ABSTRACT

AN INTERNSHIP PREPARING USER DOCUMENTATION
AT CTC PARKER AUTOMATION

by Tracy L. Scobba

To fulfill one of the requirements for the Degree of Master of Technical and Scientific Communication, I performed a 20-week internship at CTC Parker Automation (CTC) as a technical writer.

During the internship, I wrote and edited product communications in the forms of user guides, online help, and installation sheets. I was responsible for all aspects of these communications, including preparing the graphics, coordinating reviews, and preparing the files for printing.

I interviewed subject matter experts, such as software, hardware, quality-control, and customer-support engineers, to obtain product and user information. This internship was my first experience in the field of technical communication. I learned the importance of seeking information from experts throughout the company to produce effective user documentation.
AN INTERNSHIP PREPARING USER DOCUMENTATION
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An Internship Report

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Dedication

To my mother, Pam Klein, who has always assured me that I can accomplish anything I want to.
Acknowledgements

I would like to thank the following individual for their help and support: my husband Chuck for his patience, love, and encouragement; my parents; my manager David Brower and coworkers Dave Kimmel and Mary Ann McDonnell at CTC Parker Automation; Paul Anderson, for his leadership and support throughout my internship and the report writing process; the MTSC faculty: Jean Lutz, Jennie Dauterman, and Bob Johnson; Gary Shulman; and my Lord and Savior Jesus Christ, without whom this endeavor would not have been possible.
Chapter 1
Introduction

In December 1998, I completed a 20-week internship at CTC Parker Automation as a technical writer. During my time at CTC, I wrote and edited product communications in the forms of user guides, online help, and installation sheets. I also prepared technical graphics for these communications and interviewed subject matter experts, such as software, hardware, quality-control, and customer-support engineers, to obtain technical and user information. I was part of a small team of writers, but I worked independently on many of my projects.

CTC Parker Automation

Computer Technology Corporation (CTC) is a division of the Parker Hannifin Corporation. CTC was founded in 1981 and remained privately held until its acquisition by Parker in 1998. Parker is a worldwide leader in the production of motion and control components for over 1,400 industrial and aerospace companies.

CTC employs approximately 80 people and competes with companies such as Allen Bradley, Rockwell Software, Cutler-Hammer, and Total Control Products in producing man-machine interface products. The man-machine interface is the hardware and/or software that enables a person to control a machine. Companies that produce factory machines often do not produce the controls for their machines. These companies can buy the CTC control panel, called a PowerStation, and the control software, Interact, to program on-screen buttons, dials, displays, and so on to control their machines.

During my time at CTC, it had 12 departments that reported to three key individuals: the General Manager, the Division Operations Manager, and the Controller. The General Manager, who was in charge of the entire division, reported to the president of the Automation Group of Parker Hannifin. The Division Operations Manager and the Controller reported to the General Manager. The Sales, Marketing, and Training Departments each had managers who reported directly to the General Manager; all other departments had managers who reported to either the Division Operations Manager or the Controller.
I was part of the Technical Documentation Group. Because Technical Documentation was under the Marketing Department, we reported to the Marketing Manager. Technical Documentation provided user manuals, online help, installation information, and more for the CTC man-machine controls products.

**Overview of Products**

CTC produces two major products: PowerStation control panels and Interact controls software. A PowerStation (Figure 1: CTC PowerStation) is like a PC, but it is smaller and more rugged. It is usually mounted on a factory machine and must be able to handle vibration, heat, and possibly foreign substances, such as grease or oil. Because the PowerStation is most often mounted directly on a factory machine, it is controlled in the field by its touch screen. The PowerStation does not come with a keyboard or mouse, but either or both can be attached to make setting up and programming the PowerStation easier and more efficient.

![Figure 1: CTC PowerStation](image)

PowerStations are set up and programmed with the Interact software. PowerStations can also be set up and programmed with software from other companies, but Interact is the CTC-preferred software, designed specifically for use with the PowerStation. Engineers use standard drawing tools to create dynamic user interfaces that are then downloaded to the PowerStation to control the machine. The following figure is a sample user-interface designed in Interact.
Technical Documentation Group

During my time at CTC, I worked under David Brower, the Technical Documentation Manager. I also worked with two full-time writers, Dave Kimmel and Joy Bennett; the Translations Manager, Cecile Clavel; and another technical writing intern, Mary Ann McDonell. We met once a week with the Marketing Department and once a month as the Technical Documentation Group.

Before I started at CTC, the Technical Documentation Group, for several years, had included only David and Dave, although they sometimes hired contract writers to assist. David worked with the PowerStation documentation, which was paper documentation created in FrameMaker. Dave focused on the Interact software documentation, which included a paper, getting-started manual and an extensive online help system created in RoboHelp.

In the span of a couple months, Joy, Cecile, Mary Ann, and I were added to the team. David’s role shifted from writing to mostly managing the team. Dave continued to be in charge of the Interact documentation, but over the months, he was also in charge of guiding Mary Ann and me as we worked on documentation for specific applications within the Interact software.

Each member of the Technical Documentation group worked independently on projects, but the lines between projects was not as clear as it had been when there were only the two main writers, each with his own product to document. For example, while I was working on the
Interact online help, Dave and I met weekly to look over the sections we were working on and determined whether we were duplicating effort and whether either of us had learned new technical information from an SME that might be helpful to the other.

We also relied on each other for help with FrameMaker and RoboHelp questions and with grammar and usage questions. We edited each other’s writing and became friends. It was a great environment for a new writer. David was a very patient manager, and Dave was very helpful with many software and technical problems. I had never used either FrameMaker or RoboHelp, our two major documentation creation tools, but Dave helped me to learn both.

Another great source for information and support was my fellow intern, Mary Ann. She and I shared a cubicle, so we were always talking with each other about grammar questions and about subject matter expert (SME) frustrations.

**Position**

My official position at CTC was an entry-level technical writer. I wrote and edited user documentation for hardware and software products. For each project, David met with me to discuss the details of the project. He went over the purpose of the product and described the documentation that needed to be created or revised. When I was to revise an existing piece, he highlighted areas in the document on which I should focus. In addition, he referred me to people who were good resources for answers to questions about the product.

David then remained available to answer my questions. He responded quickly to my email or voicemail messages, and he usually stopped whatever he was working on to advise me. He also reviewed my work and provided praise and constructive criticism.

When I was assigned a project, it included every part of the documentation piece. I sought out the SMEs to get the information that I needed. I created and revised the technical graphics, scheduled peer and technical reviews, and prepared the documentation for print. I also created archive copies of the documentation, prepared a PDF, and posted it on the CTC Intranet site.

In the next chapter, I will describe my projects at CTC. In the third chapter, I will describe in detail a major project I completed, and in the fourth chapter, I will describe how I used the problem-solving model to complete my major project.
Chapter 2
Overview of Internship

During my time at CTC, I worked on five projects. Before I started any of them, however, I had to learn to use FrameMaker and RoboHelp. FrameMaker was the desktop publishing software used at CTC, and RoboHelp was the tool for creating online help systems. While at CTC, I also used Paint Shop Pro to create technical drawings, and I used a digital camera to capture technical photographs. Besides familiarizing myself with these tools, I also had to learn about the products produced at CTC. In this chapter, I briefly describe my training, my projects, and my other activities.

Training

When applying at CTC, I had not heard of man-machine interface hardware or software, so I had a lot to learn about the industry, its products, and its users. To begin my training, David asked me to complete several training exercises to familiarize myself with CTC products, users, and the tools the writing group used.

My first exercise was to set up a user interface for a bottle-filler machine in the Interact software. I read the getting started manual for the CTC Interact software to get a general overview of the product and its use. Then I drew the interface using standard graphics and simple drawing tools, and I assigned input and output variables to control the individual pieces of the machine. When I got that interface to work, my next exercise was to think of my own machine and create the interface for it. I created a gasoline pump interface.

Setting up the interface for a real factory machine would be much more complicated than these simple exercises, but they helped me understand the product and the kinds of tasks our users needed to accomplish with the software.

Next, David asked me to start learning the software tools used for document creation at CTC: FrameMaker and RoboHelp. I had worked with PageMaker in the past but never with FrameMaker, so I completed the FrameMaker tutorial, which helped me learn the basics of the tool. I had never worked with RoboHelp or any online help tool, so I also read the user guide for
RoboHelp and completed some of its tutorials. However, for both tools, I learned more by using trial and error and by asking Dave questions while working on my projects.

**P3–7 PowerStation User Guide**

My main project was to update the user guide for the P3–7 PowerStations. I explain this main project in detail in Chapter Three.

**Application Manager Online Help**

Interact software is divided into several modules or applications. Each module provides a specific type of functionality to the user. For example, one module is for alarms, for times when the machine malfunctions or exceeds its capabilities. When customers order the Interact software, they decide which modules they need to program the interface for their machines. They may or may not need the alarms module depending on whether they want to create and monitor alarms.

A new module, the Machine Configuration Module (MCM), was being added to the Interact software. Also, the online help for the Application Manager (AM), which controls all the modules in Interact, required updating. The AM online help system contained an extensive list of the variables available for each module. A large part of my project was adding the MCM variables, their descriptions, and examples of how they could be used, to the link-variables section of the AM online help.

**Action**

I began by reading the specifications for the MCM and then spoke with Dave, who was writing the MCM online help. We talked about what information should be included in the MCM and how we would be sure that the information would be consistent in both help systems.

Throughout the revisions, I worked closely with a software engineer and a quality control engineer to ensure that the documentation was accurate and usable. I also spoke with someone in Marketing and someone in Customer Support to address problems users had reported with the previous online help system for the Application Manager (AM). For an example of the AM online help I wrote, see Figure 3: MCM Variable Section of AM Online Help and Figure 4:
In the help system, if you clicked on one of the MCM variables in the table, an example of how to use the variable appeared. See Figure 5: MCM Variable Pop-up Example.

Machine Configuration Module Variables

This topic includes a list of all MCM variables available for use with the Machine Configuration Module (MCM). An MCM variable is an internal interact memory variable used to transfer information between the MCM and other modules and device drivers. The five types of MCM variables are the following:

- Specified Group Variables—used with the active list of a specified group.
- Selected Group/List Variables—used with any selected group or list, active or not, in conjunction with the Remote List Display tool. A group or list is “selected” when it is highlighted by the selection bar in the Remote List Display tool. A list is also “selected” when it is displayed within the tool.
- List Display Variables—used in conjunction with a PTM display tool, such as the Remote List Display tool.
- Message Variables—used to display information in a PTM display tool, such as the Remote List Display tool.
- General Variables—used with any group, list, or item.

The tables below list the MCM variable names in alphabetical order, the tasks you can perform using the variables, and their attributes. The letters listed in the Attributes column represent the following information:

- R (Reserved) This link variable is pre-defined within Interact and can be entered as an address reference. You must enter it exactly as it appears in this table.
- I (Input) This MCM variable stores data that can be read by an Interact tool or the controller for obtaining information.
- O (Output) This MCM variable stores data that can be written to by another Interact tool or the controller for initiating an action.
- A (Analog) This MCM variable stores data, which represents a numeric quantity, such as an integer or floating point value.

Figure 3: MCM Variable Section of AM Online Help
### Machine Configuration Module Variables

- **D** (Discrete) This MCM variable stores values that are either zero or non-zero, true or false.
- **$** (ASCII) This MCM variable stores an array of ASCII character codes ranging from 0 to 255 for representing text strings.

Select the MCM variable name to view an example of how to use the MCM variable in your application.

<table>
<thead>
<tr>
<th>Selected Group Variables</th>
<th>Tasks</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCM\CURRENT\GROUP</td>
<td>Used to reference the group you specify.</td>
<td>R, W, O, $</td>
</tr>
<tr>
<td>MCM\ITEM\VALUE\GROUP[ITEM]</td>
<td>Used to reference the data value field of an item in the active list.</td>
<td>R, W, O, A/D/$</td>
</tr>
<tr>
<td>MCM\LIST\CHANGED\GROUP</td>
<td>Used to indicate when the group's active list has been changed and should be saved.</td>
<td>R, O, D</td>
</tr>
<tr>
<td>MCM\LIST\DESCRIPTION\GROUP</td>
<td>Used to reference the description text of the active list in the group.</td>
<td>R, W, O, $</td>
</tr>
<tr>
<td>MCM\LIST\INFO\MSG\GROUP</td>
<td>Used to reference the information message of the active list in the group.</td>
<td>R, O, $</td>
</tr>
<tr>
<td>MCM\LIST\LOAD\SEND\GROUP\LIST\NAME</td>
<td>Used to load and send a list in one operation. The list is then active.</td>
<td>R, I, D</td>
</tr>
<tr>
<td>MCM\LIST\NAME\GROUP</td>
<td>Used to reference the name of the active list in the group.</td>
<td>R, O, $</td>
</tr>
<tr>
<td>MCM\LIST\PRINT\GROUP</td>
<td>Used to print the active list in the group.</td>
<td>R, I, D</td>
</tr>
<tr>
<td>MCM\LIST\SAVE\GROUP</td>
<td>Used to save the active list in the group.</td>
<td>R, I, D</td>
</tr>
<tr>
<td>MCM\LIST\SEND\GROUP</td>
<td>Used to send (or download) the active list in the group.</td>
<td>R, I, D</td>
</tr>
</tbody>
</table>

**Figure 4:** MCM Variable Section of AM Online Help Continued

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**MCM\CLEAR\MSG\DISPLAY**

Use this variable to clear the message display window. You could use a Momentary Push Button to clear the message display window by causing a False to True transition to occur when the button is pushed.

**Figure 5:** MCM Variable Pop-up Example
Benefits

This project was my first opportunity to work with an online help system. The biggest challenge was picturing the system as a whole and understanding its structure, but Dave had an online help map created in Microsoft Word for the system that made the structure easier to understand. The map outlined the contents of the system and explained how the help could be accessed from each window or dialog box in the module. I updated this map with the new topics I added to the system. Appendix A on page 35 is the online help map I used.

I enjoyed documenting the software and working with another writer. I also enjoyed the experience with the RoboHelp software.

Panel Toolkit Module Online Help

With creation of the new Machine Configuration Module (MCM), a tool was being added to the Panel Toolkit Module (PTM). The PTM contained standard drawing tools for the user interface, such as buttons, slides, and status displays. Information about this new tool needed to be documented in the PTM online help.

Action

I read the specifications for the MCM and then looked at the existing help system to understand how the other tools were documented. I followed the format and flow of the other sections when writing the new sections to keep the documentation consistent and familiar to our users.

I worked closely with a software engineer and a quality-control engineer to ensure that the documentation was accurate and usable. I also spoke with someone in Marketing and someone in Customer Support to address problems that users had with the previous online help system. See Figure 6: PTM Online Help—Remote List Display Tool, Figure 7: PTM online help—Remote List Display Settings, and Figure 8: PTM Online Help—Accessibility for examples of the PTM online help system.

Benefits

This project was my first opportunity to create new online help topics and pop-ups. I learned more about the CTC software and about the RoboHelp tool.
Remote List Display (Tool)

The Remote List Display tool provides a window for viewing, selecting, and editing lists and list items. The tool can be used with any MCM variable, link variable, or controller address to access lists and their items. This tool has a display area and page up, line up, action, line down, and page down buttons for viewing and making selections. By default, MCM sends strings with group and list information for display by the Remote List Display tool through the MCMLIST_DISPLAY variable. The following is a list of the pages that appear on the Remote List Display Tool property sheet:

Settings
Appearance
Accessibility

See Also:
How to add a panel tool

Figure 6: PTM Online Help—Remote List Display Tool
Remote List Display (Settings)

Use the Settings page to configure the default settings for this tool. The following is a list of the parameters that appear on the Settings page:

Remote List Tool Control (Outputs)

The Remote List Tool Control (Outputs) group contains two display parameters, List Display and List Title, that the Remote List Display tool uses to display information during Run Mode. Each parameter has been assigned an MCM variable by default. However, you can also assign controller addresses or link variables to these parameters. When the data at the assigned address makes a false to true transition, the information is displayed.

List Display
Use this parameter to display group and list information in the Remote List Display. This parameter is set to MCMLIST_DISPLAY by default.

List Title
Use this parameter to display the group and list titles in the Remote List Display title bar. This parameter is set to MCMLIST_TITLE by default.

Remote List Tool Control (Inputs)

The Remote List Tool Control (Inputs) group contains the parameters that allow you to monitor the status of this Remote List Display tool.

List Action
Use this parameter to set the action button to a specific function. The default setting is the Go Back function, which will allow you to back a level in the tool. For example, you can back out of a specific list into the list of groups. This parameter is set to MCMLIST_BACK by default.

List Select
Use this parameter to signal to the MCM, or the module you have specified, that a selection has been made. A group or list is “selected” when it is highlighted by the selection bar in the Remote List Display tool. A list is also “selected” when it is displayed within the tool. This parameter is set to MCMLIST_SELECT by default.

Figure 7: PTM online help—Remote List Display Settings
Accessibility

Use the Accessibility page to control how the user accesses this tool. The following is a list of the parameters that appear on the Accessibility page:

Selection Key

Use this parameter to assign a function key to this tool by pressing the desired function key.

*Note* If you assign a function key to a Maintained Push Button, a Latched Push Button, or an Action Button, pressing the function key during Run Mode moves the cursor and actuates the button. This feature allows the operator to control discrete inputs with a single key press.

You can also assign a function key to a Momentary Push Button. If you check the Momentary Function Key Enabled check box located on the Keys page of the Interact Settings property sheet, pressing and holding the assigned function key during Run Mode keeps the button activated until the function key is released. If you do not check the Momentary Function Key Enabled check box, pressing the assigned function key during Run Mode moves the cursor on top of the button without activating it.

Input User Level

Use this parameter to determine the minimum user level needed to use this tool. You can use this parameter along with the Panel User Level to allow the user to view the panel but not enter new data.

‘Visibility’ Output

Use this parameter to specify the location in the controller’s memory that determines whether the tool is currently displayed on the panel or hidden. When the tool is visible (Visibility Output is True) it behaves as a normal tool. When the tool is invisible (Visibility Output is False) the tool will not be shown and the operator cannot activate the tool.

Figure 8: PTM Online Help—Accessibility
P2 PowerStation User Guide

The P2 PowerStation was being updated to use a new system support card. The card was a circuit board used in the PowerStation to provide added memory and control functionality. In my first project updating the P3–P7 PowerStation user guide, the same card was being added to the P3–P7 PowerStations. I added the same information about the jumper settings, graphics, touch screen calibration instructions, and a dimensional drawing to the P2 PowerStation user guide. See the next chapter for more details. The project was a little easier with the P2 PowerStation guide because I knew the product better, and I knew who the experts were in the specific areas.

Third Serial Port Installation

The new system support card used in the P3–P7 PowerStations reduced the number of serial ports from three to two. CTC didn’t expect anyone would mind the loss of the port, but there were enough customers who wanted the option of adding a third serial port to their PowerStation that the company decided to provide a kit. The kit included a new serial tang and instructions for installing the new port and configuring the PowerStation to use the third port. I was assigned to write installation instructions for the new port.

Action

A hardware engineer gave me a list of instructions he felt would cover the serial port installation. I documented the steps from this list and took some photographs to enhance the instructions. I then sat down with a PowerStation and tried to complete the installation, but I had some problems installing the third serial port. So I met with the hardware engineer again, and he read over the documentation, made suggestions, and answered my questions.

I made further changes to the documentation and took and prepared more photos for the instructions. I then passed the documentation on to Joy because new features were added to the MCM, and I had to go back to focusing on that.

Benefits

This project was my only opportunity to prepare documentation from scratch. I learned the value of putting myself in the place of the user while trying to install a third serial port to her
PowerStation. It was also my first experience in having an engineer give instructions that he thought would be sufficient and that I would only need to “make pretty.” I know he was surprised when I came back to him with more questions and even asked him to show me how the installation should go. Never the less, he patiently showed me how to install the third port and seemed to appreciate my desire to improve the instructions.

**Other Activities**

Besides working on my projects, I also participated in several other activities. I attended monthly Technical Documentation meetings at which we writers discussed our projects. We reported the status of our projects and asked for advice, if needed. At the meetings, we also discussed ideas that we had researched for improved technical communications. For example, we discussed the possibilities of creating a computer-based training (CBT) program and new ways of improving our online help systems. We also explored technical developments and policies at CTC.

I also attended a packaging exposition in Chicago with Joy, a software engineer, and a quality control engineer. The exposition was for manufacturers of packaging equipment. CTC does not produce packaging equipment, but they provide the controls for this type of equipment. This exposition was a great learning experience in that I got to see the various types of man-machine interfaces mounted in several different ways and running on many types of factory machines.

I also performed an initial proofread and edit of a training manual for the training manager. I enjoyed having input into the document. This manual was different from the items on which I usually worked in that it was more of a step-by-step tutorial meant to teach users in class the newest software CTC would be releasing in the next year. This manual and the software were still under production when I left.
Chapter 3
Major Project
P3–7 PowerStation User Guide

My most substantial project at CTC was updating the P3–7 PowerStation User Guide: a printed manual that provided installation and setup information for the P3, P4, P5, and P7 PowerStations. While updating this guide, I completed the following:

- Added information about the hardware and software changes to the PowerStation.
- Addressed solutions to user problems discovered since the last version of the guide.
- Added dimensional drawings of the PowerStations requested by users.
- Made general editing changes to maintain consistency and readability.

Project Introduction

First, I met with my manager, David, to discuss the details of the project. He gave me a copy of the hardware specifications and explained where I could find the FrameMaker and graphics files for the current guide. He also said I would need to talk with Rick, a hardware engineer, about the changes to the hardware.

David explained that the P3–P7 PowerStations were being updated with new system support cards. This new card changed the number of serial ports from three to two and offered an Ethernet port and a Compact Flash card slot in all PowerStations.

Subject Matter Experts

When I first started at CTC, David explained the basic structure of work at CTC. He diagrammed the different projects at CTC with the names of the people most involved with these projects. I was to use this diagram to identify my subject matter experts for the project. He also told me what department each person was in. This was helpful, but I still had a lot to learn about the different departments. I had only a vague picture of what someone did in Marketing versus what someone else did in Customer Support. I found later in the project that the best way to find the right person to talk to was to ask someone else on the team. There was not a formal knowledge
management structure that I could look to. Everyone knew whom to talk with from experience in his or her field and at CTC.

**User Analysis**

In previous meetings, David and I had also discussed the primary audience for documents at CTC. Most of our users were engineers setting up controls for their factory machines. The audience for this guide was a bit more varied because the person installing the PowerStation was not necessarily an engineer. He or she could have been someone, perhaps with little formal education but lots of job experience mounting and wiring, who was only in charge of preparing the space for the PowerStation and hooking it up.

The writers at CTC had the constraint of not having access to the users themselves. Unfortunately, even the people we did have access to, such as the Marketing and Customer Service personnel had limited knowledge of the users and their daily tasks. I tried to keep an idea in my mind of a user who may have some technical knowledge as far as hardware but who may not be very computer savvy.

**Revision Process**

Because it was my first project, David also described the overall process of when and how reviews were conducted and what steps I needed to take. He explained that the guide needed to be reviewed by him and by a quality control engineer. He explained that there would be a form to prepare when the guide was ready for final review and that the guide would probably go through at least one intermediate review before it was ready for final review.

David also explained that I needed to update many of the graphics in the guide, such as new digital photographs of the PowerStations, and that I was in charge of getting the right hardware, taking the photographs, and incorporating them in the guide. He said Rick could help me with getting the hardware and to let him (David) know when I needed to use the digital camera. He thought Marianne in Marketing had the camera.
Guide Review and Rewrite

After meeting with David, I had an idea of what I needed to do. I knew I needed to meet with Rick, and possibly some other people, to get information, but I wanted to familiarize myself with the current guide and the new specifications before I tried to ask any questions or make any changes. I wanted to be well prepared before meeting with any subject matter experts. I was very nervous about looking silly or unprepared.

Specification Review

To familiarize myself with the current guide and to help determine what I needed to add, delete, or change, I read the hardware specifications that David gave me in our initial meeting. Unfortunately, the specifications were written for hardware engineers, and they made very little sense to me. See Appendix B on page 51.

I hoped the specifications would be more meaningful after reading the current guide, so I read that next. I tried to pick out areas in the guide I needed to change by comparing it to the specifications, but I read them both several times and still wasn’t sure where to begin to ask questions or make changes.

I asked David if I could meet with him again to discuss the project further now that I had a better idea of what I needed. I think he could see that I was struggling, so he took the guide and the specifications and used a highlighter to mark areas in the guide that he thought might need to be changed. David had been at CTC for 10 years and had a very good understanding of the PowerStations and the industry in general. He was able to identify the relative information in the specifications and could also pinpoint changes in the user guide that weren’t outlined in the specifications. He had insight into changes because of his previous experience and because of information he gathered in company meetings and from talking with hardware and software developers.

David’s marking of the areas that I needed to change was a huge help to me. I now had an idea of what I needed to address. I learned that the touch screen calibration procedures needed to be updated and that I needed to address any previous problem reports that had been written regarding the current guide. Problem reports were the documentation of defects to the hardware, software, or documentation. They were usually written by the engineers in Customer Support in
response to calls they received. The reports were then assigned to the appropriate department, addressed, and then approved as fixed.

David told me that a decision had been made to add appendices with dimensional drawings of the outside of the PowerStation. Users had wanted these drawings to help them in creating custom cutouts for their PowerStations. I needed to create the drawings and include them in the appendices of the guide.

I took the marked up copy of the guide and compared it again with the specifications and began making a list of questions to ask the hardware and software engineers. I mostly asked questions about what was changing and what sections needed to be added, deleted, and modified. I was so new to the man-machine interface field and the technical writing field that I needed a lot of clarification on terms and concepts. I hoped that the engineers would be helpful and patient. See the marked up copy of the guide (Appendix C on page 58).

**Graphics Preparation**

From David’s highlighting in the guide, I knew which graphics to add or modify. I asked Rick where I could get a PowerStation, and he pointed me to one of the quality control engineers. I got a P4 PowerStation to take back to my desk, experiment with, and take pictures of. I got the digital camera from Marianne in Marketing, and David showed me the basics of using the camera and its software.

I spent a lot of time learning about the digital camera and ways to get the best light and positioning to obtain a clear and helpful photograph. Taking the photographs was difficult because light would reflect off the metal, but if I did not use the flash, the picture would be too dark. I decided to take the photos in the hardware lab where they had a light on a moveable arm. By adjusting the light, I was able to brighten an area but keep the reflection down.

I spent a lot of time getting the graphics ready and struggling with my PC. I was not on the network yet, so I could not print from my PC. Anytime I wanted to see something in hard copy, I had to copy the files to a disk and then ask someone else to print it. I also did not have enough serial ports to connect the digital camera to my PC, so every time I wanted to download the photographs off the camera, I had to unplug my mouse and restart my PC. It was a very time-consuming process.
Hardware Version Changes

Because David had mentioned Rick in our meeting, I spoke first with him. We met for about
20 minutes and went over the guide and the questions I had. He answered a lot of my questions
and explained more about why the board was changing and what the users really wanted to know
about the new card. There were many things outlined in the specifications that the users did not
really want or need to know.

Rick also marked further changes in the guide that David had not marked. For some
sections, he was able to give me the exact changes; while for others, he gave me the names of
people within the company I needed to talk to.

Rick told me that he needed to get back to me with information on the jumper settings for
the new card. He later prepared some sketches of what the settings should look like. I tried to
work from these drawings, but I got confused. I had never seen a jumper before, so I didn’t know
what the best way to present the information was. I went back to Rick for help, and he took me
into the testing area and showed me the card and the jumper settings. My being able to see the
card and the jumper settings was incredibly helpful. After that experience, I decided I would try
to see as much of the hardware and software as possible to get a better understanding of what I
was writing about.

Rick and I discussed the best way to present the jumper settings in the user guide. He did
not think the previous table method with open and closed circles was very effective. See Figure
9: Jumper Setting Depicted in a FrameMaker Table. He showed me a guide he had from another
company that had used line drawings of the jumpers. We also talked about using some kind of
graphic to show the location of the jumpers relative to the whole board. He thought a photograph
or schematic drawing would be helpful. He said Paula, a board designer, would have CAD
drawings of the board that I could possibly use.
I talked with Paula about a drawing of the board, but we couldn’t find a good file format that I could use in FrameMaker. I decided to take a digital photograph of the board. I used this photograph to call out the placement of the jumpers on the board. See Figure 10: Photograph of Board with Jumper Callouts. I could not, however, get a clear photograph of the jumpers to use to demonstrate the settings. If I got too close to the board, the photograph came out blurred.

I am not a graphic artist, so I did not try to draw the jumpers. Instead, I used the previous table method with some improvements. I used circles to represent the prongs but added shaded areas to represent the clips. I also defined what an on jumper looked like versus an off jumper. See Figure 11: New Jumper Settings Depicted in a FrameMaker Table. Rick liked the changes, and hopefully the jumpers were easier to set for our users.
By default, the serial port jumpers (JP9) are set to I/O address COM2 (2F8h) by turning the A port “off” and the B port “on” as shown below. To configure to the 3F8h address, both the A and B ports would be turned “off,” as demonstrated below.

<table>
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<tr>
<th>(default)</th>
<th>2F8h</th>
<th>3F8h</th>
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<tr>
<td>A  B  C</td>
<td>A  B</td>
<td>A  B</td>
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</table>

**Note** The clip for the “off” jumper can be completely removed or placed as in the figure above.

Figure 11: New Jumper Settings Depicted in a FrameMaker Table

**Software Version Changes**

I met with Brian, a software engineer who was recommended to me by Rick, to talk about the changes to the embedded software. He explained that many of the changes I needed to make were the same or very similar to changes that were made previously in the P2 PowerStation user guide. This new system support card made the PowerStations more similar; so much of the information from the P2 PowerStation user guide could be copied and pasted into the P3–P7 PowerStation user guide.

Brian marked the changes he knew about and showed me areas that could be copied from the other guide. He also marked additional changes and told me of other people I would need to talk to about changes. He was not the expert on the changes to the touch screen calibration procedures and some of the internal maintenance specifications. He told me to talk to Brad, a quality-control engineer, to get those changes.

I marked in the guide the sections and graphics that could be copied from the P2 PowerStation guide. Then I got the electronic files from the archives for the P2 guide and copied and pasted them into the P3–P7 guide.

I met with Brad to discuss the internal maintenance areas of the guide. He showed me how to set up the PowerStation to accept the new card, and I marked these changes in the guide.
He also needed to help me with the touch screen calibration changes, but Quality Control was waiting on new software and would not have any details for a few weeks.

Later, I met with Brad again to go over the procedures for the touch screen calibrations. He showed me how to do them on the PowerStation. We tried to get screen shots, but we couldn’t get them to work on the PowerStation. The calibrations were performed in MS-DOS, so I marked carefully the exact procedures in the guide. I wrote down exactly what each screen looked like and then recreated them in Paint Shop Pro. See one example in Figure 12: Touch Screen Calibration Screen.

![Figure 12: Touch Screen Calibration Screen](image)

To calibrate the touchscreen:
- First, select option C to calibrate
- Then select option V to select video modes
- Select an appropriate video mode (must do modes 3, 12, and 101 – selections 2, 0, and 11 respectively)
- Select C to calibrate the selected mode
- Repeat until all needed video modes are calibrated

Hit any key to begin calibration...

Brad marked some additional changes in the guide and suggested adding a section describing the new Compact Flash drive. I asked him about the Compact Flash drive and what it was used for. He explained that the Compact Flash drive was a computer hard drive on the PowerStation that was used to store information. The drive is small, versatile, and affordable. We wanted the users to know this was a beneficial feature that would allow them to store more information for less money. I added the new section to the guide from our conversion.

Brad also told me there were some model numbers and specifications I needed to get from Marianne in Marketing. I met with Marianne to ask about the sizes of Compact Flash available to the users and the weight of each PowerStation. I then entered the changes into the FrameMaker files.
**Editing Changes**

I read through the entire edited guide again and made editing changes. I looked for grammatical errors and fixed bad line and page breaks. I made typographical changes, such as changing dashes to en- or em-dashes. CTC used the *Microsoft Manual of Style* as their style guide, so I referred to that in looking for inconsistencies. If something wasn’t addressed in that guide, CTC did not have a style guide, so I made sure the guide was consistent within itself. See Appendix D on page 116 for a copy of the editing changes I made to the user guide.

I also restructured the “Resolving Common Problems” chapter (question and answer section) of the user guide. This chapter had been restructured in the P2 PowerStation user guide, and David told me he wanted the P3–7 PowerStation user guide to use a similar format. The restructuring involved listing the questions in a table format with page references so that the users could look through the list of questions to find the pages on which their questions were addressed.

I updated the table of contents and edited and added index entries to the index. I met with Dave, and he told me about how he had set up the original index. I had never created or revised an index before, so I needed some guidelines on what to add and how to format it. He also showed me how to mark the entries in the text. He gave me examples of entries I would want to add and explained that they never had page numbers for level one headings that had sub-entries. I added entries for the Compact Flash and the jumper settings and edited other entries according to the software and hardware changes.

**Dimensional Drawings**

I spent a few weeks working on the PowerStation dimensional drawings. The drawings were line drawings of the PowerStations with the measurements of the outside of the PowerStation and the ports and drives. I was documenting these measurements so technicians in the field who install the PowerStations could prepare custom cutouts for the PowerStation. They needed to know the exact placement of the ports and drives so they could make them accessible when the PowerStation was mounted on the machine, in the wall, or on a larger panel. David said the users had wanted the drawings for a long time, but CTC never had the time or the resources to get them completed.
I got each of the PowerStation models from the manufacturing area and measured the dimensions. I used Paint Shop Pro to create the drawings, but I should have asked if we had a vector-based drawing tool. I didn’t because Paint Shop Pro was the only drawing program I had seen being used at CTC. However, I later found out that we did have CorelDRAW, which would have enabled me to prepare the drawings much more quickly. I have learned to ask from now on.

I worked a lot with Sara, an internal hardware designer, on the drawings. After I completed the basic drawings, she helped determine the best way to present the dimensions. She showed me examples of her CAD drawings, which I used as a model. The drawings I made were greatly appreciated by the users in the field. See Figure 13: P3 PowerStation Dimensional Drawing.
Editorial Review

I turned the guide in to David for an editorial review in about the middle of the project to make sure I was on the right track. He marked further changes and problems he found in the guide. For example, he wasn’t sure if the words Compact Flash should be capitalized, and he noticed that I was putting a space between numbers and their units, which did not follow the style used in other pieces created by CTC. He also indicated that many of the graphics weren’t high enough quality. We talked about these graphics because they really weren’t bad. They looked bad only on his
printout. I still didn’t have access to the network, so I asked Dave to print them for me. He printed them on the copy machine, and the graphics didn’t turn out well. I had another copy printed for David on the laser printer, and he was much happier with the graphics.

David marked some changes he wanted made to some of the graphics. I had the jumper photographs upside down. I wasn’t looking at the PowerStation as most users do, so I didn’t have the right perspective. He also noticed some problems with graphics I had copied from the P2 user guide.

He suggested some changes to the jumper setting diagrams. He thought I should add outlines to show the jumpers. I made this change, and I thought it made the diagrams much easier to understand.

He marked a few questions that I hadn’t addressed that I needed to talk with Rick or Brad about.

**Technical Review**

After making the touch screen calibration changes, I passed the guide on to Brad for review. He marked changes and comments. Most changes were technical changes that no one had marked in previous drafts. I made the changes and passed it back to him for a second review. See Appendix E on page 191 for copy of one of Brad’s reviews.

Brad marked a second round of changes that were caused by a few product changes, and I worked with him to implement the changes. I then passed it back to him a third time for review. He marked it as approved.

**Publication**

I prepared backup and source disks for the project and submitted a copy in hard copy and online. I had my first experience with preparing postscript and portable document format (PDF) files. Dave had documented the procedures for creating backup disks, postscript files, and PDF files, so it was a pretty easy process to follow. I also created a link for the document on the CTC Intranet site.

I sent the postscript file to the printer to be printed. I thought my work on the guide was finished, but a proof came back from the printer, and the graphics looked terrible. No one knew
what the problem was. I went through and changed a bunch of the graphics to 8-bit instead of 24-bit, which helped some of the graphics but not all. I got really frustrated because no one had ever really shown me how to prepare the graphics, and I felt as though it was my fault they were not working, but I didn’t know how to fix them.

Some of the graphics from the previous version of the guide that had turned out fine before were now looking terrible. The PowerStations were not shipping because the guides weren’t ready, so we decided to print them anyway. When we received the final copies from the printer, the figures in the guides turned out fine. I talked with David about it, and he said he thought the problem had been with the printer. I felt better, but I learned the importance of having a set procedure for everyone to use in preparing graphics and any files for that matter. Consistency between products would have made the problem easier to tackle. See Appendix F on page 206 for a copy of the final guide.
Chapter 4
Analysis

The following is a look at my internship experience with respect to the problem-solving model that is taught in the courses for the Masters of Technical and Scientific Communication program at Miami University. Its use is encouraged in practical internships and job experience.

In Paul V. Anderson’s article “What Technical and Scientific Communicators Do: A Comprehensive Model for Developing Academic Programs,” Anderson contends that the common aim of all technical and scientific communicators is “to solve problems that involve the management and communication of specialized information, where that information is to be used for practical purposes.”

To achieve this common aim, he also contends that there is a basic set of activities common to all technical and scientific communicators that includes the following:

- Defining the problem
- Planning a solution
- Testing the solution
- Implementing the solution
- Evaluating the solution

I will look at each of these activities to determine whether the structure at CTC followed this model and to describe how the model worked for me in my internship experience.

Defining the Problem

Defining the problem is determining what information you want to share, how you’re going to share it, and what you want the user to gain by sharing it.

My manager David’s policy was to meet with each writer when he or she began a new project to help him or her define and see the problem. In my major project, David explained that the PowerStations user guide needed to be updated to include instructions and specifications for the Power Station system support card. It was a very simple definition, but it explained what was happening with the product that initiated a need for a change in the documentation.
I didn’t have any real part in defining the problem in this case. David worked with the Marketing department leader and the manager for the PowerStation project to determine what documentation was needed for this project. They decided that the information needed to be shared with the users and that it should be included in the user guide instead of some other place.

I think this kind of company structure is pretty common, in which junior-level writers are given defined problems instead of helping to define them or doing it on their own. The structure worked well for me because I did not have enough technical expertise, user knowledge, or document development experience to define the problem on my own or to work with the marketing specialists and project managers to define the problem.

**Planning the Solution**

According to Anderson, planning the solution involves “… researching the subject, outlining, and selecting page design … preparing a pilot version or complete draft, together with a strategy for producing and distributing the project.”

Planning the solution was more my responsibility than defining the problem, but I worked within the guidelines of the already existing user guide. David helped me get started in researching the subject by giving me the hardware specifications and the name of someone in engineering to talk to about the hardware changes. He also described the basic product changes that affected the user guide.

I read the specifications and the existing user guide but still did not have enough information to outline the changes needed. In the end, I went back to David for more help with planning the solution. He used a highlighter to mark the specific areas I needed to focus on in the guide.

The page design and strategies for producing and distributing the project were already in place for this project. I didn’t change the existing page design for the user guide, and I followed the print specifications and distribution methods already in place.

Thus for this project, I contributed a little bit to planning the solution but relied on David to give me direction, and then my subject matter experts (SMEs) told me almost exactly what to change or add. By talking with SMEs from Hardware Engineering, Software Engineering, Marketing, and Customer Support, I was able to put together an initial draft.
Testing the Solution

The next step in the problem-solving model is to test the solution. According to Anderson, “A manual writer might test the manual by arranging to have people representative of the target audience attempt to use it under realistic conditions. He or she would note the difficulties they encountered and revise the manual to eliminate the sources of the problems.”

Unfortunately, during my time at CTC, testing the documentation with users was not part of the documentation development process. The writers had no contact with the end users, so we improvised. As a writer, I tried to put myself in the place of the user when looking at the documentation. I would ask myself questions such as what do I really want to know to get this job done, where am I working with this product (physical environment), and would this information make sense to me?

CTC did have a formal process for technically reviewing the documentation, which is testing the solution by someone from the Quality Control (QC) department. The people in QC were typically engineers who did the final testing of CTC products. They were very familiar with how the product worked, and they had a good understanding of where there were problems in the product that needed to be avoided by the end users. Someone from QA reviewed my project and suggested changes. I made the changes and this person reviewed the document again. This process continued until the QC person approved the document.

I think the documentation could have been more useful, concise, and appropriate if it had gone through even minimal usability testing, but I think this process is common in the field of technical and scientific communication. Many companies don’t want to spend the time and money to have end users test their documentation, so the writers use whatever resources they have to produce the best document possible.

Implementing the Solution

The step some writers may jump right to in the problem-solving model is implementing the solution, or doing the “work” of the project. According to Anderson, “Typically, a manual writer serves as a project manager, so that when implementing the solution, he or she must perform a broad range of activities that includes not only writing the prose but also overseeing the work of
illustrators, dealing with printers, checking the contributions of people involved in producing and distributing the product, and so on.”

At CTC, the writers were in charge of dealing with the very issues Anderson mentions in their projects. In my major project, I wrote and edited the prose but also created and edited my own graphics for the manual. I took my own photographs and manipulated CAD drawings and screen shots to fit the purposes of the manual. I worked with the printers to get the right specifications and files printed. I ordered manuals for the production line and produced a PDF of the manual and put it out on the company Intranet site.

I think the amount of this work outside of producing text a writer does depends on the size of the documentation group and the level of the writer. As a junior writer, I was excited to be in charge of all these aspects of the document, and even as I gain experience, I still enjoy contributing more to the document than only the words. I like to see the project as a whole and to test my skills in other areas outside of writing.

**Evaluating the Solution**

The final, and reiterative, step in the problem-solving model is to evaluate the solution. Anderson has this to say about evaluating the solution:

> Although the test of the planned solution provides a reasonable basis for predicting how well the solution will work, one can’t know for sure how it will work until it is fully implemented. By evaluating the implementation solution, a technical communicator learns how to refine the solution, if that is possible, and how to solve similar problems even more effectively in the future. To evaluate a user manual, a writer must obtain and interpret relevant information from actual users.

CTC did not do a lot in the area of evaluating the solution. Writers usually asked marketing specialists for any feedback they may have obtained informally from their customers. Part of the formal process of document development did include obtaining any problem reports generated in Customer Support. The customer support-engineers logged literature problem reports when defects were found by end users calling in to customer support. The writer on a revision project requested these reports, made the changes, and got verification that the defects were fixed from the customer support person who entered the report.
From what I’ve seen, testing the solution is a struggle in many companies. Even in my current job at Trane Global Controls and Contracting, we are constantly trying to find ways to get feedback from our end users to determine if we are providing the right solutions. We use customer surveys and interviews of customers attending training at our facility. Unfortunately, I did not receive much feedback on the effectiveness of my projects at CTC. I heard from a marketing specialist that one end user had called in about how much he loved the PowerStation drawings I did, but that was it.

**Conclusions**

In conclusion, my experiences at CTC were very positive. I had the opportunity to get real-world experience in a fun, relaxed, and challenging environment. I fit the concepts I learned in my MTSC classes into my role as a technical writer. I did not have a clear idea of the work of a technical writer until I had this opportunity.

The experience that taught me the most was working with subject matter experts to solve a problem. I could not have effectively solved the problem on my own or through other resources. I needed to speak with people who knew the technical information and who had knowledge of the users and what they needed. I have begun to learn what questions to ask and how to sort out technical information.

There was a lot to learn about the company and its users, and CTC did not have a formal structure for finding this information. For example, in my main project, David directed me to Rick as my SME. But after talking with Rick, I realized I also needed to talk with Brian and Brad and Marianne. I don’t think gathering information from various sources is uncommon in writing user documentation, but I think the sources could have been better defined through the documentation of project development teams and team member roles, as well as a documented process for developing user documentation at CTC.

In my current job, I have a main SME who is responsible for the documentation with me. He or she is a technical expert helping to design the new product who helps to make sure nothing is lost in developing the documentation. I think the information structure at CTC worked because it was a relatively small company and my coworkers were friendly and helpful, but the risks of something being missed were high.
I think the MTSC problem-solving model worked well for me and that it was generally part of the document-development process at CTC. I struggled with defining the problem, but I would have struggled more if I had tried to attack the problem without defining it first. It seems obvious that you would have to understand the problem before attacking it, but it is a very easy mistake to make.

Before my internship experience, I would rather have revised the user guide without any help or guidance, but now I understand that no writer, unless he or she has endless technical and user knowledge, can create a solution completely on his or her own. Doing so would be a disservice to the customer. A good writer can save a lot of time, energy, and headaches by using the resources available to him or her. He or she needs to talk to the people in the know, get all the information possible, and then he or she will have a better product, and the people in the company will appreciate his or her effort and respect his or her work.
Bibliography

Appendix A
AM Online Help Map

The Application Manage map file outlined the entire help system. It showed the links between topics and kept a record of the browse sequence numbers used.
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| LINKIIL_ACK_MOST | X | X | X | N/A |
| LINKIIL_ACTIVE_TOTAL | X | X | X | N/A |
| LINKIIL_ALARM_MESSAGE: | X | X | X | N/A |
| LINKIIL_ALARMS: | X | X | X | N/A |
| LINKIIL_AUDIBLE_CTL | X | X | X | N/A |
| LINKIIL_GROUP_ENABLE | X | X | X | N/A |
| LINKIIL_GROUP_INHIBIT | X | X | X | N/A |
| LINKIIL_PRINT_CTL | X | X | X | N/A |
| LINKIIL_PRINT_STS | X | X | X | N/A |
| LINKIIL_CLEAR_ALARM | X | X | X | N/A |
| LINKIIL_PRIORITY | X | X | X | N/A |
| LINKIIL_UNACK_TOTAL | X | X | X | N/A |

Remote Alarm Display Link Variables

| LINKIIL_ACK_ONE | X | X | X | N/A |
| LINKIIL_ALARM_DOWN | X | X | X | N/A |
| LINKIIL_ALARM_TOTAL | X | X | X | N/A |
| LINKIIL_ALARM_UP | X | X | X | N/A |
| LINKIIL_CLEAR_ALL | X | X | X | N/A |
| LINKIIL_CLEAR_ONE | X | X | X | N/A |
| LINKIIL_CURSOR_OFF | X | X | X | N/A |
| LINKIIL_CURSOR_ON | X | X | X | N/A |
| LINKIIL_END_ALARMS | X | X | X | N/A |
| LINKIIL_HOME_ALARMS | X | X | X | N/A |
| LINKIIL_PAGE_DOWN | X | X | X | N/A |
| LINKIIL_PAGE_UP | X | X | X | N/A |
| LINKIIL_TOP_ALARM | X | X | X | N/A |

Remote History Display Link Variables

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| LINKIIL_HIST_ALARM_DOWN | X | X | X | N/A |
| LINKIIL_HIST_ALARM_UP | X | X | X | N/A |</p>
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Appendix B
System Support Card Specifications

These are the specification for the new system support card I received when starting the P3–7 PowerStation User Guide revision.
Enhanced System Support Card Design Document

WA-82988-100
CTC Parker Automation
Rick Schulte 7/9/98
Ref. Schematic # CA-05463-1xx

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Introduction

The enhanced system support card is a ISA based card designed as a platform for the unique functions required by CTC Parker’s P3, P4, P5 and P7 Powerstations. It is intended to replace the original system support card and will bring added functionality to the above mentioned products. The specific changes from the original system support card are as follows:

1) Reduce the form factor from a ¾ length ISA card to ½ length ISA card by using surface mount technology.
2) Add the Ethernet circuit block found on the NP2 power supply in order to provide identical Ethernet functionality across the Powerstation product line.
3) Add a Compact Flash adapter as found on the NP2 power supply in order to provide identical non-rotating media storage across the Powerstation product line. This replaces the proprietary flash SIMM modules and flash file system found on the original system support card.
4) Replace the touchscreen 8 bit bus controller with a serial controller in order to take advantage of Dynapro Inc.’s active support and development of their serial touchscreen drivers.
5) Replace the 25 pin RS232/RS422/RS485 serial port and the 9 pin RS232 serial port with a single configurable RS232/RS422/RS485 serial port. This new 9 pin serial port is identical to that found on the NP2 and brings a consistent serial port interface to the Powerstation product line.
6) Add a temperature compensation circuit to the monochrome LCD display’s DC contrast voltage generator to counteract the lightening and darkening of the display with temperature variation.
7) Add support for SS Technologies UCS cards.

Flat Panel Interface

The flat panel power sequencing signals ENAVDD, ENAVEE, and ENABKL inherent in Chips & Technologies’ video controller are used to activate Temic 9953 mosfet switches which then switch 5Vdc, 12Vdc, and Vcontrast to the display and also switch 12Vdc to the display inverter. The switched 5Vdc and 12Vdc supplies are fused to protect the mosfets from short circuit overloads. All other data and control signals feed directly between the video input and display connectors.

LCD Contrast Voltage Generator

A Linear Technology LT1054 voltage converter/ regulator is used to create a suitable negative voltage for LCD contrast. It is configured as an inverting voltage doubler which provides a regulated -21.5Vdc output. From this regulated negative voltage, a variable LCD contrast voltage is derived using a common emitter connected 3906 PNP transistor. The base of this transistor is driven with the variable 0V to 5V VCONT signal which is controllable through software. This signal generates an emitter current which in turn develops a collector voltage across the 3.4K collector resistor. This voltage, which varies with VCONT, controls another 3906 transistor connected as a series regulator, and it is this voltage which is used as the LCD contrast voltage. The reason that the collector voltage across the 3.4K resistor cannot be used directly is because the LCD display can draw up to 25mA, and this increased magnitude of current through the 3.4K resistor would cause the collector voltage to shift dramatically. The series regulator scheme solves this problem.

LCD display contrast varies with temperature. As temperature increases, the display gets lighter and as the temperature decreases the display gets darker. At the extremes of the Powerstation’s temperature range the display can become practically unreadable. To counteract this, a temperature compensation circuit has been designed. The AD22100 is a temperature-to-DC voltage converter that outputs a nominal voltage of 1.9375V at 25°C. This voltage increases/decreases 22.5mV per Celsius degree increase/decrease. To generate a compensated contrast control voltage, the output of the AD22100 is fed
to the inverting input of an LM358 op amp and the non-inverting input is fed by the digital pot's software controlled contrast voltage. As temperature increases, the op amp's inverting input signal increases, subtracting an increasing amount from the non-inverting input. As a result, the output of the op amp (which is the compensated contrast control signal) decreases in voltage. This has the effect of darkening the display, thus countering the tendency of the display to lighten with increased temperature. The same, but opposite effect occurs as the temperature decreases. The inputs and the output of the op amp are scaled via resistors to correctly match the contrast signal to the temperature coefficient of the display.

An LCD display should not have a contrast voltage applied without the presence of the 5V logic supply because damage to the liquid crystal can occur over time. Because of the large capacitance in the LCD contrast generator circuit, it can be several seconds after 5V goes away before its voltage reaches 0VDC. To prevent this condition from reaching the display, a 4.7K "drain" resistor is added to the contrast voltage output to quickly drain away the charge stored in the capacitance.

**Ethernet Adapter**

The Ethernet circuit block is identical to that found on the NP2 power supply board and is a new feature not found on the original system support card. It is provided in as an NE2000 compatible, 10BASE-T network interface which is directly attached to the ISA bus as a 16 bit adapter. It is based around a National Semiconductor DP83907 AT/LANTIC II network interface controller.

The DP83907 uses two 8K X 8 SRAMs to provide 8K X 16 of packet buffer RAM. Note that 32K X 8 SRAM is actually implemented in this design because this size is much more readily available and costs about the same, but only 8K of each part is used. Also attached to the SRAM bus is a 64 X 16 serial eeprom that is used to store the Ethernet configuration register information and the adapter's hardware address. The key parameters stored are as follows:

<table>
<thead>
<tr>
<th>I/O Address</th>
<th>JP1 &quot;IN&quot;</th>
<th>JP1 &quot;OUT&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default = 240h</td>
<td>User Programmable</td>
<td>(see below for JP1 definition)</td>
</tr>
<tr>
<td>Default = 10</td>
<td>User Programmable</td>
<td>User Programmable (only 10BASE-T supported)</td>
</tr>
<tr>
<td>Physical Layer Interface</td>
<td>Default = 10BASE-T</td>
<td>User Programmable (no boot prom</td>
</tr>
<tr>
<td>Boot Prom Select supported</td>
<td>Default = None</td>
<td>User Programmable (only &quot;disable&quot;)</td>
</tr>
<tr>
<td>Fast Read Bit supported</td>
<td>Default = Disable</td>
<td>User Programmable (only &quot;disable&quot;)</td>
</tr>
<tr>
<td>Auto Switch supported</td>
<td>Default = Disable</td>
<td>User Programmable (only &quot;disable&quot;)</td>
</tr>
<tr>
<td>UTP/STP Filter</td>
<td>Default = UTP</td>
<td>User Programmable (only UTP supported)</td>
</tr>
<tr>
<td>Link Integrity Check</td>
<td>Default = Enable</td>
<td>Fixed by Software Utility</td>
</tr>
<tr>
<td>Hardware Address</td>
<td>Set at Manufacture</td>
<td>Fixed by Software Utility</td>
</tr>
</tbody>
</table>

The hardware address is composed of 48 bits expressed as 12 hexadecimal digits. The 6 MSDs represent the vendor ID assigned by the IEEE and the 6 LSDs are a serial number unique to each adapter (CTC's vendor ID is 001053). This address and the other parameters noted above must be programmed during final assembly using a National Semiconductor provided utility, “EEPROM.EXE”. Jumper JP1 (labeled “DEFAULT”) must be in place before running this program so that the software can find the Ethernet controller at a known address. After successful programming the jumper should be removed.

The Ethernet adapter’s I/O address and IRQ are configurable by the user with another National Semiconductor provided utility, “AT5CFG.EXE”. Since these are software-configured, there are no jumper settings for the Ethernet adapter except JP1. If the eeprom should ever become corrupt, jumper JP1 will force the adapter to reside at I/O address 240h, IRQ 10. The AT5CFG.EXE utility could then be used to properly reprogram the eeprom.
The DP83907 is set up to provide internal filtering for the twisted pair interface. Therefore only impedance matching resistors and an isolation transformer/common mode choke are needed at the 10BASE-T port.

For diagnostic purposes, a green LED labeled “NET ACT” is provided. This LED will flash for approximately 50ms whenever data is transmitted or received.

The 1996 National Ethernet Databook may be consulted by those interested in excruciating details on the DP83907.

**Touchscreen Controller**

The original system support card used a Microchip PIC16C57 as an 8 bit parallel touchscreen controller. However Dynapro Inc., whose design this circuit was based upon, does not actively support the drivers for this controller. Therefore, the circuit has been changed to use a PIC16C58 as a serial touchscreen controller. The rest of the design remains the same as in the original system support card.

The touchscreen controller is connected directly to the first channel of a 16C552 UART which is configurable as COM1, COM2, COM3, or COM4 and which also has a configurable IRQ. The drivers communicate to the controller as if it were attached to a standard PC serial port. The code needed to run the PIC is contained within its onboard 2K eprom.

The Motorola MC145051 A/D converter takes analog touchscreen data in the form of DC voltage and converts it into a 10 bit serial bitstream that is read and interpreted by the PIC. A 74HC4052 multiplexer is used to switch a conversion reference voltage to the A/D converter from the touchscreen edges and thus implements an 8 wire touchscreen interface. If the converter is set to read an X coordinate, the PIC will set the multiplexer so that the reference is taken from the touchscreen’s SX sense points. If the converter is set to read a Y coordinate, the PIC will set the multiplexer so that the reference is taken from the touchscreen’s SY sense points. These sense points are located directly at the edges of the touchscreen itself and eliminate temperature drift errors that can occur if the reference voltage source is located remotely from the touchscreen (as in a 4 wire interface).

A 93LC46 serial eeprom is connected to the same serial bus as the A/D converter and is used to store the following touchscreen configuration information:

<table>
<thead>
<tr>
<th>Min/Max (debounce filtering):</th>
<th>Normally Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/8 Wire Interface:</td>
<td>Normally 8 Wire</td>
</tr>
<tr>
<td>Hi/Low (speed filtering):</td>
<td>Normally Hi (reduces # of samples/touch with fast mouse movement)</td>
</tr>
<tr>
<td>Number of Samples/Touch:</td>
<td>Normally 32</td>
</tr>
<tr>
<td>Touchscreen Mode:</td>
<td>Normally “Continuous” (for drag &amp; drop operation)</td>
</tr>
</tbody>
</table>

**Interact Key, Digital Pot, Compact Flash and Address Decoding**

An Altera EPM7064 EPLD is implemented as an emulated parallel port, an ATA hard drive adapter, and an address decoder. The emulated parallel port supports communications to the Interact security key and the digital pot; the ATA adapter supports the Compact Flash; and the address decoder provides chip selects for the serial port, touchscreen controller, digital pot, and UCS module.

The Interact security key is read at address 279h where bit 7 connects to the key’s O1 output and bit 4 connects to the key’s O2 output. Data and clock information are written to the key through port 278h bit 0 and the key’s reset pin is controlled by a write to port 278h bit 1. The key’s enable input is controlled by a write to port 27Ah bit 1.
The digital pot is read at port 279h bit 5. Bits 0-3 and bits 6-7 at this address are unused. The pot's clock is controlled by a write to port 278h bit 2 and data is written to it at port 278h bit 3.

The digital pot chip select is latched at port 314h bit 2. All other bits are reserved. The chip select resides here rather than at the LPT port address because it has been found that when the BIOS initializes parallel ports on power up it sometimes erroneously selects the digital pot and corrupts its settings.

Hardware Note: The digital pot has a large value capacitor and a Vcc isolation diode at its Vcc pin to guarantee a power off ramp down time from 4.5V to 3V of greater than 4ms. According to Dallas Semiconductor, the pot could lose its non-volatile settings if this precaution is not taken.

Whenever a byte is written to ports 278h or 27Ah, that byte is latched by the Altera part. A subsequent read to either of these ports will return the last data written. This way the EPM3064 is able to emulate PC/AT LPT register functionality and can “fool” the BIOS into thinking a parallel port exists at 278h. The whole idea here is to avoid hidden I/O port conflicts.

A standard ATA hard drive adapter is emulated in the EPM7064 and is used to control data flow to/from the Compact Flash and ISA bus. The EPM7064 allows the Compact Flash to be jumper configured as either a primary or secondary IDE device and it also allows it to be disabled. All direct connections between the compact flash and the ISA bus are buffered.

Address decoding for the serial port and for the touchscreen is provided by the EPM7064. Each of these devices can be jumper selected as COM1, COM2, COM3, or COM4. Additionally, the serial port can be disabled if necessary.

The UCS module I/O address is software configured by writing and storing the base address information to the upper nibble of port 314h in the EPM7064. This nibble contains the upper nibble of the offset from I/O port 200h where the UCS module will reside. Bit D3 of port 314h is defined as the UCS address “latch enable” such that the address can only be written when the bit is set. This prevents writes to port 314h by the digital pot adjustment routine from corrupting the UCS address offset. On power up these bits default to all zeroes which disables the UCS port. The port becomes active immediately when UCS driver software sets a nonzero value for these bits.

Examples:
Port 314h is written with 00011X00b; UCS I/O address is 210h
Port 314h is written with 00010X00b; UCS I/O address is unchanged
Port 314h is written with 00101X00b; UCS I/O address is 220h
Port 314h is written with 11111X00b; UCS I/O address is 2F0h

This allows for a choice of 15 possible address locations for the UCS module.

Serial Port

The serial port is controlled by channel 2 of the 16C552 UART and is jumper configurable at the I/O as an RS232, RS422, or RS485 port. It provides the same functionality and pinouts as the 9 pin configurable port found on the NP2. RS232 I/O is provided by a MAX232, which is the same as that of the original system support card; RS422/RS485 I/O is provided by a pair of LTC485 transceivers, which are the same transceivers as those found on the NP2.

UCS Interface
The UCS interface is essentially a 26 pin connector that attaches directly to the ISA bus in a method similar to that of a UART. The IRQ for this interface is jumper configured and the I/O address is software configured through the EPM7064 PLD.
Appendix C
Technical Edits

This is the marked up copy of the original P3–7 PowerStation User Guide with changes marked by David and myself.
POWERSTATION

User Guide

CTC COMPUTER TECHNOLOGY CORPORATION
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Product Warranty Information

Computer Technology Corporation provides top quality products through rigid testing and the highest quality control standards. However, should a problem occur with your hardware or with the software protection key, CTC’s standard product warranty covers these items for 15 months from the date of shipment from CTC. Exceptions appear below:

- PowerStation backlight bulbs have a 90-day warranty. Push button lamps are not covered under warranty.
- Third-party products, such as PCMCIA cards, carry the manufacturer’s specified warranty.
- For all displays, image retention (burn-in) is not covered by warranty.
- Software revisions that occur within 60 days after purchase are available under warranty upon request. Please review the Interact License Agreement for additional software warranty information.

Should you have any questions about your application or need technical assistance, please call CTC’s Product Technical Support department at 513-248-1714, 8:00am to 5:00pm, EST. You may call this same number after hours for emergency assistance. See Customer Support Services on page 6 of this manual for more information about CTC’s support products and services.
Important Concepts

Now that you have opened the PowerStation package, you are ready to unpack the unit, configure it, and install it in a permanent location. This section provides an overview of the steps that are discussed in detail throughout the remainder of this manual.

Before You Begin

Before you begin operating the PowerStation, please complete the following steps:

1. Unpack the PowerStation, and verify that you have received all the components you ordered. The components that were shipped with the unit are listed on the packing list included in the PowerStation carton.

2. Fill out the product registration card, and return it to CTC. When you register your unit, you will receive a trial membership in CTC's Product Support Program that provides complimentary telephone technical support, information on product updates, and service bulletins.

3. Back up the CTC software disks that came with your unit using the Windows File Manager/Explorer or the MS-DOS diskcopy command.

4. Read the PowerStation Release Notes. This document provides important information about the PowerStation that does not appear in this manual.

Configure the PowerStation

Once you have unpacked the PowerStation and completed the steps listed in the previous section, you are ready to power up the PowerStation for the first time and configure the system defaults. Detailed information on configuring the PowerStation is described in Chapters 3 and 4.

PowerStation User Guide
Understanding the PowerStation

The PowerStation family of workstations are designed to give you an operator interface solution that is powerful, cost-effective, and very easy to use. They are available in a variety of configurations to fit the functionality and cost requirements of your application.

In this chapter, you will learn about the PowerStations' model numbers, product specifications, connectors, and their drive definitions and memory maps.

Chapter Contents

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</table>
PowerStation Models

CTC offers a complete line of workstations that you can easily and affordably customize with a variety of hardware options. This section describes the features of each PowerStation model covered in this manual.

All PowerStations discussed in this manual have an open PC architecture that allows you to run CTC’s Interact software and other MS-DOS or Windows compatible programs. PowerStations without Interact are referred to as Industrial PC PowerStations throughout this manual.

**P3 PowerStation** - This PowerStation is a touch screen workstation that includes a 5x86 133 MHz processor and one of the following 10.4” displays: LCD, E2, STN, or TFT. The P3 also includes 8 MB of RAM and an internal floppy drive.

**P4 PowerStation** - This PowerStation is a touch screen workstation that includes one of the following CPUs: 5x86 133 MHz, Pentium 133 MHz, Pentium 166 MHz, or Pentium MMX 200 MHz. The P4 also includes 8 MB of RAM, an internal floppy drive, and one of the following 10.4” displays: LCD, E2, STN, or TFT.

**P5 PowerStation** - This PowerStation is a function key workstation that includes one of the following CPUs: 5x86 133 MHz, Pentium 133 MHz, Pentium 166 MHz, or Pentium MMX 200 MHz. The P5 also includes 8 MB of RAM, an internal floppy drive, and one of the following 10.4” displays: LCD, E2, STN, or TFT.

**P7 PowerStation** - This PowerStation is a touch screen workstation that includes a large 13.8” TFT display and one of the following CPUs: 5x86 133 MHz, Pentium 133 MHz, Pentium 166 MHz, or Pentium MMX 200 MHz. The P7 also includes 8 MB of RAM and an internal floppy drive.

**Note** PowerStations with Interact are available with your choice of flash memory or a hard drive; Industrial PC PowerStations are only available with a hard drive and one of two displays, TFT or STN (P3, P4, and P5 only).
Specifications

This section lists and describes some important specifications relating to the PowerStation. Please familiarize yourself with these specifications prior to operating the PowerStation.

Physical Specifications

Physical specifications include the PowerStation’s physical characteristics, weight, and compatible hardware devices. Refer to the table below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPUs</td>
<td>5x86 133MHz; Pentium(133), 166, or Pentium MMX 200MHz (unavailable on P3)</td>
</tr>
<tr>
<td>Memory</td>
<td>8MB min., 32MB max. (64MB max. on Pentiums)</td>
</tr>
<tr>
<td>Displays</td>
<td>• Monochrome LCD, 640x480 VGA, 16 shades of gray (unavailable on P7 and Industrial PCs)</td>
</tr>
<tr>
<td></td>
<td>• Electroluminescent (EL), 640x480 VGA, 16 shades of gray (unavailable on P7 and Industrial PCs)</td>
</tr>
<tr>
<td></td>
<td>• Color TFT, 640x480 VGA, 256 colors</td>
</tr>
<tr>
<td></td>
<td>• Color TFT, 1024x768 XVG A, 256 colors</td>
</tr>
<tr>
<td></td>
<td>• Color STN, 640x480 VGA, 256 colors (unavailable on P7)</td>
</tr>
<tr>
<td>Storage</td>
<td>• 1.44MB high-density floppy drive</td>
</tr>
<tr>
<td></td>
<td>• 1.6GB (min.) hard drive (standard on Industrial PCs)</td>
</tr>
<tr>
<td></td>
<td>• 2 to 4MB Flash SIMMS (standard on units with Interact); 8MB max.</td>
</tr>
<tr>
<td></td>
<td>• PCMCIA (requires 3rd party adapter board)</td>
</tr>
<tr>
<td>I/O Ports</td>
<td>• 9-pin RS232 (non-isolated)</td>
</tr>
<tr>
<td></td>
<td>• 25-pin RS232/422/485 (isolated)</td>
</tr>
<tr>
<td></td>
<td>• 1 25-pin IBM parallel</td>
</tr>
<tr>
<td></td>
<td>• 1 RJ45 Ethernet (5x86 133MHz CPU only)</td>
</tr>
<tr>
<td>Expansion Slots</td>
<td>• P3: 3 3/4-size, 16-bit, ISA slots (1 slot is convertible to full-size using an optional expansion cover).</td>
</tr>
<tr>
<td></td>
<td>• P4: 1 1/2-size, 3 3/4-size, 16-bit, ISA slots (1 3/4-size slot is convertible to full-size using an optional expansion cover).</td>
</tr>
<tr>
<td></td>
<td>• P5 and P7: 2 full-size, 1 3/4-size, 16-bit, ISA slots</td>
</tr>
</tbody>
</table>
Environmental Specifications

The PowerStation conforms to the environmental specifications listed in the table below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature:</td>
<td>• 5x86 CPU's: 32 to 122°F (0 to 50°C) ambient air temperature at fan inlet</td>
</tr>
<tr>
<td></td>
<td>• Pentium CPU's: 32 to 113°F (0 to 45°C) ambient air temperature at fan inlet</td>
</tr>
<tr>
<td>Bulb Life:</td>
<td>• Monochrome LCD - 10,000 hours</td>
</tr>
<tr>
<td></td>
<td>• Electroluminescent (EL) - 10,000 hours</td>
</tr>
<tr>
<td></td>
<td>• Color STN - 25,000 hours</td>
</tr>
<tr>
<td></td>
<td>• Color TFT (10.4&quot;) - 25,000 hours</td>
</tr>
<tr>
<td></td>
<td>• Color TFT (13.8&quot;) - 10,000 hours</td>
</tr>
<tr>
<td>Relative Humidity:</td>
<td>5% to 95% non-condensing</td>
</tr>
<tr>
<td>Altitude:</td>
<td>-200ft. to 10,000ft. (-60.96m to 3,048m)</td>
</tr>
<tr>
<td>Shock Rating:</td>
<td>• 10g peak, 11ms (operating)</td>
</tr>
<tr>
<td></td>
<td>• 30g peak, 11ms (non-operating)</td>
</tr>
<tr>
<td>Operating Vibration:</td>
<td>0.35mm 10 to 18Hz, 1.0g from 18 to 150Hz</td>
</tr>
<tr>
<td>Faceplate Designed For:</td>
<td>NEMA 4/4X (IP65 European Std.) Environ.</td>
</tr>
</tbody>
</table>

**Important** Limit the PowerStation's exposure to adverse conditions such as dust, oil, moisture, and corrosive vapors to minimize maintenance and repair costs.

Remember that the temperature outside the protective enclosure is generally lower than the internal temperature. Thus, if the PowerStation is operating inside an enclosure at temperature levels above the maximum ambient temperature, you will need to cool the enclosure.
Available Connectors

The following graphic shows a P4 with a Pentium CPU:

![Diagram of a P4 with a Pentium CPU]

The following graphic shows a P5/P7 with a 5x86 CPU:

![Diagram of a P5/P7 with a 5x86 CPU]

Serial Ports

The PowerStation has three serial ports you can use to communicate with external devices. These ports support baud rates of up to 115 Kbaud. COM2 and COM3 reside on the PowerStation System Support board, while COM1 resides on the CPU board.

Two of the serial ports, COM1 and COM3, are identical and support the RS-232 communication standard. Use a standard DB9 connector for communicating with these ports.
The third serial port, COM2, is optically isolated with 500V of isolation to provide noise immunity. This port supports RS-232C, RS-422, and RS-485 communication standards. The communication standard you select depends on the distance between the PowerStation and the controller as well as the communication standards that the controller supports. Use a standard DB25 connector for communicating with this port.

**COM2 pinouts**

If you need to make a cable for communicating with COM2, the following table shows the pinouts and signal information for this port:

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Protocol</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RS-232/422</td>
<td>Chassis ground</td>
</tr>
<tr>
<td>2</td>
<td>RS-232</td>
<td>TXD, transmitted data</td>
</tr>
<tr>
<td>3</td>
<td>RS-232</td>
<td>RXD, received data</td>
</tr>
<tr>
<td>4</td>
<td>RS-232</td>
<td>RTS, request to send</td>
</tr>
<tr>
<td>5</td>
<td>RS-232</td>
<td>CTS, clear to send</td>
</tr>
<tr>
<td>6</td>
<td>RS-232</td>
<td>DSR</td>
</tr>
<tr>
<td>7</td>
<td>RS-232/422</td>
<td>Signal ground</td>
</tr>
<tr>
<td>8</td>
<td>RS-232</td>
<td>DCD, data carrier detect</td>
</tr>
<tr>
<td>9</td>
<td>N/A</td>
<td>not connected</td>
</tr>
<tr>
<td>10</td>
<td>RS-485</td>
<td>485 enable</td>
</tr>
<tr>
<td>11</td>
<td>RS-422</td>
<td>CTS+, clear to send +</td>
</tr>
<tr>
<td>12</td>
<td>RS-422/485</td>
<td>DTR+, data terminal ready +</td>
</tr>
<tr>
<td>13</td>
<td>RS-422/485</td>
<td>422/485 select</td>
</tr>
<tr>
<td>14</td>
<td>RS-422/485</td>
<td>TXD+, transmitted data +</td>
</tr>
<tr>
<td>15</td>
<td>RS-422/485</td>
<td>TXD-, transmitted data -</td>
</tr>
<tr>
<td>16</td>
<td>RS-422/485</td>
<td>RXD+, received data +</td>
</tr>
<tr>
<td>17</td>
<td>RS-422/485</td>
<td>RXD-, received data -</td>
</tr>
<tr>
<td>18</td>
<td>N/A</td>
<td>not connected</td>
</tr>
<tr>
<td>19</td>
<td>N/A</td>
<td>not connected</td>
</tr>
<tr>
<td>20</td>
<td>RS-232</td>
<td>DTR, data terminal ready</td>
</tr>
<tr>
<td>21</td>
<td>N/A</td>
<td>not connected</td>
</tr>
<tr>
<td>22</td>
<td>RS-485</td>
<td>485 RTS, 485 request to send</td>
</tr>
<tr>
<td>23</td>
<td>RS-422</td>
<td>CTS+, clear to send -</td>
</tr>
<tr>
<td>24</td>
<td>RS-422/485</td>
<td>DTR-, data terminal ready -</td>
</tr>
<tr>
<td>25</td>
<td>RS-422/485</td>
<td>Signal ground</td>
</tr>
</tbody>
</table>
Available Connectors

**Com1**

**COM3 pinouts**

If you need to make a cable for communicating with COM1, the following table shows the pinouts and signal information for this port:

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCD, data carrier detect</td>
</tr>
<tr>
<td>2</td>
<td>RXD, received data</td>
</tr>
<tr>
<td>3</td>
<td>TXD, transmitted data</td>
</tr>
<tr>
<td>4</td>
<td>DTR, data terminal ready</td>
</tr>
<tr>
<td>5</td>
<td>Signal ground</td>
</tr>
<tr>
<td>6</td>
<td>DSR</td>
</tr>
<tr>
<td>7</td>
<td>RTS, request to send</td>
</tr>
<tr>
<td>8</td>
<td>CTS, clear to send</td>
</tr>
<tr>
<td>9</td>
<td>RI</td>
</tr>
</tbody>
</table>

**Cable diagrams**

The following graphics represent the pinouts and cable diagrams required for communicating with COM2 in RS-232, RS-422, and RS-485 formats. Refer to your CPU manual for pinout information for COM1, the CRT port, and the PS/2 port.

**Important**

To select RS-422 communications, you MUST tie pin 13 to pin 25.
To select RS-485 communications, you MUST either tie pin 13 to pin 25 and pin 10 to pin 22, or tie pins 10, 13, and 22 together. Be careful not to connect any wires to unused connector pins.
Connecting to a PC

To transfer files from a PC to the PowerStation, connect a standard IBM PC null modem cable to an available serial port on the PC. Connect the other end of the cable to an available serial port on the PowerStation. You can construct your own cable, or you can purchase a cable from CTC. If you decide to construct your own cable, refer to the following diagram for the cable pinouts.

Connecting a serial mouse

If you need to connect a serial mouse to the PowerStation, you must use either COM1 or COM2. If you use COM2, you may need to reconfigure this port to use the RS-232-C protocol. Follow these steps to configure the PowerStation to use a serial mouse:

1. If you will be using COM2, verify that it is configured for RS-232-C communications. See Jumper settings on page 28 to change the communications protocol for this port. You will also need to use a serial 9 to 25 pin adapter to connect the mouse to the COM2 port.

   Important You cannot use a serial mouse and the touch screen simultaneously on units running Windows 95. The PowerStation will only load the driver for the device that is listed first in the AUTOEXEC.BAT file.

2. Connect the serial mouse to the port you configured, and reboot the PowerStation.
Connecting to a serial printer

To connect a serial printer to the PowerStation, you must use a printer that communicates at baud rates equal to or less than 115K baud. If you need to configure the ports for any setting other than the default, use your own device driver loaded from the AUTOEXEC.BAT file. Use the following diagram as a reference when connecting a serial printer to the PowerStation. Refer to your serial printer documentation for additional connection information.

Parallel Port

The PowerStation parallel port (LPT1) pinout is identical to the standard IBM parallel printer port. The LPT1 connector pinout is shown in the table below.

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STROBE</td>
</tr>
<tr>
<td>2</td>
<td>DATA 0</td>
</tr>
<tr>
<td>3</td>
<td>DATA 1</td>
</tr>
<tr>
<td>4</td>
<td>DATA 2</td>
</tr>
<tr>
<td>5</td>
<td>DATA 3</td>
</tr>
<tr>
<td>6</td>
<td>DATA 4</td>
</tr>
<tr>
<td>7</td>
<td>DATA 5</td>
</tr>
<tr>
<td>8</td>
<td>DATA 6</td>
</tr>
</tbody>
</table>
Connecting to a parallel printer

The PowerStation can interface to any parallel printer designed for use with IBM PC compatible computers. Connect a printer to the port marked LPT1 using a standard IBM PC parallel cable.

PS/2 Port

All PowerStations have a PS/2 port located on the CPU board. Depending on the type of PowerStation you have, this port may be used to connect a mouse and/or keyboard to the unit. Refer to the CPU manual for the PS/2 port’s pinout information.

Connecting a keyboard (P3 and P4 only)

P3 and P4 PowerStations can receive input from a PS/2 keyboard by connecting it directly to the PowerStation’s PS/2 port. However, if you want to use a keyboard and a mouse simultaneously, you must use the supplied Y-adapter cable.

The Y-adapter cable allows the P3 and P4 to accept input from a PS/2 mouse and any IBM AT (but not XT) compatible keyboard, including 84-key standard keyboards and 101-key enhanced keyboards.

If you have a P5 or P7, refer to the Keyboard Port (P5 and P7 only) section on page 22 for more information about connecting a keyboard.
Connecting a mouse

All PowerStations can receive input from a PS/2 mouse using the supplied Y-adapter cable. You must use the Y-adapter cable because the PS/2 port is configured to receive input from a PS/2 keyboard.

Keyboard Port (P5 and P7 only)

P5 and P7 PowerStations have a keyboard port located next to the parallel port. This port can accept input from any IBM AT (but not XT) compatible keyboard, including 84-key standard keyboards and 101-key enhanced keyboards.

Important Do NOT use the Y-adapter cable to connect an IBM AT compatible keyboard to the PowerStation's PS/2 port.

CRT Port

The PowerStation has a CRT port that allows you to use an external SVGA monitor in place of the flat-panel display. On TFT units, this port allows you to use an external monitor and the flat-panel display simultaneously.

This port supports monochrome and high resolution color displays.

Note The maximum resolution of the PowerStation flat-panel display is 640 x 480, but the CRT port can support up to 1024 x 768.

Refer to the CPU manual for the CRT port's pinout information.

Ethernet Port

Some PowerStation CPU cards have an Ethernet RJ-45 port. Use this port to connect the PowerStation to a Local Area Network. This port is software compatible with NE-1000 and NE-2000 protocols and supports all major network operating systems. Refer to the CPU manual for information about configuring I/O addresses and interrupts.
Drive Definitions and Memory Map

This section provides information about the PowerStation's drive definitions, depending on the type of storage device. This section also includes a graphical illustration of the PowerStation's memory map.

### Table 1: Units with a Flash-Disk

<table>
<thead>
<tr>
<th>Drive Letter</th>
<th>Type</th>
<th>Size</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>C:</td>
<td>Flash Disk (Read/Write) Compact Flash Card (CF) (Read/Write)</td>
<td>4 to 8 MB</td>
<td>System boot drive and Project disk. Stores the project, Interact, applications, etc. Download files to this drive, but do not log data to this drive because it can only accept a limited number of writes.</td>
</tr>
<tr>
<td>A:</td>
<td>3.5&quot; Floppy Drive (Read/Write)</td>
<td>1.44 MB</td>
<td>Can be used to download Projects to the unit, backup files from the unit, and log data.</td>
</tr>
</tbody>
</table>

### Table 2: Units with a Hard Drive

<table>
<thead>
<tr>
<th>Drive Letter</th>
<th>Type</th>
<th>Size</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>C:</td>
<td>Hard Disk (Read/Write)</td>
<td>1.6 GB or higher</td>
<td>System boot drive and Project disk. Stores the necessary system startup files. If you are using Interact, this drive also stores the project, Interact, applications, etc. Download files and log data to this drive.</td>
</tr>
<tr>
<td>A:</td>
<td>3.5&quot; Floppy Drive (Read/Write)</td>
<td>1.44 MB</td>
<td>Can be used to install software or save files to disk. If you are using Interact, you can download projects to the unit, backup files from the unit, and log data.</td>
</tr>
</tbody>
</table>
## Memory Guidelines

If you use Interact to develop your MMI, refer to the memory guidelines listed below when you develop projects. The following table lists guidelines to follow concerning the use and capacity of memory used for runtime and development systems.

<table>
<thead>
<tr>
<th>Memory Type</th>
<th>Runtime</th>
<th>Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>System DRAM</td>
<td>4 MB system memory runs APM, PTM, and AMM runtime modules and 2 drivers. Extra modules require more memory.</td>
<td>Modules run one at a time in development mode so a 4 MB system can support all modules and drivers.</td>
</tr>
<tr>
<td>Flash Memory</td>
<td>4 MB flash memory can store APM, PTM, AMM, plus 4 additional runtime modules, 2 drivers, and approx. 30 screens. Extra modules require more storage (4 modules/MB). Do not use for data logging.</td>
<td>4 MB flash memory can store APM, PTM, AMM, GMM, 2 drivers, and approx. 30 screens. Extra modules require more storage (2 modules/MB).</td>
</tr>
<tr>
<td>Hard Drive</td>
<td>The available hard drive can store applications and logged data.</td>
<td>The available hard drive can store any application.</td>
</tr>
<tr>
<td>Floppy Drive</td>
<td>The 1.44 MB floppy drive can be used to store logged data.</td>
<td>The 1.44 MB floppy drive can store most applications.</td>
</tr>
</tbody>
</table>

Flash memory w/ Compact Flash
Adding Adapter Cards

Many ISA-bus adapter cards are available on the market to perform numerous functions. When adding cards to the PowerStation, observe the following precautions:

- The size of the card. The size and number of available slots varies from model to model. See Physical Specifications on page 11 for more information about expansion slots.
- The total compliment of adapter cards may not exceed the current limits specified for adapter cards in the PowerStation. See Electrical Specifications on page 13 for more information about the voltage and current available for expansion cards.

Note: The PowerStation does not support Plug-n-Play features. When selecting adapter cards you must either select those with Plug-n-Play features that can be disabled or those without Plug-n-Play features. Adapter cards with Plug-n-Play enabled may not perform correctly and may adversely affect PowerStation operation.

Safety Precautions

Observe normal precautions against electrostatic discharge (ESD) to prevent damage to your PowerStation or to your adapter boards. Anyone handling internal components should do so only in an ESD-safe location and should use appropriate grounding methods.

To avoid electric shock, always disconnect power from the unit before you remove the backshell cover or separate the backshell from the front panel.

Address/IRQ Considerations

As in most ISA-bus computer port addresses, 300 through 31F are available for adapter functions. Addresses 310 through 317 are reserved for use by the PowerStation. Make sure that any adapter cards you install do not conflict with these addresses.

Note: PowerStations with flash memory use upper memory starting at C800. Contact the CTC Product Technical Support department if you need to use upper memory for specialized adapter cards. Address conflicts may cause improper operation of the unit.

PowerStation User Guide
IRQs 3, 4, 5, 7, 9, 10, 11, and 15 are available to adapter devices connected to the ISA-bus. The PowerStation configures these as shown below.

<table>
<thead>
<tr>
<th>IRQ</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>COM2*</td>
</tr>
<tr>
<td>4</td>
<td>COM1</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Ethernet</td>
</tr>
<tr>
<td>11</td>
<td>COM3*</td>
</tr>
<tr>
<td>15</td>
<td>Touch Screen*</td>
</tr>
</tbody>
</table>

The IRQs indicated as blank usage in this table are available for use by any adapter card. Those marked with an asterisk (*) may be reconfigured by changing the jumper settings on the system support card. Changing jumpers requires you to also change the operating software. You should only make these changes after consulting the CTC Product Technical Support department.

**Jumper settings**

Like most PCs, the PowerStation uses jumpers to set addresses and enable or disable various functions of the system. The PowerStation’s System Support Card has four sets of jumpers for configuring the serial ports, touch screen, and flash memory (if available).

**JP1**

This set of jumpers is used to configure the hardware IRQs for Serial Ports A and B that are found on the PowerStation’s System Support card. COM1, which is found on the CPU card is mapped to IRQ4 by default.
By default, these jumpers are set to Serial Port A = IRQ3 and Serial Port B = IRQ11. However, you can map these ports to IRQs 3, 4, 5, 7, 9, 10, 11, or 15.

**Important** IRQ 12 is used by the PS/2 port. If you intend to use a keyboard and/or a mouse, do not map to this IRQ.

**JP3 and JP4**
These jumpers allow you to select the address for Serial Port A and B. By default, these jumpers are set to Serial Port A = COM2 and Serial Port B = COM3.

If you need to change the address for a serial port, use the following table to find the desired jumper configuration.

<table>
<thead>
<tr>
<th>Address</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM1 (3F8)</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>COM2 (2F8)</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>COM3 (3E8)</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>COM4 (2E8)</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Disabled</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**JP2**
This set of jumpers is used to configure the hardware IRQs for the touch screen.
Adding Adapter Cards

JP5

This set of jumpers is only available on units with flash memory. This set of jumpers controls where the flash memory appears in memory. The flash memory uses a 12 Kbyte region of memory starting at the specified address.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>C8000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D4000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC000</td>
</tr>
</tbody>
</table>

Starting address of mapped (used) region

Communication cards

This section describes the address range for each Interact communication card when used in the PowerStation. Do NOT put all cards at the same location. In all cases, use the highest address location possible. This will provide contiguous memory for applications. Interact Design Issues

<table>
<thead>
<tr>
<th>Driver Name</th>
<th>Address Range</th>
<th>Space Required</th>
<th>Memory Boundary</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCESS4000 (ACC)</td>
<td>C800 - DFFF</td>
<td>2K</td>
<td>resides on 2K boundaries</td>
</tr>
<tr>
<td>Allen-Bradley Remote I/O (ABREMIO)</td>
<td>C800 - DFFF</td>
<td>32K</td>
<td>resides on 32K boundaries</td>
</tr>
<tr>
<td>DCSNET PC Link Module (DCSNET)</td>
<td>A000 - FC00</td>
<td>16K</td>
<td>resides on 16K boundaries</td>
</tr>
<tr>
<td>Device Net (DVNT)</td>
<td>C800 - E000</td>
<td>16K</td>
<td>resides on 16K boundaries</td>
</tr>
<tr>
<td>GE Fanuc Genius I/O (GENIUS)</td>
<td>C000 - E000</td>
<td>16K</td>
<td>resides on 16K boundaries</td>
</tr>
<tr>
<td>Giddings &amp; Lewis (GLP8)</td>
<td>C000 - E180</td>
<td>2K</td>
<td>resides on 2K boundaries</td>
</tr>
<tr>
<td>Mitsubishi A7BDE (MITS) - MELSEC-NET and A3N</td>
<td>C800 - DFFF</td>
<td>16K</td>
<td>resides on 16K boundaries</td>
</tr>
<tr>
<td>Mitsubishi A7BDE (MITS) - RS4</td>
<td>C800 - DFFF</td>
<td>8K</td>
<td>resides on 8K boundaries</td>
</tr>
<tr>
<td>Modicon ModBus Plus (MBPL)</td>
<td>C800 - DFFF</td>
<td>2K</td>
<td>resides on 2K boundaries</td>
</tr>
<tr>
<td>OMRON SYSMAC Link (SLNK)</td>
<td>C000 - D800</td>
<td>2K</td>
<td>resides on 2K boundaries</td>
</tr>
</tbody>
</table>

PowerStation User Guide
Interact Startup Directory

The INTERACT_STARTUP environment variable determines where the Startup files will be placed (i.e. C:STARTUP). When a download occurs, all existing files in the Startup directory are erased, which is why Startup files are saved in C:STARTUP, rather than in the root directory. The INTERACT_STARTUP environment variable is set in the AUTOEXEC.BAT, in case you want to change it.

Flash units vs. hard drive units

Some differences between units with flash memory and units with hard drives may affect the portability of projects containing startup files between these units.

On hard drive units, the main CONFIG.SYS file (in the root directory of drive C) cannot call a user’s CONFIG.SYS file that may be included in the Startup directory. In this case, you will need to incorporate the information from the CONFIG.SYS in the Startup directory into the main CONFIG.SYS file.
Configuration Settings

Select the CONFIG SETTNGS button to change the PowerStation hardware settings. Once assignments have been made, they are stored in the PWR.CFG file on drive C.

Important The hardware configuration settings stored in the PWR.CFG file are saved on drive C. Do not delete this file, or you will have to reset the hardware configuration.

Set Hardware

Select the SET HARDWARE button to change or modify the PowerStation setup. For most options, just select the item to toggle the selection. Other options display a submenu with additional selections. Any changes you make on this menu do not take effect until you exit this menu.

POWER ON OPERATION

Use the POWER ON OPERATION option to select whether Interact or the Shell will run after the PowerStation is turned on. The selections are:

- RUN INTERACT
- SHELL MAIN MENU (default)

If you select RUN INTERACT, the PowerStation loads Interact automatically without interaction from the user. When the user exits Interact, the Shell Main Menu is displayed. This selection is particularly useful if a power cycle should occur because the unit would automatically run Interact when the power is restored.

If you select SHELL MAIN MENU, then the PowerStation loads the Shell and displays the Shell Main Menu.

MOUSE PORT

The MOUSE PORT option automatically detects and displays the port where the mouse is connected if an external mouse is connected to the PowerStation. This port setting is displayed for informational purposes and cannot be changed through the Shell.

Important A mouse will only work if it is attached to COM1, COM2, or the PS/2 port, using the supplied Y-adapter cable. You can attach download cables to any COM port, 1 through 3.
TOUCH SCREEN

The TOUCH SCREEN option automatically detects and displays the port where the touch screen is connected if your PowerStation is configured to use a touch screen. This port setting is displayed for informational purposes, and cannot be changed through the Shell.

SHIFT KEY CONFIGURATION (P5 only)

Use the SHIFT CONFIG option to select the mode for the Shift key that appears on the faceplate of P5 PowerStations. You can select one of three modes for the Shift key:

- **Momentary** - When you press and hold the Shift key, you have access only to the F21 through F40 function keys. When you release the Shift key, you automatically regain access to the F1 through F20 keys.
- **Lock** - When you press the Shift key, it locks, allowing access only to the F21 through F40 function keys. To regain access to the F1 through F20 keys, you must press the Shift key again to release the lock.
- **Lock/Release** - When you press the Shift key, it locks, allowing access to the F21 through F40 function keys only until you press and release any other key.

An indicator on the Shift key is lit whenever the Shift key is activated or in the locked mode.

**Note** Operating a Message Input tool or a popup Numeric Keypad tool when the faceplate Shift mode is on, will input values of 2, 4, 6, and 8 for the Down, Left, Up, and Right arrow keys, respectively. To avoid entering these values when you want to use the arrow keys to control the cursor, make sure the Shift mode is off.
To allow other software drivers to use a particular serial port, that port should be set to DISABLED. The Shell automatically disables any serial port enabled for downloading whenever it detects a touch screen or a mouse is connected to it.

Note: It is possible that all the download ports could become disabled by multiple changes to the configuration file. If this occurs, then you will have to manually enable them using the DOWNLOAD ENABLE setting on the SETTINGS menu.

SERIAL PORT IRQS

Use the SERIAL PORT IRQS option to select the communication port IRQ. In order for the Shell to use the installed serial ports for downloading, and for touch screen operation, the Shell must have knowledge of the hardware IRQ numbers used by each serial port. These IRQ numbers are typically set by hardware jumpers on the serial boards. The IRQ numbers in the Shell must match the hardware jumper settings for proper operation.

In almost all cases, serial port COM1 uses IRQ4 and COM2 uses IRQ3. There are, however, no standard IRQ assignments for serial ports COM3 and COM4, so these settings must be determined from examining the system hardware configuration.
Touch Screen Calibration

Select the SCREEN CAL button to launch the touch screen calibration utility. When you select this button, the following message appears:

To calibrate the touchscreen:
- First select option 1 (Hard calibrate)
- Then select option 2 (800x600 text mode)
- Select option 3 (640x480 graphics mode)
- Finally, select X to exit calibration.

Hit any key to begin calibration...

Important  The touch screen calibration utility requires you to use an external keyboard. See PS/2 Port on page 21 for more information about connecting a keyboard to the PowerStation.

See Recalibrating the Touch Screen on page 52 for more information about calibrating the touch screen.
System Information

Select the SYS INFO button to provide information on system resources such as the Shell version number, processor type, installed memory, etc. Use this information to assist you during PowerStation configuration. This information will be requested whenever you contact CTC's Product Technical Support department for assistance.

The following items appear on the System Information Menu:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFTWARE ID</td>
<td>Identifies the version of the Shell utility.</td>
</tr>
<tr>
<td>PROCESSOR</td>
<td>Identifies the type of processor installed in the PowerStation.</td>
</tr>
<tr>
<td>INSTALLED MEMORY</td>
<td>Lists the amount of DRAM installed in the PowerStation in Kbytes.</td>
</tr>
<tr>
<td>INSTALLED FLASH</td>
<td>This parameter only appears if flash memory is installed in the unit. It indicates the amount of available flash memory in Kbytes.</td>
</tr>
<tr>
<td>DRIVES</td>
<td>Lists the type and size of the drives installed on the PowerStation along with the amount of free disk space. The flash memory is identified as a &quot;device driver&quot; in the list.</td>
</tr>
</tbody>
</table>
Port Usage

Select the PORT USAGE button to view the port memory assignments for the PowerStation. An example of this window appears below:

---

Memory Map

Select the MEMORY MAP button to display the memory map of the PowerStation. Use this menu whenever you install I/O cards that use memory addresses to make sure the card does not conflict with the PowerStation's memory addresses. See Adding Adapter Cards on page 27 for more information.

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PowerStation User Guide
Reinstalling the Shell Software

The PowerStation Shell comes pre-installed on all MS-DOS based (without Windows) units. If you need to install or reinstall the Shell software or the touch screen drivers, you can use the PowerStation Shell Setup disk. This disk automatically installs the PowerStation Shell, touch screen drivers, and the factory default AUTOEXEC.BAT and CONFIG.SYS files (if desired) on a formatted flash drive or hard drive. To install the PowerStation Shell and touch screen drivers, complete the following steps:

1. Insert the setup disk into drive A.
2. Change to the root directory of drive A.
3. Type `Install A: C:` at the DOS prompt. This will copy the Shell files into the C:\CTC directory and the touch screen drivers into the \CATOUCH directory.

At the end of the installation, you will be asked if you would like the factory-default AUTOEXEC.BAT and CONFIG.SYS files to be copied to the root directory of C. If you answer Yes, the existing AUTOEXEC.BAT and CONFIG.SYS files will be renamed to AUTOEXEC.OLD and CONFIG.OLD. If you answer No, the factory-default files will be copied to AUTOEXEC.CTC and CONFIG.CTC in the root directory of drive C.

After the AUTOEXEC.BAT and CONFIG.SYS files have been copied on to your system, press any key to continue. If the \TOUCH directory was erased or did not exist prior to running the installation program, the following screen appears prompting you to calibrate the touch screen. Otherwise, you are finished reinstalling the Shell software.

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PowerStation User Guide

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You must calibrate the touchscreen for proper operation. The calibration program will now be started automatically. To calibrate your touchscreen, perform the following steps in the Calibration program:

- Select "1" to perform a hard calibration.
- Select "2" to calibrate 80x25 text mode.
- Select "5" to calibrate 640x480 graphics mode.
- Calibrate any other video modes that are likely to be used.
- Select "X" to exit the calibration utility when finished.

Press any key to continue...
Press any key to enter the touch screen calibration utility, or press the "x" key to perform the calibration at a later time. If you decide to perform the calibration now, the on-screen commands will guide you through the calibration process.

Recalibrating the Touch Screen

The PowerStation's touch screen was calibrated prior to leaving CTC. However, you may need to recalibrate the touch screen when you begin using the PowerStation for the first time or whenever the cursor location and the location on the screen where the user touches do not match.

The PowerStation Shell comes with a calibration utility that you can use to calibrate the touch screen. The calibration utility requires a keyboard and involves calibrating the touch screen for text and for graphics. Follow these steps to calibrate the touch screen:

1. Select the SCREEN CAL button from the CONFIG SETTINGS menu. The following screen appears:

   To calibrate the touchscreen:
   - First select option 1 (Hard calibrate)
   - Then select option 2 (80x25 text mode)
   - Select option 6 (640x480 graphics mode)
   - Finally, select X to exit calibration.

   Hit any key to begin calibration...

2. Press any key when you are ready to begin the calibration program.
The following screen appears:

3. Select option H - Hard calibrate, and follow the instructions that appear on the screen.
4. Select option 2 - 80 x 25 text, and follow the instructions that appear on the screen.
5. Select option 6 - 640 x 480 graphics, and follow the instructions that appear on the screen.
6. For P7 units with an XGA display, select option 8- 800 x 600 graphics, and follow the instructions that appear on the screen.
7. For P7 units with an XGA display, select option 9- 1024 x 768 graphics, and follow the instructions that appear on the screen.
8. For any other video modes that you might wish to calibrate, select the appropriate option.
9. Select X to exit the calibration program.

**Note** Calibration data is stored in the TBCALIB file in the directory specified by the SET TBPATH= statement in the AUTOEXEC.BAT file. If this file is deleted, the touch screen will not work until it is recalibrated.

**Important** After calibrating the touch screen, enter Interact in Program Mode. Verify that the cursor appears on the screen where you touch, otherwise recalibrate the screen. The calibration MUST be accurate to avoid activating a button unintentionally during Run Mode.
Modifying the AUTOEXEC.BAT File

The following lines must appear in the AUTOEXEC.BAT file for proper operation of the PowerStation. The AUTOEXEC.BAT file that CTC supplies includes these lines and is located in the CTC directory of the PowerStation in a file called AUTOEXEC.CTC.

<table>
<thead>
<tr>
<th>Command line parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PATH C:; C:\DOS; C:\CTC</td>
<td>Sets up default DOS path.</td>
</tr>
<tr>
<td>C:\CTC\BIOSTSR</td>
<td>Loads special functions.</td>
</tr>
<tr>
<td>C:\CTC\MOUSE</td>
<td>Loads MOUSE.COM if a mouse is connected.</td>
</tr>
<tr>
<td>C:\CTC\NOMOUSE</td>
<td>Loads NOMOUSE.COM if a mouse is not connected.</td>
</tr>
<tr>
<td>C:\TOUCH\TBDRIVER /A:310/.I:15</td>
<td>Initializes mouse emulation for touch screen (DOS)</td>
</tr>
<tr>
<td>C:\NET\NET.BAT</td>
<td>Loads network batch file if unit is connected to a LAN.</td>
</tr>
<tr>
<td>* SET INTERACT=C:\INTERACT</td>
<td>Sets the Interact path.</td>
</tr>
<tr>
<td>* SET INTERACT_FILES=</td>
<td>Sets application path for Interact.</td>
</tr>
<tr>
<td>C:\INTERACT\APPPFILES</td>
<td></td>
</tr>
<tr>
<td>* SET INTERACT_STARTUP=C:\STARTUP</td>
<td>Sets up Interact startup variables.</td>
</tr>
<tr>
<td>* IF EXIST C:\STARTUP\AUTOEXEC.BAT CALL C:\STARTUP\AUTOEXEC.BAT</td>
<td>Calls second AUTOEXEC.BAT file if contained within a Project.</td>
</tr>
<tr>
<td>* C:\CTC\PSU</td>
<td>Starts the PowerStation Shell.</td>
</tr>
</tbody>
</table>

* Denotes a command line that is unnecessary on units without Interact.
Configuring the Touch Screen Drivers

CTC includes the touch screen drivers with the PowerStation that correspond to your unit’s operating system. Refer to the section below that corresponds to your operating system.

Configuring the Touch Screen Drivers in MS-DOS

The following files are needed to configure the touch screen in MS-DOS:

<table>
<thead>
<tr>
<th>Command line parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C:\TOUCH\TBDRIVER/A:310/ L:15 (See note below)</td>
<td>Initializes touch screen driver.</td>
</tr>
<tr>
<td>C:\TOUCH\TBMOUSE1</td>
<td>Initializes mouse emulation for touch screen (DOS).</td>
</tr>
</tbody>
</table>

**Important** If you purchased a PowerStation with the touch screen disabled and you want to enable it, remove the REM statement that appears at the beginning of the above lines.

Likewise, if you purchase a PowerStation with the touch screen enabled and you want to disable it, add the word REM to the beginning of these lines. If you need to permanently disable the touch screen, remove the files TBDRIVER.EXE and TBMOUSE.EXE from your system.

The TBDRIVER accepts the following command line parameters:

- `A:310` - This specifies the port address of the touch screen controller. DO NOT change!
- `A:15` - This specifies the hardware IRQ used by the touch screen controller. The factory default is IRQ15. This must match jumpers on the System Support card.

The following DOS environment variables must be set up in the AUTOEXEC.BAT file for correct touch screen operation.

- `SET TBPDKPATH=C:\TOUCH` - Specifies the directory containing touch screen drivers and calibration files. If the touch screen behaves strangely or does not appear to be calibrated, check to make sure this environment variable is set correctly.
Configuring the Ethernet Interface

Note: Calibration data for the touch screen is stored in a file named TBCALIB, in the directory specified by the TBDPATH environment variable. If the TBCALIB file is erased or corrupted, the touch screen will behave incorrectly, and must be recalibrated.

- **SET TBDINT=61**: Specifies the software interrupt number (in hex) used by the touch screen drivers. Make sure that no other system software (such as Interact, which uses interrupt 60H) uses this interrupt. This value may be set between 60 and 66.

**Configuring the Touch Screen Drivers in Windows**

If you are using Microsoft Windows 3.x, Windows 95, or Windows NT, you can configure the touch screen drivers using a utility provided by the manufacturer of the touch screen. These utilities are located in the \CTC directory on the PowerStation. When you use the configuration utility, be sure to select the following parameters:

- Select DynaPre-Bus as the driver to upgrade.
- Select 310 as the port address of the touch screen controller.
- Select 15 as the hardware IRQ used by the touch screen controller. This is the factory default - this address must match the jumpers on the System Support card.

**Configuring the Ethernet Interface**

The \NET directory of the PowerStation's Network Utility Disk contains a configuration utility and all drivers necessary to configure the Ethernet interface on the PowerStation. A list of these files appears below:

<table>
<thead>
<tr>
<th>File Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSET8019.EXE</td>
<td>A configuration utility you can use to change the interrupt and address of the Ethernet interface.</td>
</tr>
<tr>
<td>NET.BAT</td>
<td>A sample batch file you can use to run NetBIOS.</td>
</tr>
</tbody>
</table>

PowerStation User Guide
Using the Utility Disks

PowerStations ship with several disks included in the package. These disks contain various utilities and files you may need from time-to-time. This section provides a table that can be used to cross-reference your particular system with the disks needed for that system. A description of each disk and what it is used for is also presented.

<table>
<thead>
<tr>
<th>Disk Name and Part No.</th>
<th>Interact Systems</th>
<th>Non-Interact Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DOS</td>
<td>Windows</td>
</tr>
<tr>
<td>IPM KA-82228</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shell Install KA-72451</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Windows 3.1X VGA Driver (Pentium) KA-72717</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows 3.1X VGA Driver (486/5x86) KA-72716</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows 95/NT VGA Drivers KA-72670</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows 3.1X Touchscreen Driver KA-82569</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows 95 Touchscreen Driver KA-82570</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows NT Touchscreen Driver KA-72669</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows NT Emergency Repair Disk KA-72668</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilities Disk KA-72483</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash Setup KA-72452</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Interact Project Manager KA-82228**: This disk is used by all development PowerStations that ship with Interact software. This disk contains all program files for the Interact Project Manager (IPM) utility. You must
install the IPM from this disk to your development PowerStation after installing Interact in order to download projects to runtime PowerStations. Refer to the IPM User Guide for installation and usage instructions.

**PowerStation Shell Install Disk KA-72451:** This disk is used by all runtime PowerStations that ship with Interact software. The PowerStation Shell is used by runtime systems to receive Interact project files and to configure PowerStation hardware. This disk contains all PowerStation shell files, which are already installed on your unit. This disk is provided as a backup copy.

**Windows 3.1X 6555X VGA Drivers (For Pentium CPU Boards) KA-72717:** This disk is used by Pentium-based PowerStations that use the Windows 3.1 operating system. This disk contains the Windows VGA drivers, to fully support the PowerStation VGA features. The VGA drivers on this disk provide better color support than the standard drivers. The VGA drivers have already been installed on your unit. Install the files from this disk to the PowerStation only if your VGA drivers become corrupted.

**Windows 3.1X 6554X VGA Drivers (For 486 and 5x86 CPU Boards) KA-72716:** This disk is used by non-Pentium-based PowerStations that use the Windows 3.1 operating system. This disk contains the Windows VGA drivers to fully support the PowerStation VGA features. The VGA drivers on this disk provide better color support than the standard drivers. The VGA drivers have already been installed on your unit. Install the files from this disk to the PowerStation only if your VGA drivers become corrupted.

**Windows 95/NT 4.0 VGA Drivers KA-72670:** This disk is used by PowerStations that use the Windows 95 or NT operating system. This disk contains the Windows VGA drivers to fully support the PowerStation VGA features. The VGA drivers on this disk provide better color support than the standard drivers. The VGA drivers have already been installed on your unit. The Windows 95 and NT VGA drivers exist in separate directories on the disk. Install the files from this disk to the PowerStation only if your VGA drivers become corrupted.

**DOS Touchscreen Driver KA-82576:** This disk is for PowerStations that use the DOS operating system. This disk contains files necessary to operate the touch screen in a DOS-based system. The touch screen driver has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.
Using the Utility Disks

Windows 3.1X Touchscreen Driver KA-82569: This disk is for PowerStations that use the Windows 3.1 operating system. This disk contains files necessary to operate the touch screen in Windows 3.1. The touch screen driver has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.

Windows 95 Touchscreen Driver KA-82570: This disk is used by PowerStations that use the Windows 95 operating system. This disk contains files necessary to operate the touch screen in Windows 95. The touch screen driver has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.

Windows NT 4.0 Touchscreen Driver KA-72669: This disk is used by PowerStations that use the Windows NT operating system. This disk contains files necessary to operate the touch screen in Windows NT. The touch screen driver has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.

Windows NT Emergency Repair Disk KA-72668: This disk is used by PowerStations that use the Windows NT operating system. This disk is used to reboot an NT system whenever the system will not recover from a crash. This disk will allow you to restart the system and repair the corrupted files.

PowerStation Utilities Disk KA-72463: This disk contains several PowerStation utilities and is included with all units that do not ship with Interact software. PowerStations that ship with Interact already contain these utilities. These utilities support various PowerStation features such as the Brightness/Contrast Utility, Ethernet drivers, VESA VGA driver, etc. Use this disk if you need to use the utilities and drivers included on the disk.

PowerStation Flash Setup Disk KA-72452: This disk is used by all PowerStations that incorporate flash memory. This disk contains the Flash Setup Utility and all files necessary to format and rebuild the flash drive on your PowerStation if it becomes corrupted. In addition, you will need to run the Flash Setup Utility if you add additional flash memory to your unit. See Formatting the flash memory on page 75.


Cleaning the Touch Screen

Occasionally, you might find it necessary to clean the touch screen of the PowerStation. Clean the touch screen using warm soapy water and a cloth. You may also use any non-abrasive cleaner. See Faceplate Chemical Resistance on page 14.

Do not use any harsh material or powder, such as steel wool or abrasive cleansers, to clean the polyester surface. The surface is sensitive to scraping, sharp blows, or punctures. Thus, keep screwdrivers or other sharp objects away from the surface of the touch screen.

**Warning** Do NOT clean the unit while Interact is in Run mode. Clean the unit while power is removed to keep from inadvertently activating an Interact device (button, slide, etc.).

Recalibrating the Touch Screen

The PowerStation’s touch screen is calibrated prior to leaving CTC. However, you may need to recalibrate the touch screen when you begin using the PowerStation for the first time or whenever the cursor location and the location on the screen where the user touches do not match.

**Note** The calibration utility requires a keyboard and involves calibrating the touch screen for text and for graphics.

Recalibrating Under MS-DOS

Follow these steps to recalibrate the touch screen in MS-DOS mode:

1. Enter MS-DOS mode and change to the C:ATouch directory.
2. Start the touch screen calibration program by typing `CAL.ED`.
3. Select option H - Hard calibrate, and follow the screen instructions.
4. Select option 2 - 80 x 25 text, and follow the screen instructions.
5. Select option 6 - 640 x 480 graphics, and follow the screen instructions.

---

PowerStation User Guide
Recalibrating Under Windows 3.x

Follow these steps to recalibrate the touch screen in Windows 3.x:

1. Type \win at the MS-DOS prompt to enter Windows.
2. Select the file TWSETUP.EXE 3.31 using the icon in the Main program group.
3. Select the Calibrate menu from the Touchscreen Driver Setup program. Follow the instructions on the display.
4. Select the User Controls menu, and use the settings below to set up the User Controls.

<table>
<thead>
<tr>
<th>Click Time</th>
<th>Double Click Speed</th>
<th>Sensitivity</th>
<th>Stabilization</th>
<th>Button Simulation</th>
<th>Sound</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>900</td>
<td>2</td>
<td>3</td>
<td>Left</td>
<td>Optional</td>
</tr>
</tbody>
</table>

   **Note** You can select the Activate new settings button to test the settings. Test the settings by pressing the Test button.

5. Choose the User-Defined User Mode 1, then Edit Mode.
6. Use the settings below to set the Button Events in the Set User Defined Button Mode window.

<table>
<thead>
<tr>
<th>Button Event</th>
<th>Currently...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Down 1</td>
<td>Touchdown</td>
</tr>
<tr>
<td>Up 1</td>
<td>LiftOff</td>
</tr>
<tr>
<td>Down 2</td>
<td>Touchdown</td>
</tr>
<tr>
<td>Up 2</td>
<td>LiftOff</td>
</tr>
<tr>
<td>Down 3</td>
<td>Touchdown</td>
</tr>
<tr>
<td>Up 3</td>
<td>LiftOff</td>
</tr>
</tbody>
</table>
Recalibrating the Touch Screen

Note You can select the Activate New Button Mode button to test the settings. Test the settings by pressing the Test Button.

7. Return to the File Manager, and select drive A.
8. Run INSTALL.BAT to complete the installation.

Important Enter Windows in the future by typing Windows, not Win. The setup program has created the WINDOWS.BAT file that will load the correct touch screen drivers prior to entering Windows.

Recalibrating Under Windows 95/Windows NT

Follow these steps to recalibrate the touch screen under Windows 95 or Windows NT:

1. Select the Start button, and select Programs.
2. Select the Touch folder from the Programs menu.
3. Select the Touchscreen Control icon from the Touch folder to start the Touchscreen Control program.
4. Select the Calibrate button from the Touchscreen Control toolbar.
5. Place your finger on the “X” in the lower left corner, and follow the instructions on the screen.
6. Select OK when finished.
7. Select the User Controls button, and use the settings below to set up the User Controls.

   Click Time 9
   Double Click Speed 900
   Sensitivity 2
   Stabilization 3
   Button Simulation Left
   Sound Optional

Note You can select the Apply button to test the settings. Test the settings by pressing the Click or Double Click button in the Test Panel.

8. Select OK when finished.
Performing Internal Maintenance

This section includes helpful information for performing internal maintenance on the PowerStation. To prevent injury to yourself and/or damage to the PowerStation, be sure to read and understand the procedures found in this section before performing the procedures. This section will show you how to perform the following operations:

- Remove and replace flash memory
- Remove and replace DRAM

Electrostatic Discharge Precautions

Modern integrated electronic devices, especially CPUs and memory chips, are extremely sensitive to electrostatic discharges (ESD) and fields. Before you disassemble the PowerStation, be sure to follow these simple precautions to protect you and the PowerStation from harm resulting from ESD.

1. To avoid electric shock, always disconnect the power from the PowerStation before you remove the backshell cover or separate the backshell from the front panel. Do not touch any components of the CPU card or other cards while the PowerStation is on.

2. Disconnect power before making any hardware configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.
3. Only handle internal components in an ESD-safe location using appropriate grounding methods.
   - Always ground yourself to remove any static charge before you touch the CPU card.
   - Be particularly careful not to touch the chip connectors.
   - Keep any card in its anti-static packaging when it is not installed in the PowerStation, and place it on a static dissipative mat when you are working on it.
   - Wear a grounding wrist strap for continuous protection.

Disassembling the PowerStation

If you have read and understand the ESD safety precautions, you are ready to disassemble the PowerStation. Follow these steps to disassemble the unit:

**Important** As you begin to disassemble the unit, you will encounter several different screw sizes. When you reassemble the PowerStation, be sure to replace the same size screw in the same location as the one that was removed. Failure to do so could result in damage to the unit.

1. Turn off power to the unit.
2. Disconnect the unit from the power source.
3. Remove the unit from its enclosure, if installed.
4. Place the unit on a static dissipative mat in a location free from dirt and moisture and protected against static discharge. You must also wear an ESD wrist strap connected to a good known earth ground.
5. Place the unit face down, and remove the screws securing the back cover.
6. Remove the back cover from the unit.
7. Proceed to the specific configuration or replacement procedures you need to perform.
   - See Adding and Replacing Flash Memory on page 73
   - See Adding and Replacing DRAM on page 76
Adding and Replacing Flash Memory

Some PowerStations come equipped with flash memory in place of a hard drive. This section describes how to remove and replace flash memory for these units.

Important The PowerStation uses special flash memory SIMM modules that are available from CTC. Using flash memory modules from a different source will cause unreliable memory storage. Also, CTC cannot guarantee the integrity of backup operations.

Before you begin removing or replacing the flash memory, be sure to back up any important data or Interact projects on the existing flash disk. Refer to the Interact Project Manager User Guide for details on backing up Interact projects.

Removing a flash memory module

The flash memory modules are located on the System Support Card located directly in front of the CPU card as you face the back of the unit. You can also identify the System Support card as the card with the 9-pin and 25-pin D-SUB connectors. The System Support card is shown below:

1. Locate the flash SIMM sockets located in the upper left corner of the System Support Card.

2. Push outward on the socket ejectors. It might be necessary to use a small screwdriver or the tip of a pen to push on the ejectors.

3. Gently flip the flash memory module upright from the 45-degree angle.
Performing Internal Maintenance

4. Pull the flash memory module outward to remove. Place the flash memory module on an anti-static surface.

Installing a flash memory module

The steps to installing a flash memory module are the reverse of removing a module. Follow these steps to install a flash memory module:

1. Insert the flash memory module into the SIMM socket aligning the notches in the memory module with the ridges in the socket. Refer to the picture below:

2. Gently push the module down to a 45 degree angle until the tabs on the socket snap onto the flash memory module. Make sure the socket ejectors are holding the flash memory module in place.

Setting the flash memory jumpers

Like most PCs, the PowerStation uses jumpers to set addresses and enable or disable various functions of the system. The PowerStation has four sets of jumpers for configuring the serial ports, touch screen, and flash memory (if available). See Jumper settings on page 28 for a complete list of jumper settings. The jumper settings for the flash memory are shown below.

JP5

This set of jumpers is only available on units with flash memory. This set of jumpers controls where the flash memory appears in memory. The flash memory uses a 12 Kbyte region of memory starting at the specified address.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C8000 Starting address of mapped (used) region</td>
</tr>
<tr>
<td>D4000</td>
<td></td>
</tr>
<tr>
<td>DC000</td>
<td></td>
</tr>
</tbody>
</table>
Formatting the flash memory

PowerStations equipped with flash memory include a setup utility for formatting the flash memory. If the flash memory becomes corrupted or you install new flash memory, you must format the flash memory using the flash setup disk. This format procedure will erase all data on the module.

**Important**  DO NOT use the PowerStation's DOS Format command to format the flash memory.

1. Insert the flash setup disk into the PowerStation’s floppy drive.
2. Power up the PowerStation.
3. Select option 2 from the Startup Menu, and press Enter to begin the flash memory test.

**Important**  The flash memory test erases the flash memory prior to testing the capabilities of the flash memory. Be sure to back up any important data stored on the module before you begin the flash memory test.

4. Press <Y> to continue with the flash memory test when the warning message appears.
5. Press any key to reboot the PowerStation when the test is complete.
6. Select option 1 from the Startup Menu, and press Enter to format the flash memory and make it bootable. The setup utility copies the most common DOS commands onto the flash memory.
7. When the flash memory preparation is complete, remove the flash setup disk. Failure to remove the disk will restart the cycle when you reboot the PowerStation.
8. Press any key to reboot the PowerStation. The flash memory becomes drive C.
Adding and Replacing DRAM

All PowerStations use DRAM that is comparable to what is found in most PC's. The size and quantity of DRAM varies depending on the PowerStation model and the CPU card. However, the same procedure applies to add and replace DRAM on all models. Refer to the CPU manual for more information about the size and quantity of DRAM your unit can support.

Removing the System Support card

The PowerStation's DRAM is located on the CPU card, behind the System Support card. You can identify the System Support card as the card with the 9-pin and 25-pin D-SUB connectors. The System Support card is shown below:

![System Support card](image)

To add or replace DRAM you must remove the System Support card. Follow these steps to remove the System Support card.

1. Disconnect the cables from the top of the System Support card.
2. Remove the screw that secures the System Support card to the unit.
3. Remove the System Support card by carefully pulling up on the card.
   
   **Note** If necessary, remove any other cards that will give you additional room to access the CPU card.

4. Place the System Support card (and any other cards removed) on a clean and static-free work surface. If possible, place the cards in anti-static bags until you are ready to reassemble the unit.
2. Gently but firmly push the module upright into the socket until the metal clips snap into place securing the module.

**Reinstalling the System Support card**

1. Place the System Support card in its slot (J3), and gently but firmly push down on the card until it is fully seated.
2. Replace the screw that secures the System Support card to the unit.
3. Reinstall any other cards removed, and secure them to the unit.
4. Reattach the cables to the System Support card.

This completes DRAM memory installation in your PowerStation. The PowerStation will automatically recognize the additional memory. If errors occur, refer to the CPU manual that came with the PowerStation.

**Reassembling the PowerStation**

When you are finished performing internal maintenance on the PowerStation, follow these steps to reassemble the unit.

**Important** When you reassemble the PowerStation, be sure to replace the same size screw in the same location as the one that was removed. Failure to do so could result in damage to the unit.

1. Replace the back cover, and reinstall the screws that secure the back cover.
2. Reinstall the unit in its enclosure, if previously installed.
3. Reconnect power to the unit.
4. Turn on the unit.
Resolving Common Problems

This section provides some basic troubleshooting steps to help you identify and correct problems you may encounter with the PowerStation. If you encounter a problem, please consult this section to see if you can correct the problem yourself. If you encounter a problem that is not documented in this section, contact your CTC equipment supplier or the CTC Product Technical Support department at (513) 248-1714.

Resolving Problems When Powering the Unit

One of the most common problems that users encounter with PCs occurs while booting up their system. This section describes some possible problems and solutions for booting up the PowerStation.

Resolving AUTOEXEC.BAT and CONFIG.SYS problems

Some bootup problems are caused by a corrupted or modified AUTOEXEC.BAT or CONFIG.SYS file. CTC includes backup copies of these files (AUTOEXEC.CTC and CONFIG.CTC) on the PowerStation Utilities Disk. The text for AUTOEXEC.CTC appears below:

```plaintext
@ECHO OFF
PROMPT $p$g
SET TEMP=C:\DOS
PATH C:\;C:\DOS;C:\CTC
REM ********************************************
REM Install PowerStation Special Functions
REM ********************************************
REM C:\CTC\BIOSTSR
REM ********************************************
REM If an external mouse is connected, MOUSE will install successfully.
REM and NOMOUSE will do nothing. If external mouse is not found,
REM MOUSE will fail, and NOMOUSE will successfully load.
REM ********************************************
REM C:\CTC\MOUSE
REM C:\CTC\NOMOUSE
REM ********************************************
REM Install Touchscreen drivers
REM ********************************************
REM C:\CTC\TOUCH
REM ********************************************
REM ***************************************
```

PowerStation User Guide
The following lines only appear on PowerStations with Interact.

REM Set up Interact environment variables for CTC Shell
REM
SET INTERACT=C:\INTERACT
SET INTERACT_FILES=C:\INTERACT\APPFILES
SET INTERACT_STARTUP=C:\STARTUP
REM Call AUTOEXEC.BAT file contained in project, if it exists
REM
IF EXIST C:\STARTUP\AUTOEXEC.BAT CALL C:\STARTUP\AUTOEXEC.BAT
REM Start the CTC Shell
REM
CD \CTC
PSU

The following lines only appear on PowerStations without Interact.

REM Load for Windows 3.1 only, not for Windows95
REM
WINDOWS

The text for CONFIG.CTC appears below:

;MS-DOS V6.22
FILES=30
DOS=HIGH,UMB
DEVICE=C:\DOS\HIMEM.SYS

The following lines only appear on PowerStations with Interact.

REM !!! NOTE !!!
REM If EMX386 is used on a Flash-disk PowerStation, a 12KB window
REM for the flash disk must be excluded with the "/X=x" parameter,
REM as shown in the example below. This window address MUST match
REM the jumper settings on the System Support Card.
REM
REM DEVICE=C:\DOS\EMX386.EXE NOEMS RAM /X=C800-CAFF
DEVICE=C:\DOS\SETVER.EXE

The following lines only appear on PowerStations without Interact.

DEVICE=C:\DOS\EMX386.EXE NOEMS RAM
DEVICE=C:\DOS\SETVER.EXE
If at any time you suspect a problem with either the AUTOEXEC.BAT or the CONFIG.SYS file of the PowerStation, use the DOS copy command to create a backup copy of your current file, and overwrite the suspect file with the appropriate backup file. For example, if the AUTOEXEC.BAT file becomes suspect, type the following commands at the DOS prompt:

```bash
  copy autoexec.bat autoexec.old
  copy \ctc\autoexec.ctc autoexec.bat
```

---

### Resolving other problems during power up

This section lists some additional problems and solutions for booting up the PowerStation. The problem is listed first followed by a list of possible solutions. Begin with the first one, and continue through the list until you have solved the problem or reached the end of the list.

If the problem persists, look through the other problems listed in this section to determine if additional symptoms exist that require further action. Otherwise, contact your CTC equipment supplier or the CTC Product Technical Support department.

**During power up, the fan does not come on, and the display is blank.**

1. Turn off the PowerStation.
2. Make sure that power is properly connected. Otherwise, make sure that the connection between the unit and the power source is complete and firmly attached.
3. Turn on the PowerStation. If the fan does not come on, continue with step 4.
4. Disconnect power to the PowerStation.
5. Remove the PowerStation’s back cover.
6. Check the fuse located on the internal power supply. If the fuse is blown, replace it.
7. Turn on the PowerStation. If the fan does not come on, continue with step 8.
8. Check connector J8 (fan connection) on the backplane board to see if the fan is plugged in.
9. Secure the PowerStation’s back cover.
10. Reconnect power, and turn on the PowerStation.
During power up, the fan starts, but the display does not.
1. Turn off the PowerStation.
2. Remove the PowerStation’s back cover.
3. Make sure that the cables that connect to the display are properly connected. If they are not, make sure that each connector is firmly seated in the corresponding plug.
4. Check the installation of the DRAM SIMMs on the CPU board. Make sure that the SIMMs are firmly seated in their sockets and the socket latches are fully engaged.
5. Make sure that all boards are firmly seated in the backplane board.
6. Secure the PowerStation’s back cover.
7. Turn on the PowerStation.

During power up, the RAM test fails, or the total memory installed does not match the total contiguous RAM listed on the display following the RAM test.
1. Turn off the PowerStation.
2. Remove the PowerStation’s back cover.
3. Re-seat the DRAM SIMMs on the CPU board. Make sure that the SIMMs are firmly seated in their sockets, and the socket latches are fully engaged.
4. Secure the PowerStation’s back cover.
5. Turn on the PowerStation.

Resolving Problems After Powering the Unit

This section lists some possible problems and solutions that may occur after you power up the PowerStation. This section is divided into three sub-sections, one for touch screen problems, one for Interact problems, and one for other problems.

Each section lists some possible problems and solutions that may occur. The problem is listed first followed by a list of possible solutions. Begin with the first one, and continue through the list until you have solved the problem or reached the end of the list.
If the problem persists, look through the other problems listed in this section to determine if additional symptoms exist that require further action. Otherwise, contact your CTC equipment supplier or the CTC Product Technical Support department.

Resolving problems with the touch screen

This section lists some possible problems and solutions that may occur with the touch screen.

After power up, the touch screen does not work.

1. If the PowerStation appears to be operating correctly otherwise, reboot the unit.

2. The touch screen calibration might be in error. See Performing Internal Maintenance on page 71 to recalibrate the touch screen.

3. Check the AUTOEXEC.BAT file. See Resolving AUTOEXEC.BAT and CONFIG.SYS problems on page 79 for more information.
   a. Verify that the following lines appear before the lines that load touch screen driver:
      
      LH C:\CTC\MOUSE
      LH C:\CTC\NOMOUSE
   b. Verify that the touch screen drivers are being loaded. Look for the following lines:
      
      SET TBOPATH=C:\TOUCH
      SET TBOINT=61
      LH C:\TOUCH\TBCAL/ /A:310 /I:15
      LH C:\TOUCH\TBM  

   Important  You cannot use a serial mouse and the touch screen simultaneously on units running Windows 95. The PowerStation will only load the driver for the device that is listed first in the AUTOEXEC.BAT file.

After power up, the touch screen does not work properly, or the touch screen calibration is incorrect.

1. Enter MS-DOS mode.

2. Change to the vTouch directory.

3. Type TBCAL, and perform the following calibrations: H, 2, and 6.

4. If you are using Windows, choose the Touch Screen icon.

5. Make sure that the touch screen hardware settings are correct: Address =310H, IRQ = 15.
Resolving Common Problems

6. Recalibrate the touch screen. See *Performing Internal Maintenance* on page 71 for more information.

After calibrating the touch screen, it either does not work or follow your finger.

1. Make sure the touch screen cable has been properly connected. If the touch screen cable is damaged, replace the touch screen. Contact CTC for information about purchasing a replacement.
2. Inspect the touch screen for broken, loose, or frayed wiring. If you encounter wiring problems, replace the damaged wiring.

Resolving other problems after power up

This section lists other possible problems and solutions that may occur after power up.

The PowerStation locks up while booting and will not reboot.

1. Turn off the PowerStation.
2. Connect a keyboard.
3. Turn on the PowerStation. When the message "Starting MS-DOS" appears, press the F8 key. This will cause the system to step through the CONFIG.SYS or AUTOEXEC.BAT files line-by-line. If the "Starting MS-DOS" message does not appear, go to step 6.
4. Step through the CONFIG.SYS and AUTOEXEC.BAT files line-by-line until the lockup is found. Remove or correct the offending line in the CONFIG.SYS or AUTOEXEC.BAT. In particular, on PowerStations with flash memory, make sure that the memory region used by the flash memory (configured by jumpers on the System Support Card) is excluded (with the "X=" parameter) when loading EMM386.EXE.
5. Restart the PowerStation to see if the problem has been solved.
6. If the system locks up before the "Starting MS-DOS" message appears, reboot the unit, and press the Delete key to enter the BIOS setup program.
7. Select the Standard CMOS Setup option or its equivalent, and restore the system defaults. This will restore CMOS settings to their factory default configuration. Save these settings, and exit the setup program. Refer to the CPU manual that came with the PowerStation for more information about using the BIOS setup program.
A PS/2 mouse does not work.
1. Make sure that you are using a Microsoft PS/2 mouse. Some PS/2 mice that claim to be Microsoft compatible, will not work correctly with the PowerStation. Do NOT use a serial mouse with a serial to PS/2 port adapter.
2. Make sure that you are using the supplied Y-adapter cable to connect the mouse to the PS/2 port. Do NOT plug the mouse directly into the PS/2 port.

A serial mouse does not work.
See Connecting a serial mouse on page 19 for information on how to configure the PowerStation to accept a serial mouse.

A keyboard does not work.
1. If you have a P3 or P4, make sure that you are using the supplied Y-adapter cable to connect any AT compatible keyboard to the PS/2 port.
   If you have a P5 or P7, make sure that you plug the keyboard into the AT socket located next to the parallel port. Do NOT use the Y-adapter cable to connect an IBM AT compatible keyboard to the PS/2 port.
2. Make sure the keyboard is an AT keyboard NOT an XT keyboard.
3. If you have a P3 or P4, try using a new Y-adapter cable.
4. Try using a new keyboard.

The Ethernet port does not work.
1. Make sure the Ethernet cable is plugged in.
2. Make sure the networking software is being loaded. Check the AUTOEXEC.BAT file. See Resolving AUTOEXEC.BAT and CONFIG.SYS problems on page 79 for more information.
   a. Verify that the following line does NOT have the word “REM” in front of it:
   ```
   C:\NET\NET.BAT
   ```
3. Make sure that you have properly configured the networking software. See Configuring the Ethernet Interface on page 62 for more information.
Resolving problems with Interact

This section lists some possible problems and solutions that may occur on a PowerStation that is running Interact.

**After power up, the DOS prompt is displayed instead of the PowerStation Shell Main Menu.**

1. If the PowerStation appears to be operating correctly otherwise, reboot the unit.
2. The AUTOEXEC.BAT file may be corrupted or has been modified. See *Resolving AUTOEXEC.BAT and CONFIG.SYS problems* on page 79 for information about correcting this problem.

**After selecting the Go To Interact button from the Shell Main Menu, Interact does not run.**

1. Verify that the Interact security key is connected to the PowerStation.
2. Verify that Interact is loaded for this project. Go to the Shell Main Menu, and observe the selection for INTERACT TYPE. If the word UNKNOWN is displayed, return to your development system, and download a project that has Interact included. Refer to the Interact Project Manager User Guide for information on downloading projects.

**After selecting the Go To Interact button from the Shell Main Menu, Interact loads, but the screen is blank.**

Interact device driver communications have stopped. Check the following:

- On a development system, check to ensure you selected the correct device driver communications parameters (baud rate, number of data bits, etc.)
- Go to the Shell Settings menu and ensure the COM port that the driver is using is selected.
- Make sure the COM2 hardware jumpers are selected for the particular protocol used with the driver.

**You are unable to communicate with the PowerStation's COM ports.**

1. Refer to the Interact device driver Program Mode screen of the driver being used to determine if the driver is correctly setup.
2. Verify that the communication cable is wired properly.
3. Make sure the jumpers are set correctly for address and IRQ, without conflicts.
4. Make sure the proper interrupts have been selected in Application Manager.

5. Refer to the programmable controller documentation for proper cable connection instructions.

6. Use a serial port communication test device to check communications between the PowerStation and your controller. These devices can be purchased at local electronics stores.

**You are unable to transfer a project to the PowerStation.**

1. Make sure the PowerStation Shell program is running.

2. Verify the COM port you are using is enabled for download. This parameter is located on the Config Settings/Set Hardware menu of the Shell.

3. Verify that the IRQs match the jumper settings on the System Support card. Default = COM1:4, COM2:3, **COM3:1**.

4. Disconnect any communication cables connected to PowerStation communication cards.

5. Make sure you are not logged onto a network and a print spooler is not connected to your system.

6. Make sure a defective or incompatible mouse or keyboard is not connected to the PowerStation.

7. On your computer, do not load a disk cache such as “Smartdrive.” This will interfere with your project transfer. Smartdrive could exist either in your computer’s CONFIG.SYS or AUTOEXEC.BAT files.

8. Verify that the IPM baud rate located on the Transfer Settings menu is compatible with your PC's COM port.

9. Cycle power to the unit to see if the problem clears.

**Sending a project results in a message on the display indicating the ?????FIL could not be found.**

You must use a Project developed using Interact version 2.1 or higher on a PowerStation. Previous versions of Interact do not have the .FIL file.

**A message appears on the PowerStation stating that the disk is full.**

Verify that Interact Project Manager is set to download to a Runtime Only system. If not, select Runtime Only from the Settings menu of Interact Project Manager, and re-send the project.
Resolving Common Problems

If it is already set to Runtime Only, you must add more flash memory, make more hard drive space available, or the reduce the size of the application.

When you try to run Interact, a message appears on the PowerStation stating that the Interact Security Device is missing or invalid.

1. Make sure the version of Interact sent to the PowerStation is 4.X or higher.

2. If the error occurred after sending an old PSU Backup to the PowerStation, then the version of Interact is wrong. Restore the old backup to the PC using Interact Project Manager, and send the project to the PowerStation. Refer to the Interact Project Manager User Guide for more information about converting PSU backups.

3. If the security key is still not recognized, use the Interact Setup Utility to verify if the key is recognized.

The PowerStation has corrupted application files, a panel won’t load, or modules/drivers won’t load.

1. Attempt to restore a previous backup of your system. If this is not successful go to step 2.

2. Verify that the PowerStation has enough memory available by using the Interact Memory Available button. Your system may need more extended memory.

3. If your PowerStation is equipped with a hard drive, run the MS-DOS Scandisk utility.

4. Download the Interact Project.

An Interact module (i.e. HTM) does not start up.

Verify that the security key is programmed with the correct module using the Security Key selection under the Utility Menu of the Shell. See Security Key on page 48 for more information about using Interact Security Keys.

A driver does not work with the installed hardware card.

Make sure there are no interrupt or memory conflicts with other adapter cards. See Communication cards on page 30 for a list of hardware cards and their associated memory locations. Also, refer to the Windows help file that corresponds to your Interact Device Driver.
The code <00> appears on the display during Super User mode.

Reboot the PowerStation, and return to the Shell or type `exit` to return to the Main Menu. This indicates that a communication problem on the computer occurred. Verify that Interact Project Manager was only executed once.
Appendix D
Editorial Edits

This is a copy of the editing changes I made to the user guide based on style and grammatical usage.
Documentation Components

The PowerStation documentation set contains all the information you need to configure, install, and use the PowerStation as well as information about the PowerStation Shell Utility program and the Interact Project Manager. The PowerStation documentation set is described below.

**Release Notes** - This document is provided whenever there is important information about the PowerStation that does not appear in this manual. Be sure to read the release notes before operating the unit.

**PowerStation User Guide** - This document is the document you are reading. It provides detailed information about the PowerStation and describes how to configure, install, and use the unit. It also contains information about the PowerStation Shell Utility. Please read this manual in its entirety prior to operating the unit.

**CPU Manual** - This document is the manual provided by the manufacturer of the CPU board found in your PowerStation. Please familiarize yourself with this manual prior to operating the unit.

**PowerStation Template** - This document is a full-size template of the PowerStation you can use to prepare the location where you want to install the unit.

**IPM User Guide** - This document describes how to install and use the Interact Project Manager to download Interact projects from a PC to the PowerStation. This manual is only included with Interact systems.

**Software Disks** - CTC pre-loads each PowerStation with the operating system, utilities, and Interact (if purchased) software so you can run the PowerStation immediately upon its arrival at your facility. CTC also provides source disks for this software should you need to reinstall it at a later time.
Documentation Standards

As you read this manual, you will notice that the following documentation standards have been followed.

1. Important terms are shown in bold.
2. Text to be entered from the keyboard is shown in Courier font.
3. Buttons, menu titles, and keyboard keys are shown in Initial Caps.
4. Indented paragraphs denote one of the following:
   - Note - Describes alternative approaches or issues you should be aware of while using a particular function.
   - Important - Contains information that needs particular attention while reading the text. Follow this information to save development time and/or minimize problems.
   - Warning - Contains information on safety issues. Follow this information to prevent equipment damage or personal injury.

ISO Symbols

This symbol is the International Standards Organization (ISO) symbol for Caution (ISO 3864 No. B.3.1). This symbol denotes information that could affect operation of the PowerStation if not properly followed.

This symbol is the ISO symbol for Caution - risk of electrical shock (ISO 3864 No B.3.6). This symbol denotes information that could cause personal injury from electrical shock or damage to equipment if not properly followed.
Important Concepts

Now that you have opened the PowerStation package, you are ready to unpack the unit, configure it, and install it in a permanent location. This section provides an overview of the steps that are discussed in detail throughout the remainder of this manual.

Before You Begin

Before you begin operating the PowerStation, please complete the following steps:

1. Unpack the PowerStation and verify that you have received all the components you ordered. The components that were shipped with the unit are listed on the packing list included in the PowerStation carton.

2. Fill out the product registration card, and return it to CTC. When you register your unit, you will receive a trial membership in CTC’s Product Support Program that provides complimentary telephone technical support, information on product updates, and service bulletins.

3. Back up the CTC software disks that came with your unit using the Windows File Manager/Explorer or the MS-DOS `diskcopy` command.

4. Read the PowerStation Release Notes. This document provides important information about the PowerStation that does not appear in this manual.

Configure the PowerStation

Once you have unpacked the PowerStation and completed the steps listed in the previous section, you are ready to power up the PowerStation for the first time and configure the system defaults. Detailed information on configuring the PowerStation is described in Chapters 3 and 4.
Customer Support Services

CTC welcomes your thoughts and suggestions on our products and services. You can contact CTC by telephone, email, or fax. You can also visit CTC on the World Wide Web to learn the latest about CTC hardware, software, and customer support services.

Telephone: 513-831-2340
Fax: 513-831-5042
E-mail: sales@ctcusab.com or support@ctcusab.com
World Wide Web: http://www.ctcusab.com

CTC recognizes that every customer and every application has different support needs so CTC offers a variety of support services designed to meet these needs. CTC offers three types of customer support services: Product Technical Support, Technical Support Products, and the Product Support Program.

Product Technical Support

The Product Technical Support department welcomes any question that might arise as you develop or run your applications. We offer complimentary support for any customer, whether you are an end-user, original equipment manufacturer (OEM), system integrator, or distributor.

If you have a question about the PowerStation, be sure to complete the following steps:

1. Check the release notes shipped with the unit. These notes provide important information about the PowerStation.
2. Consult the PowerStation documentation and other printed materials included with the PowerStation.
3. Review Chapter 5 of this manual, Maintaining and Troubleshooting the PowerStation.

If you cannot find a solution using one of the above sources, contact CTC’s Product Technical Support department at 513-248-1714, 8:00am to 5:00pm, EST. You may call this same number after hours for emergency assistance.
Technical Support Products

Our Technical Support Products department provides service in two areas: training and consulting. CTC offers training on all our products either at CTC in our state-of-the-art training center or at your site. You can learn how to write custom interfaces, develop specialized applications, and implement your complete operator interface application. You can contact the Training Coordinator by phone at 1-800-233-3329 or by email at training@ctcusa.com.

CTC offers consulting services through our Professional Consulting Services (PCS) group. Our PCS group can build your application from the ground up by writing custom communications drivers or designing special modules to perform functions unique to your application. Our team of specialists is flexible so they can create a project development schedule that meets your needs. You can contact the PCS Coordinator by phone at 1-800-233-3329 or by email at pcs@ctcusa.com.

Product Support Program

The Product Support Program (PSP) is designed to keep you up-to-date with the current version of Interact software. The PSP consists of a renewable, one-year membership that provides you with free upgrades, utilities, automatic notification of software updates, and other valuable tools for Interact. Single-user, site, and corporate licenses are available. The PSP is an easy, cost-effective way to automatically receive the most recent Interact software and the associated utilities. You can contact the PSP Coordinator by phone at 1-800-233-3329 or by email at psp@ctcusa.com.
Understanding the PowerStation

The PowerStation family of workstations are designed to give you an operator interface solution that is powerful, cost-effective, and very easy to use. They are available in a variety of configurations to fit the functionality and cost requirements of your application.

In this chapter, you will learn about the PowerStations' drive definitions and memory maps, connectors, model numbers, and other important specifications.

Chapter Contents

| PowerStation Models                       | 10 |
| Specification                             | 11 |
| Available Connectors                      | 15 |
| Function Key Operation                    | 24 |
| Drive Definitions and Memory Map          | 26 |
| Adding Adapter Cards                      | 29 |
| Interact Design Issues                    | 35 |
PowerStation Models

CTC offers a complete line of workstations that you can easily and affordably customize with a variety of hardware options. This section describes the features of each PowerStation model covered in this manual.

All PowerStations discussed in this manual have an open PC architecture that allows you to run CTC's Interact software and other MS-DOS or Windows compatible programs. PowerStations without Interact are referred to as Industrial PC PowerStations throughout this manual.

**P3 PowerStation** - This PowerStation is a touch screen workstation that includes a 5x86 133 MHz processor and one of the following 10.4'' displays: LCD, STN, or TFT. The P3 also includes 8 MB of RAM and an internal floppy drive.

**P4 PowerStation** - This PowerStation is a touch screen workstation that includes one of the following CPUs: 5x86 133 MHz, Pentium 166 MHz, or Pentium MMX 200 MHz. The P4 also includes 8 MB of RAM, an internal floppy drive, and one of the following 10.4'' displays: LCD, STN, or TFT.

**P5 PowerStation** - This PowerStation is a function key workstation that includes one of the following CPUs: 5x86 133 MHz, Pentium 166 MHz, or Pentium MMX 200 MHz. The P5 also includes 8 MB of RAM, an internal floppy drive, and one of the following 10.4'' displays: LCD, STN, or TFT.

**P7 PowerStation** - This PowerStation is a touch screen workstation that includes a large 13.3'' TFT display and one of the following CPUs: 5x86 133 MHz, Pentium 166 MHz, or Pentium MMX 200 MHz. The P7 also includes 8 MB of RAM and an internal floppy drive.

*Note*  PowerStations with Interact are available with your choice of Compact Flash or a hard drive; Industrial PC PowerStations are only available with a hard drive and one of two displays, TFT or STN (P3, P4, and P5 only).
Specifications

This section lists and describes some important specifications relating to the PowerStation. Please familiarize yourself with these specifications prior to operating the PowerStation.

Physical Specifications

Physical specifications include the PowerStation’s physical characteristics, weight, and compatible hardware devices. Refer to the table below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPUs</td>
<td>5x86 133MHz; Pentium 166, or Pentium MMX 200MHz (unavailable on P3)</td>
</tr>
<tr>
<td>Memory</td>
<td>8MB min., 32MB max. (64MB max. on Pentiums)</td>
</tr>
</tbody>
</table>
| Displays      | • Monochrome LCD, 640x480 VGA, 16 shades of gray (unavailable on P7 and Industrial PCs)  
                | • Color TFT, 640x480 VGA, 256 colors                                           |
|               | • Color TFT, 1024x768 XVG A, 256 colors                                       |
|               | • Color STN, 640x480 VGA, 256 colors (unavailable on P7)                      |
| Storage       | • 1.44MB high-density floppy drive                                           |
|               | • 1.6GB (min.) hard drive (standard on Industrial PCs)                        |
|               | • 4, 10, 20, or 40 MB solid state flash drive (field expandable and replaceable) |
|               | • PCMCIA (requires 3rd party adapter board)                                   |
| I/O Ports     | • 1 9-pin RS232 (non-isolated)                                                |
|               | • 1 9-pin RS232/422/485 (non-isolated)                                        |
|               | • 1 25-pin IBM parallel                                                       |
|               | • 1 RJ45 Ethernet                                                            |
| Expansion     | • P3: 3 3/4-size, 16-bit, ISA slots (1 slot is convertible to full-size using an optional expansion cover) |
| Slots         | • P4: 1 1/2-size, 3 3/4-size, 16-bit, ISA slots (1 3/4-size slot is convertible to full-size using an optional expansion cover) |
|               | • P5 and P7: 2 full-size, 1 3/4-size, 16-bit, ISA slots                      |
| Dimensions    | • P3: 11.0" (280mm) x 13.8" (350mm) x 6.0" (152mm)                           |
| (H x W x D)    | • P4: 11.0" (280mm) x 13.8" (350mm) x 8.5" (216mm)                           |
|               | • P5 and P7: 14" (356mm) x 16" (406mm) x 7" (178mm)                          |
### Specifications

<table>
<thead>
<tr>
<th>Category</th>
<th>Specifications</th>
</tr>
</thead>
</table>
| Weight       | • P3: 16.2 lbs. (7.3 Kg)  
                | • P4: 18.8 lbs. (8.5 Kg)  
                | • P5 and P7: 23.8 lbs. (10.8 Kg)                                        |

### Environmental Specifications

The PowerStation conforms to the environmental specifications listed in the table below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature:</td>
<td>• 5x86 CPU’s: 32 to 122°F (0 to 50°C) ambient air temperature at fan inlet</td>
</tr>
<tr>
<td></td>
<td>• Pentium CPU’s: 32 to 113°F (0 to 45°C) ambient air temperature at fan inlet</td>
</tr>
</tbody>
</table>
| Bulb Life:                      | • Monochrome LCD - 10,000 hours  
                                 | • Color STN - 25,000 hours  
                                 | • Color TFT (10.4”) - 25,000 hours  
                                 | • Color TFT (13.8”) - 10,000 hours |
| Relative Humidity:              | 5% to 95% non-condensing                                                     |
| Altitude:                       | -200ft. to 10,000ft. (-60.96m to 3,048m)                                    |
| Shock Rating:                   | • 10g peak, 11ms (operating)  
                                 | • 30g peak, 11ms (non-operating)                                           |
| Operating Vibration:            | 0.35mm 10 to 18Hz, 1.0g from 18 to 150Hz                                     |
| Faceplate Designed For:         | NEMA 4/4X (IP65 European Std.) Environ.                                      |

**Important** Limit the PowerStation’s exposure to adverse conditions such as dust, oil, moisture, and corrosive vapors to minimize maintenance and repair costs.

Remember that the temperature outside the protective enclosure is generally lower than the internal temperature. Thus, if the PowerStation is operating inside an enclosure at temperature levels above the maximum ambient temperature, you will need to cool the enclosure.
Electrical Specifications

The PowerStation’s electrical specifications for both AC and DC units appear in the table below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Unit Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>AC Units</td>
</tr>
<tr>
<td></td>
<td>• P3: 90-250 VAC, 80W max., 50/60 Hz</td>
</tr>
<tr>
<td></td>
<td>• P4, P5, and P7: 90-250 VAC, 110W max., 50/60 Hz</td>
</tr>
<tr>
<td></td>
<td>DC Units</td>
</tr>
<tr>
<td></td>
<td>• P3 - P7: 18-36 VDC in, 110W max.</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>AC Units</td>
</tr>
<tr>
<td></td>
<td>• P3: 80W maximum</td>
</tr>
<tr>
<td></td>
<td>• P4, P5, and P7: 110W maximum</td>
</tr>
<tr>
<td></td>
<td>DC Units</td>
</tr>
<tr>
<td></td>
<td>• P3 - P7: 110W maximum</td>
</tr>
<tr>
<td>Fuse Type</td>
<td>AC Units</td>
</tr>
<tr>
<td></td>
<td>• 3.15A, 250 VAC Little fuse 216.315 or equivalent</td>
</tr>
<tr>
<td></td>
<td>DC Units</td>
</tr>
<tr>
<td></td>
<td>• 12A, 250 VAC Little fuse 314.012 or equivalent</td>
</tr>
<tr>
<td>ISA Cards</td>
<td>Voltage and current available for expansion cards (either AC or DC Units):</td>
</tr>
<tr>
<td></td>
<td>• 5x86 CPUs: 2.25A @ +5V, .3A @ -5V, 1.0A @ +/-12V</td>
</tr>
<tr>
<td></td>
<td>• Pentium CPUs: 2.5A @ +5V, .25A @ -5V, 1.0A @ +12V, .75A @ -12V</td>
</tr>
</tbody>
</table>

**Important** The PowerStation’s power supply automatically detects the input voltage level and adjusts accordingly. However, always use reliable sources of power, and isolate all communication cables from power lines to enhance noise immunity.

If possible, locate the PowerStation away from machinery that produces intense electrical noise (arc welders, etc.). Otherwise, isolate the input power to the PowerStation from the equipment generating electrical noise.

**Special note for units with replaceable lithium batteries**
Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer’s instructions.
All PowerStation surfaces exposed to the outside of your enclosure are resistive to the following chemicals:

- Commercial glass cleaners
- Ammonia (10% dilute solution)
- Motor Oil
- Hydraulic fluid
- Diesel fuel
- Gasoline (leaded, unleaded)
- Silicone based lubricant
- Alcohol (ethyl, methyl)
- Automatic transmission fluid

**Important** Sustained exposure to brake fluid or Gunk® brand degreaser can cause damage to monitor materials.

**Available Connectors**

The PowerStation includes the same ports found on most PC’s. All PowerStations have two serial ports, one parallel port, a video port, an Ethernet connector, and a PS/2 port. The following graphic shows a P3 with a 5x86 CPU:
Available Connectors

The following graphic shows a P4 with a Pentium CPU:

![Diagram of a P4 with a Pentium CPU with labels for COM 1 RS-232, COM 2 RS-232/RS-422/RS-485, COM 3 RS-232, Video port, PS/2 port, Parallel port, Ethernet port, and Keyboard port.]

The following graphic shows a P5/P7 with a 5x86 CPU:

![Diagram of a P5/P7 with a 5x86 CPU with labels for COM 1 RS-232, COM 2 RS-232/RS-422/RS-485, COM 3 RS-232, Video port, Ethernet port, PS/2 port, Parallel port, and Keyboard port.]

Serial Ports

The PowerStation has two serial ports you can use to communicate with external devices. These ports support baud rates of up to 115 Kbaud.

COM1 supports the RS-232 communication standard. Use a standard DB9 connector for communicating with this port.

The other serial port, COM2, is optically isolated with 500V of isolation to provide noise immunity. This port supports RS-232C, RS-422, and RS-
Available Connectors

485 communication standards. The communication standard you select depends on the distance between the PowerStation and the controller as well as the communication standards that the controller supports. Use a standard DB25 connector for communicating with this port.

Note If you are using RS-232 communications, the length of the serial cable should not exceed 50 feet (15 meters).

RS-422 and RS-485 communications offer greater noise immunity than RS-232. These standards increase the maximum cable length to 4000 feet (1200 meters).

RS-422 communications are full-duplex (can send and receive simultaneously), while RS-485 communications are half-duplex (can only send or receive at one time).

For either configuration, be careful not to connect any wires to unused connector pins. Information on the specific connection required for the Interact driver you use is located in the Help file associated with the driver.

COM1 pinouts

If you need to make a cable for communicating with COM1, the following table shows the pinouts and signal information for this port:

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCD, data carrier detect</td>
</tr>
<tr>
<td>2</td>
<td>RXD, received data</td>
</tr>
<tr>
<td>3</td>
<td>TXD, transmitted data</td>
</tr>
<tr>
<td>4</td>
<td>DTR, data terminal ready</td>
</tr>
<tr>
<td>5</td>
<td>Signal ground</td>
</tr>
<tr>
<td>6</td>
<td>DSR</td>
</tr>
<tr>
<td>7</td>
<td>RTS, request to send</td>
</tr>
<tr>
<td>8</td>
<td>CTS, clear to send</td>
</tr>
<tr>
<td>9</td>
<td>RI</td>
</tr>
</tbody>
</table>

COM2 pinouts

If you need to make a cable for communicating with COM2, the following
Cable diagrams

The following graphics represent the pinouts and cable diagrams required for communicating with COM1 or COM2 using the RS-232 protocol. Also shown are cable diagrams for communicating with COM2 using the RS-422 or RS-485 protocols.

<table>
<thead>
<tr>
<th>RS-232</th>
<th>RS-422</th>
<th>RS-485</th>
</tr>
</thead>
<tbody>
<tr>
<td>TXD</td>
<td>Signal Gnd.</td>
<td>1</td>
</tr>
<tr>
<td>RXD</td>
<td>CTS+</td>
<td>7</td>
</tr>
<tr>
<td>RTS</td>
<td>CTS-</td>
<td>11</td>
</tr>
<tr>
<td>CTS</td>
<td>422/485 Select</td>
<td>23</td>
</tr>
<tr>
<td>Signal Gnd.</td>
<td>TXD+</td>
<td>13</td>
</tr>
<tr>
<td>BCD</td>
<td>TXD-</td>
<td>14</td>
</tr>
<tr>
<td>DTR</td>
<td>RXD+</td>
<td>15</td>
</tr>
<tr>
<td>DSR</td>
<td>RXD-</td>
<td>16</td>
</tr>
</tbody>
</table>

Important  Be careful not to connect any wires to unused connector pins.

Connecting to a PC

To transfer files from a PC to the PowerStation, connect a serial cable with a null modem to an available serial port on the PC. Connect the other end of the cable to the serial port on the PowerStation. If you need to construct your own cables, refer to the figures below.
During the download, IPM transfers the AUTOEXEC.BAT file you created in step 1 into the \STARTUP directory specified by the INTERACT_STARTUP environment variable. This environment variable resides in the PowerStation’s AUTOEXEC.BAT.

When IPM finishes the download, the PowerStation automatically reboots, and MODE.COM configures the COM port to the required baud rate. For example, if you are communicating at 9600, NONE, 8, and 1, use:

```
MODE COM1: 9600,N,8,1
```

**Note** If you will be printing to a port that is configured for downloading, you must disable downloading for that port, and reboot the PowerStation. Rebooting the PowerStation allows MODE.COM to reset the communication settings for that port. Use the DOWNLOAD ENABLE command on the SETTINGS menu of the Shell to disable downloading.

4. Use the following diagram as a reference when connecting a serial printer to the PowerStation.

---

**Parallel Port**

The PowerStation parallel port (LPT1) pinout is identical to the standard IBM parallel printer port. The LPT1 connector pinout is shown in the table below.

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STROBE</td>
</tr>
<tr>
<td>2</td>
<td>DATA 0</td>
</tr>
<tr>
<td>3</td>
<td>DATA 1</td>
</tr>
</tbody>
</table>

---

*PowerStation User Guide*
Available Connectors

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>DATA 2</td>
</tr>
<tr>
<td>5</td>
<td>DATA 3</td>
</tr>
<tr>
<td>6</td>
<td>DATA 4</td>
</tr>
<tr>
<td>7</td>
<td>DATA 5</td>
</tr>
<tr>
<td>8</td>
<td>DATA 6</td>
</tr>
<tr>
<td>9</td>
<td>DATA 7</td>
</tr>
<tr>
<td>10</td>
<td>- ACKNOWLEDGE</td>
</tr>
<tr>
<td>11</td>
<td>BUSY</td>
</tr>
<tr>
<td>12</td>
<td>PAPER EMPTY</td>
</tr>
<tr>
<td>13</td>
<td>+ SELECT</td>
</tr>
<tr>
<td>14</td>
<td>- AUTO FEED</td>
</tr>
<tr>
<td>15</td>
<td>- ERROR</td>
</tr>
<tr>
<td>16</td>
<td>- INIT PRINTER</td>
</tr>
<tr>
<td>17</td>
<td>- SELECT INPUT</td>
</tr>
<tr>
<td>18-25</td>
<td>GROUND</td>
</tr>
</tbody>
</table>

Connecting to a parallel printer

The PowerStation can interface to any parallel printer designed for use with IBM PC compatible computers. Connect a printer to the port marked LPT1 using a standard IBM PC parallel cable.

PS/2 Port

All PowerStations have a PS/2 port located on the CPU board. Depending on the type of PowerStation you have, this port may be used to connect a mouse and/or keyboard to the unit. Refer to the CPU manual for the PS/2 port’s pinout information.

Connecting a keyboard (P3 and P4 only)

P3 and P4 PowerStations can receive input from a PS/2 keyboard by connecting it directly to the PowerStation’s PS/2 port. However, if you want to use a keyboard and a mouse simultaneously, you must use the supplied Y-adapter cable.

The Y-adapter cable allows the P3 and P4 to accept input from a PS/2
mouse and any IBM AT (but not XT) compatible keyboard, including 84-key standard keyboards and 101-key enhanced keyboards.

If you have a P5 or P7, refer to the Keyboard Port (P5 and P7 only) section on page 23 for more information about connecting a keyboard.

Connecting a mouse

All PowerStations can receive input from a PS/2 mouse using the supplied Y-adapter cable. You must use the Y-adapter cable because the PS/2 port is configured to receive input from a PS/2 keyboard.

Keyboard Port (P5 and P7 only)

P5 and P7 PowerStations have a keyboard port located next to the parallel port. This port can accept input from any IBM AT (but not XT) compatible keyboard, including 84-key standard keyboards and 101-key enhanced keyboards.

Important Do NOT use the Y-adapter cable to connect an IBM AT compatible keyboard to the PowerStation’s PS/2 port.

CRT Port

The PowerStation has a CRT port that allows you to use an external SVGA monitor in place of the flat-panel display. On TFT units, this port allows you to use an external monitor and the flat-panel display simultaneously. This port supports monochrome and high resolution color displays.

Note The maximum resolution of the PowerStation flat-panel display is 640 x 480, but the CRT port can support up to 1024 x 768.

Refer to the CPU manual for the CRT port’s pinout information.
Ethernet Port

The PowerStation has an Ethernet RJ-45 port that allows you to connect the PowerStation to a Local Area Network. This port is software compatible with the NE-2000 protocol and supports all major network operating systems.

<table>
<thead>
<tr>
<th>Pin#</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX+</td>
</tr>
<tr>
<td>2</td>
<td>TX-</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>N/C</td>
</tr>
<tr>
<td>6</td>
<td>RX-</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
</tr>
</tbody>
</table>

Function Key Operation

The P5 PowerStation includes 40 function keys (F1 through F20 + F21 through F40 using the Shift key), and a programmable Select key. This section describes how to operate units equipped with function keys.

- **Function Keys:** Allow you to send instructions to a software program. These instructions depend on the software package you are using. For example, if you are using Interact, you can assign a function key to each input tool on a panel.

- **Cursor Keys:** Use these keys to move the cursor around the screen. In Interact, you can use the cursor keys to select options from menus.

- **Numeric Keypad:** Contains keys for entering numeric data into the PowerStation.

- **Shift Key:** When active, allows you to access function keys F21 through F40. This key is set to Momentary control by default. Momentary control provides access to F21 through F40 function keys whenever you press and hold the Shift key. When you release the Shift key, you automatically regain access to the F1 through F20 keys.

If you purchased Interact with your PowerStation, you can also choose...
Shift Lock mode or Shift Lock Release mode. See \textit{SHIFT KEY CONFIGURATION (P5 only)} on page 40 for more information.

- Select Key: Pressing this key generates a key scan code that is like pressing the Right Shift key on a keyboard.

If you purchased Interact with your PowerStation, you can change the operation of this to emulate any key that you might find on a standard keyboard. See \textit{SELECT KEY CONFIGURATION (P5 only)} on page 41 for more information.
Drive Definitions and Memory Map

This section provides information about the PowerStation's drive definitions, depending on the type of storage device. This section also includes a graphical illustration of the PowerStation's memory map.

Table 1: Units with a Compact Flash

<table>
<thead>
<tr>
<th>Drive Letter</th>
<th>Type</th>
<th>Size</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>C:</td>
<td>Compact Flash (CF) Card (Read/Write)</td>
<td>4, 10, 20, or 40 MB</td>
<td>System boot drive and Project disk. Stores the project, Interact, applications, etc. Download files to this drive, but do not log data to this drive because it can only accept a limited number of writes.</td>
</tr>
<tr>
<td>A:</td>
<td>3.5&quot; Floppy Drive (Read/Write)</td>
<td>1.44 MB</td>
<td>Can be used to download Projects to the unit, backup files from the unit, and log data.</td>
</tr>
</tbody>
</table>

Table 2: Units with a Hard Drive

<table>
<thead>
<tr>
<th>Drive Letter</th>
<th>Type</th>
<th>Size</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>C:</td>
<td>Hard Disk (Read/Write)</td>
<td>1.6 GB or higher</td>
<td>System boot drive and Project disk. Stores the necessary system startup files. If you are using Interact, this drive also stores the project, Interact, applications, etc. Download files and log data to this drive.</td>
</tr>
<tr>
<td>A:</td>
<td>3.5&quot; Floppy Drive (Read/Write)</td>
<td>1.44 MB</td>
<td>Can be used to install software or save files to disk. If you are using Interact, you can download projects to the unit, backup files from the unit, and log data.</td>
</tr>
</tbody>
</table>
## Memory Guidelines

If you use Interact to develop your MMI, refer to the memory guidelines listed below when you develop projects. The following table lists guidelines to follow concerning the use and capacity of memory used for runtime and development systems.

<table>
<thead>
<tr>
<th>Memory Type</th>
<th>Runtime</th>
<th>Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>System DRAM</td>
<td>4 MB system memory runs APM, PTM, and AMM runtime modules and 2 drivers. Extra modules require more memory.</td>
<td>Modules run one at a time in development mode so a 4 MB system can support all modules and drivers.</td>
</tr>
<tr>
<td>Compact Flash</td>
<td>4 MB Compact Flash can store APM, PTM, AMM, plus 4 additional runtime modules, 2 drivers, and approx. 30 screens. Extra modules require more storage (4 modules/MB). Do not use for data logging.</td>
<td>4 MB Compact Flash can store APM, PTM, AMM, GMM, 2 drivers, and approx. 30 screens. Extra modules require more storage (2 modules/MB).</td>
</tr>
<tr>
<td>Hard Drive</td>
<td>The available hard drive can store applications and logged data.</td>
<td>The available hard drive can store any application.</td>
</tr>
<tr>
<td>Floppy Drive</td>
<td>The 1.44 MB floppy drive can be used to store logged data.</td>
<td>The 1.44 MB floppy drive can store most applications.</td>
</tr>
</tbody>
</table>
Adding Adapter Cards

Many ISA-bus adapter cards are available on the market to perform numerous functions. When adding cards to the PowerStation, observe the following precautions:

- The size of the card. The size and number of available slots varies from model to model. See Physical Specifications on page 11 for more information about expansion slots.

- The total compliment of adapter cards may not exceed the current limits specified for adapter cards in the PowerStation. See Electrical Specifications on page 13 for more information about the voltage and current available for expansion cards.

Note: The PowerStation does not support Plug-n-Play features. When selecting adapter cards you must either select those with Plug-n-Play features that can be disabled or those without Plug-n-Play features. Adapter cards with Plug-n-Play enabled may not perform correctly and may adversely affect PowerStation operation.

Safety Precautions

Observe normal precautions against electrostatic discharge (ESD) to prevent damage to your PowerStation or to your adapter boards. Anyone handling internal components should do so only in an ESD-safe location and should use appropriate grounding methods.

To avoid electric shock, always disconnect power from the unit before you remove the backshell cover or separate the backshell from the front panel.

Address/IRQ Considerations

As in most ISA-bus computer port addresses, 300 through 31F are available for adapter functions. Addresses 310 through 317 are reserved for use by the PowerStation. Make sure that any adapter cards you install do not conflict with these addresses.
IRqs 3, 4, 5, 7, 9, 10, 11, and 15 are available to adapter devices connected to the ISA-bus. The PowerStation configures these as shown below.

<table>
<thead>
<tr>
<th>IRQ</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>COM2*</td>
</tr>
<tr>
<td>4</td>
<td>COM1</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Ethernet (software configured)</td>
</tr>
<tr>
<td>11</td>
<td>Touch Screen*</td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

The IRQs indicated as blank usage in this table are available for use by any adapter card. Those marked with an asterisk (*) may be reconfigured by changing the jumper settings on the system support card. Changing jumpers requires you to also change the operating software. You should only make these changes after consulting the CTC Product Technical Support department.

The Ethernet port is software configured. See *Configuring the Ethernet Interface* on page 62 for more information.
Jumper settings

Like most PCs, the PowerStation uses jumpers to set addresses and enable or disable various functions of the system. The PowerStation's System Support Card has seven sets of jumpers for configuring the serial ports, touch screen, Compact Flash, USC module, and Ethernet.

JP8 Serial Port configuration

This set of jumpers is used to set the serial port configuration. The default setting is the RS-485, but you can configure the jumpers to the RS-232 or the RS-422 settings. Refer to the figure below to configure your settings to RS-485.

To configure to the RS-422 setting, follow the figure below.

232  422  485
m m m m m m m

232  422  485
m m m m m m m
The figure below demonstrates the RS-232 setting.

JP9 and JP11 Serial Port and Touch screen address

These sets of jumpers configure the addresses for the Serial Port (JP9) and the touch screen (JP11). Each is configured by turning on or off the ports A and B. The following configuration chart demonstrates the on/off combination for COM1, COM2, COM3, and COM4.

<table>
<thead>
<tr>
<th>I/O Address</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM1 (3F8h)</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>COM2 (2F8h)</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>COM3 (3E8h)</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>COM4 (2E8h)</td>
<td>on</td>
<td>on</td>
</tr>
</tbody>
</table>

By default, the Serial Port jumpers (JP9) are set to I/O address COM2 (2F8h) as shown below.

Note: The clip for the "off" jumper can be completely removed or placed as in the figure above.

The touch screen jumpers (JP11) are set to I/O address COM3 (3E8h) by default.
JP7 Serial Port and Touch screen IRQ

This set of jumpers is used to configure the hardware IRqs for the Serial Port and the touch screen. By default, these jumpers are set to Serial Port = IRQ3 and touch screen = IRQ11. However, you can map these ports to IRqs 3, 4, 5, 7, 9, 10, 11, or 15.

<table>
<thead>
<tr>
<th>IRQs</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>7</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM</td>
<td></td>
<td></td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>Touch</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
</tr>
</tbody>
</table>

**Important** IRQ 12 is used by the PS/2 port. If you intend to use a keyboard and/or a mouse, do not map to this IRQ.

JP10 Compact Flash Configuration

These jumpers are used to configure the Compact Flash. By default, the P/S jumper is set to off, and the ENA jumper is set to on as in the following figure.

P/S | ENA
---|---
   |   

Use the table below to reconfigure your Compact Flash.

<table>
<thead>
<tr>
<th></th>
<th>P/S</th>
<th>ENA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary IDE adaptor, IRQ14</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Secondary IDE adaptor, IRQ15</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>Disabled</td>
<td>X</td>
<td>off</td>
</tr>
</tbody>
</table>

JP6 USC module IRQ

This set of jumpers configures the USC module IRQ. The jumpers are set to IRQ15 by default as shown below.

```
3 4 5 7 9 10 11 12 15
m m m m m m m m m
m m m m m m m m m
m m m m m m m m m
m m m m m m m m m
```

PowerStation User Guide 33
JP1 Ethernet default jumper

This jumper determines when the Ethernet is configured to its default settings. When the jumper is on, the Ethernet is forced to the default settings. While the jumper is off, the Ethernet is configured by the software utility, as shown in the table below. The figure demonstrates the default “off” settings for the jumper. See Configuring the Ethernet Interface on page 62 for more information.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Ethernet forced to default settings</td>
</tr>
<tr>
<td>OFF</td>
<td>Ethernet configured by software utility</td>
</tr>
</tbody>
</table>

Communication cards

This section describes the address range for each Interact communication card when used in the PowerStation. Do NOT put all cards at the same location. In all cases, use the highest address location possible. This will provide contiguous memory for applications.

<table>
<thead>
<tr>
<th>Driver Name</th>
<th>Address Range</th>
<th>Space Required</th>
<th>Memory Boundary</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCESS4000 (ACC)</td>
<td>C800 - DFFF</td>
<td>2K</td>
<td>resides on 2K boundaries</td>
</tr>
<tr>
<td>Allen-Bradley Remote I/O (ABREMO)</td>
<td>C800 - DFFF</td>
<td>32K</td>
<td>resides on 32K boundaries</td>
</tr>
<tr>
<td>DCSNET PC Link Module (DCSNET)</td>
<td>A000 - FC00</td>
<td>16K</td>
<td>resides on 16K boundaries</td>
</tr>
<tr>
<td>Device Net (DVNT)</td>
<td>C800 - E000</td>
<td>16K</td>
<td>resides on 16K boundaries</td>
</tr>
<tr>
<td>GE Fanuc Genius I/O (GENIUS)</td>
<td>C000 - E000</td>
<td>16K</td>
<td>resides on 16K boundaries</td>
</tr>
<tr>
<td>Giddings &amp; Lewis (GLP9)</td>
<td>C000 - E180</td>
<td>2K</td>
<td>resides on 2K boundaries</td>
</tr>
<tr>
<td>Mitsubishi A7BDE (MITS) - MELSEC-NET and A3N</td>
<td>C800 - DFFF</td>
<td>16K</td>
<td>resides on 16K boundaries</td>
</tr>
<tr>
<td>Mitsubishi A7BDE (MITS) - RS4</td>
<td>C800 - DFFF</td>
<td>8K</td>
<td>resides on 8K boundaries</td>
</tr>
<tr>
<td>Modicon ModBus Plus (MBPL)</td>
<td>C800 - DFFF</td>
<td>2K</td>
<td>resides on 2K boundaries</td>
</tr>
</tbody>
</table>
Interact Design Issues

Interact Startup Directory

The INTERACT_STARTUP environment variable determines where the Startup files will be placed (i.e. C:\STARTUP). When a download occurs, all existing files in the Startup directory are erased, which is why Startup files are saved in C:\STARTUP rather than in the root directory. The INTERACT_STARTUP environment variable is set in the AUTOEXEC.BAT, in case you want to change it.

Flash units vs. hard drive units

Some differences between units with Compact Flash and units with hard drives may affect the portability of projects containing startup files between these units.

On hard drive units, the main CONFIG.SYS file (in the root directory of drive C) cannot call a user’s CONFIG.SYS file that may be included in the Startup directory. In this case, you will need to incorporate the information from the CONFIG.SYS in the Startup directory into the main CONFIG.SYS file.
Introduction

Prior to using the PowerStation, you should understand the features available with the PowerStation Shell Utility. The PowerStation Shell comes pre-installed on your system. However, if you need to reinstall the Shell software or the touch screen drivers, you can use the PowerStation Shell Setup disk. See Recalibrating the Touch Screen on page 52 for more information.

When you first power up the PowerStation, the Shell Main Menu appears. The Shell Main Menu contains information about the project currently loaded on the PowerStation. If no project exists, these settings will be set to NONE. See Main Menu on page 37 for more information about the Shell Main Menu.

Selecting Screen Options

To select screen options, touch the menu item, or move the cursor over the menu item you want to select, and press the left mouse button. A submenu of options appears that you can change for this menu item. Upon selecting a submenu, you can return to the previous menu by:

- pressing the PREVIOUS MENU button on the screen
- touching outside the pop-up menu area
- pressing the left mouse button outside the pop-up menu area
- pressing the Esc key on the keyboard
- pressing the right mouse button
- pressing the Cancel button on units with function keys.

Throughout the remainder of this section, it is assumed that you are using a keyboard and mouse.
Menu Definitions

This section provides a description of each item on the Shell Main Menu and the function of each selection button.

Main Menu

When you power up the PowerStation, the Shell performs an internal check of the configuration settings for the unit and displays the Shell Main Menu as shown below.

![Shell Main Menu](image)

The following items appear on the Shell Main Menu:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROJECT NAME</td>
<td>Displays the name of the currently loaded project.</td>
</tr>
<tr>
<td>INTERACT TYPE</td>
<td>Displays whether Interact software is installed on your PowerStation. Will display 'UNKNOWN,' 'EXTENDED DEVELOPMENT,' or 'RUNTIME.'</td>
</tr>
<tr>
<td>MODULES</td>
<td>Displays the abbreviated name of each Interact module installed with the application you are using on the PowerStation. For example, if the Panel Toolkit Module is loaded, the acronym PTM is displayed.</td>
</tr>
<tr>
<td>DRIVERS</td>
<td>Displays the abbreviated name of each Interact driver installed with the application you are using on the PowerStation. For example, if the Siemens Programming Port driver is loaded, the acronym SIEMPP is displayed.</td>
</tr>
</tbody>
</table>
Help On Shell

Select the HELP ON SHELL button to enter the Shell help system. To request help on a menu button or option, move the cursor to the function, and press the F1 key on the keyboard. A page of text is displayed similar to the one below.

To exit the help screen, or to exit a menu and return to the previous menu, do one of the following:
- press the [Esc] key on the keyboard
- click outside of the help window or menu
- press the right mouse button

To exit the help, press the Esc key on the keyboard, press the right mouse button, or click outside the Help box. If more than one page of information is available for an item, press the PgUp or PgDn buttons.
TOUCH SCREEN

The TOUCH SCREEN option automatically detects and displays the port where the touch screen is connected if your PowerStation is configured to use a touch screen. This port setting is displayed for informational purposes, and cannot be changed through the Shell.

SHIFT KEY CONFIGURATION (P5 only)

Use the SHIFT CONFIG option to select the mode for the Shift key that appears on the faceplate of P5 PowerStations. You can select one of three modes for the Shift key:

- **Momentary** - When you press and hold the Shift key, you have access only to the F21 through F40 function keys. When you release the Shift key, you automatically regain access to the F1 through F20 keys.

- **Lock** - When you press the Shift key, it locks, allowing access only to the F21 through F40 function keys. To regain access to the F1 through F20 keys, you must press the Shift key again to release the lock.

- **Lock/Release** - When you press the Shift key, it locks, allowing access to the F21 through F40 function keys only until you press and release any other key.

An indicator on the Shift key is lit whenever the Shift key is activated or in the locked mode.

**Note** Operating a Message Input tool or a popup Numeric Keypad tool when the faceplate Shift mode is on, will input values of 2, 4, 6, and 8 for the Down, Left, Up, and Right arrow keys, respectively. To avoid entering these values when you want to use the arrow keys to control the cursor, make sure the Shift mode is off.
SELECT KEY CONFIGURATION (P5 only)

Use the SELECT CONFIG option to select the key scan code that you want to be generated whenever the Select button is pressed. This option is only available on P5 PowerStations.

**Important** The button you select here must agree with the Selection Key that you select in Interact, in order for the Select button to work correctly with Interact.

![Configuration Shell Screen]

DOWNLOAD ENABLE

Use the DOWNLOAD ENABLE option to select which of the installed serial ports can be used for downloading projects to the PowerStation. When a serial port is enabled for download, the Shell "takes control" of the port to "listen" for the start of a project download; this takeover may interfere with TSRs or network drivers that use that serial port.
Menu Definitions

To allow other software drivers to use a particular serial port, that port should be set to DISABLED. The Shell automatically disables any serial port enabled for downloading whenever it detects a touch screen or a mouse is connected to it.

Note: It is possible that all the download ports could become disabled by multiple changes to the configuration file. If this occurs, then you will have to manually enable them using the DOWNLOAD ENABLE setting on the SETTINGS menu.

SERIAL PORT IRQS

Use the SERIAL PORT IRQS option to select the communication port IRQ. In order for the Shell to use the installed serial ports for downloading, and for touch screen operation, the Shell must have knowledge of the hardware IRQ numbers used by each serial port. These IRQ numbers are typically set by hardware jumpers on the serial boards. The IRQ numbers in the Shell must match the hardware jumper settings for proper operation.
SYSTEM CLOCK

Use the SYSTEM CLOCK option to change the PowerStation's date and time. After you select a parameter, use the numeric keypad to enter the desired value.

The range for each parameter appears below:

<table>
<thead>
<tr>
<th>DAY</th>
<th>1 - 31</th>
<th>HOUR</th>
<th>0 - 23</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONTH</td>
<td>1 - 12</td>
<td>MINUTE</td>
<td>0 - 59</td>
</tr>
<tr>
<td>YEAR</td>
<td>1980 - 2099</td>
<td>SECOND</td>
<td>0 - 59</td>
</tr>
</tbody>
</table>

SET BRIGHTNESS/SET CONTRAST

Use these options to change the brightness and contrast levels of your display. When you select either one of these options, a popup menu will display Increase/Decrease options. Each click on a selection will increase or decrease the brightness or contrast by one level.

Note: Not all display types support Brightness and Contrast adjustments. If the installed display does not support Brightness and Contrast adjustments, these menu options will not appear.
Touch Screen Calibration

Select the SCREEN CAL button to launch the touch screen calibration utility. When you select this button, the following message appears:

To calibrate the touchscreen:
- First select option H (Hard calibrate)
- Then select option 2 (80x25 text mode)
- Select option 5 (640x480) graphics mode
- Finally, select X to exit calibration.
Hit any key to begin calibration...

Important The touch screen calibration utility requires you to use an external keyboard. See PS/2 Port on page 22 for more information about connecting a keyboard to the PowerStation.

See Recalibrating the Touch Screen on page 52 for more information about calibrating the touch screen.
System Information

Select the SYS INFO button to provide information on system resources such as the Shell version number, processor type, installed memory, etc. Use this information to assist you during PowerStation configuration. This information will be requested whenever you contact CTC’s Product Technical Support department for assistance.

The following items appear on the System Information Menu:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFTWARE ID</td>
<td>Identifies the version of the Shell utility.</td>
</tr>
<tr>
<td>PROCESSOR</td>
<td>Identifies the type of processor installed in the PowerStation.</td>
</tr>
<tr>
<td>INSTALLED MEMORY</td>
<td>Lists the amount of DRAM installed in the PowerStation in Kbytes.</td>
</tr>
<tr>
<td>DRIVES</td>
<td>Lists the type and size of the drives installed on the PowerStation along with the amount of free disk space. The Compact Flash is identified as a “device driver” in the list.</td>
</tr>
</tbody>
</table>
Port Usage

Select the PORT USAGE button to view the port memory assignments for the PowerStation. An example of this window appears below:

Memory Map

Select the MEMORY MAP button to display the memory map of the PowerStation. Use this menu whenever you install I/O cards that use memory addresses to make sure the card does not conflict with the PowerStation’s memory addresses. See Adding Adapter Cards on page 29 for more information.
Go To Interact

Select the GO TO INTERACT button to execute Interact from the Shell. Doing so provides the proper environment for Interact to create and use the applications within the currently selected project.

The Interact module displayed is determined by the project’s Startup Application configuration setting in the Application Manager. If this setting is None, then the Application Manager Main Menu is displayed. Upon exiting Interact, the Shell Main Menu appears.

Utility Menu

Select the UTILITY MENU button to enter the Shell Utility menu. The Utility menu allows you to do the following:

- Access the Interact security device
- Restore an Interact project backup from a floppy disk to the hard drive
- View directory names and file names, including their size and date/time information

Security Key

Use this option to activate the Interact Setup Utility (ISU) which allows you to enable options and transfer enabled options between security keys. Refer to the Interact Getting Started guide for more information about using security keys. To upgrade the key and enable or transfer modules and drivers, follow the basic guidelines listed below:

- To upgrade the PowerStation’s internal key, place the upgrade key on the LPT1 (parallel) port, and use the Upgrade command in ISU.
- To enable modules and drivers on the PowerStation’s internal key, use the Enable Option command in ISU.
- To transfer modules and drivers to the PowerStation’s Internal Key, place a key with the enabled module or driver on the LPT1 port of the PowerStation, and use the Transfer Option command in ISU.

Note: When you choose the Enable Option command, a numeric keypad appears so you can enter enabling codes. This eliminates the need for an external keyboard.
Restore Project

Use this option to restore a project from a floppy drive to Compact Flash or a hard drive. The following warning message appears when you select this option:

WARNING! You are restoring a project from a floppy drive to the Interact Disk. Any existing project will be ERASED. Continue?

< YES >    < NO >

Dir

Use this option to display a list of all files and directories on the PowerStation. Select the desired drive letter and directory to display the files in that directory.

The directory path is listed at the top of the screen. The number of files, the total number of bytes in this directory, and the total number of bytes remaining on this drive are listed at the bottom of the screen. This menu also displays file names with their size and the date and time the file was created.

If the list of files is greater than what can be displayed on screen, then you can scroll and page through the list. Use the arrow keys to scroll through the list, or press the Page Up or Page Down keys.

Exit Shell

Select the EXIT SHELL button to exit the Shell program and return to DOS. When you select this button, the Shell reminds you that you must have a keyboard connected to the PowerStation before you can exit the Shell. If you have a keyboard connected to the PowerStation, select YES to exit the Shell. You can restart the Shell at any time by typing \PSU and pressing the Enter key on the keyboard.
System Tests

Select the SYSTEM TESTS menu to display a submenu of tests that you can perform on the PowerStation. At this time, you can perform a keyboard test by pressing the KEYBOARD TEST button.

Keyboard Test

Select the KEYBOARD TEST button to begin the keyboard test. When you press a key, the PowerStation will display the text string that matches that key.

Note: If your PowerStation has a touch screen, upon pressing the display the text string “SELECT” is displayed. Also, pressing the Shift, Ctrl, and Alt keys does not display a text string.

DOS Shell

Select the DOS SHELL button to enter DOS mode without exiting the Shell. You will need to connect a keyboard to the PowerStation prior to selecting this feature. CTC includes all DOS utilities on all PowerStations equipped with a hard drive. Refer to your DOS manual for information about using DOS commands. To return to the Shell, type `exit` at the prompt.
Reinstalling the Shell Software

The PowerStation Shell comes pre-installed on all MS-DOS based (without Windows) units. If you need to install or reinstall the Shell software or the touch screen drivers, you can use the PowerStation Shell Setup disk. This disk automatically installs the PowerStation Shell, touch screen drivers, and the factory default AUTOEXEC.BAT and CONFIG.SYS files (if desired) on a formatted flash drive or hard drive. To install the PowerStation Shell and touch screen drivers, complete the following steps:

1. Insert the setup disk into drive A.
2. Change to the root directory of drive A.
3. Type `install a: c:` at the DOS prompt. This will copy the Shell files into the C:\CTC directory and the touch screen drivers into the C:\TOUCH directory.

At the end of the installation, you will be asked if you would like the factory-default AUTOEXEC.BAT and CONFIG.SYS files to be copied to the root directory of C. If you answer Yes, the existing AUTOEXEC.BAT and CONFIG.SYS files will be renamed to AUTOEXEC.OLD and CONFIG.OLD. If you answer No, the factory-default files will be copied to AUTOEXEC.CTC and CONFIG.CTC in the root directory of drive C.

After the AUTOEXEC.BAT and CONFIG.SYS files have been copied on to your system, press any key to continue. If the "TOUCH" directory was erased or did not exist prior to running the installation program, the following screen appears prompting you to calibrate the touch screen. Otherwise, you are finished reinstalling the Shell software.

---

You must calibrate the touchscreen for proper operation. The calibration program will now be started automatically. To calibrate your touchscreen, perform the following steps in the calibration program:
- Select "H" to perform a Hard calibration.
- Select "2" to calibrate 640x480 test node.
- Select "6" to calibrate 640x480 graphics node.
- Calibrate any other video nodes that are likely to be used.
- Select "X" to exit the calibration utility when finished.

Press any key to continue . . .

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PowerStation User Guide
Recalibrating the Touch Screen

Press any key to enter the touch screen calibration utility, or press the “X” key to perform the calibration at a later time. If you decide to perform the calibration now, the on-screen commands will guide you through the calibration process.

Recalibrating the Touch Screen

The PowerStation’s touch screen is calibrated prior to leaving CTC. However, you may need to recalibrate the touch screen when you begin using the PowerStation for the first time or whenever the cursor location and the location on the screen where the user touches do not match.

The PowerStation Shell comes with a calibration utility that you can use to calibrate the touch screen. The calibration utility requires a keyboard and involves calibrating the touch screen for text and for graphics. Follow these steps to calibrate the touch screen:

1. Select the SCREEN CAL button from the CONFIG SETTING menu.
   The following screen appears:

   To calibrate the touchscreen:
   - First select option H (Hard calibrate)
   - Then select option 2 (80x25 text mode)
   - Select option 6 (640x480) graphics mode
   - Finally, select X to exit calibration.
   Hit any key to begin calibration...

2. Press any key when you are ready to begin the calibration program.
The following screen appears:

3. Select option H - Hard calibrate, and follow the instructions that appear on the screen.
4. Select option 2 - 80 x 25 text, and follow the instructions that appear on the screen.
5. Select option 6 - 640 x 480 graphics, and follow the instructions that appear on the screen.
6. For P7 units with an XGA display, select option 8 - 800 x 600 graphics, and follow the instructions that appear on the screen.
7. For P7 units with an XGA display, select option 9 - 1024 x 768 graphics, and follow the instructions that appear on the screen.
8. For any other video modes that you might wish to calibrate, select the appropriate option.
9. Select X to exit the calibration program.

Note Calibration data is stored in the TBCALIB file in the directory specified by the SET TBPATH= statement in the AUTOEXEC.BAT file. If this file is deleted, the touch screen will not work until it is recalibrated.

Important After calibrating the touch screen, enter Interact in Program Mode. Verify that the cursor appears on the screen where you touch, otherwise recalibrate the screen. The calibration MUST be accurate to avoid activating a button unintentionally during Run Mode.
Selecting a Location

The first step to installing the PowerStation is to select an appropriate location for the unit. This is the most important aspect of the installation because the location you select can affect the PowerStation’s performance, ease-of-use, life expectancy, and more. This section provides some guidelines that you should follow when selecting a location for the PowerStation.

Class I, Division II Guidelines

If you purchased a Class I, Division II compliant PowerStation, you must always follow these guidelines to maintain a safe operating environment:

1. Suitable for use in Class I, Division II, Groups A, B, C, and D hazardous locations only.
2. **Warning: Explosion Hazard** - Do not disconnect equipment, replace, or insert cards unless power has been switched to the off or the area is known to be non-hazardous.
3. **Warning: Explosion Hazard** - Substitution of components may impair suitability for Class I, Division II.
4. Make sure that power is always secured to the unit using the supplied L bracket (AC units).
5. When performing field wiring, always use copper wire with 60C or 60/75C insulation and a tightening torque of 7.0 lb/in. (0.79 N·m).

Environmental Guidelines

The environment is the area where the PowerStation will be located. In general, you should limit the unit’s exposure to adverse conditions such as dust, oil, moisture, and corrosive vapors.

Faceplate Considerations

The PowerStation's faceplate is designed to the NEMA 4 (IP65 European standard) rating. You should mount the PowerStation in a similar enclosure to provide further protection. The PowerStation's faceplate is resistant to a variety of chemicals. See *Faceplate Chemical Resistance* on page 14 for a complete list of these chemicals.
Electrical Guidelines

To minimize unwanted electrical interference, select a location away from machinery that produce intense electrical noise. If this cannot be avoided, isolate input power to the unit, and separate all data communication cables used with the unit from power lines.

See Electrical Specifications on page 13 for a list of electrical specifications. Make sure that your power source is completely compatible with the PowerStation before starting the unit.

Temperature Guidelines

You can safely operate the PowerStation within the temperature range specified in the Environmental Specifications section on page 13. If you are using a protective enclosure, remember that the temperature outside the enclosure is generally lower than the internal temperature. Thus, if the PowerStation is operating inside an enclosure at temperature levels above its rated ambient temperature, it will be necessary to cool the enclosure.

Enclosure Guidelines

Select an enclosure that is large enough to allow free airflow in and around the unit. You should allow a minimum of a 2-inch gap between the enclosure and the top, bottom, and sides of the PowerStation.

Also, make sure that the surface of the enclosure on which the PowerStation is mounted is flat and free of raised or depressed areas.

Creating the Cutout

Once you have selected a location, you can begin preparing it to accept the unit. Prior to installing the PowerStation, you will need to create a cutout for the unit and clean the area of any dirt or debris that may come in contact with the unit.

The PowerStation comes with a template that is designed to simplify the task of creating the cutout for the unit. It is important that you follow the drill hole and cutout dimensions precisely so the PowerStation properly seals.
Mounting the Unit

Follow these steps to create the cutout:

1. Attach the template securely to the mounting surface.

2. Cut out the shaded area of the template referred to as the 'Panel Cutout Area.' To maintain the flatness of the mounting surface, CTC recommends that you cut out the Panel Cutout Area rather than punch it out.

3. Drill the appropriate number of 0.23-inch diameter mounting holes as seen on the template. Once again, you should be careful to protect the flatness of the surface.

4. Deburr the cutout area and the drill holes.

5. Ensure that the mounting surface has remained flat and that the panel surface is clean and free of foreign materials.

Mounting the Unit

Once the mounting surface has been prepared, you can install the PowerStation. For your convenience, CTC includes all necessary mounting hardware with the unit. Follow these steps to mount the unit:

1. Gently insert the PowerStation into the cutout.

2. Install a nut on each of the protruding studs on the back of the panel, and tighten each nut to a torque of 17 inch/pounds.

Important The unit must fit flush in the enclosure. Tighten the nuts in a crosswise sequence to ensure a good seal and prevent damage to the unit.
Powering Up the Unit

Once the unit has been mounted, you are ready to power up the unit. This procedure appears below.

Before connecting power to your unit, make sure you have read and understand the following sections of this manual: Electrical Specifications on page 13 and Testing Specifications on page 14. Also, make sure you follow the guidelines listed below:

- For PERMANENTLY CONNECTED EQUIPMENT, a readily accessible disconnect device shall be incorporated in the fixed wiring.
- For PLUGGABLE EQUIPMENT, the socket-outlet shall be installed near the equipment and shall be easily accessible.

Special note for use in EU member countries

Proper installation of this PowerStation model for use in European Union countries requires the use of a harmonized power cord. The power cord must be identified with the <HAR> symbol. Ensure that this PowerStation is only connected to the mains supply with a harmonized power cord.

1. Verify that the power switch is OFF.
2. Connect the power cord to your voltage source. Voltage input to the unit should be within the range specified in the Electrical Specifications section on page 13 of this manual.
3. Connect the power cord plug to the PowerStation.
4. Turn the power switch ON.

Note: The fan should come on followed immediately by the display.

If you are using Interact, you are now ready to download your project to the PowerStation. Refer to the Interact Project Manager User Guide for more information about downloading projects to the PowerStation.
Modifying the AUTOEXEC.BAT File

The following lines must appear in the AUTOEXEC.BAT file for proper operation of the PowerStation. The AUTOEXEC.BAT file that CTC supplies includes these lines and is located in the \CTC directory of the PowerStation in a file called AUTOEXEC.CTC.

<table>
<thead>
<tr>
<th>Command line parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PATH C:; C:\DOS; C:\CTC</td>
<td>Sets up default DOS path.</td>
</tr>
<tr>
<td>C:\CTC\BIOSTSR</td>
<td>Loads special functions.</td>
</tr>
<tr>
<td>C:\CTC\MOUSE</td>
<td>Loads MOUSE.COM if a mouse is connected.</td>
</tr>
<tr>
<td>C:\CTC\NOMOUSE</td>
<td>Loads NOMOUSE.COM if a mouse is not connected.</td>
</tr>
<tr>
<td>SET TBDRIVER=TBDRIVER /A:310 /I:15</td>
<td>Sets touch screen driver path.</td>
</tr>
<tr>
<td>SET TBDRIVER=TBDRIVER /A:310 /I:15</td>
<td>Sets touch screen driver software interrupt.</td>
</tr>
<tr>
<td>C:\TOUCH\TBDRIVER /A:310 /I:15</td>
<td>Initializes touch screen driver.</td>
</tr>
<tr>
<td>C:\TOUCH\TBDRIVER /A:310 /I:15</td>
<td>Initializes mouse emulation for touch screen (DOS).</td>
</tr>
<tr>
<td>C:\NET\NET.BAT</td>
<td>Loads network batch file if unit is connected to a LAN.</td>
</tr>
<tr>
<td>SET INTERACT=C:\INTERACT</td>
<td>Sets the Interact path.</td>
</tr>
<tr>
<td>SET INTERACT_FILES=C:\INTERACT\APPFILES</td>
<td>Sets application path for Interact.</td>
</tr>
<tr>
<td>SET INTERACT_STARTUP=C:\STARTUP</td>
<td>Sets up Interact startup variables.</td>
</tr>
<tr>
<td>* IF EXIST C:\STARTUP\AUTOEXEC.BAT CALL C:\STARTUP\AUTOEXEC.BAT</td>
<td>Calls second AUTOEXEC.BAT file if contained within a Project.</td>
</tr>
<tr>
<td>* C:\CTC\PSU</td>
<td>Starts the PowerStation Shell.</td>
</tr>
</tbody>
</table>

* Denotes a command line that is unnecessary on units without Interact.
Configuring the Ethernet Interface

Note  Calibration data for the touch screen is stored in a file named TBCALIB, in the directory specified by the TBDPATH environment variable. If the TBCALIB file is erased or corrupted, the touch screen will behave incorrectly, and must be recalibrated.

- SET TBDINT=61 - Specifies the software interrupt number (in hex) used by the touch screen drivers. Make sure that no other system software (such as Interact, which uses interrupt 60H) uses this interrupt. This value may be set between 60 and 66.

Configuring the Touch Screen Drivers in Windows

If you are using Microsoft Windows 3.1, Windows 95, or Windows NT, you can configure the touch screen drivers using a utility provided by the manufacturer of the touch screen. These utilities are located in the \CTC directory on the PowerStation. When you use the configuration utility, be sure to select the following parameters:

- Select Dynapro-Bus, post version J2LB5 as touch screen type.
- Select 310 as the port address of the touch screen controller.
- Select 15 as the hardware IRQ used by the touch screen controller. This is the factory default. This address must match the jumpers on the System Support card.

Configuring the Ethernet Interface

The \NET directory of the PowerStation's flash drive contains a configuration utility and all drivers necessary to configure the Ethernet interface. CTC also includes backup copies of these files on the PowerStation Shell Installation Disk. These files are described below:

<table>
<thead>
<tr>
<th>File Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT5CFG.EXE</td>
<td>A configuration utility you can use to change the interrupt and address of the Ethernet interface.</td>
</tr>
<tr>
<td>NET.BAT</td>
<td>A sample batch file you can use to run NetBIOS.</td>
</tr>
</tbody>
</table>
Using the Utility Disks

PowerStations ship with several disks included in the package. These disks contain various utilities and files you may need from time to time. This section provides a table that can be used to cross-reference your particular system with the disks needed for that system. A description of each disk and what it is used for is also presented.

<table>
<thead>
<tr>
<th>Disk Name and Part No.</th>
<th>Interact Systems</th>
<th>Non-Interact Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DOS 3.1  95 NT</td>
<td>DOS 3.1  95 NT</td>
</tr>
<tr>
<td>IPM KA-82228</td>
<td>X X X X</td>
<td>X X</td>
</tr>
<tr>
<td>Shell Install KA-72451</td>
<td>X X X</td>
<td></td>
</tr>
<tr>
<td>Windows 3.1X VGA Driver (Pentium)</td>
<td>X X</td>
<td>X</td>
</tr>
<tr>
<td>KA-72717</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows 3.1X VGA Driver (486/5x86)</td>
<td>X X</td>
<td>X</td>
</tr>
<tr>
<td>KA-72716</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows 95/NT VGA Drivers KA-72670</td>
<td>X X</td>
<td>X X</td>
</tr>
<tr>
<td>Windows 3.1X Touchscreen Driver</td>
<td>X X</td>
<td>X</td>
</tr>
<tr>
<td>KA-82569</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows 95 Touchscreen Driver</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>KA-82570</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows NT Touchscreen Driver</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>KA-72669</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows NT Emergency Repair Disk</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>KA-72668</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilities Disk KA-72463</td>
<td>X X X X</td>
<td>X</td>
</tr>
</tbody>
</table>

"occasionally"
Interact Project Manager KA-82228: This disk is used by all development PowerStations that ship with Interact software. This disk contains all program files for the Interact Project Manager (IPM) utility. You must install the IPM from this disk to your development PowerStation after installing Interact in order to download projects to runtime PowerStations. Refer to the IPM User Guide for installation and usage instructions.

PowerStation Shell Install Disk KA-72451: This disk is used by all runtime PowerStations that ship with Interact software. The PowerStation Shell is used by runtime systems to receive Interact project files and to configure PowerStation hardware. This disk contains all PowerStation shell files, which are already installed on your unit. This disk is provided as a backup copy.

Windows 3.1X 6555X VGA Drivers (For Pentium CPU Boards) KA-72717: This disk is used by Pentium-based PowerStations that use the Windows 3.1 operating system. This disk contains the Windows VGA drivers, to fully support the PowerStation VGA features. The VGA drivers on this disk provide better color support than the standard drivers. The VGA drivers have already been installed on your unit. Install the files from this disk to the PowerStation only if your VGA drivers become corrupted.

Windows 3.1X 6554X VGA Drivers (For 486 and 5x86 CPU Boards) KA-72716: This disk is used by non-Pentium-based PowerStations that use the Windows 3.1 operating system. This disk contains the Windows VGA drivers to fully support the PowerStation VGA features. The VGA drivers on this disk provide better color support than the standard drivers. The VGA drivers have already been installed on your unit. Install the files from this disk to the PowerStation only if your VGA drivers become corrupted.

Windows 95/NT 4.0 VGA Drivers KA-72670: This disk is used by PowerStations that use the Windows 95 or NT operating system. This disk contains the Windows VGA drivers to fully support the PowerStation VGA features. The VGA drivers on this disk provide better color support than the standard drivers. The VGA drivers have already been installed on your unit. The Windows 95 and NT VGA drivers exist in separate directories on the disk. Install the files from this disk to the PowerStation only if your VGA drivers become corrupted.

DOS Touchscreen Driver KA-82576: This disk is for PowerStations that use the DOS operating system. This disk contains files necessary to operate the touch screen in a DOS-based system. The touch screen driver
has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.

**Windows 3.1X Touchscreen Driver KA-82569:** This disk is for PowerStations that use the Windows 3.1 operating system. This disk contains files necessary to operate the touch screen in Windows 3.1. The touch screen driver has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.

**Windows 95 Touchscreen Driver KA-82570:** This disk is used by PowerStations that use the Windows 95 operating system. This disk contains files necessary to operate the touch screen in Windows 95. The touch screen driver has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.

**Windows NT 4.0 Touchscreen Driver KA-72669:** This disk is used by PowerStations that use the Windows NT operating system. This disk contains files necessary to operate the touch screen in Windows NT. The touch screen driver has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.

**Windows NT Emergency Repair Disk KA-72668:** This disk is used by PowerStations that use the Windows NT operating system. This disk is used to reboot an NT system whenever the system will not recover from a crash. This disk will allow you to restart the system and repair the corrupted files.

**PowerStation Utilities Disk KA-72463:** This disk contains several PowerStation utilities and is included with all units that do not ship with Interact software. PowerStations that ship with Interact already contain these utilities. These utilities support various PowerStation features such as the Brightness/Contrast Utility, Ethernet drivers, VESA VGA driver, etc. Use this disk if you need to use the utilities and drivers included on the disk.
Cleaning the Touch Screen

Occasionally, you might find it necessary to clean the touch screen of the PowerStation. Clean the touch screen using warm soapy water and a cloth. You may also use any non-abrasive cleaner. See *Faceplate Chemical Resistance* on page 14.

Do not use any harsh material or powder, such as steel wool or abrasive cleansers, to clean the polyester surface. The surface is sensitive to scraping, sharp blows, or punctures. Thus, keep screwdrivers or other sharp objects away from the surface of the touch screen.

**Warning**  Do NOT clean the unit while Interact is in Run mode. Clean the unit while power is removed to keep from inadvertently activating an Interact device (button, slide, etc.).
Reformatting the Compact Flash

This section explains the procedure to create a bootable Compact Flash (CF) card for the PowerStation from a “blank” CF card. This procedure may be necessary if certain critical files are deleted or corrupted on the card or to prepare a new card for use. This procedure requires the following items:

- PC with a Type II PCMCIA slot and a 3.5” floppy drive running MS-DOS 6.22 or Windows 95
- CF-to-PCMCIA adapter
- ROM-DOS 6.22 and Utilities distribution disk (KA-72579-101 or later)
- Shell Installation disk (KA-72451-120 or later)

**Note** This procedure will only work correctly under MS-DOS 6.22 or Windows 95. Do not run this utility under Windows NT.

1. Power down the PowerStation.

**Important** Always make sure power to the PowerStation is turned OFF when inserting or removing the CF card.

2. Remove the flash card from the PowerStation flash card slot.
3. Insert the CF card into the PC’s PCMCIA slot, using the CF-to-PCMCI A adapter.

The PCMCIA drivers should recognize and configure the card as an ATA card, assigning an additional drive letter for the card (e.g., D):

**Note** In this example, drive D: represents the PCMCIA card; however, your system may assign a different drive letter to the PCMCIA card.

4. Enter MS-DOS mode.

5. At the DOS prompt, type the following command sequence:
   
   FORMAT D:

6. Press Enter to execute this command.

7. Insert the ROM-DOS 6.22 and Utilities disk into the PC’s floppy drive.

**Important** If you are performing the install procedure in a DOS window under Windows 95, you must execute the command LOCK D: before entering the INSTALL command shown below. After the ROM-DOS installation is complete, execute the UNLOCK D: command.

8. At the DOS prompt, type the following command sequence:
   
   A: INSTALL A: D:

9. Press Enter to execute this command.

   This will install the ROM-DOS system files onto the CF card to make the card bootable and create a DOS directory containing a few basic ROM-DOS utilities (HIMEM.SYS, EMM386.EXE, etc.).

10. Insert the Shell Installation disk into the PC’s floppy drive.
11. At the DOS prompt, type the following command sequence:
   A: INSTALL A: D:

12. Press Enter to execute this command.

   This will install the PowerStation Shell files and necessary drivers onto drive D (or the drive assigned to the CF card in the PCMCIA slot). You will be asked whether you wish to install the standard CTC AUTOEXEC.BAT and CONFIG.SYS files as part of the installation. CTC recommends that you answer "Yes."

   If you answer Yes, the existing AUTOEXEC.BAT and CONFIG.SYS files will be renamed to AUTOEXEC.OLD and CONFIG.OLD. If you answer No, the factory-default files will be copied to AUTOEXEC.CTC and CONFIG.CTC in the root directory of drive D, and you will need to manually update your existing AUTOEXEC.BAT and CONFIG.SYS later.

   After the AUTOEXEC.BAT and CONFIG.SYS files have been copied on to your system, press any key to continue. You will be asked if you want to calibrate the touch screen; however, you cannot do this until you reinstall the CF card in the PowerStation.

13. Press N when you are asked if you want to recalibrate the touch screen.

   The PowerStation Shell installation is complete.

14. Eject the CF-to-PCMCIA adapter, and remove the CF from the adapter.

   The CF card is now ready to use in the PowerStation.

   **Important** Always make sure power to the PowerStation is turned OFF when inserting or removing the CF card.

15. Insert the CF into PowerStation’s flash card slot.

16. Power up the PowerStation.

   The PowerStation automatically boots into the PowerStation Shell.

17. Recalibrate the touch screen. See *Recalibrating the Touch Screen* on page 52 for complete instructions.
Recalibrating the Touch Screen

The PowerStation's touch screen is calibrated prior to leaving CTC. However, you may need to recalibrate the touch screen when you begin using the PowerStation for the first time or whenever the cursor location and the location on the screen where the user touches do not match.

**Note** The calibration utility requires a keyboard and involves calibrating the touch screen for text and for graphics.

Recalibrating Under MS-DOS

Follow these steps to recalibrate the touch screen in MS-DOS mode:

1. Enter MS-DOS mode, and change to the C:\Touch directory.
2. Start the touch screen calibration program by typing **TBCAL**.
3. Select option H - Hard calibrate, and follow the screen instructions.
4. Select option 2 - 80 x 25 text, and follow the screen instructions.
5. Select option 6 - 640 x 480 graphics, and follow the screen instructions.
6. Select X to exit the calibration program.

**Note** Calibration data is stored in the TBCALIB file in the directory specified by the SET TBPATH= statement in the AUTOEXEC.BAT file. If this file is deleted, the touch screen will not work until it is recalibrated.

Recalibrating Under Windows 3.x

Follow these steps to recalibrate the touch screen in Windows 3.x:

1. Type **Win** at the MS-DOS prompt to enter Windows.
2. Select the file **TWSETUP.EXE 3.31** using the icon in the Main program group.
3. Select the Calibrate menu from the Touchscreen Driver Setup program. Follow the instructions on the display.
Performing Internal Maintenance

This section includes helpful information for performing internal maintenance on the PowerStation. To prevent injury to yourself and/or damage to the PowerStation, be sure to read and understand the procedures found in this section before performing the procedures. This section will show you how to perform the following operations:

- Remove and replace Compact Flash
- Remove and replace DRAM

Electrostatic Discharge Precautions

Modern integrated electronic devices, especially CPUs and memory chips, are extremely sensitive to electrostatic discharges (ESD) and fields. Before you disassemble the PowerStation, be sure to follow these simple precautions to protect you and the PowerStation from harm resulting from ESD.

1. To avoid electric shock, always disconnect the power from the PowerStation before you remove the backshell cover or separate the backshell from the front panel. Do not touch any components of the CPU card or other cards while the PowerStation is on.

2. Disconnect power before making any hardware configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

3. Only handle internal components in an ESD-safe location using appropriate grounding methods.
   - Always ground yourself to remove any static charge before you touch the CPU card.
   - Be particularly careful not to touch the chip connectors.
   - Keep any card in its anti-static packaging when it is not installed in the PowerStation, and place it on a static dissipative mat when you are working on it.
   - Wear a grounding wrist strap for continuous protection.
Disassembling the PowerStation

If you have read and understand the ESD safety precautions, you are ready to disassemble the PowerStation. Follow these steps to disassemble the unit:

**Important** As you begin to disassemble the unit, you will encounter several different screw sizes. When you reassemble the PowerStation, be sure to replace the same size screw in the same location as the one that was removed. Failure to do so could result in damage to the unit.

1. Turn off power to the unit.
2. Disconnect the unit from the power source.
3. Remove the unit from its enclosure, if installed.
4. Place the unit on a static dissipative mat in a location free from dirt and moisture and protected against static discharge. You must also wear an ESD wrist strap connected to a good known earth ground.
5. Place the unit face down, and remove the screws securing the back cover.
6. Remove the back cover from the unit.
7. Proceed to the specific configuration or replacement procedures you need to perform.

* See *Adding and Replacing DRAM* on page 77
Adding and Replacing DRAM

All PowerStations use DRAM that is comparable to what is found in most PC's. The size and quantity of DRAM varies depending on the PowerStation model and the CPU card. However, the same procedure applies to add and replace DRAM on all models. Refer to the CPU manual for more information about the size and quantity of DRAM your unit can support.

Removing the System Support card

The PowerStation's DRAM is located on the CPU card, behind the System Support card. You can identify the System Support card as the card with the Compact Flash Card and the Ethernet port. The System Support card is shown below:

To add or replace DRAM you must remove the System Support card. Follow these steps to remove the System Support card:

1. Disconnect the cables from the top of the System Support card.
2. Remove the screw that secures the System Support card to the unit.
3. Remove the System Support card by carefully pulling up on the card.
   Note: If necessary, remove any other cards that will give you additional room to access the CPU card.
4. Place the System Support card (and any other cards removed) on a clean and static-free work surface. If possible, place the cards in anti-static bags until you are ready to reassemble the unit.
Removing a DRAM module

Follow these instructions to remove a DRAM module from the CPU card.

2. Locate the DRAM SIMM socket(s) located on the left side of the CPU card. The number of SIMM sockets varies depending on the PowerStation model and the manufacturer of the CPU card.

3. Push outward on the socket ejectors. It might be necessary to use a small screwdriver or the tip of a pen to push on the ejectors.

4. Tilt the DRAM module slightly to the left (away from the fan on the CPU card), and lift the module out of its socket at an angle.

5. Place the DRAM module in an anti-static bag for storage if you do not plan to reinstall the DRAM module at this time.

Installing a DRAM module

Follow these instructions to install a DRAM module in the CPU card.

1. Carefully insert the DRAM module into its socket at a 45-degree angle.

   Note The notch on the bottom of the DRAM module will align with the ridge on the socket.
2. Gently but firmly push the module upright into the socket until the metal clips snap into place securing the module.

Reinstalling the System Support card

1. Place the System Support card in its slot (J3), and gently but firmly push down on the card until it is fully seated.
2. Replace the screw that secures the System Support card to the unit.
3. Reinstall any other cards removed, and secure them to the unit.
4. Reattach the cables to the System Support card.

This completes DRAM memory installation in your PowerStation. The PowerStation will automatically recognize the additional memory. If errors occur, refer to the CPU manual that came with the PowerStation.

Adding PC/104 Modules

The PowerStation supports PC/104 expansion modules. These modules perform a variety of functions that are typically done by traditional plug-in expansion cards. However, the advantage of using PC/104 modules is that you can stack several modules together, saving valuable space. When adding modules to the PowerStation, keep the following information in mind:

- The total combination of modules may not exceed the current limits specified for PC/104 modules in the PowerStation. See Electrical Specifications on page 13 for more information about the voltage and current available for expansion cards.

- The PowerStation does not support Plug-n-Play features. When selecting PC/104 modules you must either select those with Plug-n-Play features that can be disabled or those without Plug-n-Play features. PC/104 modules with Plug-n-Play enabled may not perform correctly and may adversely affect PowerStation operation.
Changing the Jumper Settings

The PowerStation has two sets of jumpers located on the Ethernet/Power Supply board that you can change, if necessary. The first set of jumpers (JP1) allows you to restore the Ethernet port to a known configuration of IRQ 10 and I/O address 240H. The second set of jumpers (JP6) allows you to change the IRQ used by the touch screen.

Note: The PowerStation’s CPU card also has several sets of jumpers that may also be changed. Refer to the CPU manual that came with your PowerStation for more information about changing these jumpers.

**JP1 Ethernet default jumper**

This jumper is used to restore the Ethernet configuration to IRQ 10 and I/O 240H. This jumper is located near the IDE hard drive connector on the Ethernet/Power Supply board. To restore the Ethernet configuration to IRQ 10 and I/O 240H, install a clip on this jumper.

**JP6 Touch screen IRQ jumpers**

This set of jumpers is used to configure the hardware IRQs for the touch screen. The touch screen IRQ jumpers are located at the lower left corner of the Ethernet/Power Supply board, just beneath the CPU card. To change these jumpers, you may need to remove the CPU card. This procedure is described on page 81.
Removing the CPU card

CTC does not recommend removing the CPU card; however, you may need to do so to change the jumper settings for the touch screen IRQ. The following procedure describes how to remove the CPU card:

1. Disassemble the PowerStation following the procedure described on page 76.

Refer to the graphic below for remainder of this procedure.

2. Remove the screw that secures CPU card support bracket. This screw is located inside the unit just above the VGA port.

3. Remove the screw that secures the CPU card to the back shell.

4. Disconnect the four cables shown above. Pay attention to which socket you remove each cable from, so you can properly reassemble the unit.

5. Gently push the CPU card out of its socket.

6. Change the touch screen IRQ by moving the clip to the desired jumper. CTC sets the touch screen IRQ to 15.

7. Re-install the CPU card by performing steps 1-5 in reverse order.
COM2 jumpers

CTC configures the COM2 serial port for RS-485 communications; however, you can configure this port to communicate using RS-232 or RS-422 by changing the jumper settings on the CPU card. To configure COM2 to use RS-232, move the clip to the RS-232 position, and move the COM2 cable from RS-422/485 connector to the RS-232 connector.

For more information about the COM2 jumpers, refer to the CPU manual that came with your unit.

Reassembling the PowerStation

When you are finished performing internal maintenance on the PowerStation, follow these steps to reassemble the unit.

Important When you reassemble the PowerStation, be sure to replace the same size screw in the same location as the one that was removed. Failure to do so could result in damage to the unit.

1. Replace the back cover, and reinstall the screws that secure the back cover.
2. Reinstall the unit in its enclosure, if previously installed.
3. Reconnect power to the unit.
4. Turn on the unit.
Resolving Common Problems

This section provides some basic troubleshooting steps to help you identify and correct problems you may encounter with the PowerStation. If you encounter a problem, please consult this section to see if you can correct the problem yourself. If you encounter a problem that is not documented in this section, contact your CTC equipment supplier or the CTC Product Technical Support department at (513) 248-1714.

Refer to the lists below for the possible troubleshooting topics, how they are organized, and where they are located in this section.

Resolving AUTOEXEC.BAT and CONFIG.SYS problems

Resolving other problems during power up
- During power up, the fan does not come on, and the display is blank. (page 87)
- During power up, the fan starts, but the display does not. (page 87)
- During power up, the RAM test fails, or the total memory installed does not match the total contiguous RAM listed on the display following the RAM test. (page 88)

Resolving problems with the touch screen
- After power up, the touch screen does not work. (page 88)
- After power up, the touch screen does not work properly, or the touch screen calibration appears to be incorrect. (page 89)
- After calibrating the touch screen, it either does not work or follow your finger. (page 89)

Resolving other problems after power up
- The PowerStation locks up while booting and will not reboot. (page 90)
- A PS/2 mouse does not work. (page 91)
- A serial mouse does not work. (page 91)
- A keyboard does not work. (page 91)
- The Ethernet port does not work. (page 91)

Resolving problems with Interact
Resolving other problems during power up

This section lists some additional problems and solutions for booting up the PowerStation. The problem is listed first followed by a list of possible solutions. Begin with the first one, and continue through the list until you have solved the problem or reached the end of the list.

If the problem persists, look through the other problems listed in this section to determine if additional symptoms exist that require further action. Otherwise, contact your CTC equipment supplier or the CTC Product Technical Support department.

**During power up, the fan does not come on, and the display is blank.**

1. Turn off the PowerStation.
2. Make sure that power is properly connected. Otherwise, make sure that the connection between the unit and the power source is complete and firmly attached.
3. Turn on the PowerStation. If the fan does not come on, continue with step 4.
4. Disconnect power to the PowerStation.
5. Remove the PowerStation’s back cover.
6. Check the fuse located on the internal power supply. If the fuse is blown, replace it.
7. Turn on the PowerStation. If the fan does not come on, continue with step 8.
8. Check connector J8 (fan connection) on the backplane board to see if the fan is plugged in.
9. Secure the PowerStation’s back cover.
10. Reconnect power, and turn on the PowerStation.

**During power up, the fan starts, but the display does not.**

1. Turn off the PowerStation.
2. Remove the PowerStation’s back cover.
3. Make sure that the cables that connect to the display are properly connected. If they are not, make sure that each connector is firmly seated in the corresponding plug.
4. Check the installation of the DRAM SIMMs on the CPU board. Make sure that the SIMMs are firmly seated in their sockets and the socket latches are fully engaged.

5. Make sure that all boards are firmly seated in the backplane board.

6. Secure the PowerStation’s back cover.

7. Turn on the PowerStation.

**During power up, the RAM test fails, or the total memory installed does not match the total contiguous RAM listed on the display following the RAM test.**

1. Turn off the PowerStation.

2. Remove the PowerStation’s back cover.

3. Re-seat the DRAM SIMMs on the CPU board. Make sure that the SIMMs are firmly seated in their sockets, and the socket latches are fully engaged.

4. Secure the PowerStation’s back cover.

5. Turn on the PowerStation.

**Resolving Problems After Powering the Unit**

This section lists some possible problems and solutions that may occur after you power up the PowerStation. This section is divided into three sub-sections, one for touch screen problems, one for Interact problems, and one for other problems.

Each section lists some possible problems and solutions that may occur. The problem is listed first followed by a list of possible solutions. Begin with the first one, and continue through the list until you have solved the problem or reached the end of the list.

If the problem persists, look through the other problems listed in this section to determine if additional symptoms exist that require further action. Otherwise, contact your CTC equipment supplier or the CTC Product Technical Support department.
Resolving problems with the touch screen

This section lists some possible problems and solutions that may occur with the touch screen.

**After power up, the touch screen does not work.**

1. If the PowerStation appears to be operating correctly otherwise, reboot the unit.

2. The touch screen calibration might be in error. See *Performing Internal Maintenance* on page 75 to recalibrate the touch screen.

3. Check the AUTOEXEC.BAT file. See *Resolving AUTOEXEC.BAT and CONFIG.SYS problems* on page 85 for more information.
   a. Verify that the following lines appear before the lines that load touch screen driver:
      
      LH C:\CTC\MOUSE
      LH C:\CTC\NOMOUSE
   
   b. Verify that the touch screen drivers are being loaded. Look for the following lines:
      
      SET TBDPATH=C:\TOUCH
      SET TDBINT=61
      LH C:\TOUCH\TBDRIVER /A:310 /I:15
      LH C:\TOUCH\TBMOUSE

   **Important** You cannot use a serial mouse and the touch screen simultaneously on units running Windows 95. The PowerStation will only load the driver for the device that is listed first in the AUTOEXEC.BAT file.

**After power up, the touch screen does not work properly, or the touch screen calibration is incorrect.**

1. Enter MS-DOS mode.

2. Change to the \Touch directory.

3. Type TBCAL, and perform the following calibrations: H, 2, and 6.

4. If you are using Windows, choose the Touch Screen icon.

5. Make sure that the touch screen hardware settings are correct:
   
   Address =310H, IRQ = 15.

6. Recalibrate the touch screen. See *Performing Internal Maintenance* on page 75 for more information.

**After calibrating the touch screen, it either does not work or follow your finger.**
A PS/2 mouse does not work.

1. Make sure that you are using a Microsoft PS/2 mouse. Some PS/2 mice that claim to be Microsoft compatible, will not work correctly with the PowerStation. Do NOT use a serial mouse with a serial to PS/2 port adapter.

2. Make sure that you are using the supplied Y-adapter cable to connect the mouse to the PS/2 port. Do NOT plug the mouse directly into the PS/2 port.

A serial mouse does not work.

See Connecting a serial mouse on page 20 for information on how to configure the PowerStation to accept a serial mouse.

A keyboard does not work.

1. If you have a P3 or P4, make sure that you are using the supplied Y-adapter cable to connect any AT compatible keyboard to the PS/2 port.

   If you have a P5 or P7, make sure that you plug the keyboard into the AT socket located next to the parallel port. Do NOT use the Y-adapter cable to connect an IBM AT compatible keyboard to the PS/2 port.

2. Make sure the keyboard is an AT keyboard NOT an XT keyboard.

3. If you have a P3 or P4, try using a new Y-adapter cable.

4. Try using a new keyboard.

The Ethernet port does not work.

1. Make sure the Ethernet cable is plugged in.

2. Make sure the networking software is being loaded. Check the AUTOEXEC.BAT file. See Resolving AUTOEXEC.BAT and CON- FIG.SYS problems on page 85 for more information.

   a. Verify that the following line does NOT have the word “REM” in front of it:

      C:\NET\NET.BAT

3. Make sure that you have properly configured the networking software. See Configuring the Ethernet Interface on page 62 for more information.
Resolving problems with Interact

This section lists some possible problems and solutions that may occur on a PowerStation that is running Interact.

**After power up, the DOS prompt is displayed instead of the PowerStation Shell Main Menu.**

1. If the PowerStation appears to be operating correctly otherwise, reboot the unit.

2. The AUTOEXEC.BAT file may be corrupted or has been modified. See *Resolving AUTOEXEC.BAT and CONFIG.SYS problems on page 85* for information about correcting this problem.

**After selecting the Go To Interact button from the Shell Main Menu, Interact does not run.**

1. Verify that the Interact security key is connected to the PowerStation.

2. Verify that Interact is loaded for this project. Go to the Shell Main Menu, and observe the selection for INTERACT TYPE. If the word UNKNOWN is displayed, return to your development system, and download a project that has Interact included. Refer to the Interact Project Manager User Guide for information on downloading projects.

**After selecting the Go To Interact button from the Shell Main Menu, Interact loads, but the screen is blank.**

Interact device driver communications have stopped. Check the following:

a. On a development system, check to ensure you selected the correct device driver communications parameters (baud rate, number of data bits, etc.)

b. Go to the Shell Settings menu and ensure the COM port that the driver is using is selected.

c. Make sure the COM2 hardware jumpers are selected for the particular protocol used with the driver.

**You are unable to communicate with the PowerStation’s COM ports.**

1. Refer to the Interact device driver Program Mode screen of the driver being used to determine if the driver is correctly setup.

2. Verify that the communication cable is wired properly.

3. Make sure the jumpers are set correctly for address and IRQ, without conflicts.
If it is already set to Runtime Only, you must add more Compact Flash, make more hard drive space available, or reduce the size of the application.

**When you try to run Interact, a message appears on the PowerStation stating that the Interact Security Device is missing or invalid.**

1. Make sure the version of Interact sent to the PowerStation is 4.X or higher.

2. If the error occurred after sending an old PSU Backup to the PowerStation, then the version of Interact is wrong. Restore the old backup to the PC using Interact Project Manager, and send the project to the PowerStation. Refer to the Interact Project Manager User Guide for more information about converting PSU backups.

3. If the security key is still not recognized, use the Interact Setup Utility to verify if the key is recognized.

**The PowerStation has corrupted application files, a panel won’t load, or modules/drivers won’t load.**

1. Attempt to restore a previous backup of your system. If this is not successful go to step 2.

2. Verify that the PowerStation has enough memory available by using the Interact Memory Available button. Your system may need more extended memory.

3. If your PowerStation is equipped with a hard drive, run the MS-DOS Scandisk utility.

4. Download the Interact Project.

**An Interact module (i.e. HTM) does not start up.**

Verify that the security key is programmed with the correct module using the Security Key selection under the Utility Menu of the Shell. See *Security Key* on page 48 for more information about using Interact Security Keys.

**A driver does not work with the installed hardware card.**

Make sure there are no interrupt or memory conflicts with other adapter cards. See *Communication cards* on page 34 for a list of hardware cards and their associated memory locations. Also, refer to the Windows help file that corresponds to your Interact Device Driver.
The code <00> appears on the display during Super User mode.
Reboot the PowerStation, and return to the Shell or type exit to return to the Main Menu. This indicates that a communication problem on the computer occurred. Verify that Internet Project Manager was only executed once.
Appendix E
Technical Review

This is copy of one of Brad’s technical reviews.
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Ethernet Port

The PowerStation has an Ethernet RJ-45 port that allows you to connect the PowerStation to a Local Area Network. This port is software compatible with the NE-2000 protocol and supports all major network operating systems.

<table>
<thead>
<tr>
<th>Pin#</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX+</td>
</tr>
<tr>
<td>2</td>
<td>TX-</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>N/C</td>
</tr>
<tr>
<td>6</td>
<td>RX-</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
</tr>
</tbody>
</table>

Compact Flash

The PowerStation has a Compact Flash (CF) card that is like a removable hard drive. It provides non-volatile memory storage. The CF is often used as a supplement to or a replacement for hard drives because it is well-suited for environments where the PowerStation may be vibrated or shaken. The CF has DOS-like functions and is recognized as drive C. If you have a hard drive unit, the CF can be configured as a secondary IDE hard drive.

Function Key Operation

The P5 PowerStation includes 40 function keys (F1 through F20 + F21 through F40 using the Shift key), and a programmable Select key. This section describes how to operate units equipped with function keys.

- **Function Keys**—allow you to send instructions to a software program. These instructions depend on the software package you are using. For example, if you are using Interact, you can assign a function key to each input tool on a panel.

- **Cursor Keys**—move the cursor around the screen. In Interact, you can use the cursor keys to select options from menus.
Set Path

Select the SET PATH button to enter the path where the Interact application and executable files reside.

**Important** Any changes you make to this setting are also made to the “SET INTERACT=” and “SET INTERACT_FILES=” lines in your AUTOEXEC.BAT file. However, these changes will not take effect until you restart the PowerStation or exit the Shell.

Touch Screen Calibration

Select the SCREEN CAL button to launch the touch screen calibration utility. When you select this button, the following message appears:

```
To calibrate the touchscreen:
- First, select option C to calibrate
- Then select option V to select video nodes
- Select an appropriate video node (must be nodes 1, 12, and 101 - selections 2, 0, and 11 respectively)
- Select C to calibrate the selected node
- Repeat until all needed video nodes are calibrated
Hit any key to begin calibration...
```

**Important** The touch screen calibration utility requires you to use an external keyboard. See *PS/2 Port* on page 22 for more information about connecting a keyboard to the PowerStation.

See *Recalibrating the Touch Screen* on page 55 for more information about calibrating the touch screen.
Modifying the AUTOEXEC.BAT File

The following lines must appear in the AUTOEXEC.BAT file for proper operation of the PowerStation. The AUTOEXEC.BAT file that CTC supplies includes these lines and is located in the \CTC directory of the PowerStation in a file called AUTOEXEC.CTC.

<table>
<thead>
<tr>
<th>Command line parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PATH C:; C:\DOS; C:\CTC</td>
<td>Sets up default DOS path.</td>
</tr>
<tr>
<td>C:\CTC\BIOSTSR</td>
<td>Loads special functions.</td>
</tr>
<tr>
<td>C:\CTC\MOUSE</td>
<td>Loads MOUSE.COM if a mouse is connected.</td>
</tr>
<tr>
<td>C:\CTC\NOMOUSE</td>
<td>Loads NOMOUSE.COM if a mouse is not connected.</td>
</tr>
<tr>
<td>C:\TOUCH\DOX\EMOUSE\NOMOUSE /NOBOUNDS/</td>
<td>Initializes touch screen driver.</td>
</tr>
<tr>
<td>C:\NET\NET.BAT</td>
<td>Loads network batch file if unit is connected to a LAN.</td>
</tr>
<tr>
<td>SET INTERACT=C:\INTERACT</td>
<td>Sets the Interact path.</td>
</tr>
<tr>
<td>SET INTERACT_FILES=C:\INTERACT\APPFILES</td>
<td>Sets application path for Interact.</td>
</tr>
<tr>
<td>SET INTERACT_STARTUP=C:\STARTUP</td>
<td>Sets up Interact startup variables.</td>
</tr>
<tr>
<td>IF EXIST C:\STARTUP\AUTOEXEC.BAT CALL C:\STARTUP\AUTOEXEC.BAT</td>
<td>Calls second AUTOEXEC.BAT file if contained within a Project.</td>
</tr>
<tr>
<td>C:\CTC\PSU</td>
<td>Starts the PowerStation Shell.</td>
</tr>
</tbody>
</table>

* Denotes a command line that is unnecessary on units without Interact.
Configuring the Touch Screen Drivers

CTC includes the touch screen drivers with the PowerStation that correspond to your unit's operating system. Refer to the section below that corresponds to your operating system.

Configuring the Touch Screen Drivers in MS-DOS

The `C:\TOUCH\DOX\EMOUSE.EXE` file is needed to configure the touch screen in MS-DOS. This file initialized the touch screen driver.

**Important** If you purchased a PowerStation with the touch screen disabled and you want to enable it, remove the REM statement that appears at the beginning of the above line.

Likewise, if you purchase a PowerStation with the touch screen enabled and you want to disable it, add the word REM to the beginning of this line. If you need to permanently disable the touch screen, remove the file `EMOUSE.EXE` from your system.

The `EMOUSE` accepts the following command line parameter `NOBOUNDS`—this specifies the touch screen boudoirs in Interact.

**Important** DO NOT change this parameter.

Follow the directions below to configure the touch screen drivers:

1. Enter MS-DOS mode and change to the `C:\touch\dox` directory.
2. Start the touch screen calibration program by typing `touchcfg`. The following touch screen driver configuration screen will appear.
3. Press I for Interface. The following Interface Configuration Options screen will appear.

![Interface Configuration Options](image)

4. Press I to change the Interrupt or press 1, 2, 3 or 4 to change the COM port.

**Note** If you use Set COM3 or COM4, they will default to COM1 and COM2 IRQs. You will need to reset them.

5. Press A to change the Address.

6. Press C to change the Connection.

**Important** The Connection must be set to UART.

7. Press O to set your touch screen driver.

8. Press Escape or X to exit.

**Important** You must reboot your system for the changes to take effect.

### Configuring the Touch Screen Drivers in Windows

If you are using Microsoft Windows 3.x, Windows 95, or Windows NT, you can configure the touch screen drivers using a utility provided by the manufacturer of the touch screen.

Follow the directions below to configure the touch screen drivers:

1. Select the Start button and select Programs.

2. Select the Touch Screen Utilities folder from the Programs menu.
Using the Utility Disks

PowerStations are shipped with several disks included in the package. These disks contain various utilities and files you may occasionally need. This section provides a table that can be used to cross-reference your particular system with the disks needed for that system. A description of each disk and what it is used for is also presented.

<table>
<thead>
<tr>
<th>Disk Name and Part No.</th>
<th>Interact Systems</th>
<th>Non-Interact Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DOS 3.1</td>
<td>95</td>
</tr>
<tr>
<td>IPM KA-82228</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Shell Install KA-72451</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Windows 3.1X VGA Driver (Pentium)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>KA-72717</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows 3.1X VGA Driver (486/5x86)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>KA-72716</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows 95/NT VGA Drivers KA-72670</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Windows 3.1X Touch-screen Driver</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>KA-82569</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows 95 Touch-screen Driver</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>KA-82570</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows NT Touch-screen Driver</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>KA-72669</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows NT Emergency Repair Disk</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>KA-72668</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilities Disk KA-72463</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Using the Utility Disks

**Interact Project Manager KA-82228**: This disk is used by all development PowerStations shipped with Interact software. This disk contains all program files for the Interact Project Manager (IPM) utility. You must install the IPM from this disk to your development PowerStation after installing Interact in order to download projects to runtime PowerStations. Refer to the IPM User Guide for installation and usage instructions.

**PowerStation Shell Install Disk KA-72451**: This disk is used by all runtime PowerStations shipped with Interact software. The PowerStation Shell is used by runtime systems to receive Interact project files and to configure PowerStation hardware. This disk contains all PowerStation shell files, which are already installed on your unit. This disk is provided as a backup copy.

**Windows 3.1X 6555X VGA Drivers (For Pentium CPU Boards) KA-72717**: This disk is used by Pentium-based PowerStations that use the Windows 3.1 operating system. This disk contains the Windows VGA drivers, to fully support the PowerStation VGA features. The VGA drivers on this disk provide better color support than the standard drivers. The VGA drivers have already been installed on your unit. Install the files from this disk to the PowerStation only if your VGA drivers become corrupted.

**Windows 3.1X 6554X VGA Drivers (For 486 and 5x86 CPU Boards) KA-72716**: This disk is used by non-Pentium-based PowerStations that use the Windows 3.1 operating system. This disk contains the Windows VGA drivers to fully support the PowerStation VGA features. The VGA drivers on this disk provide better color support than the standard drivers. The VGA drivers have already been installed on your unit. Install the files from this disk to the PowerStation only if your VGA drivers become corrupted.

**Windows 95/NT 4.0 VGA Drivers KA-72670**: This disk is used by PowerStations that use the Windows 95 or NT operating system. This disk contains the Windows VGA drivers to fully support the PowerStation VGA features. The VGA drivers on this disk provide better color support than the standard drivers. The VGA drivers have already been installed on your unit. The Windows 95 and NT VGA drivers exist in separate directories on the disk. Install the files from this disk to the PowerStation only if your VGA drivers become corrupted.
DOS Touchscreen Driver KA-82576: This disk is for PowerStations that use the DOS operating system. This disk contains files necessary to operate the touch screen in a DOS-based system. The touch screen driver has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.

Windows 3.1X Touchscreen Driver KA-82569: This disk is for PowerStations that use the Windows 3.1 operating system. It contains files necessary to operate the touch screen in Windows 3.1. The touch screen driver has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.

Windows 95 Touchscreen Driver KA-82570: This disk is used by PowerStations that use the Windows 95 operating system. It contains files necessary to operate the touch screen in Windows 95. The touch screen driver has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.

Windows NT 4.0 Touchscreen Driver KA-72669: This disk is used by PowerStations that use the Windows NT operating system. It contains files necessary to operate the touch screen in Windows NT. The touch screen driver has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.

Windows NT Emergency Repair Disk KA-72668: This disk is used by PowerStations that use the Windows NT operating system. This disk is used to reboot an NT system whenever the system will not recover from a crash. This disk will allow you to restart the system and repair the corrupted files.

PowerStation Utilities Disk KA-72463: This disk contains several PowerStation utilities and is included with all units that are not shipped with Interact software. PowerStations that ship with Interact already contain these utilities. These utilities support various PowerStation features such as the Brightness/Contrast Utility, Ethernet drivers, VESA VGA driver, etc. Use this disk if you need to use the utilities and drivers included on the disk.
Recalibrating the Touch Screen

6. Follow the instructions on the screen by touching each square as it appears—there will be three all together.

7. Press V to select a new video mode.

8. Enter 0 for 640 x 480 16 color Graphics mode.


11. Follow the instructions on the screen by touching each square as it appears—there will be three all together.


13. Enter 11 for 640 x 480 256 color Graphics mode.

14. Press Enter.

15. Press C for Calibrate.

16. Follow the instructions on the screen by touching each square as it appears—there will be three all together.

17. Press 0 for OK.

18. Press Escape or X to exit.

Recalibrating Under Windows 3.x

Follow these steps to recalibrate the touch screen in Windows 3.x:

1. Type Win at the MS-DOS prompt to enter Windows.

2. Select the file TWSETUP.EXE 3.31 using the icon in the Main program group.

3. Select the Calibrate menu from the Touchscreen Driver Setup program. Follow the instructions on the display.
Recalibrating the Touch Screen

4. Select the User Controls menu, and use the settings below to set up the User Controls.
   
   Click Time 9
   Double Click Speed 900
   Sensitivity 2
   Stabilization 3
   Button Simulation Left
   Sound Optional

   **Note** You can select the Activate new settings button to test the settings. Test the settings by pressing the Test button.

5. Choose the User-Defined User Mode 1, then Edit Mode.

6. Use the settings below to set the Button Events in the Set User Defined Button Mode window.

<table>
<thead>
<tr>
<th>Button Event</th>
<th>Currently...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Down 1</td>
<td>Touchdown</td>
</tr>
<tr>
<td>Up 1</td>
<td>LiftOff</td>
</tr>
<tr>
<td>Down 2</td>
<td>Touchdown</td>
</tr>
<tr>
<td>Up 2</td>
<td>LiftOff</td>
</tr>
<tr>
<td>Down 3</td>
<td>Touchdown</td>
</tr>
<tr>
<td>Up 3</td>
<td>LiftOff</td>
</tr>
</tbody>
</table>

   **Note** You can select the Activate New Button Mode button to test the settings. Test the settings by pressing the Test Button.

7. Return to the File Manager, and select drive A.

8. Run INSTALL.BAT to complete the installation.

   **Important** Enter Windows in the future by typing windows, not win. The setup program has created the WINDOWS.BAT file that will load the correct touch screen drivers prior to entering Windows.
Resolving Common Problems

- An Interact module (i.e., HTM) does not start up (page 102)
- A driver does not work with the installed hardware card (page 102)
- The code <00> appears on the display during Super User mode (page 103)

Resolving Problems When Powering the Unit

One of the most common problems that users encounter with PCs occurs while booting up their system. This section describes some possible problems and solutions for booting up the PowerStation.

Resolving AUTOEXEC.BAT and CONFIG.SYS problems

Some bootstrap problems are caused by a corrupted or modified AUTOEXEC.BAT or CONFIG.SYS file. CTC includes backup copies of these files (AUTOEXEC.CTC and CONFIG.CTC) on the PowerStation Utilities Disk. The text for AUTOEXEC.CTC appears below:

```plaintext
@ECHO OFF
PROMPT $p$g
SET TEMP=C:\DOS
PATH C:\C:\DOS;C:\CTC
REM ****************************************
REM Install PowerStation Special Functions
REM ****************************************
LH C:\CTC\BIOSTSR
REM ****************************************
REM If an external mouse is connected, MOUSE will install successfully.
REM Fully, and NOMOUSE will do nothing. If external mouse is not
REM found, MOUSE will fail, and NOMOUSE will successfully load.
REM ****************************************
LH C:\CTC\MOUSE
REM ****************************************
REM Install Dynapro touchscreen drivers
REM ****************************************
LH C:\TOUCH\DOS\EMOUSE /NOBOUNDS/
REM ****************************************
REM Uncomment next statement to load network batch file
REM ****************************************
REM C:\NET\NET.BAT
```
Resolving Common Problems

The following lines only appear on PowerStations with Interact.

REM *************************************************************
REM Set up Interact environment variables for CTC Shell
REM *************************************************************
SET INTERACT=C:\INTERACT
SET INTERACT\FILES=C:\INTERACT\APFILES
SET INTERACT\STARTUP=C:\\STARTUP
REM *************************************************************
REM Call AUTOEXEC.BAT file contained in project, if it exists
REM *************************************************************
IF EXIST C:\STARTUP\AUTOEXEC.BAT CALL C:\STARTUP\AUTOEXEC.BAT
REM *************************************************************
REM Start the CTC Shell
REM *************************************************************
CD \CTC
PSU

The following lines only appear on PowerStations without Interact.

REM *************************************************************
REM Load for Windows 3.1 only, not for Windows95
REM *************************************************************

The text for CONFIG.CTC appears below:

\MS-DOS V6.22
FILES=30
DOS=HIGH,UMB
DEVICE=C:\DOS\HIMEM.SYS

The following lines only appear on PowerStations with Interact.

REM !!! NOTE !!!
REM If EMM386 is used on a Flash-disk PowerStation, a 12KB window
REM for the flash disk must be excluded with the '/X=' parameter,
REM as shown in the example below. This window address MUST match
REM the jumper settings on the System Support card!
REM
REM DEVICE=C:\DOS\EMM386.EXE NOEMS RAM /X=C800-CAFF
DEVICE=C:\DOS\SETVER.EXE

The following lines only appear on PowerStations without Interact.

DEVICE=C:\DOS\EMM386.EXE NOEMS RAM
DEVICE=C:\DOS\SETVER.EXE
If the problem persists, look through the other problems listed in this section to determine if additional symptoms exist that require further action. Otherwise, contact your CTC equipment supplier or the CTC Product Technical Support department.

Resolving problems with the touch screen

This section lists some possible solutions for problems that may occur with the touch screen.

After power up, the touch screen does not work.

1. If the PowerStation appears to be operating correctly otherwise, reboot the unit.

2. The touch screen calibration might be in error. See Performing Internal Maintenance on page 81 to recalibrate the touch screen.

3. Check the AUTOEXEC.BAT file. See Resolving AUTOEXEC.BAT and CONFIG.SYS problems on page 93 for more information.
   a. Verify that the following lines appear before the lines that load the touch screen driver:
      
      \LH C:\CTC\MOUSE \\
      \LH C:\CTC\MOUSE

   b. Verify that the touch screen drivers are being loaded. Look for the following lines:
      
      \LH C:\TOUCH\DOX\SC3DOX /NODOUNDS

Important You cannot use a serial mouse and the touch screen simultaneously on units running Windows 95. The PowerStation will only load the driver for the device that is listed first in the AUTOEXEC.BAT file.

After power up, the touch screen does not work properly, or the touch screen calibration is incorrect.

1. Enter MS-DOS mode.

2. Change to the VTouch directory.

3. Type TBCAL, and perform the following calibrations: H, 2, and 6.

4. If you are using Windows, choose the Touch Screen icon.

5. Make sure that the touch screen hardware settings are correct:
   Address =3E8H, IRQ = 11.

6. Recalibrate the touch screen. See Performing Internal Maintenance on page 81 for more information.
Appendix F
Final, Revised Guide

This is a copy of the final, revised P3–7 PowerStation User Guide.
POWERSTATION

User Guide

CTC Parker Automation
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Product Warranty Information

CTC Parker Automation provides top quality products through rigid testing and the highest quality control standards. However, should a problem occur with your hardware or with the software protection key, CTC’s standard product warranty covers these items for 15 months from the date of shipment from CTC. Exceptions appear below:

- PowerStation backlight bulbs have a 90-day warranty. Push button lamps are not covered under warranty.
- Third-party products, such as PCMCIA cards, carry the manufacturer’s specified warranty.
- For all displays, image retention (burn-in) is not covered by warranty.
- Software revisions that occur within 60 days after purchase are available under warranty upon request. Please review the Interact License Agreement for additional software warranty information.

Should you have any questions about your application or need technical assistance, please call CTC’s Product Technical Support department at 513-248-1714, 8:00am to 5:00pm, EST. You may call this same number after hours for emergency assistance. See Customer Support Services on page 6 of this manual for more information about CTC’s support products and services.
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Chapter 1

Getting Started

Thank you for purchasing a PowerStation. CTC offers a complete line of workstations that you can easily and affordably customize with a variety of hardware options. You will find that the PowerStation has been designed to provide years of trouble-free operation even in the harshest environments.

This manual covers most of the PowerStation line including the P3, P4, P5, and P7. Model P3, P4, and P7 PowerStations are touch-only workstations that feature a durable touch screen and pop-up keyboards for numeric entry. Model P5 PowerStations include function keys and a numeric keypad but share many internal components with the P3, P4, and P7.

All PowerStations discussed in this manual have an open PC architecture that allows you to run CTC’s Interact software and other MS-DOS® or Windows® compatible programs. Please take a few minutes to review this manual and all other documentation included with the PowerStation before operating the unit.

Chapter Contents

Documentation Components 2
Documentation Standards 3
Important Concepts 4
Customer Support Services 6
The PowerStation documentation set contains all the information you need to configure, install, and use the PowerStation as well as information about the PowerStation Shell Utility program and the Interact Project Manager.

The PowerStation documentation set is described below.

**Release Notes**—This document is provided whenever there is important information about the PowerStation that does not appear in this manual. Be sure to read the release notes before operating the unit.

**PowerStation User Guide**—This document is the document you are reading. It provides detailed information about the PowerStation and describes how to configure, install, and use the unit. It also contains information about the PowerStation Shell Utility. Please read this manual in its entirety prior to operating the unit.

**CPU Manual**—This document is the manual provided by the manufacturer of the CPU board found in your PowerStation. Please familiarize yourself with this manual prior to operating the unit.

**PowerStation Template**—This document is a full-size template of the PowerStation you can use to prepare the location where you want to install the unit.

**IPM User Guide**—This document describes how to install and use the Interact Project Manager to download Interact projects from a PC to the PowerStation. This manual is only included with Interact systems.

**Software Disks**—CTC pre-loads each PowerStation with the operating system, utilities, and Interact (if purchased) software so you can run the PowerStation immediately upon its arrival at your facility. CTC also provides source disks for this software should you need to reinstall it at a later time.
Documentation Standards

As you read this manual, you will notice that the following documentation standards have been followed.

1. Important terms are shown in **bold**.
2. Text to be entered from the keyboard is shown in **Courier font**.
3. Buttons, menu titles, and keyboard keys are shown in Initial Caps.
4. Indented paragraphs denote one of the following:
   - **Note**—Describes alternative approaches or issues you should be aware of while using a particular function.
   - **Important**—Contains information that needs particular attention while reading the text. Follow this information to save development time and/or minimize problems.
   - **Warning**—Contains information on safety issues. Follow this information to prevent equipment damage or personal injury.

ISO Symbols

This symbol is the International Standards Organization (ISO) symbol for Caution (ISO 3864 No. B.3.1). This symbol denotes information that could affect operation of the PowerStation if not properly followed.

This symbol is the ISO symbol for Caution—risk of electrical shock (ISO 3864 No B.3.6). This symbol denotes information that could cause personal injury from electrical shock or damage to equipment if not properly followed.
Important Concepts

Now that you have opened the PowerStation package, you are ready to unpack the unit, configure it, and install it in a permanent location. This section provides an overview of the steps that are discussed in detail throughout the remainder of this manual.

Before You Begin

Before you begin operating the PowerStation, please complete the following steps:

1. Unpack the PowerStation and verify that you have received all the components you ordered. The components that were shipped with the unit are listed on the packing list included in the PowerStation carton.

2. Fill out the product registration card and return it to CTC. When you register your unit, you will receive a trial membership in CTC’s Product Support Program that provides complimentary telephone technical support, information on product updates, and service bulletins.

3. Back up the CTC software disks that came with your unit using the Windows File Manager/Explorer or the MS-DOS `diskcopy` command.

4. Read the PowerStation Release Notes. This document provides important information about the PowerStation that does not appear in this manual.

Configure the PowerStation

Once you have unpacked the PowerStation and completed the steps listed in the previous section, you are ready to power up the PowerStation for the first time and configure the system defaults. Detailed information on configuring the PowerStation is described in Chapters 3 and 4.
Develop an Interact Application

If you use Interact to develop your Man-Machine Interface (MMI), you can develop applications on the PowerStation, or you can develop applications on a PC and download them to the PowerStation.

Note If you use another software package to develop your MMI, refer to the documentation that came with the software for information about developing applications.

Create an application

If you are new to Interact, read the Interact Getting Started Manual to learn more about the software. This manual includes example applications you can modify and run, providing hands-on experience with each Interact module.

Test the application

When you finish developing an application, you should test it prior to running it in a production environment. If you develop an application on a PC using Interact, you can use Interact’s Test Mode to test the application before downloading it to the PowerStation.

Download the application

If you are using a PC or another PowerStation to develop your application, you must download it to the PowerStation you intend to use to run the application. The Interact Project Manager (IPM) allows you to assign the application to a project and download the project to the PowerStation. Refer to the Interact Project Manager User Guide for more information about downloading projects to the PowerStation.

Install the PowerStation

When you finish unpacking the PowerStation and developing an application, you are ready to install the unit in a permanent location. Refer to Chapter 4 for complete installation instructions.
Customer Support Services

CTC welcomes your thoughts and suggestions on our products and services. You can contact CTC by telephone, email, or fax. You can also visit CTC on the World Wide Web to learn the latest about CTC hardware, software, and customer support services.

Telephone: 513-831-2340
Fax: 513-831-5042
E-mail: sales@ctcusa.com or support@ctcusa.com
World Wide Web: http://www.ctcusa.com

CTC recognizes that every customer and every application has different support needs, so CTC offers a variety of support services designed to meet these needs. CTC offers three types of customer support services: Product Technical Support, Technical Support Products, and the Product Support Program.

Product Technical Support

The Product Technical Support department welcomes any question that might arise as you develop or run your applications. We offer complimentary support for any customer, whether you are an end-user, original equipment manufacturer (OEM), system integrator, or distributor.

If you have a question about the PowerStation, be sure to complete the following steps:

1. Check the release notes shipped with the unit. These notes provide important information about the PowerStation.
2. Consult the PowerStation documentation and other printed materials included with the PowerStation.
3. Review Chapter 5 of this manual, Maintaining and Troubleshooting the PowerStation.

If you cannot find a solution using one of the above sources, contact CTC’s Product Technical Support department at 513-248-1714, 8:00am to 5:00pm, EST. You may call this same number after hours for emergency assistance.
Technical Support Products

Our Technical Support Products department provides service in two areas: training and consulting. CTC offers training on all our products either at CTC in our state-of-the-art training center or at your site. You can learn how to write custom interfaces, develop specialized applications, and implement your complete operator interface application. You can contact the Training Coordinator by phone at 1-800-233-3329 or by email at training@ctcusa.com.

CTC offers consulting services through our Professional Consulting Services (PCS) group. Our PCS group can build your application from the ground up by writing custom communications drivers or designing special modules to perform functions unique to your application. Our team of specialists is flexible, so they can create a project development schedule that meets your needs. You can contact the PCS Coordinator by phone at 1-800-233-3329 or by email at pcs@ctcusa.com.

Product Support Program

The Product Support Program (PSP) is designed to keep you up-to-date with the current version of Interact software. The PSP consists of a renewable, one-year membership that provides you with free upgrades, utilities, automatic notification of software updates, and other valuable tools for Interact. Single-user, site, and corporate licenses are available. The PSP is an easy, cost-effective way to automatically receive the most recent Interact software and the associated utilities. You can contact the PSP Coordinator by phone at 1-800-233-3329 or by email at psp@ctcusa.com.
Understanding the PowerStation

The PowerStation family of workstations is designed to give you an operator interface solution that is powerful, cost-effective, and very easy to use. These workstations are available in a variety of configurations to fit the functionality and cost requirements of your application.

In this chapter, you will learn about the PowerStations’ drive definitions and memory maps, connectors, model numbers, and other important specifications.

Chapter Contents

- PowerStation Models 10
- Specifications 11
- Available Connectors 16
- Function Key Operation 24
- Drive Definitions and Memory Map 26
- Adding Adapter Cards 29
- Interact Design Issues 36
PowerStation Models

CTC offers a complete line of workstations that you can easily and affordably customize with a variety of hardware options. This section describes the features of each PowerStation model covered in this manual.

All PowerStations discussed in this manual have an open PC architecture that allows you to run CTC’s Interact software and other MS-DOS or Windows compatible programs. PowerStations without Interact are referred to as Industrial PC PowerStations throughout this manual.

**P3 PowerStation**—This PowerStation is a touch screen workstation that includes a 5x86 133 MHz processor and one of the following 10.4" displays: LCD, STN, or TFT. The P3 also includes 8MB of RAM and an internal floppy drive.

**P4 PowerStation**—This PowerStation is a touch screen workstation that includes one of the following CPUs: 5x86 133 MHz, Pentium 166 MHz, or Pentium MMX 200 MHz. The P4 also includes 8MB of RAM, an internal floppy drive, and one of the following 10.4" displays: LCD, STN, or TFT.

**P5 PowerStation**—This PowerStation is a function key workstation that includes one of the following CPUs: 5x86 133 MHz, Pentium 166 MHz, or Pentium MMX 200 MHz. The P5 also includes 8MB of RAM, an internal floppy drive, and one of the following 10.4" displays: LCD, STN, or TFT.

**P7 PowerStation**—This PowerStation is a touch screen workstation that includes a large 13.8" TFT display and one of the following CPUs: 5x86 133 MHz, Pentium 166 MHz, or Pentium MMX 200 MHz. The P7 also includes 8MB of RAM and an internal floppy drive.

**Note** PowerStations with Interact are available with your choice of Compact Flash or a hard drive; Industrial PC PowerStations are only available with a hard drive and one of two displays, TFT or STN (P3, P4, and P5 only).
Specifications

This section lists and describes some important specifications relating to the PowerStation. Please familiarize yourself with these specifications prior to operating the PowerStation.

Physical Specifications

Physical specifications include the PowerStation’s physical characteristics and compatible hardware devices. Refer to the table below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPUs</td>
<td>5x86 133MHz; Pentium 166, or Pentium MMX 200MHz (unavailable on P3)</td>
</tr>
<tr>
<td>Memory</td>
<td>8MB min., 32MB max. (64MB max. on Pentiums)</td>
</tr>
<tr>
<td>Displays</td>
<td>• Monochrome LCD, 640x480 VGA, 16 shades of gray (unavailable on P7 and Industrial PCs)</td>
</tr>
<tr>
<td></td>
<td>• Color TFT, 640x480 VGA, 256 colors</td>
</tr>
<tr>
<td></td>
<td>• Color TFT, 1024x768 XVGA, 256 colors</td>
</tr>
<tr>
<td></td>
<td>• Color STN, 640x480 VGA, 256 colors (unavailable on P7)</td>
</tr>
<tr>
<td>Storage</td>
<td>• 1.44MB high-density floppy drive</td>
</tr>
<tr>
<td></td>
<td>• 1.6GB (min.) hard drive (standard on Industrial PCs)</td>
</tr>
<tr>
<td></td>
<td>• 4, 10, 20, or 40MB solid state flash drive (field expandable and replaceable)</td>
</tr>
<tr>
<td></td>
<td>• PCMCIA (requires 3rd party adapter board)</td>
</tr>
<tr>
<td>I/O Ports</td>
<td>• 1 9-pin RS232 (non-isolated)</td>
</tr>
<tr>
<td></td>
<td>• 1 9-pin RS232/422/485 (non-isolated)</td>
</tr>
<tr>
<td></td>
<td>• 1 25-pin IBM parallel</td>
</tr>
<tr>
<td></td>
<td>• 1 RJ45 Ethernet</td>
</tr>
<tr>
<td>Expansion</td>
<td>• P3: 3 3/4-size, 16-bit, ISA slots (1 slot is convertible to full-size using an optional expansion cover).</td>
</tr>
<tr>
<td>Slots</td>
<td>• P4: 1 1/2-size, 3 3/4-size, 16-bit, ISA slots (1 3/4-size slot is convertible to full-size using an optional expansion cover).</td>
</tr>
<tr>
<td></td>
<td>• P5 and P7: 2 full-size, 1 3/4-size, 16-bit, ISA slots</td>
</tr>
<tr>
<td>Dimensions</td>
<td>• P3: 11.0&quot; (280mm) x 13.8&quot; (350mm) x 6.0&quot; (152mm)</td>
</tr>
<tr>
<td>(H x W x D)</td>
<td>• P4: 11.0&quot; (280mm) x 13.8&quot; (350mm) x 8.5&quot; (216mm)</td>
</tr>
<tr>
<td></td>
<td>• P5 and P7: 14&quot; (356mm) x 16&quot; (406mm) x 7&quot; (178mm)</td>
</tr>
</tbody>
</table>
Environmental Specifications

The PowerStation conforms to the environmental specifications listed in the table below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>• P3: 16.2 lbs. (7.3 Kg)</td>
</tr>
<tr>
<td></td>
<td>• P4: 18.8 lbs. (8.5 Kg)</td>
</tr>
<tr>
<td></td>
<td>• P5 and P7: 23.8 lbs. (10.8 Kg)</td>
</tr>
<tr>
<td>Operating Temperature:</td>
<td>• 5x86 CPU’s: 32 to 122°F (0 to 50°C) ambient air temperature at fan inlet</td>
</tr>
<tr>
<td></td>
<td>• Pentium CPU’s: 32 to 113°F (0 to 45°C) ambient air temperature at fan inlet</td>
</tr>
<tr>
<td>Bulb Life:</td>
<td>• Monochrome LCD - 10,000 hours</td>
</tr>
<tr>
<td></td>
<td>• Color STN - 25,000 hours</td>
</tr>
<tr>
<td></td>
<td>• Color TFT (10.4&quot;) - 25,000 hours</td>
</tr>
<tr>
<td></td>
<td>• Color TFT (13.8&quot;) - 10,000 hours</td>
</tr>
<tr>
<td>Relative Humidity:</td>
<td>5% to 95% non-condensing</td>
</tr>
<tr>
<td>Altitude:</td>
<td>-200ft. to 10,000ft. (-60.96m to 3,048m)</td>
</tr>
<tr>
<td>Shock Rating:</td>
<td>• 10g peak, 11ms (operating)</td>
</tr>
<tr>
<td></td>
<td>• 30g peak, 11ms (non-operating)</td>
</tr>
<tr>
<td>Operating Vibration:</td>
<td>0.35mm 10 to 18Hz, 1.0g from 18 to 150Hz</td>
</tr>
<tr>
<td>Faceplate Designed For:</td>
<td>NEMA 4/4X (IP65 European Std.) Environ.</td>
</tr>
</tbody>
</table>

**Important** Limit the PowerStation’s exposure to adverse conditions, such as dust, oil, moisture, and corrosive vapors to minimize maintenance and repair costs.

Remember that the temperature outside the protective enclosure is generally lower than the internal temperature. Thus, if the PowerStation is operating inside an enclosure at temperature levels above the maximum ambient temperature, you will need to cool the enclosure.
Electrical Specifications

The PowerStation’s electrical specifications for both AC and DC units appear in the table below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Unit Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power Supply</strong></td>
<td></td>
</tr>
<tr>
<td>AC Units</td>
<td>• P3: 90-250 VAC, 80W max., 50/60 Hz</td>
</tr>
<tr>
<td></td>
<td>• P4, P5, and P7: 90-250 VAC, 110W max., 50/60 Hz</td>
</tr>
<tr>
<td></td>
<td>• P3 - P7: 18-36 VDC in, 110W max.</td>
</tr>
<tr>
<td><strong>Power Consumption</strong></td>
<td></td>
</tr>
<tr>
<td>AC Units</td>
<td>• P3: 80W maximum</td>
</tr>
<tr>
<td></td>
<td>• P4, P5, and P7: 110W maximum</td>
</tr>
<tr>
<td></td>
<td>• P3 - P7: 110W maximum</td>
</tr>
<tr>
<td><strong>Fuse Type</strong></td>
<td></td>
</tr>
<tr>
<td>AC Units</td>
<td>• 3.15A, 250 VAC Little fuse 216.315 or equivalent</td>
</tr>
<tr>
<td></td>
<td>• 12A, 250 VAC Little fuse 314.012 or equivalent</td>
</tr>
<tr>
<td><strong>ISA Cards</strong></td>
<td>Voltage and current available for expansion cards (either AC or DC Units):</td>
</tr>
<tr>
<td></td>
<td>• 5x86 CPUs: 2.25A @ +5V, .3A @ -5V; 1.0A @ +/-12V</td>
</tr>
<tr>
<td></td>
<td>• Pentium CPUs: 2.5A @ +5V, .25A @ -5V; 1.0A @ +12V, .75A @ -12V</td>
</tr>
</tbody>
</table>

**Important**  The PowerStation’s power supply automatically detects the input voltage level and adjusts accordingly. However, always use reliable sources of power and isolate all communication cables from power lines to enhance noise immunity.

If possible, locate the PowerStation away from machinery that produces intense electrical noise (arc welders, etc.). Otherwise, isolate the input power to the PowerStation from the equipment generating electrical noise.

**Special note for units with replaceable lithium batteries**

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer’s instructions.
Testing Specifications

The PowerStation conforms to the testing specifications listed below:

<table>
<thead>
<tr>
<th>Testing Criteria</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Showering arc</td>
<td>NEMA showering arc</td>
</tr>
<tr>
<td>Surge withstanding capacitance</td>
<td>IEEE 472-1974</td>
</tr>
<tr>
<td>ESD requirements</td>
<td>IEC 801-2</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>IEC 68-2-1</td>
</tr>
<tr>
<td>Electrical fast transient</td>
<td>IEC 801-4</td>
</tr>
<tr>
<td>European Harmonized EAC Standards</td>
<td>EN50082-2, EN55011</td>
</tr>
<tr>
<td>Operating vibration</td>
<td>IEC 68-2-6</td>
</tr>
<tr>
<td>Mechanical shock</td>
<td>IEC 68-2-27</td>
</tr>
<tr>
<td>Random vibration</td>
<td>MIL-STD-810D</td>
</tr>
</tbody>
</table>

Faceplate Chemical Resistance

The faceplate of the PowerStation can resist the chemicals listed in the table below with no visible effect.

<table>
<thead>
<tr>
<th>Faceplate Chemical Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
</tr>
<tr>
<td>MEK</td>
</tr>
<tr>
<td>Toluene</td>
</tr>
<tr>
<td>Methylene Chloride</td>
</tr>
<tr>
<td>Isopropyl Alcohol</td>
</tr>
<tr>
<td>Xylene</td>
</tr>
<tr>
<td>Hexane</td>
</tr>
<tr>
<td>Butyl Cellosolve</td>
</tr>
<tr>
<td>Cyclohexanone</td>
</tr>
<tr>
<td>Trichloroethylene</td>
</tr>
<tr>
<td>Ethanol</td>
</tr>
<tr>
<td>Methanol</td>
</tr>
<tr>
<td>Nitric Acid 10%</td>
</tr>
</tbody>
</table>
All PowerStation surfaces exposed to the outside of your enclosure are resistive to the following chemicals:

- Commercial glass cleaners
- Ammonia (10% dilute solution)
- Motor Oil
- Hydraulic fluid
- Diesel fuel
- Gasoline (leaded, unleaded)
- Silicone based lubricant
- Alcohol (ethyl, methyl)
- Automatic transmission fluid

**Important**  Sustained exposure to brake fluid or Gunk® brand degreaser can cause damage to monitor materials.
Available Connectors

The PowerStation includes the same ports found on most PC’s. All PowerStations have two serial ports, one parallel port, a video port, an Ethernet connector, a Compact Flash drive, and a PS/2 port. Each PowerStation (P3–P7) will be configured slightly differently. The following graphic shows a P4 with a Pentium CPU, use this graphic to locate the ports on your PowerStation.

Serial Ports

The PowerStation has two serial ports, COM1 and COM2, you can use to communicate with external devices. These ports support baud rates of up to 115 Kbaud. COM1 supports the RS-232 communication standard. Use a standard DB9 connector for communicating with this port.

The other serial port, COM2, is optically isolated with 500V of isolation to provide noise immunity. This port supports RS-232C, RS-422, and RS-485 communication standards. The communication standard you select depends on the distance between the PowerStation and the controller, as well, as the communication standards that the controller supports. Use a standard DB9 connector for communicating with this port.

**Note**  If you are using RS-232 communications, the length of the serial cable should not exceed 50 feet (15 meters).
RS-422 and RS-485 communications offer greater noise immunity than RS-232. These standards increase the maximum cable length to 4000 feet (1200 meters).

RS-422 communications are full-duplex (can send and receive simultaneously), while RS-485 communications are half-duplex (can only send or receive at one time).

For either configuration, be careful not to connect any wires to unused connector pins. Information on the specific connection required for the Interact driver you use is located in the Help file associated with the driver.

**COM1 pinouts**

If you need to make a cable for communicating with COM1, the following table shows the pinouts and signal information for this port:

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCD, data carrier detect</td>
</tr>
<tr>
<td>2</td>
<td>RXD, received data</td>
</tr>
<tr>
<td>3</td>
<td>TXD, transmitted data</td>
</tr>
<tr>
<td>4</td>
<td>DTR, data terminal ready</td>
</tr>
<tr>
<td>5</td>
<td>Signal ground</td>
</tr>
<tr>
<td>6</td>
<td>DSR</td>
</tr>
<tr>
<td>7</td>
<td>RTS, request to send</td>
</tr>
<tr>
<td>8</td>
<td>CTS, clear to send</td>
</tr>
<tr>
<td>9</td>
<td>RI</td>
</tr>
</tbody>
</table>
COM2 pinouts

If you need to make a cable for communicating with COM2, the following table shows the pinouts and signal information for this port:

<table>
<thead>
<tr>
<th>Pin#</th>
<th>RS-232 Signal</th>
<th>RS-422 Signal</th>
<th>RS-485 Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCD, data carrier detect</td>
<td>TXD-, transmitted data -</td>
<td>TXD-, transmitted data -</td>
</tr>
<tr>
<td>2</td>
<td>RXD, received data</td>
<td>TXD+, transmitted data +</td>
<td>TXD+, transmitted data +</td>
</tr>
<tr>
<td>3</td>
<td>TXD, transmitted data</td>
<td>RXD+, received data +</td>
<td>RXD+, received data +</td>
</tr>
<tr>
<td>4</td>
<td>DTR, data terminal ready</td>
<td>RXD-, received data -</td>
<td>RXD-, received data -</td>
</tr>
<tr>
<td>5</td>
<td>Signal ground</td>
<td>Signal ground</td>
<td>Signal ground</td>
</tr>
<tr>
<td>6</td>
<td>DSR, data set ready</td>
<td>DSR, data set ready</td>
<td>DSR, data set ready</td>
</tr>
<tr>
<td>7</td>
<td>RTS, request to send</td>
<td>RTS, request to send</td>
<td>RTS, request to send</td>
</tr>
<tr>
<td>8</td>
<td>CTS, clear to send</td>
<td>CTS, clear to send</td>
<td>CTS, clear to send</td>
</tr>
<tr>
<td>9</td>
<td>RI</td>
<td>RI</td>
<td>RI</td>
</tr>
</tbody>
</table>
Cable diagrams

The following graphics represent the pinouts and cable diagrams required for communicating with COM1 or COM2 using the RS-232 protocol. Also shown are cable diagrams for communicating with COM2 using the RS-422 or RS-485 protocols.

<table>
<thead>
<tr>
<th>RS-232</th>
<th>RS-422</th>
<th>RS-485</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM1.COM2</td>
<td>COM2</td>
<td>COM2</td>
</tr>
<tr>
<td>RXD</td>
<td>TXD-</td>
<td>TXD-</td>
</tr>
<tr>
<td>TXD</td>
<td>TXD+</td>
<td>RXD+</td>
</tr>
<tr>
<td>RTS</td>
<td>RXD</td>
<td>RXD</td>
</tr>
<tr>
<td>CTS</td>
<td>GND</td>
<td>DSR</td>
</tr>
<tr>
<td>RI</td>
<td>RTS</td>
<td>RTS</td>
</tr>
<tr>
<td>GND</td>
<td>CTS</td>
<td>RI</td>
</tr>
<tr>
<td>DCD</td>
<td>CTS</td>
<td>CTS</td>
</tr>
<tr>
<td>DTR</td>
<td>GND</td>
<td>GND</td>
</tr>
<tr>
<td>DSR</td>
<td>RI</td>
<td>RI</td>
</tr>
</tbody>
</table>

232 | 422 | 485

Important Be careful not to connect any wires to unused connector pins.

Connecting to a PC

To transfer files from a PC to the PowerStation, connect a serial cable with a null modem to an available serial port on the PC. Connect the other end of the cable to the serial port on the PowerStation. If you need to construct your own cables, refer to the figures below.
Connecting a serial mouse

If you need to connect a mouse to the PowerStation, you must use a serial mouse connected to either COM1 or COM2. If you use COM2, you may need to reconfigure this port to use the RS-232 protocol (See JP8 serial port configuration on page 83). Follow these steps to configure the PowerStation to use a serial mouse:

1. If you will be using COM2, verify that it is configured for RS-232 communications. See JP8 serial port configuration on page 83 to change the communications protocol for this port.
2. Connect the serial mouse to the port you configured, and reboot the PowerStation.

Connecting to a serial printer

If you need to connect the PowerStation to a serial printer, you will need to change the mode settings for one of the serial ports to match those of your printer. The easiest way to change these settings is to use MODE.COM. MODE.COM can modify the following options:

**baud:** 110, 150, 300, 600, 1200, 2400, 4800, 9600

**parity:** N - none, O - odd, E - even

**databits:** either 7 or 8

**stopbits:** either 1 or 2

To use MODE.COM, complete the following steps:

1. Create a new AUTOEXEC.BAT file with the following line:
   
   ```
   MODE COM#:baud,parity,databits,stopbits
   ```

2. Copy this file into the \STARTUP directory of the IPM project on your development system.

   **Note**  CTI installs MODE.COM on the PowerStation’s flash drive and includes a copy on the ROM-DOS 6.22 and Utilities Disk.

3. Run Interact Project Manager (IPM), and download the project that contains AUTOEXEC.BAT and MODE.COM from your development system to the PowerStation.
During the download, IPM transfers the AUTOEXEC.BAT file you created in step 1 into the \STARTUP directory specified by the INTERACT_STARTUP environment variable. This environment variable resides in the PowerStation’s AUTOEXEC.BAT.

When IPM finishes the download, the PowerStation automatically reboots, and MODE.COM configures the COM port to the required baud rate. For example, if you are communicating at 9600, NONE, 8, and 1, use:

MODE COM1: 9600,N,8,1

**Note** If you will be printing to a port that is configured for downloading, you must disable downloading for that port, and reboot the PowerStation. Rebooting the PowerStation allows MODE.COM to reset the communication settings for that port. Use the DOWNLOAD ENABLE command on the SETTINGS menu of the Shell to disable downloading.

4. Use the following diagram as a reference when connecting a serial printer to the PowerStation.
Available Connectors

Parallel Port

The PowerStation parallel port (LPT1) pinout is identical to the standard IBM parallel printer port. The LPT1 connector pinout is shown in the table below.

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STROBE</td>
</tr>
<tr>
<td>2</td>
<td>DATA 0</td>
</tr>
<tr>
<td>3</td>
<td>DATA 1</td>
</tr>
<tr>
<td>4</td>
<td>DATA 2</td>
</tr>
<tr>
<td>5</td>
<td>DATA 3</td>
</tr>
<tr>
<td>6</td>
<td>DATA 4</td>
</tr>
<tr>
<td>7</td>
<td>DATA 5</td>
</tr>
<tr>
<td>8</td>
<td>DATA 6</td>
</tr>
<tr>
<td>9</td>
<td>DATA 7</td>
</tr>
<tr>
<td>10</td>
<td>- ACKNOWLEDGE</td>
</tr>
<tr>
<td>11</td>
<td>BUSY</td>
</tr>
<tr>
<td>12</td>
<td>PAPER EMPTY</td>
</tr>
<tr>
<td>13</td>
<td>+ SELECT</td>
</tr>
<tr>
<td>14</td>
<td>- AUTO FEED</td>
</tr>
<tr>
<td>15</td>
<td>- ERROR</td>
</tr>
<tr>
<td>16</td>
<td>- INIT PRINTER</td>
</tr>
<tr>
<td>17</td>
<td>- SELECT INPUT</td>
</tr>
<tr>
<td>18-25</td>
<td>GROUND</td>
</tr>
</tbody>
</table>

Connecting to a parallel printer

The PowerStation can interface to any parallel printer designed for use with IBM PC compatible computers. Connect a printer to the port marked LPT1 using a standard IBM PC parallel cable.

PS/2 Port

All PowerStations have a PS/2 port located on the CPU board. Depending on the type of PowerStation you have, this port may be used to connect a mouse and/or keyboard to the unit. Refer to the CPU manual for the PS/2 port’s pinout information.
Connecting a keyboard (P3 and P4 only)

P3 and P4 PowerStations can receive input from a PS/2 keyboard by connecting it directly to the PowerStation’s PS/2 port. However, if you want to use a keyboard and a mouse simultaneously, you must use the supplied Y-adapter cable.

The Y-adapter cable allows the P3 and P4 to accept input from a PS/2 mouse and any IBM AT (but not XT) compatible keyboard, including 84-key standard keyboards and 101-key enhanced keyboards.

If you have a P5 or P7, refer to the Keyboard Port (P5 and P7 only) section on page 23 for more information about connecting a keyboard.

 Connecting a mouse

All PowerStations can receive input from a PS/2 mouse using the supplied Y-adapter cable. You must use the Y-adapter cable because the PS/2 port is configured to receive input from a PS/2 keyboard.

Keyboard Port (P5 and P7 only)

P5 and P7 PowerStations have a keyboard port located next to the parallel port. This port can accept input from any IBM AT (but not XT) compatible keyboard, including 84-key standard keyboards and 101-key enhanced keyboards.

Important Do NOT use the Y-adapter cable to connect an IBM AT compatible keyboard to the PowerStation’s PS/2 port.

CRT Port

The PowerStation has a CRT port that allows you to use an external SVGA monitor in place of the flat-panel display. On TFT units, this port allows you to use an external monitor and the flat-panel display simultaneously. This port supports monochrome and high resolution color displays.

Note The maximum resolution of the PowerStation flat-panel display is 640 x 480, but the CRT port can support up to 1024 x 768.

Refer to the CPU manual for the CRT port’s pinout information.
Ethernet Port

The PowerStation has an Ethernet RJ-45 port that allows you to connect the PowerStation to a Local Area Network. This port is software compatible with the NE-2000 protocol and supports all major network operating systems.

<table>
<thead>
<tr>
<th>Pin#</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX+</td>
</tr>
<tr>
<td>2</td>
<td>TX-</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>N/C</td>
</tr>
<tr>
<td>6</td>
<td>RX-</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
</tr>
</tbody>
</table>

Compact Flash

The PowerStation has a Compact Flash (CF) card that is like a removable hard drive. It provides non-volatile memory storage. The CF is often used as a supplement to or a replacement for hard drives because it is well-suited for environments where the PowerStation may be vibrated or shaken. If no hard drive is present, the CF card is recognized as drive C. If you have a hard drive unit, the CF can be configured as a secondary IDE hard drive. While the CF is removable, it cannot be removed while the PowerStation is running because it is used as an IDE drive.

Function Key Operation

The P5 PowerStation includes 40 function keys (F1 through F20 + F21 through F40 using the Shift key), and a programmable Select key. This section describes how to operate units equipped with function keys.

- Function Keys—allow you to send instructions to a software program. These instructions depend on the software package you are using. For example, if you are using Interact, you can assign a function key to each input tool on a panel.
- **Cursor Keys**—move the cursor around the screen. In Interact, you can use the cursor keys to select options from menus.

- **Numeric Keypad**—contains keys for entering numeric data into the PowerStation.

- **Shift Key**—when active, allows you to access function keys F21 through F40. This key is set to Momentary control by default. Momentary control provides access to F21 through F40 function keys whenever you press and hold the Shift key. When you release the Shift key, you automatically regain access to the F1 through F20 keys.

  If you purchased Interact with your PowerStation, you can also choose Shift Lock mode or Shift Lock Release mode. See *SHIFT KEY CONFIGURATION (P5 only)* on page 44 for more information.

- **Select Key**—generates a key scan code that is like pressing the Right Shift key on a keyboard.

  If you purchased Interact with your PowerStation, you can change the operation of this to emulate any key that you might find on a standard keyboard. See *SELECT KEY CONFIGURATION (P5 only)* on page 45 for more information.
Drive Definitions and Memory Map

This section provides information about the PowerStation’s drive definitions, depending on the type of storage device. This section also includes a graphical illustration of the PowerStation’s memory map.

**Table 1: Units with Compact Flash**

<table>
<thead>
<tr>
<th>Drive Letter</th>
<th>Type</th>
<th>Size</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>C:</td>
<td>Compact Flash (CF) Card (Read/Write)</td>
<td>4, 10, 20, or 40MB</td>
<td>System boot drive and Project disk. Stores the project, Interact, applications, etc. Download files to this drive, but do not log data to this drive unless the size of your CF is sufficient because it can only accept a limited number of writes.</td>
</tr>
<tr>
<td>A:</td>
<td>3.5&quot; Floppy Drive (Read/Write)</td>
<td>1.44MB</td>
<td>Can be used to download Projects to the unit, backup files from the unit, and log data.</td>
</tr>
</tbody>
</table>

**Table 2: Units with a Hard Drive**

<table>
<thead>
<tr>
<th>Drive Letter</th>
<th>Type</th>
<th>Size</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>C:</td>
<td>Hard Disk (Read/Write)</td>
<td>1.6 GB or higher</td>
<td>System boot drive and Project disk. Stores the necessary system startup files. If you are using Interact, this drive also stores the project, Interact, applications, etc. Download files and log data to this drive.</td>
</tr>
<tr>
<td>A:</td>
<td>3.5&quot; Floppy Drive (Read/Write)</td>
<td>1.44 MB</td>
<td>Can be used to install software or save files to disk. If you are using Interact, you can download projects to the unit, backup files from the unit, and log data.</td>
</tr>
</tbody>
</table>
PowerStation Memory Map

The following graphic illustrates how the PowerStation allocates conventional memory and extended memory. The range of available address references is listed next to each device.

Note: The factory default for the flash card maps from C8000 to CAFFF.
Memory Guidelines

If you use Interact to develop your MMI, refer to the memory guidelines listed below when you develop projects. The following table lists guidelines to follow concerning the use and capacity of memory used for runtime and development systems.

<table>
<thead>
<tr>
<th>Memory Type</th>
<th>Runtime</th>
<th>Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>System DRAM</td>
<td>4MB system memory runs APM, PTM, and AMM runtime modules and 2 drivers. Extra modules require more memory.</td>
<td>Modules run one at a time in development mode so a 4MB system can support all modules and drivers.</td>
</tr>
<tr>
<td>Compact Flash</td>
<td>4MB Compact Flash can store APM, PTM, AMM, plus 4 additional runtime modules, 2 drivers, and approx. 30 screens. Extra modules require more storage (4 modules/MB). Use for data logging only if used in conjunction with hard drive.</td>
<td>4MB Compact Flash can store APM, PTM, AMM, GMM, 2 drivers, and approx. 30 screens. Extra modules require more storage (2 modules/MB).</td>
</tr>
<tr>
<td>Hard Drive</td>
<td>The available hard drive can store applications and logged data.</td>
<td>The available hard drive can store any application.</td>
</tr>
<tr>
<td>Floppy Drive</td>
<td>The 1.44MB floppy drive can be used to store logged data.</td>
<td>The 1.44MB floppy drive can store most applications.</td>
</tr>
</tbody>
</table>
Adding Adapter Cards

Many ISA-bus adapter cards are available on the market to perform numerous functions. When adding cards to the PowerStation, observe the following precautions:

• The size of the card is important because the size and number of available slots varies from model to model. See Physical Specifications on page 11 for more information about expansion slots.

• The total compliment of adapter cards may not exceed the current limits specified for adapter cards in the PowerStation. See Electrical Specifications on page 13 for more information about the voltage and current available for expansion cards.

  **Note** The PowerStation does not support Plug-n-Play features. When selecting adapter cards you must either select those with Plug-n-Play features that can be disabled or those without Plug-n-Play features. Adapter cards with Plug-n-Play enabled may not perform correctly and may adversely affect PowerStation operation.

Safety Precautions

Observe normal precautions against electrostatic discharge (ESD) to prevent damage to your PowerStation or to your adapter boards. Anyone handling internal components should do so only in an ESD-safe location and should use appropriate grounding methods.

To avoid electric shock, always disconnect power from the unit before you remove the backshell cover or separate the backshell from the front panel.

Address/IRQ Considerations

As in most ISA-bus computer port addresses, 300 through 31F are available for adapter functions. Addresses 310 through 317 are reserved for use by the PowerStation. Make sure that any adapter cards you install do not conflict with these addresses.
IRQs 3, 4, 5, 7, 9, 10, 11, and 15 are available to adapter devices connected to the ISA-bus. The PowerStation configures these as shown below.

<table>
<thead>
<tr>
<th>IRQ</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>COM2*</td>
</tr>
<tr>
<td>4</td>
<td>COM1</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Ethernet (software configured)</td>
</tr>
<tr>
<td>11</td>
<td>Touch Screen*</td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

The IRQs indicated as blank usage in this table are available for use by any adapter card. The Ethernet port is software configured. See *Configuring the Ethernet Interface* on page 68 for more information. Those marked with an asterisk (*) may be reconfigured by changing the jumper settings on the System Support card. Changing jumpers requires you to also change the operating software. You should only make these changes after consulting the CTC Product Technical Support department.
Jumper settings

Like most PCs, the PowerStation uses jumpers to set addresses and enable or disable various functions of the system. The PowerStation’s System Support card has seven sets of jumpers for configuring the serial ports, touch screen, Compact Flash, USC module, and Ethernet.

The following section will describe how the jumpers are set when they are shipped and what they control. To learn more about setting your jumpers, see *Changing the Jumper Settings* on page 83.

**JP8 COM2 serial port configuration**

This set of jumpers, located on the upper right corner of the System Support card, is used to set the serial port configuration. The default setting is the RS-485 communication protocol, but you can configure the jumpers to the RS-232 or the RS-422 settings. The figure below demonstrates the default RS-485 setting.
JP9 and JP11 serial port and touch screen address

These sets of jumpers configure the addresses for the serial port (JP9) and the touch screen (JP11). Each is configured by turning “on” or “off” the ports A and B. The chart below demonstrates the on/off combinations for each of the ports.

<table>
<thead>
<tr>
<th>I/O Address</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM1 (3F8h)</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>COM2 (2F8h)</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>COM3 (3E8h)</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>COM4 (2E8h)</td>
<td>on</td>
<td>on</td>
</tr>
</tbody>
</table>

By default, the serial port jumpers (JP9) are set to I/O address COM2 (2F8h) by turning the A port “off” and the B port “on” as shown below. To configure to the 3F8h address, both the A and B ports would be turned “off,” also demonstrated below.

Note  The clip for the “off” jumper can be completely removed or placed as in the figure above.
The touch screen jumpers (JP11) are set to I/O address COM3 (3E8h) with the A port “on” and the B port “off” by default. The touch screen could also be configured to the COM4 (2E8h) address by turning the A and B ports “on,” as demonstrated below.

**Important** After changing the jumper settings for the touch screen I/O address, you must change the touch screen configuration drivers for the changes to be implemented. See *Configuring the Touch Screen Drivers* on page 65 for more information.

**Note** The clip for the “off” jumper can be completely removed or placed as in the figure above.

**JP7 serial port and touch screen IRQ**

This set of jumpers is used to configure the hardware IRQs for the serial port and the touch screen. By default, these jumpers are set to serial port = IRQ3 and touch screen = IRQ11.

**Important** After changing the jumper settings for the touch screen IRQ, you must change the touch screen configuration drivers for the changes to be implemented. See *Configuring the Touch Screen Drivers* on page 65 for more information.

**Important** IRQ 12 is used by the PS/2 port. If you intend to use a keyboard and/or a mouse, do not map to this IRQ.
JP10 Compact Flash adaptor configuration

These jumpers are used to configure the Compact Flash. By default, the Compact Flash is configured to the Primary IDE adaptor (IRQ14), so the P/S jumper is set to “off,” and the ENA jumper is set to “on” as in the following figure. To configure to the Secondary IDE adaptor (IRQ15), set both jumpers to “on,” also demonstrated below.

Note  The clip for the “off” jumper can be completely removed or placed as in the figure above.

JP6 USC module IRQ

This set of jumpers configures the USC module IRQ. The jumpers are all set to “off” when shipped, as shown below.

Note  The clip for the “off” jumper can be completely removed or placed as in the figure above.

JP1 Ethernet default jumper

This jumper determines when the Ethernet is configured to its default settings. When the jumper is “on,” the Ethernet is forced to the default settings. While the jumper is “off,” the Ethernet is configured by the software utility. The figure below demonstrates the default “off” setting for the jumper. See Configuring the Ethernet Interface on page 68 for more information.

Note  The clip for the “off” jumper can be completely removed or placed as in the figure above.
Communication cards

This section describes the address range for each Interact communication card when used in the PowerStation. Do NOT put all cards at the same location. In all cases, use the highest address location possible. This will provide contiguous memory for applications.

<table>
<thead>
<tr>
<th>Driver Name</th>
<th>Address Range</th>
<th>Space Required</th>
<th>Memory Boundary</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCESS4000 (ACC)</td>
<td>C800 - DFFF</td>
<td>2K</td>
<td>resides on 2K boundaries</td>
</tr>
<tr>
<td>Allen-Bradley Remote I/O (ABREMIO)</td>
<td>C800 - DFFF</td>
<td>32K</td>
<td>resides on 32K boundaries</td>
</tr>
<tr>
<td>DCSNET PC Link Module (DCSNET)</td>
<td>A000 - FC00</td>
<td>16K</td>
<td>resides on 16K boundaries</td>
</tr>
<tr>
<td>Device Net (DVNT)</td>
<td>C800 - E000</td>
<td>16K</td>
<td>resides on 16K boundaries</td>
</tr>
<tr>
<td>GE Fanuc Genius I/O (GENIUS)</td>
<td>C000 - E000</td>
<td>16K</td>
<td>resides on 16K boundaries</td>
</tr>
<tr>
<td>Giddings &amp; Lewis (GLP9)</td>
<td>C000 - E180</td>
<td>2K</td>
<td>resides on 2K boundaries</td>
</tr>
<tr>
<td>Mitsubishi A7BDE (MITS) - MELSEC-NET and A3N</td>
<td>C800 - DFFF</td>
<td>16K</td>
<td>resides on 16K boundaries</td>
</tr>
<tr>
<td>Mitsubishi A7BDE (MITS) - RS4</td>
<td>C800 - DFFF</td>
<td>8K</td>
<td>resides on 8K boundaries</td>
</tr>
<tr>
<td>Modicon ModBus Plus (MBPL)</td>
<td>C800 - DFFF</td>
<td>2K</td>
<td>resides on 2K boundaries</td>
</tr>
<tr>
<td>OMRON SYSMAC Link (SLNK)</td>
<td>C000 - D800</td>
<td>2K</td>
<td>resides on 2K boundaries</td>
</tr>
<tr>
<td>Opto 22 (MIST)</td>
<td>C000 - E180</td>
<td>2K</td>
<td>resides on 2K boundaries</td>
</tr>
<tr>
<td>Reliance R-NET PC Link Module (RLNT)</td>
<td>C800 - DFFF</td>
<td>16K</td>
<td>resides on 16K boundaries</td>
</tr>
<tr>
<td>Siemens TIWAY (TIWAY)</td>
<td>C000 - E000</td>
<td>4K</td>
<td>resides on 4K boundaries</td>
</tr>
<tr>
<td>Square D SY/MAX Module (SDSL)</td>
<td>CA00 - D300</td>
<td>4K</td>
<td>resides on 4K boundaries</td>
</tr>
<tr>
<td>Sutherland-Schultz SD Adapter (SSSD)</td>
<td>C800 - DFFF</td>
<td>32K</td>
<td>resides on 32K boundaries</td>
</tr>
</tbody>
</table>
This section is provided for PowerStations with Interact, CTC’s MMI software. If you do not have Interact, you can skip this section.

### Using a Touch Screen with Interact

If you are using a touch screen with Interact, and your application uses PTM Slide input tools, be sure to select the Arrow cursor type using the Interact Settings command in Application Manager. When you select the Arrow cursor type, touching the Slide tool selects the tool, and moving your finger over the touch screen moves the slide knob.

If you use the Box Cursor type, the slide knob immediately moves to the location where you press the tool. For example, if the knob is currently positioned at 100 and you press the touch screen at a value of 800, the knob immediately moves to 800 and writes this value to the controller.

**Warning** Using the Box Cursor with a touch screen and an application that uses Slide input tools may cause you to inadvertently select input values. If your application requires you to use a cursor, select the Arrow cursor type instead.

<table>
<thead>
<tr>
<th>Driver Name</th>
<th>Address Range</th>
<th>Space Required</th>
<th>Memory Boundary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas Instruments Remote I/O (TIRIO)</td>
<td>C800 - DFFF</td>
<td>1K</td>
<td>resides on 1K boundaries</td>
</tr>
</tbody>
</table>
Interact Startup Directory

The INTERACT_STARTUP environment variable determines where the Startup files will be placed (i.e. C:\STARTUP). When a download occurs, all existing files in the Startup directory are erased, which is why Startup files are saved in C:\STARTUP rather than in the root directory. The INTERACT_STARTUP environment variable is set in the AUTOEXEC.BAT, in case you want to change it.

Flash units vs. hard drive units

Some differences between units with Compact Flash and units with hard drives may affect the portability of projects containing startup files between these units.

On hard drive units, the main CONFIG.SYS file (in the root directory of drive C) cannot call a user’s CONFIG.SYS file that may be included in the Startup directory. In this case, you will need to incorporate the information from the CONFIG.SYS in the Startup directory into the main CONFIG.SYS file.
Using the PowerStation Shell Utility

Now that you are familiar with some of the PowerStation’s features, it’s time to configure your system. This chapter is provided for those users who purchased PowerStations with Interact, CTC’s MMI software. If you do not have Interact, you may skip this chapter.

This chapter will show you how to use the PowerStation Shell Utility (also referred to throughout this manual as “the Shell”) to configure your system. The PowerStation Shell Utility is a program that runs on the PowerStation and is used to configure the unit and enable various features for using the PowerStation with Interact.

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<th>Page</th>
</tr>
</thead>
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<td>Reinstalling the Shell Software</td>
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<tr>
<td>Recalibrating the Touch Screen</td>
<td>55</td>
</tr>
</tbody>
</table>
Introduction

Prior to using the PowerStation, you should understand the features available with the PowerStation Shell Utility. The PowerStation Shell comes pre-installed on your system. However, if you need to reinstall the Shell software or the touch screen drivers, you can use the PowerStation Shell Setup disk. See Recalibrating the Touch Screen on page 55 for more information.

When you first power up the PowerStation, the Shell Main Menu appears. The Shell Main Menu contains information about the project currently loaded on the PowerStation. If no project exists, these settings will be set to NONE. See Main Menu on page 41 for more information about the Shell Main Menu.

Selecting Screen Options

To select screen options, touch the menu item or move the cursor over the menu item you want to select and press the left mouse button. A submenu of options appears that you can change for this menu item. Upon selecting a submenu, you can return to the previous menu by:

- pressing the PREVIOUS MENU button on the screen
- touching outside the pop-up menu area
- pressing the left mouse button outside the pop-up menu area
- pressing the Esc key on the keyboard
- pressing the right mouse button
- pressing the Cancel button on units with function keys.

Throughout the remainder of this section, it is assumed that you are using a keyboard and mouse.
Menu Definitions

This section provides a description of each item on the Shell Main Menu and the function of each selection button.

Main Menu

When you power up the PowerStation, the Shell performs an internal check of the configuration settings for the unit and displays the Shell Main Menu as shown below.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROJECT NAME</td>
<td>Displays the name of the currently loaded project.</td>
</tr>
<tr>
<td>INTERACT TYPE</td>
<td>Displays whether Interact software is installed on your PowerStation. Will display “UNKNOWN,” “EXTENDED DEVELOPMENT,” or “RUNTIME.”</td>
</tr>
<tr>
<td>MODULES</td>
<td>Displays the abbreviated name of each Interact module installed with the application you are using on the PowerStation. For example, if the Panel Toolkit Module is loaded, the acronym “PTM” is displayed.</td>
</tr>
<tr>
<td>DRIVERS</td>
<td>Displays the abbreviated name of each Interact driver installed with the application you are using on the PowerStation. For example, if the Siemens Programming Port driver is loaded, the acronym “SIEMPP” is displayed.</td>
</tr>
</tbody>
</table>
Help On Shell

Select the HELP ON SHELL button to enter the Shell help system. To request help on a menu button or option, move the cursor to the function, and press the F1 key on the keyboard. A page of text is displayed similar to the one below.

To exit the Help, press the Esc key on the keyboard, press the right mouse button, or click outside the Help box. If more than one page of information is available for an item, press the PgUp or PgDn buttons on the lower right corner of the screen.

Configuration Settings

Select the CONFIG SETTINGS button to change the PowerStation hardware settings. Once assignments have been made, they are stored in the PWR.CFG file on drive C.

Important The hardware configuration settings stored in the PWR.CFG file are saved on drive C. Do not delete this file, or you will have to reset the hardware configuration.
Set Hardware

Select the SET HARDWARE button to change or modify the PowerStation setup. For most options, just select the item to toggle the selection. Other options display a submenu with additional selections. Any changes you make on this menu do not take effect until you exit this menu.

POWER ON OPERATION

Use the POWER ON OPERATION option to select whether Interact or the Shell will run after the PowerStation is turned on. The selections are:

- RUN INTERACT
- SHELL MAIN MENU (default)

If you select RUN INTERACT, the PowerStation loads Interact automatically without interaction from the user. When the user exits Interact, the Shell Main Menu is displayed. This selection is particularly useful if a power cycle should occur because the unit would automatically run Interact when the power is restored.

If you select SHELL MAIN MENU, then the PowerStation loads the Shell and displays the Shell Main Menu.

MOUSE PORT

The MOUSE PORT option automatically detects and displays the port where the mouse is connected if an external mouse is connected to the PowerStation. This port setting is displayed for informational purposes and cannot be changed through the Shell.

Important A mouse will only work if it is attached to COM1, COM2, or the PS/2 port, using the supplied Y-adapter cable. You can attach download cables to either COM1 or COM2.

TOUCH SCREEN

The TOUCH SCREEN option automatically detects and displays the port where the touch screen is connected if your PowerStation is configured to use a touch screen. This port setting is displayed for informational purposes and cannot be changed through the Shell.
SHIFT KEY CONFIGURATION (P5 only)

Use the SHIFT CONFIG option to select the mode for the Shift key that appears on the faceplate of P5 PowerStations. You can select one of three modes for the Shift key:

- **Momentary**—When you press and hold the Shift key, you have access only to the F21 through F40 function keys. When you release the Shift key, you automatically regain access to the F1 through F20 keys.

- **Lock**—When you press the Shift key, it locks, allowing access only to the F21 through F40 function keys. To regain access to the F1 through F20 keys, you must press the Shift key again to release the lock.

- **Lock/Release**—When you press the Shift key, it locks, allowing access to the F21 through F40 function keys only until you press and release any other key.

An indicator on the Shift key is lit whenever the Shift key is activated or in the locked mode.

**Note** Operating a Message Input tool or a popup Numeric Keypad tool when the faceplate Shift mode is on, will input values of 2, 4, 6, and 8 for the Down, Left, Up, and Right arrow keys, respectively. To avoid entering these values when you want to use the arrow keys to control the cursor, make sure the Shift mode is off.
SELECT KEY CONFIGURATION (P5 only)

Use the SELECT CONFIG option to select the key scan code that you want to be generated whenever the Select button is pressed. This option is only available on P5 PowerStations.

Important  The button you select here must agree with the Selection Key that you select in Interact for the Select button to work correctly with Interact.

DOWNLOAD ENABLE

Use the DOWNLOAD ENABLE option to select which of the installed serial ports can be used for downloading projects to the PowerStation. When a serial port is enabled for download, the Shell “takes control” of the port to “listen” for the start of a project download; this takeover may interfere with TSRs or network drivers that use that serial port.
To allow other software drivers to use a particular serial port, that port should be set to DISABLED. The Shell automatically disables any serial port enabled for downloading whenever it detects a touch screen or a mouse is connected to it.

**Note**  
It is possible that all the download ports could become disabled by multiple changes to the configuration file. If this occurs, then you will have to manually enable them using the DOWNLOAD ENABLE setting on the SETTINGS menu.

**SERIAL PORT IRQS**

Use the SERIAL PORT IRQS option to select the communication port IRQ. In order for the Shell to use the installed serial ports for downloading, and for touch screen operation, the Shell must have knowledge of the hardware IRQ numbers used by each serial port. These IRQ numbers are typically set by hardware jumpers on the System Support card. The IRQ numbers in the Shell must match the hardware jumper settings for proper operation.
SYSTEM CLOCK

Use the SYSTEM CLOCK option to change the PowerStation’s date and time. After you select a parameter, use the numeric keypad to enter the desired value.

The range for each parameter appears below:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAY</td>
<td>1 - 31</td>
</tr>
<tr>
<td>HOUR</td>
<td>0 - 23</td>
</tr>
<tr>
<td>MONTH</td>
<td>1 - 12</td>
</tr>
<tr>
<td>MINUTE</td>
<td>0 - 59</td>
</tr>
<tr>
<td>YEAR</td>
<td>1980 - 2099</td>
</tr>
<tr>
<td>SECOND</td>
<td>0 - 59</td>
</tr>
</tbody>
</table>

SET BRIGHTNESS/SET CONTRAST

Use these options to change the brightness and contrast levels of your display. When you select either one of these options, a popup menu will display Increase/Decrease options. Each click on a selection will increase or decrease the brightness or contrast by one level.

**Note** Not all display types support brightness and contrast adjustments. If the installed display does not support brightness and contrast adjustments, these menu options will not appear.
Set Path

Select the SET PATH button to enter the path where the Interact application and executable files reside.

```
<table>
<thead>
<tr>
<th>Interact Path: C:\INTERACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interact Files:    C:\INTERACT\APFILES</td>
</tr>
</tbody>
</table>
```

**Important** Any changes you make to this setting are also made to the “SET INTERACT=” and “SET INTERACT_FILES=” lines in your AUTOEXEC.BAT file. However, these changes will not take effect until you restart the PowerStation or exit the Shell.

Touch Screen Calibration

Select the SCREEN CAL button to launch the touch screen calibration utility. When you select this button, the following message appears:

```
To calibrate the touchscreen:
- First, select option C to calibrate
- Then select option V to select video modes
- Select an appropriate video mode (Note: 60 modes: 3, 12, and 101 = selections 1, 6, and 11 respectively)
- Select C to calibrate the selected mode
- Repeat until all needed video modes are calibrated
Hit any key to begin calibration...
```

**Important** The touch screen calibration utility requires you use an external keyboard. See *Connecting a keyboard (P3 and P4 only)* on page 23 for more information about connecting a keyboard.

See *Recalibrating the Touch Screen* on page 55 for more information about calibrating the touch screen.
System Information

Select the SYS INFO button to provide information on system resources such as the Shell version number, processor type, installed memory, etc. Use this information to assist you during PowerStation configuration. This information will be requested whenever you contact CTC’s Product Technical Support department for assistance.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFTWARE ID</td>
<td>Identifies the version of the Shell utility.</td>
</tr>
<tr>
<td>PROCESSOR</td>
<td>Identifies the type of processor installed in the PowerStation.</td>
</tr>
<tr>
<td>INSTALLED MEMORY</td>
<td>Lists the amount of DRAM installed in the PowerStation in Kbytes.</td>
</tr>
<tr>
<td>DRIVES</td>
<td>Lists the type and size of the drives installed on the PowerStation along with the amount of free disk space. The Compact Flash is identified as a “device driver” in the list.</td>
</tr>
</tbody>
</table>
Menu Definitions

Port Usage

Select the PORT USAGE button to view the port memory assignments for the PowerStation. An example of this window appears below:

![Port Usage Window]

Memory Map

Select the MEMORY MAP button to display the memory map of the PowerStation. Use this menu whenever you install I/O cards that use memory addresses to make sure the card does not conflict with the PowerStation’s memory addresses. See *Adding Adapter Cards* on page 29 for more information.

![Memory Map Window]
Go To Interact

Select the GO TO INTERACT button to execute Interact from the Shell. This execution provides the proper environment for Interact to create and use the applications within the currently selected project.

The Interact module displayed is determined by the project’s Startup Application configuration setting in the Application Manager. If this setting is None, then the Application Manager Main Menu is displayed. Upon exiting Interact, the Shell Main Menu appears.

Utility Menu

Select the UTILITY MENU button to enter the Shell Utility menu. The Utility menu allows you to do the following:

- Access the Interact security device
- Restore an Interact project backup from a floppy disk to the hard drive
- View directory names and file names, including their size and date/time information

Security Key

Use this option to activate the Interact Setup Utility (ISU), which allows you to enable options and transfer enabled options between security keys. Refer to the Interact Getting Started guide for more information about using security keys. To upgrade the key and enable or transfer modules and drivers, follow the basic guidelines listed below:

- To upgrade the PowerStation’s internal key, place the upgrade key on the LPT1 (parallel) port and use the Upgrade command in ISU.
- To enable modules and drivers on the PowerStation’s internal key, use the Enable Option command in ISU.
- To transfer modules and drivers to the PowerStation’s Internal Key, place a key with the enabled module or driver on the LPT1 port of the PowerStation and use the Transfer Option command in ISU.

Note  When you choose the Enable Option command, a numeric keypad appears so you can enter enabling codes. This eliminates the need for an external keyboard.
Menu Definitions

Restore Project

Use this option to restore a project from a floppy drive to Compact Flash or a hard drive. The following warning message appears when you select this option:

```
WARNING! You are restoring a project from a floppy drive to the
Internal Disk. Any existing project will be ERASED. Continue?

< YES >   < NO >
```

Dir

Use this option to display a list of all files and directories on the PowerStation. Select the desired drive letter and directory to display the files in that directory.

The directory path is listed at the top of the screen. The number of files, the total number of bytes in this directory, and the total number of bytes remaining on this drive are listed at the bottom of the screen. This menu also displays file names with their size and the date and time the file was created.

If the list of files is greater than what can be displayed on screen, then you can scroll and page through the list. Use the arrow keys to scroll through the list, or press the Page Up or Page Down keys.

Exit Shell

Select the EXIT SHELL button to exit the Shell program and return to DOS. When you select this button, the Shell reminds you that you must have a keyboard connected to the PowerStation before you can exit the Shell. If you have a keyboard connected to the PowerStation, select YES to exit the Shell. You can restart the Shell at any time by typing PSU and pressing the Enter key on the keyboard.
System Tests

Select the SYSTEM TESTS menu to display a submenu of tests that you can perform on the PowerStation. At this time, you can perform a keyboard test by pressing the KEYBOARD TEST button.

Keyboard Test

Select the KEYBOARD TEST button to begin the keyboard test. When you press a key, the PowerStation will display the text string that matches that key.

Note  If your PowerStation has a touch screen, upon pressing the display the text string, “SELECT” is displayed. Also, pressing the Shift, Ctrl, or Alt keys does not display a text string.

DOS Shell

Select the DOS SHELL button to enter DOS mode without exiting the Shell. You will need to connect a keyboard to the PowerStation prior to selecting this feature. CTC includes all DOS utilities on all PowerStations equipped with a hard drive. Refer to your DOS manual for information about using DOS commands. To return to the Shell, type `exit` at the prompt.
Reinstalling the Shell Software

The PowerStation Shell comes pre-installed on all MS-DOS based (without Windows) units. If you need to install or reinstall the Shell software or the touch screen drivers, you can use the PowerStation Shell Setup disk. This disk automatically installs the PowerStation Shell, touch screen drivers, and the factory default AUTOEXEC.BAT and CONFIG.SYS files (if desired) on a Compact Flash drive or hard drive. To install the PowerStation Shell and touch screen drivers, complete the following steps:

1. Insert the setup disk into drive A.
2. Change to the root directory of drive A.
3. Type `Install A: C:` at the DOS prompt. This will copy the Shell files into the \C:CTC directory and the touch screen drivers into the \C:TOUCH directory.

At the end of the installation, you will be asked if you would like the factory-default AUTOEXEC.BAT and CONFIG.SYS files to be copied to the root directory of C. If you answer Yes, the existing AUTOEXEC.BAT and CONFIG.SYS files will be renamed to AUTOEXEC.OLD and CONFIG.OLD. If you answer No, the factory-default files will be copied to AUTOEXEC.CTC and CONFIG.CTC in the root directory of drive C.

Then you will be asked if you would like to calibrate the touch screen. CTC recommends you calibrate at this time.
Recalibrating the Touch Screen

After the AUTOEXEC.BAT and CONFIG.SYS files have been copied on to your system, press any key to continue. If the \TOUCH directory was erased or did not exist prior to running the installation program, you will be prompted as to whether or not you would like to calibrate the touch screen. Your PowerStation will not run properly if the touch screen is not calibrated. Otherwise, you are finished reinstalling the Shell software.

Press Y to enter the touch screen calibration utility, or press N to perform the calibration at a later time. If you decide to perform the calibration now, the following screen will appear to guide you through the calibration process.

Recalibrating the Touch Screen

The PowerStation’s touch screen is calibrated prior to leaving CTC. However, you may need to recalibrate the touch screen when you begin using the PowerStation for the first time or whenever the cursor location and the location on the screen where the user touches do not match.

The PowerStation Shell comes with a calibration utility that you can use to calibrate the touch screen. The calibration utility requires a keyboard and involves calibrating the touch screen for text and for graphics. Follow these steps to calibrate the touch screen:
1. Select the SCREEN CAL button from the CONFIG SETTINGS menu. The following screen appears:

```
To calibrate the touchscreen:
- First, select option C to calibrate
- Then select option V to select video modes
- Select an appropriate video mode (must do modes 3, 12, and 101 - selections 2, 0, and 11 respectively)
- Select C to calibrate the selected mode
- Repeat until all needed video modes are calibrated
Hit any key to begin calibration...
```

2. Press any key when you are ready to begin the calibration program. The following screen appears:

```
Touch Screen Driver Configuration Utility 2.0 11/22-Sep-96
Synapsis Technologies Inc (C)
   Calibration
   Display
   Touchscreen
   Buttons
   Interface
   Exit
Enter your selection (C/D/T/B/I/E).
```

3. Press C for Calibration. When the next screen appears, you will be calibrating video mode 80 x 25 Text (2,3).
4. Press C again for Calibrate.
5. Place your finger on the square on the screen and hold until you hear a beep.
6. Follow the instructions on the screen by touching each square as it appears—there will be three all together.
7. Press V to select a new video mode.
8. Enter 0 for 640 x 480 16 color Graphics mode.
11. Follow the instructions on the screen by touching each square as it appears—there will be three all together.
13. Enter 11 for 640 x 480 256 color Graphics mode.
14. Press Enter.
15. Press C for Calibrate.
16. Follow the instructions on the screen by touching each square as it appears—there will be three all together.
17. Press O for OK.
18. Press Escape or X to exit.

**Important** After calibrating the touch screen, enter Interact in Program Mode. Verify that the cursor appears on the screen where you touch, otherwise recalibrate the screen. The calibration MUST be accurate to avoid activating a button unintentionally during Run Mode.
Installing and Configuring the PowerStation

When you finish configuring the PowerStation, you can begin making preparations to install the unit in a permanent location. This chapter will help you select an appropriate location for the unit, provide instructions for creating a cutout for the unit, and describe how to install the unit.

Chapter Contents

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<th>Page</th>
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</thead>
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<tr>
<td>Creating the Cutout</td>
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<td>Mounting the Unit</td>
<td>62</td>
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<td>Powering Up the Unit</td>
<td>63</td>
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<tr>
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<td>Configuring the Touch Screen Drivers</td>
<td>65</td>
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<tr>
<td>Configuring the Ethernet Interface</td>
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</tr>
<tr>
<td>Using the Utility Disks</td>
<td>69</td>
</tr>
</tbody>
</table>
Selecting a Location

The first step to installing the PowerStation is to select an appropriate location for the unit. This is the most important aspect of the installation because the location you select can affect the PowerStation’s performance, ease-of-use, life-expectancy, and more. This section provides some guidelines to follow when selecting a location for the PowerStation.

Class I, Division II Guidelines

If you purchased a Class I, Division II compliant PowerStation, you must always follow these guidelines to maintain a safe operating environment:

1. Suitable for use in Class I, Division II, Groups A, B, C, and D hazardous locations only.
2. **Warning: Explosion Hazard**—Do not disconnect equipment or replace or insert cards unless power has been switched to off or the area is known to be non-hazardous.
3. **Warning: Explosion Hazard**—Substitution of components may impair suitability for Class I, Division II.
4. Make sure that power is always secured to the unit using the supplied L bracket (AC units).
5. When performing field wiring, always use copper wire with 60C or 60/75C insulation and a tightening torque of 7.0 lb/in. (0.79 N-m).

Environmental Guidelines

The environment is the area where the PowerStation will be located. In general, you should limit the unit’s exposure to adverse conditions, such as dust, oil, moisture, and corrosive vapors.

Faceplate Considerations

The PowerStation’s faceplate is designed to the NEMA 4 (IP65 European standard) rating. You should mount the PowerStation in a similar enclosure to provide further protection. The PowerStation’s faceplate is resistant to a variety of chemicals. See *Faceplate Chemical Resistance* on page 14 for a complete list of these chemicals.
Electrical Guidelines

To minimize unwanted electrical interference, select a location away from machinery that produces intense electrical noise. If this cannot be avoided, isolate input power to the unit, and separate all data communication cables used with the unit from power lines.

See Electrical Specifications on page 13 for a list of electrical specifications. Make sure that your power source is completely compatible with the PowerStation before starting the unit.

Temperature Guidelines

You can safely operate the PowerStation within the temperature range specified in the Environmental Specifications section on page 13. If you are using a protective enclosure, remember that the temperature outside the enclosure is generally lower than the internal temperature. Thus, if the PowerStation is operating inside an enclosure at temperature levels above its rated ambient temperature, you must cool the enclosure.

Enclosure Guidelines

Select an enclosure that is large enough to allow free airflow in and around the unit. You should allow a minimum of a 2-inch gap between the enclosure and the top, bottom, and sides of the PowerStation.

Also, make sure that the surface of the enclosure on which the PowerStation is mounted is flat and free of raised or depressed areas.

Creating the Cutout

Once you have selected a location, you can begin preparing it to accept the unit. Prior to installing the PowerStation, you will need to create a cutout for the unit and clean the area of any dirt or debris that may come in contact with the unit.

The PowerStation comes with a template designed to simplify the task of creating the cutout for the unit. It is important that you follow the drill hole and cutout dimensions precisely so the PowerStation properly seals.
Mounting the Unit

Follow these steps to create the cutout:

1. Attach the template securely to the mounting surface.
2. Cut out the shaded area of the template referred to as the “Panel Cutout Area.” To maintain the flatness of the mounting surface, CTC recommends that you **cut** out the Panel Cutout Area rather than punch it out.
3. Drill the appropriate number of 0.23-inch diameter mounting holes as seen on the template. Once again, you should be careful to protect the flatness of the surface.
4. Debur the cutout area and the drill holes.
5. Ensure that the mounting surface has remained flat and that the panel surface is clean and free of foreign materials.
6. See *PowerStation Dimensional Drawings* on page 101 in Appendix A for the depth and port dimensions of your PowerStation. Use these dimensions to customize the mounting of your unit.

Mounting the Unit

Once the mounting surface has been prepared, you can install the PowerStation. For your convenience, CTC includes all necessary mounting hardware with the unit. Follow these steps to mount the unit:

1. Gently insert the PowerStation into the cutout.
2. Install a nut on each of the protruding studs on the back of the panel, and tighten each nut to a torque of 17 inch/pounds.

**Important** The unit must fit flush in the enclosure. Tighten the nuts in a cross-wise sequence to ensure a good seal and prevent damage to the unit.
Powering Up the Unit

Once the unit has been mounted, you are ready to power up the unit. This procedure appears below.

Before connecting power to your unit, make sure you have read and understand the following sections of this manual: *Electrical Specifications* on page 13 and *Testing Specifications* on page 14. Also, make sure you follow the guidelines listed below:

- For PERMANENTLY CONNECTED EQUIPMENT, a readily accessible disconnect device shall be incorporated in the fixed wiring.
- For PLUGGABLE EQUIPMENT, the socket-outlet shall be installed near the equipment and shall be easily accessible.

**Special note for use in EU member countries**

Proper installation of this PowerStation model for use in European Union countries requires the use of a harmonized power cord. (The power cord must be identified with the <HAR> symbol.) Ensure that this PowerStation is only connected to the main supply with a harmonized power cord.

1. Verify that the power switch is OFF.
2. Connect the power cord to your voltage source. Voltage input to the unit should be within the range specified in the *Electrical Specifications* section on page 13 of this manual.
3. Connect the power cord plug to the PowerStation.
4. Turn the power switch ON.
   
   **Note**  The fan should come on followed immediately by the display.

If you are using Interact, you are now ready to download your project to the PowerStation. Refer to the Interact Project Manager User Guide for more information about downloading projects to the PowerStation.
Modifying the AUTOEXEC.BAT File

The following lines must appear in the AUTOEXEC.BAT file for proper operation of the PowerStation. The AUTOEXEC.BAT file that CTC supplies includes these lines and is located in the \CTC directory of the PowerStation in a file called AUTOEXEC.CTC.

<table>
<thead>
<tr>
<th>Command line parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PATH C:; C:\DOS; C:\CTC</td>
<td>Sets up default DOS path.</td>
</tr>
<tr>
<td>C:\CTC\BIOSTSR</td>
<td>Loads special functions.</td>
</tr>
<tr>
<td>C:\CTC\MOUSE</td>
<td>Loads MOUSE.COM if a mouse is connected.</td>
</tr>
<tr>
<td>C:\CTC\NOMOUSE</td>
<td>Loads NOMOUSE.COM if a mouse is not connected.</td>
</tr>
<tr>
<td>C:\TOUCH\DOX\SC3DOX /NOBOUNDS/</td>
<td>Initializes touch screen driver.</td>
</tr>
<tr>
<td>C:\NET\NET.BAT</td>
<td>Loads network batch file if unit is connected to a LAN.</td>
</tr>
<tr>
<td>* SET INTERACT=C:\INTERACT</td>
<td>Sets the Interact path.</td>
</tr>
<tr>
<td>* SET INTERACTFILES=C:\INTERACT\APPFILES</td>
<td>Sets application path for Interact.</td>
</tr>
<tr>
<td>* SET INTERACTSTARTUP=C:\STARTUP</td>
<td>Sets up Interact startup variables.</td>
</tr>
<tr>
<td>* IF EXIST C:\STARTUP\AUTOEXEC.BAT CALL C:\STARTUP\AUTOEXEC.BAT</td>
<td>Calls second AUTOEXEC.BAT file if contained within a Project.</td>
</tr>
<tr>
<td>* C:\CTC\PSU</td>
<td>Starts the PowerStation Shell.</td>
</tr>
</tbody>
</table>

* Denotes a command line that is unnecessary on units without Interact.
Configuring the Touch Screen Drivers

CTC includes the touch screen drivers with the PowerStation that correspond to your unit’s operating system. Refer to the section below that corresponds to your operating system.

**Note**  The instructions for MS-DOS also apply to units with ROM-DOS operating systems.

### Configuring the Touch Screen Drivers in MS-DOS

The `C:\TOUCH\DOX\SC3DOX.EXE` file is needed to configure the touch screen in MS-DOS. This file initialized the touch screen driver.

**Important** If you purchased a PowerStation with the touch screen disabled and you want to enable it, remove the REM statement that appears at the beginning of the above line.

Likewise, if you purchase a PowerStation with the touch screen enabled and you want to disable it, add the word REM to the beginning of this line. If you need to permanently disable the touch screen, remove the file `SC3DOX.EXE` from your system.

The `SC3DOX` accepts the following command line parameter NOBOUNDS—this specifies the touch screen boundaries in Interact.

**Important**  DO NOT change this parameter.

Follow the directions below to configure the touch screen drivers:

1. Enter MS-DOS mode and change to the `C:\TOUCH\DOX` directory.

2. Start the touch screen calibration program by typing `touchcfg`. The following touch screen driver configuration screen will appear.
3. Press I for Interface. The following Interface Configuration Options screen will appear.

4. Press I to change the Interrupt or press 1, 2, 3 or 4 to change the COM port.
   
   **Note** If you use Set COM3 or COM4, they will default to COM1 and COM2 IRQs. You will need to reset them.

5. Press A to change the Address.
6. Press C to change the Connection.

   **Important** The Connection must be set to UART.

7. Press O to set your touch screen driver.
8. Press Escape or X to exit.

   **Important** You must reboot your system for the changes to take effect.

### Configuring the Touch Screen Drivers in Windows

If you are using Microsoft Windows 95 or Windows NT, you can configure the touch screen drivers using a utility provided by the manufacturer of the touch screen.

Follow the directions below to configure the touch screen drivers:

1. Select the Start button and select Programs.
2. Select the Touch Screen Utilities folder from the Programs menu.
3. Select the Configuration icon from the Touch Screen Utilities folder. The Calibration Utilities dialog box should appear as shown below.

4. Select the Interface button from the Calibration Utilities dialog box. The Interface Configuration Options dialog will appear as shown below.

5. The touch screen is set to COM3, IRQ11, 3E8h by default. Click on the drop-down arrows to change these settings.

   **Note** As you change the COMPort, the other settings will change automatically.

6. Select OK when finished.
Configuring the Ethernet Interface

The \NET directory of the PowerStation’s flash drive contains a configuration utility and all drivers necessary to configure the Ethernet interface. CTC also includes backup copies of these files on the PowerStation Shell Installation Disk. These files are described below:

<table>
<thead>
<tr>
<th>File Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATSCFG.EXE</td>
<td>A configuration utility you can use to change the interrupt and address of the Ethernet interface.</td>
</tr>
<tr>
<td>NET.BAT</td>
<td>A sample batch file you can use to run NetBIOS.</td>
</tr>
</tbody>
</table>
| NET.CFG      | Stores the interrupts and memory for the network drivers. The default PowerStation configuration reserves the following interrupts and I/O addresses. You cannot use these for the Ethernet interface.  
  • COM1: Int 4, I/O 3F8  
  • COM2: Int 3, I/O 2F8  
  • Touch Screen: Int 15, I/O 310  
  CTC recommends that you use the following interrupt and I/O address setting for the Ethernet interface: Int 10, I/O 280H |
| NETX.EXE     | The Novell Netware shell program that makes the final connection with the server. |
| *LSL.COM     | A Novell driver that enables the workstation to communicate with different protocols. |
| *IPXODI.COM  | A Novell driver that supports the IPX protocol and other protocols over the same network. |
| *NE2000.COM  | A Novell driver that supports the NE2000 protocol. It allows the PowerStation to communicate over a local area network. |
| *NETBIOSS.EXE| Used by Interact to communicate over a network.                               |

* Denotes files that can be downloaded from Novell’s FTP site: ftp://137.65.3.15/pub/updates/dsktop/nwl11/l11d03.exe

Interact will also communicate over any network or operating system that supports NetBIOS protocols. Examples include Lantastic, Microsoft, and IBM. If you need assistance with NetBIOS and networking, consult your network administrator or a certified network technician.
Using the Utility Disks

PowerStations are shipped with several disks included in the package. These disks contain various utilities and files you may occasionally need. This section provides a table that can be used to cross-reference your particular system with the disks needed for that system. A description of each disk and what it is used for is also presented.

<table>
<thead>
<tr>
<th>Disk Name and Part No.</th>
<th>Interact Systems</th>
<th>Non-Interact Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DOS</td>
<td>Windows</td>
</tr>
<tr>
<td></td>
<td>95</td>
<td>NT</td>
</tr>
<tr>
<td>IPM KA-82228</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Shell Install KA-72451</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Windows 95/NT VGA Drivers KA-72670</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Windows 95 Touch-screen Driver KA-72816</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Windows NT Touch-screen Driver KA-72817</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Windows NT Emergency Repair Disk KA-72668</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Utilities Disk KA-72463</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**Interact Project Manager KA-82228:** This disk is used by all development PowerStations shipped with Interact software. This disk contains all program files for the Interact Project Manager (IPM) utility. You must install the IPM from this disk to your development PowerStation after installing Interact in order to download projects to runtime PowerStations. Refer to the IPM User Guide for installation and usage instructions.

**PowerStation Shell Install Disk KA-72451:** This disk is used by all runtime PowerStations shipped with Interact software. The PowerStation Shell is used by runtime systems to receive Interact project files and to configure PowerStation hardware. This disk contains all PowerStation shell files and DOS touch screen drivers, which are already installed on your unit. This disk is provided as a backup copy.
Using the Utility Disks

**Windows 95/NT 4.0 VGA Drivers KA-72670:** This disk is used by PowerStations that use the Windows 95 or NT operating system. This disk contains the Windows VGA drivers to fully support the PowerStation VGA features. The VGA drivers on this disk provide better color support than the standard drivers. The VGA drivers have already been installed on your unit. The Windows 95 and NT VGA drivers exist in separate directories on the disk. Install the files from this disk to the PowerStation only if your VGA drivers become corrupted.

**Windows 95 Touchscreen Driver KA-72816:** This disk is used by PowerStations that use the Windows 95 operating system. It contains files necessary to operate the touch screen in Windows 95. The touch screen driver has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.

**Windows NT 4.0 Touchscreen Driver KA-72817:** This disk is used by PowerStations that use the Windows NT operating system. It contains files necessary to operate the touch screen in Windows NT. The touch screen driver has already been installed on your unit. Install the files from this disk to the PowerStation only if your touch screen drivers become corrupted.

**Windows NT Emergency Repair Disk KA-72668:** This disk is used by PowerStations that use the Windows NT operating system. This disk is used to reboot an NT system whenever the system will not recover from a crash. This disk will allow you to restart the system and repair the corrupted files.

**PowerStation Utilities Disk KA-72463:** This disk contains several PowerStation utilities and DOS touch screen drivers. The disk is included with all units that are not shipped with Interact software. PowerStations that ship with Interact already contain these utilities. These utilities support various PowerStation features such as the Brightness/Contrast Utility, Ethernet drivers, VESA VGA driver, etc. Use this disk if you need to use the utilities and drivers included on the disk.
Maintaining and Troubleshooting the PowerStation

The PowerStation has been designed to provide years of trouble-free operation even in the harshest environments. However, you will occasionally need to perform routine maintenance on some of the PowerStation’s components.

This chapter provides troubleshooting advice as well as instructions on cleaning the touch screen, recalibrating the touch screen, and reformatting the Compact Flash.

Chapter Contents

Cleaning the Touch Screen 72
Reformatting the Compact Flash 72
Recalibrating the Touch Screen 75
Performing Internal Maintenance 78
Resolving Common Problems 88
Cleaning the Touch Screen

Occasionally, you might find it necessary to clean the touch screen of the PowerStation. Clean the touch screen using warm soapy water and a cloth. You may also use any non-abrasive cleaner. See Faceplate Chemical Resistance on page 14.

Do not use any harsh material or powder, such as steel wool or abrasive cleansers to clean the polyester surface. The surface is sensitive to scraping, sharp blows, or punctures. Thus, keep screwdrivers or other sharp objects away from the surface of the touch screen.

**Warning** Do NOT clean the unit while Interact is in Run mode. Clean the unit while power is removed to keep from inadvertently activating an Interact device (button, slide, etc.).

Reformatting the Compact Flash

This section explains the procedure to create a bootable Compact Flash (CF) card for the PowerStation from a “blank” CF card. This procedure may be necessary to replace deleted or corrupted critical files on the card or to prepare a new card for use. This procedure requires the following items:

- PC with a Type II PCMCIA slot and a 3.5” floppy drive running MS-DOS 6.22 or Windows 95
- CF-to-PCMCIA adapter
- ROM-DOS 6.22 and Utilities distribution disk (KA-72579-101 or later)
- Shell Installation disk (KA-72451-120 or later)

**Note** This procedure will work correctly under only MS-DOS 6.22 or Windows 95. Do not run this utility under Windows NT.
To reformat the CF:

1. Power down the PowerStation.

   **Important** Always make sure power to the PowerStation is turned OFF when inserting or removing the CF card.

2. Press the eject button and remove the flash card from the PowerStation flash card slot.

3. Insert the CF card into the PC’s PCMCIA slot, using the CF-to-PCMCIA adapter.

   The PCMCIA drivers should recognize and configure the card as an ATA card, assigning an additional drive letter for the card (e.g., D:)

   **Note** In this example, drive D: represents the PCMCIA card; however, your system may assign a different drive letter to the PCMCIA card.

4. Enter MS-DOS mode.
5. At the DOS prompt, type the following command sequence:
   ```
   FORMAT D:
   ```

6. Press Enter to execute this command.

7. Insert the ROM-DOS 6.22 and Utilities disk into the PC’s floppy drive.

   **Important**  If you are performing the install procedure in a DOS window under Windows 95, you must execute the command `LOCK D:` before entering the INSTALL command shown below. After the ROM-DOS installation is complete, execute the `UNLOCK D:` command.

8. At the DOS prompt, type the following command sequence:
   ```
   A:INSTALL A: D:
   ```

9. Press Enter to execute this command.

   This will install the ROM-DOS system files onto the CF card to make the card bootable and create a DOS directory containing a few basic ROM-DOS utilities (HIMEM.SYS, EMM386.EXE, etc.).

10. Insert the Shell Installation disk into the PC’s floppy drive.

11. At the DOS prompt, type the following command sequence:
    ```
    A:INSTALL A: D:
    ```

12. Press Enter to execute this command.

    This will install the PowerStation Shell files and necessary drivers onto drive D (or the drive assigned to the CF card in the PCMCIA slot). You will be asked whether you wish to install the standard CTC AUTOEXEC.BAT and CONFIG.SYS files as part of the installation. CTC recommends that you answer “Yes.”

    If you answer Yes, the existing AUTOEXEC.BAT and CONFIG.SYS files will be renamed to AUTOEXEC.OLD and CONFIG.OLD. If you answer No, the factory-default files will be copied to AUTOEXEC.CTC and CONFIG.CTC in the root directory of drive D, and you will need to manually update your existing AUTOEXEC.BAT and CONFIG.SYS later.

    After the AUTOEXEC.BAT and CONFIG.SYS files have been copied on to your system, press any key to continue. You will be asked if you want to calibrate the touch screen; however, you cannot do this until you reinstall the CF card in the PowerStation.
13. Press N when you are asked if you want to recalibrate the touch screen.
   The PowerStation Shell installation is complete.
14. Eject the CF-to-PCMCIA adapter, and remove the CF from the adapter.
   The CF card is now ready to use in the PowerStation.
   **Important** Always make sure power to the PowerStation is turned OFF when inserting or removing the CF card.
15. Insert the CF into PowerStation’s flash card slot.
16. Power up the PowerStation.
   The PowerStation automatically boots into the PowerStation Shell.
17. Recalibrate the touch screen.

Recalibrating the Touch Screen

The PowerStation’s touch screen is calibrated prior to leaving CTC. However, you may need to recalibrate the touch screen when you begin using the PowerStation for the first time or whenever the cursor location and the location on the screen where the user touches do not match.

   **Note** The calibration utility requires a keyboard and involves calibrating the touch screen for text and for graphics.

Recalibrating Under MS-DOS

Follow these steps to recalibrate the touch screen in MS-DOS mode:
1. Enter MS-DOS mode and change to the C:\touch\dox directory.
2. Start the touch screen calibration program by typing `touchcfg`.
3. Press C for Calibration. When the next screen appears, you will be calibrating video mode 80 x 25 Text (2,3).
4. Press C again for Calibrate.
5. Place your finger on the square on the screen and hold until you hear a beep.
6. Follow the instructions on the screen by touching each square as it appears—there will be three all together.
7. Press V to select a new video mode.
8. Enter 0 for 640 x 480 16 color Graphics mode.
11. Follow the instructions on the screen by touching each square as it appears—there will be three all together.
13. Enter 11 for 640 x 480 256 color Graphics mode.
14. Press Enter.
15. Press C for Calibrate.
16. Follow the instructions on the screen by touching each square as it appears—there will be three all together.
17. Press o for OK.
18. Press Escape or X to exit.
Recalibrating Under 95/Windows NT

Follow these steps to recalibrate the touch screen under Windows 95 or Windows NT:

1. Select the Start button and select Programs.
2. Select the Touch Screen Utilities folder from the Programs menu.
3. Select the Configuration icon from the Touch Screen Utilities folder. The Calibration Utilities dialog box will appear as shown below.

4. Select the Calibration button from the Calibration Utilities dialog box.
5. Select the Calibrate button from the Calibration dialog box.
6. Place your finger on the target in the upper left corner and follow the instructions on the screen.
7. Select Exit when finished.
Performing Internal Maintenance

This section includes helpful information for performing internal maintenance on the PowerStation. To prevent injury to yourself and/or damage to the PowerStation, be sure to read and understand the procedures found in this section before performing the procedures. This section will show you how to perform the following operations:

- Remove and replace DRAM
- Change the jumper settings

Electrostatic Discharge Precautions

Modern integrated electronic devices, especially CPUs and memory chips, are extremely sensitive to electrostatic discharges (ESD) and fields. Before you disassemble the PowerStation, be sure to follow these simple precautions to protect you and the PowerStation from harm resulting from ESD.

1. To avoid electric shock, always disconnect the power from the PowerStation before you remove the backshell cover or separate the backshell from the front panel. Do not touch any components of the CPU card or other cards while the PowerStation is on.

2. Disconnect power before making any hardware configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

3. Only handle internal components in an ESD-safe location using appropriate grounding methods.
   - Always ground yourself to remove any static charge before you touch the CPU card.
   - Be particularly careful not to touch the chip connectors.
   - Keep any card in its anti-static packaging when it is not installed in the PowerStation, and place it on a static dissipative mat when you are working on it.
   - Wear a grounding wrist strap for continuous protection.
Disassembling the PowerStation

If you have read and understand the ESD safety precautions, you are ready to disassemble the PowerStation. Follow these steps to disassemble the unit:

**Important** As you begin to disassemble the unit, you will encounter several different screw sizes. When you reassemble the PowerStation, be sure to replace the same size screw in the same location as the one that was removed. Failure to do so could result in damage to the unit.

1. Turn off power to the unit.
2. Disconnect the unit from the power source.
3. Remove the unit from its enclosure, if installed.
4. Place the unit on a static dissipative mat in a location free from dirt and moisture and protected against static discharge. You must also wear an ESD wrist strap connected to a good known earth ground.
5. Place the unit face down, and remove the screws securing the back cover.
6. Remove the back cover from the unit.
7. Proceed to the specific configuration or replacement procedures you need to perform.
Adding and Replacing DRAM

All PowerStations use DRAM that is comparable to what is found in most PC’s. The size and quantity of DRAM varies depending on the PowerStation model and the CPU card. However, the same procedure applies to add and replace DRAM on all models. Refer to the CPU manual for more information about the size and quantity of DRAM your unit can support.

Removing a DRAM module

The PowerStation’s DRAM is located on the CPU card, under the System Support card. You can identify the System Support card as the card with the Compact Flash Card and the Ethernet port. The System Support card is shown below:

Follow these instructions to remove a DRAM module from the CPU card.

1. Lift the locking ears to disconnect the video cable from the right edge of the System Support card.

2. Locate the DRAM SIMM socket(s) located on the right side of the CPU card. The number of SIMM sockets varies depending on the PowerStation model and the manufacturer of the CPU card.
3. Push outward on the socket ejectors. You may need to use a small screwdriver or the tip of a pen to push on the ejectors.

4. Tilt the DRAM module slightly to the right (away from the fan on the CPU card) and lift the module out of its socket at an angle.

5. Place the DRAM module in an anti-static bag for storage if you do not plan to reinstall the DRAM module at this time.

Installing a DRAM module

Follow these instructions to install a DRAM module in the CPU card.

1. Carefully insert the DRAM module into its socket at a 45-degree angle.

   **Note** The notch on the bottom of the DRAM module will align with the ridge on the socket.

2. Gently but firmly push the module upright into the socket until the metal clips snap into place securing the module.

3. Press the video cable into the socket to reattach the video cable to the System Support card. The locking ears should be secure.
Performing Internal Maintenance

This completes DRAM memory installation in your PowerStation. The PowerStation will automatically recognize the additional memory. If errors occur, refer to the CPU manual that came with the PowerStation.

Adding PC/104 Modules

The PowerStation supports PC/104 expansion modules. These modules perform a variety of functions that are typically done by traditional plug-in expansion cards. However, the advantage of using PC/104 modules is that you can stack several modules together, saving valuable space. When adding modules to the PowerStation, remember the following information:

• The total combination of modules may not exceed the current limits specified for PC/104 modules in the PowerStation. See Electrical Specifications on page 13 for more information about the voltage and current available for expansion cards.

• The PowerStation does not support Plug-n-Play features. When selecting PC/104 modules, you must either select those with Plug-n-Play features that can be disabled or those without Plug-n-Play features. PC/104 modules with Plug-n-Play enabled may not perform correctly and may adversely affect PowerStation operation.
Changing the Jumper Settings

Like most PCs, the PowerStation uses jumpers to set addresses and enable or disable various functions of the system. The PowerStation’s System Support card has seven sets of jumpers for configuring the serial ports, touch screen, Compact Flash, USC module, and Ethernet.

The following section will describe how the jumpers are set, what they control, and what options you have in configuring your own jumpers.

**JP8 serial port configuration**

This set of jumpers, located on the upper right corner of the System Support card, is used to set the serial port configuration. The default setting is the RS-485, but you can configure the jumpers to the RS-232 or the RS-422 protocols.

Place the clips in the positions shown below to configure to the default RS-485 protocol.
To configure to the RS-422 protocol, place the clips in the positions shown below.

To configure to the RS-232 protocol, place the clips in the positions shown below.

**JP9 and JP11 serial port and touch screen address**

These sets of jumpers configure the addresses for the serial port (JP9) and the touch screen (JP11). Each is configured by turning “on” or “off” the ports A and B. Use the following chart to determine the on/off combination for the port to which you would like to configure: COM1, COM2, COM3, or COM4.

<table>
<thead>
<tr>
<th>I/O Address</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM1 (3F8h)</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>COM2 (2F8h)</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>COM3 (3E8h)</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>COM4 (2E8h)</td>
<td>on</td>
<td>on</td>
</tr>
</tbody>
</table>
Performing Internal Maintenance

To set the serial port jumpers (JP9) to the default I/O address COM2 (2F8h), place the clips as seen below with the A port “off” and the B port “on.” Set both jumpers to “off” to map to the COM1 port, also shown below.

**Important** If the COM port is configured as COM1, the COM1 must be disabled in the system BIOS.

![Diagram of serial port jumpers](image)

**Note** The clip for the “off” jumper can be completely removed or placed as in the figure above.

To set the touch screen jumpers (JP11) to the default I/O address COM3 (3E8h), place the clips as seen below with the A port “on” and the B port “off.” Set both jumpers to “on” to map the touch screen to the COM4 port, also shown below.

**Important** After changing the jumper settings for the touch screen I/O address, you must change the touch screen configuration drivers for the changes to be implemented. See *Configuring the Touch Screen Drivers* on page 65 for more information.

![Diagram of touch screen jumpers](image)

**Note** The clip for the “off” jumper can be completely removed or placed as in the figure above.
JP7 serial port and touch screen IRQ

This set of jumpers is used to configure the hardware IRQs for the serial port and the touch screen. Place the clips as shown below to map to the default protocols: serial port = IRQ3 and touch screen = IRQ11. You can map these ports to IRQs 3, 4, 5, 7, 9, 10, 11, or 15.

Important After changing the jumper settings for the touch screen IRQ, you must change the touch screen configuration drivers for the changes to be implemented. See Configuring the Touch Screen Drivers on page 65 for more information.

<table>
<thead>
<tr>
<th>IRQs</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>7</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOUCH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Important IRQ 12 is used by the PS/2 port. If you intend to use a keyboard and/or a mouse, do not map to this IRQ.

JP10 Compact Flash adaptor configuration

These jumpers are used to configure the Compact Flash. By default, the Compact Flash is configured to the Primary IDE adaptor (IRQ14). To configure your CF to the Primary IDE adaptor, set the P/S jumper to “off” and the ENA jumper to “on” as in the first example below.

To configure to the Secondary IDE adaptor (IRQ15), set both jumpers to “on,” as in the second example below.

Finally, to disable your CF, set the ENA jumper to “off.” Once the ENA jumper is set to “off,” the P/S setting doesn’t matter, so you can set it however you want. In the third example below, both jumpers are set to “off.”

<table>
<thead>
<tr>
<th>IRQ14 (default)</th>
<th>IRQ15</th>
<th>Disabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>P/S</td>
<td>ENA</td>
<td>P/S</td>
</tr>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
<td><img src="image3.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

Note The clip for the “off” jumper can be completely removed or placed as in the figure above.
### JP6 USC module IRQ

This set of jumpers configures the USC module IRQ. The jumpers are all set to “off” when shipped, as shown below, but you can configure the jumpers to 3, 4, 5, 7, 9, 10, 11, 12, or 15.

<table>
<thead>
<tr>
<th>IRQ</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>7</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jumper Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note**  The clip for the “off” jumper can be completely removed or placed as in the figure above.

### JP1 Ethernet default jumper

This jumper determines when the Ethernet is configured to its default settings. When the jumper is “on,” the Ethernet is forced to the default settings. While the jumper is “off,” the Ethernet is configured by the software utility. To turn the default settings off, set the jumper to off as shown in the figure below. See *Configuring the Ethernet Interface* on page 68 for more information.

![JP1 Ethernet Default Jumper](image)

**Note**  The clip for the “off” jumper can be completely removed or placed as in the figure above.
Reassembling the PowerStation

When you are finished performing internal maintenance on the PowerStation, follow these steps to reassemble the unit.

Important When you reassemble the PowerStation, be sure to replace the same size screw in the same location as the one that was removed. Failure to do so could result in damage to the unit.

1. Replace the back cover and reinstall the screws that secure the back cover.
2. Reinstall the unit in its enclosure, if previously installed.
3. Reconnect power to the unit.
4. Turn on the unit.

Resolving Common Problems

This section provides some basic troubleshooting steps to help you identify and correct problems you may encounter with the PowerStation. If you encounter a problem, please consult this section to see if you can correct the problem yourself. If you encounter a problem that is not documented in this section, contact your CTC equipment supplier or the CTC Product Technical Support department at (513) 248-1714.

Refer to the lists below for the possible troubleshooting topics, how they are organized, and where they are located in this section.

Resolving AUTOEXEC.BAT and CONFIG.SYS problems

Resolving other problems during power up

- During power up, the fan does not come on, and the display is blank. (page 92)
- During power up, the fan starts, but the display does not. (page 92)
- During power up, the RAM test fails, or the total memory installed does not match the total contiguous RAM listed on the display following the RAM test. (page 93)
Resolving Common Problems

Resolving problems with the touch screen

- After power up, the touch screen does not work (page 94)
- After power up, the touch screen does not work properly, or the touch screen calibration appears to be incorrect (page 94)
- After calibrating the touch screen, it either does not work or follow your finger (page 95)

Resolving other problems after power up

- The PowerStation locks up while booting and will not reboot (page 95)
- A PS/2 mouse does not work (page 96)
- A serial mouse does not work (page 96)
- A keyboard does not work (page 96)
- The Ethernet port does not work (page 96)

Resolving problems with Interact

- After power up, the DOS prompt is displayed instead of the PowerStation Shell Main Menu (page 97)
- After selecting the Go To Interact button from the Shell Main Menu, Interact does not run (page 97)
- After selecting the Go To Interact button from the Shell Main Menu, Interact loads, but the screen is blank (page 97)
- You are unable to communicate with the PowerStation’s COM ports (page 97)
- You are unable to transfer a project to the PowerStation (page 98)
- Sending a project results in a message on the display indicating the ????.FIL could not be found (page 98)
- A message appears on the PowerStation stating that the disk is full (page 98)
- When you try to run Interact, a message appears on the PowerStation stating that the Interact Security Device is missing or invalid (page 99)
- The PowerStation has corrupted application files, a panel will not load, or modules/drivers will not load (page 99)
- An Interact module (i.e., HTM) does not start up (page 99)
• A driver does not work with the installed hardware card (page 99)
• The code <00> appears on the display during Super User mode (page 100)

Resolving Problems When Powering the Unit

One of the most common problems that users encounter with PCs occurs while booting up their system. This section describes some possible problems and solutions for booting up the PowerStation.

Resolving AUTOEXEC.BAT and CONFIG.SYS problems

Some bootup problems are caused by a corrupted or modified AUTOEXEC.BAT or CONFIG.SYS file. CTC includes backup copies of these files (AUTOEXEC.CTC and CONFIG.CTC) on the PowerStation Utilities Disk. The text for AUTOEXEC.CTC appears below:

```bash
@ECHO OFF
PROMPT $p$g
SET TEMP=C:\DOS
PATH C:\;C:\DOS;C:\CTC
REM ********************************************************
REM Install PowerStation Special Functions
REM ********************************************************
LH C:\CTC\BIOSTSR
REM ********************************************************
REM If an external mouse is connected, MOUSE will install success
REM fully, and NOMOUSE will do nothing. If external mouse is not
REM found, MOUSE will fail, and NOMOUSE will successfully load.
REM ********************************************************
IF EXIST C:\CTC\MOUSE.INI DEL C:\CTC\MOUSE.INI
LH C:\CTC\MOUSE
REM ********************************************************
REM Install Dynapro touchscreen drivers
REM ********************************************************
LH C:\TOUCH\DOS\EMOUSE /NOBOUNDS/
REM ********************************************************
REM Uncomment next statement to load network batch file
REM ********************************************************
REM C:\NET\NET.BAT
```
The following lines only appear on PowerStations with Interact.

REM ********************************************************
REM Set up Interact environment variables for CTC Shell
REM ********************************************************
SET INTERACT=C:\INTERACT
SET INTERACT_FILES=C:\INTERACT\APPFILES
SET INTERACT_STARTUP=C:\STARTUP
REM ********************************************************
REM Call AUTOEXEC.BAT file contained in project, if it exists
REM ********************************************************
IF EXIST C:\STARTUP\AUTOEXEC.BAT CALL C:\STARTUP\AUTOEXEC.BAT
REM ********************************************************
REM Start the CTC Shell
REM ********************************************************
CD \CTC
PSU

The text for CONFIG.CTC appears below:

;MS-DOS V6.22
FILES=30
DOS=HIGH,UMB
DEVICE=C:\DOS\HIMEM.SYS

The following lines only appear on PowerStations with Interact.

REM !!! NOTE !!!
REM If EMM386 is used on a Flash-disk PowerStation, a 12KB window
REM for the flash disk must be excluded with the "/X=" parameter,
REM as shown in the example below. This window address MUST match
REM the jumper settings on the System Support card!
REM
REM DEVICE=C:\DOS\EMM386.EXE NOEMS RAM /X=C800-CAFF
REM DEVICE=C:\DOS\SETVER.EXE

The following lines only appear on PowerStations without Interact.

DEVICE=C:\DOS\EMM386.EXE NOEMS RAM
DEVICE=C:\DOS\SETVER.EXE

If at any time you suspect a problem with either the AUTOEXEC.BAT or
the CONFIG.SYS file of the PowerStation, use the DOS copy command
to create a backup copy of your current file, and overwrite the suspect file
with the appropriate backup file. For example, if the AUTOEXEC.BAT
file becomes suspect, type the following commands at the DOS prompt:

   copy autoexec.bat autoexec.old
   copy \ctc\autoexec.ctc autoexec.bat
Resolving other problems during power up

This section lists some additional problems and solutions for booting up the PowerStation. The problem is listed first followed by a list of possible solutions. Begin with the first one, and continue through the list until you have solved the problem or reached the end of the list.

If the problem persists, look through the other problems listed in this section to determine if additional symptoms exist that require further action. Otherwise, contact your CTC equipment supplier or the CTC Product Technical Support department.

**During power up, the fan does not come on, and the display is blank.**

1. Turn off the PowerStation.
2. Make sure that power is properly connected. Otherwise, make sure that the connection between the unit and the power source is complete and firmly attached.
3. Turn on the PowerStation. If the fan does not come on, continue with step 4.
4. Disconnect power to the PowerStation.
5. Remove the PowerStation’s back cover.
6. Check the fuse located on the internal power supply. If the fuse is blown, replace it.
7. Turn on the PowerStation. If the fan does not come on, continue with step 8.
8. Check connector J8 (fan connection) on the backplane board to see if the fan is plugged in.
9. Secure the PowerStation’s back cover.
10. Reconnect power and turn on the PowerStation.

**During power up, the fan starts, but the display does not.**

1. Turn off the PowerStation.
2. Remove the PowerStation’s back cover.
3. Make sure that the cables that connect to the display are properly connected. If they are not, make sure that each connector is firmly seated in the corresponding plug.
4. Check the installation of the DRAM SIMMs on the CPU board. Make sure that the SIMMs are firmly seated in their sockets and the socket latches are fully engaged.

5. Make sure that all boards are firmly seated in the backplane board.

6. Secure the PowerStation’s back cover.

7. Turn on the PowerStation.

During power up, the RAM test fails, or the total memory installed does not match the total contiguous RAM listed on the display following the RAM test.

1. Turn off the PowerStation.

2. Remove the PowerStation’s back cover.

3. Re-seat the DRAM SIMMs on the CPU board. Make sure that the SIMMs are firmly seated in their sockets, and the socket latches are fully engaged.

4. Secure the PowerStation’s back cover.

5. Turn on the PowerStation.

Resolving Problems After Powering the Unit

This section lists some possible solutions for problems that may occur after you power up the PowerStation. This section is divided into three subsections, one for touch screen problems, one for Interact problems, and one for other problems.

Each section lists some possible solutions for problems that may occur. The problem is listed first followed by a list of possible solutions. Begin with the first one, and continue through the list until you have solved the problem or reached the end of the list.

If the problem persists, look through the other problems listed in this section to determine if additional symptoms exist that require further action. Otherwise, contact your CTC equipment supplier or the CTC Product Technical Support department.
Resolving problems with the touch screen

This section lists some possible solutions for problems that may occur with the touch screen.

After power up, the touch screen does not work.

1. If the PowerStation appears to be operating correctly otherwise, reboot the unit.
2. The touch screen calibration might be in error. See Performing Internal Maintenance on page 78 to recalibrate the touch screen.
3. Check the AUTOEXEC.BAT file. See Resolving AUTOEXEC.BAT and CONFIG.SYS problems on page 90 for more information.
   a. Verify that the following lines appear before the lines that load touch screen driver:
      
      IF EXIST C:\CTC\MOUSE.INI DEL C:\CTC\MOUSE.INI
      LH C:\CTC\MOUSE

   b. Verify that the touch screen drivers are being loaded. Look for the following lines:
      LH C:\TOUCH\DOX\SC3DOX /NOBOUNDS

Important  You cannot use a serial mouse and the touch screen simultaneously on units running Windows 95. The PowerStation will only load the driver for the device that is listed first in the AUTOEXEC.BAT file.

After power up, the touch screen does not work properly, or the touch screen calibration is incorrect.

1. Enter MS-DOS mode.
2. Change to the \Touch directory.
3. Type TBCAL, and perform the following calibrations: H, 2, and 6.
4. If you are using Windows, choose the Touch Screen icon.
5. Make sure that the touch screen hardware settings are correct:
   Address =3E8H, IRQ = 11.
6. Recalibrate the touch screen. See Performing Internal Maintenance on page 78 for more information.
After calibrating the touch screen, it either does not work or follow your finger.

1. Make sure the touch screen cable has been properly connected. If the touch screen cable is damaged, replace the touch screen. Contact CTC for information about purchasing a replacement.

2. Inspect the touch screen for broken, loose, or frayed wiring. If you encounter wiring problems, replace the damaged wiring.

**Resolving other problems after power up**

This section lists other possible problems and solutions that may occur after power up.

**The PowerStation locks up while booting and will not reboot.**

1. Turn off the PowerStation.

2. Connect a keyboard.

3. Turn on the PowerStation. When the message “Starting MS-DOS” appears, press the F8 key. This will cause the system to step through the CONFIG.SYS or AUTOEXEC.BAT files line-by-line. If the “Starting MS-DOS” message does not appear, go to step 6.

4. Step through the CONFIG.SYS and AUTOEXEC.BAT files line-by-line until the lockup is found. Remove or correct the offending line in the CONFIG.SYS or AUTOEXEC.BAT. In particular, on PowerStations with Compact Flash, make sure that the memory region used by the Compact Flash (configured by jumpers on the System Support card) is excluded (with the “X=” parameter) when loading EMM386.EXE.

5. Restart the PowerStation to see if the problem has been solved.

6. If the system locks up before the “Starting MS-DOS” message appears, reboot the unit, and press the Delete key to enter the BIOS setup program.

7. Select the Standard CMOS Setup option or its equivalent, and restore the system defaults. This will restore CMOS settings to their factory default configuration. Save these settings, and exit the setup program.

Refer to the CPU manual that came with the PowerStation for more information about using the BIOS setup program.
Resolving Common Problems

A PS/2 mouse does not work.
1. Make sure that you are using a Microsoft PS/2 mouse. Some PS/2 mice that claim to be Microsoft compatible, will not work correctly with the PowerStation. Do NOT use a serial mouse with a serial to PS/2 port adapter.
2. Make sure that you are using the supplied Y-adapter cable to connect the mouse to the PS/2 port. Do NOT plug the mouse directly into the PS/2 port.

A serial mouse does not work.
See Connecting a serial mouse on page 20 for information on how to configure the PowerStation to accept a serial mouse.

A keyboard does not work.
1. If you have a P3 or P4, make sure that you are using the supplied Y-adapter cable to connect any AT compatible keyboard to the PS/2 port.
   If you have a P5 or P7, make sure that you plug the keyboard into the AT socket located next to the parallel port. Do NOT use the Y-adapter cable to connect an IBM AT compatible keyboard to the PS/2 port.
2. Make sure the keyboard is an AT keyboard NOT an XT keyboard.
3. If you have a P3 or P4, try using a new Y-adapter cable.
4. Try using a new keyboard.

The Ethernet port does not work.
1. Make sure the Ethernet cable is plugged in.
2. Make sure the networking software is being loaded. Check the AUTOEXEC.BAT file. See Resolving AUTOEXEC.BAT and CONFIG.SYS problems on page 90 for more information.
   a. Verify that the following line does NOT have the word “REM” in front of it:
      C:\NET\NET.BAT
3. Make sure that you have properly configured the networking software. See Configuring the Ethernet Interface on page 68 for more information.
Resolving problems with Interact

This section lists some possible problems and solutions that may occur on a PowerStation that is running Interact.

After power up, the DOS prompt is displayed instead of the PowerStation Shell Main Menu.

1. If the PowerStation appears to be operating correctly otherwise, reboot the unit.
2. The AUTOEXEC.BAT file may be corrupted or has been modified. See Resolving AUTOEXEC.BAT and CONFIG.SYS problems on page 90 for information about correcting this problem.

After selecting the Go To Interact button from the Shell Main Menu, Interact does not run.

1. Verify that the Interact security key is connected to the PowerStation.
2. Verify that Interact is loaded for this project. Go to the Shell Main Menu, and observe the selection for INTERACT TYPE. If the word UNKNOWN is displayed, return to your development system and download a project that has Interact included. Refer to the Interact Project Manager User Guide for information on downloading projects.

After selecting the Go To Interact button from the Shell Main Menu, Interact loads, but the screen is blank.

Interact device driver communications have stopped. Check the following:

a. On a development system, check to ensure you selected the correct device driver communications parameters (baud rate, number of data bits, etc.)
b. Go to the Shell Settings menu and ensure the COM port that the driver is using is selected.
c. Make sure the COM2 hardware jumpers are selected for the particular protocol used with the driver.

You are unable to communicate with the PowerStation’s COM ports.

1. Refer to the Interact device driver Program Mode screen of the driver being used to determine if the driver is correctly setup.
2. Verify that the communication cable is wired properly.
3. Make sure the jumpers are set correctly for address and IRQ, without conflicts.
4. Make sure the proper interrupts have been selected in Application Manager.

5. Refer to the programmable controller documentation for proper cable connection instructions.

6. Use a serial port communication test device to check communications between the PowerStation and your controller. These devices can be purchased at local electronics stores.

You are unable to transfer a project to the PowerStation.

1. Make sure the PowerStation Shell program is running.

2. Verify the COM port you are using is enabled for download. This parameter is located on the Config Settings/Set Hardware menu of the Shell.

3. Verify that the IRQs match the jumper settings on the System Support card. Default = COM1:4, COM2:3.

4. Disconnect any communication cables connected to PowerStation communication cards.

5. Make sure you are not logged onto a network and a print spooler is not connected to your system.

6. Make sure a defective or incompatible mouse or keyboard is NOT connected to the PowerStation.

7. On your computer, do not load a disk cache such as “Smartdrive.” This will interfere with your project transfer. Smartdrive could exist either in your computer’s CONFIG.SYS or AUTOEXEC.BAT files.

8. Verify that the IPM baud rate located on the Transfer Settings menu is compatible with your PC’s COM port.

9. Cycle power to the unit to see if the problem clears.

Sending a project results in a message on the display indicating the ????.FIL could not be found.

You must use a Project developed using Interact version 2.1 or higher on a PowerStation. Previous versions of Interact do not have the .FIL file.

A message appears on the PowerStation stating that the disk is full.

Verify that Interact Project Manager is set to download to a Runtime Only system. If not, select Runtime Only from the Settings menu of Interact Project Manager, and re-send the project.
If it is already set to Runtime Only, you must add more Compact Flash, make more hard drive space available, or the reduce the size of the application.

**When you try to run Interact, a message appears on the PowerStation stating that the Interact Security Device is missing or invalid.**

1. Make sure the version of Interact sent to the PowerStation is 4.X or higher.

2. If the error occurred after sending an old PSU Backup to the PowerStation, then the version of Interact is wrong. Restore the old backup to the PC using Interact Project Manager, and send the project to the PowerStation. Refer to the Interact Project Manager User Guide for more information about converting PSU backups.

3. If the security key is still not recognized, use the Interact Setup Utility to verify if the key is recognized.

**The PowerStation has corrupted application files, a panel won’t load, or modules/drivers won’t load.**

1. Attempt to restore a previous backup of your system. If this is not successful go to step 2.

2. Verify that the PowerStation has enough memory available by using the Interact Memory Available button. Your system may need more extended memory.

3. If your PowerStation is equipped with a hard drive, run the MS-DOS Scandisk utility.

4. Download the Interact Project.

**An Interact module (i.e. HTM) does not start up.**

Verify that the security key is programmed with the correct module using the Security Key selection under the Utility Menu of the Shell. See Security Key on page 51 for more information about using Interact Security Keys.

**A driver does not work with the installed hardware card.**

Make sure there are no interrupt or memory conflicts with other adapter cards. See Communication cards on page 35 for a list of hardware cards and their associated memory locations. Also, refer to the Windows help file that corresponds to your Interact Device Driver.
The code <00> appears on the display during Super User mode.
Reboot the PowerStation and return to the Shell or type exit to return to
the Main Menu. This indicates that a communication problem on the
computer occurred. Verify that Interact Project Manager was only
executed once.
Appendix A

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Appendix A

P4 Side View
Appendix A

P4 Back View
Appendix A

P5/P7 Side View
Appendix A

P5/P7 Back View
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