

Section 1

Introduction

-
- Welcome
 - Features and Components
 - Getting Started

Welcome . . .

Juniper Systems provides field computing solutions for natural resource applications. We are pleased to welcome you as a new or on-going user of our JS 600 FieldBook™. You will quickly discover that the JS 600 is a cost-effective, labor saving tool for collecting data in the field. We are sure you will be pleased with its performance.

If you have any questions or comments about the JS 600 after reviewing this manual, please feel free to contact us.



Natural Resource Applications

- Forest Management
 - Forest Inventory
 - Timber Cruising
 - Street Tree Inventory
- Forest Products
 - Log Scaling
 - Lumber Grading
 - Lumber Inventory
- Range Management
 - Range Analysis
 - Range Classification
 - Inventory
- Fisheries
 - Creel Census
 - Fish Health Assessment
 - Habitat Classification
 - Resource Assessment
- Wildlife Biology
 - Behavior Studies
 - Hunting Check Stations
 - Nutrition

Features and Components

The JS 600 FieldBook is a rugged, hand-held field computer that stores information in a data sheet format. The FieldBook is designed to perform the following tasks:

- Record data entered from the keyboard.
- Read and integrate data from digital sensors, bar code wands, and RS-232C devices.
- Perform mathematical and logical operations on the data.
- Transfer data directly to a desktop computer for long-term storage and analysis.

▲ Features

The hardware features of the FieldBook are listed below:

- Rugged, Waterproof Case
- 4 Line x 16 Character Display
- Sealed Membrane Keyboard with 21 keys
- 256K or 448K Internal Random Access Memory
- Serial RS-232C Port for Digital Input and Communications
- Rechargeable Nickel-Cadmium Battery Pack
- Lithium Backup Battery
- Real Time Clock

▲ Components

A standard FieldBook comes with the following components:

- JS 600 FieldBook
- Rechargeable Battery Pack
- SmartCharger Battery Pack Charger
- Utility Software Disk Containing Programming Tools
- User's Manual

If you purchased your FieldBook as part of a package, you should also receive a: carrying case, DATAPLUS EX™ software package, communication cable, and battery tester.

▲ Optional Accessories

The following optional accessories are also available:

- Bar Code Wands
- Digital Calipers
- Electronic Measurement Sticks
- Application Software Packages

Getting Started

Before you get started on your FieldBook application, you can familiarize yourself with the unique hardware, memory, and software features of the FieldBook. This manual:

- 1) Educates first-time users on how to use the FieldBook.
- 2) Points out potential time-saving methods and features that can streamline your data collection procedure.
- 3) Provides quick reference information for experienced users.

This manual was written with the assumption that you are familiar with the basic elements of programming and RS-232C communication protocol.

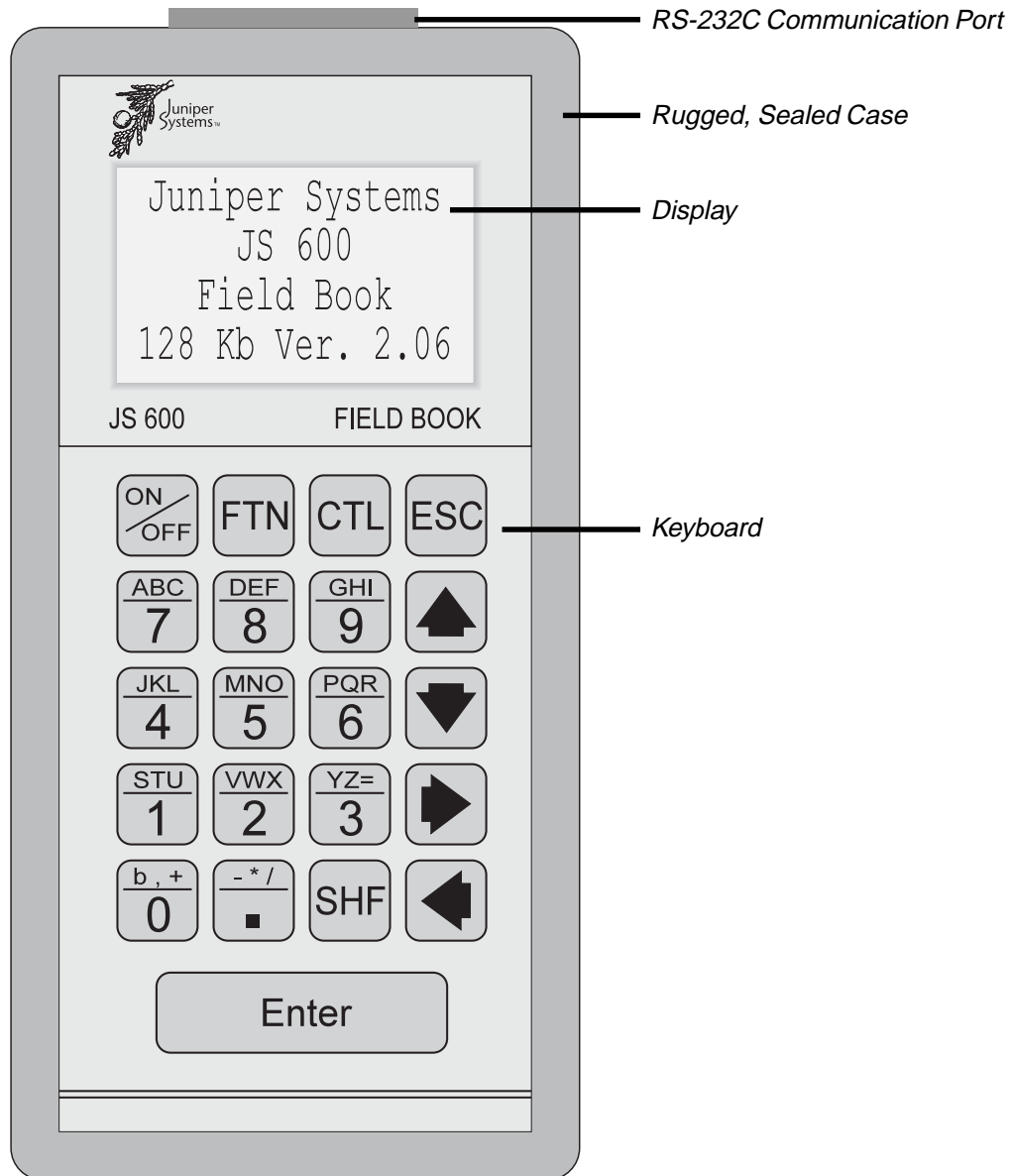
Section 2

Hardware Features

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- Enclosure
 - Keyboard
 - Display
 - Serial Communication Port
 - Batteries

Enclosure

The FieldBook's internal components are enclosed in an impact-resistant polycarbonate case. The case is sealed from moisture and dust with a neoprene rubber gasket, allowing the FieldBook to be used in harsh field conditions. To ensure a proper seal, the gasket should be cleaned periodically and replaced when it is worn out. Replacements are available from Juniper Systems.



Keyboard

The FieldBook has a rugged, sealed, membrane keyboard with tactile response. There are 21 keys that are 1/2 inch (1.27 cm) square. Key usage is described below.

On/Off Key: Toggles the FieldBook on and off.

Function Key (FTN): Used in custom programming. In an application program, the function key plus a numeric key can be used to spawn another activity. For example, <FTN> + <1> can be used to show a help menu for a data entry field. (See *Section 6, Programming the FieldBook*, for details.)

Control Key (CTL): Enables you to type characters not included on the keyboard by entering an ASCII code. The ASCII code is always a three-digit decimal number. Non-printable ASCII characters will appear on the display as odd symbols. A list of ASCII codes can be found at the end of *Section 7, PolyTools Program*.

Escape Key (ESC): Returns you to the MODE? prompt.

Alphanumeric Keys: To access the numbers printed on the bottom of the keys, simply press the key. To access the letters and symbols printed on the top of the keys, press the shift key in combination with the alphanumeric key. For example, <SHF> <ABC/7> yields the letter A. <SHF> <SHF> <ABC/7> yields the letter B.

Shift Key: Used to access the alphabetic characters and symbols printed on the top of the keys. Each time the shift key is pressed, a vertical bar is shown on the display. If the shift key is pressed 3 times in succession, 3 vertical bars are shown on the display.

Arrow Keys: Used to move the cursor around. Various operations use the arrow keys in different ways. For example, the right and left arrow keys scroll through the directory when you are in the File Directory Mode.

Enter Key: Causes the FieldBook to act on the command or data previously entered.

b (blank space): The small b (located on the top row of the 0 key) is used to create a blank space. Press <SHF> <b/0>.



Display

The FieldBook has a 4 line by 16 character liquid crystal display (LCD). Individual characters are 0.187 x 0.116 inches (4.75 x 2.95 mm) in size. The display is 1 inch deep x 2.38 inches wide.

When the FieldBook is turned on, the message shown below flashes on the screen, giving you the model number of the unit, the memory size, and the version number of the operating system.

```
Juniper Systems  
JS 600  
FieldBook  
256 Kb Ver. 2.06
```

Serial Communication Port

The FieldBook has a D type serial communication port with 25 pin contacts. The port is sealed against moisture and fitted with a soft plastic plug to protect the pins. A slide lock secures connectors when they are attached to the port.

The communication port handles the following:

❑ *Serial RS-232C Communication Signals*

The RS-232C serial port is used for transferring data between the FieldBook and a computer, modem, printer, or another FieldBook. It can also read data from measurement instruments which output information in RS-232C serial signals, such as bar code wands and scanners, electronic balances, and water quality sensors.

❑ *External Wakeup*

The ring indicator can wake the FieldBook up from a powered-down state to collect data based on an external event.

❑ *Battery Charging*

The main FieldBook batteries are charged through an AC battery charger which is connected to the communication port.

❑ *Digital Inputs and Outputs*

The digital inputs can read data from digital sensors such as the Water Content Reflectometer which measures the water content of porous media. The digital outputs can be used in control applications to open switches for activating alarms or other devices.

❑ *Clocked Serial Data Communications*

Data can be read from sensors with a clocked serial output such as the Mitutoyo Digimatic Caliper.

The connector pinouts are shown in *Section 8, Technical Reference, Serial Communication Port Connector Pinouts*.

Batteries

The FieldBook has two types of batteries:

- Ni-Cad Battery pack (main power supply)
- Lithium backup battery

▲ Battery Pack

The main power is provided by a rechargeable battery pack consisting of six AA nickel-cadmium (Ni-Cad) batteries.

Battery Life

Battery life during manual data entry can be anywhere from 20 to 40 hours. For other applications, battery life depends largely on what sensors are used and how much data processing you are doing. Here are some examples of the current draw during typical tasks:

<u>Activity</u>	<u>Power Consumption</u>
Powered down	0.25 mA
Waiting for input	12 mA
Processing data	25 mA

Fully charged Ni-Cad batteries have a life of 600 milliamp-hours. The formula for calculating the expected battery life in hours follows:

$$H = 600 / (.25A + 12B + 25C)$$

Where

- A = Fraction of time off
- B = Fraction of time on and idle
- C = Fraction of time processing

The shelf life of the battery pack is about three months (left in the FieldBook).

Battery Test Connector

The PW-645 Battery Test Connector is an optional accessory that allows you to check the battery pack voltage for your FieldBook. If you have a Battery Test Connector, refer to the *Appendix, FieldBook Battery Test Connector*, for instructions on how to use it. If you are interested in ordering one, contact Juniper Systems.

What Happens as Battery Voltage Drops

As the FieldBook is operating, drawing from the main power supply, it monitors the battery voltage. When the voltage drops below a pre-set threshold (voltage = 6.8), a low battery message is displayed. Each time you press <ESC> or <Enter> while executing a program or editing a data file, the following message is displayed:

CHARGE BATTERIES
CHARGE BATTERIES
CHARGE BATTERIES
CHARGE BATTERIES

Charge your batteries as soon as possible if you see this message. You usually have less than an hour of operating time left (depending on your application).

The FieldBook turns itself off if the battery voltage drops below 6.0 volts. Each time you turn it on, the same “CHARGE BATTERIES” message is displayed and the unit shuts down again. If the FieldBook is not charged, the main battery is eventually discharged and the lithium backup battery maintains all data and programs.

Recharging the Battery Pack

You should let the main batteries discharge just short of seeing the “LOW BATTERIES” message to get the most out of each charging. For units that are in short or long-term storage, the batteries should be charged about every six weeks.

The FieldBook comes with a SafeCharger battery pack charger (120 or 220 V AC) . To charge the batteries, plug the AC charging adapter into a 120 V or 220 V power outlet (depending on which model you have) and insert the connector into the serial port on top of the FieldBook. Refer to the *Appendix* for more information about how to use the SafeCharger.

Replacing the Battery Pack

Ni-Cad batteries can be recharged several hundred times, but the effective working life continually decreases. Eventually the battery pack will need to be replaced. Replacement battery packs are available from Juniper Systems.

The backup battery maintains the memory while you are changing the battery pack. Follow these steps to change the battery pack:

- 1) Turn the FieldBook off and lay it face down.
- 2) Loosen the six screws, pull the bottom of the case straight up, and rotate it over the top, being careful not to pull on the cable connecting the top of the case to the bottom.
- 3) At the lower left corner of the board, disconnect the white molex connector that leads to the battery pack.
- 4) Pull out the battery pack and replace it with a fresh pack.
- 5) Plug in the white molex connector of the new pack, being sure to align the pins properly.
- 6) Check the six hex standoffs which are mounted on the battery board and tighten them if necessary. Be sure the holes in the battery holder are aligned with the holes in the hex standoffs.
- 7) Before closing the case, check the rubber gasket for nicks, dirt, etc. Clean or replace it as necessary to ensure a proper seal.
- 8) Be sure to seat the six aluminum washers in place properly. Insert and tighten the screws until they are snug, but not over-tightened. The aluminum washers must not extend past the case edge. (Replacement washers are available from Juniper Systems.)

▲ Backup Battery

The backup battery is a half-sized AA lithium cell. This battery maintains the FieldBook's memory for 5 years, as long as the main batteries are kept charged.

What to Expect if Your Backup Battery Has Been Drained

If the backup battery is drained, memory is not maintained and program and data files are lost.

Replacing the Backup Battery

The backup battery is not user-replaceable. You must return your Fieldbook to Juniper Systems for replacement.

Section 3

Operating System

-
- Files
 - Operating Modes

Files

The FieldBook has four types of files as described below:

- ❑ **Data Files:** Where your data are stored. Data files are divided into a three-dimensional matrix of fields identified by the page, line, and column number. Data can be written into a data file from the keyboard or an external sensor.
- ❑ **Format Files:** Contain the configuration for data files, including the number of columns per line, the number of lines per page, column headings, and data types for each column.
- ❑ **Polycode Program Files:** Contain programs written in Polycode, the FieldBook's unique programming language.
- ❑ **System Program Files:** Special files supplied by Juniper Systems. These files are primarily used for specialized functions. For example, a system file is called to return the time from the real-time clock.

File Names

A filename can be any string of ten or fewer ASCII characters. Numbers and blanks may be leading or embedded in the string.

Examples: TREE.DAT TREE.FMT AB CD EF 123ABC TREES

Passwords

You can protect your files against accidental deletion with a password. To do this, include a slash (/) in the filename. Everything following the slash is the password. The filename, counting the slash and the password, may not exceed ten characters.

Example: TREE.D/123 (TREE.D is the filename and 123 is the password)

You can edit a file with a password without supplying the password, however, you must supply the password to erase it. (You need to remember your file passwords since there is no way to display them!)

Hiding Files

You can hide a file by giving it a name that begins with @ (<CTL> <0> <6> <4> on the FieldBook). A hidden file will not show up in the file directory unless it was the file most recently opened. To edit or transmit a hidden file, key in the filename, including the @. When you are finished with the file, you can hide it again by briefly opening and closing another file so it will no longer be the last file opened.

Example: @DATA.PGM (this file will not show up in the file directory)

Number of Files

The maximum number of files that will fit in the FieldBook directory is 255.

Operating Modes

All the functions of the FieldBook are accessed through the eight operating modes described in the chart below.

<u>Mode</u>	<u>Display</u>	<u>Function</u>
0	EXECUTE PROGRAM FILE:	Execute a Polycode program.
1	EDIT 1,2,3 DAT,FMT,PGM	Edit a data, format, or program file.
2	XMIT SER 1,2,3 DATA,FILE,MEM	Transmit data, a file, or a memory image through the serial port.
3	LOAD SER 1,2,3 DATA,FILE,MEM	Load data, a file, or a memory image into the FieldBook from another computer or FieldBook via the serial port.
4	FILE 1,2,3 DIR, ERA-F, ERA-D	Review the file directory, erase a file, or erase the data within a file.
5	SET 1,2 AUTOLOG, PROTOCOL	Set automatic logging or RS-232 communication protocol parameters.
6	TEST 1,2,3,4 PGM, ANA, DIG, MEM	Test program execution, analog sensors, digital I/O, or memory.
7	MISC 1,2,3 CLK, BAT, TERM	Set system clock/calendar, perform battery check, or emulate a terminal.

When you turn the FieldBook on you will see a sign-on screen followed by the following message:

MODE?

Simply enter the desired mode and submode number. For example, to edit a data file, enter a 1 at the MODE prompt then press 1 again to select DAT (data) as the file type. You are then prompted to select or enter a filename.

The modes are described in detail in this section. Additionally, the use of the modes is also described in the following sections of the manual:

<u>Mode</u>	<u>Described in This Section</u>
0 Execute Program	Section 6: Programming the FieldBook
1 Edit	Section 4: Using the Built-In Spreadsheet Feature
2 Transmit	Section 6: Programming the FieldBook Section 5: Sending and Receiving Information
3 Load	Section 7: PolyTools Application Development Program Section 5: Sending and Receiving Information
4 File	Section 7: PolyTools Application Development Program
5 Set	Section 4: Using the Built-In Spreadsheet Feature
6 Test	Section 5: Sending and Receiving Information Section 6: Programming the FieldBook

Cursor Movement Commands

The arrow keys are used to move the cursor around to select mode options and view or edit data in a file as described below:

<u>Action</u>	<u>Keyboard Entry</u>
Move down one line	<↓>
Move down 25 lines or to bottom of file	<SHF> <↓>
Move down to bottom of file	<SHF> <SHF> <↓>
Move up one line	<↑>
Move up 25 lines	<SHF> <↑>
Move to top of file	<SHF> <SHF> <↑>
Move one column or parameter to the right	<→>
Move all the way to the right on a line	<SHF> <→>
Move one column or parameter to the left	<←>
Move all the way to the left on a line	<SHF> <←>
Delete a line	<SHF> <SHF> <SHF> <↑>
Insert a line	<SHF> <SHF> <SHF> <↓>
Recover from keying errors	<←>
Edit data	Move to the data you want to edit, enter the new data, and press <Enter>
View list of files	Press the <←> or <→> to scroll through the list when asked for a filename. Highlight desired filename and press <Enter>.

▲ Mode 0: Execute Program

The Execute Program Mode is used to execute a Polycode program file. Instructions for using Mode 0 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter 0 for EXECUTE PROGRAM Mode.
0	EXECUTE PROGRAM FILE:	Enter the filename or select it using the right or left arrow key.
Filename <Enter>		The program is executed. What you see on the screen next depends on the program being run.

▲ Mode 1: Edit

The Edit Mode has three submodes: Mode 1-1 Edit Data File (EDIT DAT), Mode 1-2 Edit Format File (EDIT FMT), and Mode 1-3 Edit Program File (EDIT PGM).

Mode 1-1, Edit Data File

The Edit Data File submode is used to create a new data file or change the contents of an existing file. Note that if you are creating a new data file, a format file for it must exist or be created first (Mode 1-2). Instructions for using Mode 1-1 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 1 for EDIT Mode.
1	EDIT 1,2,3 DAT,FMT,PGM	Enter a 1 for submode DAT.
1	EDIT DATA FILE:	Enter a new filename or select an existing name using the right or left arrow key.
Filename <Enter>	FORMAT FILE:	Enter the format filename for this data file (only needed for new files)
Filename <Enter>	P 1 HEADING L 1	The page number, line number, and column heading are displayed as specified by the format file. In this example, you are on page 1, line 1. There is no data shown because this is a new file. If the data file already exists, the file pointer remains at the place it was left at when the file was last closed. You can now edit the data.

Mode 1-2, Edit Format File

The Edit Format File submode is used to create new format files or edit an existing format file. Instructions for using Mode 1-2 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 1 for EDIT Mode.
1	EDIT 1,2,3 DAT,FMT,PGM	Enter a 2 for submode FMT.
2	EDIT FORMAT FILE:	Enter a new filename or select an existing name using the right or left arrow key.
Filename <Enter>	# OF COL.	Enter the number of columns desired. The maximum allowed is 99.
Column Value <Enter>	LINES/PAGE	Enter the number of lines per page desired. The maximum allowed is 9,999
Line Value <Enter>	FORMAT C 1:N6	At this point, the following parameters can be set up: data format, field width, and number of decimal places. A default setting of N6 is shown for new files. You can edit the setting as follows: Format = Xn.d Where: X = A for alphanumeric data N for numeric data F for floating point data n = Total field width counting the decimal point d = Number of decimal places (optional)
Format Value <Enter> or just <Enter> to accept default value	PROMPT C 1:COL. 1	Enter the desired column heading for column 1 or accept the default heading of COL. 1 by pressing <Enter>.
Column Heading <Enter> or just <Enter> to accept default value	COL LEADER C 1:	Enter the string of characters you want to precede the data in column 1 when it is transmitted to a computer or printer. These are usually blank spaces or delimiter characters. The default is two blank spaces.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
Leader Value <Enter> or just <Enter> to accept the default value	FORMAT C 2:N6	You are now asked to set up the format, column heading, and column leader for column 2, and so forth, just like you did for column 1, until all the columns are set up.

Guide to Formatting Files

- You must set up a format file before you can set up a data file.
- You cannot use the same name for a format file and a data file. However, you can use an extension, i.e. LOG.DAT could be the data filename, and LOG.FMT the format filename.
- After you have created a format file, you can edit the column formats, leaders, and prompts. You cannot change the number of columns or the number of lines per page.
- After you have created a data file that uses a format file, you can change only the column leaders and prompts.
- To combine the same kind of data gathered by several FieldBooks, have each user record data using the same format.
- The same format file can be assigned to different data files.

Mode 1-3, Edit Program File

The Edit Program File submode is used to create a new program file or edit an existing program file. You can key a Polycode program directly into the FieldBook using Mode 1-3 or create the program using PolyTools or a text editor on a desktop computer and transfer it to the FieldBook via the RS-232 port (refer to *Section 6: Programming the FieldBook* and *Section 7: PolyTools* for details). Instructions for using Mode 1-3 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 1 for EDIT Mode.
1	EDIT 1,2,3 DAT,FMT,PGM	Enter a 3 for submode PGM.
3	EDIT PROGRAM FILE:	Enter a new filename or select an existing name using the right or left arrow key.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
Filename <Enter>	END: OPCODE L 1! 0	If the file already exists, you go directly into the first line of the program. If you are creating a new file, the screen shown in this example is displayed. An END statement is automatically supplied as the last instruction. Key in the first line of your program, entering either the opcode or mnemonic for the instruction. For this example, let's say the mnemonic is JNK.
JNK <Enter>	JNK: PARAMETER L 1!	You are asked to enter a parameter if one is required for the instruction you entered. In this example, the parameter required is the jump location (line number).
Parameter <Enter>	END: OPCODE L 2! 0	Enter the second line of the program, and so on until you have entered all the instructions.

Guide to Editing Program Files

- To insert a line in a program, press <SHF><SHF><SHF><↓>, then enter the appropriate opcode in place of the END statement.
- If you insert or delete a line, remember to change line number references in the Polycode parameter fields to match the renumbered program. You can use the NOP command as a place holder in a list of Polycode instructions if you need to delete an instruction so you do not have to change all the line number references in the subsequent lines in the program.
- It is much easier to modify a Polycode program using PolyTools on the computer and send the new version to the FieldBook for testing. The PolyTools mode "PolyTran" accepts symbolic labels, then translates them to actual line numbers during compilation.
- When you are satisfied the program file is correct, press <ESC> to compile the program.

▲ Mode 2: Transmit

The Transmit Mode has three submodes: Mode 2-1 Transmit Serial Data (XMIT SER DATA), Mode 2-2 Transmit Serial File (XMIT SER FILE), and Mode 2-3 Transmit Memory Image (XMIT SER MEM).

Mode 2-1 Transmit Serial Data

The Transmit Data submode is used to transmit the contents of a data file through the RS-232C port to another device. Instructions for using Mode 2-1 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 2 for XMIT SER Mode.
2	XMIT SER 1,2,3 DAT, FILE, MEM	Enter a 1 for submode DAT.
1	XMIT SER DATA FILE:	Enter the filename containing the file to be transmitted or select the name using the right or left arrow key.
Filename <Enter>	L 1 P 1 CP=D L=A R=B C=C S=D	“L 1 P 1” indicates the current line and page numbers. Data will be transmitted beginning at the current line. The bottom line shows the current settings of the line request, repeat request, continuous request, and stop request characters. In the upper right corner is the current parameter or the request character currently in force.

Guide to Transmitting Serial Data

- To initiate transmission, send a request character from the connected device or key it in on the FieldBook's keyboard.
- The output format depends on the format file associated with the data file (refer to Mode 1-2) and data transmission protocol settings (refer to Mode 5-2).
- The checksum, if enabled, and the end-of-line sequence trail each line, including column heading lines. One blank is output between the data line and the checksum. The blank is not counted in calculating the checksum.
- Column headings are transmitted at the top of each page if transmit prompts (XMIT PMTS) is set to Y in Mode 5-2.
- An end-of-page sequence is transmitted at the end of each page and an end-of-file sequence is transmitted at the end of the file.

Mode 2-2 Transmit Serial File

The Transmit Serial File submode is used to transmit a data, format, or program file through the RS-232C port to another device. Instructions for using Mode 2-2 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 2 for TRANSMIT Mode.
2	XMIT SER 1,2,3 DAT, FILE, MEM	Enter a 2 for submode FILE.
2	XMIT SER FILE FILE:	Enter the filename to be transmitted or select the name using the right or left arrow key.
Filename <Enter>	L 1 P 1 CP=D L=A R=B C=C S=D	“L 1 P 1” indicates the current line and page numbers. For format and program files, the page field is vacant. The entire file is transmitted regardless of the line number.

The bottom line shows the current settings of the line request, repeat request, continuous request, and stop request characters. In the upper right corner is the current parameter or the request character currently in effect.

Output Formats

DAT

<filename>

<format filename>

< Data lines with column leaders embedded; checksums follow >

< if CHECKSUM is set to Y; column prompts not sent even if >

< XMIT PMTS set to Y. >

&

FMT

<filename>

<lines per page>

< Column number, period; then column format, column >

< prompt, and column leader, delimited by asterisks. >

&

PGM

<filename>

< Polycode program with line number ending with a period, opcode, >

< mnemonic, and parameter delimited by blanks. >

&

Guide to Transmitting Serial Files

- ❑ To initiate transmission, send a request character from the connected device or key it in on the FieldBook's keyboard.
- ❑ Checksums, if enabled, follow each line in the body of a data file.
- ❑ An end-of-line sequence follows every output line. This is typically a carriage return followed by a line feed.
- ❑ One blank is output between the data and the checksum, but it is not counted when calculating the checksum
- ❑ An & is sent at the end of each file.

Mode 2-3 Transmit Serial Memory

The Transmit Serial Memory submode is used to transmit an image of the entire FieldBook memory in hexadecimal form through the RS-232C port to a computer or another FieldBook for reloading at a later time. Instructions for using Mode 2-3 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 2 for TRANSMIT Mode.
2	XMIT SER 1,2,3 DAT, FILE, MEM	Enter a 3 for submode MEM.
3	XMIT SER MEM	No action.
	CP=D L=A R=B C=C S=D	The bottom line shows the current settings of the line request, repeat request, continuous request, and stop request characters. In the upper right corner is the current parameter or the request character currently in force.

Guide to Transmitting Serial Memory

- ❑ To initiate transmission, send a request character from the connected device or key it in on the FieldBook's keyboard.
- ❑ The first line of the output file contains the total number of bytes being saved, expressed as a four-digit hexadecimal number.
- ❑ The final line is a four-digit hexadecimal checksum.
- ❑ The body of the memory image transmitted between the two checksums should be a block of 64 character lines of hexadecimal numbers. If the lines are longer or shorter than 64 characters, the memory image has not transmitted correctly to the connected device.

▲ Mode 3: Load

The Load Mode has three submodes: Mode 3-1 Load Serial Data (LOAD SER DATA), Mode 3-2 Load Serial File (LOAD SER FILE), and Mode 3-3 Load Serial Memory (LOAD SER MEM).

Mode 3-1 Load Serial Data

The Load Serial Data submode is used to load data from another computer or FieldBook into the FieldBook via the RS-232C port. Instructions for using Mode 3-1 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 3 for LOAD SER Mode.
3	LOAD SER 1,2,3 DAT, FILE, MEM	Enter a 1 for submode DATA.
1	LOAD SER DATA FILE:	Enter the filename the data is to be loaded to or select the name using the right or left arrow key.
Filename	SET START LINE L 1 P 1	“L 1 P 1” indicate the current line and page numbers. Data are loaded beginning at the current line and page. Use the up and down arrow keys to change the current page and line number if desired. To initiate loading, press <Enter>. Data scroll across the screen as they are loaded.

Guide to Loading Serial Data

- Before you load data into the FieldBook, you must set the FieldBook up to receive information. Refer to *Section 5, Communications*, for details.
- You must create a data file in the FieldBook before you can load the data.
- The input file must conform to one of the following formats:
 - Column leader length and data format match the format of the destination file exactly
 - Data fields are formatted to match destination file and are separated by commas; null fields may be included
- Column prompts or headings cannot be included in the source file.
- The end-of-line may be denoted by a carriage return or an input line terminator.
- The line length in the input file may exceed the maximum input line length, but the FieldBook ignores any characters in the transmitted lines which exceed the value set as the maximum line length.

Mode 3-2 Load Serial File

The Load Serial File submode is used to load a data, format, or program file from another computer or FieldBook into the FieldBook via the RS-232C port. Instructions for using Mode 3-2 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 3 for LOAD SER Mode.
3	LOAD SER 1,2,3 DAT, FILE, MEM	Enter a 2 for submode FILE.
2	LOAD SER FILE	The mating call is transmitted and the transfer begins. Each line of information appears on the lower line of the display as it is received.

Guide to Loading Serial Data

- Before you load a file into the FieldBook, you must set the FieldBook up to receive information. Refer to *Section 5, Sending and Receiving Information*, for details.
- If you are loading a file which includes one or several program files, the message "COMPILING" appears after each program file is loaded. If there are compilation errors in a program, the FieldBook displays an error message and stops transmitting.
- The format file which corresponds to a given data file must precede that data file during file transfer.
- Lines are separated by a carriage return (default) or an input line terminator.
- Files are delimited by a key word (FMT, DAT, or PTM) on the first line of each file and an ampersand (&) on the last line. A pound sign (#) is used instead of an & on the last line of the last file loaded.
- The line length in the input file may exceed the maximum input line length, but the FieldBook ignores any characters in the transmitted lines which exceed the value set as the maximum line length.

Input Formats for Format, Data and Program Files

```
FMT
<filename>
<lines per page>
< Column number, period, column format, column prompt,      >
< and column leader separated by any delimiter. Null column  >
< leaders are acceptable. Example:  1. *A8* Species * *      >
&
```

DAT

<filename>

<format filename>

< Correctly formatted data fields separated by either column >
< leaders or commas; null fields acceptable. >
&

PGM

<filename>

< Line number followed by a period, opcode, mnemonic, >
< parameter (if required), semi-colon, and comments, where >
< opcode, semi-colon, and comments are optional. String >
< constants in the parameter field may be enclosed in quotes. >
< Control characters in the parameter field are expressed as >
< ^x where ^ is the control and x represents the alphanumeric >
< portion of the control character. Example: carriage return, >
< line feed is represented in control characters as ^M ^J. >
&

Mode 3-3 Load Serial Memory

The Load Serial Memory submode is used to load a FieldBook memory image into the FieldBook from another FieldBook or computer through the RS-232C port. Instructions for using Mode 3-3 follow.

❖ *Caution: The entire contents of the FieldBook's memory is lost when a new memory image is loaded. Before you load a new memory image, make sure you save copies of data and programs you want to keep on another FieldBook or computer to be reloaded as needed.*

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 3 for LOAD SER Mode.
3	LOAD SER 1,2,3 DAT, FILE, MEM	Enter a 3 for submode MEM.
3	LOAD SER MEM	The mating call is sent and the memory image is loaded into the FieldBook.

Guide to Loading Serial Memory

- ❑ We recommend that you reset the FieldBook using the @@SYS/RESET connector before loading a memory image. Refer to Section 6, System Resest and @@SYS Inhibit Connector, for details. *Remember that the RESET connector erases everything stored in memory.*
- ❑ Before you load a a memory image into the FieldBook, you must set the FieldBook up to receive information. Refer to *Section 5, Communications*, for details.
- ❑ The input file (memory image) must have been generated by a FieldBook in Mode 2-3.

▲ Mode 4: File

File Mode is used to perform file maintenance tasks. There are three submodes: Mode 4-1 File Directory (FILE DIR), Mode 4-2 Erase File (FILE ERA-F), and Mode 4-3 Erase Data (FILE ERA-D).

Mode 4-1 File Directory

The File Directory submode displays a directory of all data, format, and program files. The name, type, size, associated format file, and the amount of space remaining in memory is shown. Instructions for using Mode 4-1 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 4 for FILE Mode.
4	FILE 1,2,3 DIR, ERA-F, ERA-D	Enter a 1 for submode DIR.
1	FILE: FILENAME TYPE BYTES FMT FILENAME	The filenames are displayed one by one. Scroll through them using the arrow keys. The name of the file is shown as well as the file type (format, data, or program), size in bytes, and associated format file (for data files). To see how much space is available in memory, continue to press the right or down arrow key until all the files have been displayed.
<Right Arrow> or <Down Arrow>, Repeatedly...	BYTES AVAILABLE TOTAL: PGM/FMT:	The total number of remaining bytes is displayed as well as the portion available for program files, format files, and the directory.

Mode 4-2 Erase File

The Erase File submode is used to erase a data, format, or program file. Instructions for using Mode 4-2 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 4 for FILE Mode.
4	FILE 1,2,3 DIR, ERA-F, ERA-D	Enter a 2 for submode ERA-F.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
2	ERASE FILE:	Enter the filename to be erased or select the name using the right or left arrow key.
Filename <Enter>	ENTER PASSWORD	If the file has a password, this screen is displayed. Key in the password.
Password <Enter>	SURE? (Y/N)	Press Y if you are sure you want to erase the file. Pressing any other key prevents erasing.
Y	DONE	The file has been erased.

Guide to Erasing Files

- When a file is erased, it will no longer be listed in the file directory.
- To erase a format file, you must first erase the associated data files which use the format file. If you do not, the FieldBook displays the message: FMT IN USE.

Mode 4-3 Erase Data

The Erase Data submode is used to erase the data in a data file without erasing the file header information. Instructions for using Mode 4-3 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 4 for FILE Mode.
4	FILE 1,2,3 DIR, ERA-F, ERA-D	Enter a 3 for submode ERA-D.
3	ERASE DATA FILE:	Enter the filename you want to erase the data from or select the name using the right or left arrow key.
Filename <Enter>	SURE? (Y/N)	Press Y if you are sure you want to erase the data from the file. Pressing any other key prevents erasing.
Y	DONE	The data have been erased.

Guide to Erasing Data

- Although the data are erased, the file still exists and the filename will be listed in the file directory.

▲ Mode 5: Set

The Set Mode has two submodes: Mode 5-1 Set Autolog (SET AUTOLOG), and Mode 5-2 Set Communication Protocol (SET PROTOCOL).

Mode 5-1 Set Autolog

The Set Autolog submode is used to set the scan interval, units of time, and start time for automatic data logging. Autolog is used to automatically turn the FieldBook on at a preset time and start a Polycode program. The program can alert you (by beeping) that it is time to enter data, or readings can be automatically taken from sensors with RS-232C output. Instructions for using Mode 5-1 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 5 for SET Mode.
5	SET 1,2	Enter a 1 for submode AUTOLOG.
1	LOG N/S/M/H L 1!N	Enter the units of time to be used for both the autologging interval and start time as follows: N = autolog not in use (default) S = seconds M = minutes H = hours
Units of Time <Enter>	INTERVAL L 1!0	Enter the scan interval between executions of autolog, in the logging units selected. The interval must be an integer less than sixty if logging units are minutes or seconds, and less than 24 if logging units are hours.
Scan Interval <Enter>	START TIME L 1!	Enter the hour, minute, or second you want autologging to start (based on the internal clock).
Start Time <Enter>		Autolog is now set. Press ESC to exit.

Guide to Setting Autolog

- Before autolog can be enabled, an autolog program must be written and stored in a program file named AUTOLOG. Otherwise, the following message is displayed when the FieldBook is turned off and autolog is returned to the default setting (off):

NO AUTOLOG PGM
AUTOLOG RESET

- The autolog start time is based on the internal 24-hour system clock. For example, if your logging units are minutes and your start time is 45, the FieldBook will execute the autolog program the next time the minute field of the system clock reads 45.

Mode 5-2 Set Communication Protocol

The Communication Protocol submode is used to set up the following communication parameters:

- Baud rate
- Parity
- Duplex
- Line request character
- Continuous request character
- Input line terminator
- Transmit delay
- End of line sequence
- End of file sequence
- Data bits
- Stop bits
- Transmit prompts
- Repeat request character
- Stop request character
- Input maximum length
- Checksum
- End of page sequence
- Mating call

Characteristics of the FieldBook's internal beeper are also set up in this mode.

Use the left ← and right → arrow keys to view each of the parameters. Instructions for using Mode 5-2 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 5 for SET Mode.
5	SET 1,2	Enter a 2 for submode PROTOCOL.
2	BAUD L 1!_9600	Enter the desired baud rate (bits transmitted or received per second). Valid entries are: 300, 600, 1200, 2400, 4800, 9600 (default), and 19200.
Baud Rate <Enter> or just <Enter> to accept default	DATA BITS 7/8 L 1!8	Enter the number of data bits desired per word. Valid entries are 7 and 8 (default).
Data Bits <Enter> or just <Enter> to accept default	PARITY E/O/N L 1!N	Enter the parity settings for transmitted data. The FieldBook does not check parity when receiving data. Valid entries are: E = Eighth parity bit set for even parity O = Eighth parity bit set for odd parity N = No parity (default)

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
Parity <Enter> or just <Enter> to accept defaults	STOP BITS 1/2 L 1! <u>1</u>	Enter the desired number of stop bits. Valid entries are 1 (default) and 2.
Stop Bits <Enter> or just <Enter> to accept default	DUPLEX L 1! <u>H</u>	Enter the duplex setting for transmissions. Valid entries are: H = Half duplex (default): in terminal mode, the character is displayed on the screen before being transmitted F = Full duplex: in terminal mode, the character is displayed on the screen only after being echoed back by the computer
Duplex <Enter> or just <Enter> to accept default	XMITS PMTS Y/N L 1! <u>N</u>	If you wish to transmit the column prompts at the top of each page, enter a Y for yes. The default is N, no column prompts.
Y <Enter> or just <Enter> to accept default	LINE REQ L 1! <u>A</u>	A line request character can be designated as any ASCII character. The FieldBook interprets a line request character received from either the keyboard or the I/O port as a prompt to transmit one line. The default is A.
Line request character <Enter> or just <Enter> to accept default	REPEAT REQ L 1! <u>B</u>	A repeat request character can be designated as any ASCII character. The FieldBook interprets a repeat request character received from either the keyboard or the I/O port as a prompt to transmit the last line transmitted again. The default is B.
Repeat request character <Enter> or just <Enter> to accept default	CONTINUOUS REQ L 1! <u>C</u>	A continuous request character can be designated as any ASCII character. The FieldBook interprets a continuous request character received from either the keyboard or the I/O port as a prompt to transmit the remainder of the data without pausing between lines. The default is C.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
Continuous req. character <Enter> or just <Enter> to accept default	STOP REQ L 1! <u>D</u>	A stop request character can be designated as any ASCII character. The FieldBook interprets a stop request character received from either the keyboard or the I/O port as a signal to interrupt transmission at the end of the current line. The default is D.
Stop request character <Enter> or just <Enter> to accept default	INP LINE TERM L 1!←	An input line terminator can be designated. While receiving data, the FieldBook watches for the input line terminator and interprets it as the end of the line of data. The default is a carriage return. Carriage return and line feed characters are represented by ← ↵ symbols on the display.
Input line terminator <Enter> or just <Enter> to accept default	INP MAX LENGTH L 1! <u>95</u>	The maximum line length can be designated. The FieldBook terminates a line of incoming data after it reads in the number of characters given by the input maximum length, provided it has not already read in a carriage return or the input line terminator. The default is 95, which is maximum.
Max. line length <Enter> or just <Enter> to accept default	TRANSMIT DELAY L 1! <u>0</u>	Enter the time, in tenths of a second, you want the FieldBook to wait before responding to a request to transmit data. The default is 0.
Transmit delay <Enter> or just <Enter> to accept default	CHECKSUM Y/N L 1! <u>N</u>	Enter a Y if you want to compute and transmit a checksum at the end of each line of data. The checksum is calculated as the sum of all ASCII codes in the line. It does not include the end of line sequence or the checksum itself. The default is N, no checksum.
Y <Enter> or just <Enter> to accept default	END OF LINE SEQ L 1!←↵	An end-of-line sequence can be designated that the FieldBook transmits at the end of each line of data. A character or sequence of up to ten characters can be used. The default setting is a carriage return followed by a line feed.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
End-of-line sequence <Enter> or just <Enter> to accept default	END OF PAGE SEQ L 1!←↵	An end-of-page sequence can be designated that the FieldBook transmits at the end of each page. A character or sequence of up to ten characters can be used. The default setting is a carriage return followed by a line feed.
End-of-page sequence <Enter> or just <Enter> to accept default	MATING CALL L 1!A	A mating call can be designated that the FieldBook will send to the connected device whenever it is ready to accept another line of data. A character or sequence of up to ten characters can be used. The default is A.
Mating call <Enter> or just <Enter> to accept default	BEEP TONE L 1!55	The pitch of the FieldBook's beep can be set, ranging from 1 (lowest pitch) to 80 (highest pitch). The default is 55.
Beep tone <Enter> or just <Enter> to accept default	BEEP TIME L 1!10	The duration of the FieldBook's beep can be set in hundredths of a second, ranging from 0 to 99. The default is 10. To turn the beep off, set the beep time to 0.
Beep time <Enter> or just <Enter> to accept default		

▲ Mode 6: Test

The Test Mode is used to test software, hardware, or memory. There are four submodes: Mode 6-1 Test Program (TEST PGM), Mode 6-2 Test Analog (TEST ANA), Mode 6-3 Test Digital I/O (TEST DIG), and Mode 6-4 Test Memory (TEST MEM).

Mode 6-1 Test Program

The Test Program submode is used to test a Polycode program. You can step through instructions in a program line-by-line. Mode 6-1 also allows you to view the values in the numeric stack and user registers after each instruction. To view these registers, use the arrow keys as follows:

<u>Action</u>	<u>Keyboard Entry</u>
See the next register	<→>
Jump ahead ten registers.....	<SHF> <→>
Jump ahead 19 registers	<SHF> <SHF> <→>
Jump ahead 28 registers	<SHF> <SHF> <SHF> <→>

<u>Action</u>	<u>Keyboard Entry</u>
Jump back to previous register	<←>
Jump back ten registers	<SHF> <←>
Jump back 19 registers	<SHF> <SHF> <←>
Jump back 28 registers	<SHF> <SHF> <SHF> <←>
Execute line	<↓>
Input a value, then execute line	<↓> <VALUE> <Enter>

Instructions for using Mode 6-1 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 6 for TEST Mode.
6	TEST 1,2,3,4 PGM, ANA, DIG, MEM	Enter a 1 for submode PGM.
1	TEST PROGRAM FILE:	Enter the filename to be tested or select the name using the right or left arrow key.
Filename <Enter>	1 OPN DATPGM REG A __.00000000	The top line shows the program line number (1), mnemonic (OPN), and parameter (DATPGM). The bottom line shows the register letter (A) and contents prior to executing the instruction (.00000000).

At this point, you can view the other registers using the right arrow key or press the down arrow key to execute line 1 and move on to line 2. If an instruction requires input, key it in and press <Enter>. Continue to execute your program until you have viewed each line.

<Down Arrow>
to execute line or
<Right Arrow> to
view registers

Guide to Testing Programs

- ❑ To change the contents of a register, bring the register onto the screen, enter the new value, and press <Enter>.
- ❑ Keep in mind as you are testing your program that the FieldBook has not yet executed the instruction shown on the display. In other words, the status of the registers you see is their condition before the instruction is executed. To execute the current statement, press the down arrow key.
- ❑ You cannot pass beyond JNK or JKY instructions while testing a program in mode 6-1. Substituting an NOP instruction temporarily for either instruction allows you to complete testing of the program.

Mode 6-2 Test Analog

The Test Analog submode is not applicable to this version of the FieldBook.

Mode 6-3 Test Digital

The Test Digital submode is used to test digital inputs and outputs. Instructions for using Mode 6-3 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 6 for TEST Mode.
6	TEST 1,2,3,4 PGM, ANA, DIG, MEM	Enter a 3 for submode DIG.
3	INPUTS 1234 OUTPUTS 3	The top line shows which of the four input channels are presently high on the serial connector. If no external device is attached, numbers 1 through 4 are displayed. The second line shows which of the three output channels are presently high. You can toggle the lines from high to low by pressing their corresponding numbers on the keyboard.

Mode 6-4 Test Memory

The Test Memory submode is used to test the Random Access Memory and make sure it is working properly. Instructions for using Mode 6-4 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 6 for TEST Mode.
6	TEST 1,2,3,4 PGM, ANA, DIG, MEM	Enter a 4 for submode MEM.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
4	PROM # RAM TEST	The prom number is a four-digit checksum that refers to the operating system version contained in your FieldBook.
	PROM # RAM GOOD	As the RAM is tested, memory addresses flash on the display. If the memory is good, the message RAM GOOD is displayed. If there is a problem with the memory, the message RAM BAD appears. Immediately download all files from the Fieldbook to a computer to avoid losing information and contact our customer service department.

▲ Mode 7: Miscellaneous

The Miscellaneous Mode has three submodes: Mode 7-1 Misc Clock (MISC CLK), Mode 7-2 Misc Battery (MISC BAT), and Mode 7-3 Misc Terminal (MISC TERM).

Mode 7-1 Misc Clock

The Misc. Clock submode is used to set the FieldBook's internal clock/calendar. Instructions for using Mode 7-1 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 7 for MISC Mode.
7	MISC 1,2,3 CLK, BAT, TERM	Enter a 1 for submode CLK.
	MO DA HR MN SC 7 31 12 10 47	The month (MO), day (DA), hour (HR), minutes (MN), and seconds (SC) are displayed on a 24 hour clock basis. To change a field, use the right arrow key to get to the field, key in the new number, and press <Enter>.

Guide to Setting the Clock

❑ Seconds run continually and cannot be set. If you change the minutes (MN) field, the seconds (SC) field is automatically reset to zero.

Mode 7-2 Misc Batteries

The Misc Batteries submode is not applicable to this version of the FieldBook.

Mode 7-3 Misc Terminal

In the Misc Terminal submode, the FieldBook functions as a terminal to another RS-232C device, such as a printer, computer, or another FieldBook. Instructions for using Mode 7-3 follow.

<u>Keyboard Entry</u>	<u>Next Message Shown</u>	<u>Action</u>
<ON>	MODE?	Enter a 7 for MISC Mode.
7	MISC 1,2,3 CLK, BAT, TERM	Enter a 3 for submode TERM.
3	–	A blank screen is initially displayed. As information is received from the connected device, it is displayed on the FieldBook. Information keyed in on the FieldBook keyboard is sent to the connected device.

Guide to Using the FieldBook as a Terminal

- Before you can use the FieldBook as a terminal, you must set the FieldBook up to receive and send information. Refer to *Section 5, Sending and Receiving Information*, for details.
- This mode can be used to test the communication link between the FieldBook and another RS-232C device.

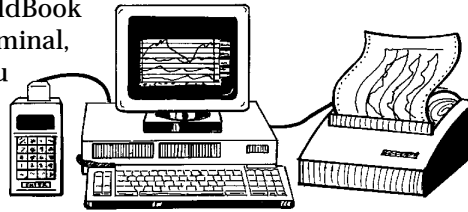
Section 5

Sending and Receiving Information

-
- Setting Up Communication With Another Device
 - Transmitting Information to Another Device
 - Loading Information From Another Device

Setting Up Communication With Another Device

You can transmit data and files directly from the FieldBook to another device, including a computer, printer, terminal, or another FieldBook using the Transmit Modes. You can also load information from another device to the FieldBook using the Load Modes. The Transmit Modes and Load Modes complement each other exactly.



To get the FieldBook to communicate with another device, you must complete these tasks:

- Make the appropriate hardware connections with an RS-232C cable.
- Set up the communication protocol parameters on the FieldBook and the other device so that a communication link can be established. If you are communicating with a computer, you can use the PolyTools transfer option, the Windows Terminal program, or any commercially available communication program.

▲ Hardware Connections

To connect the devices together, you must have a properly wired RS-232C communication cable. The appropriate cable is available as an optional accessory from Juniper Systems. A schematic of this cable can be found in the Appendix.

To connect the devices, plug the FieldBook end of the connector into the RS-232C communication port on the top of the FieldBook and the other end into the communication port on the other device.

▲ Communication Protocol Parameters

The next step is to ensure that the sending and receiving devices speak the same language. The values for baud rate, data bits, parity, and stop bits on the FieldBook and the other device must match to establish the communication link. You can change these parameters to match the settings on the other device or vice versa. The duplex and communication port settings do not have to match. A description of these parameters follows.

Baud Rate

The FieldBook will send or receive at rates of 300, 600, 1200, 2400, 4800, 9600, and 19200 bits per second. The default is 9600.

Data Bits

The FieldBook can send or receive either 7 or 8 bit characters. The default setting is 8.

Stop Bits

The FieldBook can send or receive either 1 or 2 stop bits. The default setting is 1.

Parity

The parity setting specifies how the FieldBook sets the bits before sending data. Valid entries include:

- E = Even parity
- O = Odd parity
- N = No parity (default)

Duplex

Valid duplex settings for transmissions include:

- H = Half duplex (default): in terminal mode, characters are displayed on the screen before being transmitted
- F = Full duplex: in terminal mode, characters are displayed on the screen only after being echoed back by the computer

Communication Port

There is one RS-232C communication port on the FieldBook (COM1). Select either COM1 or COM2 on your computer, depending on which port the cable is connected to.

Setting up the Parameters on the FieldBook

On the FieldBook, the communication parameters are set up in Mode 5-2, Set Communication Protocol. Refer to *Section 3, Operating System, Operating Modes, Mode 5: Set*, for details on how to use Mode 5-2.

Setting up the Parameters on a Computer

PolyTools

You can use PolyTools to set up the communication protocol parameters on the computer. The instructions in this manual assume you are using PolyTools. See *Section 7, PolyTools Application Development Program, Transfer Files*, for details.

Windows Terminal Program

If you have Windows on your computer, you can use the Windows Terminal program to set up communication with the FieldBook. In addition to the parameters listed previously, set up the following parameters to match the FieldBook's default settings:

Settings Menu

Communications Sub-menu

Flow Control: ● None

Text Transfers Sub-menu

Flow Control: ● Line at a Time.

Transfer a Line at a Time: ● Wait for Prompt String:

(Note: The Wait for Prompt String must be equal to the mating call on the FieldBook.)

Other Programs

You can also use a commercially available communication program or write your own.

▲ **Testing Your Setup in Terminal Mode**

A good way to test your hardware connections and communication protocol settings is to put the FieldBook in Mode 7-3, Terminal Mode. The FieldBook behaves like a terminal, sending characters keyed in on the keyboard out the communication port and displaying characters received from the other device. Refer to *Section 3, Operating System, Operating Modes, Mode 7: Misc*, for details on how to use Mode 7-3.

If the Device is a Printer or Terminal:

Hit a few keys on the FieldBook followed by <Enter>. The string of characters should be printed out by the printer or displayed on the terminal screen. Likewise, characters typed on the terminal keyboard should appear on the FieldBook's display.

If the Device is a Time-share Computer via Modem:

Call up your computer. You should be able to key in the account number and password.

If the Device is a Personal Computer:

PolyTools has a mode called Test Terminal Mode you can use to test the communication setup between the Fieldbook and a computer. Refer to *Section 7, PolyTools, Transferring Files, Test Terminal Mode* for details.

The Windows Terminal program can also be used to test communication.

Troubleshooting

If you see nonsense characters:

- Make sure that the baud rate, parity, stop bits, and number of data bits for the two devices match.

If you see nothing at all:

- Check the cable, making sure both connectors are plugged firmly in place. If you built your own cable, you may have a wiring problem.
- Make sure that the communication port is assigned properly on the computer.

Transmitting Information to Another Device

Once you have established communication, you can set the FieldBook up to transmit information to the other device. The FieldBook has three Transmit Modes:

Mode 2-1, Transmit Serial Data: Sends data from a data file

Mode 2-2, Transmit Serial File: Sends an entire format, data, or program file, including filename and type

Mode 2-3, Transmit Serial Memory: Sends an image of the entire FieldBook memory in hexadecimal form

In addition to using the Transmit Modes, you can transmit data using a Polycode program.

▲ Transmission Communication Parameters

Before you can transmit information from the FieldBook to another device, you need to set up the transmission communication parameters on the FieldBook. This is done in Mode 5-2, Set Communication Protocol. Refer to *Section 3, Operating System, Operating Modes, Mode 5: Set*, for details on how to use Mode 5-2. A description of the parameters follows.

Line Request Character

The FieldBook interprets the line request character when received from the keyboard or the RS-232C port as the signal to send one line of data. Any single ASCII character can be used. The device sends the line request character, then reads and stores the line of data sent in response by the FieldBook. The default character is A.

Repeat Request Character

The FieldBook interprets the repeat request character when received from the keyboard or the RS-232C port as the signal to retransmit whatever line was last transmitted. This parameter is useful if the FieldBook transmits over phone lines to a computer that can detect transmission errors. Any single ASCII character can be used. The default character is B.

Continuous Request Character

The FieldBook interprets the continuous request character when received from the keyboard or the RS-232C port as the signal to transmit data continuously until either the end-of-file is reached or until it receives another valid request character. This is the request character most often used. If you are sending data to a computer, use the continuous request only if you are controlling data flow with the RS-232C handshaking lines. Any single ASCII character can be used. The default character is C.

Stop Request Character

The FieldBook recognizes the stop request character as the signal to stop transmission at the end of the current line. Any single ASCII character can be used. The default character is D.

End-of-Line Sequence

The FieldBook transmits the end-of-line sequence at the end of each line. The end-of-line sequence can be up to 10 ASCII characters long. The default is a carriage return followed by a line feed (displayed as ←↵).

End-of-Page Sequence

The FieldBook transmits the end-of-page sequence after transmitting the last line on a page and the end-of-line sequence, subject to the following:

- When transmitting a response to a continuous request character, the FieldBook sends the end-of-page sequence after the last end-of-line sequence and before the data in the first line of the following page.
- If prompted line-by-line, the FieldBook sends the end-of-page sequence in response to a line request. It does not tack on the end-of-line sequence.

The end-of-page sequence can be up to ten ASCII characters long. If you are transferring data to a printer and want it to page up, set the end-of-page sequence to the ASCII form feed by pressing <CTL> <0> <1> <2> <Enter>. If you don't want anything transmitted, press <CTL> <0> <0> <0> <Enter>. The default setting is a carriage return followed by a line feed (displayed as ←↵).

End-of-File Sequence

The FieldBook sends the end-of-file sequence after it has transmitted the last line of a file, subject to the following:

- If prompted with the continuous request character, the FieldBook transmits the end-of-file sequence automatically.
- If transmitting line-by-line, the end-of-file sequence is sent in response to a line request.

The end-of-file sequence can be up to ten ASCII characters long. If you don't want anything transmitted, press <CTL> <0> <0> <0> <Enter>. The default setting is carriage return followed by a line feed (displayed as ←↵).

Transmit Prompts

If you want the column prompts to appear at the top of each page, set this parameter to Y (yes). Column prompts are transmitted only in Mode 2-1. The default is N (no).

Transmit Delay

The transmit delay is the amount of time, in tenths of a second, the FieldBook waits before responding to a request character. A computer uses this time to prepare to receive data from the FieldBook. A delay is especially useful when sending data to a printer with a limited buffer size. The default setting is 0.

Checksum

A checksum is the sum of ASCII codes for all the characters in a line of data, excluding the checksum itself. It provides a transmission error check if your computer is programmed to calculate its own sum on the incoming characters. If the sum on your computer does not match the sum sent by the FieldBook, an error has occurred. Your computer will request retransmission of the line by sending the repeat request to the FieldBook. If you want a checksum, set this parameter to Y (yes). The default setting is N (no).

▲ Coordinating the Devices

Transmitting to a Printer

Transmitting data to a printer is usually simple. Set the end-of-line sequence to a carriage return, line feed; or just a carriage return if your printer automatically supplies a line feed whenever it receives a carriage return. Turn the printer on and make sure the paper is properly installed.

Transmitting to a Computer

Via PolyTools

If you are using PolyTools to communicate with the FieldBook, execute PolyTools on the computer and get into the *Transfers Files, Upload From FieldBook* option. See *Section 7, PolyTools Application Development Program, Transfer Files*, for details.

Via Windows Terminal Program

If you are using the Windows Terminal program to communicate with the FieldBook, execute the program and get into the *Transfers, Receive Text File* option. Type in the name of the file you are transferring from the FieldBook and press OK.

Via a Communication Package

If you are using a communication program, refer to the instructions included with the program.

To a Computer With Standard Software Handshaking

Most computers use standard communication protocol to control the flow of data. The FieldBook supports a subset of the XON/XOFF communication protocols.

A computer using the XON/XOFF protocol issues XON to indicate that it is ready to accept data and XOFF to stop data transmission. XON and XOFF are ASCII characters DC1 (ASCII decimal 17) and DC3 (ASCII decimal 19), respectively. If your computer uses this protocol, set the FieldBook's continuous request character to DC1 and stop request character to DC3. When the computer issues XON, the FieldBook begins to transmit data continuously.

To a Computer Without a Program to Provide Communication or Standard Software Handshaking

If your computer does not have a program to provide communication through the serial port, you have to write one.

Sample program:

```
10 OPEN COM1: AS #1
20 OPEN DATAFILE AS #2
30 PRINT #1, A
40 INPUT #1, DATAS$
50 IF DATAS$ = EOF THEN END
60 PRINT #2, DATAS$
70 GO TO 30
80 END
```

The program transmits A as the line request character and checks each input line to see if it is the end-of-file character string. The FieldBook responds with a line of data followed by the end-of-line sequence.

Transmitting to Another FieldBook

Sending FieldBook

The transmission communication parameters must be set up on the sending FieldBook in Mode 5-2. To transmit information, the sending FieldBook must be in Mode 2-1 to transmit data, 2-2 to transmit a file, or 2-3 to transmit a memory image, as outlined in the following pages.

Receiving FieldBook

The communication parameters for loading must be set up on the receiving FieldBook in Mode 5-2. To load information, the receiving FieldBook must be in Mode 3-1 to load data, 3-2 to load a file, or 3-3 to load a memory image. Refer to *Loading Information From Another Device* later in this section.

▲ Mode 2-1: Transmitting Data From a Data File

You can transmit data from a data file to a computer, printer, or another FieldBook using Mode 2-1, Transmit Serial Data.

After you are sure that the FieldBook and the other device are communicating properly, enter Mode 2-1 on the FieldBook. The following screen is displayed:

XMIT SER DATA
FILE:

Enter the filename containing the data to be transmitted or select the name using the right or left arrow key.

```
L 1 P 1 CP=D
L=A R=B C=C S=D
```

“L 1 P 1” indicates the current line and page numbers. The bottom line shows the current settings of the line request, repeat request, continuous request, and stop request characters. In the upper right corner is the current parameter for the request character currently in force.

Data are transmitted beginning at the active line. Position yourself at the beginning of the file or selectively transmit sections of the file. Initiate transmission by keying in the line request or continuous request character, or executing your computer program so that it sends one of the request characters. The line number on the display is updated as each line is transmitted.

Refer to *Section 3, Operating System, Operating Modes, Mode 2:Transmit* for more details on using Mode 2-1.

▲ Mode 2-2: Transmitting a Serial File

You can transmit a format, data, or program file to a another device using Mode 2-2, Transmit Serial File.

After you are sure that the FieldBook and the other device are communicating properly, enter Mode 2-2 on the FieldBook. The following screen is displayed:

```
XMIT SER FILE
FILE:
```

Enter the filename to be transmitted or select the name using the right or left arrow key.

```
L 1 P 1 CP=D
L=A R=B C=C S=D
```

“L 1 P 1” indicates the current line and page numbers. For format and program files, the page field is vacant. The entire file is transmitted regardless of the line number. The bottom line shows the current settings of the line request, repeat request, continuous request, and stop request characters. In the upper right corner is the current parameter for the request character in force.

Initiate transmission by keying in the line request or continuous request character, or executing your computer program so that it sends one of the request characters. The line number on the display is updated as each line is transmitted.

Following are sample printouts of each type of file:

<i>Format File</i>	FMT FIELDFMT 14 1. *A4*ROW1** 2. *N5.1*HEIGHT** 3. *N5.1*%KILL** 4. *N5.1*LAI** &
<i>Data File</i>	DAT FIELDDAT FIELDFMT ROW1 14.0 25.0 1.5 ROW2 12.0 30.0 2.1 &
<i>Program File</i>	PGM FIELDPGM 1. OPN FIELDDAT ;Open the data file FIELDDAT 2. ENT ;Enter the row value 3. ICP ;Move column pointer to Height column 4. ENT ;Enter the Height value 5. END ;End &

Refer to *Section 3, Operating System, Operating Modes, Mode 2:Transmit* for more details on using Mode 2-2.

▲ Mode 2-3: Transmitting a Memory Image

Mode 2-3 is used to transmit a memory image from the FieldBook to a computer or another FieldBook. All the files, operating system variables, attributes, user registers, etc. are sent. The memory image can be reloaded onto the FieldBook as needed. This feature is also useful for loading a clone of one FieldBook's memory image onto another FieldBook.

Transmitting a Memory Image to Another FieldBook

If you are transmitting a memory image to another FieldBook, the FieldBooks must have identical memory sizes. Set the communication parameters up as follows:

- Set the mating call on the receiving FieldBook to match the line request character on the transmitting FieldBook.
- Set the input line terminator on the receiving FieldBook to match the end-of-line sequence on the transmitting FieldBook.

Operating Mode 2-3

After you are sure that the FieldBook and the other device are communicating properly, enter Mode 2-3 on the FieldBook. The following screen is displayed:

```
XMIT SER MEM
```

Then:

```
CP=D  
L=A R=B C=C S=D
```

The bottom line shows the current settings of the line request, repeat request, continuous request, and stop request characters. In the upper right corner is the current parameter for the request character currently in force.

Initiate transmission by keying in the line request or continuous request character, or executing your computer program so that it sends one of the request characters.

Refer to *Section 3, Operating System, Operating Modes, Mode 2:Transmit* for more details on using Mode 2-3.

▲ Transmitting Under Polycode Program Control

If Transmit Mode 2 does not meet your needs, you can write your own custom transmitting program in Polycode. For instance, if you wanted to transmit your data in some sorted order, you could create an index file in the FieldBook, then write a program to transmit lines in the order they appear in the index file.

A sample Polycode program to transmit a file line by line follows:

```
      OPN  FIELDDAT      ;Open data file
      CON  1             ;Load constant = 1 in A register
      PSH                     ;Load constant = 1 in B register
      PSH                     ;Load constant = 1 in C register
      SLC                     ;Set file pointer to top of file
      LCT                     ;Load total number of lines in B register and total
                          ;number of columns in A register
      POP                     ;Load total number of lines in A register
      STO  10            ;Store total number of lines in register 10
LOOP:  TRL                     ;Start loop, transmit line of data
      DJZ  10, DONE      ;If register 10 = 0 then go to label DONE
      ILP                     ;Increment line pointer (go to next line in data file),
      JMP  LOOP          ;Jump to start of loop
DONE:  CDS  0, 64        ;Label DONE, clear FieldBook display
      WID  16            ;Set display width to 16
      VUM  "Transmission" ;View message
      CDS  16, 0         ;Set cursor to beginning of second line
      VUM  "Complete"    ;Show message
      END                     ;Quit program
```

See *Section 6, Programming the FieldBook*, for details on how to write a Polycode program.

Loading Information From Another Device

The FieldBook has three Load Modes for loading information from a computer or another FieldBook:

Mode 3-1 Load Serial Data: Loads data into an existing data file

Mode 3-2, Load Serial File: Loads a data, format, or Polycode program file

Mode 3-3, Load Serial Memory: Loads a FieldBook memory image

▲ Communication Parameters for Loading

Before you can load information onto the FieldBook from another device, you need to set up the communication parameters for loading on the FieldBook. This is done in Mode 5-2, Set Communication Protocol. Refer to *Section 3, Operating System, Operating Modes, Mode 5: Set*, for details on how to use Mode 5-2. A description of the parameters follows:

Mating Call

The FieldBook sends a mating call to the connected device when it is ready to accept another line of information. The mating call can be a string of 1 to 10 characters (1 is most efficient). The default character is A.

Input Line Terminator

The input line terminator signals the FieldBook that the end of the data line being loaded has been reached. It is a single character, usually set to a carriage return, which is the default.

Input Maximum Length

The input maximum length is the maximum number of characters the FieldBook will accept in an incoming line of information. The maximum allowable number is 95, which is the default.

Default Parameters

The default settings for the communication parameters are adequate most of the time. If you decide to change them, remember that the FieldBook identifies the end of a line as the first occurrence of one of the following:

- A carriage return
- The input line terminator
- The maximum number of characters have been transmitted

▲ Coordinating the Devices

Loading From a Computer

Via PolyTools

If you are using PolyTools to communicate with the FieldBook, execute PolyTools on the computer and get into the *Transfers Files, Download to FieldBook* option. See *Section 7, PolyTools Application Development Program, Transfer Files*, for details.

Via Windows Terminal Program

If you are using the Windows Terminal program to communication with the FieldBook, execute the program and get into the *Transfers, Send Text File* option. Type in the name of the file you are transferring to the FieldBook and press OK.

Via a Communication Package

If you are using a communication program, refer to the instructions included with the program.

Loading From Another FieldBook

Receiving FieldBook

The communication parameters for loading must be set up on the receiving FieldBook in Mode 5-2. To load information, the receiving FieldBook must be in Mode 3-1 to load data, 3-2 to load a file, or 3-3 to load a memory image, as outlined on the following pages.

Sending FieldBook

The transmission communication parameters must be set up on the sending FieldBook in Mode 5-2. To transmit information, the sending FieldBook must be in Mode 2-1 to transmit data, 2-2 to transmit a file, or 3-3 to transmit a memory image, as outlined previously in this section.

▲ Mode 3-1: Loading Data Into a Data File

Mode 3-1, Load Serial Data, is used to load data from another computer or FieldBook into an existing data file on the FieldBook. This feature is handy when you have data, such as sample identifiers or historic information, you want to pre-load in specific columns of a file before you start collecting data in the field.

In mode 3-1, the FieldBook repeatedly issues the mating call, reads a line of data, stores it in the current line of the open file, and increments the line pointer. The download session terminates when the host fails to respond, the FieldBook is full, or <ESC> is pressed.

The FieldBook can successfully store data if the column leaders and field widths of the incoming data match the format of the destination file. Column headings should be removed from a file before it is transmitted to the FieldBook.

The FieldBook can also store values in a data file if the incoming data fields are delimited by commas. For example, suppose your data file was formatted for four columns having the formats N5.2, A4, N4, and N6.1. Assume you want to preload data into column two only. Your computer file could look something like the following:

```
,ABSX,  
,LARZ,  
,MUX,  
,EVRS,
```

The comma following the values is the delimiter for the end of the data to be loaded into the second column of the FieldBook data file. Note that the third line of data, MUX, did not fill the A4 field. The FieldBook will store the value MUX without any trailing blanks. If the comma was omitted, the four character field MUX_ would be stored, where _ indicates a blank.

The leading comma causes the FieldBook to skip column 1 and load the alphabetic characters in column 2. Since the carriage return received next signifies the end-of-line, the FieldBook increments the line pointer without writing anything into columns 3 or 4. Columns that are skipped are omitted in the file, not zeroed out. Thus, if you loaded the above file into a file all ready containing data, the old values in columns 1, 3, and 4 would remain.

Operating Mode 3-1

After you are sure that the FieldBook and the other device are communicating properly, enter Mode 3-1 on the FieldBook. The following screen is displayed:

```
LOAD SER DATA  
FILE:
```

Enter the filename the data is to be loaded to or select the name using the right or left arrow key.

```
SET START LINE  
L 1 P 1
```

“L 1 P 1” indicate the current line and page numbers. Data are loaded beginning at the current line and page. Use the up and down arrow keys to change the current page and line number if desired.

The FieldBook is now ready to receive a file. To initiate loading, press the appropriate keys required by the transmitting device. Each line of data scrolls across the FieldBook's display as it is being loaded.

For more information, refer to *Section 3, Operating System, Operating Modes, Mode 3-1: Load Serial Data* for more details on using Mode 3-1.

▲ Mode 3-2: Loading a File

Mode 3-2, Load Serial File, is used to load a data, format, or Polycode program file from a computer or another FieldBook. This features allows you to store programs for a given application on a computer and transfer them to the FieldBook as needed. You can also write Polycode programs on a computer using PolyTools or a text editor and load them onto the FieldBook, eliminating the need to key them directly into the FieldBook.

Loading Criteria

All Files

- If the file was created by the FieldBook in Mode 2-2, it will be properly formatted. If you created the file yourself, make sure it conforms to the proper FieldBook format requirements.
- If you are loading a data or program file and it has the same name as an existing file, the FieldBook writes over the existing file. A format file will not write over an existing format file if that format file is currently in use by a data file.

Format Files

- The format file for a data file must be loaded before the associated data file. The format file can be loaded in the same computer file as the data file. It must precede the data file and be separated from it by an ampersand.
- If a format file already exists in the FieldBook that is being used by a current data file, a new format file with the same name cannot be sent. An error message is displayed.

Program Files

- If the FieldBook detects an invalid instruction while loading a Polycode program file, it displays INPUT ERROR, replaces the instruction with NOP, and continues to load. You can correct the program later, but the program may not execute correctly due to the change in Polycode instructions.
- Program files are immediately compiled by the FieldBook. Compilation errors abort the loading process.
- Programs called in a GSB (go subroutine) command must be loaded before the calling program is loaded, or you will get a compilation error.

Operating Mode 3-2

After you are sure that the FieldBook and the other device are communicating properly, enter Mode 3-2 on the FieldBook. The following screen is displayed:

LOAD SER FILE

A mating call is sent from the computer to the FieldBook and from the FieldBook to the computer. The FieldBook begins to load the file. Each line of the file appears on the lower line of the display as it is received.

For more information, refer to *Section 3, Operating System, Operating Modes, Mode 3-2: Load Serial File* for more details on using Mode 3-2.

▲ Mode 3-3: Loading a Memory Image

Mode 3-3 is used to load a memory image onto the FieldBook from a computer or another FieldBook. All the files, operating system variables, attributes, user registers, etc. are loaded. This feature is useful for loading a clone of one FieldBook's memory onto another FieldBook.

Setting up Another FieldBook to Transmit a Memory Image to the FieldBook

If you are loading a memory image from another FieldBook, the FieldBooks must have identical memory sizes. The receiving FieldBook must be in Mode 3-3 and the sending computer in Mode 2-3. Set the communication parameters up as follows:

- Set the mating call on the receiving FieldBook to match the line request character on the transmitting FieldBook.
- Set the input line terminator on the receiving FieldBook to match the end-of-line sequence on the transmitting FieldBook.

Operating Mode 3-3

After you are sure that the FieldBook and the other device are communicating properly, enter Mode 3-3 on the FieldBook. The following screen is displayed:

LOAD SER MEM

A mating call is sent from the computer to the FieldBook and from the FieldBook to the computer. The FieldBook begins to load the memory image.

For more information, refer to *Section 3, Operating System, Operating Modes, Mode 3-3: Load Serial Memory* for more details on using Mode 3-3.

Section 7

PolyTools Application Development Program

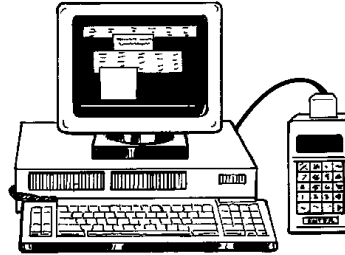
-
- ❑ Introduction
 - ❑ Creating and Editing Programs: Edit Mode
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 - ❑ Transferring Files: Transfer Files Mode
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 - ❑ Quit Mode
 - ❑ Editing Commands: Quick Reference
 - ❑ Polycode Error Messages

Introduction

PolyTools is an integrated application development program for JS 600 FieldBooks designed to simplify the creation and editing of Polycode programs. It is included on the Utility Software disk.

PolyTools, a menu driven program, assists you in performing the following functions:

- Creating new programs on a PC that can be used with the FieldBook.
- Editing existing FieldBook programs.
- Examining programs for syntax errors.
- Transferring files and data between a FieldBook and computer.
- Accessing DOS commands from within PolyTools.



▲ Installing PolyTools on the Computer

Hardware Requirements

PolyTools is written specifically for DOS-based computers, versions 2.10 or greater. The program requires a minimum of 350 K of free memory space. Optimum performance is obtained by running PolyTools from a hard disk. If a hard disk is not available, the program can also be run from a 3-1/2 or 5-1/4 inch disk drive.

Installation Program

The following files are included on the Utility Software disk:

INSTALL.EXE	Program to install PolyTools on a PC hard disk
PINSTAL.EXE	Archived files required for the installation of PolyTools
PINSTAL.CFG	Configuration file required for the installation program

To install PolyTools on a PC, follow these steps:

- 1) Place the Utility Software disk into a floppy disk drive (A: or B:).
- 2) Change to the floppy disk drive letter.
- 3) At the DOS prompt, type INSTALL and press <Enter>.
- 4) As instructed, enter the hard disk drive letter where PolyTools is to be installed and the desired path. The default drive and path is C:\PT.
- 5) Press <Enter> to start the installation procedure.

Executing PolyTools

To execute PolyTools, type <PT> at the DOS prompt and press <Enter>. After the program has finished loading, the license, serial number, and copyright is displayed on the screen. At the computer prompt, respond by striking any key to continue.

▲ PolyTools Programming Guidelines

Before you use PolyTools to develop Polycode programs, review the following programming guidelines:

Source Code and Object Code

Program files which have not been translated by PolyTran, the Polycode translator program described later in this section, are called source code files. Source code files usually end with a .P extension. Program files that have been translated by PolyTran are referred to as object code files. Use a .PGM extension at the end of object code filenames.

We recommend that you do not use line numbers in source code files. PolyTran automatically numbers the lines when it converts the source code file to an object code file. If you use line numbers in your source code files, PolyTran ignores them in the translation process.

Labels

PolyTools allows you to use a label before a line of code in source code files. It is possible, therefore, to use labels in jump instructions instead of line numbers, thus eliminating the need to recalculate the line numbers if lines of code are added or deleted. Development time is reduced and errors caused by miscalculated line numbers are eliminated. When PolyTran translates the source code into object code, it replaces all labels with their equivalent line numbers.

Labels are used to flag sections of code that are repeated in a loop or are accessed from a different section of the Polycode program. For example, if you had a section of source code you wished to return to, you could use the label, 'RETURN: ', before the first line of the section. A jump instruction, such as 'JNK', could use the label as a parameter. When PolyTran translates the source code file, the label is replaced by the actual line number. If code is added or deleted in the source code file, the source code can be translated again and PolyTran places the new line number for the JNK parameter into the object code file.

A label is placed at the beginning of the line of code and must be followed by a colon (:). The label can be 1 to 10 characters long, but cannot be a valid Polycode mnemonic or opcode instruction. Each source code file can define up to 100 labels.

INCLUDE Instruction

It is possible to have PolyTran insert other programs or files inside the program it is translating. When you edit your program, use the INCLUDE instruction, followed by the DOS filename of the program you are including. For example, you could save the format and data portions of the program as separate files and then have these files inserted as your main

program is being translated in PolyTran. You would insert an INCLUDE instruction for each file you want added, as follows:

```
INCLUDE <MYPROG.FMT>
INCLUDE <myprog.dat>
```

The INCLUDE statement must be in uppercase letters, but the filename can be in either lowercase or uppercase. The filename must be bracketed with the '<' and '>' symbols. The last Polycode subroutine in the file that you are including must end with an ampersand (&), not a pound (#) symbol. The ampersand may be placed at the end of the inserted file or it may immediately follow the INCLUDE statement in the calling program. If it follows the INCLUDE statement, no end-of file marker (& or #) should appear in the inserted segment.

An inserted file can also contain an INCLUDE statement which inserts a second file. This is called a nested INCLUDE statement.

There is no limit to the number of INCLUDE statements that can appear in a source code file, but the INCLUDE statements can only be nested 10 levels deep.

Size Limitations

PolyTools allows you to create large programs and files. These files can also be merged into a larger file called a project file (explained below). There are limitations on the DOS filenames, the number of lines of code for a program file, and the number of files in a project file.

Filenames

The names for files used with PolyTools must meet the same requirements as all DOS filenames. Names can be up to eight characters long with a three character extension. The DOS filename is not downloaded to the FieldBook. FieldBook filenames are declared immediately after the PGM statement and can be 1-10 characters long.

Number of Lines

Program files can have 1 to 250 lines of instructions. Format files are limited to 99 lines of format information. There is no line limit for data and system files.

Project Files

Program, format, and data files can be added together (concatenated) with the ampersand (&) symbol. The concatenated file is referred to as a project file. A project file has the following size limitations:

Maximum number of program files (PGM)	= 100
Maximum number of format files (FMT)	= 50
Maximum number of data files (DAT)	= 100

Using the Backslash with Data Files

PolyTran treats single semicolons as the beginning of a comment field and removes the semicolon and any remaining text on the line. If you wish to include a semicolon in your data (DAT) file, you must precede the semicolon with a backslash (\). PolyTran discards the backslash and prints the first character after the backslash. For example, the following text string is contained in the source data file: MIDDLE\;INITIAL. PolyTran translates the string as follows: MIDDLE;INITIAL. If the backslash had not been present in the source code, PolyTran would have removed the semicolon and the text string 'INITIAL.' If you need a backslash to appear in your object code data file, you must precede it with another backslash.

▲ PolyTools Menu Options

PolyTools has the following main menu options:

- *Edit*: Editor for writing and editing Polycode programs
- *PolyTran*: Translates Polycode source files into usable formats for the FieldBook
- *Transfer Files*: Communication module that lets you send or receive files or data
- *DOS*: Provides direct access to DOS from within PolyTools
- *Quit*: Exit PolyTools

When you execute PolyTools, the menu bar is displayed at the top of the screen as depicted below:

Edit	PolyTran	Transfer Files	DOS	Quit
F1: help		RETURN: sub-menu		

Moving Around the Screen

Menu options can be selected by using the right and left arrow keys to move the highlight bar to the desired option and pushing <Enter>. You can also type in the letter the option starts with, for example, type in a P to select the *PolyTran* menu. The current menu selection is always highlighted on the computer screen.

The following key commands are used often with PolyTools:

- <F1> Displays a help menu on the screen while in any menu or submenu option.
- <F2> Lets you view available options while in a PolyTools main menu or submenu.
- <F10> Saves communication parameters and exits to the previous menu level.
- <Esc> Backs up to the previous menu level.

Tutorial Program, SIMPDEM

Throughout this section, you will see references to a sample program called SIMPDEM. This program is included with PolyTools. If you wish, you can refer to it to help you learn how PolyTools works. Look for the italicized comments that begin with: ❖ *Tutorial*.

Creating and Editing Programs: Edit Mode

The *Edit* mode has two submode options: *Poly Edit* and *Select Editor*. *Poly Edit* is the PolyTools editor. The *Select Editor* submode option allows you to specify another text editor if you wish.

▲ Poly Edit Submode

Poly Edit is a full-screen editor which allows you to create new Polycode programs for the FieldBook. Additionally, you can modify or repair existing programs. *Poly Edit* is similar to MicroPro's WordStar and the editors found in most of Novell's products. If you have used these programs, the editing commands will be very familiar.

When the *Poly Edit* option is selected, you see the following screen:

Edit	PolyTran	Transfer Files	DOS	Quit
Poly Edit Select Editor				
Enter Filename: .P _____				
F1: help	F2: show files	ESC: exit	RETURN: accept	

If you are creating a new file, enter a filename at the prompt and press <Enter>. To edit an existing file, press <F2> to view a listing of the files. Scroll through the list until the desired filename is highlighted, then press <Enter>. The selected filename is displayed. Press <Enter> again to access the selected file.

❖ *Tutorial: If you wish to view the SIMPDEM.P sample program, select SIMPDEM.P from the list. Press <Enter> again and the program appears on the screen.*

A status line is displayed at the top of the screen as shown below:

Line n	Col n	Insert	Indent	<dir>:Filename
--------	-------	--------	--------	----------------

A description of the status parameters follows:

- Line n: The line number the cursor is currently on. The beginning of the file is line 1.
- Col n: The number of the column where the cursor is currently located. The columns are numbered from left to right.

- Insert: Insert mode is active. The character you type from the keyboard is inserted at the current cursor position. Insert mode can be toggled on and off by using the <Ins> key or by typing <Ctrl-V>. If the word "Insert" is not present on the status line, the editor is in Overwrite mode. As a character is typed from the keyboard, it overwrites the information present at the current cursor position.
- Indent: Indicates that the auto-indentation is on. The Indent mode can be toggled on and off by pressing <Ctrl-QI>.
- <Dir>:Filename: Indicates the filename and directory of the current file being edited.

Editing Commands

The PolyTools editing commands are issued by pressing the "Control" (Ctrl) key on the keyboard in conjunction with any other key from A to Z. The editing commands are described on the following pages. (A quick reference to the editing commands is included at the end of Section 7 for your convenience.)

Cursor Movement Commands

<Ctrl-S> or <Left Arrow Key>:

Moves the cursor one character position to the left. It is a non-destructive backspace. When the cursor reaches the left edge of the display, it stops.

<Ctrl-D> or <Right Arrow Key>:

Moves the cursor one character position to the right. It is a non-destructive forward space. When the cursor reaches the right edge of the video display monitor, the text starts scrolling until the cursor reaches the last column in the line (column 250).

<Ctrl-A> or <Ctrl-Right Arrow Key>:

Moves the cursor to the beginning of the word to the right of where the cursor was at the time the command was initiated.

<Ctrl-E> or <Up-Arrow Key>:

Moves the cursor up one line. The screen scrolls down one line if the cursor is at the top line of the screen.

<Ctrl-C> or <Down-Arrow Key>:

Moves the cursor down one line from its current position. The screen scrolls up one line if the cursor is at the bottom line of the screen.

<Ctrl-W>:

Scrolls up towards the beginning of the file, one line at a time. The cursor remains in position until the top of the screen is reached.

<Ctrl-Z>:

Scrolls down towards the end of the file, one line at a time. The cursor remains in position until the bottom of the screen is reached.

<Ctrl-R> or <PgUp> key:
Scrolls the cursor up by one screen to the beginning of the document.

<Ctrl-C> or <PgDn> key:
Scrolls the cursor down by one screen to the end of the document.

Rapid Movement Through the Text

The following commands allow you to move rapidly around the text. These commands require that two characters be entered in conjunction with the <Ctrl> key.

<Ctrl-QS> or <Home> key:
Moves the cursor to the first character on the current line.

<Ctrl-QD> or <End> key:
Moves the cursor to the end of the line which is the position following the last printable character on the line (trailing blanks are always removed from lines to preserve space.)

<Ctrl-QE> or <Ctrl-Home>:
Moves the cursor to the top of the editor screen.

<Ctrl-QX> or <Ctrl-End>:
Moves the cursor to the bottom of the editor screen.

<Ctrl-QR> or <Ctrl-PgUp>:
Moves the cursor to the beginning of the file which is the first character of the text.

<Ctrl-QC> or <Ctrl-PgDn>:
Moves the cursor to the end of the file which is the last character of the text.

<Ctrl-QB>:
Moves the cursor to the position of the Block Begin marker, which has been set with the <Ctrl-KB> command.

<Ctrl-QK>:
Moves the cursor to the position of the Block End marker, which has been set with the <Ctrl-KK> command.

<Ctrl-QP>:
Moves the cursor to the last position of the cursor. This command is useful to use after a Find or Find/Replace command.

Insert and Delete Commands

These commands let you delete and insert characters, words, and lines.

<Ctrl-V> or <Ins>:

Toggles between insert and overwrite mode while entering text. The current mode of operation is displayed on the status line. Insert mode is the default mode when the editor is entered. When you type characters on the keyboard, the existing text to the right of the cursor moves to the right while the new text is being typed in. Overwrite mode can be selected if you wish to replace old text with new text. In overwrite mode, characters are replaced by the new characters that are being typed at the location of the cursor.

<Back Space> key:

Deletes the character directly to the left of the cursor position. Any characters to the right of the cursor move to the left.

<Ctrl-G> or :

Deletes the character at the cursor position and moves any characters to the right of the cursor one position to the left.

<Ctrl-T>:

Deletes the word or portion of the word to the right of the cursor including the character at the cursor position.

<Ctrl-N>:

Inserts a line break at the cursor position. The cursor does not move.

<Ctrl-Y>:

Deletes the line the cursor is positioned on and moves any lines below the cursor up one line. After completion of the command, the cursor moves to the left edge of the window. Once a line has been deleted, there is no way to restore it other than typing it again.

<Ctrl-QY>:

Deletes all text from the cursor position to the end of the current line.

<Ctrl-KY>:

When a block is selected, deletes a block of text that has been defined using the marks for block beginning and end. Any text below the block moves up as many lines as were deleted by the block delete command.

Block Commands

Block commands are extended commands that require two keys in addition to the <Ctrl> key. A block of text can be any amount of text from one character to many pages. Blocks are marked by placing a Begin Block marker at the beginning of the block and an End Block marker at the end of the block. These blocks can then be moved, copied, written to a file, or deleted.

<Ctrl-KB>:

The beginning of the block is marked by this command. The marker itself is not visible on the screen. When the End Block marker is set, the block becomes highlighted.

<Ctrl-KK>:

The end of the block is marked by this command. The marker itself is not visible on the screen. If the Begin Block marker is set, the block becomes highlighted.

<Ctrl-KH>:

This command causes the visual marking (highlight) of a block to be toggled either on or off. Block commands such as copy, move, delete, or write to a file only work when the block is displayed. The command that moves the cursor to the beginning or end of a block works whether the block is hidden or displayed.

<Ctrl-KC>:

Causes the marked and displayed block to be copied to the current insertion point. The original block is left unchanged, and markers are placed around the new copy of the block.

<Ctrl-KV>

A marked and displayed block is moved from its original position to the current cursor position. The block is removed from its original position, and the markers remain around the block at its new position.

<Ctrl-KY>

Deletes a marked and displayed block. There is no provision to restore a deleted block.

<Ctrl-KR>:

This command is used to read a file into the current text at the current cursor location. The file that is read is marked as a block. When this command is used, you are prompted for the name of a file to read.

<Ctrl-KW>:

This command is used to write a marked block to a file. The block is left unchanged, and the markers remain in place. The command prompts you to enter the name of the file the block is to be written to. If no block is marked, nothing will happen. Do not name the file with a file extension .BAK.

Miscellaneous Editing Commands

<Ctrl-KD>:

Saves the file that is currently being edited and gives the original file the extension .BAK.

<Ctrl-I> or <Tab> key:

There are no fixed tab positions in the PolyTools editor. Tab positions are automatically set to the beginning of each word on the line just above the cursor. This is useful when making notes

and outlines because columns of related items can be lined up.

<Ctrl-QI>:

When Auto Indent is active, the message "Indent" is displayed on the status line. When it is inactive, the message is removed. It provides automatic line indentation when active, that is, the indentation of the current line is repeated on each of the following lines. When you want to change the indentation, use any of the cursor movement commands to select the new column.

▲ Select Editor Submode

If you wish to use another text editor instead of *Poly Edit*, select the *Select Editor* option on the Edit submenu. The following screen appears:

Edit	PolyTran	Transfer Files	DOS	Quit
Poly Edit Select Editor				
Enter Filename : _____ Command Line Parameters : _____				
F1: help		ESC: back up		RETURN: accept

The first line prompts you to enter the DOS directory path and the full name of the text editing program you want to use in place of *Poly Edit*. For example, if the program was in a subdirectory with the path C:\DOS and the program name was EDIT.COM, you would type:

C:\DOS\EDIT <Enter>

The second line is the DOS command line instructions for setting parameters. These parameters are dependent on the editor you are using. Enter the required parameters and press <Enter>. You will return to the *Edit* menu. (If you do not wish to set any parameters, just press <Enter> to return to the *Edit* menu.)

The selected editor is the default editor until you change it with *Select Editor*. Each time you load PolyTools and select *Poly Edit*, you automatically enter your text editor instead of the PolyTools editor. If you entered any parameters on the second line, they also remain in effect. When you quit your text editor, you will return to the PolyTools main menu.

Writing/Editing a Polycode Program

Once you are in *Poly Edit* or the alternate editor you have chosen to use and have entered the name of your file, you are ready to begin writing a Polycode program. Refer to Section 6 for details on Polycode programming.

When the program is complete, press <Ctrl-KD> to save it. You are now ready to translate it using *PolyTran*.

Translating Programs: PolyTran Mode

PolyTran prepares the program you created in the *Edit* mode for rapid downloading to the FieldBook by performing the following functions:

- ❑ Stripping comments and extra spaces from the program.
- ❑ Adding line numbers to the program.
- ❑ Replacing labels with line numbers.
- ❑ Checking the program for syntax errors.

▲ Operation

Select *PolyTran* from the main menu. The following information appears in the center of the screen:

```
Input File:  Filename.P
Output File: Filename.Pgm
```

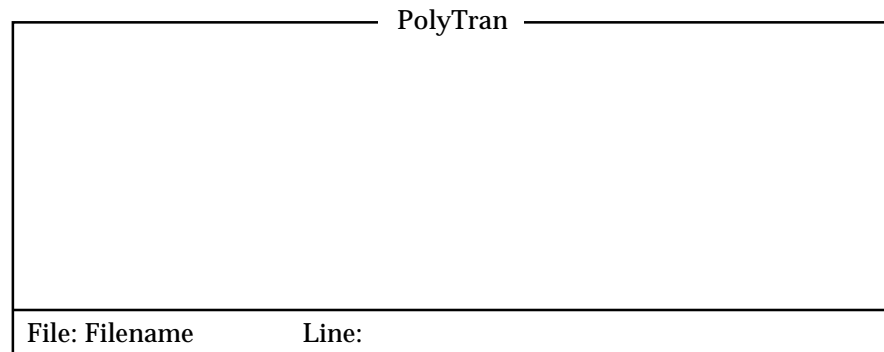
PolyTran automatically places the name of the program you just created or edited into the Input File field.

❖ *Tutorial: If the SIMPDEM.P sample program was the last file opened, the input filename SIMPDEM.P and output filename SIMPDEM.PGM is automatically placed on the screen.*

If you want to translate a different program, type the desired filename in place of the displayed filename or press <F2> to display a list of the existing files, scroll to the desired filename, and press <Enter>. The selected filename is automatically placed in the Input File.

Once the input filename is correct, press <Enter> again. The program prompts you for an output filename. The program automatically places the same filename in the output file field, including the .PGM extension, identifying it now as a FieldBook program file. If you wish to change the filename, you may do so by typing the new filename, followed by the .PGM extension.

To execute *PolyTran* and begin translating the program, press <Enter>. The following screen appears:



It may take a few minutes for *PolyTran* to execute, depending on the length of the program. While *PolyTran* is executing, messages appear in the message screen. The numbers of the lines being translated is also displayed.

Upon completion, the lower screen shows the final line number. If no errors were detected, the following message is displayed on the screen:

```
total 0 error(s) and 0 warning(s)
any key to continue...
```

Error Codes and Warning Messages

If errors are found in your program, *PolyTran* displays the line numbers, the error numbers, and a description of the errors. A list of error codes and warnings and their corresponding messages is included at the end of Section 7. Warnings about potential problems are also displayed in the message screen. For example, if you created a program and left off the mnemonic END, the message screen would appear as follows:

```
ERROR 1033:Line 51 in File Filename
-->no END statement
total 1 error(s) and 0 warning(s)
any key to continue...
```

The line number may be off by one line because the error may not be detected until *PolyTran* has moved to the next line.

The error codes and warnings are written out to an error file labeled with the same filename as the program file and the extension .ERR.

Correcting a Program File

To repair a program file, exit *PolyTran* and return to *Edit*. Do not attempt to edit the translated program file. Edit the original source code file and then translate the file again.

After you have saved the edited file, return to *PolyTran* to re-translate it. Even though your original program was incorrect, *PolyTran* saved the translated file. The program name automatically appears in the Input File field. You want to “overwrite” (replace) the saved, translated file with the corrected version. Press <Enter> twice to select the displayed file. The following message appears in the bottom of the screen:

File already existed. Overwrite it? (Y/N) _____

Type <Y> to translate the file again.

If you do not receive any more error codes or warning messages, you are ready to download the program into your FieldBook.

❖ *Tutorial: To see what the SIMPDEM program looks like after it is translated, enter the Poly Edit submode and open the SIMPDEM.PGM file. You will see that line numbers have been added and comments have been removed.*

Transferring Files: Transfer Files Mode

The *Transfer Files* mode can be used to send or receive data and files between a FieldBook and a computer.

▲ Hardware Connections

For your FieldBook to communicate with a computer, you must have a properly wired RS-232C communication cable. The appropriate cable is available as an optional accessory from Juniper Systems. Refer to *Section 5, Sending and Receiving Information*, for details regarding the cable.

▲ Communication Parameters

To communicate with each other, both the FieldBook and the computer must be set up with the same communication parameters (baud rate, parity, data bits, stop bits, communication ports, and mating call).

Setting up the Computer

The communication parameters for the computer are set up within PolyTools. Select *Transfer Files* from the main menu. The following submenu appears:

Edit	PolyTran	Transfer Files	DOS	Quit
		Set up Parameters Test Terminal Mode Send to FldBook Rcv from FldBook View Transfer Choose Mating Call		
F1: help		ESC: back up		RETURN: accept

Select the *Set up Parameters* submenu option. The following submenu screen appears:

Baud Rate	Parity	Data Bits	Stop Bits	Comm Port
9600	NONE	8	1	COM1
9600	NONE	8	1	COM1
4800	ODD	7	2	COM2
2400				
1200				
600				
300				
F1: help F2: modify F10: exit ESC: abort				

The default values for the communication parameters are shown. To view the options for each parameter (shown in the graphic above), highlight the displayed value and press <F2>. To change a parameter, scroll up and down the list, highlight the desired parameter, and press <Enter>. For example, if you wish to modify the baud rate to 4800 (to slow the transfer of information), highlight 9600 with the highlight bar, press <F2>, use the down arrow key to highlight 4800, and press <Enter>. To save the value you selected, you must press <F10> before returning to the *Transfer Files* submenu.

Choose Mating Call

Another communication parameter that must correspond with the FieldBook is the mating call. Select the *Choose Mating Call* submenu option. Key in the correct mating call character and press <Enter>.

Viewing Information as it is Transferred

If you wish, you can view information as it is being transferred on the computer display. Select the *View Transfer* submenu and highlight *Yes*. Keep in mind that the transfer time increases if you choose to do this. If you do not wish to view the information while it is transmitting, select *No*.

Setting up the FieldBook

On the FieldBook, the communication parameters are set up in Mode 5-2, Set Communication Protocol. Refer to *Section 3, Operating System, Operating Modes, Mode 5: Set*, and *Section 5, Sending and Receiving Information* for details.

Test Terminal Mode

If the baud rate, parity, data bits, stop bits, communication port, and mating call parameters set up on the computer and FieldBook match, you are able to send information between them in *Test Terminal Mode*.

Select the *Test Terminal Mode* submenu option. The following screen appears:

Receive
Send
Esc: Finish

Connect the FieldBook to the computer with the proper RS-232 communication cable. Turn on the FieldBook and get into *Terminal Mode* by invoking Mode 7-3.

Press any character on the FieldBook. The same character you typed in should be displayed on the Receive portion of the computer screen. Press any key on the computer keyboard. This character should be displayed on the FieldBook screen. If the character you typed is displayed on the Send or Receive portion of the computer screen and on the FieldBook screen, the parameters are set up correctly and the machines are communicating. If the characters do not match, check the communication parameter settings on the FieldBook and the computer and make the necessary corrections. If you are still unable to establish communication, check your cable connections and the settings for the port.

You are now ready to transfer files between the computer and the FieldBook.

▲ Sending Files From the Computer to the FieldBook

Setting up the Computer to Send Information

To send a file from the computer to the FieldBook, select the *Send to FldBook* submenu. The following information is displayed on the screen:

Enter Filename: _____
F1: help F2: show files ESC: exit RETURN: accept

To view a listing of files, press <F2>. Scroll through the list until the desired filename is highlighted, then press <Enter>. The selected filename is displayed. You can also type in the name of the file followed by the proper filename extension and press <Enter>.

❖ *Tutorial: If you wish to transfer the sample program to the FieldBook, select SIMPDEM.PGM from the list of files, then press <Enter>.*

Once the filename has been selected, the following message appears on the screen:

“Hit any key to start downloading...”

If you strike a key now, you will see the message:

“Waiting for mating call “xxx” (mode 3-n)...”

The computer is now ready to send the file to the FieldBook.

Setting up the FieldBook to Receive Information

Before you can load information onto the FieldBook from a computer, you need to set up the communication parameters for loading. This is done in Mode 5-2, Set Communication Protocol. Refer to *Section 3, Operating System, Operating Modes, Mode 5: Set*, for details on how to use Mode 5-2. Once the communication parameters are set up, get into Mode 3, Load. Select the type of information the FieldBook is going to receive (refer to *Section 3, Operating System, Operating Modes, Mode 3: Load* and *Section 5, Sending and Receiving Data* for more information). The FieldBook is now ready to accept information.

Sending a File to the FieldBook

Strike any key on the computer to begin sending the file. If the *View Transfer* option is on, the information being transmitted is displayed line by line in the message box on the computer.

After the file is sent, the following message is displayed on the computer:

“Transmission COMPLETED; press any key to continue...”

Check the file directory on your FieldBook (Mode 4-1) to ensure that the file was received. If the file was not received, double check the communication parameters on both the computer and FieldBook, make sure the cable is connected to the correct ports, and be sure that the computer was initiated before the FieldBook.

Executing the Program

Once you have successfully sent a program to the FieldBook, you can execute the program and begin using it.

❖ *Tutorial: If you wish to run the SIMPDEM sample program on the FieldBook, at the MODE? prompt press <0> to enter the Execute Program mode. Press <Enter> to start the program. You see a message on the screen accompanied by a song. You can exit the program by pressing <ESC> on the FieldBook.*

▲ Receiving Files From the FieldBook

Files and data can also be transferred from the FieldBook to the computer. For example, you can key in data in the field and later transfer it to the computer for analysis and report generation. You can use PolyTools on the computer to receive the data files.

Setting up the Computer to Receive Information

Once you have set up the communication parameters and verified that the FieldBook and computer are communicating with each other (as outlined in the preceding pages), select the *Rcv from FldBook* submenu option from the *Transfers Files* menu. The following screen is displayed:

Enter Filename: .DAT _____

Enter a filename in which the information received from the FieldBook will be saved. PolyTools automatically enters a file extension .DAT for this filename. You can overwrite this extension if desired. Press <Enter> and the following message is displayed on the screen:

“Hit any key to start transmission...”

Strike any key. The computer is now ready to receive information from the FieldBook.

Setting up the FieldBook to Send Information

To set up the FieldBook to send information to the computer, turn the FieldBook on and select *Mode 2, Transmitting Operations*. Select the type of file to send to the computer (refer to *Section 3, Operating System, Operating Modes, Mode 2: Receiving* and *Section 5, Sending and Receiving Data* for more information).

The FieldBook asks you for a filename. Key in the filename (a file extension is not used) or use the right or left arrow keys to scroll through a list of files and select the desired file.

Starting the Upload Operation

Press <Enter> then <SHF> <SHF> <SHF> <C> on the FieldBook to begin transmission to the computer. If the *View Transfer* option is on, the information being transmitted is displayed line by line in the message box on the computer. When the transfer is complete, the following message is displayed on the computer:

“Transmission COMPLETED; any key to continue...”

Check the file directory on the computer to ensure that transmission has occurred. If the file was not received, double check the communication parameters on both the computer and FieldBook and make sure the cable is connected to the correct ports.

DOS Mode

PolyTools allows you to access DOS directly so you may change drives, delete files, change filenames, etc. Select DOS from the main PolyTools menu. The following screen is displayed:

```
Enter EXIT to return to PolyTools.
```

```
Microsoft MS-DOS Version (X.XX)  
Copyright Microsoft Corp 1981-1987
```

```
(POLYTOOLS)[DEFAULT DRIVE]:>
```

Upon completion of your DOS tasks, you can return to PolyTools without having to reload the program by typing <EXIT> then pressing <Enter>.

Quit Mode

Use the *Quit* menu option to exit from PolyTools. Select *Quit* from the main menu. The following message is displayed:

“Exit? (Y/N)”

To exit PolyTools, press <Y> and you return to DOS.

◆ *Note: if any communications parameters were changed in the Transfer Files mode, the new parameters are automatically saved upon quitting PolyTools if the current directory contains the PT.EXE file. Also, any changes made in Select Editor mode are saved and the new editor becomes the default editor in PolyEdit.*

Editing Commands: Quick Reference

Moving the cursor UP or DOWN, RIGHT or LEFT

<Ctrl-E>	Move the cursor one line up
<Ctrl-R>	Move the cursor one screen up
<Ctrl-QR>	Move the cursor to the top of the file
<Ctrl-X>	Move the cursor one line down
<Ctrl-C>	Move the cursor one screen down
<Ctrl-QC>	Move the cursor to the end of the file
<Ctrl-S>	Move the cursor one character left
<Ctrl-D>	Move the cursor one character right
<Ctrl-A>	Move the cursor to the first character of the current line (if the cursor is already on the first character, it moves to the last character on the previous line)
<Ctrl-F>	Move the cursor to the last character of the current line (if the cursor is already on the last character, it moves to the first character on the next line)

Quick Cursor Movement

<Ctrl-QF>	Move the cursor to any character, word, or phrase specified
<Ctrl-QB>	Move the cursor to the beginning of a marked block
<Ctrl-QK>	Move the cursor to the end of a marked block
<Ctrl-QP>	Move the cursor back to the cursor position before the last command
<Ctrl-QV>	Move the cursor back to the cursor position before the last find replace command

Scrolling the Text

<Ctrl-W>	Scroll one line up
<Ctrl-R>	Scroll one screen up
<Ctrl-QW>	Scroll continuously up, line by line
<Ctrl-QQR>	Scroll continuously up, screen by screen
<Ctrl-Z>	Scroll one line down
<Ctrl-C>	Scroll one screen down
<Ctrl-QZ>	Scroll continuously down, line by line
<Ctrl-QQC>	Scroll continuously down, screen by screen

Miscellaneous Editing Commands

<Ctrl-V>	Turn insertion mode on/off
<Ctrl-QI>	Toggle auto-indent mode on/off
<Ctrl-B>	Reformat paragraphs, one paragraph at a time
<Ctrl-OR>	Set the right margin
<Ctrl-OL>	Set the left margin

Miscellaneous Editing Commands (continued)

<Ctrl-QL> Undo the editing (will not restore deleted lines)
<Ctrl-KD> Save the file and end the edit session

Deleting to the LEFT or RIGHT

 Delete the character at the cursor position
<Ctrl-G> Delete the character at the cursor position
<Back Space> Delete the character to the left of the cursor position
<Ctrl-T> Delete to the end of the word
<Ctrl-QY> Delete to the end of the line
<Ctrl-QDEL> Delete to the start of the line
<Ctrl-Y> Delete the entire line

Deleting Specified Text

<Ctrl-KY> Delete a marked block

Searching and Replacing

<Ctrl-QF> Find the specified character, word or phrase
<Ctrl-QA> Find the specified character, word, or phrase and replace
<Ctrl-L> Repeat the last Find or Replace command
<Ctrl-QV> Move the cursor to the last Find or Replace
<Ctrl-QB> Find the beginning of a marked block
<Ctrl-QK> Find the end of a marked block
<CTRL-QF> Find the nth occurrence.

Search and Replace Command Options:

B Search backwards
G Global search and replace
N Replace without asking for OK
W Search for whole words only

Marking, Placing and Handling Blocks

<Ctrl-KB> Mark the beginning of a block
<Ctrl-KK> Mark the end of a block
<Ctrl-QB> Find the beginning of a block
<Ctrl-QK> Find the end of a block
<Ctrl-QV> Find the previous position of a block that was copied, moved, or deleted
<Ctrl-KH> Hide a marked block
<Ctrl-KC> Copy a marked block
<Ctrl-KW> Write (copy) a marked block to a separate file
<Ctrl-KR> Read (copy) a whole file into text
<Ctrl-KV> Move a marked block
<Ctrl-KY> Delete a marked block

Polycode Error Messages

<u>Error Code</u>	<u>Message</u>
1000	Statements expected between '&' and '#'
1001	Statements expected between '&'s
1002	Cannot open error message file {filename}
1003	Cannot open include file {filename}
1004	Cannot open input file {filename}
1005	Cannot open output file {filename}
1006	Parameter {parameter name} has more than one decimal point.
1007	Empty file
1008	Error in data file
1009	Error in format file
1010	Error in program file
1011	Error in system file
1012	Insufficient memory to run PolyTran
1015	Invalid length of filename {filename}(up to 10 characters)
1016	Invalid recursive call {Polycode program filename}
1017	Invalid input {character(s)}
1018	Invalid parameter {value} -> should be an integer
1019	Line number {value} in jump instruction > total lines of program
1020	Invalid length of label {name} (up to 10 characters)
1021	Line number {value} out of the limit of a program (1 to 250).
1024	Invalid mnemonic {name}
1025	Invalid parameter {name} -> should be a number
1026	Parameterless mnemonic with parameter(s)
1027	Invalid parameter list {name}
1028	Invalid statement
1029	String length is out of range (up to {77 including quotes})
1031	Missing &
1032	Missing ':' or invalid mnemonic
1033	Missing '#' at the end of file
1034	No END statement
1035	No statement for format file
1036	No statement for system file {filename}
1038	No statement for system file
1039	Null parameter
1040	Parameter {name} defined
1041	Duplicate data file {name} defined
1042	Duplicate format file {name} defined
1043	Duplicate label {name} defined
1044	Duplicate program or system file {name} defined
1045	Invalid space(s) in {data format}

<u>Error Code</u>	<u>Message</u>
1046	Too many data files (max. =100)
1047	Too many levels (max.=50)
1048	Too many levels (max.=10) of include statements for file {name}
1049	Too many program and system files (max.=100)
1051	Too many statements in program {name} (up to 250)
1052	Data file {name} used before defined
1053	Format file {name} used before defined
1054	Label {name} used but not defined
1055	Internal error

<u>Warning Code</u>	<u>Message</u>
2000	Parameter {name} is too long (up to 7 digits)
2001	Bit number {value} redefined in DCD
2002	Label {name} defined but not used
2003	Internal error

Unknown

<u>Errors</u>	<u>Message</u>
XXXX	Internal error (write down error number and contact customer service department).

Section 8

Technical Reference

-
- ❑ Specifications
 - ❑ Serial Communication Port
 - ❑ Operating Modes: Quick Reference

Specifications

PROCESSOR

- Hitachi 64180, 3 MHz clock speed, 6 MHz crystal

OPERATING SYSTEM

- Proprietary
- Permanently stored in ROM

INTERNAL DATA STORAGE

- 256 K or 448 K CMOS static RAM

SOFTWARE INCLUDED

- Polycode programming language optimized for data collection
- Polycode subroutine library
- PolyTools application development and communication software
- DATAPLUS EX spreadsheet program (included with packages only)

PHYSICAL SPECIFICATIONS

- Size: 8 x 4 x 2.1 inches (20.32 x 10.16 x 5.33 cm)
- Weight: 1 lb. 13 oz. (.822 kg)
- Operating temperature: -4 to +122° F (-20 to +50° C)
- Operating humidity: 0 to 100%, condensing
- Rugged design: high-impact polycarbonate case sealed from water and dust, EMI shielded conforms to NEMA 4X standard

SERIAL I/O CONNECTOR

- Integral serial RS-232C sub D 25 pin male communication port with digital I/O, RTS-CTS, DTR-DSR, ring indicator, and ring excitation
- Standard 8-bit ASCII, one or two stop bits
- Baud rate: 300-19200, programmable
- Parity: odd, even, or none
- Programmable transmission protocol characters and software flow control

DIGITAL I/O

- Integral digital input/output section (4 in, 3 out)
- 4 lines of parallel input with software instructions to perform bit manipulation; 3 lines of parallel output
- Signal levels: 5V CMOS

DISPLAY

- 64 character liquid crystal
- 4 lines by 16 characters, alphanumeric

KEYBOARD

- Hermetically sealed membrane keypad with tactile response
- 21 raised keys: 0.5" (1.27 cm) square on 0.7" (1.78 cm) centers
- All alphanumeric characters available

POWER

- Powered by 6 "AA" rechargeable nickel-cadmium batteries in shrink-wrapped battery pack.
- Battery life: fully charged batteries provide up to 40 hours of continuous operation (depending on application); may be recharged up to 300 times
- Backup battery: Lithium battery maintains memory for up to 5 years

CLOCK

- Functions: month, day, hour, minute, second, and hundredth-second
- Clock accuracy: maximum 3 minutes deviation/month

Serial Communication Port

Connector Pinouts

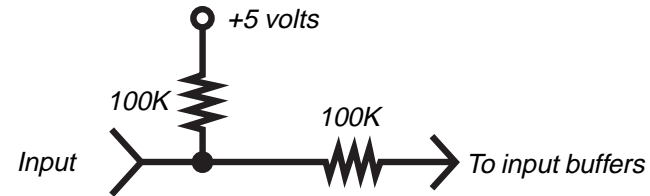
Pin	Description	1 14	13 25
2	RS-232C: Transmit Data (TD)		
3	RS-232C: Receive Data (RD)		
4	RS-232C: Request to Send (RTS)		
5	RS-232C: Clear to Send (CTS)		
6	RS-232C: Data Set Ready (DSR)		
7	RS-232C: Signal Ground (SIG GND)		
20	RS-232C: Data Terminal Ready (DTR)		
22	Ring Indicator (RI)		
16	Ring Excitation (RX)		
1	Digital Input 1 (least significant)		
8	Digital Input 2		
11	Digital Input 3		
13	Digital Input 4/Bar Code Wand Signal (most significant)		
14	Digital Output 1 (least significant)		
15	Digital Output 2		
17	Digital Output 3 (most significant)		
12	Light Pen Ground		
25	Light Pen Power		
13	Light Pen/Digital Input 4		
21	Battery Charge High		
19	Battery Charge Low		
18	Transmit Clocked Serial (TXS)		
23	Receive Clocked Serial (RXS)		
24	Serial Clock (CKS)		
9	Not Used		
10	Not Used		

Digital Inputs/Outputs

Do not connect digital output 1 to digital input 1, digital output 2 to digital input 2, and digital output 3 to digital input 3 simultaneously. This configuration is used for the Reset Connector. If you use this configuration, you will lose your files when the FieldBook is turned on.

Digital Inputs

Logic Levels: Less than 0.8V = Low (0)
Greater than 4.0V = High (1)
Default Level: Tied high through 100K Ohm resistor
Input Protection: 100K Ohm resistor
Schematic:



Digital Outputs

Logic Levels: 0V to 5V
Low (1) = Less than 0.8V at 6 mA
High (1) = Greater than 4.0V at 6 mA
Powered-Down State: The state of the outputs is undefined when the FieldBook is off.

Input Threshold

The input signal voltage threshold is approximately 1V. This input threshold allows signals that swing between 0V and 5V, or negative to positive inputs to be used. Inputs are protected to a maximum of +/- 25V.

Output Voltage

RS-232C outputs swing from +10V to -5V. Digital outputs are 0V to 5.0V DC.

Ring Indicator (RI) / Ring Excitation (RX)

The ring indicator wakes the FieldBook up from a powered-down state and automatically executes a user program named RING if one exists when one of the following occurs:

- When pulsed (>200 ms) with a voltage of 5 to 25 volts (e.g. the ring excitation)
- There is a switch closure (>200 ms) between RX and RI.

The ring excitation uses the system battery voltage (5.5 to 8 V) through a protection resistor.

For more information about the serial communication port, refer to *Section 2, Hardware Features, Serial Communication Port*.

Operating Modes: Quick Reference

<u>Mode</u>	<u>Submode</u>	<u>Format</u>	<u>Function</u>
0		EXECUTE PROGRAM FILE:	Execute a Polycode program.
1		EDIT 1,2,3 DAT,FMT,PGM	Edit a data, format, or program file.
1	1	EDIT DAT	Create or edit a data file.
1	2	EDIT FMT	Create or edit a format file.
1	3	EDIT PGM	Create or edit a program file.
2		XMIT SER 1,2,3 DATA,FILE,MEM	Transmit data, a file, or a memory image through the serial port to a computer, printer, or FieldBook
2	1	XMIT SER DATA	Transmit data through the serial port.
2	2	XMIT SER FILE	Transmit a file through the serial port.
2	3	XMIT SER MEM	Transmit a memory image through the serial port.
3		LOAD SER 1,2,3 DATA,FILE,MEM	Load data, a file, or a memory image into the FieldBook from a computer or another FieldBook via the serial port.
3	1	LOAD SER DATA	Load data via the serial port.
3	2	LOAD SER FILE	Load a file via the serial port.
3	3	LOAD SER MEM	Load memory image via the serial port.
4		FILE 1,2,3 DIR, ERA-F, ERA-D	Review the file directory, erase a file, or erase the data within a file.
4	1	FILE DIR	Review the file directory.
4	2	FILE ERA-F	Erase a file.
4	3	FILE ERA-D	Erase the data within a file (not the file).

<u>Mode</u>	<u>Submode</u>	<u>Format</u>	<u>Function</u>
5		SET 1,2 AUTOLOG, PROTOCOL	Set automatic logging or RS-232C communication protocol parameters.
5	1	SET AUTOLOG	Set automatic logging.
5	2	SET PROTOCOL	Set RS-232C communication protocol parameters.
6		TEST 1,2,3,4 PGM, ANA, DIG, MEM	Test program execution, analog sensors, digital I/O, or memory.
6	1	TEST PGM	Test program execution.
6	2	TEST ANA	Test analog sensors (not applicable to this model).
6	3	TEST DIG	Test digital I/O.
6	4	TEST MEM	Test memory.
7		MISC 1,2,3 CLK, BAT, TERM	Set system clock/calendar, perform battery check, or emulate a terminal.
7	1	MISC CLK	Set system clock/calendar.
7	2	MISC BAT	Perform battery check (not applicable to this model).
7	3	MISC TERM	Emulate a terminal.

Appendix

Operating Instructions for Miscellaneous Accessories

-
- ❑ Battery Test Connector
 - ❑ SafeCharger Battery Pack Charger
 - ❑ System Reset and @@SYS Inhibit Connector
 - ❑ RS-232C Communication Cable and Adaptor

Battery Test Connector

The PW-645 Battery Test Connector allows you to check the battery pack voltage for your FieldBook. The battery voltage and a charge percentage are shown on the FieldBook's display.

Program Installation

A copy of the Battery Test Program (CHECKBAT.PGM) has to be installed on your FieldBook before you can use the Battery Test Connector. If you are using DATAPLUS on your FieldBook, the Battery Test Program is preloaded with the DATAPLUS software.

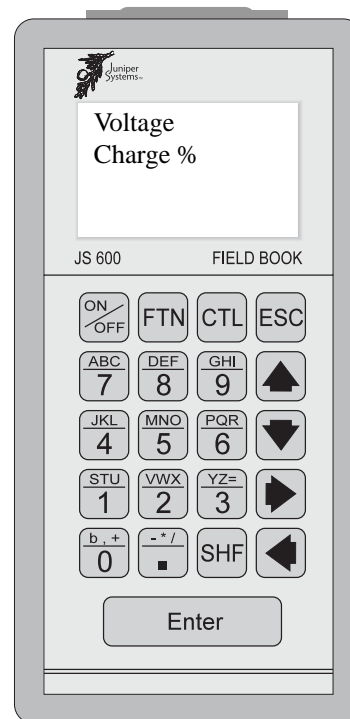
To install the program on your FieldBook, follow these steps:

- 1) Connect the FieldBook to your computer (COM1 port) using an RS-232C communication cable.
- 2) Insert the disk into the disk drive on your PC.
- 3) At the DOS prompt, type <LOAD> and press <Enter>.
- 4) Follow the instructions on your computer screen to complete the installation.

Operating Instructions

- 1) Plug the Battery Test Connector into the FieldBook's RS-232C port.
- 2) Turn on the FieldBook. At the "MODE ?" prompt, press <0> (zero).
- 3) Use the right or left arrow key to select the program CHECKBATTS, then press <Enter>.
- 4) The battery voltage is displayed until the <ESC> key is pressed.

For more information about the FieldBook batteries, refer to *Section 2, Hardware Features, Batteries*.



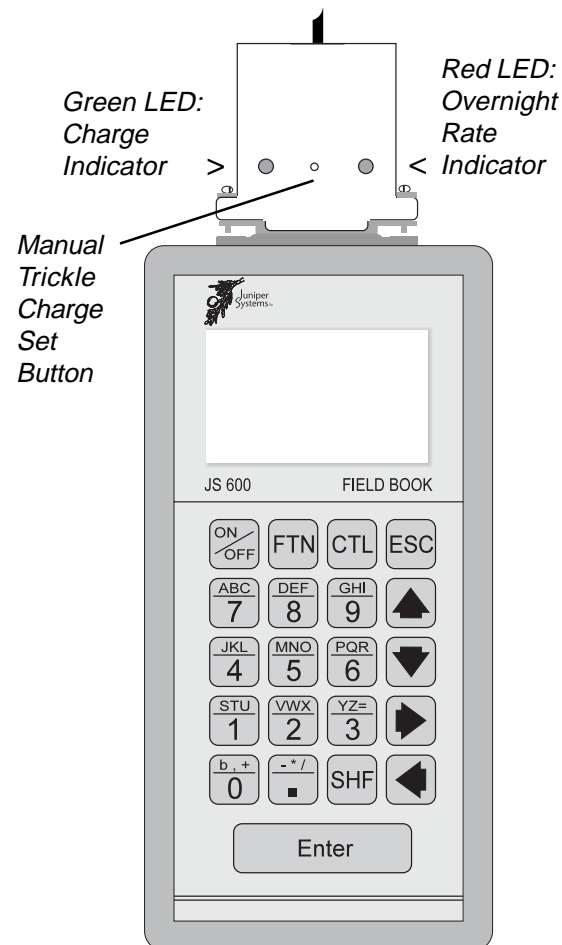
SafeCharger Battery Pack Charger

The SafeCharger™ is a timed charger with two functions:

- ❑ Recharging a FieldBook battery pack over a 12 hour period (overnight charge rate).
- ❑ Maintaining the charge of the battery pack and backup battery during periods of disuse (trickle charge mode).

▲ How to Use the SafeCharger

- 1) Plug the AC charging adaptor into a 110V or 220V AC outlet (depending on which model you have).
- 2) Insert the charger's connector into the serial port on the FieldBook and tighten the thumbscrews.



Green and Red LEDs

There is a red and a green LED (light emitting diode) on the face of the connector. When you plug the power adaptor into the wall socket and attach the SafeCharger to the FieldBook, both LEDs turn on.

Green LED

The green LED is the charge indicator. When it is on, everything is connected correctly and the FieldBook is being charged. If the green LED does not come on, it is not charging. Make sure the battery is installed, the charger is connected to FieldBook, and the AC outlet you plugged the power adaptor into is energized.

Red LED

The red LED is the overnight rate indicator. When it is on, the charger is in the overnight charge rate. The FieldBook is given a full charge over 12 hours. The charger then automatically switches to trickle charge mode and the red LED turns off. You can leave the FieldBook in trickle charge mode continuously without damaging the batteries, allowing you to keep it charged over the weekend and during inactive periods.

Manually Switching to Trickle Charge Mode

You can manually switch the SafeCharger to trickle charge mode by gently inserting a pointed object into the trickle charge set button found between the LEDs. The green LED stays on and the red LED turns off, indicating that the charger is in trickle charge mode.

❖ *Note: If there is a power failure which lasts for more than a few seconds, the SafeCharger will switch back to overnight charge mode for 12 hours then return to trickle charge mode.*

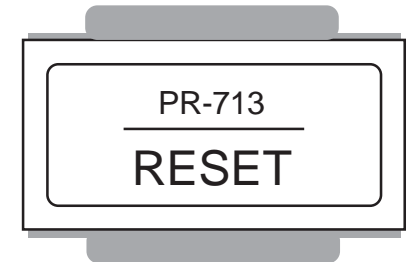
System Reset and @@SYS Inhibit Connector

The RESET/@@SYS Inhibit Connector included with your FieldBook consists of two 25-pin subminiature D female connectors back-to-back in one connector package. One side is labeled RESET and the other is labeled @@SYS.

▲ RESET Connector

The RESET end of the connector resets the FieldBook, erasing all data and programs stored in memory.

To reset the FieldBook, plug the RESET end of the connector into the serial port of the FieldBook, then turn the FieldBook on. EVERYTHING IS ERASED!



Wiring Schematic

<u>Pin</u>		<u>Pin</u>
14	Digital Out 1	Digital In 1 1
15	Digital Out 2	Digital In 2 8
17	Digital Out 3	Digital In 3 11

▲ @@SYS Program File Inhibit Connector

The @@SYS end of the connector inhibits the automatic execution of @@SYS programs on the FieldBook.

Plug the @@SYS end of the connector into the FieldBook's serial port. The MODE? prompt is shown when the FieldBook is turned on or when <ESC> is pressed instead of the @@SYS program.

Wiring Schematic

<u>Pin</u>		<u>Pin</u>
14	Digital Out 1	Digital In 2 8
15	Digital Out 2	Digital In 3 11
17	Digital Out 3	Digital In 4 13

For more information about the RESET/@@SYS Inhibit Connector, refer to *Section 6, Programming the FieldBook, System Reset and @@SYS Inhibit Connector*.

RS-232C Communication Cables

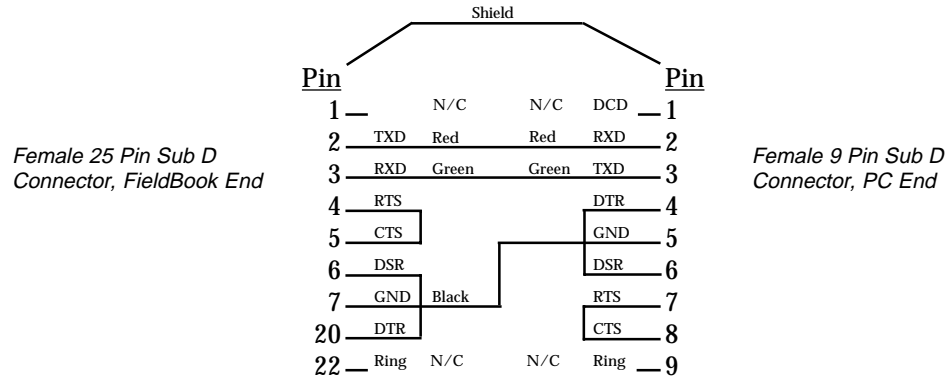
▲ RS-232C Communication Cables

An RS-232C communication cable is used to connect the FieldBook to a computer, printer, or another FieldBook. Two models are available from Juniper Systems:

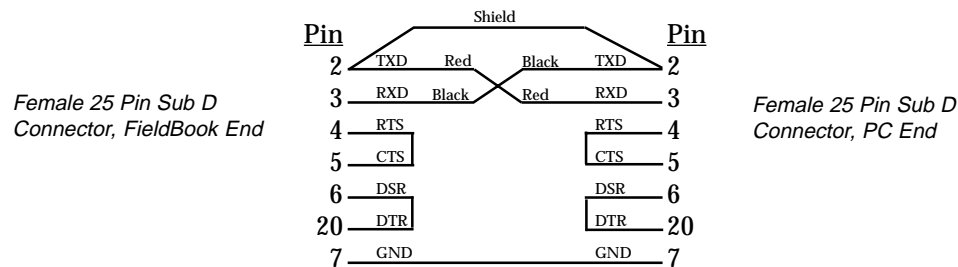
- CA-009-9: features one 25 pin D subminiature connector with socket contacts to plug into the FieldBook's serial port and one 9 pin D subminiature connector with socket contacts to plug into devices with a 9 pin communication port.
- CA-009: features two 25 pin D subminiature connectors with socket contacts. One connector plugs into the FieldBook's serial port and the other plugs into devices with a 25 pin communication port.

The cable length for both models is six feet.

CA-009-9 Wiring Schematic

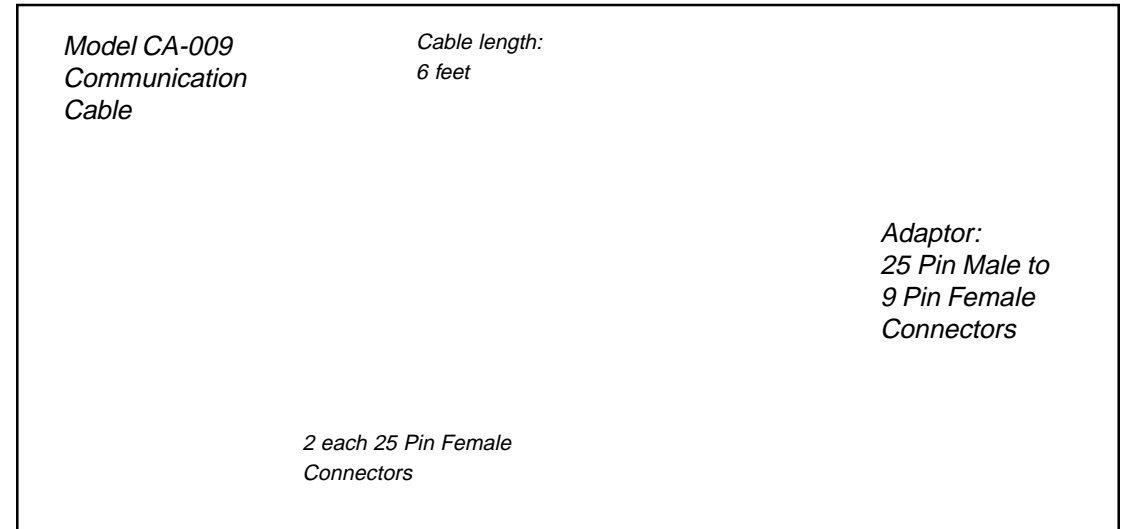


CA-009 Wiring Schematic



25 Pin to 9 Pin Adaptor

If you have the CA-009 model communication cable and the device you are connecting to the FieldBook has a 9 pin communication port with pin contacts, a 25 pin male to 9 pin female adaptor can be attached to the cable (see diagram below). This accessory is available from Junipier Systems.



Plug the 25 pin male end of the adaptor into one of the 25 pin female connectors on the RS-232C cable and the 9 pin female end into the 9 pin communication port on the device.

Refer to *Section 2, Hardware Features, Serial Communication Port*, and *Section 5, Sending and Receiving Information, Setting Up Communication With Another Device*, for more information.