MEMEX
Measuring Manufacturing Excellence

Dostek DNC
Application Guide

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Introduction

Dostek DNC software works with machine tools equipped with an RS-232C serial communication port. It includes an Explorer-style file manager, a multiple-document program editor, two DNC communication applications ("classic" and "remote callup server"), several supplementary applications, and document and help files.
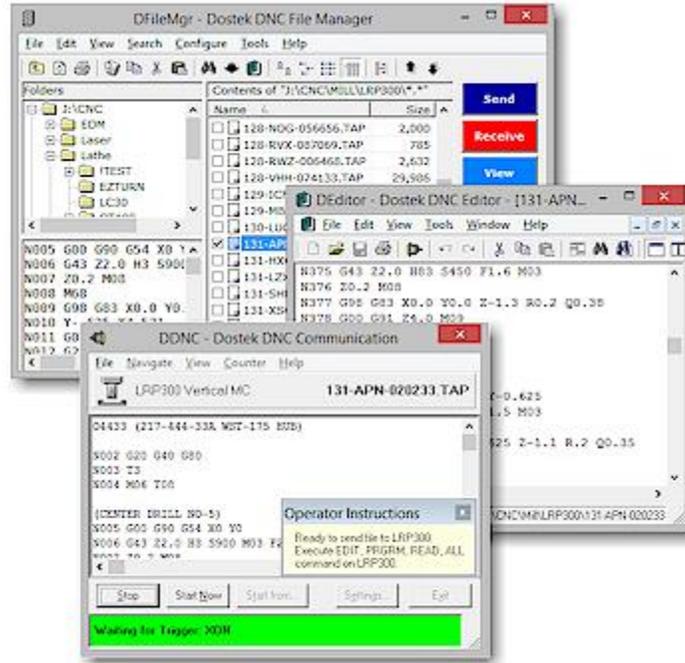
You can connect all your CNCs to one computer, or you can connect each CNC or work cell (group of CNCs) to a separate computer. A separate software license is required for each computer.

With Dostek DNC, you can:

- Load a part program into the CNC's memory from a computer.

- Run (drip feed) a part program on the CNC directly from a computer. (Note: Some CNC models do not support drip-feeding or require purchase of the vendor's optional hardware or software.)

- Save a part program from the CNC's memory to a computer file.

- Load and save CNC data, such as tool offsets, machine parameters, and even machine executive software.

- Simplify installation and setup by choosing from the pre-configured "sample" configurations provided for more than 100 CNC models.

Free Trial

You can download a free trial of the Dostek DNC software at:

MemexOEE.com/Dostek DNC

The fully functional free trial works for 10 days. To extend your trial period, contact Memex.

Direct and Distributed Numerical Control (DNC)

You can use Dostek DNC for both "Direct" and "Distributed" numerical control.

Direct Numerical Control is the process of running a large CNC program directly from the computer. This process is also referred to as "drip feeding". Drip-feeding is used when a program is too large to fit in the CNC's limited program memory, or to save the time required to load a large program into memory before starting.

Distributed Numerical Control refers to connecting machines and computers for the purpose of distributing (loading and saving) NC programs.

Drip Feeding

Dostek DNC can drip-feed large files using the CNC's RS-232C serial port if the CNC is capable. Most Fanuc and Mitsubishi CNC models allow drip-feeding via their RS-232C serial port. However, Fanuc models 2000, 3000, 5 and 6 require a Memex 440A BTR for drip-feeding.

Some CNC models require purchase of optional hardware or software. Most Okuma models require proprietary Okuma DNC-B hardware and software for drip-feeding.

Some CNC models, such as Fagor and Heidenhain, require use of an unsupported (by Dostek DNC) proprietary protocol for drip-feeding.

Some CNC models, such as Mazak and Hurco, are incapable of drip-feeding by design.

"Classic" and "Remote Callup" DNC Methods

You can use Dostek DNC for "classic" DNC or for "remote callup" DNC. The main differences are:

- With classic DNC, you select a file or folder on the computer, and then go to the CNC and execute a load, run (drip feed) or save command to complete the transfer.

- With remote callup DNC, CNC operators transfer files using the CNC control panel; there is no need to go to the computer. The Dostek DNC software continuously monitors all CNCs. To save a file from the CNC to the computer, you simply punch it. To load or run a program from the computer, you first send a short "command" program from the CNC to the computer. For example, to load or run file "A1234," you might first send a command like this from the CNC to the computer:

  ```
  07999 (DNC REMOTE CALLUP)
  (LOAD A1234)
  ```

- With classic DNC, each transfer occurs in a separate window, and each window scrolls the data during the transfer so you can monitor progress in detail.

- With remote callup DNC, all transfers occur in the same window, one per line, and only the status of the transfer is displayed (data is not scrolled). This greatly reduces computing overhead and allows simultaneous communication with up to 64 CNCs.

- Remote callup DNC eliminates the need for shop-floor computers. One computer can service up to 64 CNCs, and the computer can be located in the office or a secure computer room. To service more than 64 machines, you can install Dostek DNC on additional computers.

- To use remote callup DNC, each CNC must be connected to a separate computer COM port. With classic communication, you can use a switch box to share one COM port with several CNCs.

Dostek DNC Editions

Dostek DNC is available in a single-port edition and several multi-port editions. The single-port edition can communicate with one machine at a time, while the multi-port editions can communicate with up to 64 machines simultaneously.

Ports	Memex Order Number
1	7200-16
16	7201-16
32	7202-16
64	7203-16

Dostek DNC is also licensed by the number of computers on which it is installed. For example:

- To communicate with 8 machines using 8 separate computers, purchase 8 single-port licenses.

- To communicate with 8 machines simultaneously using a single computer, purchase one 16-port license.

- To communicate with 75 machines simultaneously, use two computers and purchase two 64-port licenses, or use three computers and purchase three 32-port licenses.

Single-Port Edition

With Dostek DNC single-port edition, you can connect any number of machines to the computer but communicate (transfer or drip-feed) with only one machine at a time.

Multi-Port Editions

With multi-port editions, you can:

- Use the "Remote callup" DNC method to transfer or drip-feed with multiple machines simultaneously.

- Use the "Classic" CNC method to transfer or drip-feed with up to 8 machines simultaneously.

To use multi-port editions, connect each machine to the computer by a separate Windows COM port. Memex recommends using single-port Memex or Moxa Ethernet/serial adapters (see "Recommended Communication Hardware" below).
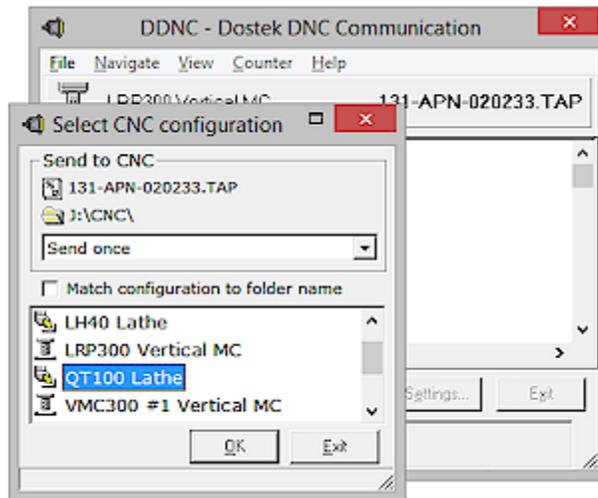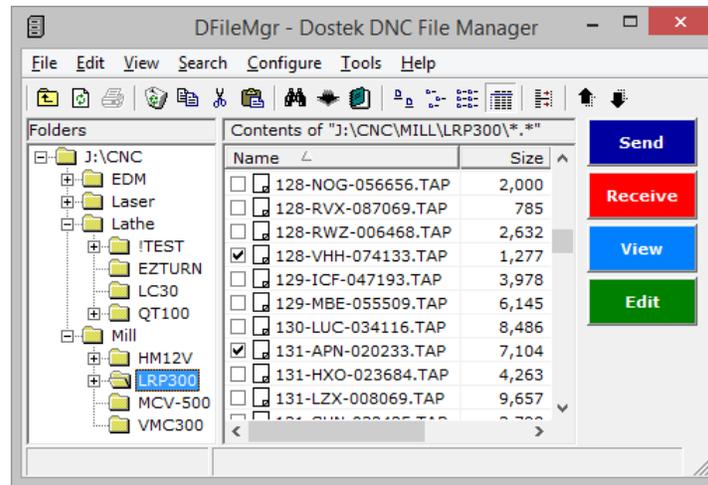
How Dostek DNC Works

You can use Dostek DNC for "classic" DNC or for "remote callup" DNC.

Classic DNC

Loading a file to the CNC using the "classic" DNC method is a simple 3-step process.

Step 1. At the computer, open Dostek DNC File Manager and then select a file.

Step 2. Click Send. The Dostek DNC Communication window opens.

Step 3. Go to the CNC machine and execute a "Read" or "Input" command. The file is sent from the computer to the CNC.

See the notes on the following page.

File Manager

- With the Dostek DNC File Manager, you can organize your files however you like. You decide which folders to make available, and you can choose folders on the local hard drive, any network drive (mapped drive or UNC name), or any removable media.

- Files for the current folder are displayed in the right window. The advanced search function lets you find files by name, by date or by file contents. For example, you can find all files that contain a certain part number or tool, and even view a list of the lines in each file that contain the search text.

- The buttons shown along the right edge of the File Manager window above can be customized to suit your preferences. You can choose from 4 button sizes, customize the colors, specify the commands and button legends, and even create buttons that launch other applications.

Communication

- The Communication window lets you preview the file before you start sending, and lets you start or restart from anywhere in the file. A pop-up window can remind the operator of the command sequence required at the machine to load the files. If you select multiple files, they are queued so they all load in a single operation.

Convenience

- With most CNC machines, you don't need to type in the program number when loading or saving a program. When sending to the CNC, Dostek DNC detects when the machine is ready to receive and starts sending automatically; there's no need to walk back and forth between the computer and machine. When sending from the CNC to the computer, Dostek DNC can automatically name received files according to the CNC's program number or according to a comment in the first line of the program.

Drip Feeding

- When you're drip feeding, Dostek DNC scrolls the program on the screen so you can see where you are and what's coming next. And you can stop anytime and restart from another position. When the end of the program is reached, you can automatically restart from the beginning to run multiple parts.

Remote DNC

Loading a file to the CNC using the "remote" DNC method is a simple 3-step process.

Step 1. At the CNC, create (or edit) a designated "command" file to include a simple one-line command string. For example, to load file "A7-53759", create program O7990:

```
07999 (DNC REMOTE CALLUP)
(LOAD A1234)
```

Step 2. Punch the designated "command" file and wait 5 seconds for the computer to receive and process the command. The computer prepares to send the requested file.

Step 3. Execute a "Read" or "Input" command on the CNC to load the part program into memory or execute a "Cycle Start" (or similar) command on the CNC to drip feed the part program directly from the computer. The computer detects that the CNC is ready to receive data and starts sending the file.

Notes

- Remote DNC uses the Dostek DNC Remote Server application, which continuously monitors all CNCs.
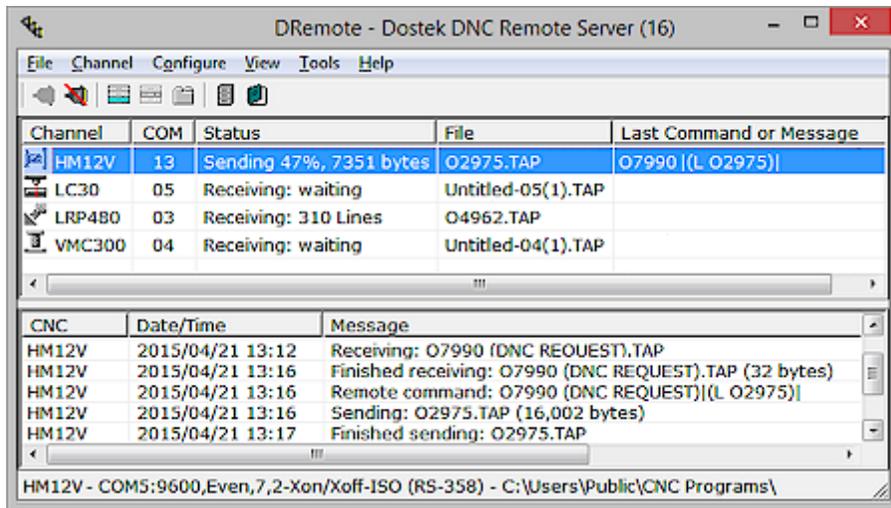
- A single computer can simultaneously serve up to 64 CNCs, and multiple computers can be used to serve a virtually unlimited number of CNCs.

- Because remote access requires continuous monitoring of all CNCs, each CNC must be connected to the computer by a separate COM port.

Recommended Communication Hardware

Memex recommends wired or wireless single-port Ethernet/RS-232C adapters for connecting CNC machine tools to your computer. These adapters provide electrical isolation, which greatly reduces the risk of equipment damage caused by electrical surges.

Ethernet/RS-232C adapters connect to your network, not directly to your computer.

Recommended adapters are described on the following pages.

Choosing Wired or Wireless

Wired networking components are less expensive that wireless components. However, wired systems require installing cables, which can more than offset the cost difference.

Wired networks can be more secure because they require physical access. However, properly configured wireless systems are very secure.

Wired systems allow a maximum cable length of 100 meters for standard Category 5 cables.

Network repeaters or fiber-optic cables are required to extend the distance. Wireless access points have a maximum range of about 100 meters, although higher-range components are available at higher cost.

You can mix wired and wireless components. Both wired and wireless Ethernet/RS-232C adapters require a power source, and a short RS-232C cable to connect to the CNC machine's RS-232C port.

Memex Ethernet/RS-232C DNC Adapter

The Memex DA-S1E3 DNC Adapter provides a single-port Ethernet/RS-232C adapter plus a 3-port Ethernet switch. The Ethernet switch lets you connect up to two additional network devices with a single network drop. For example, you can connect a Memex MTC-one machine interface for monitoring and a touchscreen computer for Merlin DNC Operator Panel.

Merlin DNC communicates directly with the adapter via TCP/IP protocol. No device driver software is required.
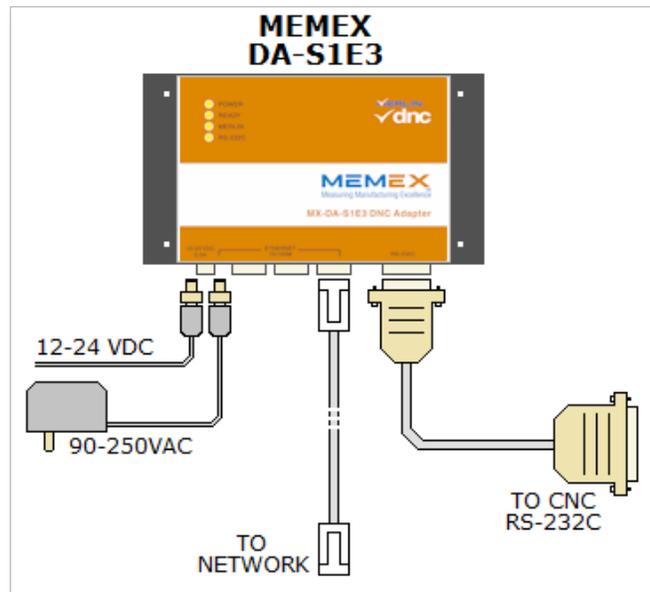
The adapter provides 1,500 volts of magnetic electrical isolation on the Ethernet port, and 15,000 volts of electrostatic protection on the RS-232C signals.

MEMEX MX-DA-S1E3

The DA-S1E3 DNC Adapter is available for either a DC or AC power source. For more information about power sources and optional power cables, see the *Memex DA-S1E3 User Guide.*

To use the wired Ethernet/RS-232C adapter, you:

- Configure the adapter, including assigning a static IP address.

- Install the Ethernet/RS-232C adapter in, on or near the CNC machine.

- Plug the adapter's power cable into a standard power plug or 12-24 VDC power source. See the *Merlin DA-S1E3 User Guide* for important information and precautions about the adapter's power source.

- Install a Category 5 network cable between the adapter's RJ45 network port and your network switch or hub.

- Install a short RS-232C serial cable between the adapter's DE9P serial connector and the CNC's RS-232C serial port. Memex RS-232C cable, order # 5705-23, is suitable for most CNC models.

Moxa Wired Ethernet/RS-232C Adapter

Wired Ethernet/RS-232C adapters plug into your computer network and provide a standard DE9P RS-232C serial port. You can connect any number of adapters to your network.

The adapter provides 1,500 volts of magnetic electrical isolation on the Ethernet port, and 15,000 volts electrostatic protection on the RS-232C signals.
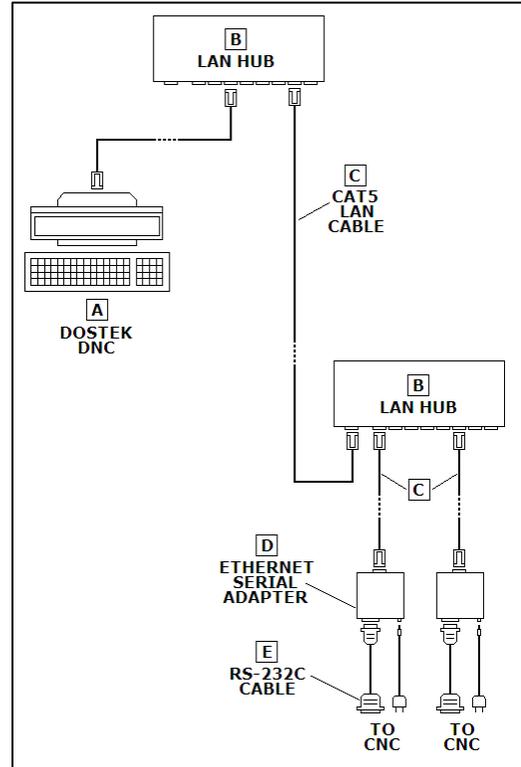
To use the wired Ethernet/RS-232C adapter, you:

- install the Ethernet/RS-232C adapter [D] in, on or near the CNC machine

- plug the adapter's power cable into a standard power plug

- install a Category 5 network cable [C] between the adapter's RJ45 network port and your network switch or hub

- install a short RS-232C serial cable [E] between the adapter's DE9P serial connector and the CNC's RS-232C serial port

- install the adapter's device driver software on the computer [A], and then assign a static IP address and COM port number to the device

Two versions of the single-port wired Ethernet/RS-232C adapter are available:

- Memex order # 4502-15: Single Ethernet port, single serial port. Includes 115VAC power adapter.

- Memex order # 4503-15: Two cascading Ethernet ports, single serial port. Requires 12-48 VDC power (115VAC adapter is optional). Choose the 4503-15 when you need to install a second Ethernet device, such as a Memex Universal Machine Interface.

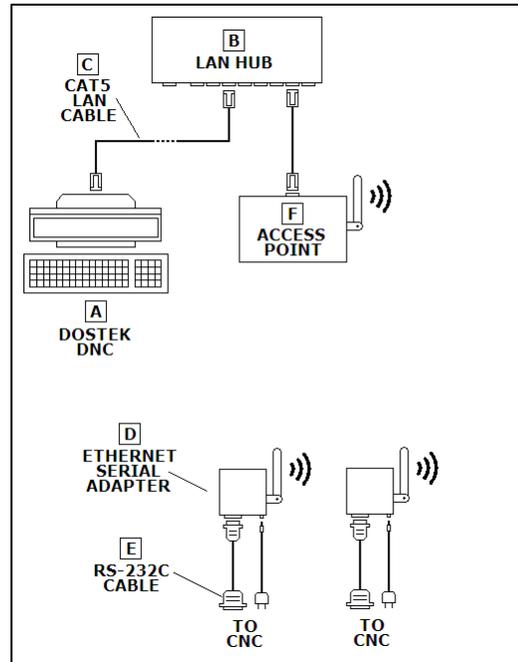For cable [E], Memex order # 5705-21 is suitable for most CNC models.

Moxa Wireless Ethernet/Serial Adapter

Memex order #4501-15

The 4501 single-port wireless Ethernet/RS-232C adapter connects to your 802.11 wireless network and provides a standard DE9P RS-232C serial port. You can connect any number of NPort wireless adapters to your wireless network.

The 4501 wireless adapter works with your wireless access points and provides a wireless range of up to 100 meters in open areas. It provides total electrical isolation and 15,000 volts electrostatic protection on the RS-232C signals.

To use the wireless Ethernet/RS-232C adapter, you:

- install the wireless Ethernet/RS-232C adapter [D] on or near the CNC machine

- plug the adapter's power cable into a standard power plug

- install a short RS-232C serial cable [E] between the adapter's DE9P serial connector and the CNC's RS-232C serial port

- install the adapter's device driver software on the computer [A], and then assign a static IP address and COM port number to the adapter

For cable [E], Memex order # 5705-21 is suitable for most CNC models.

Digi Edgeport/1 USB/RS-232C Adapter

Memex does not recommend using a USB/RS-232C adapter. Although widely available and low in cost, USB/RS-232C adapters are often poorly designed and unsuitable or unreliable for CNC communication. Consider using a recommended Ethernet/RS-232C device.

If you must use a USB/RS-232C device, the best choice at time of writing is likely the Digi Edgeport/1 device (Memex order number 5711-23) as it has only one know flaw that Dostek DNC can accommodate.

For more information about USB/RS-232C problem symptoms, ask for Memex technical note "Using USB-Serial Adapters."

For more information about the Digi Edgeport/1 device, ask for Memex application note AN58, "Using Digi Edgeport USB-Serial Adapter."

Behind-the-Tape Reader (BTR)

The Model 440A Behind-the-Tape Reader (BTR) is an affordable RS-232 serial communication retrofit for older NC/CNC machine tools equipped with tape readers. It lets you integrate older NC machine tools into a modern DNC system for loading or drip feeding of part programs or executive software directly from computer.

A 256Kb battery-backed memory is included for file storage. You can use the memory to run the same program over and over again, or to continuously drip feed files of unlimited size.

The 440A BTR lets you load or run standard ISO or EIA part program files or binary files such as machine executive software and diagnostics. Standard parallel (Facit) and serial (RS-232/current loop) puncher ports let you send data from the CNC's punch output back to the computer (an optional cable may be required).

The 440A BTR can replace most tape reader models, including: Decitek, EECO, Fanuc, General Electric, Ghielmetti, Remex, Ricom and Sanyo Denki.

The 440A BTR works with most NC/CNC machines equipped with a tape reader, including: Agie, Allen Bradley, Bendix, Bridgeport, Cincinnati Milacron, Fanuc, General Electric, Giddings and Lewis, Houdaille, Kearney and Trecker, Mitsubishi, Okuma, Swedturn, Warner Swasey, Westhinghouse and Yasnac.

A cable kit is required for certain 440A BTR applications. To order a BTR, specify the manufacturer and model number of the machine's numerical control and tape reader.
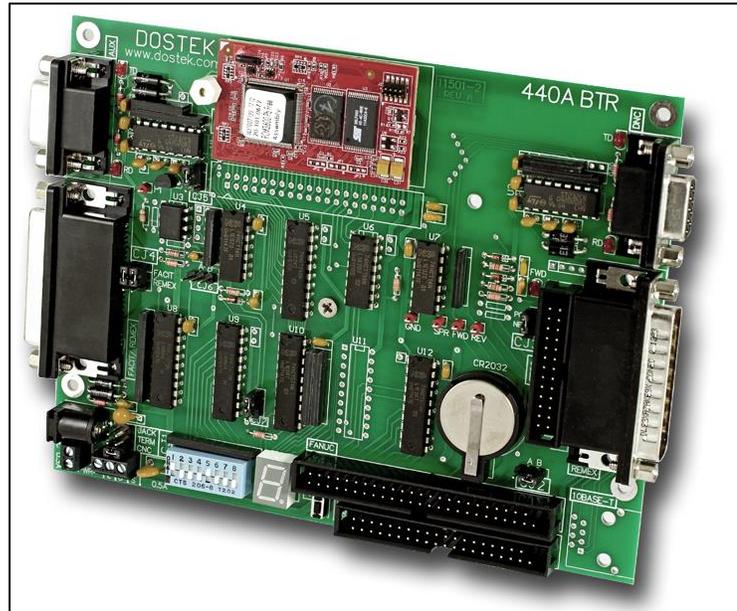
Preparing for DNC System Installation

This section explains how to prepare for a DNC system installation. Customers are responsible for providing the network, computing and power resources needed for the DNC system.

Network Infrastructure

For a **wired** DNC system, you provide the following network infrastructure:

- Network switches with capacity to provide a connection for each machine tool and each computer.

- A Category 5 network cable between each machine tool and a network switch. Locate the machine end of the cable near the machine's RS-232C serial port and provide at least 2 meters of extra cable length. Terminate both ends of each cable with RJ45 plugs. The maximum length for a network cable is typically 100 meters.

For a **wireless** DNC system, you provide the following network infrastructure:

- One or more wireless access points to provide coverage for all machine tools. Industrial grade access points are usually required to ensure adequate reliability, security and manageability.

For both wired and wireless systems, you also provide:

- A static IP address for each Ethernet/RS-232C adapter. Static IP addresses are usually reserved and assigned by the network administrator.

Discuss these requirements with your network administrator when planning your DNC installation.

Power

Provide a 110-volt 1-ampere power outlet located near each machine's RS-232C serial port. This plug provides power for the wired or wireless Ethernet/RS-232C adapter. A power source that is always on is ideal. Some machines provide a convenient accessory power plug near the serial port.

Computers

If you plan to use remote DNC (page 5), one computer can service up to 64 machines. The DNC computer can be located anywhere on your network; it does not need to be located on the shop floor. However, you may also consider installing one or more additional workstations on the shop floor to allow CNC operators to view program files, drawings and so on.

If you plan to use classic DNC (page 3), you can use one computer for all CNCs, or one computer for each machine, work cell or department. Remember that DNC computers connect to your network (they do not connect directly to the machines).

Dostek DNC works with Windows XP through Windows 10. If you plan to use remote DNC, a minimum of 8 GB of computer memory is recommended.

Tasks

To prepare for your DNC installation:

1. Discuss the network infrastructure with your network administrator.

2. Ask your network administrator to reserve and assign a static IP address for each machine.

3. Prepare a list of machines. Include the following information:
   - The machine name and/or asset number.
   - The manufacturer and model number of the machine's control.
   - The type and location of the machine's RS-232C serial port (see "Connecting to the Machine's RS-232C Serial Port," below).
   - The assigned static IP address.

4. Consider contracting with a local data cabling contractor for installation of network infrastructure to ensure compliance with local codes and standards.

5. Supply and install the required network cables, wireless access points, network switches or other infrastructure required for your system.

6. Supply required computers and connect them to the network.

7. Provide the required power for the Ethernet/RS-232C adapter at each machine.

Connecting to the Machine's RS-232C Serial Port

Locate each CNC machine's RS-232C serial port. It is usually a D-shaped 25-pin connector. It may be located on the rear panel of the machine near the control electronics, or it may be located on or near the operator panel on the front of the machine.

Some CNC models provide 9-pin connectors or provide the connection inside the control cabinet. Refer to the machine manuals or contact the manufacturer if you need help locating the serial port.

If the machine's RS-232C serial connector is located where the cable from the Ethernet/RS-232C adapter will be in the way, you may be able to relocate the connector inside the cabinet. In this case, you can install the Ethernet/RS-232C adapter inside the cabinet and route the network cable inside, or you can install the Ethernet/RS-232C adapter outside the cabinet and route the RS-232C serial cable inside.

The Ethernet/RS-232C adapter is normally connected to the machine's RS-232C serial port with a 5-foot serial cable. This means you must provide a power plug for the adapter near this location.

If you are unable to locate an external RS-232C port, look in the machine's manuals for a connector identification diagram or connection block diagram that identifies the existence or location of the connector. Search the manual for "RS-232," "RS232" or "baud" to find sections related to the RS-232C ports.