

CHAPTER 3

CENTRAL STATION AND ISLAND STATION HARDWARE

1. HARDWARE CONFIGURATION.

a. The central station and island stations are arrangements of personal computers (PCs), peripherals, and PC based operator workstations communicating together on a local area network (LAN). The central station and island station provide human operator interface, centralized utility optimization routines, and archival data storage for the UMCS. For UMCS extended to multiple geographical and functional areas, each island station provides human operator interface with field equipment panels within a geographical and functional area, while the central station provides supervisory interface with multiple island stations. For UMCS installed at a single installation, the central station provides human operator interface, centralized optimization and archival data storage, and there are no island stations. Depending on the utility monitoring and control needs of the installation, a UMCS may include only a central station or may include a central station and a number of island stations.

b. A UMCS for a single installation requires a central station interfaced with field equipment through data transmission systems. This configuration is illustrated in Figure 3-1.

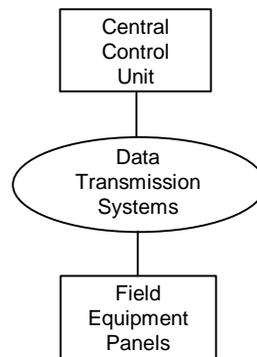


Figure 3-1. Single-Site UMCS with Central Station.

c. A UMCS for multiple installations requires a central station interfaced through data transmission systems to island stations at each remote geographical area. Field equipment at each installation is interfaced through data transmission systems to that installation's island station. Field equipment at the installation containing the central station will be interfaced to the central station. This configuration is illustrated in Figure 3-2.

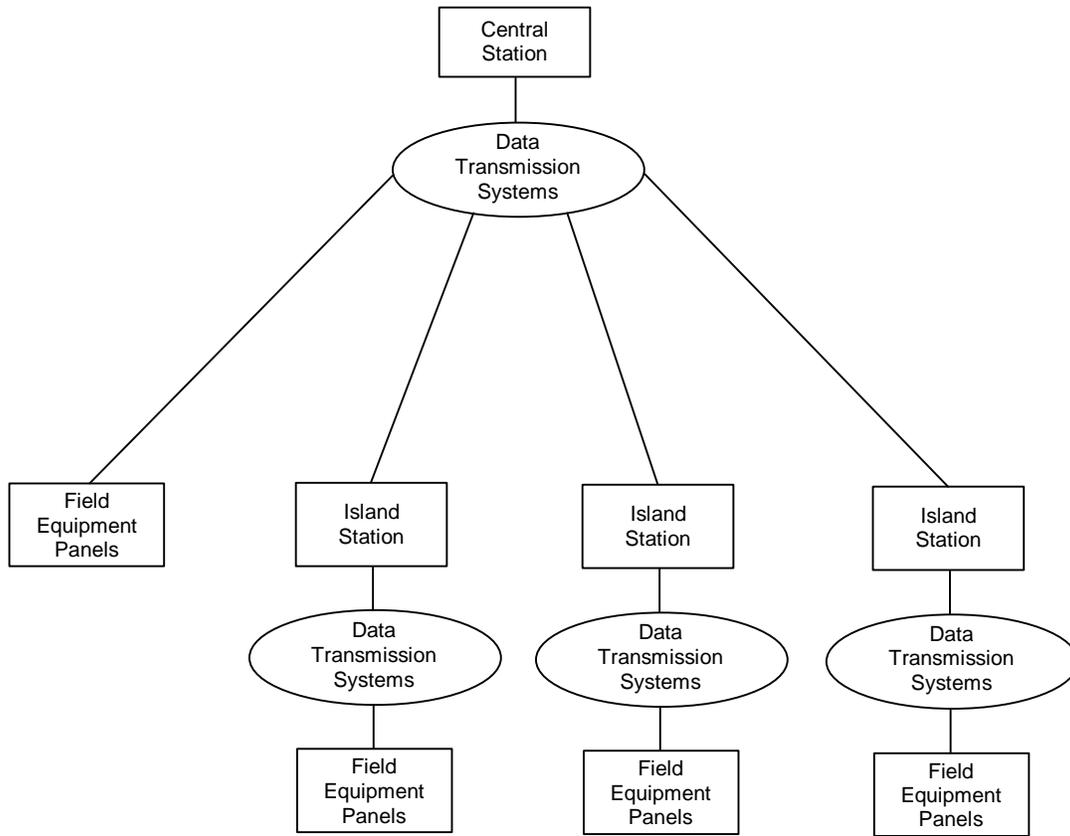


Figure 3-2. Multi-Site UMCS with Central Station and Island Stations.

- d. The central station or island station may include the following equipment:
- (1) Central station or island station computer.
 - (2) Communication processor.
 - (3) Network interface adapter.
 - (4) Printers.
 - (5) Workstations.
 - (6) Local Area Network (LAN)
 - (7) Modems
 - (8) UMCS test set with I/O simulator

A typical island station arrangement is shown in Figure 3-3 for an island configuration using multiple data transmission channels to field equipment.

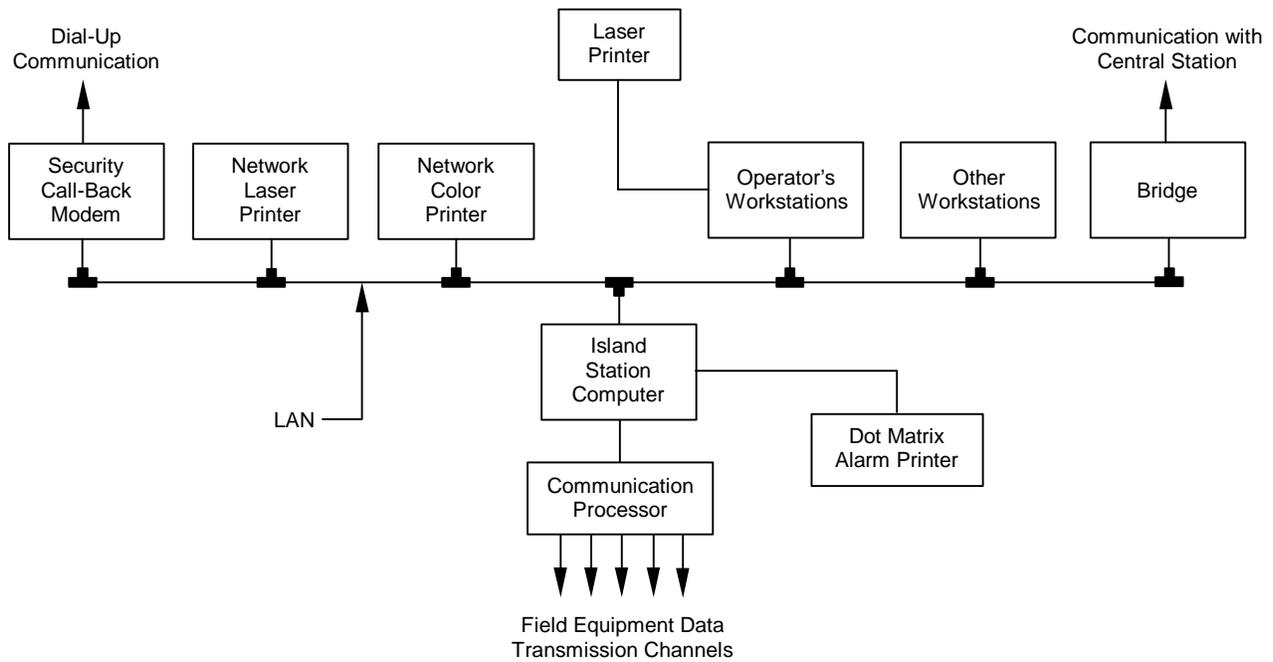


Figure 3-3. Typical Island Station Arrangement (Multiple Data Transmission Channels).

A typical island station arrangement is shown in Figure 3-4 for an island configuration using LAN-based field equipment.

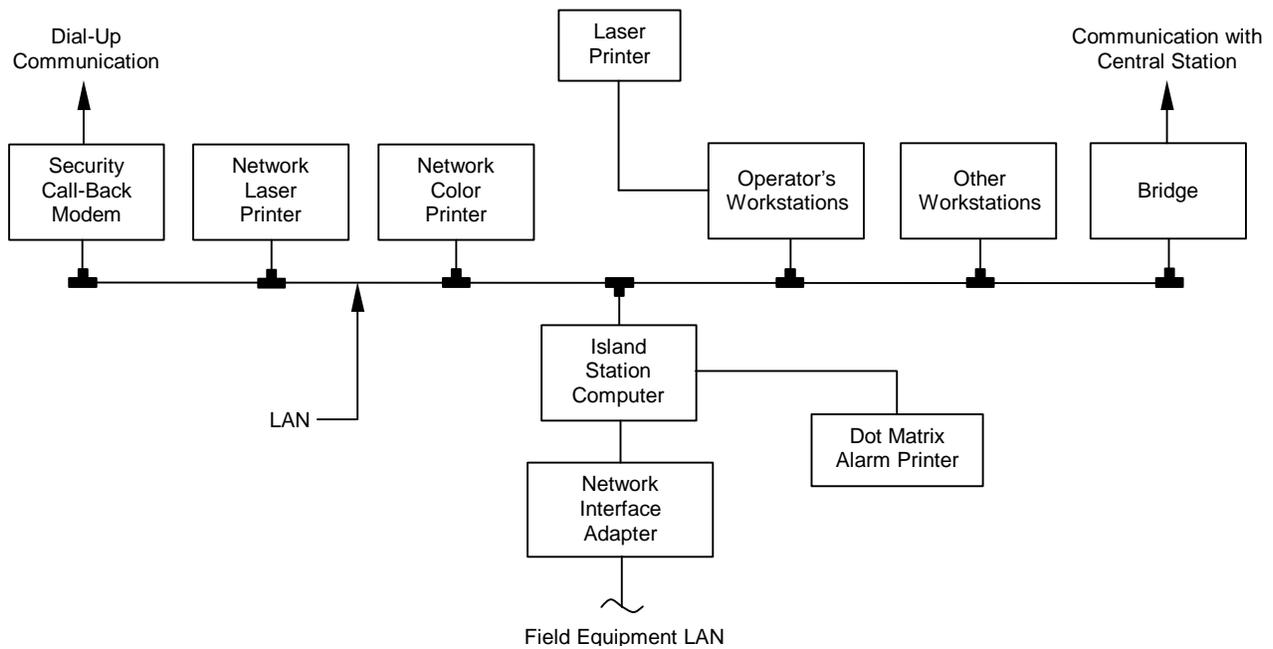


Figure 3-4. Typical Island Station Arrangement (LAN-based Field Equipment).

A typical central station arrangement is shown in Figure 3-5.

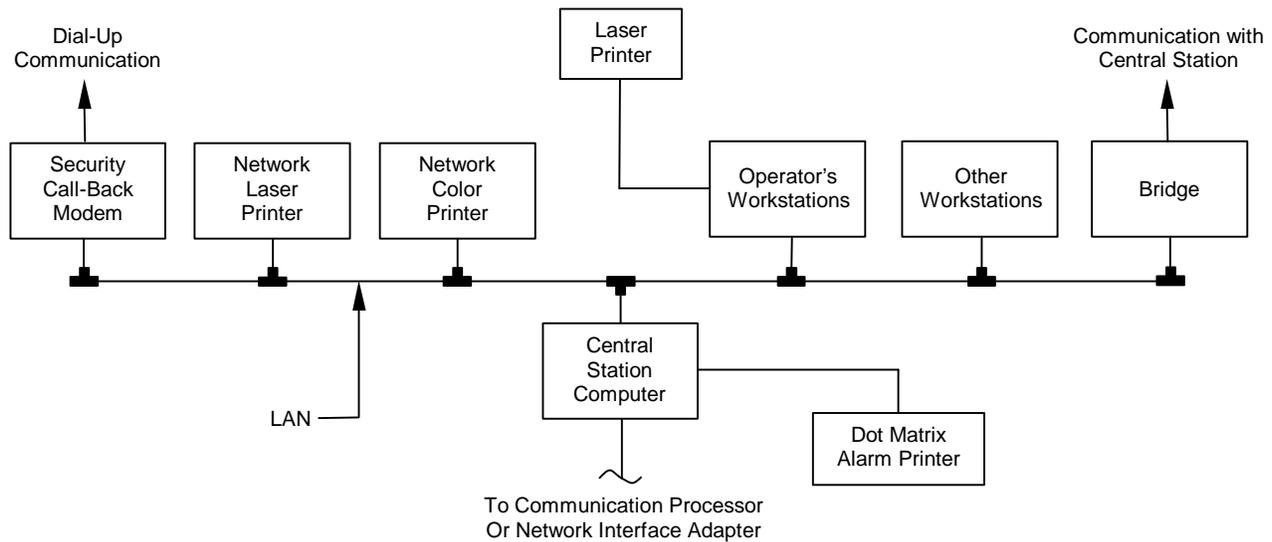


Figure 3-5. Typical Central Station Arrangement.

2. CENTRAL/ISLAND STATION COMPUTER.

a. The central station computer or island station computer functions as the overall system coordinator, performing centralized utility management functions, complex calculations, control of peripheral devices, alarm management and reports management.

b. The central station computer or island station computer is a complete computer system consisting of a system unit with central processing unit, memory, input-output interfaces, keyboard, mouse, monitor, hard disk drives, floppy disk drives, CD ROM drive, cartridge tape drive and WORM drive, and a dedicated dot matrix alarm printer. A block diagram of a central station computer or island station computer is provided in Figure 3-6.

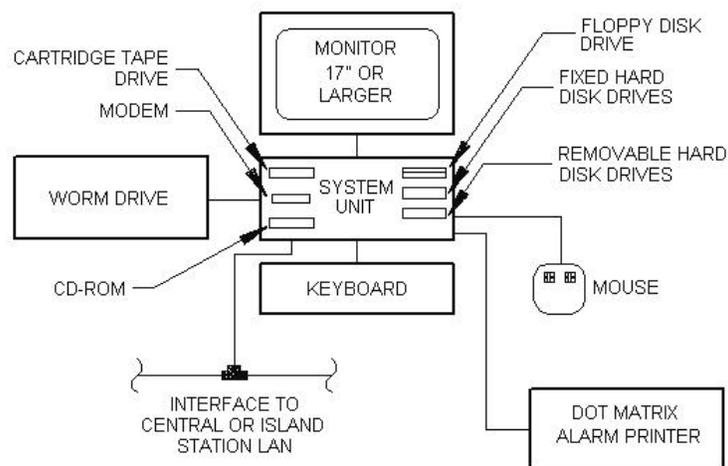


Figure 3-6. Central/Island Station Computer.

3. COMMUNICATION PROCESSOR.

a. The communication processor is provided on systems with multiple dedicated data transmission channels (as opposed to a LAN) between the central/island station and the field equipment. The communication processor functions as the overall communication manager, directing operator commands, alarm messages, status information and other data between the central/island station computer and the field equipment. On systems with LAN-compatible smart field panels, the communication processor is not required because data transmission between the central/island station and the field equipment is managed by the LAN using the network interface adapter.

b. The communication processor is a special purpose, dedicated processor with a single connection to the central/island station computer and multiple interfaces for communication with field equipment, typically 16 EIA 232 serial ports.

4. NETWORK INTERFACE ADAPTER.

a. The network interface adapter is provided on systems with LAN-based field equipment. The network interface adapter provides a physical media interface and a communication protocol interface between the central/island station computer and the field equipment LAN.

b. The network interface adapter is a special purpose, dedicated processor which is mounted internal to the central/island station computer or interfaced to it through a communication port, with interfaces for one or more field equipment LANs.

5. **HARD DRIVES.** Hard drives are sealed rotating magnetic storage media integrated with the read/write drive mechanism and controller, and mounted internal to the computer system unit. Advances in equipment technology have resulted in the availability of hard drives with storage capacities in excess of 1 gigabyte. Hard drives are used to store the computer's operating system software, applications software program files, and data files requiring frequent access. Hard drives provide faster file access than other mass memory storage devices such as floppy drives, cartridge tape drives and optical disk drives. Hard drives will not be used as the only file archival mechanism because failure of the hard drive requires replacement of the drive and may result in loss of all files on the drive. Mirrored hard drives or redundant arrays of hard drives should be considered for UMCS with critical data acquisition and storage requirements, where loss of data gathered between archival backups is undesirable. These arrangements will provide for access to all data, even if one hard drive fails. Removable hard drives, which are installed in PCMCIA slots, provide portability of data and can be installed in laptop PCs.

6. **FLOPPY DRIVES.** Floppy drives are mounted internal to the computer system unit and use removable magnetic media (floppy disks or diskettes). Three and one-half inch floppy disks typically store up to 1.44 megabytes of information. Floppy drives are suitable for small program file updates or for storage and transfer of small data files between computers which are not networked together. Floppy drives are not suitable for most file archival applications because of the low storage capacity.

7. **MAGNETIC TAPE SYSTEMS.** Magnetic cartridge tape systems are mounted internal to the computer system unit and use removable magnetic tape cartridges for data storage. They can typically store 40 to 250 megabytes of data. Magnetic tape systems are used for file archival/backup.

8. OPTICAL DRIVES.

a. Optical drives are mounted internally to the computer system unit or provided in a separate enclosure with an interface to the computer system unit. Optical drives are used for large file archival applications. Optical drives utilize lasers to read data encoded as discrete variations in reflectivity on optical media (disks). There are several types of optical drive systems which are classified based on the type of disk used.

b. Write-once-read-many (WORM) disks use an organic dye thin film optical recording technique and have typical storage capacities starting at 650 megabytes. Data can only be written to a WORM disk until the disk capacity is filled one time, so there is no risk of accidentally destroying archived data on the WORM disk by overwriting. WORM disks provide very secure archival of large files, such as the static database of a UMCS island, a snapshot of the dynamic database, trend values or graphic display diagrams, and have a life of more than fifteen years.

c. Compact disk read only memory (CD ROM) disks have a typical storage capacity of 650 megabytes. CD ROM disks can only be read from, not written to by an optical drive. A special purpose CD ROM recorder is required to write files to the CD ROM disks. Because of this feature, CD ROM disks are often used for software distribution (such as delivery of a complete system software update from the UMCS manufacturer) instead of archiving. An important advantage of CD-ROM is standardization of the recording format according to ISO guidelines.

d. The rewriteable (or erasable) optical drives have the advantage of high volume data storage capacity (650 Mbytes or 1.3 Gbytes) coupled with the ability to erase and write again. Some manufacturers offer multifunctional drives that will support both the write-once (archival) and erasable (working storage) function. This removable media has a long shelf life of 30 years and is easy to handle and store.

e. Specific optical drives are required for each type and size of disk. Multiple disk changers (jukeboxes) can be provided for installations requiring greater storage capacity.

9. PRINTERS.

a. Dot Matrix alarm printers will be provided for all island stations and central stations, connected to the island/central station computer printer port. Dot matrix alarm printers utilize sprocket-fed fanfold paper up to 11 inches wide, providing hard-copy record of all alarm activity including acknowledgment and return-to-normal. Printing speed and character spacing will be specified for all dot matrix alarm printers.

b. Laser printers with both automatic and manual feed of single sheets will be provided for all island stations and central stations. The system will include dedicated laser printers connected to printer ports on workstations as well as network laser printers. Network compatible laser printers which can be accessed by the central/island station computer or any workstation on the LAN are used to provide economy in cost and in required console areas. Laser printers provide letter quality (high resolution) output suitable for reports. The laser printer resolution, random access memory capacity and printing speeds will be specified for all UMCS.

c. Network Color printers will be included in the design, if required by the installation. Thermal ink jet color printers which allow the use of standard laser printer paper will be used. Although color printers can be used for text printing, they should not be used in place of dot matrix or laser printers because of their slower speed and higher cost per page. Color printers will be connected to the LAN.

10. WORKSTATIONS.

a. A full color, microcomputer based graphic workstation is the primary operator-machine interface. The workstation displays equipment schematics, system status, operating parameters, and equipment operating data. The workstation includes a dedicated keyboard and mouse for entry of operator commands. Graphic displays may be brought up automatically when an alarm is activated, or upon operator command. Operator workstations are located in the central station or island station equipment room. Additional workstations may be located in other areas of the installation based on the installation's requirements. Location of workstations in maintenance shops, such as an HVAC shop, is encouraged. The workstation software permits partitioning of alarms and other information so that, for example, an operator workstation located in the electrical maintenance facility will only display alarms associated with

electrical utility systems. The central station or island station LAN may be extended to the additional workstations or they may communicate with the LAN using a network modem.

b. The workstation is a complete microcomputer system consisting of a system unit with central processing unit, memory, input-output interfaces, keyboard, monitor, mouse or trackball, hard disk drive, floppy disk drives, cartridge tape drive and CD ROM drive. Since the UMCS operator requires clear graphic displays which are easily viewed and recognized, the operator workstation monitor will not be smaller than 17 inches (nominal diagonal screen measurement). A block diagram of an operator workstation is provided in Figure 3-7.

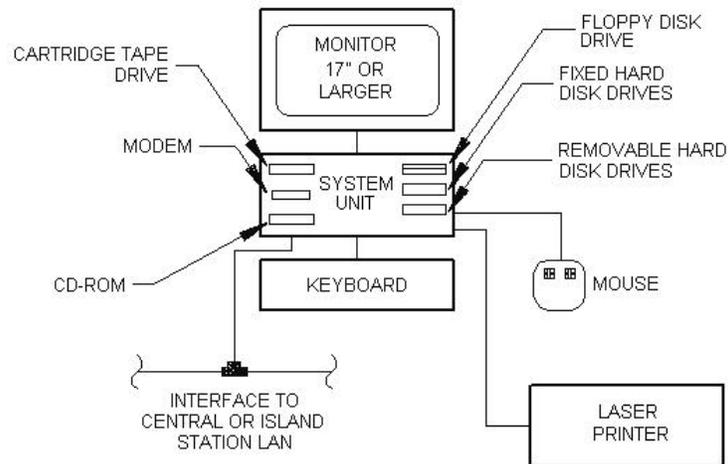


Figure 3-7. Workstation with Laser Printer.

11. LOCAL AREA NETWORK.

a. A LAN is a system composed of hardware, media (cabling) and software which allows computers to share information and resources. The central station or island station LAN will be configured in a bus or star topology as shown in Figures 3-8 and 3-9. In a star topology, cables from network devices are connected to a hub which passes data signals between connected ports. The LAN will utilize fiber optics, twisted pairs, coaxial cable, or radio frequency (RF).

b. Two or more LANs may be interfaced together using dedicated communication circuits, switched circuits, or a packet RF data transmission system to form a wide area network (WAN). Connection of the WAN requires network devices such as network modems or remote bridges at each connected LAN.

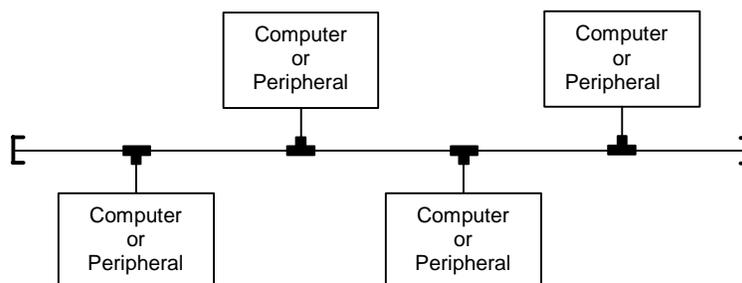


Figure 3-8. Central or Island Station LAN using a Bus Topology.

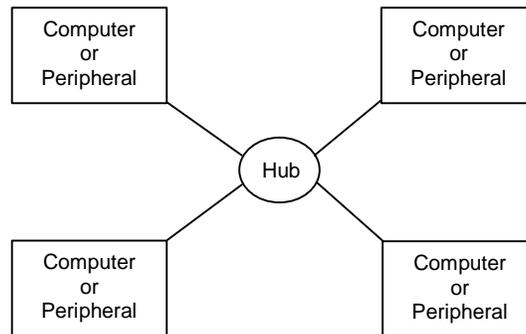


Figure 3-9. Central or Island Station LAN using a Star Topology.

12. MODEMS.

a. A dial-up modem with auto answer security callback and manual originate capabilities will be used for remote interface between the central or island station and a remote location, such as the UMCS supplier's diagnostics facility. The modem allows the supplier's personnel to perform system diagnostic checks and programming from their facilities. However, the security callback feature terminates the connection after auto answer, and then automatically dials a previously established and programmed number, preventing dial-in access to the system from unauthorized locations. The modem's manual originate capabilities allow on-site maintenance personnel to communicate with the supplier's home office to transmit data as required to resolve field problems. The manual originate capabilities are also used by utilities/UMCS operations personnel to establish communication between a central station and an island station in the event that the normal network communication circuits fail.

b. Network modems provide communication between geographically separated LANs or between a remote processor, such as an operator workstation, and a LAN. In some systems, this function is provided by LAN devices referred to as remote bridges.