions can be made easily and cost effectively.

Modern protocol converters (such as the ScanData PRC unit) can be programmed

to communicate in MODBUS or CAP protocols (see sidebar, How many protocols?). The PRC converts your old system to communicate in a universally used protocol and new RTUs and PLCs can be bought from ScanData or any other supplier who supplies devices which speak these modern and universally accepted protocols.

HOW MANY RTU PROTOCOLS ARE THERE?

How many human languages are there? Thousands, probably. How many signal protocols are there? Several hundred (not counting the smoke signals, tom drum protocols and others).

Before the wide spread use of ASCII there were a number of binary protocols in use. Some still survive. Morse code was one of the first protocols in use (and it is still used, but not in telemetry). It is binary, in a way, and hard to understand.

The widespread acceptance of Personal Computers (PCs) have changed all that. Now practically everything communicates in ASCII (American Standard Code for Information Interchange).

The early telemetry and SCADA manufacturers tried to lock in the customer with proprietary secret binary protocols. This unfair practice has now largely been abandoned and most SCADA and Telemetry systems use open (not secret) ASCII in some form. This makes the systems easy to service and expand.

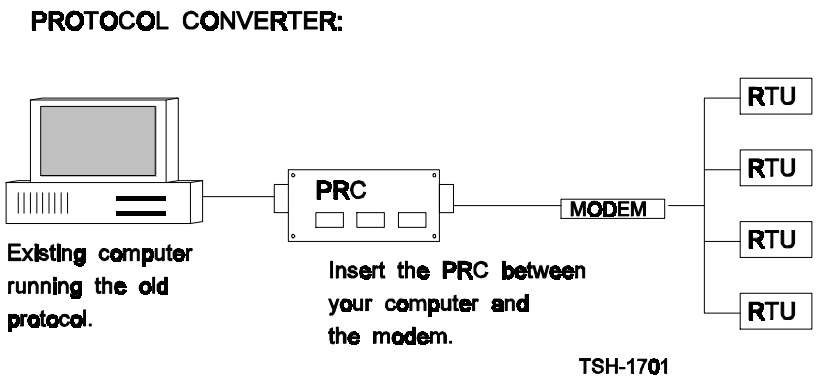
Which is the leading protocol? Two come to mind: MODBUS and CAP. MODBUS (Gold and AEG) is probably the most widely used. It comes in two versions, ASCII and RTU. ASCII is the easiest to deal with. Of the two, Compressed ASCII Protocol (CAP) is probably the easiest to use. ScanData RTUs can communicate in both.

The descriptions and use of protocol converters is covered in detail in CHAPTER 13, Protocol Converters and Data Concentrators.

Briefly, the PRC Protocol Converter acts as a translator. On the existing system side, the PRC receives the polling requests and commands in the old protocol.

On the RTU side, the PRC transmits these polling requests and commands in the new protocol. The new RTUs respond in the new protocol and the PRC sends the RTU responses back to the existing system in the old protocol.

The existing system software will not have to be changed, only configured to accept the more RTUs.



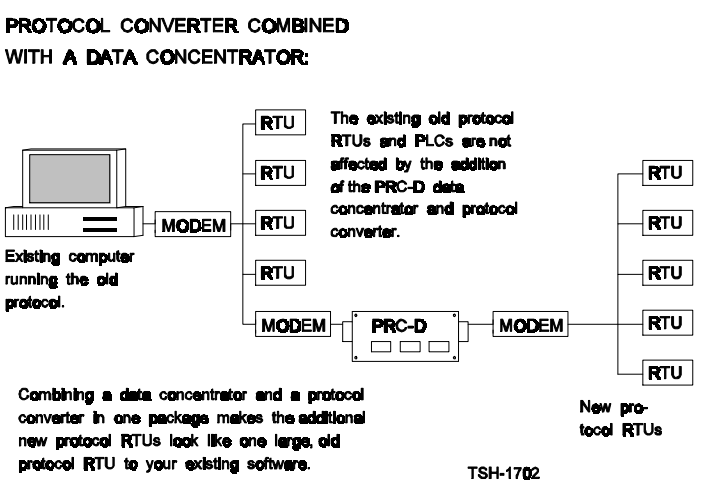
17.C.1 CONNECTING SEVERAL RTUS TO THE PROTOCOL CONVERTER:

Protocol converters can be practical for a single RTU, but they are even more practical if they can talk to several RTUs. This can be done over cable or over radio.

The line side (the new protocol side) of the PRC can connect to a modem which connects over radio to several RTUs. The modem can also connect through a cable branching device such as the FSD- 202A to several cable runs with an RTU at each end. The PRC translates each RTU request or command from the central and broadcasts it to all new protocol RTUs.

17.D ADDING RTUs OVER DATA CONCENTRATORS TO THE EXISTING SYSTEM:

The ScanData PRC-D data concentrator can act both as a data concentrator, gathering information from a number of RTUs (up to 100) and as a protocol converter.



The advantage of this approach is that virtually any number of new RTUs (all communicating in a modern protocol) can be made to look like one or more existing protocol large RTUs to your system.

The descriptions and use of data concentrators is covered in detail in CHAPTER 13, Protocol Converters and Data Concentrators.

Briefly, the Protocol Converter and Data Concentrator (PRC-D), continuous to work as a Protocol Converter as described above. In addition, the Data Concentrator software in the PRC-D continuously and independently polls several RTUs.

This Data Concentrator software is multi-tasking and interrupt driven. It is totally transparent to the Protocol Converter software, which accepts RTU requests and commands in the old protocol as described above.

The only difference is that the PRC-D now appears as one large RTU to the old central station software. The PRC-D collects all the information from the RTUs

it automatically polls into one RTU data base. This data base is delivered to the central as if it were one RTU. All commands from the central are also automatically distributed to each RTU that the PRC-D automatically polls.

17.E ADDING SIGNAL MULTIPLEXING POINT TO POINT RTUs TO THE EXISTING SYSTEM:

This is probably the easiest way to expand an existing system when you need to add more remote points. It is best explained by an example:

Lets say you need to add eight digital inputs, two analog inputs, eight digital outputs and two analog outputs to a site which is several miles away from an existing RTU site.

First you arrange to communicate between the sites, either by radio or by cable.

You then install a ScanData Mode-C LMX RTU at the existing RTU site and another Mode-C LMX RTU at the new remote site. These two RTUs start automatically and continuously communicate with each other when power is applied. No programming is required.

Digital and analog signals input at the new remote site are now repeated out at the existing RTU site, where they are simply input to the existing old RTU. Analog and digital output signals from the existing old RTU are input to the LMX and repeated out to the LMX at the new remote site.

You have now expanded your system with eight digital inputs and outputs and two analog inputs and outputs to and from the remote site without incurring any central station software costs. The hardware cost of the two LMX RTUs is also very reasonable.

17.F ADDING EXTRA CABLE RUNS TO THE EXISTING SYSTEM:

As described above, additional cable runs can be added to an existing system, using the FSD-202A splitter and combiner (multidrop) amplifier. You can add more old RTUs at the end of each of these cable runs. Use the ScanData MDM-202A modem at each RTU if they don't come equipped with modems.

You can also add a Protocol Converter with or without a Data Concentrator at the cable hub if you prefer to add new protocol RTUs, as described above.

17.G ADDING RADIO LINKS TO THE EXISTING SYSTEM:

Radios are inherently multi-drop and need no FSD-202A splitter and combiner. Adding new data radios connected to RTUs to an existing radio system presents no problem, as long as the new data radios use the same frequency.

If you need a number of new RTUs, you may consider using a new frequency and

an independent new network of RTUs. This is a very practical and cost effective solution for adding new RTUs in a new area.

A new central radio site communicates to all new RTUs on the new frequency. An old frequency receiver can be connected directly to the new frequency central radio transmitter and the central radio transmitter connected to the old frequency receiver. The central radio site then acts as a simple two frequency repeater for the system. This works well if the new RTUs communicate in the old protocol.

Adding a PRC Protocol Converter at the new central radio site makes it possible to use a modern protocol in the new RTUs. Adding a PCR-D Protocol Converter with the Data Concentrator software makes the new central radio site look like one large RTU to the old system.

Placing Scan-Data RTUs on the WEB.

The UDS Device Servers allows connecting serial devices such as Scan-Data RTUs, PLCs and SCADA master station PCs to IP based Ethernet networks, quickly and easily. Using a method called serial tunneling, the UDS encapsulates serial data into packets and transports it over Ethernet. Using two UDS units, connected by a network, virtual seral connections can be extended across a facility or around the world.

There is no need to develop special software to take advantage of Ethernet networking. With virtual COM ports, mapped to remote Device Servers o the network, you can replace direct serial connections.

In modem emulation mode, the UDS is used dto replace dial-up modems. The unit accepts modem AT commands on the serial port, then establishes a network conection to the end RTU or PLC, leveraging network infrastructure and bandwith to eliminate dedicated modems and phone lines.

The UDS Device Server includes a built-in WEB server, which can be used for configuration or to display operating and troubleshooting information on the attached device. When attached to the Internet, it provides links to online support.

Flash memory provides for maintenance-free non-volatile storage of WEB pages, and allows future system software upgrades.

WHERE CAN I GET MORE INFORMATION?

The following descriptions, pertinent to this chapter, are included in the DESCRIPT directory on the SCADAtech(TM) CD:

pri-0901.pdf Design Guide and Price List.

sdc-1321.pdf SCADA Data Concentrator.

spc-1001.pdf SCADA Protocol Converter.

app-1498.pdf How to add inputs and outputs to SCADA systems.

uss-1333.pdf How to upgrade older SCADA systems.

app-1319.pdf How to distribute SCADA data over the WEB.

app-1112.pdf How to select data radios.

2BY41559.pdf 2BY4 controller description.

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.