

# WORKABOUT PRO

## Hardware Development Kit User Manual

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*ISO 9001 Certified  
Quality Management System*



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# TABLE OF CONTENTS

## Chapter 1: Introduction

1.1	About This Manual . . . . .	3
1.2	The Contents Of The HDK . . . . .	4
1.3	About The WORKABOUT PRO Hand-Held Computer . . . . .	4
1.3.1	Variants Of The WORKABOUT PRO . . . . .	4

## Chapter 2: Hardware

2.1	Overview . . . . .	9
2.2	Identifying Hardware . . . . .	9
2.3	Block Diagram. . . . .	10
2.4	The Display . . . . .	12
2.4.1	Touch Input . . . . .	12
2.4.2	The Display Backlight. . . . .	12
2.5	The Keyboard . . . . .	12
2.5.1	The Keyboard Backlight. . . . .	12
2.6	The LEDs . . . . .	12
2.7	The Beeper. . . . .	12
2.8	Connectors. . . . .	13
2.8.1	The LIF Connector . . . . .	13
2.8.2	The Tether Connector . . . . .	14
2.8.3	The Audio Connector . . . . .	14
2.9	Power Management . . . . .	15
2.10	The Docking Station. . . . .	15

## Chapter 3: Software

3.1	Overview . . . . .	19
3.2	Installing The Software . . . . .	19
3.2.1	Working With IDEs . . . . .	19
3.3	Installed Files . . . . .	19
3.3.1	The Mobile Devices SDK . . . . .	19
3.4	Windows CE Drivers . . . . .	20
3.4.1	The Expansion-Slot (PCO) Driver . . . . .	20
3.4.1.1	PCO Driver Initialization . . . . .	20
3.4.1.2	PCO LIF And Tether Functions . . . . .	21
3.4.1.3	PCO USB Functions . . . . .	22
3.4.1.4	PCO Scanner Functions . . . . .	22
3.4.1.5	PCO Power Management Functions. . . . .	22
3.4.2	The PCMCIA Driver . . . . .	22
3.4.3	The Serial Port Driver . . . . .	22
3.4.4	Loading Of Third-Party Drivers. . . . .	23
3.5	Installing Third-Party Drivers . . . . .	23
3.6	The Application Programming Interface . . . . .	23

3.6.1	The Expansion-Slot API . . . . .	23
3.6.1.1	The Interrupts Namespace. . . . .	24
3.6.1.2	The ExpansionWakeup Namespace. . . . .	25
3.6.1.3	The GPIO Namespace. . . . .	25
3.6.1.4	The EEPROM Namespace . . . . .	25
3.6.1.5	The ExpansionUSB Namespace. . . . .	25
3.6.1.6	The USBhub Namespace . . . . .	25
3.6.1.7	The ScannerPort Namespace . . . . .	25
3.6.1.8	The smBus Namespace . . . . .	26
3.6.1.9	The PCMCIA Namespace. . . . .	26
3.6.2	Registry Keys . . . . .	26
3.6.3	User Interface . . . . .	26

## Chapter 4: The BooSt Bootloader

4.1	Overview . . . . .	31
4.2	The BooSt Console . . . . .	31
4.3	Connecting To The WORKABOUT PRO's Serial Port . . . . .	31
4.4	Access To The BooSt Console . . . . .	31
4.5	Super-User Mode . . . . .	32
4.6	Pathnames . . . . .	32
4.7	BooSt Commands . . . . .	33
4.7.1	ac97 . . . . .	34
4.7.2	adc . . . . .	34
4.7.3	audio. . . . .	34
4.7.4	cksum . . . . .	35
4.7.5	config . . . . .	35
4.7.6	debug . . . . .	36
4.7.7	distest . . . . .	36
4.7.8	doc. . . . .	37
4.7.9	editmem . . . . .	38
4.7.10	go . . . . .	38
4.7.11	i2c . . . . .	39
4.7.12	kbd. . . . .	39
4.7.13	load . . . . .	40
4.7.14	ls. . . . .	40
4.7.15	memtest . . . . .	40
4.7.16	pcctest . . . . .	40
4.7.17	rtc . . . . .	40
4.7.18	sleep . . . . .	41
4.7.19	standby . . . . .	41
4.7.20	touch. . . . .	41
4.7.21	uptest . . . . .	41
4.7.22	usb. . . . .	42
4.7.23	ver . . . . .	43
4.7.24	wan . . . . .	43
4.7.25	ymodem . . . . .	43

## Chapter 5: Replacing System Software

5.1	Overview . . . . .	46
5.1.1	The Boot Process And Loading Software. . . . .	46

5.2	The Main Operating System. . . . .	46
5.2.1	Displaying The Date Code Of The Main OS . . . . .	47
5.2.2	USB Download . . . . .	47
5.2.2.1	Equipment Needed. . . . .	47
5.2.2.2	Replacing The Main OS Software. . . . .	47
5.2.3	Load From Memory Card . . . . .	49
5.2.3.1	Equipment Needed. . . . .	49
5.2.3.2	Configuring the Memory Card. . . . .	49
5.2.3.3	Replacing The Main OS Software. . . . .	50
5.2.4	Serial Download . . . . .	50
5.2.4.1	Equipment Needed. . . . .	51
5.2.4.2	Replacing The Main OS Software. . . . .	51
5.3	The BooSt Bootloader Software. . . . .	53
5.3.1	Equipment Needed. . . . .	53
5.3.2	Displaying The BooSt Datecode . . . . .	53
5.3.3	Replacing The BooSt Software Serially. . . . .	54
5.3.4	Starting The Main OS . . . . .	55

## Chapter 6: Tools

6.1	Overview . . . . .	59
6.2	Selected Fasteners In The WORKABOUT PRO . . . . .	59
6.3	Standard Psion Teklogix Torque Settings . . . . .	60

## Chapter 7: Mechanical Considerations

7.1	Overview . . . . .	63
7.2	Installation . . . . .	63
7.2.1	Scanner Device Installation . . . . .	63
7.2.1.1	Hardware. . . . .	63
7.2.1.2	Installing A Scanner Device . . . . .	64
7.2.2	Expansion Module Installation . . . . .	65
7.2.3	Endcap Installation . . . . .	68
7.2.3.1	Installation . . . . .	69
7.3	Location And Construction . . . . .	70
7.3.1	Materials . . . . .	70
7.3.2	Scanner Device . . . . .	70
7.3.3	Expansion Board. . . . .	71
7.3.3.1	The 100-Pin Connector . . . . .	72
7.3.3.2	Endcap And Card Stop. . . . .	72

## Chapter 8: Expansion Cards: Electrical

8.1	Overview . . . . .	77
8.1.1	System Block Diagram . . . . .	77
8.2	Signals On The 100-Pin Connector . . . . .	78
8.2.1	Power And Ground . . . . .	78
8.2.2	Data And Address Buses . . . . .	79
8.2.3	Serial. . . . .	79
8.2.4	USB . . . . .	79
8.2.5	General-Purpose I/O. . . . .	80
8.2.6	PCMCIA. . . . .	81
8.2.7	Wakeup . . . . .	82
8.2.8	I2C . . . . .	82

8.3	100-Pin Connector: Pinout . . . . .	83
8.4	I2C Device Identification . . . . .	87
8.4.1	I2C Addresses . . . . .	87
8.4.2	Fields Of The EEPROM . . . . .	87
8.4.3	Loading Of Drivers . . . . .	89
8.4.4	Examples . . . . .	89
8.4.4.1	The PCMCIA Module . . . . .	89
8.4.4.2	The Multi-I/O Expansion Module . . . . .	90
8.4.4.3	The GSM/GPRS Module . . . . .	90

## Chapter 9: The Scanner Connection

9.1	Overview . . . . .	95
9.2	Scanner Device Installation . . . . .	95
9.3	The Scanner . . . . .	96
9.3.1	Varieties . . . . .	96
9.4	Connector Location . . . . .	96
9.5	Connector Pinout . . . . .	97
9.6	The Scanner Flex . . . . .	98
9.7	Connection Block Diagram . . . . .	99
9.8	Power And Ground . . . . .	99
9.9	Signals To The Scanner Device . . . . .	100

## Chapter 10: The Scanner Convertor Board

10.1	Overview . . . . .	105
10.2	Example Scanner Board . . . . .	105
10.3	Power And Ground . . . . .	110
10.4	Signals To The Scanner Module . . . . .	110
10.4.1	Serial Signals . . . . .	110
10.4.2	USB Signals . . . . .	111
10.4.3	Control Signals . . . . .	111

## Chapter 11: The PCMCIA Expansion Module

11.1	Overview . . . . .	115
11.2	Installation . . . . .	116
11.3	Dimensions . . . . .	116
11.4	Expansion Module Connectors . . . . .	117
11.5	Block Diagram . . . . .	118
11.6	Electrical . . . . .	118
11.6.1	Unused Host Signals . . . . .	118
11.6.2	Unused PCMCIA Signals . . . . .	119
11.6.3	PCMCIA Compatibility . . . . .	119
11.6.4	The Card Detect Signals . . . . .	120
11.6.5	The Buffer Enable Signals . . . . .	120
11.6.6	The Slot Power Enable Signal . . . . .	120
11.6.7	Selectable Card Supply Voltage . . . . .	120
11.7	EEPROM Data . . . . .	120

## Chapter 12: The Multi I/O Expansion Module

12.1	Overview . . . . .	125
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12.2	Installation . . . . .	125
12.3	Connectors . . . . .	126
12.3.1	Motherboard 100-Pin Connector (J1) . . . . .	126
12.3.2	Motherboard Scanner Connector (J2) . . . . .	126
12.3.3	Scanner-Port Serial Connector (J3) . . . . .	127
12.3.4	USB Host Port 2 Connector (J4) . . . . .	127
12.3.5	The FF UART Serial Connector (J5) . . . . .	128
12.3.6	The USB Host 1 Connector (J6) . . . . .	129
12.3.7	The Power Connector (J7) . . . . .	130
12.4	Configuration . . . . .	130
12.4.1	Slot Power Control . . . . .	131
12.4.2	EEPROM Write Control. . . . .	131
12.4.3	Voltage Configuration For High-Power Output. . . . .	132
12.4.4	Voltage Configuration For Standard-Power Output. . . . .	132
12.4.5	Control Signals For FFUART Level Converter. . . . .	133
12.4.6	TTL Output Option For Scanner Serial Port . . . . .	133
12.5	Block Diagram. . . . .	134
12.6	Electrical. . . . .	135
12.6.1	Unused Host Signals. . . . .	135
12.6.2	Power And Ground . . . . .	135

## Appendices

### Appendix A: Support Services And Worldwide Offices

A.1	Technical Support . . . . .	A-1
A.2	Product Repairs . . . . .	A-1
A.3	Worldwide Offices. . . . .	A-2

### Appendix B: Schematics

B.1	Schematic - Multi-I/O Expansion Module . . . . .	B-4
B.2	Schematic - PCMCIA Expansion Module . . . . .	B-7
B.3	Serial Scanner Converter Board For Symbol And Intermec Scanners . . . . .	B-10
B.4	USB Scanner Convertor Board For Symagery And HHP Scanners . . . . .	B-11
B.5	Backplate Mechanical . . . . .	B-12
B.6	Internal Frame Mechanical . . . . .	B-13
B.7	Top Assembly Mechanical . . . . .	B-14
B.8	Card Stop For PCMCIA And CF Cards Mechanical . . . . .	B-15
B.9	Standard Endcap Mechanical . . . . .	B-16
B.10	Body Mechanical . . . . .	B-17
B.11	Stylus Sealing Casket Mechanical. . . . .	B-18

### Appendix C: HDK License Agreement

C.1	HARDWARE DEVELOPER KIT LICENSE AGREEMENT . . . . .	C-3
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# INTRODUCTION

# 1

1.1 About This Manual . . . . .	3
1.2 The Contents Of The HDK. . . . .	4
1.3 About The WORKABOUT PRO Hand-Held Computer. . . . .	4
1.3.1 Variants Of The WORKABOUT PRO . . . . .	4



## 1.1 About This Manual

This manual is intended to support developers of third-party hardware for the Teklogix WORKABOUT PRO Hand-Held Computer, also known as the 7525.

### ***Chapter 1: Introduction***

is an overview of the WORKABOUT PRO Hand-Held Computer.

### ***Chapter 2: Hardware***

describes, in general terms, the hardware of the WORKABOUT PRO.

### ***Chapter 3: Software***

describes the driver for the expansion slot, which is included in the WORKABOUT PRO's system software, discusses installing device drivers created with this HDK, and gives an overview of the API for expansion devices.

### ***Chapter 4: The BooSt Bootloader***

describes the WORKABOUT PRO's bootloading software.

### ***Chapter 5: Replacing System Software***

described how to replace the WORKABOUT PRO's operating system.

### ***Chapter 6: Tools***

gives torque settings and lists tools and fasteners used with the WORKABOUT PRO.

### ***Chapter 7: Mechanical Considerations***

describes the space and mounting for the potential Expansion Module devices.

### ***Chapter 8: Expansion Cards: Electrical***

describes the interface between the WORKABOUT PRO and potential Expansion Module devices.

### ***Chapter 9: The Scanner Connection***

describes the mounting of the WORKABOUT PRO's scanner device and the electrical connections to it.

### ***Chapter 10: The Scanner Convertor Board***

describes the interface between the scanner and the standardized scanner connector.

### ***Chapter 11: The PCMCIA Expansion Module***

describes the available Expansion Module that carries a PCMCIA slot.

### ***Chapter 12: The Multi I/O Expansion Module***

describes the available Expansion Module that makes the WORKABOUT PRO's serial and USB connections easily available for developers.

### ***Appendix A: Support Services And Worldwide Offices***

provides the helpdesk phone number at the Mississauga, Ontario, Canada office and details the support services available. This appendix also lists the worldwide office addresses and phone numbers.

### ***Appendix B: Schematics***

provides schematics for the PCMCIA and Multi-I/O Expansion Modules, and for selected scanner convertor boards. Also provides selected mechanical drawings.

### ***Appendix C: HDK License Agreement***

provides text of the License Agreement that accompanies the HDK.

## 1.2 The Contents Of The HDK

The Hardware Development Kit includes the following items:

- This manual.
- Libraries and sample programs for the APIs for managing expansion cards and scanner devices.
- Drawings and engineering models of the backplates and endcaps available for the WORKABOUT PRO. The models can be customised. See [CHANGE].

All of these items are available as a download from Psion Teklogix.

## 1.3 About The WORKABOUT PRO Hand-Held Computer

The WORKABOUT PRO Hand-Held Computer, is an industrial hand-held computer that runs the Microsoft® Windows® CE .NET operating system. The main processor is the Intel PXA255, which is the second generation of the StrongArm processor (SA1110). The WORKABOUT PRO is intended for operation in temperatures from -10°C to +50°C. It supports the following features:

- An 8.4-cm (3.3-inch) QVGA (240x320 pixel) monochrome FSTN transfective display with electroluminescent (EL) backlight, or an 8.9-cm (3.5-inch) QVGA (240x320 pixel) colour TFT transfective display with LED backlight.
- 55- or 29-key keyboard with LED backlighting.
- 64 MB of on-board flash memory.
- 128 MB (or 64 MB) of on-board SDRAM.
- An optional decoded scanner (sold separately).
- An optional decoided 2-D imager (sold separately).
- An optional 802.11b Compact Flash radio (sold separately).
- An internal Bluetooth radio (on the C and S variants of the WORKABOUT PRO).
- An internal SD card slot intended for use with memory cards.



Other options and variants of the device may be made available.

### 1.3.1 Variants Of The WORKABOUT PRO

The WORKABOUT PRO is available with a number of options, including 1-D laser scanners, 1-D and 2-D imagers, keyboards, and displays. A handstrap and handgrip are also available as customer-installable options.

#### Memory Variants

The WORKABOUT PRO may be ordered in three versions. The M version has 64 MB of RAM; the C version has 128 MB of RAM, and the S version has a shorter body and 128 MB of RAM.

## Keyboard Variants

The C and M variants of the WORKABOUT PRO have a 55-key alphanumeric keyboard. The S variant has a 29-key numeric keyboard.

## Scanner Variants

The WORKABOUT PRO comes standard with no scanner. The following scanners can be included with the WORKABOUT PRO as options:

- Decoded 1-D laser scanner (Symbol SE923HP, SE1223HP).
- Decoded 1-D imager (Intermec E1022).
- Decoded 2-D imager (Symagery SX5093).

These fastens to the underside of the WORKABOUT PRO, replacing the backplate. The scanner connects through a flex cable to a connector on the WORKABOUT PRO's motherboard. The scanner may be installed by the end user; for instructions see Psion Teklogix document 8100030.

Only one internal scanner can be installed in the WORKABOUT PRO. Internal scanners can be triggered from the trigger switch on the WORKABOUT PRO's handgrip (if present) or from one of the Scan buttons on the WORKABOUT PRO's keyboard.

## Display Variants

The WORKABOUT PRO is available with the following displays:

- Monochrome with touch screen.
- Colour with touch screen.

The touch screen is provided as part of the display window glass.

## Card Variants

The WORKABOUT PRO has two internal card slots, one for a Compact Flash card, and one for an MMC/SD card.

The MMC/SD slot supports SD cards. It is accessible from the battery compartment. An optional expansion card containing a PCMCIA-card slot may be connected to the 100-pin expansion bus on the WORKABOUT PRO's motherboard.

The CF slot (and the PCMCIA slot, if installed) are accessible when the device's endcap is removed.

The Compact Flash slot can accept the following options:

- A memory card (64, 128, 256, or more megabytes).
- An 802.11b radio card.

The MMC/SD slot can accept the following options:

- A memory card (32, 64, 128, 256, 512, or 1024 megabytes).



2.1 Overview . . . . .	9
2.2 Identifying Hardware . . . . .	9
2.3 Block Diagram . . . . .	10
2.4 The Display . . . . .	12
2.5 The Keyboard . . . . .	12
2.6 The LEDs . . . . .	12
2.7 The Beeper . . . . .	12
2.8 Connectors . . . . .	13
2.9 Power Management . . . . .	15
2.10 The Docking Station . . . . .	15





## 2.1 Overview

This section gives an overview of the hardware of the WORKABOUT PRO.

## 2.2 Identifying Hardware

The WORKABOUT PRO's hardware configuration is listed in the information provided by the System Properties applet in the Control Panel.

To reach this manually:

1. Press <BLUE> + <.> (dot) to open the start menu.
2. Select **Settings, Control Panel**. The *Control Panel* opens.
3. Double-click on the **System** icon. The *System Properties* window opens.
4. Click on the **Properties** tab. *System Properties* lists the hardware and software in the WORKABOUT PRO.

Listed items include:

- Date codes for the WORKABOUT PRO's boot software ('boot code'), OS software ('WinCE code'), and keyboard-controller code ('uP code').
- Processor type and speed.
- Amount of RAM and flash memory.
- Type and orientation of display.
- Presence and type of touch screen.
- Presence and type of scanner.
- Type of keyboard.
- Type of main logic board (MLB).
- Serial number of main logic board ('MLB Serial').
- Serial number of device ('Term serial').
- Presence and type of card in internal PCMCIA and Compact Flash slots ('PCM/CF Slots').
- Presence and type of card in internal MMC slots ('MMC/SD Slots').
- Presence and type of card in internal expansion slot ('Expansion Slot').
- Revision of expansion card.
- Serial number of expansion card.



The WORKABOUT PRO is built around a 400-MHz Intel X-Scale PXA-255 main processor, connected to 64 or 128 megabytes of RAM and 64 megabytes of flash memory.

There are a number of peripheral processors:

### **MSP430MF133 Keyboard Processor**

The WORKABOUT PRO has a keyboard processor, the “uP”, for controlling and monitoring the keyboard and signal LEDs, and the battery.

### **MQ1188 “Multimedia Platform Controller”**

This processor handles connections to the liquid-crystal display module and the SD/MMC card slot. It also provides the USB host interface to the USB host (through the hub) and client connections.

### **ISP1122A USB Host Hub**

The ISP1122A USB host hub provides USB data lines, overcurrent sensing, and DC power to the four USB ports contained in the LIF connector, the tether port, the internal scanner connector, and the 100-pin expansion connector. It integrates a Serial Interface Engine (SIE), hub repeater, hub controller, USB data transceivers, and a configurable number (2 - 5) of downstream ports.

- Complies with USB Specification 1.1.
- Full (12Mbps) speed fully compliant.
- OHCI register compliant.
- Supports DMA.

### **WM9705 Audio Controller**

The audio controller permits audio recording and playback to the AC97 specification. This chip also handles the touchscreen digitizing input. It includes the following features:

- AC'97 rev2.2 compliant codec with pen digitizer.
- 18-bit stereo audio codec.
- On-board sample rate converter.
- Multiple channel input mixer.
- S/PDIF digital audio output.
- Analog to S/PDIF and I<sup>2</sup>S output option.
- Headphone drivers on AUX and MONO outputs.
- 4-wire touch screen interface with co-ordinate and pressure measurement, and pen-down detection.
- Power management features including a hardware power down option.
- Standard AC'97 pinout in 48-pin TQFP package.

## 2.4 The Display

The WORKABOUT PRO is available with a 240x320-pixel display. The M variant has a monochrome (64 shades of grey) display; the C and S variants have a colour (256k colours) display.

The contrast of the monochrome display can be adjusted from the keyboard via hot-keys, and is automatically temperature-compensated. This contrast can be adjusted under program control.

### 2.4.1 Touch Input

Touch input is a standard for the WORKABOUT PRO's display. The touch driver controls the hardware directly to receive touch-down, touch-up, and movement events. Touch events are passed to the application via the operating system.

### 2.4.2 The Display Backlight

The WORKABOUT PRO has a backlight behind its display. This backlight can be adjusted for intensity, can be adjusted from the keyboard via hot-keys, and is automatically temperature-compensated.

The backlight can be turned on and off and its brightness adjusted under program control. On WORKABOUT PRO M devices with the monochrome screen, the brightness cannot be adjusted.

## 2.5 The Keyboard

The WORKABOUT PRO M and S variants have a 55-key keyboard layout. The C variant has a 27-key keyboard, plus two scan buttons, one on each side of the device.

Windows CE .NET returns 'virtual key codes' for keypresses. Psion Teklogix' keyboard drivers take into account when Psion Teklogix' own special modifier keys (such as the Blue or Orange key) are pressed; the keyboard driver provides the virtual key code of the modified key.

### 2.5.1 The Keyboard Backlight

The WORKABOUT PRO has a backlight behind its keyboard. This backlight can only be turned off and on, not adjusted for brightness, but it can be configured to turn on when the ambient light level drops below a configured value. The backlight can be turned on and off and its brightness adjusted under program control

## 2.6 The LEDs

The WORKABOUT PRO has a two-coloured indicator LED to show power and charging state. This LED cannot be controlled by application programs.

## 2.7 The Beeper

The WORKABOUT PRO has an internal beeper whose volume can be manually adjusted via keyboard hot-keys. It can be turned on and off and its loudness adjusted under program control.

## 2.8 Connectors

The WORKABOUT PRO has the following connectors:

- LIF connector.  
Connects to the docking station; provides USB and serial connections.
- Tether connector.  
Connects scanners and other cabled peripherals.
- Audio connector:  
Connects a single-channel microphone and a two-channel headset.

### 2.8.1 The LIF Connector



Figure 2.2 The LIF Connector

The LIF connector accepts DC power to the terminal, as well as supplying DC power to peripherals. This port also includes a USB host port and a USB client port.

#### Power

Power for charging the batteries and powering the terminal (5 V DC; 3.4 A max) is supplied to the terminal from the AC-to-DC wall adaptor through the LIF connector.

This power, 5V\_DC\_IN, is used to charge the terminal's battery. Main DC power for the terminal, VIN, is taken from 5V\_DC\_IN or from the output of the battery. VIN is provided to the expansion slot.

The terminal can supply 5V power (400 mA max) to an external device through the 'Power Output' pins. This power is switched; the switch is controlled by the Docking Port Services driver and is turned on only after the device is attached and a valid Dock ID is detected.

#### USB Host Port

The LIF connector supplies a USB host port connected to the WORKABOUT PRO's internal USB host hub. The interface complies with USB specification 1.1 and provides a "high-speed" connection to external devices and hubs. Power for external devices is provided through the docking port's power output pins.

## USB Client Port

The LIF connector also provides a USB client port to connect the WORKABOUT PRO to a USB host computer or hub. The WORKABOUT PRO can act as a USB client (a Mass Storage Device), when its bootloader is running, to allow software updates via USB. This port is connected to the main processor.

## 2.8.2 The Tether Connector



Figure 2.3 The Tether Connector

The tether port allows an external devices such as a DC power-supply, serial adapter, or USB client device to be connected to the WORKABOUT PRO.

## Console Port

The ‘console port’ is a serial text-mode interface to the WORKABOUT PRO’s system. Commands can be issued to the WORKABOUT PRO’s bootloader software through this interface.

The console port is available as a 3-wire serial interface (TxD, RxD, GND) on 3.3-V serial lines on the tether connector. These lines require an adapter for RS-232-level access.

This console port is COM3 under Windows CE .NET. The Console port is only available on devices without Bluetooth or when Bluetooth has been turned off through the Windows control panel (the power manager “Built-ins” tab

## DC Input

The tether connector can accept DC input from a power adaptor.

## USB Client Port

The tether connector provides a USB host port with USB power.

## 2.8.3 The Audio Connector

The WORKABOUT PRO has a 2.5-mm headphone jack on its base. It also has a microphone and speaker.



Figure 2.4 The Audio Connector

The WORKABOUT PRO supports:

- Full-duplex operation for simultaneous recording and playback.
- Mono recording.
- Stereo playback with sampling rates of 8.0, 11.025, 22.05, and 44.1 kHz.

The speaker has software volume control. The headphone uses a stereo 32-ohm output, driving a nominal headset impedance of 16 or 32 ohms with at least 15 mW of continuous power. There is headphone plug-in detection. The onboard microphone has a flat frequency response from 100Hz to 16kHz.

## 2.9 Power Management

The WORKABOUT PRO is powered by a lithium-ion rechargeable battery pack. The WORKABOUT PRO can be powered from external power when used with the AC adaptor. When the WORKABOUT PRO is powered from the AC adaptor, it will also charge the battery pack.

A rechargeable internal coin cell provides backup power to preserve the contents of RAM while the WORKABOUT PRO's battery is being changed.

## 2.10 The Docking Station

The WORKABOUT PRO can be connected to a Docking Station.

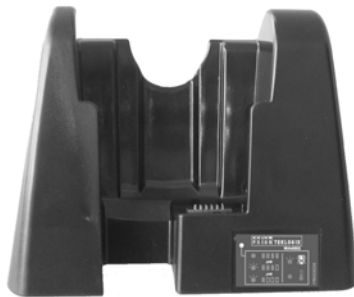


Figure 2.5 The Docking Station

There are two variants of the docking station: model WA4002 for the M and C variants of the WORKABOUT PRO, and model WA4102 for the S variant. The docking station provides USB host and USB client ports, plus a connector to the WORKABOUT PRO:

- USB type B port.  
This port accepts a cable from a USB host (typically a desktop computer).
- USB type A port.  
This port connects the WORKABOUT PRO to other peripheral devices; the WORKABOUT PRO serves as a USB host.
- LIF connector.  
This connects to the WORKABOUT PRO.
- DC power connector.  
Accepts DC from the AC adaptor.

The docking stations is available as part of a kit from Psion Teklogix. USB cables and power cords are sold separately.





3.1 Overview . . . . .	19
3.2 Installing The Software . . . . .	19
3.3 Installed Files . . . . .	19
3.4 Windows CE Drivers . . . . .	20
3.4.1 The Expansion-Slot (PCO) Driver. . . . .	20
3.4.1.1 PCO Driver Initialization . . . . .	20
3.4.1.2 PCO LIF And Tether Functions . . . . .	21
3.4.1.3 PCO USB Functions . . . . .	22
3.4.1.4 PCO Scanner Functions. . . . .	22
3.4.1.5 PCO Power Management Functions . . . . .	22
3.4.2 The PCMCIA Driver . . . . .	22
3.4.3 The Serial Port Driver . . . . .	22
3.4.4 Loading Of Third-Party Drivers . . . . .	23
3.5 Installing Third-Party Drivers . . . . .	23
3.6 The Application Programming Interface . . . . .	23
3.6.1 The Expansion-Slot API. . . . .	23
3.6.1.1 The Interrupts Namespace . . . . .	24
3.6.1.2 The ExpansionWakeup Namespace . . . . .	25
3.6.1.3 The GPIO Namespace . . . . .	25
3.6.1.4 The EEPROM Namespace . . . . .	25
3.6.1.5 The ExpansionUSB Namespace . . . . .	25
3.6.1.6 The USBhub Namespace . . . . .	25
3.6.1.7 The ScannerPort Namespace . . . . .	25
3.6.1.8 The smBus Namespace . . . . .	26
3.6.1.9 The PCMCIA Namespace . . . . .	26
3.6.2 Registry Keys . . . . .	26
3.6.3 User Interface . . . . .	26



## 3.1 Overview

This chapter describes the software and APIs provided for developers to connect to the WORKABOUT PRO.

The WORKABOUT PRO's expansion slot is intended to provide third parties with a method to extend the device by adding custom hardware. The expansion-slot driver and its API allow the WORKABOUT PRO to identify the expansion slot hardware, then start appropriate device drivers to connect to the hardware.

The expansion slot API supports a C++ interface only. Each device that can connect to the expansion slot contains an I<sup>2</sup>C EEPROM, which identifies the device. The operating system can then load the proper device driver.

## 3.2 Installing The Software

The API component of the Psion Teklogix Hardware Development Kit for the WORKABOUT PRO has been developed for Windows platforms. The WORKABOUT PRO uses Microsoft Windows® CE .NET as its main operating system.

The core libraries of the HDK's API has been developed for C++. The installation package assumes that you will be using a Windows development environment.

The installation package is available as a download from [www.teklogix.com/developer](http://www.teklogix.com/developer) or as a CD-ROM available from Psion Teklogix. The main installation program, `Setup.exe`, will install all libraries and documentation for the API.

Run the `Setup.exe` program, and follow the prompts, accepting the license agreement and selecting an install location. By default, the install program will place all the files under `C:\Program Files\Psion Teklogix\`.

### 3.2.1 Working With IDEs

There is one language library included with the SDK, for C++. This library can be used with Microsoft's eMbedded Visual C++, an IDE specifically designed for development for the Microsoft Windows® CE platform.

## 3.3 Installed Files

### 3.3.1 The Mobile Devices SDK

The installation procedure places all files you will need to begin development on your computer. This includes header (`.hpp`) files for C++ development. Documentation for the SDK is also installed.

Some code is specific to the WORKABOUT PRO. You will need to link in these libraries.

Figure 3.1 shows the installation directory structure for the software component of the Psion Teklogix WORKABOUT PRO HDK.

The directory tree shown below is for the version 1.01 release of the HDK; subsequent releases will have a different directory name below the `/Psion Teklogix` directory. This directory is referred to as the `<HDK directory>` elsewhere in this book. Multiple versions of the WORKABOUT PRO HDK can thus be installed on the same computer.

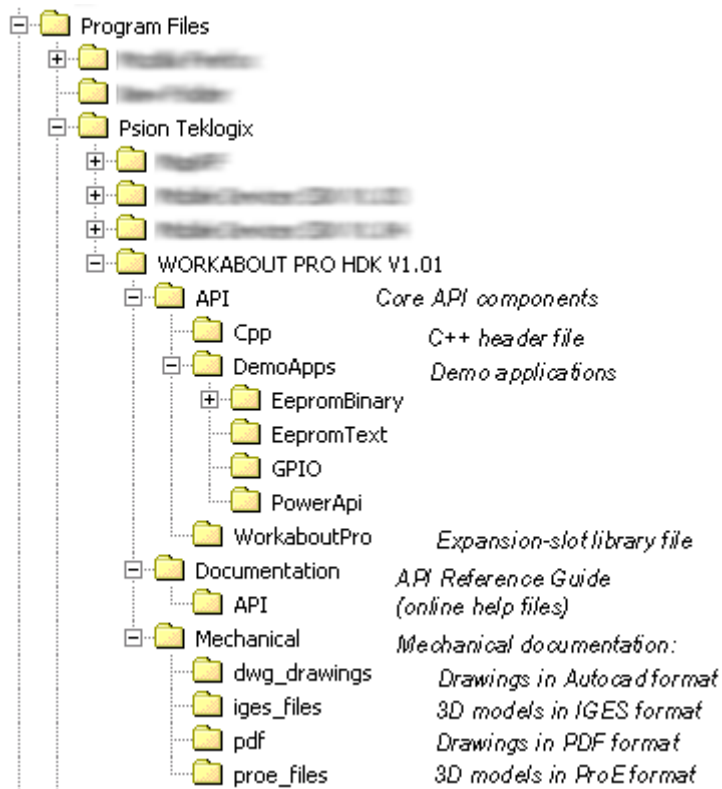


Figure 3.1 HDK File Locations

The core Hardware Development Kit API software components include a header file and a library file.

Demo applications include programs to read the EEPROM of the installed expansion-slot module in text or binary, a program to control the general-purpose I/O pins on the expansion slot, and a program to control power to the expansion slot.

Documentation includes the online API Reference guide, manuals, mechanical drawings (in PDF and Autocad format), and 3-D engineering models (in Pro/E and IGES format).

## 3.4 Windows CE Drivers

### 3.4.1 The Expansion-Slot (PCO) Driver

The expansion-slot driver is also called the peripheral control driver, and uses the “PCO” designation. The PCO driver is a Streams driver activated very early at boot up time (it is loaded after File devices and the I<sup>2</sup>C driver).

The PCO driver handles miscellaneous peripheral devices to avoid a proliferation of tiny drivers handling only a few GPIO pins. The PCO driver is a power managed device and will respond to power management API functions.

#### 3.4.1.1 PCO Driver Initialization

When it is loaded, the PCO driver performs the following steps:

1. Sets up mapped memory to manipulate the general purpose I/O pins on both the main processor (the PXA255) and the MQ1188. This allows access to GPIO expansion functions.

2. Initializes the expansion EEPROM device.
3. Reads the expansion slot EEPROM.
4. Identifies the third-party driver for the device in the expansion slot using the data from the Manufacturer/Model field in the EEPROM.
5. Attempts to access the registry entry defined by this data.

This registry entry designates the third-party device driver. If the registry entry is present, the PCO driver attempts to activate the designated third-party device driver.

6. Activates the PCMCIA/CF-card driver.

The PCMCIA/CF-card driver will always enable the Compact Flash socket. If it detects a Psion Teklogix PCMCIA expansion module, it will enable the PCMCIA card slot as well. It will also enable the PCMCIA socket if the registry key desires the PCMCIA socket to be enabled.

The PCMCIA/CF-card driver maintains knowledge of the registry key to control access to PCMCIA-related API functions.

7. Activates the full-function UART (FFUART) serial port driver, if needed.  
if enabled (indicated by the FFUART registry key, or Expansion EEPROM hardware type settings)
8. Initializes other peripherals.

These include the LIF port, detection of devices on the tether port, Bluetooth power and reset, and Bluetooth UART receive-data multiplexor.

9. Enables the USB hub, if needed.

The PCO driver enables the USB hub if the device in the expansion slot supports USB (as indicated by registry settings, or expansion EEPROM hardware type settings), or if the hardware-detect function indicates that a USB scanner is connected to the internal scanner port.

10. Sets the keyboard processor wake up sources for the scan keys if a scanner is detected.

The expansion driver also manages the setup of the expansion interrupts, and sets and gets GPIO pin states.

### **3.4.1.2 PCO LIF And Tether Functions**

The PCO driver manages the USB power GPIOs for the LIF and tether ports. The driver waits on LIF/Tether event notifications from the SPI driver. When something is attached to the LIF or tether port, the PCO driver turns on the appropriate USB power GPIO after a two second delay. When the device is removed from the LIF or tether port, the PCO driver removes USB power.

The PCO driver manages power for LIF and tether function during suspend and resume.

### 3.4.1.3 PCO USB Functions

The PCO manages the power to the WORKABOUT PRO's internal USB hub, and also USB power control to the expansion slot.

Power management for the USB hub consists of applying power if USB is selected by one of the control sources. Control source include: the LIF port, the tether port, the scanner port (hwdetectScanner function), and the expansion slot (registry key or Expansion EEPROM hardware type). As a number of devices can trigger this, PCO must maintain a count of enables and disables.

The PCO driver manages power for the USB hub and the expansion slot during suspend and resume.

Power control for the expansion USB function consists of applying power when requested by registry key or by Expansion Slot API function. There are Expansion Slot API functions to enable and disable the USB hub, and enable and disable USB power to the expansion slot.

### 3.4.1.4 PCO Scanner Functions

The PCO driver sets wake-up sources for the keyboard scan keys if a scanner is configured, and enables the USB hub if a USB scanner is indicated.

An API function is provided to enable scanner power even if a scanner is not configured. This allows third parties to use the scanner port for their own purposes.

### 3.4.1.5 PCO Power Management Functions

The PCO driver is a power managed device, and responds to the following power management API functions:

- IOCTL\_POWER\_CAPABILITIES.
- IOCTL\_POWER\_SET, IOCTL\_POWER\_GET.

Power-down (suspend) functionality is initiated by changing to the D3 or D4 power state. Power-up (resume) functionality is initiated by a change to the D0, D1 or D2 power states. This is common behavior for Psion Teklogix power-managed devices using Windows CE.

## 3.4.2 The PCMCIA Driver

Hardware containing a PCMCIA slot may be connected to the expansion slot. The expansion-slot driver determines whether this PCMCIA socket is present and enabled, and controls the loading of the PCMCIA driver.

The PCMCIA driver handles both the CompactFlash and the PCMCIA socket interfaces.

Since the PCMCIA socket is itself a piece of expansion slot hardware, the expansion-slot driver must identify this hardware prior to activating the PCMCIA driver. It will then determine whether to initialize the CF socket only, or both the CF and PCMCIA sockets.

Third-party expansion-slot drivers may not separately activate the PCMCIA socket. Third parties may design interfaces using the PCMCIA memory specification and interface to the hardware using the predefined PCMCIA memory windows. See [CHANGE].

## 3.4.3 The Serial Port Driver

The expansion-slot driver also controls the loading of the full-function UART serial port driver, as the pins available to these devices are only available on the expansion slot.

### 3.4.4 Loading Of Third-Party Drivers

In order to load the driver for the device in the expansion slot, the PCO driver retrieves the text information from the Manufacturer/Model field in the expansion device's EEPROM and appends it to the registry key HKLM\PsionTeklogix\Expansion Slot\.

The driver then calls `ActivateDevice()` with the combined text as the device's registry key and with a null parameter. If the key does not exist, the activation fails.



**Note:** *It is not a requirement that there must be a third-party driver be present for the device in the expansion slot.*

### 3.5 Installing Third-Party Drivers

Third-party drivers must be stored on the WORKABOUT PRO's flash memory (in the Flash Disk folder) by a third-party-supplied installation program. This is necessary to ensure the expansion driver will be able to activate the third-party driver following cold resets. The third-party installation program must also set up the registry to define the OEM device driver parameters.

See Section 3.6.2 on page 26 for more details about the HDK's use of registry keys.

## 3.6 The Application Programming Interface

The following additional APIs are provided for the use of third-party drivers and cards. APIs are only provided for C++.

### 3.6.1 The Expansion-Slot API

The expansion slot API provides third-party access to various functions by means of API entry points. The file is named `ExpansionSlotLibrary`

The expansion-slot library defines general-purpose I/O (GPIO) pins, plus access routines that designers may use to manipulate them. Access to the expansion card's EEPROM is also provided. For flexibility, the library includes access to the Scanner GPIO pins in addition to the Expansion Port GPIO pins.

The GPIO pins and signal directions on the WORKABOUT PRO hardware have been defined by Psion Teklogix. The expansion slot designer is restricted to the predefined uses for these pins. The state of these pins is known at power-up, and in suspend. See Section 8.2.5 on page 80 for details on these pins.

namespace	Classes and Global Functions	Description
<i>All routines below are in the PsionTeklogix::HDK7525 namespace.</i>		
Interrupts	Configure SetType GetPinState	
ExpansionWakeup	Enable Disable	
GPIO	Configure SetPinState GetPinState	
EEPROM	Configure EnumerateFields SetTextField GetTextField GetBinaryField SetBinaryField	
ExpansionUSB	EnablePower	
USBhub	EnablePower	
ScannerPort	EnablePower Configure SetPinState GetPinState	
smBus	Write Read WriteRead	
PCMCIA	SetSocket SetTiming GetMemoryAttributes	
<i>Classes appear in italics.</i>		

Table 3.1 Listing of Classes and Global Functions

### 3.6.1.1 The Interrupts Namespace

Two interrupts are provided. These signals are carried on pin 63 (PCMCIA SLOT\_READY, an active high input) and pin 65 (PCMCIA nSLOT\_CD, and active-low input) of the 100-pin expansion slot. If the PCMCIA driver is in use, these interrupts are not available. If a pin is not used as an interrupt, then the pin may be used as a GPIO input.



### 3.6.1.2 The ExpansionWakeup Namespace

These functions manage the ‘wake up from suspend’ signal on pin 79 of the 100-pin expansion slot (an active low input to the WORKABOUT PRO).

This signal is connected to the keyboard controller and is monitored from there. This pin does not generate any interrupt except to wake up the processor. Any interrupt signals should be connected in parallel to interrupt the appropriate driver.

### 3.6.1.3 The GPIO Namespace

These functions allow access to the general-purpose I/O signals of the 100-pin expansion slot.

### 3.6.1.4 The EEPROM Namespace

These functions provide access to the expansion EEPROM. The function that accesses the EEPROM text fields uses `std::wstring`, but the returned data is restricted to printable ASCII characters, since that is how the data is stored in the EEPROM.

The expansion EEPROM size defaults to 128 bytes long, with a page size of 8 bytes. The `EEPROMResultConfigure()` function enables the user to set different sizes for the expansion EEPROM.



**Note:** *The Expansion API handles EEPROMS of up to 256 bytes only. Accessing EEPROMs larger than this requires the use of the smBUS API functions to communicate directly with the EEPROM.*

### 3.6.1.5 The ExpansionUSB Namespace

The `EnablePower` function in this namespace manages USB power on the USB port included in the 100-pin connector. The function enables the expansion USB power switch signal (pin 88 of the 100-pin connector).

Enabling the Expansion USB will also enable the USB hub if it is not already enabled.

Expansion USB power is power-managed and will be automatically disabled in suspend and re-enabled on resume (if it was previously enabled).



**Note:** *Expansion USB power can also be enabled by setting a registry key and by setting the hardware type field appropriately in the expansion EEPROM. If power is enabled in this way then the `EnablePower()` function will not override those settings.*

### 3.6.1.6 The USBhub Namespace

The `EnablePower` function in this namespace enables power on the USB hub to allow USB devices to be connected to and powered by the 100-pin connector.

Multiple calls can be made and will increment the count of requests. The expansion API source is in addition to other devices that enable power to the USB hub. This function will not override the internal settings. The USB hub is power managed and will automatically be turned off in suspend, and re-enabled on resume (if it was previously enabled).

### 3.6.1.7 The ScannerPort Namespace

If the internal scanner port is not used for a scanner, third parties may use it for any purpose. These functions provide access to the connected device’s signals. The serial driver (COM3) already provides access to the serial lines on the scanner port: `Tx_data`, `Rx_data`, `nBAR_RTS` and `nBAR_CTS`.

### 3.6.1.8 The smBus Namespace

The smBus functions allow access to the I<sup>2</sup>C bus.

### 3.6.1.9 The PCMCIA Namespace

If the expansion card requires memory or I/O ports, they can be created using the PCMCIA interface signals from the processor. The PCMCIA hardware provides three types of memory: common memory, attribute memory and I/O memory. These functions provide access to the software aspects of the PCMCIA ‘socket’.



**Note:** *These functions will return errors if the PCMCIA socket is already in use. In this case the standard PCMCIA driver will manage the memory windows.*

## 3.6.2 Registry Keys

The OEM expansion slot hardware identifies itself by means of EEPROM information. The Manufacturer/Model field will be appended to the key

```
HKLM\Drivers\PsionTeklogix\Expansion Slot\.
```

This key will be used to activate the third-party device driver.

Additional key values may be placed under the top key

```
HKLM\Drivers\PsionTeklogix\Expansion Slot\
```

to enable additional functions.

The key and value “PCMCIA=dword:1” enables the PCMCIA socket on the expansion slot (this is socket 1). These pins then become unavailable for other uses. The pins defined for this slot have predefined meanings and must be adhered to in the hardware design. These pins include both expansion interrupts.

If the value is 0, or the key value is absent, the PCMCIA socket will not be enabled.

The key and value “FFUART=dword:1” enables the full-function UART (FFUART) using the standard serial driver as COM1. If the value is 0 or the key value is absent, the FFUART COM1 port will not be enabled.

The key and value “USB=dword:1” enables the USB hub and the expansion slot USB power control when the PCO driver initializes. This assumes USB is used on the expansion slot. If the value is 0 or the key value is absent, neither the USB hub nor the USB power control signal will be enabled (for the expansion slot). If the USB key is absent or has a value of 0, the expansion slot USB power control can still be controlled by the expansion-slot library.

## 3.6.3 User Interface

The only user interface for the PCO driver is the setting of the Expansion EEPROM fields in BooSt and the display of certain Expansion EEPROM fields in the *System Properties* tab of the *System* control panel applet. These fields are displayed in the *System Properties* tab as:

“Expansion Module: <manufacturer/model>”,

“Expansion Revision: <hardware revision>”, and

“Expansion Serial No: <serial number>”.

Undefined or non-programmed EEPROM fields are displayed as “Unknown”.





4.1 Overview . . . . .	31
4.2 The BooSt Console . . . . .	31
4.3 Connecting To The WORKABOUT PRO's Serial Port . . . . .	31
4.4 Access To The BooSt Console . . . . .	31
4.5 Super-User Mode . . . . .	32
4.6 Pathnames. . . . .	32
4.7 BooSt Commands. . . . .	33
4.7.1 ac97 . . . . .	34
4.7.2 adc . . . . .	34
4.7.3 audio . . . . .	34
4.7.4 cksum . . . . .	35
4.7.5 config . . . . .	35
4.7.6 debug. . . . .	36
4.7.7 distest . . . . .	36
4.7.8 doc . . . . .	37
4.7.9 editmem . . . . .	38
4.7.10 go . . . . .	38
4.7.11 i2c. . . . .	39
4.7.12 kbd . . . . .	39
4.7.13 load . . . . .	40
4.7.14 ls . . . . .	40
4.7.15 memtest. . . . .	40
4.7.16 pcctest. . . . .	40
4.7.17 rtc . . . . .	40
4.7.18 sleep . . . . .	41
4.7.19 standby . . . . .	41
4.7.20 touch . . . . .	41
4.7.21 uptest . . . . .	41
4.7.22 usb . . . . .	42
4.7.23 ver. . . . .	43
4.7.24 wan . . . . .	43
4.7.25 ymodem. . . . .	43



## 4.1 Overview

This section describes operation of the WORKABOUT PRO's bootloader, BooSt.

The WORKABOUT PRO's main processor uses BooSt to load software for the keyboard processor, and for the main operating system.

## 4.2 The BooSt Console

The BooSt bootloader presents a text-mode 'console' interface, with a prompt > at which one can enter commands.

This console is usually presented to the screen of the terminal, at which times the user can enter commands through the terminal's keyboard.

The text-mode console interface is also presented through one of the WORKABOUT PRO's serial ports (COM3), which is available through the serial lines on the WORKABOUT PRO's tether connector. An adaptor is required to convert the low-level signals on these lines to RS-232 levels.

## 4.3 Connecting To The WORKABOUT PRO's Serial Port

Equipment needed:

- A PC with an available serial connection.
- An RS-232 serial adaptor which can connect to the WORKABOUT PRO's tether port.
- Serial communications software that can handle Y-modem file transfer.
- A serial cable. This cable, available as Psion Teklogix part number 9003659, has a 9-pin D-connector on both ends.

To connect, follow these steps:

1. Connect the WORKABOUT PRO to the development PC using the serial cable. One end of the serial cable plugs into the PC's serial port and the other end of the cable plugs into the serial adaptor.
2. Set the serial communications software for the port where the serial cable is connected. Use 8 data bits, no parity, one stop bit (8N1), a data rate of 115 200 bits per second, and no flow control.
3. Start the serial communications software. It displays a console window.
4. Press <ENTER>. The WORKABOUT PRO echoes a menu to the PC's screen through the communications software.

## 4.4 Access To The BooSt Console

If Windows CE is running, you can gain access to the BooSt console by performing the following:

- Press and hold the <LEFT SCAN>, <BLUE>, and <ENTER> buttons for 6 seconds. The WORKABOUT PRO unit reboots, and displays the BooSt console prompt on the screen and on the serial port.

When this key combination is used, the WORKABOUT PRO attempts to boot from a memory card (if one is present). If no memory card is present or if the memory card doesn't contain a `7525.img` file, the WORKABOUT PRO then tries to boot normally, from the BooSt code in its internal flash.

This behaviour can be used to ensure that a full BooSt and Windows CE software update goes as expected, running under the BooSt code on the CF card rather than relying on the old BooSt code already in the terminal.

## 4.5 Super-User Mode

The boot loader in the WORKABOUT PRO is configured by default to present a restricted menu of choices to the user:

```
WORKABOUT PRO boot menu
-----
1) Run main OS
!) Clean start main OS
2) Begin YMODEM load
3) Show configuration
4) Audio test
5) Display test
6) Touch test
7) RAM test
S) Configure internal scanner
```

Other commands are hidden.

To break out of this menu, and enter 'super-user mode', where all commands are available:

- Type three dots ('...'), then the Teklogix back-door password, then press **<ENTER>**. The WORKABOUT PRO prints the message "Superuser mode." and displays a `>` prompt.



**Note:** This sequence of keystrokes is not echoed to the console.

To break out of super-user mode, and return to the BooSt menu, it is necessary to restart BooSt. To restart BooSt:

- Type `go boot`. The WORKABOUT PRO reboots and the BooSt menu reappears.

## 4.6 Pathnames

Various storage devices in the WORKABOUT PRO system have names that are used in issuing commands.

In Psion Teklogix' usage, each device name is suffixed with a number indicating which card of the type it is. The first card of each type receives a zero; the second, a one, and so on. Partitions are indicated with a dash and a further number, also starting at zero.

Thus, the first SD card is named `sdmmc0`. A second card, if possible, would be `sdmmc1`. Likewise, the first partition on the first SD card is `sdmmc0-0`, and the second partition on the first card is `sdmmc0-1`.

In the WORKABOUT PRO, there are four possible devices: the internal flash memory, the SD or MMC card, the CompactFlash card, and the PCMCIA card (if the optional adapter is installed).



Since there is a maximum of one of each type of device present in the WORKABOUT PRO at any given time, all their names will have a zero before the partition number.

Device	Name	Notes
Secure Digital / MultiMedia Card	/sdmmc0	
Internal flash memory (reserved partition)	/doc0	
Compact Flash card	/cf0	
PCMCIA Card	/pccard0	

Table 4.1 Memory Location Names

These devices appear as directories under the root directory /.

## 4.7 BooSt Commands

From the BooSt console, you can type ? then <ENTER> to get a list of available commands:

```
Registered console commands:
?      Displays a list of registered commands
ac97   AC97 link command
adc    Capture touch screen ADC samples
audio  Audio test command
cksum  Calculate POSIX.2 CRC for a file
config Configuration command
debug  Display debugging information
distest Display test
doc    Perform Disk On Chip operations
econfig Expansion slot configuration command
editmem Edit memory
go     Jump to boot code or flash module (OS)
i2c    I2C
kbd    Keyboard test
load   Image file loader
ls     Directory list command
memtest Test unused memory regions
pcctest Sycard PCCTest172/CFtest222 interface test command
rtc    Real Time Clock
sleep  Delay for the specified amount of time
standby Put the terminal in suspend mode
touch  Touch driver calibration commands
uptest uP test commands
usb    USB device related commands
ver    Display BooSt version information
wan    WAN test command
ymodem Perform a YMODEM transfer
```

For more information on a specific command type the name of the command followed by a space, then a question mark, then press <ENTER>. For example:

```
editmem ?
```

Many of the commands, such as `editmem`, `i2c`, and `memtest`, are for manufacturing test purposes. System configuration commands include `rtc`, `config`, and `ver`. The `debug` command lists the tasks running on the WORKABOUT PRO system and shows their state.

## 4.7.1 ac97

AC97 link command.

Usage:

```
ac97 [close | open | read <addr> | write <addr> <data>]
```

Options:

close	Close
open	Open
read	Read
write	Write

## 4.7.2 adc

Capture touch screen ADC samples.

Usage:

```
adc <channel>
```

Options:

<channel>	The ADC channel to sample, must be one of:
x	Differential X position measurement
y	Differential Y position measurement
<n>	ADC control byte (in hex, only bits 2 through 6 valid)

## 4.7.3 audio

Test the terminal's audio system.

Usage:

```
audio [<options>] <command> [<command>...]
```

Options:

-d<name>	Use the named audio device.
-g<gain>	Specify the input gain setting (range: 0 - 100)
-i<chan>	Input from the specified channel.
-o<chan>	Output to the specified channel.
-v<vol>	Specify the output volume setting (range: 0 - 100).
-w<type>	Specify the output waveform. <type> can be 1 for sine, 2 for square, 3 for triangle, 4 for sawtooth, or 5 for inverse sawtooth.

The `<chan>` parameter is any combination of `l` (the letter `el`) for left, `r` for right, `f` for front, `b` for back, `u` for up, and `d` for down. For example, the command `audio -ofl` outputs to the front left channel.

Sample commands:

```
output <freq>[,<ms>]
```

Output the specified frequency for the specified time (default = until stopped)

```
output stop
```

Stop output.

```
input
```

Sample the audio input and report the detected signal's frequency and amplitude

```
wait <ms>
```

Delay for the specified number of milliseconds before continuing

## 4.7.4 cksum

Calculate a POSIX.2 CRC checksum for a file.

Usage:

```
cksum <file>
```

Options:

`<file>` the full path and file name to work on (e.g. `/mmc0-0/test.bin`)

If a memory card containing a known file is installed in the WORKABOUT PRO, you can verify operation of the card slot via a `cksum /<card and partition ID>/<filename>` command (for example,

`cksum /cf0-0/test.bin`) and comparing the resulting checksum value to that of a known good checksum for the file.

See Section 4.6 on page 32 for description of Psion Teklogix' path naming convention.

## 4.7.5 config

Read or configure certain parameters of the terminal.

Usage:

```
config [get | set [boostSecurity | cpuSpeed | flags | hwSerNo | mlbRev | scan  
| termSerNo]]
```

Options:

`boostSecurity` Enables or disables the menu of restricted BooSt commands.

Choices: 0 for disable, 1 for enable, 2 for lockdown mode. When lockdown is selected, and the terminal is rebooted, the BooSt menu is not available through the WORKABOUT PRO's own display or keyboard, just through the console

port.

`cpuSpeed` Read or set a record of the CPU speed.

`hwSerNo` Read or set a record of the terminal's hardware serial number.

`mlbRev` Read or set a record of the revision level of the terminal's main logic board.

scan                      Read or set a record of the type of scanner installed in the WORKABOUT PRO.

termSerNo                Read or set a record of the terminal's serial number.

## 4.7.6 debug

Show a list of the tasks running in the WORKABOUT PRO system, and their state.

Usage:  
debug [zero]

zero                      If specified, this option causes the thread run times to be reset

The information is displayed as a table:

```
Thread list:
  Name          ID      Status    Pri   Unused Stack   Run Time
-----
mqUsbInt       0005BA00 Blocked   BF/BF    714/800        0.000022
touch          0005AD00 Blocked   7F/7F    410/800        0.000750
Scanner        0005A2E0 Blocked   01/01    61C/800        0.000147
PortMonitor    00059A60 Blocked   01/01    4A8/800        0.000972
Keyboard       000591E0 Blocked   80/80    640/800        0.000037
loader         00057B00 Blocked   3F/3F    3C4/800        0.002778
beeper         00056A60 Blocked   BF/BF    708/800        0.000004
cf             000561E0 Sleeping  BF/BF    71C/800        0.005037
sdmmc          00055960 Sleeping  BF/BF    718/800        0.013495
textWin        000548A0 TimedBlock 7F/7F    694/800        0.016252
power          000530C0 Blocked   FF/FF    730/800        0.000008
fileSysMan     000527C0 Blocked   7F/7F    564/800        0.091518
TimedEvents    00051F40 Blocked   3F/3F    728/800        0.000003
I2C slave      0004DB60 Blocked   C0/C0    21C/300        0.000108
I2C master     0004D7E0 Blocked   BF/BF    1E4/300        0.001496
clock          0004CEA0 Sleeping  01/01    6F8/800        0.003485
console        0004C0A0 Ready     7F/7F    384/800        0.130508
idle           00048CA0 Ready     00/00    6C/100        857.443100

Free pool stats: A4DA0/A3D40/4
```

The columns are as follows:

Name	Thread name
ID	Address of the pthread structure (in hex)
Status	Current state of the thread
Pri	Current priority / scheduled priority (in hex)
Unused Stack	Unused stack / total stack size (bytes, in hex)
Run Time	The cumulative time spent executing the thread (in seconds, in decimal)
Free pool stats	Total free / largest block / num blocks (in hex)

## 4.7.7 distest

Test the WORKABOUT PRO's display.

**Usage:**

```
distest [<options>] [<id>|close]
```

**Options:**

```
-b<R,G,B>      Set background colour red, green, and blue (use with test 0)
-f             Force a new window to be created
-i<id>         Window ID to control (0 = newest)
-s<num>        Set the grid/checkerboard square size (in pixels)
-w<X,Y,W,H>    Use left X, top Y, Width, and Height when opening window
<id>           Select a test by ID:
                0 for Black/background
                1 for White
                2 for Full red
                3 for Full green
                4 for Full blue
                5 for B & W checkerboard
                6 for W & B checkerboard
                7 for Grid
                8 for Box and cross
                9 for Colour bars
                a for Colour test
                b for Walking bits
close          Causes a previously opened display test window to be closed.
```

During these tests, the WORKABOUT PRO's console port remains active, and you may continue to issue commands to it through the serial connection.

After performing a touch calibration you can 'doodle' on the screen to test the accuracy of the touch panel. Exit from this test by pressing <Esc> on the terminal keyboard, or issuing the `touch close` command at the console.

If the calibration has been previously done you can get directly to the 'doodle' screen through the `touch i n` command. While the 'doodle' screen is open you can clear it by pressing the <SPACE> key on the WORKABOUT PRO.

### 4.7.8 doc

Operate on the WORKABOUT PRO's 'Disk On Chip' flash memory.

**Usage:**

```
doc [-b] [-s<socket>] [<action>]
```

**Options:**

```
-b             Operate on boot area as well as the main flash memory.
-s<n>          Operate on Disk On Chip socket <n> (default: socket 0)
and <action> is one of:
```

```
format [<partition>]
    Format the partition (default: partition 0)

info
    Display Disk On Chip info (default action).

mount [<partition>]
    Let file system mount the partition (default: all partitions).

partition <size>
    Set the OS partition size in kilobytes.

unmount [<partition>]
    Force file system to unmount partition (default: all partitions)

verify [<partition>]
    Verify the partition (default: partition 0).
```

## 4.7.9 editmem

Edit memory.

Usage:

```
editmem [-d<length>] [-s<word size>] [-w] <address> [?|=|'|&=] [<value>]
```

Options:

```
-d<length>      dump specified length of memory contents instead of editing
-s<word size>   start editing with the specified word size (1, 2, or 4)
-w             use write only mode (reads are not performed unless requested)
<address>      the starting address for memory editing
```

Memory-modification operators:

```
?<value>        read <value> from address
=<value>        write <value> to address
|=<value>        bitwise-OR <value> with current value at address
&=<value>        bitwise-AND <value> with current value at address
<value>        value to use (if a memory-modification operator was specified)
```

All editmem values are specified in hexadecimal.

The editmem command has an interactive memory editing mode that is entered when you specify an address but not a command.

When in this mode, the normal BooSt command prompt is replaced with a prompt displaying the current memory address and optionally the current value stored at that address. A single ? followed by <ENTER> will display a list of interactive commands for editmem. To exit from this mode send a single . (dot) followed by <ENTER>.

## 4.7.10 go

Jump to and run code.

Usage:

```
go [boot|hw|os[!]|ram <address> [noreset]]
```

Where `boot` = boot code, `hw` = cause a hardware reset, `os` = main OS (default), `os!` = clean start main OS, and `ram` = RAM module

This command is often used for starting the main OS after using BooSt. Thus,

```
go os starts Windows CE.
go os! starts Windows CE cleanly, discarding previously-stored Windows settings.
go boot restarts BooSt
go hw reboots the WORKABOUT PRO.
```

The `1` and `!` options from the restricted BooSt menu correspond to the `go os` and `go os!` commands respectively.

## 4.7.11 i2c

Issue a command to the I<sup>2</sup>C bus.

Usage:

```
i2c write <device> <data> [ <data> [ <data> [ ... ] ] ]
i2c read <device> <numBytes>
i2c writeRead <device> <data> <numBytes>
```

Where: `<device>` is the address of the device on the I2C bus (in hex)

`<data>` is the data byte to be written (in hex)

`<numBytes>` is the number of bytes to be read (decimal)

## 4.7.12 kbd

Send a command to the keyboard controller.

Usage:

```
kbd <command> [<data>]
```

Commands:

```
backlight <data>
```

Set the illumination level of the keyboard's backlight. Range: 0 to 255. Specify 0 to turn the backlight off.

```
cmd <data>
```

Send a hex byte to the keyboard controller.

```
id
```

Display keyboard id value.

```
mode [normal | test]
```

Select keyboard driver mode

```
status
```

Displays keyboard status

ver

Display version of keyboard software.

### 4.7.13 load

Load an ‘image’ (usually an executable program) file.

Usage:

```
load [-f] <file> [run]
```

-f                      Force load

<file>                The full path and name of the file to load. See Section 4.6 on page 32 for information on specifying pathnames.

run                    If the load is successful, run the image

### 4.7.14 ls

List the contents of a directory.

Usage:

```
ls [<path>]
```

This command accepts an optional pathname. If the pathname is not specified, the root directory / is assumed. See Section 4.6 on page 32 for information on pathnames.

### 4.7.15 memtest

Test unused memory regions.

Usage:

```
memtest [<address> <size>]
```

Options:

<address>            the starting address of the region to test (in hex)

<size>                the length, in bytes, of the region to test (in hex)

### 4.7.16 pcctest

Sycard PCCtest172/CFtest222 interface test command

Usage:

```
pcctest [socket]
```

Options:

socket                socket number to test (default 0)

### 4.7.17 rtc

Send a command to the WORKABOUT PRO’s Real Time Clock

Usage:

rtc get                Display current RTC time and data

rtc set <hour> <minute> <second> <dayOfWeek> <month> <dayOfMonth> <year>  
                        Set the time



In this command, <hour> is in 24-hour format (00:00 to 24:00), days of the week are numbered starting with Sunday = 0, and months are numbered starting with January = 1

## 4.7.18 sleep

Delay for the specified amount of time

Usage:

`sleep <duration> [ms]`

<duration> is specified in seconds unless the `ms` argument is supplied, in which case it will be in milliseconds. By default duration is expressed as a decimal value.

## 4.7.19 standby

Put the terminal in suspend mode.

Usage:

`standby`

## 4.7.20 touch

Test the touch screen.

Usage:

`touch [-p<x>,<y>] <command>`

`-p<x>,<y>` Specify the target location for the next sample.

<command> is one of:

`init [auto|nocal]`

Start calibration. Use the `auto` option to specify automatic sampling. Use the `nocal` option to skip calibration and go straight to testing.

`samp`

Capture an X/Y sample for calibration.

`cal [write]`

Calculate calibration values based on recent samples. The `write` option may be specified to store the result in EEPROM.

`erase`

Clear the post-calibration screen.

`line <x>,<y> <x>,<y> [<red>,<green>,<blue>]`

Draw a reference line between the two given points. The colour parameters are optional, with a range of 0-255 for each component; the default is the last colour used.)

`close`

Exit calibration

`print`

Display the current calibration parameters.

`read`

Read calibration parameters from EEPROM.

## 4.7.21 uptest

Test the keyboard processor (sometimes referred to as the 'uP').

Usage:

`uptest <command>`

where `<command>` is one of:

`bat`                      Display basic battery data

`command <code>`  
                            send a command to the keyboard processor (`<code>` is in hex).

`read <address>`  
                            Read battery data from the DS2761 (`<address>` is in hex).

`setAcc <value>`  
                            Set the “accumulated current” register in the DS2761 (`<value>` is in mAH).

`write <address> <data>`  
                            Write battery data to the DS2761 (`<address>` and `<data>` are in hex)



**Important:**    *The `setAcc` and `write` commands may adversely affect current battery readings.*

`ver`                      Display the version of the keyboard processor’s firmware.

## 4.7.22 *usb*

Issue a USB-related command.

Usage:

`usb <command>`

`<command>` is one of:

`disable`                  Disable the USB device.

`enable`                   Enable the USB device.

`use <device>`            Set the block storage device `<device>` to be accessible via USB.

By default, when you connect a WORKABOUT PRO to a PC through USB, the WORKABOUT PRO makes the reserved partition of the WORKABOUT PRO’s internal flash accessible to the PC as a USB Mass Storage Device. This is used for quick operating-system image-file transfers (see Section 5.2.2 on page 47).

The `usb use <device>` command allows you to make a SD/MMC or CF card installed in the WORKABOUT PRO available as the USB Mass Storage Device on your PC, instead of the reserved portion of the internal flash memory.

For example, `usb use sdmmc0u` will make any card inserted in the SD/MMC slot available through USB. The command `usb use cf0` will make the card in the Compact Flash slot available, and `usb use doc0` makes the reserved portion of the WORKABOUT PRO’s internal flash available again.



**Important:**    *Be sure to always use Window’s “Unplug or Eject Hardware” icon in the system tray to stop the USB device before unplugging it or rebooting the terminal. If this is not done, the memory device may be left in a corrupt state, with data left unwritten. This could result in an unreadable file system or files that contain corrupt data.*

### 4.7.23 ver

Display BooSt version information.

Usage: ver

### 4.7.24 wan

Test Psion Teklogix' GSM/GPRS expansion module.

Usage:  
wan

This command configures the WORKABOUT PRO's console port and full-function (FF) UART for serial pass-through communication with the GSM/GPRS expansion module.



**Important:** *The WORKABOUT PRO must be reset following the use of this command to resume normal console operation!*

While this command is running, the following control characters may be used to trigger events:

^P	Generate power pulse.
^R	Reset WAN module.
^S	Report SIM on/off status.
^X	Exit WAN test mode.

### 4.7.25 ymodem

Perform a YMODEM transfer

Usage:  
ymodem [<destination> [<options>]]

Where <destination> is one of

boot	Load a new version of BooSt.
load	Load a file using the BooSt loader.
load!	Force the load.
module	Load a BooSt module to RAM.
ram	Load binary data to the specified memory address (in hex).

If no destination for a downloaded file is specified, the ymodem command passes the file to the BooSt loader, which examines the header of the file to decide what to do with it.

If you send a BooSt image, the WORKABOUT PRO will reprogram the boot code region of the reserved partition of its internal flash memory, then reboot into the new BooSt image. If you send a Windows CE image, the WORKABOUT PRO will reprogram the OS region of the reserved partition of its internal flash memory, then reboot into the new Windows CE image.

When the "Boot to BooSt" key combo is used (<LEFT SCAN>, <BLUE>, and <ENTER> held for 6 seconds) a boot from the Compact Flash card is always attempted first. If no CF card is present or if the

CF card does not contain a 7525 .img file, the WORKABOUT PRO tries a normal boot to BooSt. This behaviour can be used to ensure that a full BooSt & WinCE software update goes as expected, running under new BooSt code on the CF card rather than relying on the old BooSt code already in the terminal.

# REPLACING SYSTEM SOFTWARE

# 5

5.1 Overview . . . . .	46
5.2 The Main Operating System . . . . .	46
5.2.1 Displaying The Date Code Of The Main OS . . . . .	47
5.2.4 Serial Download . . . . .	50
5.2.4.1 Equipment Needed . . . . .	51
5.2.4.2 Replacing The Main OS Software . . . . .	51
5.2.2 USB Download . . . . .	47
5.2.2.1 Equipment Needed . . . . .	47
5.2.2.2 Replacing The Main OS Software . . . . .	47
5.2.3 Load From Memory Card . . . . .	49
5.2.3.1 Equipment Needed . . . . .	49
5.2.3.2 Configuring the Memory Card . . . . .	49
5.2.3.3 Replacing The Main OS Software . . . . .	50
5.3 The BooSt Bootloader Software . . . . .	53
5.3.1 Equipment Needed. . . . .	53
5.3.2 Displaying The BooSt Datecode. . . . .	53
5.3.3 Replacing The BooSt Software Serially . . . . .	54
5.3.4 Starting The Main OS . . . . .	55

## 5.1 Overview

This section describes what you need to do to replace the software on the WORKABOUT PRO.

The software in the WORKABOUT PRO is divided into several types:

- Main operating system
- Keyboard-controller software
- Boost bootloader

Upgrading this software is described in the following sections.

### 5.1.1 The Boot Process And Loading Software

There are two ‘reset’ key combinations: <BLUE> + <ENTER> and <BLUE> + <LEFT SCAN> + <ENTER>.

The first key combination causes a reboot into the main operating system, Windows CE. The operating system must be present in the reserved partition of the WORKABOUT PRO’s internal flash memory as a file named `7525os.img`. During boot, this file is copied into the WORKABOUT PRO’s RAM and run.

The second key combination causes a reboot to the BooSt bootloader. It does not load the main OS from the file `7525os.img` in the reserved partition in the WORKABOUT PRO’s flash memory. It *will* copy any file named `7525.img` that it finds in the root directory of any other filesystem partition to the reserved partition, then copy it to RAM and run it.

Filesystem partitions include the user partition in the WORKABOUT PRO’s internal flash, an MMC/SD card, a CF card, or PCMCIA ATA card. This boot from the memory card allows an easy operating-system upgrade without requiring user input.

The <BLUE> + <LEFT SCAN> + <ENTER> key combination will always attempt a boot from an external filesystem first, and only do a normal boot from the reserved partition of internal flash (as described above) if an external filesystem containing a `7525Boot.img` file is not present. This boot mechanism is designed to allow a terminal with a corrupt or missing copy of BooSt to bootstrap from a memory card.

## 5.2 The Main Operating System

The software image of the main operating system on a WORKABOUT PRO contains the Windows CE .NET operating system (OS), the .NET runtime engine, and all the user-level software included with the WORKABOUT PRO. It may also include Open TekTerm (Psion Teklogix’ terminal emulator program), or the Jeode Java Virtual Machine (JVM).

The main OS image is available with the .NET runtime engine and Java (part number 1001975x).

## 5.2.1 Displaying The Date Code Of The Main OS

There are a few ways to display the date code of the main operating system software in the WORKABOUT PRO. The version of this software is reported as a date code from the day the software was built. The date code of the software image can be found using any of the following methods:

- Enter the **Control Panel**, select the **System** icon, and open the **Properties** tab. The item for 'WinCE Code' displays the datecode of the OS image.
- Hold down the WORKABOUT PRO's <LEFT SCAN>, <BLUE> and <ENTER> buttons for 6 seconds. The WORKABOUT PRO boots into its bootloader and displays the datecode of the OS image.

## 5.2.2 USB Download

This section explains how to replace the main operating-system (OS) software image in a WORKABOUT PRO through a USB cable.

### 5.2.2.1 Equipment Needed

Replacing the main OS software image requires the following items:

- The new main OS software image. The software image has part number 1000428x (where x is the version).
- A PC with an available USB Type-A connection.
- A WORKABOUT PRO docking station or adaptor with a USB Type-B port.
- A USB A/B cable.

### 5.2.2.2 Replacing The Main OS Software

The main OS software on a WORKABOUT PRO is upgraded by rebooting the device into the BooSt bootloader, copying the main-OS image file to the WORKABOUT PRO, then rebooting the device. The WORKABOUT PRO's bootloader loads and runs the new main-OS image file.

When the WORKABOUT PRO is booted into BooSt and connected to a PC using a USB cable, a drive labeled "Removable Disk" appears on the PC. This drive contains the WORKABOUT PRO software image. To upgrade the software image copy the new software image (which must be named 7525os.img) to this drive.



**Important:** *Before connecting a WORKABOUT PRO to the PC using USB, you must update the USB .inf file on the PC. This can be done by running the USB Setup program included on the SDK CD.*

*The USB Setup program can also be downloaded from the Psion Teklogix developers' web site at <http://www.psionteklogix.com/developers/> with part number 1000997x.*

The following steps explain the process for upgrading the software image in a WORKABOUT PRO connected through USB using a Docking Station:

1. Hold down the <LEFT SCAN>, <BLUE> and <ENTER> buttons simultaneously for 6 seconds. The WORKABOUT PRO reboots to the BooSt bootloader and displays text similar to the following:

```
Psion Teklogix 7525 BooSt.  
Copyright Psion Teklogix Inc. 2002, 2003  
Starting BooSt...  
Graphical console connected.  
CPU (rev = 0x6) clock 400 MHz (SDRAM 100 MHz)  
Psion Teklogix 7525 Colour ES3  
DiskOnChip: 32 MB  
RAM: 128 MB  
BooSt version I164p (0x4149EC17)  
Boot code image info: size = 297024  
    BooSt OS for 7525  
    Build version I164p  
7525OS.img image info: size = 11923822  
    7525 Windows CE.NET  
    version I164p  
BooSt key combo detected.  
OS load skipped.  
doc0-0 mounted: size = 16384 kB(32768 * 512)  
doc1-0 mounted: size = 15089 kB(30178 * 512)
```

```
7525 boot menu  
-----  
1) Run main OS  
!) Clean start main OS  
2) Begin YMODEM load  
3) Show configuration  
4) Audio test  
5) Display test  
6) Touch test  
7) RAM test  
  
Command>
```

2. Connect the WORKABOUT PRO to the PC using the USB cable.

The A end of the USB cable plugs into the PC and the smaller square B end of the cable plugs into the docking station or adaptor connected to the WORKABOUT PRO. When the USB connection is established, a new drive appears on the PC named “Removable Disk”.

The WORKABOUT PRO displays the following line on the console:

```
doc0-0 removed  
  
Command>
```

That part of the WORKABOUT PRO’s flash memory which stores the operating system image and is normally accessible only by the bootloader has been dismantled and made available to the bootloader’s USB driver.

The regular bootloader commands (1 and !) to load and run the main operating system will not work, and will give an error that there is no operating system image available.

3. Rename the Software Image from the part number under which it was provided (such as 1000428A1.img) to 7525os.img.
4. Copy the file 7525os.img to the “Removable Disk” drive on the PC.



5. ‘Stop’ the Removable Disk drive.

Once the file copy has finished, the Removable Disk must be ‘stopped’ to properly save the new file. To do this, select the **Unplug or Eject Hardware** icon in the system tray in the bottom right corner of the PC, or use the **Add/Remove Hardware** option in the **Control Panel** (follow the options to “Uninstall/Unplug a device”, and then “Unplug/Eject a device”, then select the Mass Storage Device).



**Important:** *If the Removable Disk is not stopped, the WORKABOUT PRO image could become corrupt causing the terminal not to boot properly.*

*If this happens, you must boot the WORKABOUT PRO into BooSt, connect it to the PC with the USB cable, and format the Removable Disk (right click on the drive and select the Format option).*

Once the Removable Disk has been properly stopped on the PC, the BooSt Console displays a message similar to the following:

```
nand0-0 mounted: size = 16220160 (31680 * 512)
>
```

The flash memory containing the operating-system image has been disconnected from the development computer and is now accessible by the bootloader. The regular bootloader commands (**1** and **!**) to load and run the main operating system now work.

6. Reboot the WORKABOUT PRO by selecting option **1**, “Run Main OS”, from the boot-loader menu. The device boots into the new operating system.



**Note:** *You may need to reconfigure any changes done to the system configuration through the Control Panel. The registry will be set to default values if the new OS determines that the previously-existing registry values are not compatible.*

## 5.2.3 Load From Memory Card

This section explains how to replace the main operating-system (OS) software image in a WORKABOUT PRO from a memory card. For initial software installation, when the terminal is open, loading from memory card is easiest.

### 5.2.3.1 Equipment Needed

Replacing the main OS software image from a memory card requires the following items:

- A memory card (Compact Flash or SD/MMC) containing the required software.

### 5.2.3.2 Configuring the Memory Card

Files should be placed in the root directory of the memory card.

When booting from a memory card, the WORKABOUT PRO loads any file named `7525.img` that is present on the memory card, it is copied to the reserved partition of the WORKABOUT PRO’s internal flash memory. This is typically the image file of the main operating system.

When run from the memory card, BooSt does *not* automatically load any files from any file system partition other than the memory card.

To create a memory card that loads BooSt into the reserved partition of the WORKABOUT PRO's internal flash, you must either put the BooSt file on the memory card twice, once named `7525Boot.img` and once named `7525.img`), or put a BooSt script on the card named `7525.img` that directs the loading of the `7525Boot.img` file. This script can load the image of the main operating system as well.

A Windows CE image file named `7525OS.img` can be manually placed in the WORKABOUT PRO's internal flash. When the WORKABOUT PRO boots from internal memory, it attempts to load this file before loading any file named `7525.img`.

You can prevent a Windows CE image named `7525.img` (resident in internal flash) from being loaded on any boot by connecting the WORKABOUT PRO to a PC through USB. By default, the WORKABOUT PRO makes the reserved partition of the WORKABOUT PRO's internal flash available on the PC as a USB Mass Storage device, and therefore will not boot from it.(see section 5.2.2 on page 47 for details).

### 5.2.3.3 Replacing The Main OS Software


To replace the OS software automatically from the memory card:

1. Insert the memory card into the slot in the open terminal.
2. Reboot the terminal by pressing **<BLUE> + <LEFT SCAN> + <ENTER>**. The WORKABOUT PRO boots from the memory card, then copies the new OS software to its internal memory.
3. Remove the memory card.
4. Reboot the terminal using the **<BLUE> + <ENTER>** key combination. The terminal reboots using the new OS software.

To replace the OS software manually, use the BooSt `load` command, described in section 4.7.13 on page 40.

## 5.2.4 Serial Download

This section explains how to replace the main operating-system software image on a WORKABOUT PRO through a serial cable.

 **Note:** *This is not recommended for loading the main OS because of the length of time required for the file transfer.*

### 5.2.4.1 Equipment Needed

Replacing the software image serially requires the following items:

- The new software image.
- A PC with an available serial connection.
- A WORKABOUT PRO serial adaptor, which has a serial port that connects to the WORKABOUT PRO's tether port.
- Serial communications software that can handle Y-modem file transfer.
- A serial cable. This cable, available as Psion Teklogix part number 9003659, has a 9-pin D-connector on both ends.

### 5.2.4.2 Replacing The Main OS Software

The main OS software image on a WORKABOUT PRO is upgraded by booting the device into the BooSt bootloader, copying the OS image file to the WORKABOUT PRO, then rebooting the device. The WORKABOUT PRO's bootloader loads and runs the new OS image file.

The following steps explain the process for upgrading the main OS software image in a WORKABOUT PRO using a serial connection and a Portable Docking Module:

*On the WORKABOUT PRO...*

1. Press and hold the <LEFT SCAN>, <BLUE> and <ENTER> buttons simultaneously for six seconds. The WORKABOUT PRO reboots to the BooSt bootloader and displays text similar to the following:

```
Psion Teklogix 7525 BooSt.  
Copyright Psion Teklogix Inc. 2002, 2003  
Starting BooSt...  
Graphical console connected.  
CPU (rev = 0x6) clock 400 MHz (SDRAM 100 MHz)  
Psion Teklogix 7525 Colour ES3  
DiskOnChip: 32 MB  
RAM: 128 MB  
BooSt version I173o (0x4149EC17)  
Boot code image info: size = 297024  
    BooSt OS for 7525  
    Build version I164p  
1001975xx.img image info: size = 11923822  
    7525 Windows CE.NET  
    version I164p  
BooSt key combo detected.  
OS load skipped.  
Touch calibration read from EEPROM successful  
doc0-0 mounted: size = 16384 kB(32768 * 512)  
doc1-0 mounted: size = 15089 kB(30178 * 512)  
  
7525 boot menu  
-----  
1) Run main OS  
!) Clean start main OS  
2) Begin YMODEM load  
3) Show configuration
```

- 4) Audio test
- 5) Display test
- 6) RAM test
- 7) Erase flash file system

Command>

2. Connect the WORKABOUT PRO to the development PC using the serial cable. One end of the serial cable plugs into the PC's serial port and the other end of the cable plugs into the serial port on the tether-port adaptor.

*On the development PC...*

3. Set the serial communications software for the port where the serial cable is connected. Use 8 data bits, no parity, one stop bit (8N1), a data rate of 115 200 bits per second, and no flow control.
4. Start the serial communications software.
5. Press <ENTER>. The WORKABOUT PRO echoes a menu to the PC's screen through the communications software. This menu is also displayed on the WORKABOUT PRO's own screen.

*In the communications software on the PC, or on the WORKABOUT PRO...*

6. Press 2 to begin a Y-modem transfer. The WORKABOUT PRO displays:

```
Attempting YMODEM receive to BooSt loader...
CCCCCCCCCCCC
```

*On the PC...*

7. Select the OS image file for serial transfer, using Y-modem protocol.
8. Start the download. The WORKABOUT PRO receives the image file, identifies its file header, and places it the appropriate place in memory.

It then displays messages similar to the following:

```
YMODEM successfully received 0x115A880 bytes.
Load copy to nand0 info: size = 12601941
    7525 Windows CE.NET
    K053r
Load completed successfully.
nand0-0 mounted: size = 15728640 (30720 * 512)
Command> load "/nand0-0/7525os.img" run
Loading "/nand0-0/7525os.img"...
Load RAM image info: size = 12601941
    7525 Windows CE.NET
    K053r
Loading 9% complete...
Loading 29% complete...
Loading 48% complete...
Loading 68% complete...
Loading 92% complete...
Loading 100% complete...
Resetting to RAM module.
```

The WORKABOUT PRO automatically reboots copies the newly-loaded operating system to RAM, then runs it.



**Note:** *You may need to reconfigure any changes done to the system configuration through the Control Panel. The registry will be set to default values if the new OS determines that the previously-existing registry values are not compatible.*

## 5.3 The BooSt Bootloader Software

BooSt is the low level boot code which performs some initial hardware configuration, verifies basic hardware functionality through built-in tests, and is responsible for loading the operating system into RAM and executing it.

In response to a specific set of key presses, BooSt provides a boot menu that enables the user to manually initiate several tests and perform maintenance tasks. BooSt on the WORKABOUT PRO can emulate a USB mass storage device (UFI protocol) for updating the OS. BooSt is capable of reading updates directly from FAT12/FAT16 formatted storage devices (Compact Flash, PCMCIA ATA, MMC, or Secure Digital Memory Cards).

### 5.3.1 Equipment Needed

Replacing the BooSt software image serially requires the following items:

- The new software image.
- A PC with an available serial connection.
- A WORKABOUT PRO serial adaptor, which connects to the WORKABOUT PRO's tether port.
- Serial communications software that can handle Y-modem file transfer.
- A serial cable. This cable, available as Psion Teklogix part number 9003659, has a 9-pin D-connector on both ends.

The BooSt Image can be found on the Psion Teklogix Intranet and has the part number 1001976xx (where xx is the version).

### 5.3.2 Displaying The BooSt Datecode

There are a few ways to verify the current version of BooSt in the 753x. The version of BooSt is always reported as a date code from the day the software was built. This date code can be cross-referenced to BooSt version through it's software release notice.

The date code of the BooSt image can be found using any of the following methods:

- Enter the **Control Panel**, select the **System** icon and open the **Properties** tab. The 'Boot code' item displays the version of the BooSt image.
- Hold down the <LEFT SCAN>, <BLUE>, and <ENTER> keys simultaneously for 6 seconds. The WORKABOUT PRO boots into the Boost bootloader and displays among its messages the BooSt version.

### 5.3.3 Replacing The BooSt Software Serially

The BooSt image on a WORKABOUT PRO is upgraded by rebooting the terminal into BooSt, selecting option 2 “Begin YMODEM load” and transferring the BooSt image to the terminal. The terminal knows where to store the software image because of its name.

The following steps explain the process for upgrading the BooSt Image in a WORKABOUT PRO:

1. Start the communications software.
2. Configure the communications settings to 115200 baud, 8-N-1, no flow control.
3. Connect the WORKABOUT PRO to your PC using the serial cable.
4. Hold down the WORKABOUT PRO’s <LEFT SCAN>, <BLUE>, and <ENTER> buttons simultaneously for 6 seconds. The terminal boots to the bootloader.

When the terminal boots, it displays the following messages similar to the following on its display. The messages are echoed to the WORKABOUT PRO’s console port to be displayed in the screen of the communications software:

```
Psion Teklogix 7525 BooSt.
Copyright Psion Teklogix Inc. 2002, 2003
Starting BooSt...
Graphical console connected.
CPU (rev = 0x5) clock 400 MHz
Psion Teklogix 7525 rev B
NAND flash: 32 MB (Samsung K9F5616U0B), 15 MB reserved
for OS partition
RAM: 64 MB
BooSt version F233n (0x3EF73FF7)
PCon version F233n
Keyboard version 3
Boot code image info: size = 232812
    BooSt OS for 7525
    Build version I164p
7525OS.img image info: size = 9914140
    7525 Windows CE.NET
    version I164p
BooSt key combo detected.
OS load skipped.
Touch calibration read form EEPROM successful.
doc0-0 mounted: size = 16384 kB(32768 * 512)
doc1-0 mounted: size = 15089 kB(30178 * 512)

Command>
7525 boot menu
-----
1) Run main OS
!) Clean start main OS
2) Begin YMODEM load
3) Show configuration
4) Audio test
5) Display test
```

```
6) Touch test
7) RAM test
Command>
```

5. Press 2 to select a YMODEM download. The following message appears on the WORKABOUT PRO's display and in the screen of the communications software:

```
Command> ymodem
Attempting YMODEM receive to BooSt loader...
CCCCCCCC
```

6. In the communications software on the PC, select the option to send a file using YMODEM transfer.
7. Select the BooSt-software image file, `BooSt.img`, to send. The communications software sends it to the WORKABOUT PRO, which receives and stores it in the appropriate place.

When the file transfer is complete, the WORKABOUT PRO automatically reboots to BooSt.

### 5.3.4 Starting The Main OS

At the BooSt command prompt, type `go` and press **<ENTER>** to reboot the WORKABOUT PRO and load Windows CE.





6.1 Overview . . . . .	59
6.2 Selected Fasteners In The WORKABOUT PRO. . . . .	59
6.3 Standard Psion Teklogix Torque Settings. . . . .	60



## 6.1 Overview

This section describes fasteners, tools, and torque settings required for assembling the WORKABOUT PRO.

## 6.2 Selected Fasteners In The WORKABOUT PRO

Use	Pision Teklogix Part Number	Quantity	Type	Size	Driver Type	Torque	Colour
End Cap to Main Housing	9001900	4	MS	M2.6 x 8	#1 Phillips	0.339 N·m (3.0 in·lb)	Black
Mechanical Stop to Enclosure	9001906	4	MS	M2 x 4	#1 Phillips	0.226 N·m (2.0 in·lb)	Black
Internal Frame to Main Logic Board	9001906	4	MS	M2 x 4	#1 Phillips	0.226 N·m (2.0 in·lb)	Black
Expansion Board to Internal Frame	9001906	4	MS	M2 x 4	#1 Phillips	0.226 N·m (2.0 in·lb)	Black
Backplate to Main Housing	9001898	6	MS	M2.6 x 4	#1 Phillips	0.339 N·m (3.0 in·lb)	Black
Scanner to Scanner Backplate (example for SE1223 scanner)	9001898	2	MS	M2.6 x 4	#1 Phillips	0.339 N·m (3.0 in·lb)	Black
Notes: MS = 'Machine Screw'.							

Table 6.1 Selected Fasteners In The WORKABOUT PRO

## 6.3 Standard Psion Teklogix Torque Settings

Fastener Size	Range for input torque		Size Of Tool Bit
	lb•in	N•m	
M2, M2.5, 2-56 UNC (plastic or metal base)	$2.5 \pm 0.25$	$0.282 \pm 0.028$	P0, S1
M3, 4-40 UNC (plastic or metal base)	$5.0 \pm 0.5$	$0.565 \pm 0.056$	P1, S1
M3.5, 6-32 UNC (into plastic base)	$5.0 \pm 0.5$	$0.565 \pm 0.056$	P2, S1
M3.5, 6-32 UNC (into metal base)	$9.0 \pm 1.0$	$1.017 \pm 0.113$	P2, S1
M4, 8-32 UNC (into plastic base)	$9.0 \pm 1.0$	$1.017 \pm 0.113$	P2, S2
M4, 8-32 UNC (into metal base)	$18.0 \pm 1.0$	$2.034 \pm 0.113$	P2, S2
10-24 UNC (into plastic base)	$9.0 \pm 1.0$	$1.017 \pm 0.113$	P2, S2
10-24 UNC (into metal base)	$18.0 \pm 1.0$	$2.034 \pm 0.113$	P2, S2
M5, 10-32 UNF (into plastic base)	$9.0 \pm 1.0$	$1.017 \pm 0.113$	P2, S2
M5, 10-32 UNF (into metal base)	$23.0 \pm 2.0$	$2.599 \pm 0.226$	P2, S2
¼-20 UNC (into metal base)	$65 \pm 5.0$	$7.344 \pm 0.565$	
¼-28 UNF (into metal base)	$80 \pm 5.0$	$9.038 \pm 0.565$	

Table 6.2 Standard Psion Teklogix Torque Settings



### Notes:

1. Fasteners are installed into inserts, self-retaining nuts or tapped holes in either a metal or plastic base.
2. The input torque is the torque applied by the torque tool onto the fastener or nut.
3. The conversion factor is:  $1 \text{ lb}\cdot\text{in} = 0.11298 \text{ N}\cdot\text{m}$ .
4. Tool bit sizes apply to phillips and slot tips only - P represents phillips; S represents slot.
5. Material of fastener and nut to be steel or corrosion-resistant steel only.
6. If the fastener is abraded during installation, the fastener shall be removed and discarded.

This torque specification document applies to all Psion Teklogix products that are assembled at Psion Teklogix. This specification is intended to provide optimum seating torques for fasteners and nuts, and thus minimize damage to the fasteners and nuts due to over-torquing.

The potential application of an adhesive (i.e. loctite) or of a locking device (i.e. lock washer, tension nut) have been taken into account when deriving these torque values.

Assembly drawings reference this specification whenever a fastener or nut is to be used in a situation as those seen above. Any other fastener or nut that does not fall within the categories stated above shall be given a torque value that is appropriate for its application.

# MECHANICAL CONSIDERATIONS

# 7

7.1 Overview . . . . .	.63
7.2 Installation . . . . .	.63
7.2.1 Scanner Device Installation . . . . .	.63
7.2.2 Expansion Module Installation . . . . .	.65
7.2.3 Endcap Installation. . . . .	.68
7.3 Location And Construction . . . . .	.70
7.3.1 Materials . . . . .	.70
7.3.2 Scanner Device . . . . .	.70
7.3.3 Expansion Board. . . . .	.71



## 7.1 Overview

This chapter describes the physical connectors, space, and mounting of the expansion module and the scanner device. It also describes the WORKABOUT PRO's backplate and endcap.

The Hardware Development Kit provides drawings and models of the WORKABOUT PRO's hardware, including drawings of the backplate, the endcap, the main body, and the mounting frame for the expansion board.

## 7.2 Installation

### 7.2.1 Scanner Device Installation

Scanner modules provided by Psion Teklogix, and third-party scanner devices, are attached to the WORKABOUT PRO's backplate:

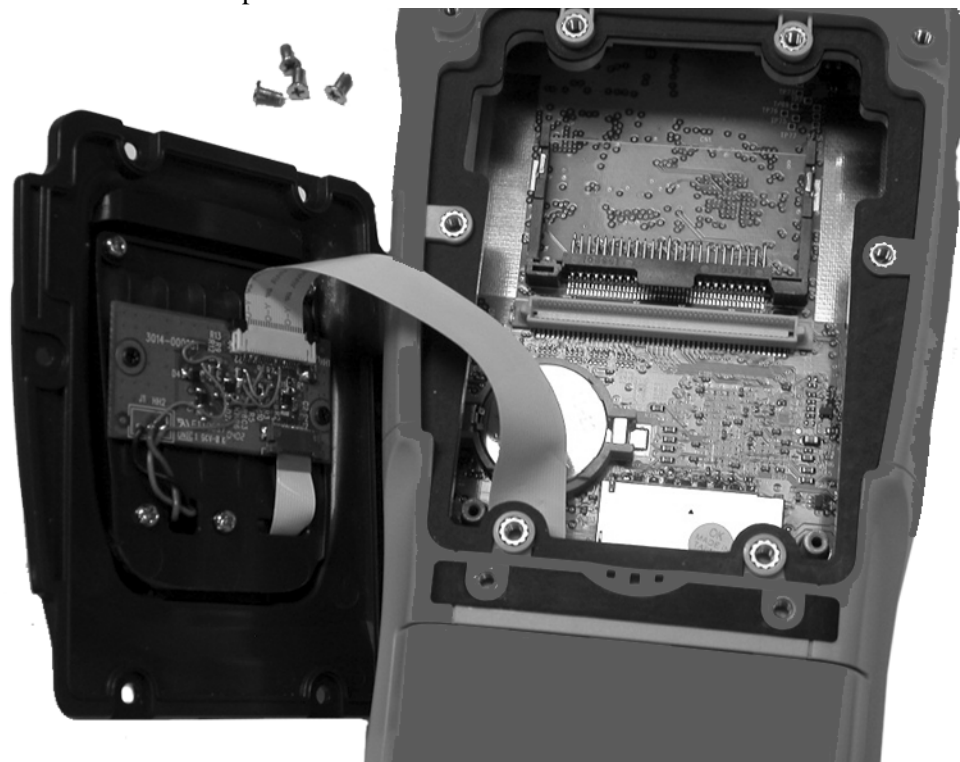


Figure 7.1 The Backplate, A Scanner, And The Scanner Cable

The backplate is fastened to the back of the WORKABOUT PRO using six M2.6 x 4 screws. Use a #1 Philips screwdriver to remove these.

#### 7.2.1.1 Hardware

Psion Teklogix-provided scanner modules are mounted on scanner-specific backplates, which are then fastened to the case of the WORKABOUT PRO.

Several types of scanner modules are available, which include the Symbol SE1223 and SE923, the Symagery SX5093, and the Intermec E1022 scan engines.

There are a number of scanner kits available for the WORKABOUT PRO. These include scanner modules, backplates, and mounting hardware:

Kit Description	Kit Model Number	Scan Engine Included	Screws to attach scanner to backplate
Flat backplate	WA6208	no scanner	none
Backplate (with window for scanner), scan engine, and mounting screws	WA9000	Symbol SE1223	M2.6 x 4 (qty 4)
	WA9002	Symbol SE923	
	WA9010	Symagery SX5093	
	WA9003	Intermec E1022	

Table 7.1 Scanner Kits For The WORKABOUT PRO

Third parties may connect other devices to the scanner connector as well. In this manual, these devices will be referred to as “scanner devices”. Third-party devices connected to the scanner port must be mounted on a backplate as well.

The HDK provides 3-dimensional models of the backplates, giving dimensions and locations of mounting points. See Section 7.3.2 on page 70.

### 7.2.1.2 Installing A Scanner Device

Installing a scanner device will vary according to the scanner device. However, the installation of a Psion Teklogix scanner module can be used as an example.

To install the Psion Teklogix scanner module (with the Symbol SE1223 scan engine), you will need:

- WORKABOUT PRO device.
- WORKABOUT PRO scanner module.
- Power supply and battery.
- Posidrive screw driver.
- #1 Philips screwdriver.

Follow these steps:



**Important:** *Make sure all external power is removed from the device before starting to install the scanner module.*

1. Disconnect the WORKABOUT PRO from external power.
2. Remove the battery.
3. Remove the top four screws on the top of the unit:
4. Remove the endcap.
5. Turn off switch SW1401 at the top of the WORKABOUT PRO’s main circuit board:

This switch controls power from the WORKABOUT PRO’s backup battery to the motherboard and connected devices. It must be always turned off when inserting and removing WORKABOUT PRO expansion modules.





**Note:** In *WORKABOUT PRO M* and *S* units, SW1401 is located to the right of the motherboard, as viewed looking into the unit with the screen facing down. On *WORKABOUT PRO C* units, SW1401 is located to the left of the card slot.

6. Remove the back plate of the WORKABOUT PRO.
7. Near the bottom left of the circuit board, locate a folded lead.
8. Remove the tape on this lead.
9. Connect this lead to the scanner converter board (located on the scanner module/backplate assembly):
10. Place the scanner module/backplate assembly on the WORKABOUT PRO.
11. Fasten the six screws.
12. Turn SW1401 back on. This restores power from the backup battery to the motherboard and connected devices.
13. Reattach the endcap.
14. Connect the WORKABOUT PRO to a power supply and insert the battery.
15. Turn the device on. The main operating system, Windows CE .NET, loads.
16. Press and hold down the <BLUE>, <LEFT SCAN> and <ENTER> keys. The WORKABOUT PRO reboots to its bootloader, BooSt.
17. Type S at the BooSt prompt, then press <ENTER>. The utility for configuring the scanner module starts.
18. Select “Symbol SE1223HP” from the displayed scanner list, then press <ENTER>. The device displays: “internal scanner symbol SE1223HP”. The scanner now is configured and will work in Windows.
19. Press 1, then <ENTER>. The WORKABOUT PRO reboots and loads Windows CE .NET.



**Note:** To activate the scanner in Windows you can press the two scan buttons on the WORKABOUT PRO or press the button located on the scanner module itself.

A similar procedure would be used for third-party scanner devices.

## 7.2.2 Expansion Module Installation

The expansion board is fastened to the metal frame inside the WORKABOUT PRO by four M2.6 x 4 screws. Installing it requires the following tools:

- #1 Phillips screwdriver.

To install the expansion module:

1. Remove the WORKABOUT PRO’s endcap.

2. Switch off the battery power to the motherboard with SW1401.

SW1401



**Note:** This picture shows a WORKABOUT PRO C. SW1401 is in a different location on the S variant of the WORKABOUT PRO.

3. Remove the screws holding the WORKABOUT PRO's backplate.



4. Remove the backplate:



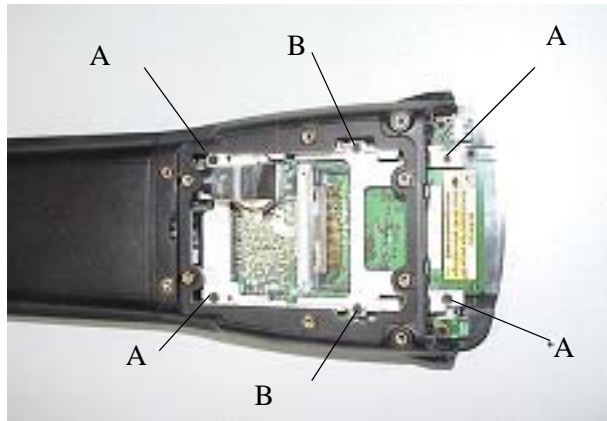
The top half of the device's motherboard, with the 100-pin connector and the scanner connector, are exposed:



5. The WORKABOUT PRO may already have a frame installed, as shown above. If this is true, skip to Step 9. Otherwise continue with Step 6.
6. Insert the PCMCIA mounting frame through the top of the device as shown:



7. Fasten the frame with four M2x4 screws at locations A in the following diagram:



8. If the WORKABOUT PRO is an engineering prototype (EPR), fasten the grounding straps with two more M2 x 4 screws at points B above.
9. Insert the expansion module as shown here.



10. Fasten the expansion module to the frame with four M2 x 4 screws.

### 7.2.3 Endcap Installation

The endcap

### 7.2.3.1 Installation

The endcap is attached with four screws.

#### Figure 7.1 Location Of Endcap Fasteners

The endcap is attached with four M2. 6 x 8 screws. (Use a #1 Philips bit for them, and torque to 0.339 N·m (3.0 lb·in).)

When a PCMCIA card or Compact Flash card is inserted into the WORKABOUT PRO, a mechanical stop must be inserted before the endcap is attached, to prevent the card from moving out of place.

#### Figure 7.2 Location Of Card Stop

This card stop is attached with four M2.6 x 8 screws as well (Use a #1 Philips bit for them, and torque to 0.339 N·m (3.0 lb·in).)

To remove the endcap:

1. Remove the four screws.
2. Remove the endcap.
3. If necessary, remove the card stop to gain access to CF or PCMCIA cards.

To install the endcap:

1. Insert the card stop, if necessary.
2. Insert the endcap.
3. Insert and tighten the four screws.

## 7.3 Location And Construction

### 7.3.1 Materials

The recommended material for endcaps and backplates intended to attach to the WORKABOUT PRO is GE C1200 standard black. The recommended texturing is AT-IM002, 0.035mm deep.

### 7.3.2 Scanner Device

The scanner device must fit within the backplate of the WORKABOUT PRO. It can project downwards into the WORKABOUT PRO to a varying distance, depending on what other options are installed within the device.

The greatest amount of room is found within a WORKABOUT PRO that has no expansion module installed. Expansion modules take up part of the available room, and the PCMCIA card attached to the Expansion Module takes up even more.

This HDK provides a number of IGES models of the backplate and the associated areas of the WORKABOUT PRO to aid the designer in sizing a scanner device. These models are as follows:

Type Of Model	Filename	Notes
Device with no Expansion Module		
Device with Expansion Module		
Device with PCMCIA Expansion Module		

**Table 7.2 IGES Models For The Scanner Device**

See the drawing “Backplate Mechanical” on page E-12 for the backplate’s hole locations and shape.

To maintain IP sealing the sealing rib of the backplate must have a height of 0.60 mm and a width of 0.5mm

To prevent any interference with expansion cards, the backplate must not protrude into the terminal plastic housing by more than 3 mm. To maintain terminal drop test spec it must not weigh more than 100 g (0.2 lb), the same weight as the SE1223 backplate/scanner module combination.

### 7.3.3 Expansion Board

The expansion board must fit into the mounting frame inside the WORKABOUT PRO:

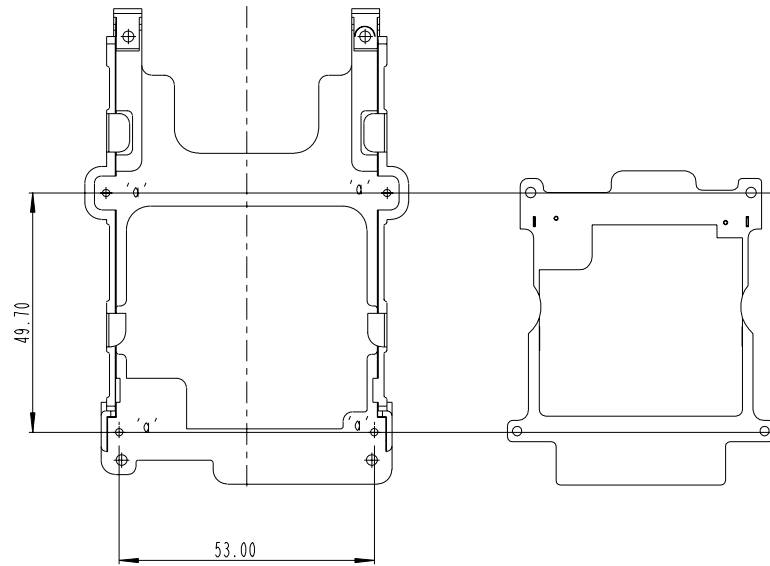


Figure 7.1 Mounting Frame And PCMCIA Expansion Module

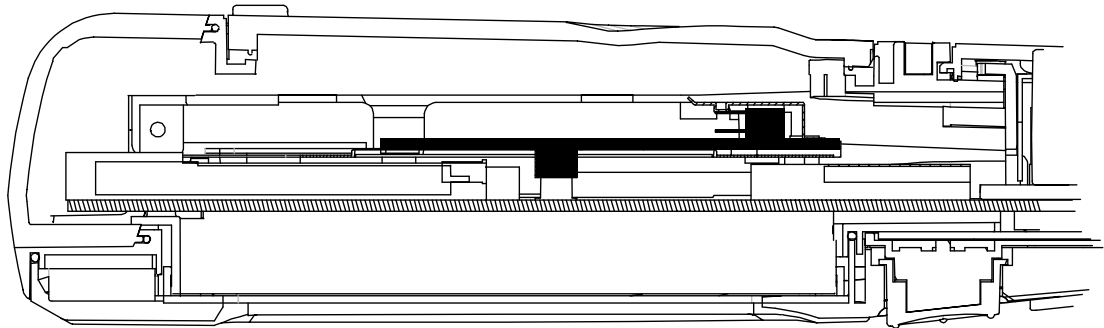


Figure 7.2 Side View Of Stacked Expansion Module

Expansion modules must fit within the perimeter of the mounting frame, and cannot exceed a height of 5.5 mm. The holes that connect to the card stop must not be covered.

### 7.3.3.1 The 100-Pin Connector

The connector on the WORKABOUT PRO's motherboard is an FX6-100P-0.8SV2 header.

The centre of the expansion module's connector is aligned on the centreline of the mounting frame. The connector is mounted in the following location::

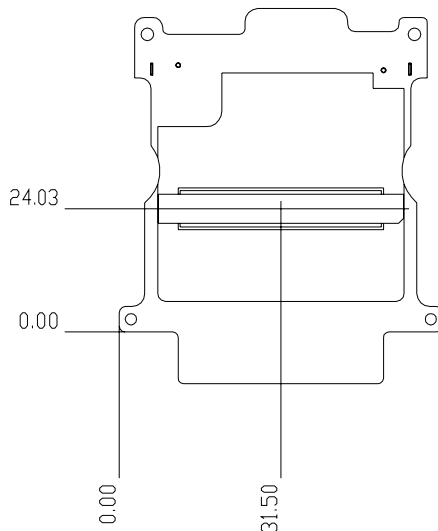


Figure 7.3 Location Of 100-Pin Connector On Expansion Module

### 7.3.3.2 Endcap And Card Stop

The endcap and card stop fit onto the WORKABOUT PRO as follows:

Figure 7.4 Endcap And Card Stop

See the drawing “Standard Endcap Mechanical” on page E-16 for hole dimensions and space restrictions for the endcap. This HDK provides a number of IGES models of the endcap and the associated areas of the WORKABOUT PRO to aid the designer in sizing a custom endcap. These models are as follows:

Type Of Model	Filename	Notes
Standard Endcap		

Table 7.3 IGES Models For The Endcap



The endcap is 83.35 mm long, 25.40 mm wide, and 23.87 mm deep. To maintain the existing drop test specifications, endcaps designed by third parties must not weigh more than 100 g (0.05 lb), the same weight as the current endcap.

To maintain IP sealing, the endcap's sealing rib must have a height and width of 0.8mm. If the stylus pen is to be used then it must be sealed against the stylus holder using the rubber stylus gasket described in drawing "Stylus Sealing Casket Mechanical" on page E-18.

See the drawing "Card Stop For PCMCIA And CF Cards Mechanical" on page E-15 for the card stop's hole locations and required dimensions. These must be met so that the card stop fits properly into the WORKABOUT PRO, fitting into the internal frame and housing with no interference to the endcap.



8.1 Overview . . . . .	77
8.1.1 System Block Diagram . . . . .	77
8.2 Signals On The 100-Pin Connector. . . . .	78
8.2.1 Power And Ground . . . . .	78
8.2.2 Data And Address Buses . . . . .	79
8.2.3 Serial . . . . .	79
8.2.4 USB . . . . .	79
8.2.5 General-Purpose I/O . . . . .	80
8.2.6 PCMCIA . . . . .	81
8.2.7 Wakeup. . . . .	82
8.2.8 I2C . . . . .	82
8.3 100-Pin Connector: Pinout . . . . .	83
8.4 I2C Device Identification. . . . .	87
8.4.1 I2C Addresses . . . . .	87
8.4.2 Fields Of The EEPROM. . . . .	87
8.4.3 Loading Of Drivers . . . . .	89
8.4.4 Examples. . . . .	89
8.4.4.1 The PCMCIA Module . . . . .	89
8.4.4.2 The Multi-I/O Expansion Module . . . . .	90
8.4.4.3 The GSM/GPRS Module . . . . .	90





## 8.2 Signals On The 100-Pin Connector

The WORKABOUT PRO provides several groups of signals to expansion devices on the 100-pin bus:

- DC power supply and ground.
- System data and address bus.
- Serial support.
- Connections to the WORKABOUT PRO's USB host.
- Control signals.

These groups of signals are described in the following sections.



**Note:** Names listed here are those used by the WORKABOUT PRO. Signals may have other names in expansion modules, scanner converter boards, or other devices.

### 8.2.1 Power And Ground

The power supply pins include:

- DC\_IN (an external supply to the WORKABOUT PRO) (pins 97 and 99).
- V\_IN (DC nominal 5V supply to the expansion module) (pins 1, 2, 3, and 4).
- Ground (pins 21, 22, 39, 40, 57, 58, 77, 78, 84).

Devices connected to the 100-pin expansion slot can be powered from the DC supply labeled V\_IN, which uses pins 1, 2, 3, and 4 on the 100-pin connector. Return is through ground (pins 21, 22, 39, 40, 57, 58, 77 and 78. V\_IN is a diode OR of V\_BAT (the DC voltage supplied by the WORKABOUT PRO's battery), and DC\_IN, the DC power input to the terminal. When the terminal is powered by a DC power supply, the VIN rail will be at 5V minus a diode drop. When the terminal is powered by the battery, the VIN rail will be at whatever voltage the battery is at.

Nominal battery voltage is 3.7V. The WORKABOUT PRO's battery is a single cell lithium ion battery, available in two capacities, 1700mA·h and 2350 mA·h.

VIN conforms to the following specifications:

Pin Name	Voltage Minimum	Voltage Maximum	Maximum Current
VIN	2.6 V	5 V	2000 mA

Table 8.1 VIN Specification

Power can be supplied to the WORKABOUT PRO from the 100-pin expansion connector as well, through the DC\_IN pins (pin 97 and 99). These pins are connected to the same line as the DC\_IN input from the external power supply. These pins can accept DC power of the following specification:

Pin Name	Nominal Voltage	Tolerance	Maximum Ripple	Maximum Current
DC_IN	5 V	5 %	50 mV	2100 mA

Table 8.2 DC\_IN Specification

## 8.2.2 Data And Address Buses

The system data and address buses include:

- Data bus (signals SD0-SD15).
- Address bus (signals SA0-SA25).

These signals are at CMOS levels.

## 8.2.3 Serial

Serial expansion devices can be connected as modems through the following signals:

- FF\_RXD (data from the expansion device) (pin 81).
- FF\_TXD (data to the expansion device) (pin 83).
- FF\_CTS (Clear To Send flow-control signal from the expansion device) (pin 85).
- FF\_DCD (Data Carrier Detect flow-control signal from the expansion device) (pin 87).
- FF\_DSR (Data Set Ready flow-control signal from the expansion device) (pin 89).
- FF\_RI (Ring Indicator flow-control signal from the expansion device) (pin 91).
- FF\_DTR (Data Terminal Ready flow-control signal to the expansion device) (pin 93).
- FF\_RTS (Ready To Send flow-control signal to the expansion device) (pin 95).

These signals originate from the full-function UART (FFUART) in the PXA255, and are connected directly to the 100-pin expansion connector. The signals are at CMOS levels. The FFUART has a maximum data rate of 115.2 kilobits per second. It is compatible with 16550 UARTs.

## 8.2.4 USB

The expansion bus provides the following signals from the WORKABOUT PRO's USB host:

- USB\_H1\_D- (pin 82).
- USB\_H1\_D+ (pin 80).
- USB\_H1\_PSW (pin 88).

“Full speed” (12 megabits per second) or “low speed” (1.5 megabits per second) communication are supported.

The USB\_H1\_PSW signal can be used to control a power switch for the USB V+. The designer must provide the appropriate 5V power supply and the switch. USB\_H1\_PSW is managed by software and can be controlled by the HDK software API.

## 8.2.5 General-Purpose I/O

A number of dedicated GPIO signals are provided.

These signals are pre-defined as outputs by Psion Teklogix:

- MQ\_GPIO20 (pin 71).
- MQ\_GPIO43 (pin 74).
- MQ\_GPIO44 (pin 76).
- SSPCLK (pin 90).
- SSPSRM (pin 92).
- SSPTXD (pin 94).

These signals are pre-defined as inputs by Psion Teklogix:

- nCS3 (pin 64).
- nCS4 (pin 66).
- SSPRXD (pin 96).

The following PCMCIA signals can be used as GPIO outputs if the PCMCIA interface is not being used:

- SLOT\_RST (pin 67).
- SLOT\_3/5\_SEL (pin 69).
- SLOT\_PWR\_EN (pin 70).
- nSLOT\_BUF\_EN (pin 72).

The following PCMCIA signals can be used as GPIO inputs if the PCMCIA interface is not being used:

- nSLOT\_VS1 (pin 73).
- nSLOT\_BVD1 (pin 75).



## 8.2.6 PCMCIA

The PCMCIA signals can be used as a standard PCMCIA interface. They can be also used to connect memory devices or SRAM-like variable-latency I/O devices.

Signals provided to devices supporting the PCMCIA interface are as follows:

- Data bus (signals SD0-SD15).
- Address bus (signals SA0-SA25).
- nSLOT\_WAIT\_SRC (pin 41).
- nSLOT\_IOIS16 (pin 43).
- nPREG (pin 45).
- nPOE (pin 47).
- nPWE (pin 49).
- nPIOR (pin 51).
- nPIOW (pin 53).
- nSLOT\_PSKTEL (pin 55).
- nPCE1 (pin 59).
- nPCE2 (pin 61).

The following PCMCIA signals can be used as general-purpose I/O (GPIO) outputs if the PCMCIA interface is not being used:

- SLOT\_RST (pin 67).
- SLOT\_3/5\_SEL (pin 69).
- SLOT\_PWR\_EN (pin 70).
- nSLOT\_BUF\_EN (pin 72).

The following PCMCIA signals can be used as GPIO inputs if the PCMCIA interface is not being used:

- nSLOT\_VS1 (pin 73).
- nSLOT\_BVD1 (pin 75).

The following PCMCIA signals can be used as general-purpose interrupts if the PCMCIA interface is not being used:

- SLOT\_READY (pin 63).
- SLOT\_CD (pin 65).

These signals can also be used as GPIO inputs if interrupts are not required. The active edge of these interrupts can be defined in software.

If the Psion Teklogix PCMCIA driver is used, all of the dual function pins (general-purpose I/O and interrupt signals) that can be used by the PCMCIA interface will be reserved by the PCMCIA driver. All of these pins conform to the pin functions as defined by the PC Card Standard, Release 8.

A proprietary driver can be developed so that the dual function pins can be separated from the PCMCIA interface. Psion Teklogix does not supply such a driver.

Memory devices and Variable Latency IO devices (such as ASICs and FPGAs) can be connected to the PCMCIA interface. Timing of the interface is configurable, see following section. The 'nSLOT\_WAIT\_SRC' signal may be used to extend the bus cycle.

The PCMCIA control signals are named according to the PXA255 naming convention, apart from the following:

PXA255 Name	Name On WORKABOUT PRO	Notes
nPWAIT	nSLOT_WAIT_SRC	
PSKTSEL	nSLOT_PSKTSEL	Low = Expansion PCMCIA interface enabled

**Table 8.3 Non-PXA255 PCMCIA Control Signal Names**

The data bus, address bus, and control signals should be buffered in the expansion device to prevent excessive loading. These traces should also be kept to the minimum possible length.

## PCMCIA Interface Timing

For PCMCIA interface timing, please refer to Table 21 from the PXA255 documentation 'Processor Electrical Mechanical and Thermal Specifications' and section 6.8 from the PXA255 'Developers Manual'. Software provides access to the MCMEM1, MCATT1 and MCIO1 registers so that the timing can be configured by third parties. These three registers allow developers to configure the timing for the three PCMCIA memory regions: Common Memory, Attribute Memory and I/O.

### 8.2.7 Wakeup

A wakeup input is available so that expansion devices can signal the WORKABOUT PRO. This pin is:

- nSLOT\_WAKEUP (pin 79).

This signal is monitored by the keyboard processor inside the WORKABOUT PRO, and does not generate an interrupt except to wake up the PXA255. Connect the source to an expansion-slot interrupt pin as well (SLOT\_READY or nSLOT\_CD), if a PXA255 interrupt is also required

### 8.2.8 I<sup>2</sup>C

The 100-pin connector provides signals for an I<sup>2</sup>C bus:

- I2C\_SDA (pin 98).
- I2C\_SCL (pin 100).

An I<sup>2</sup>C EEPROM must be included in any expansion device connected to the 100-pin bus, so that the expansion module can be identified, allowing the WORKABOUT PRO's main OS to load the correct driver for the expansion device.

This identifying EEPROM should be an I<sup>2</sup>C EEPROM of at least 128 bytes. Psion Teklogix recommends using a serial-access 1-kilobit (128 x 8) EEPROM, such as SGS Thompson's ST24C01 or similar. Larger

EEPROMs may be used. The address of the device must be set to 0x01 by connecting the A0 pin to the expansion module's VCC and A1 and A2 to ground.

An example of the circuit, as implemented on the Multi-I/O Expansion Module, is shown below:

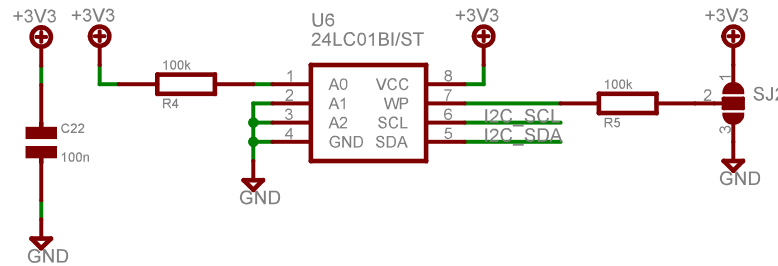


Figure 8.2 EEPROM Circuitry

In this circuit, the WP line can be connected to the +3.3-volt supply at jumper SJ2 to write-protect the EEPROM, and to ground to enable writing to the EEPROM.

See Section 8.4 on page 87 for a description of the contents of this EEPROM. Other I<sup>2</sup>C devices can also be connected to the I<sup>2</sup>C bus.

More information about the I<sup>2</sup>C bus can be found at:

<http://www.semiconductors.philips.com/buses/i2c/facts/>

## 8.3 100-Pin Connector: Pinout

This is the pinout of the 100-pin connector. Pin names are those used on the WORKABOUT PRO:

Pin	Name	Function	Signal Direction	Active	State During Reset	State During Sleep	Pull-up value (ohms)	PCMCIA	GSM
1	VIN	Power		N/A					
3	VIN	Power		N/A					
5	SD0	System data bus	bi-direct					Yes	
7	SD1	System data bus	bi-direct					Yes	
9	SD2	System data bus	bi-direct					Yes	
11	SD3	System data bus	bi-direct					Yes	
13	SD4	System data bus	bi-direct					Yes	
15	SD5	System data bus	bi-direct					Yes	
17	SD6	System data bus	bi-direct					Yes	
19	SD7	System data bus	bi-direct					Yes	
21	GND			N/A					
23	SD8	System data bus	bi-direct					Yes	

Notes:

Pin names are those used on the WORKABOUT PRO.

The PCMCIA column indicates that the signal is provided to the PCMCIA Expansion Module.

The GSM column indicates that the signal is provided to the GSM/GPRS Adaptor Expansion Module.

When nPSKTSEL is H, the PCMCIA slot is selected; when low, the Compact Flash slot is selected.

In the Active column, X = don't care; L = active low, H = active high, B = both high and low.

Chapter 8: Expansion Cards: Electrical  
100-Pin Connector: Pinout

Pin	Name	Function	Signal Direction	Active	State During Reset	State During Sleep	Pull-up value (ohms)	PCMCIA	GSM
25	SD9	System data bus	bi-direct					Yes	
27	SD10	System data bus	bi-direct					Yes	
29	SD11	System data bus	bi-direct					Yes	
31	SD12	System data bus	bi-direct					Yes	
33	SD13	System data bus	bi-direct					Yes	
35	SD14	System data bus	bi-direct					Yes	
37	SD15	System data bus	bi-direct					Yes	
39	GND			N/A					
41	nSLOT_WAIT_SRC	PCMCIA wait	Input	L				Yes	
43	nSLOT_IOIS16	PCMCIA IOIS16	Input	L				Yes	
45	nPREG	PCMCIA REG	Output	L				Yes	
47	nPOE	PCMCIA OE	Output	L				Yes	
49	nPWE	PCMCIA WE	Output	L				Yes	
51	nPIOR	PCMCIA IOR	Output	L				Yes	
53	nPIOW	PCMCIA	Output	L				Yes	
55	nSLOT_PSKTSEL	socket select	Output	see note				Yes	
57	GND			N/A					
59	nPCE1	PCMCIA CE1	Output	L				Yes	
61	nPCE2	PCMCIA CE2	Output	L				Yes	
63	SLOT_READY	PCMCIA Slot ready	Input	H		@	100K	Yes	
65	nSLOT_CD	PCMCIA Slot Card Detect	Input	L			100k	Yes	Low
67	SLOT_RST	Slot Reset	Output	H	Float	High	None	Hi Pulse	Hi Pulse
69	SLOT_3/5_SEL	Slot power select	Output		Float	High	None	Yes	
71	MQ_GPIO20	System GPO	Output		Float	High	None	Yes	
73	nSLOT_VS1	System GPI	Input	X			100k		
75	nSLOT_BVD1	System GPI	Input	X			100k		
77	GND			N/A					
79	SLOT_BAT_DATA	u-P GPI	Input	B					
81	FF_RXD	UART RXD	Input	X					Yes
83	FF_TXD	UART TXD	Output	X					Yes
85	FF_CTS	UART CTS	Input	L					Yes
87	FF_DCD	UART DCD	Input	L					Yes

**Notes:**

Pin names are those used on the **WORKABOUT PRO**.

The **PCMCIA** column indicates that the signal is provided to the **PCMCIA Expansion Module**.

The **GSM** column indicates that the signal is provided to the **GSM/GPRS Adaptor: Expansion Module**

When **nPSKTSEL** is **H**, the **PCMCIA** slot is selected; when low, the **Compact Flash** slot is selected.

In the **Active** column, **X** = don't care; **L** = active low, **H** = active high, **B** = both high and low.

Pin	Name	Function	Signal Direction	Active	State During Reset	State During Sleep	Pull-up value (ohms)	PCMCIA	GSM
89	FF_DSR	UART DSR	Input	L					Yes
91	FF_RI	UART RI	Input	L					Yes
93	FF_DTR	UART DTR	Output	L					Yes
95	FF_RTS	UART RTS	Output	L					Yes
97	DC_IN	DC power	Power In	N/A					
99	DC_IN	DC power	Power In	N/A					

Notes:

Pin names are those used on the *WORKABOUT PRO*.

The *PCMCIA* column indicates that the signal is provided to the *PCMCIA Expansion Module*.

The *GSM* column indicates that the signal is provided to the *GSM/GPRS Adaptor: Expansion Module*.

When *nPSKTSEL* is *H*, the *PCMCIA* slot is selected; when low, the *Compact Flash* slot is selected.

In the *Active* column, *X* = don't care; *L* = active low, *H* = active high, *B* = both high and low.

Pin	Name on WORK-ABOUT PRO	Function	Direction	Active	State During Reset	State During Sleep	Pull-Up Value (ohms)	PCMCIA	GSM
2	VIN	Power		N/A					
4	VIN	Power		N/A					
6	SA0	System address bus	Output					Yes	
8	SA1	System address bus	Output					Yes	
10	SA2	System address bus	Output					Yes	
12	SA3	System address bus	Output					Yes	
14	SA4	System address bus	Output					Yes	
16	SA5	System address bus	Output					Yes	
18	SA6	System address bus	Output					Yes	
20	SA7	System address bus	Output					Yes	
22	GND			N/A					
24	SA8	System address bus	Output					Yes	
26	SA9	System address bus	Output					Yes	
28	SA10	System address bus	Output					Yes	
30	SA11	System address bus	Output					Yes	
32	SA12	System address bus	Output					Yes	
34	SA13	System address bus	Output					Yes	
36	SA14	System address bus	Output					Yes	
38	SA15	System address bus	Output					Yes	
40	GND			N/A					
42	SA16	System address bus	Output					Yes	

Note:

Pin names are those used on the *WORKABOUT PRO*.

The *PCMCIA* column indicates that the signal is provided to the *PCMCIA Expansion Module*.

The *GSM* column indicates that the signal is provided to the *GSM/GPRS Adaptor: Expansion Module*.

In the *Active* column, *X* = don't care; *L* = active low, *H* = active high, *B* = both high and low.

Pin	Name on WORK-ABOUT PRO	Function	Direction	Active	State During Reset	State During Sleep	Pull-Up Value (ohms)	PCMCIA	GSM
44	SA17	System address bus	Output					Yes	
46	SA18	System address bus	Output					Yes	
48	SA19	System address bus	Output					Yes	
50	SA20	System address bus	Output					Yes	
52	SA21	System address bus	Output					Yes	
54	SA22	System address bus	Output					Yes	
56	SA23	System address bus	Output					Yes	
58	GND			N/A					
60	SA24	System address bus	Output					Yes	
62	SA25	System address bus	Output					Yes	
64	nCS3	Peripheral chip select 3	Input	L			10k		
66	nCS4	Peripheral chip select 4	Input	L			10k		
68	RDY	peripheral ready	Input						
70	SLOT_PWR_EN	Slot power enable	Output		Float		None	Hi	
72	nSLOT_BUF_EN	Slot buffer enable	Output		Float		None	Low	
74	MQ_GPIO43	System GPO	Output		Float		None		Low pulse
76	MQ_GPIO44	System GPO	Output		Float		None		
78	GND			N/A					
80	USB_H1_D+	USB host port 1 D+	bi-direct						
82	USB_H1_D-	USB host port 1 D-	bi-direct						
84	GND			N/A					
86	nUSB_H1_OC	USB host over-current	Input						
88	USB_H1_PSW	USB host power enable	Output						
90	SSPSCLK	SSP clock	Output						
92	SSPSFRM	SSP frame	Output						
94	SSPTXD	SSP data out	Output						
96	SSPRXD	SSP data in	Input						
98	I2C_SDA	I2C data	bi-direct					Yes	Yes
100	I2C_SCL	I2C clock	Output					Yes	Yes

Note:

Pin names are those used on the WORKABOUT PRO.

The PCMCIA column indicates that the signal is provided to the PCMCIA Expansion Module.

The GSM column indicates that the signal is provided to the GSM/GPRS Adaptor. Expansion Module

In the Active column, X = don't care; L = active low, H = active high, B = both high and low

Table 8.4 Pinout Of 100-Pin Connector

## 8.4 I<sup>2</sup>C Device Identification

All expansion devices connected to the WORKABOUT PRO's 100-pin expansion bus must contain an I<sup>2</sup>C EEPROM. The expansion EEPROM is used to identify the hardware and load appropriate drivers. The identity is displayed to the user in the system properties panel of the System control panel.

### 8.4.1 I<sup>2</sup>C Addresses

I<sup>2</sup>C and SMBus device addresses are 7 bits long.

The addresses defined here are shifted left by one bit to suit the device address format required by the Windows CE I<sup>2</sup>C driver. The following addresses are reserved:

Address	Name	Notes
0x64	I2C_ADDRESS_RICOH_RV5C386A_RTC	Real-time clock
0xa0	I2C_ADDRESS_ST_24C01_EEPROM	Lowest 3 bits of address are set using E0, E1, E2 pins.
(I2C_ADDRESS_ST_24C01_EEPROM   0)	I2C_ADDRESS_7525_EEPROM	E0, E1, E2 low
(I2C_ADDRESS_ST_24C01_EEPROM   2)	I2C_ADDRESS_7525_EXP_EEPROM	E0 high, E1, E2 low
0xe0	I2C_ADDRESS_7525_HOST_CPU	PXA255 configurable I2C address

Table 8.5 WORKABOUT PRO I<sup>2</sup>C Reserved Addresses

### 8.4.2 Fields Of The EEPROM

The EEPROM has an internal address space of at least 128 bytes. Some of these bytes are predefined. Developers are free to use unused areas of the EEPROM for their own purposes.

These contents of the EEPROM are defined as follows:

Field	Address (decimal)	Size	Contents
Manufacturing test region	0-9	10 bytes	Any.
Revision	10	1 byte	ASCII '1' (one).
Hardware revision	11	1 byte	ASCII '0' - '9', 'A' - 'Z', 'a' - 'z'
Hardware type	12	1 byte	ASCII character.
Manufacturer/Model	13-32	20 bytes	ASCII text. Zero-terminated if less than 20 bytes. Character set is restricted to alpha-numeric plus space.
Serial number	33-44	12 bytes	ASCII text. Zero-terminated if less than 12 bytes.
Manufacturer-specific	45+	83+	Any

Table 8.6 EEPROM Address Space

### Manufacturing test region

The manufacturing test region is provided to allow manufacturing test of the EEPROM. The contents are not used for any other purpose. This is reserved for the original board manufacturer.

### Revision

The revision of the specification which defines the layout of the EEPROM and the contents of the 45 byte header. This value is specified by Psion Teklogix Inc. This EEPROM layout is revision 1.

### Hardware revision

This is an ASCII character that defines the hardware revision. This field is displayed to the user in the system properties panel. This field may be used by the driver to vary the operation of the device. The OEM may set the contents in any order.

### Hardware type

This field contains a single ASCII character. It defines the expansion hardware type as follows:

Hardware Type	PCMCIA	Serial	USB
	The hardware supports a PCMCIA socket. The PCMCIA socket will be enabled	The hardware supports the serial port. The serial FFUART (COM1) driver will be loaded.	The hardware supports the USB port. The USB hub and USB connection will be powered.
ASCII ‘a’ - 0x61	Yes		
ASCII ‘b’ - 0x62		Yes	
ASCII ‘c’ - 0x63			Yes
ASCII ‘d’ - 0x64	Yes	Yes	
ASCII ‘e’ - 0x65	Yes		Yes
ASCII ‘f’ - 0x66		Yes	Yes
ASCII ‘g’ - 0x67	Yes	Yes	Yes
ASCII ‘s’ - 0x73	See note below		
Any other value			
Note: An ‘s’ or any undefined value means the hardware is standard, and the WORKABOUT PRO’s operating system will load drivers based on various registry settings.			

Table 8.7 EEPROM Hardware Type Codes

### Manufacturer/Model

This field uniquely defines the expansion slot hardware. This field will be displayed to the user in the system properties panel. This field will also define the registry key of the driver to be loaded. The character set is restricted to alphanumeric characters plus the space character as this string will be used as a Windows CE registry key.

### Serial Number.

This field will be displayed to the user in the WORKABOUT PRO's system properties panel.

### Manufacturer specific

This area is free for use by the manufacturer of the expansion card.

Unused fields/bytes will be 0xFF. If the specified fields are 0xFF then "Unknown" will be displayed in the corresponding system properties panel.



## 8.4.3 Loading Of Drivers

The Manufacturer/Model field is used by the operating system to determine the driver to load as follows.

1. The contents of the field are appended to the registry key  
HKEY\_LOCAL\_MACHINE\Drivers\PsionTeklogix\Expansion Slot\.
2. The DriverActivate() function is called with this combined registry key to activate the device.

All appropriate driver settings should be defined under this key. If multiple device drivers are required, sub keys can be used; the device driver must activate them. If the Manufacturer/Model field is not defined, or no registry key exists, then no driver will be loaded.

## 8.4.4 Examples

A number of expansion modules are produced by Psion Teklogix.

One, the PCMCIA Expansion Module, supports a slot for adding PCMCIA cards. See Chapter 11: The PCMCIA Expansion Module for details on this card.

Another, the Multi-I/O Expansion Module, provides separate connectors for the various USB and serial ports provided on both the 100-pin and scanner connectors. See Chapter 12: The Multi I/O Expansion Module for details about this card.

Psion Teklogix makes other modules, including one that implements a GSM/GPRS data radio.

### 8.4.4.1 The PCMCIA Module

The PCMCIA module uses the hardware type field to enable the PCMCIA socket on the expansion hardware. The Manufacturer/Model field is used only to identify the module. The expansion slot driver will still attempt to load a driver using the manufacturer/model field but there is no driver defined, so no extra driver will be loaded.

EEPROM Field	Address	Size	Contents
1) manufacturing test region	0-9	10 bytes	
2) Revision	10	1 byte	ASCII '1' (0x31)
3) Hardware revision	11	1 byte	ASCII '0' (0x30) for revision ES0, ASCII '1' (0x31) for revision ES1
4) Hardware type	12	1 byte	ASCII 'a' (0x61)
5) Manufacturer/Model	13-32	20 bytes	ASCII text 'PsionTeklogix PCMCIA': .0x50, 0x73, 0x69, 0x6f, 0x6e, 0x54, 0x65, 0x6b, 0x6c, 0x6f, 0x67, 0x69, 0x78, 0x20 0x50, 0x43, 0x4d, 0x43, 0x49, 0x41
6) Serial number	33-44	12 bytes	ASCII text, as appropriate. Example: '1234' is 0x31, 0x32, 0x33, 0x34, 0x00. The remaining locations are not programmed, and contain 0xff
7) Manufacturer specific	45+	83+	Not programmed - all 0xff

Table 8.8 PCMCIA Adapter EEPROM Contents

#### 8.4.4.2 The Multi-I/O Expansion Module

The Multi-I/O module uses the Manufacturer/Model field to define the driver to be loaded to activate the module. The driver's registry settings are found under the key

HKEY\_LOCAL\_MACHINE\Drivers\PsionTeklogix\  
Expansion Slot\PsionTeklogix Multi-IO

Hardware type is just set as standard.

Field	Address	Size	Contents
Manufacturing test region	0-9	10 bytes	
Revision	10	1 byte	ASCII '1' (0x31)
Hardware revision	11	1 byte	ASCII '0' (0x30) for revision ES0, ASCII '1' (0x31) for revision ES1
Hardware type	12	1 byte	ASCII 's' (0x73)
Manufacturer/Model	13-3132	19 bytes1 byte	ASCII text 'PsionTeklogix GPRS': 0x50, 0x73, 0x69, 0x6f, 0x6e, 0x54, 0x65, 0x6b, 0x6c, 0x6f, 0x67, 0x69, 0x78, 0x20, 0x47, 0x50, 0x52, 0x53, 0x00 Any bytes not programmed are 0xff
Serial number	33-44	12 bytes	ASCII text. As appropriate
Manufacturer specific	45+	83+	Not programmed; all 0xff

Table 8.9 Multi-I/O EEPROM Contents

[CHANGE]

#### 8.4.4.3 The GSM/GPRS Module

The GSM/GPRS module uses the Manufacturer/Model field to define the driver to be loaded to activate the module. The driver's registry settings are found under the key

HKEY\_LOCAL\_MACHINE\Drivers\PsionTeklogix\  
Expansion Slot\PsionTeklogix GPRS

Hardware type is just set as standard.

Field	Address	Size	Contents
Manufacturing test region	0-9	10 bytes	
Revision	10	1 byte	ASCII '1' (0x31)
Hardware revision	11	1 byte	ASCII '0' (0x30) for revision ES0, ASCII '1' (0x31) for revision ES1

Field	Address	Size	Contents
Hardware type	12	1 byte	ASCII 's' (0x73)
Manufacturer/Model	13-3132	19 bytes1 byte	ASCII text 'PsionTeklogix GPRS': 0x50, 0x73, 0x69, 0x6f, 0x6e, 0x54, 0x65, 0x6b, 0x6c, 0x6f, 0x67, 0x69, 0x78, 0x20, 0x47, 0x50, 0x52, 0x53, 0x00 Any bytes not programmed are 0xff
Serial number	33-44	12 bytes	ASCII text. As appropriate
Manufacturer specific	45+	83+	Not programmed; all 0xff

Table 8.10 GSM/GPRS EEPROM Contents



9.1 Overview . . . . .	95
9.2 Scanner Device Installation. . . . .	95
9.3 The Scanner. . . . .	96
9.4 Connector Location. . . . .	96
9.5 Connector Pinout . . . . .	97
9.6 The Scanner Flex . . . . .	98
9.7 Connection Block Diagram. . . . .	99
9.8 Power And Ground . . . . .	99
9.9 Signals To The Scanner Device. . . . .	100



## 9.1 Overview

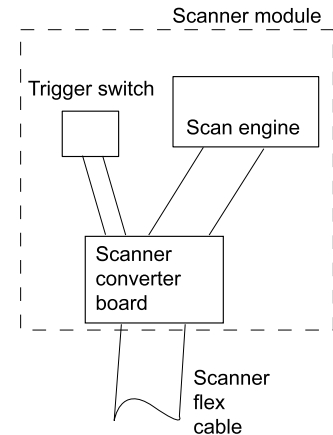
This chapter describes the WORKABOUT PRO's scanner connector and devices that connect to it. These devices may not actually be scanners, this manual will refer to them as 'scanner devices'.

Scanners provided by Psion Teklogix include the following parts:

- Scan engine.
- Scanner converter board.
- Trigger switch.

The scanner converter board interfaces the scan engine and the trigger switch to the WORKABOUT PRO system. Different scan engines may require different convertor boards. These items together comprise the scanner module.

The scanner module is connected to the WORKABOUT PRO's scanner connector by the scanner flex cable, using a standardized interface.



## 9.2 Scanner Device Installation

Scanner modules provided by Psion Teklogix, and third-party scanner devices, are attached to the WORKABOUT PRO's backplate:

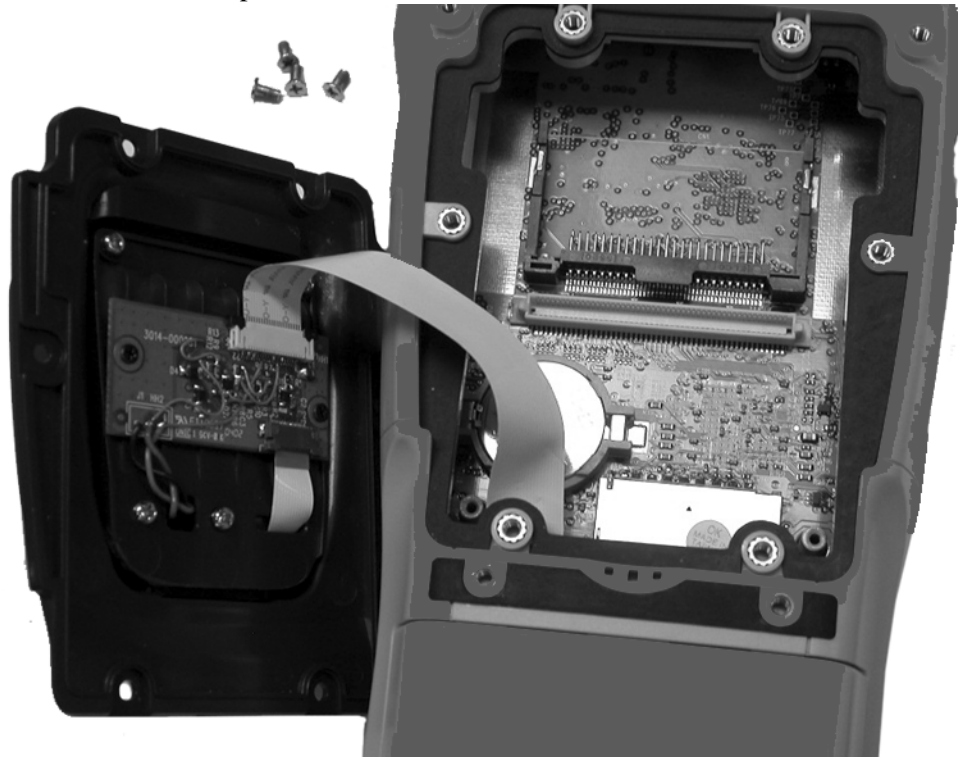


Figure 9.1 The Backplate, A Scanner, And The Scanner Cable

The backplate is fastened to the back of the WORKABOUT PRO using six M2.6 x 4 screws. Use a #1 Philips screwdriver to remove these.

## 9.3 The Scanner

### 9.3.1 Varieties

Several types of scanner modules are available, which include the Symbol SE1223 and SE923, the Symagery SX5093, and the Intermec E1022 scan engines.

There are a number of scanner kits available for the WORKABOUT PRO. These include scanner modules, backplates, and mounting hardware:.

Kit Description	Kit Model Number	Scan Engine Included	Screws to attach scanner to backplate
Flat backplate	WA6208	no scanner	none
Backplate (with window for scanner), scan engine, and mounting screws	WA9000	Symbol SE1223	M2.6 x 4 (qty 4)
	WA9002	Symbol SE923	
	WA9010	Symagery SX5093	
	WA9003	Intermec E1022	

Table 9.1 Scanner Kits For The WORKABOUT PRO

Third parties may connect other devices to the scanner connector as well. In this manual, these devices will be referred to as “scanner devices”.

## 9.4 Connector Location

The scanner connector is located on the main logic board of the WORKABOUT PRO, near the backup battery:



Figure 9.2 Location Of The Scanner Connector

The connector on the WORKABOUT PRO’s motherboard is a 22-pin connector.



## 9.5 Connector Pinout

The scanner connector has the following pins:

Pin	Name	Description	Direction	State When Active	State During Sleep	Pull-up Or Pull-down
1	V+5_BAR	+5V barcode supply.	Power	N/A	Disabled	N/A
2	V+5_BAR	+5V barcode supply.	Power	N/A	Disabled	N/A
3	IR_TXD	Data from WORK-ABOUT PRO to scanner device.	Output	B		None
4	USB_H2_D-	USB host port 2 D-.	Bidirectional	B	Pulled down	15k
5	IR_RXD	Data from scanner device to WORK-ABOUT PRO.	Input	B	Pulled up	100k
6	USB_H2_D+	USB host port 2 D+.	Bidirectional	B	Pulled down	15k
7	nBAR_CTS	CTS from scanner device to WORK-ABOUT PRO.	Input	L	Pulled up	100k
8	GND	Ground.	Power	N/A	N/A	N/A
9	nBAR_RTS	RTS from WORK-ABOUT PRO to scanner device.	Output	L	Low	N/A
10	N/C	Do not connect.	N/A	N/A	N/A	N/A
11	GND	Ground.	Power	N/A	N/A	N/A
12	GND	Ground.	Power	N/A	N/A	N/A
13	KB_SCAN_R7	Keyboard row 7.	Input	N/A	Pulled down	1M
14	V+3.3	3.3-V Power supply.	Power	N/A	Enabled	N/A
15	KB_SCAN_COA	Keyboard column 0.	Output	N/A	Driven	None
16	BAR_PWRWDWN	Power-down from scanner device to WORKABOUT PRO.	Input	H	Pulled up	100k
17	BAR_TYPE	Not used.	Input	B	Pulled up	100k
18	nBAR_WKUP	Wakeup signal to scanner device.	Output	L		None
19	N/C	Do not connect.	N/A	N/A	N/A	N/A
20	nBAR_TRIG	Trigger signal to scanner device.	Output	L		None
21	GND	Ground.	Power	N/A	N/A	N/A
22	GND	Ground.	Power	N/A	N/A	N/A

Note: X = don't care; L = active low, H = active high, B = both high and low

Table 9.1 Pinout Of Scanner Connector

## 9.6 The Scanner Flex

The scanner connector accepts a flexible ribbon cable, which is supplied with the WORKABOUT PRO. The flex used with Psion Teklogix scanners has part number 1040017.



Figure 9.3 The Scanner Flex Cable

## 9.7 Connection Block Diagram

The scanner connector sits in the WORKABOUT PRO system as follows:

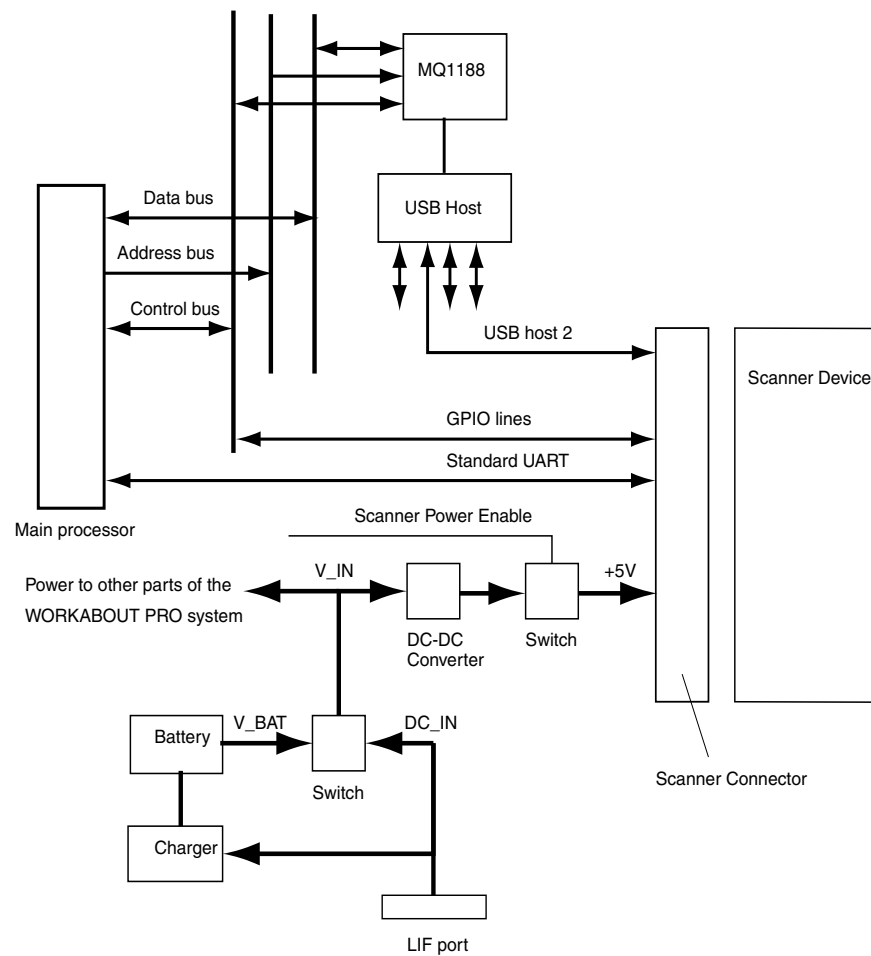


Figure 9.4 Scanner Connector Signals (Block Diagram)

## 9.8 Power And Ground

The WORKABOUT PRO provides the following power and ground connections to the scanner device:

- Ground (pins 8, 11, 12, 21, 22).
- V+5\_BAR (pins 1 and 2).  
This voltage is +5V from a DC-DC converter fed by V\_IN, the WORKABOUT PRO's main supply.
- V+3.3 (pin 14)  
+3.3V from the WORKABOUT PRO's internal DC-to-DC converter.

These voltages have the following specifications:

Supply	Nominal Voltage	Continuous Current
V+5_BAR	5V	300mA
V+3.3	3.3V	100mA

**Table 9.2 Voltages Supplied To The Scanner Device**

The voltage VIN is fed by a diode OR of V\_BAT (the DC voltage supplied by the WORKABOUT PRO's battery), and DC\_IN, the DC power input to the terminal. VIN feeds a DC-to-DC convertor; the output of the convertor is switched by the scanner power enable signal, and is known as V+5\_BAR.

When the terminal is powered by a DC power supply, VIN will be at 5V minus a diode drop. When the terminal is powered by the battery, VIN will be at whatever voltage the battery is at, minus a diode drop. (Nominal battery voltage is 3.7V.) VIN has a minimum of 2V and a maximum of 5V.

V+5\_BAR is maintained by the DC-to-DC convertor at 5V. V+5\_BAR can be switched on and off while the WORKABOUT PRO is running, but is disabled when it is suspended.

V+3.3 remains powered when the WORKABOUT PRO is suspended.

## 9.9 Signals To The Scanner Device

The WORKABOUT PRO does not provide the data and address buses of its main processor (the PXA-255) to the scanner port. Instead, communication to the scanner is provided by USB or serial lines.

All the serial signals are present to connect a decoded scanner. A USB host port is also provided so that USB peripherals can be connected via the scanner port.

These signals are at 3.3-V CMOS levels.

Serial scanner devices can be connected through the following signals:

- IR\_TXD (data to the scanner device, pin 3).
- IR\_RXD (data from the scanner device, pin 5).
- nBAR\_CTS (Clear To Send flow-control signal from the scanner device, pin 7).
- nBAR\_RTS (Ready To Send flow-control signal to the scanner device, pin 9).

USB scanner devices can communicate through the following bidirectional data signals:

- USB\_H2\_D+ (pin 6).
- USB\_H2\_D- (pin 4).



**Note:** *There is no USB power-enable signal on the scanner port.*

In addition, there are control signals for both USB and serial scanner devices:

- BAR\_PWRDWN (pin 16).
- nBAR\_WAKEUP (pin 18).
- nBAR\_TRIG (pin 20).

BAR\_PWRDWN is an input to the main logic board. The scanner device can use this signal to inform the WORKABOUT PRO that it has shut down, and power can then be safely be removed from the scanner device. Pull this signal high to enable it.

nBAR\_WAKEUP is an output from the main logic board. Pull this signal low for 200 milliseconds to send a signal to the scanner device. This signal is pulled low by the Psion Teklogix scanner driver when the WORKABOUT PRO wakes up.

nBAR\_TRIG is an output from the main logic board. Pull this signal low for 200 milliseconds to send a signal to the scanner device. This signal is pulled low by the Psion Teklogix scanner driver when the scan button on the WORKABOUT PRO's keyboard is pressed.

The use of these signals varies depending on the connected scanner device.

A pair of lines from the WORKABOUT PRO's keyboard matrix are also provided:

- KB\_SCAN\_R7 (an input, pin 13)
- KB\_SCAN\_C0A (an output, pin 15)

Short these signals together for a minimum of 20 milliseconds to initiate a scan or wake up the terminal.



**Notes:**

1. *nBAR\_CTS and nBAR\_RTS are not “hardware” flow-control signals, CTS must be polled by software, and RTS has to be set / cleared by software.*
2. *Apart from V+5\_BAR, the signals connected to the scanner port are at 3.3-V CMOS levels. Use a level translator before the scanner cable to connect 5V signals to the WORKABOUT PRO's main PCB.*



10.1 Overview . . . . .	105
10.2 Example Scanner Board. . . . .	105
10.3 Power And Ground . . . . .	110
10.4 Signals To The Scanner Module . . . . .	110
10.4.1 Serial Signals . . . . .	110
10.4.2 USB Signals . . . . .	111
10.4.3 Control Signals . . . . .	111





## 10.1 Overview

Pision Teklogix provides a scanner convertor board in WORKABOUT PRO units that incorporate a scanner. This board is attached to the scan engine, and differs depending on the installed scanner.

At a minimum, the scanner board physically connects the supply voltages and signal lines provided by the scanner flex to the scanner device. Different scanner devices require different scanner boards. More complex scanner boards can be designed to buffer signals and provide voltage regulation and switching.

This chapter describes the scanner convertor board used with the Symbol SE1223 scanner, and its interface to the WORKABOUT PRO's motherboard.

## 10.2 Example Scanner Board

As an example, here is the scanner board used with the Symbol SE1223 scan engine. This board can also be configured for Intermec scan engines.

This scanner board incorporates AND-gate buffers on the signal lines: a 74HCT08 buffers outbound signals, and a 74LVC08 buffers inbound signals.

The scanner board can be configured for the Symbol or Intermec scan engines by providing zero-ohm resistors (jumpers) in locations according to the following table:

Name	Connects When Jumpered	For Symbol Scan Engines	For Intermec Scan Engines
R10	HOST_TRIG to Symbol_TRIG		
R11	HOST_TRIG to Inter_TRIG		X
R12	HOST_WKUP to Inter_PWREn		X
R13	HOST_WKUP to Symbol_WKUP	X	
R14	RTS to Symbol_CTS	X	
R15	RTS to Inter_CTS		X
R16	CTS to Inter_RTS_Symbol_CTS		X
R17	CTS to Symbol_RTS	X	
R18	TXD to Inter_RXD		X
R19	TXD to Symbol_RXD_Inter_PWREn	X	
R20	Connects V+5 to JP1 pin 5 (Inter_Symbol_TXD)	X	
R21	Connects JP1 pin 8 and JP1 pin 11		X
PR1	V+5 to JP1 pin 2 (Inter_RXD)	X	
PR2	V+5 to JP1 pin 1		X
GR1	Gnd to JP1 pin 12 (Symbol_TRIG)		X
GR2	Gnd to JP1 pin 7 (Symbol_RTS)		X
GR3	Gnd to JP1 pin 3 (Inter_Trigger)	X	
Note: X = zero-ohm resistor (jumper) present			

**Table 9.3 Configuration Resistors**

The default provision is for Symbol scan engines. The schematic (see Section B.3 on page 10) is drawn this way.

Chapter 10: The Scanner Convertor Board  
Example Scanner Board

This scanner convertor board has three connectors.

JP2 is a 22-pin connector that accepts the 22-pin flex cable from the WORKABOUT PRO's motherboard. This connector has the following pins:

Pin	Name On WORKABOUT PRO	Name On Convertor Board	Description	Direction	Active State	State During Device Sleep	Pull-up Or Pull-down
1	V+5_BAR	V+5	+5V barcodes supply	Power	N/A	Disabled	N/A
2	V+5_BAR	V+5	+5V barcode supply	Power	N/A	Disabled	N/A
3	IR_TXD	TXD	Data from WORKABOUT PRO to scanner device	Output	B		None
4	USB_H2_D-	(Not connected.)	USB host port 2 D-	Bidirectional	B	Pulled down	15k
5	IR_RXD	RXD	Data from scanner device to WORKABOUT PRO	Input	B	Pulled up	100k
6	USB_H2_D+	(Not connected.)	USB host port 2 D+	Bidirectional	B	Pulled down	15k
7	nBAR_CTS	CTS	CTS from scanner to WORKABOUT PRO	Input	L	Pulled up	100k
8	GND	(Connected to ground.)	Ground	Power	N/A	N/A	N/A
9	nBAR_RTS	RTS	RTS from WORKABOUT PRO to scanner.	Output	L	Low	N/A
10	N/C	(Connected to ground.)	Do not connect.	N/A	N/A	N/A	N/A
11	GND	(Connected to ground.)	Ground.	Power	N/A	N/A	N/A
12	GND	(Connected to ground.)	Ground.	Power	N/A	N/A	N/A
13	KB_SCAN_R7	KB_SCAN_R7	Keyboard row 7	Input	N/A	Pulled down	1M
14	V+3.3	V+3.3	3.3V Power supply.	Power	N/A	Enabled	N/A
15	KB_SCAN_COA	KB_SCAN_COA	Keyboard column 0.	Output	N/A	Driven	None
16	BAR_PWRDWN	HOST_PWRDWN	Power-down from scanner device to WORKABOUT PRO.	Input	H	Pulled up	100k
17	BAR_TYPE	BAR_TYPE	Not used.	Input	B	Pulled up	100k
18	nBAR_WKUP	HOST_WKUP	Wakeup signal to scanner device.	Output	L		None
Note: X = don't care; L = active low, H = active high, B = both high and low							

Pin	Name On WORKABOUT PRO	Name On Convertor Board	Description	Direction	Active State	State During Device Sleep	Pull-up Or Pull-down
19	N/C	(Connected to ground.)		N/A	N/A	N/A	N/A
20	nBAR_TRIG	HOST_TRIG	Trigger signal to scanner device	Output	L		None
21	GND	(Connected to ground.)	Ground	Power	N/A	N/A	N/A
22	GND	(Connected to ground.)	Ground	Power	N/A	N/A	N/A
Note: X = don't care; L = active low, H = active high, B = both high and low							

**Table 5.1 Pinout Of Host Scanner Connector (JP2)**

JP1 is a 12-pin connector that accepts a cable that connects to the scan engine itself. This connector has different pinouts depending on whether the convertor board is configured for Symbol or Intermec scan engines..

Pin	Name On Convertor Board	Description	Direction
1	V+5_BAR	+5V supply to scan engine	Power
2	V+5_BAR	+5V supply to scan engine	Power
3	GND	Ground	Power
4	Symbol_RXD_Inter_PWREn	Data from scan engine to WORKABOUT PRO.	Input
5	Inter_Symbol_TXD	Data from WORKABOUT PRO to scan engine.	Output
6	Inter_RTS_Symbol_CTS	CTS from scan engine to WORKABOUT PRO	Input
7	Symbol_RTS	RTS from WORKABOUT PRO to scan engine.	Output
8	Symbol_PWRDWN	Power-down signal from scan engine to WORKABOUT PRO.	Input
9	NC	Not connected.	
10	Symbol_CTS	CTS from scan engine to WORKABOUT PRO	Input
11	Symbol_WKUP	Wakeup signal to scan engine.	Output
12	Symbol_TRIG	Trigger signal to scan engine.	Output
Note: "Input" and "output" are relative to the WORKABOUT PRO's motherboard.			

**Table 5.2 Pinout Of Scan Engine Connector JP1 (Configured For Symbol)**

Pin	Name On Convertor Board	Description	Direction
1	V+5_BAR	+5V supply to scan engine	Power
2	Inter_RXD	Data from scan engine to WORKABOUT PRO.	Input
3	Inter_Trigger	Trigger signal to scan engine.	Output
4	Symbol_RXD_Inter_PWREn	Wakeup signal to scan engine.	Output
5	Inter_Symbol_TXD	Data from WORKABOUT PRO to scan engine.	Output
6	Inter_RTS_Symbol_CTS	RTS from WORKABOUT PRO to scanner module	Output
Note: "Input" and "output" are relative to the WORKABOUT PRO's motherboard.			

Pin	Name On Convertor Board	Description	Direction
7	GND	Ground	Power
8	Symbol_PWRDWN	Power-down signal from scan engine to WORK-ABOUT PRO. Connected to pin 11.	Input
9	NC	Not connected.	
10	Inter_CTS	CTS from scan engine to WORKABOUT PRO	Input
11	Symbol_PWRDWN	Power-down signal from scan engine to WORK-ABOUT PRO. Connected to pin 8.	Input
12	GND	Ground	Power
Note: “Input” and “output” are relative to the WORKABOUT PRO’s motherboard.			

**Table 5.3 Pinout Of Scan Engine Connector JPI (Configured For Intermec)**

CN3 is a three-pin header that allows connection to the trigger-switch lines fed from the WORKABOUT PRO’s keyboard matrix.

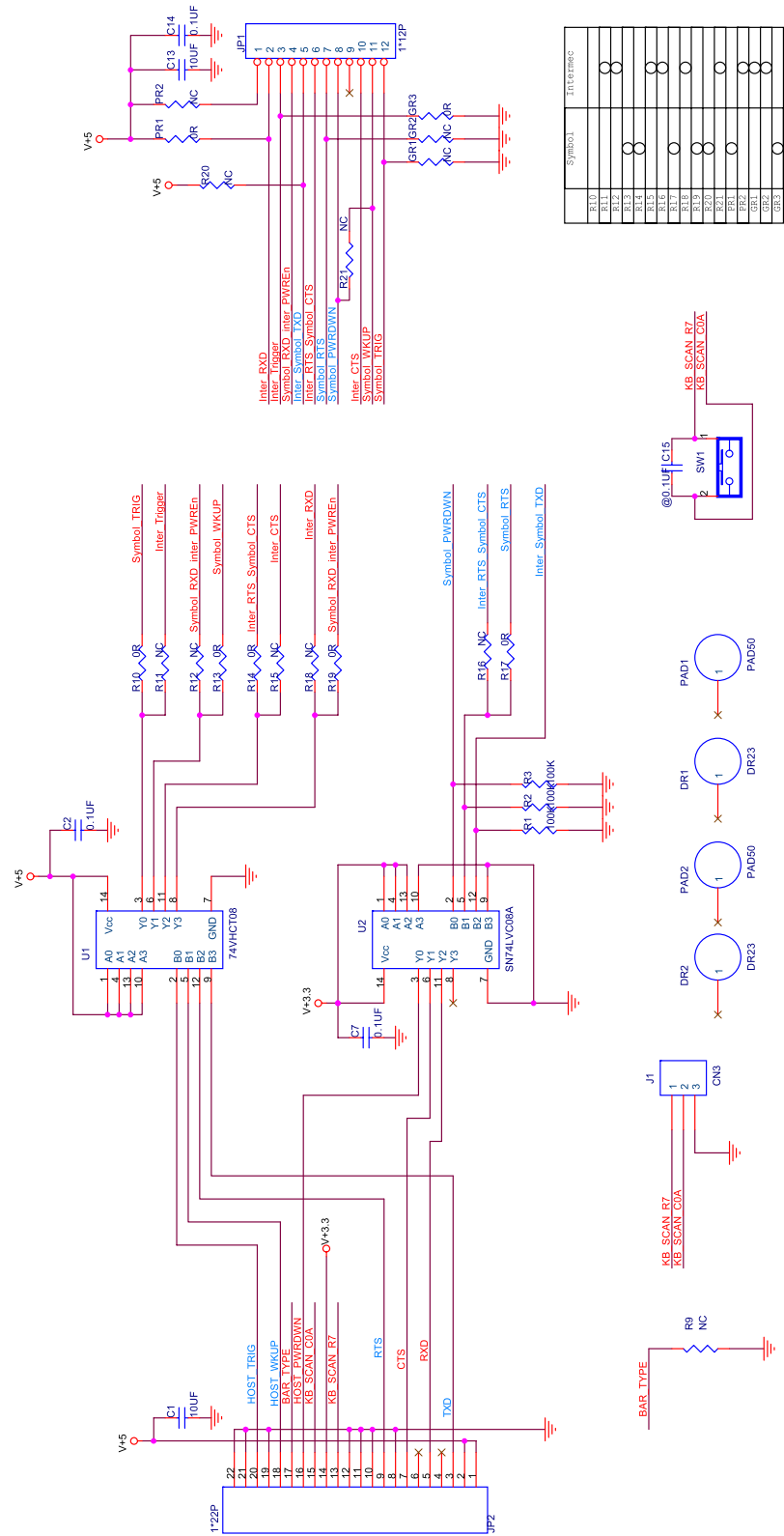


Figure 9.3 SE1223 Scanner Converter Board

## 10.3 Power And Ground

The WORKABOUT PRO provides the following power and ground connections to JP2 on the scanner board:

- Ground (pins 8, 11, 12, 21, 22 on the scanner flex).
- V+5\_BAR (pin 1 and 2).  
This voltage is +5V from a DC-DC converter fed by V\_IN, the WORKABOUT PRO's main supply. It is switched by the scanner power enable signal.
- V+3.3:  
+3.3V from the WORKABOUT PRO's internal DC-to-DC converter.

These voltages have the following specifications:

Supply	Nominal Voltage	Continuous Current	Peak Current	Max Peak Duration
V+5_BAR	5V	300mA	700mA	100mS
V+3.3	3.3V	100mA	100mA	N/A

Table 5.4 Supply Voltages For The Scanner

The voltage VIN is fed by a diode OR of V\_BAT (the DC voltage supplied by the WORKABOUT PRO's battery), and DC\_IN, the DC power input to the terminal. VIN feeds a DC-to-DC converter; the output of the convertor is switched by PWR\_EN and is known as V+5\_BAR.

V+5\_BAR is maintained by the DC-to-DC convertor at 5V. V+5\_BAR can be switched on and off by software while the WORKABOUT PRO is running, but is disabled when it is suspended.

V+3.3 remains powered when the WORKABOUT PRO is suspended.

On this scanner board, V+5\_BAR controls an Atmel AAT4250 switch to switch V+3.3 to the scanner module itself. The switched 3.3-volt power is V+3.3\_bar.

## 10.4 Signals To The Scanner Module

The WORKABOUT PRO does not provide the data and address buses of its main processor (the PXA-255) to the scanner port. Instead, communication to the scanner is provided by USB or serial lines. All the serial signals are present to connect a decoded scanner. A USB host port is also provided so that USB peripherals can be connected via the scanner port.

### 10.4.1 Serial Signals

This scanner board is configured to use serial communications with the Symbol SE1223 scanner series. When the scanner board is configured to use serial communication, the scanner uses the following signals from JP2, the 22-pin scanner flex that connects to the WORKABOUT PRO:

- IR\_TXD (data to the scanner device, pin 3 on JP2).
- IR\_RXD (data from the scanner device, pin 5).
- nBAR\_CTS (Clear To Send flow-control signal from the scanner device, pin 7).
- nBAR\_RTS (Ready To Send flow-control signal to the scanner device, pin 9).

These signals are buffered through U1, a 74LVC244A octal buffer. The buffered signals connected to the scanner itself (through the 12-pin JP1) are, in the same order:

- BAR\_TXD (data to the scanner device, pin 5 on JP1).
- BAR\_RXD (data from the scanner device, pin 4).
- BAR\_CTS (Clear To Send flow-control signal from the scanner module, pin 6).
- BAR\_RTS (Ready To Send flow-control signal to the scanner device, pin 7).



**Notes:**

1. nBAR\_CTS and nBAR\_RTS are not “hardware” flow-control signals, CTS must be polled by software, and RTS has to be set / cleared by software.
2. Apart from V+5\_BAR, the signals connected to the scanner port are 3.3V CMOS. Use a level translator before the scanner cable to connect 5V signals to the WORKABOUT PRO’s main PCB.

## 10.4.2 USB Signals

When the scanner board is configured to use USB communication, the scanner uses the following signals from JP2, the 22-pin scanner flex that connects to the WORKABOUT PRO:

- USB\_H2\_D+ (pin 6 on JP2).
- USB\_H2\_D- (pin 4).

These signals are buffered through U1, and use the following pins on JP1, in the same order:

- pin 6.
- pin 4.



**Note:** The WORKABOUT PRO does not provide a USB power-enable signal to the scanner board.

## 10.4.3 Control Signals

In addition, there are control signals, used for both USB and serial scanner devices:

- BAR\_PWRDWN (pin 16 on JP2).
- nBAR\_WKUP (pin 18).
- nBAR\_TRIG (pin 20).

BAR\_PWRDWN is an input to the main logic board. The scanner can use this signal to inform the WORKABOUT PRO that it has shut down, and power can then be safely be removed from the scanner device. This signal is buffered through U1 and is provided by the scanner module as HOST\_PWRDWN. The scanner module pulls this signal high to enable it.

nBAR\_WKUP is an output from the main logic board. This signal is buffered through U1 and is provided to the scanner module as BAR\_WKUP. Pull this line low for 200 milliseconds to send a signal to the scanner device. This signal is pulled low by the Psion Teklogix scanner driver when the WORKABOUT PRO wakes up.

nBAR\_TRIG is an output from the main logic board. This signal is buffered through U1 and is provided to the scanner module as BAR\_TRIG. Pull this signal low for 200 milliseconds to send a signal to the scanner device. This signal is pulled low by the Psion Teklogix scanner driver when the scan button on the WORKABOUT PRO's keyboard is pressed.

A pair of lines from the WORKABOUT PRO's keyboard matrix are also provided through JP2:

- KB\_SCAN\_R7 (an input, pin 13 on JP2)
- KB\_SCAN\_C0A (an output, pin 15)

These signals can be shorted together for a minimum of 20 milliseconds to initiate a scan or wake up the terminal. On the scanner board, these signals are connected directly to CN3.



11.1 Overview . . . . .	115
11.2 Installation . . . . .	116
11.3 Dimensions . . . . .	116
11.4 Expansion Module Connectors . . . . .	117
11.5 Block Diagram. . . . .	118
11.6 Electrical. . . . .	118
11.6.1 Unused Host Signals . . . . .	118
11.6.2 Unused PCMCIA Signals . . . . .	119
11.6.3 PCMCIA Compatibility . . . . .	119
11.6.4 The Card Detect Signals . . . . .	120
11.6.5 The Buffer Enable Signals . . . . .	120
11.6.6 The Slot Power Enable Signal . . . . .	120
11.6.7 Selectable Card Supply Voltage . . . . .	120
11.7 EEPROM Data . . . . .	120



## 11.1 Overview

This chapter describes the PCMCIA Expansion Module available for the WORKABOUT PRO.

The PCMCIA expansion module allows the user to connect a Type-1 or Type-2 PCMCIA card to the WORKABOUT PRO. The expansion module accepts 3.3-V and 5-V PCMCIA cards.

The card must fit within the enclosure of the WORKABOUT PRO when the endcap and card stop are installed, although a custom endcap can be created for extended PCMCIA cards.

See Section 11.6.3 on page 119 for information on compatibility with the PCMCIA standard.

This expansion module plugs into the WORKABOUT PRO's 100-pin expansion connector.

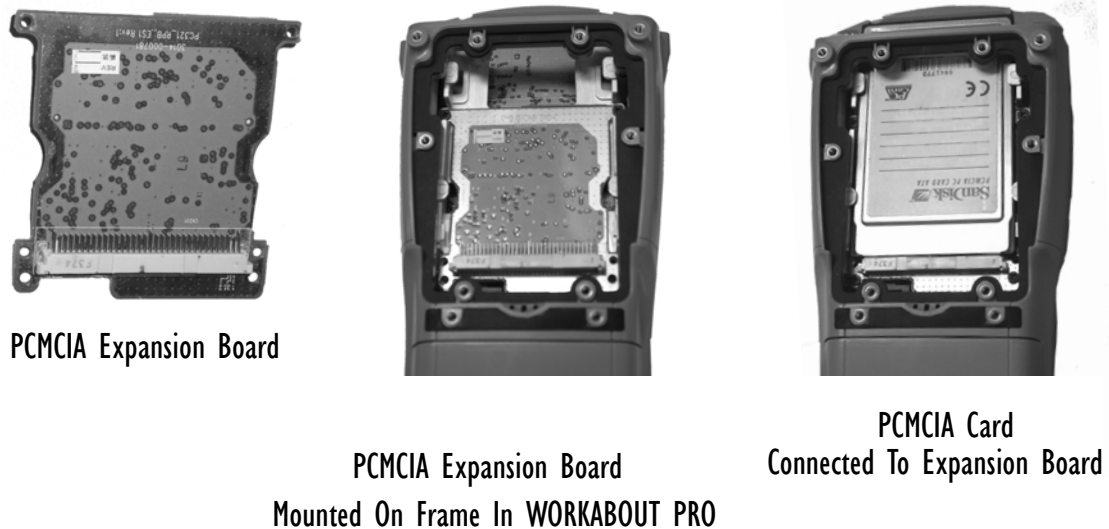


Figure 11.1 The PCMCIA Adaptor Expansion Module

The PCMCIA expansion module is available as a kit, model number WA9001. The kit includes the following items:

- PCMCIA adapter board (part number 1030313).
- Mechanical stop for the PCMCIA card (1030224).
- Eight M2 x 4 screws (9001906).
- Installation instructions. (8000037).

A metal frame for mounting the expansion module is already provided in the WORKABOUT PRO. It also serves as a guide for the PCMCIA card:

## 11.2 Installation

To install the PCMCIA Adaptor Expansion Module:

1. Remove the WORKABOUT PRO's endcap and backplate (see Section 7.2 on page 63).
2. Install the expansion module as shown in Section 7.2.2 on page 65.

To insert a PCMCIA card, slide it in through the end of the terminal:

Figure 11.2 Insertion Of PCMCIA Card

The expansion module is screwed to the frame using four M2 x 4 screws (part number 9001906).

When the PCMCIA card is inserted, it is restrained by a plastic card stop, part number 1030024. This card stop is fastened to the body of the WORKABOUT PRO by four M2 x 4 screws. The endcap fits over top of the card stop.

## 11.3 Dimensions

The PCMCIA expansion module must fit into the mounting frame inside the WORKABOUT PRO:

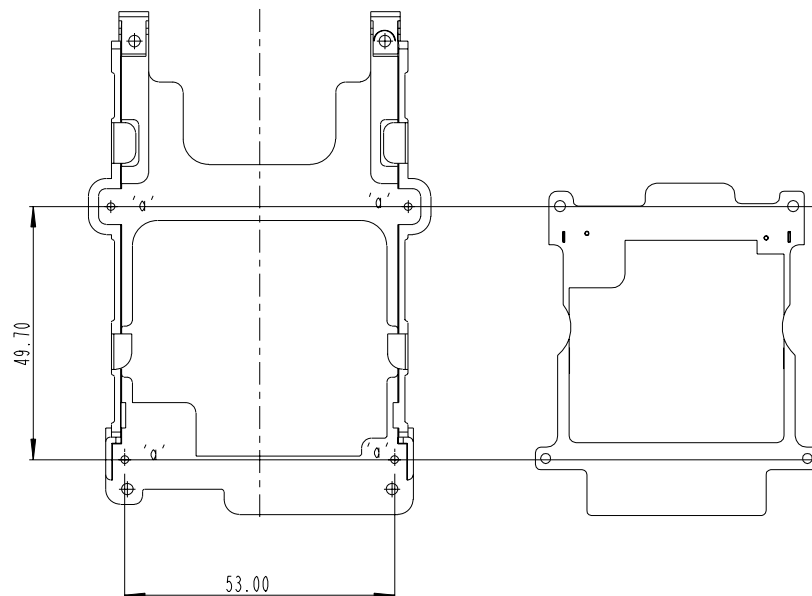


Figure 11.3 Location Of PCMCIA Expansion Module

Expansion modules must fit within the perimeter of the mounting frame, and cannot exceed a height of 5.5 mm.

The HDK provides 3D models of the

## 11.4 Expansion Module Connectors

The expansion module connects to the WORKABOUT PRO's 100-pin connector. It also has an unkeyed PCMCIA connector.

The expansion module's 100-pin connector is an FX6-100S-0.8SV2, a 100-pin receptacle. The connector is aligned on the centreline of the expansion board. The corresponding connector on the WORKABOUT PRO's motherboard is an FX6-100P-0.8SV2 header.

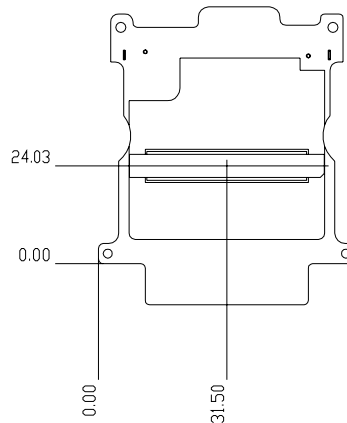


Figure 11.4 Location Of 100-Pin Connector

The PCMCIA connector is aligned parallel to the expansion board, on the other side to the 100-pin connector.



Figure 11.5 Expansion Module And PCMCIA Card

When installed inside the WORKABOUT PRO, the PCMCIA Expansion Module can accept PCMCIA Type I and Type II cards. The cards are secured by the PCMCIA card stop (Psion Teklogix model number WA6203). Extended Type I and Type II cards can be accommodated if the WORKABOUT PRO's endcap and card stop are removed.

## 11.5 Block Diagram

The Psion Teklogix PCMCIA Expansion Module sits in the WORKABOUT PRO's system as follows:

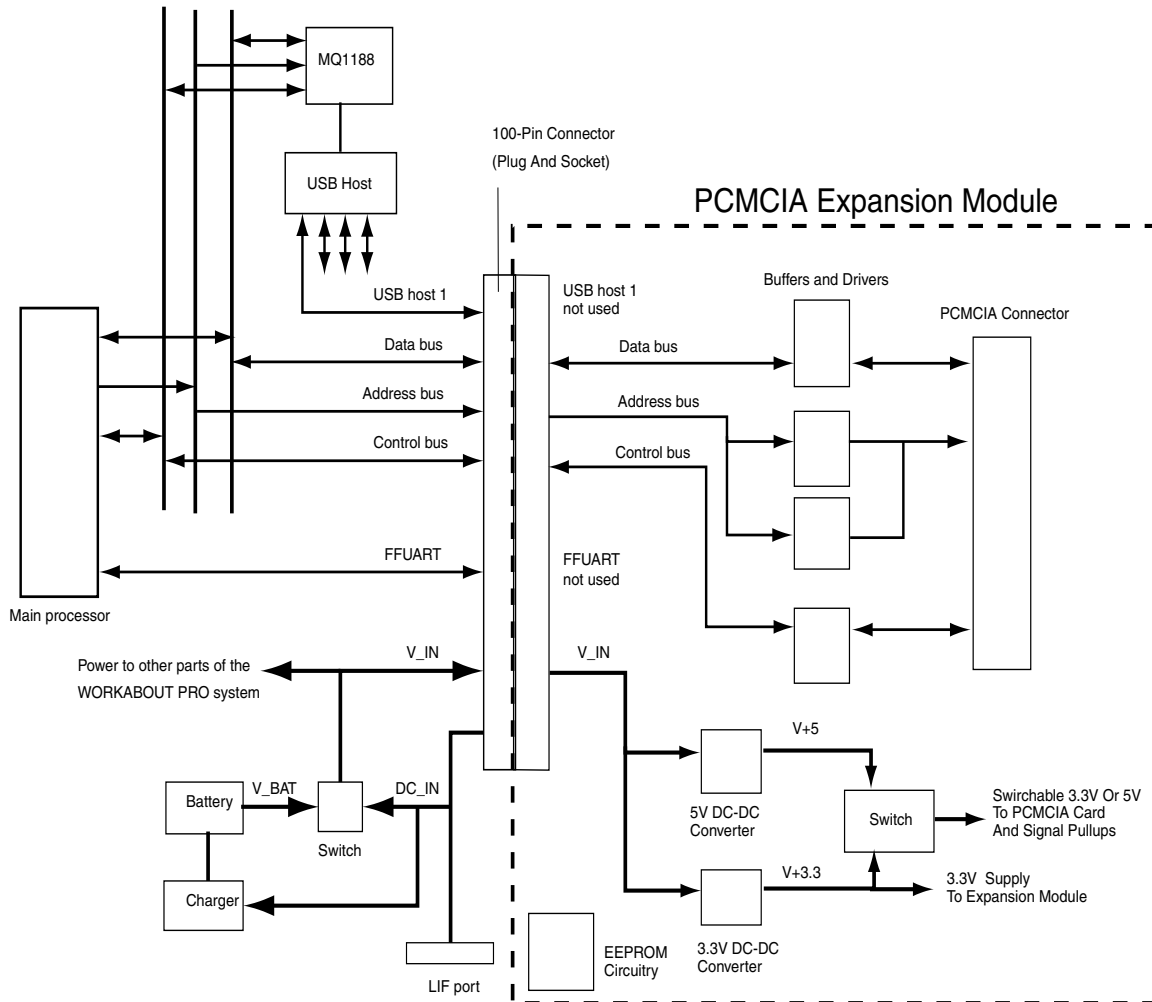


Figure 11.6 The PCMCIA Module In The WORKABOUT PRO System

The PCMCIA Expansion Module serves as a PCMCIA Host Bus Adaptor for the WORKABOUT PRO, buffering the system data and address buses from the 100-pin connector to the PCMCIA connector.

Standard PCMCIA control signals are buffered as well., but there are some differences between the standard use of these signals and Psion Teklogix' use. See Section 11.6.3 on page 119.

The expansion module incorporates a Psion Teklogix-standard serial EEPROM for identification to the WORKABOUT PRO system.

## 11.6 Electrical

### 11.6.1 Unused Host Signals

The PCMCIA Expansion Module does not use the following signals on the WORKABOUT PRO's 100-pin expansion connector:

- nCS3 (pin 64)

- nCS4 (pin 66)
- RDY (pin 68)
- MQ\_GPIO43 (pin 74)
- MQ\_GPIO44 (pin 76)
- nSLOT\_WAKEUP (pin 79)
- the USB signals from Host 1 (pins 80, 82, 88)
- the FFUART serial signals (pin 81, 83, 85, 87, 89, 91, 93, 95)
- pin 86, which is not connected
- SSPCLK (pin 90)
- SSPSRM (pin 92)
- SSPTXD (pin 94)
- SSPRXD (pin 96)
- DC\_IN (pins 97, 99)

These pins comprise the USB lines from the WORKABOUT PRO's USB host 1, the serial lines from the full-function UART, and a number of general-purpose inputs and outputs, plus the unregulated DC input from the WORKABOUT PRO's AC adaptor.

## 11.6.2 Unused PCMCIA Signals

The PCMCIA Expansion Module does not use the following signals on the PCMCIA 68-pin connector:

- VPP1 (pin 16)
- VPP2 (pin 54)
- BVD2 (pin 62)
- VS2# (pin 57)
- INPACK# (pin 60)

See Section 11.6.3 for descriptions of the Expansion Module's compatibility.

## 11.6.3 PCMCIA Compatibility

The PCMCIA Expansion Module implements a subset of the PCMCIA standard [CHANGE] 2.0?. Depending on driver support in the WORKABOUT PRO, it can handle the following PCMCIA Card interfaces:

- Memory
- Memory or I/O

The Expansion Module does not use the following signals and features of the PCMCIA connector:

- Programming voltages (Vpp1 and Vpp2)
- Voltage Select 2 (VS2#)
- Battery Voltage Detect 2 (BVD2#)

The Expansion Module can supply a maximum of 750 mA to the PCMCIA card through the VCC pins.

The handling of some other signals is described below.

The following sections use the signal names on the schematic of the Expansion Module, referencing pin names at the connectors only when necessary.

## 11.6.4 The Card Detect Signals

The two Card Detect signals from the PCMCIA connector (nPC\_CD1 and nPC\_CD2, active low) are pulled low when a card is inserted. On the expansion card, they are ORed through buffer U208 to become the nSLOT\_CD signal (active low). This signal goes to the 100-pin connector, and is also used elsewhere in the module.

## 11.6.5 The Buffer Enable Signals

The nSLOT\_CD signal is ORed with nSLOT\_PSKTSEL and nSLOT\_BUF\_EN (active-low and from the 100-pin connector) to create the nSLOT\_BUF\_OE signal. This signal, active low, enables the data-bus, control-bus, and address-bus buffers on the expansion module.

The data-bus buffer, U201, is bidirectional. The signal nCARD\_D\_DIR (active low) specifies which direction U201 will forward data.

## 11.6.6 The Slot Power Enable Signal

The SLOT\_PWR\_EN signal from the 100-pin connector (active high) is ANDed with a number of other signals as they cross the Expansion Module.

The nPC\_VS1, nPC\_BVD1 signals from the PCMCIA connector, active low, become nSLOT\_VS1 and nSLOT\_BVD1 respectively at the 100-pin connector. The PC\_READY signal from the PCMCIA connector, active high, becomes the SLOT\_READY signal. at the 100-pin connector

The SLOT\_RST signal from the 100-pin connector, active high, becomes the PC\_RST signal at the PCMCIA connector.

All of these signals require the SLOT\_PWR\_EN signal to be asserted (high) before they are forwarded.

## 11.6.7 Selectable Card Supply Voltage

The supply voltage for the PCMCIA card is selectable (3.3V or 5V) through the SLOT\_PWR\_SEL and SLOT\_5V\_EN signals from the 100-pin connector.

The SLOT\_PWR\_SEL signal, when active (high), enables the supply voltage to the PCMCIA card.

When asserted (high), the SLOT\_5V\_EN signal switches the 5-V output of U301 to the V+3.3/V+5 line. When SLOT\_5V\_EN is low, the 3.3-V module supply voltage from U303 is switched to the V+3.3/V+5 line.

The V+3.3/V+5 line provides the PCMCIA card's supply voltage VCC on pins 17 and 51 of the PCMCIA connector. It also serves to pull the PC\_READY, nPC\_BVD1, nPC\_VS1, nPC\_WAIT\_SRC, and nPC\_IOIS16 lines high, maintaining compatibility between these signals and the PCMCIA card.

## 11.7 EEPROM Data

The EEPROM in the PCMCIA module has the following structure. It uses the hardware type field to enable the PCMCIA socket on the expansion hardware. The Manufacturer/Model field is used only to identify the module.



The expansion slot driver will still attempt to load a driver using the manufacturer/model field but there is no driver defined, so no extra driver will be loaded.

EEPROM Field	Address	Size	Contents
1) manufacturing test region	0-9	10 bytes	
2) Revision	10	1 byte	ASCII '1' (0x31)
3) Hardware revision	11	1 byte	ASCII '0' (0x30) for revision ES0, ASCII '1' (0x31) for revision ES1
4) Hardware type	12	1 byte	ASCII 'a' (0x61)
5) Manufacturer/Model	13-32	20 bytes	ASCII text 'PsionTeklogix PCMCIA': .0x50, 0x73, 0x69, 0x6f, 0x6e, 0x54, 0x65, 0x6b, 0x6c, 0x6f, 0x67, 0x69, 0x78, 0x20 0x50, 0x43, 0x4d, 0x43, 0x49, 0x41
6) Serial number	33-44	12 bytes	ASCII text, as appropriate. Example: '1234' is 0x31, 0x32, 0x33, 0x34, 0x00. The remaining locations are not programmed, and contain 0xff
7) Manufacturer specific	45+	83+	Not programmed - all 0xff

Table 5.1 PCMCIA Adapter EEPROM Contents



# THE MULTI I/O EXPANSION MODULE

# 12

12.1 Overview . . . . .	125
12.2 Installation. . . . .	125
12.3 Connectors. . . . .	126
12.3.1 Motherboard 100-Pin Connector (J1) . . . . .	126
12.3.2 Motherboard Scanner Connector (J2) . . . . .	126
12.3.3 Scanner-Port Serial Connector (J3). . . . .	127
12.3.4 USB Host Port 2 Connector (J4) . . . . .	127
12.3.5 The FF UART Serial Connector (J5). . . . .	128
12.3.6 The USB Host 1 Connector (J6) . . . . .	129
12.3.7 The Power Connector (J7) . . . . .	130
12.4 Configuration . . . . .	130
12.4.1 Slot Power Control . . . . .	131
12.4.2 EEPROM Write Control . . . . .	131
12.4.3 Voltage Configuration For High-Power Output . . . . .	132
12.4.4 Voltage Configuration For Standard-Power Output . . . . .	132
12.4.5 Control Signals For FFUART Level Converter . . . . .	133
12.4.6 TTL Output Option For Scanner Serial Port . . . . .	133
12.5 Block Diagram . . . . .	134
12.6 Electrical. . . . .	135
12.6.1 Unused Host Signals . . . . .	135
12.6.2 Power And Ground. . . . .	135



## 12.1 Overview

This chapter describes the Multi-I/O Expansion Module available for the WORKABOUT PRO.

The Multi-I/O Expansion Module fits inside the WORKABOUT PRO and is designed to connect to the 100-pin connector and optionally to the scanner connector of the WORKABOUT PRO. It allows easy access (through low profile SMT MOLEX connectors) to the WORKABOUT PRO's full-function UART (FFUART) at TTL or RS232 level; to the scanner port's UART (at RS232 level), and to two USB host connections.

The Multi-I/O Expansion Module is also able to provide power to the devices it is connected to. Two options are available, one to supply 5V, and one to supply 3.3V. The standard current supply is limited to 100mA, whereas the high-current power option provides a 4A at 5V. This supply can be software controlled.

The Multi-I/O Expansion Module comes with a standard set of plugs and pre-crimped wires for easy connection to its signals. This allows developers to create custom connectors for specific applications.

The EEPROM provided in the Multi-I/O Expansion Module is not programmed.

Features of the Multi-I/O Expansion Module include:

- Interface to the WORKABOUT PRO's 100 pin connector (FFUART serial connections, USB host 1 connections, I<sup>2</sup>C EEPROM, 3 General-Purpose IO signals, +VIN DC supply).
- Interface to the WORKABOUT PRO's scanner connector (Scanner serial connections, USB host 2 connections, 3.3V and 5V for the scanner device).
- Conversion of the serial data and control lines for the FFUART and the scanner UART from CMOS levels to RS-232 levels. The conversion for the FFUART can be bypassed.
- Provision of regulated 5-volt and 3.3-volt DC supplies from the WORKABOUT PRO's unregulated supply voltage VIN (5V at 100mA, 3.3V at 50mA standard; 5V at 4A optional).
- Optional loading of extra drivers through the I<sup>2</sup>C EEPROM.
- Easy-to-use SMT wire-to-board connectors with pre-crimped wires.

## 12.2 Installation

The Multi-I/O Board fits in the WORKABOUT PRO's expansion slot, and fastens to the device's metal mounting frame:

The Multi-I/O Board fastens to the mounting frame with the standard screws (M2.. When used for development, it is easiest to leave the backplate or endcap off for access to the Multi-I/O Board's connectors. The Multi-I/O Expansion Module needs only a normal backplate to function, but for cable access, a custom arrangement may be preferred.

## 12.3 Connectors

The Multi-I/O Board has the following connectors:

- 100-pin connector to the WORKABOUT PRO's motherboard (J1).
- Scanner connector to the WORKABOUT PRO's motherboard (J2).
- Connector for the scanner-port UART (J3).
- Connector for the scanner-port USB host (USB host 2) (J4).
- Connector for the UART on the 100-pin connector (the FFUART) (J5).
- Connector for the USB host on the 100-pin connector (USB host 1) (J6).
- Power connector (Ground and +5V) (J7).

These connectors are located as follows:

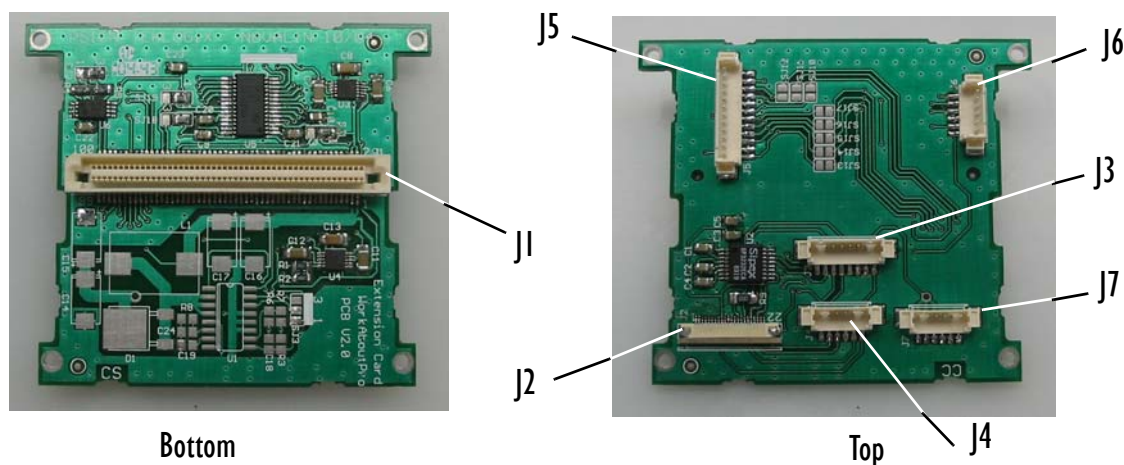


Figure 12.1 Connector Locations

The pinouts are as follows:

### 12.3.1 Motherboard 100-Pin Connector (J1)

The full pinout of the motherboard's 100-pin connector is given in Section 8.3 on page 83.

### 12.3.2 Motherboard Scanner Connector (J2)

The full pinout of the motherboard's scanner connector is given in Section 9.5 on page 97.

### 12.3.3 Scanner-Port Serial Connector (J3)

The serial connector (from the UART on the WORKABOUT PRO's scanner-port) has the following pins:

Pin	Name	Description	Direction	Active State	State During Sleep	Pull-up Or Pull-down
1	+3V3_SCANNER	Regulated 3.3V supply from WORKABOUT PRO	Power	N/A	N/A	N/A
2	TX_232	Data from WORKABOUT PRO to scanner device. At RS-232 levels	Output	B		
3	GND	Ground	Power	N/A	N/A	N/A
4	RX_232	Data from scanner device to WORKABOUT PRO. At RS-232 levels	Input	B		None
6	+5V_SCANNER	Regulated 5V supply from WORKABOUT PRO	Power	N/A	N/A	N/A
7	CTS	CTS from scanner device to WORKABOUT PRO. At RS-232 levels.	Input	L	Pulled up	100k
8	RTS	RTS from WORKABOUT PRO to scanner device. At RS-232 levels.	Output	L	Low	N/A
Note: X = don't care; L = active low, H = active high, B = both high and low						

Table 12.1 Pinout Of Scanner-Port Serial Connector (J3)

### 12.3.4 USB Host Port 2 Connector (J4)

The USB Host 2 connector (from the WORKABOUT PRO's scanner connector) has the following pins:

Pin	Name	Description	Direction	Active State	State During Sleep	Pull-up Or Pull-down
1	+3V3_SCANNER	Regulated 3.3V supply from WORKABOUT PRO	Power	N/A	N/A	N/A
2	USB_H2_D+	USB host port 2 D+	Bidirectional	B	Pulled down	15k
3	GND	Ground	N/A	N/A	N/A	N/A
4	USB_H2_D-	USB host port 2 D-	Bidirectional	B	Pulled down	15k
5	+5V	Regulated 5V supply	Power	N/A	Disabled	N/A
6	+V_IN	unregulated DC supply from WORKABOUT PRO	Power	N/A	N/A	N/A
Note: X = don't care; L = active low, H = active high, B = both high and low						

Table 12.2 Pinout Of USB Host 2 Connector (J4)

### 12.3.5 The FF UART Serial Connector (J5)

The serial connector from the FF UART (on the WORKABOUT PRO's 100-pin connector) has the following pins:

Pin	Name	Description	Direction	Active State	State During Sleep	Pull-up Or Pull-down
1	+V_IN	Unregulated DC supply from WORKABOUT PRO	Power			
2	+3V3	Regulated 3.3V supply from expansion module.	Power	N/A	N/A	N/A
3	FF_RTS	Ready To Send signal from WORKABOUT PRO to scanner device. Configurable for RS-232 or TTL levels through SJ12.	Output	L	Low	N/A
4	FF_DTR	Data Terminal Ready signal from WORKABOUT PRO to scanner device. Configurable for RS-232 or TTL levels through SJ11.	Output	L	Low	N/A
5	GND	Ground	N/A	N/A	N/A	N/A
6	FF_TXD	Data from WORKABOUT PRO to scanner device. Configurable for RS-232 or TTL levels through SJ10.	Output	L	Low	N/A
7	FF_RI	Ring Indicator signal from scanner device to WORKABOUT PRO. Configurable for RS-232 or TTL levels through SJ17.	Input	L	Pulled up	100k
8	FF_DSR	Data Set Ready signal from scanner device to WORKABOUT PRO. Configurable for RS-232 or TTL levels through SJ16	Input	L	Pulled up	100k
Note: X = don't care; L = active low, H = active high, B = both high and low						



Pin	Name	Description	Direction	Active State	State During Sleep	Pull-up Or Pull-down
9	FF_DCD	Data Carrier Detect signal from scanner device to WORKABOUT PRO. Configurable for RS-232 or TTL levels through SJ15	Input	L	Pulled up	100k
10	FF_CTS	Clear To Send signal from scanner device to WORKABOUT PRO. Configurable for RS-232 or TTL levels through SJ14	Input	L	Pulled up	100k
11	GND	Ground	N/A	N/A	N/A	N/A
12	FF_RXD	Data from scanner device to WORKABOUT PRO. Configurable for RS-232 or TTL levels through SJ13.	Input			
Note: X = don't care; L = active low, H = active high, B = both high and low						

Table 12.3 Pinout Of FF UART Connector (J5)

### 12.3.6 The USB Host 1 Connector (J6)

The serial connector from the FF UART (on the WORKABOUT PRO's 100-pin connector) has the following pins:

Pin	Name	Description	Direction	Active State	State During Sleep	Pull-up Or Pull-down
1	+V_IN	Unregulated DC supply from WORKABOUT PRO	Power	N/A	Disabled	N/A
2	USB_H1_PSW	Power Enable signal from the WORKABOUT PRO's USB hub	Output			
3	GND	Ground	N/A	N/A	N/A	N/A
4	USB_H1_D-	USB host port 1 D-	Bidirectional	B	Pulled down	15k
5	USB_H1_D+	USB host port 1 D+	Bidirectional	B	Pulled down	15k
6	+3.3V	Regulated 3.3V supply from expansion module.	Power	N/A	N/A	N/A
Note: X = don't care; L = active low, H = active high, B = both high and low						

Table 12.4 Pinout Of USB Host 1 Connector (J6)

## 12.3.7 The Power Connector (J7)

Connector J7 carries power and ground. This connector has the following pins:

Pin	Name	Description	Direction	Active State	State During Sleep	Pull-up Or Pull-down
1, 2, 3	GND	Ground	Power	N/A	N/A	N/A
4, 5, 6	VOUT	Output supply voltage. See Section 12.4.3 and Section 12.4.4 for configuration details.	Power	N/A	N/A	N/A

Note: X = don't care; L = active low, H = active high, B = both high and low

Table 12.5 Pinout Of Power Connector (J7)

## 12.4 Configuration

The Multi-I/O Expansion Module v2 has a number of jumpers and resistors, (SJ1 through SJ19, plus R1, R2, R6, and R7), for configuration of its hardware. Several sets of components are optional depending on how the board is configured:

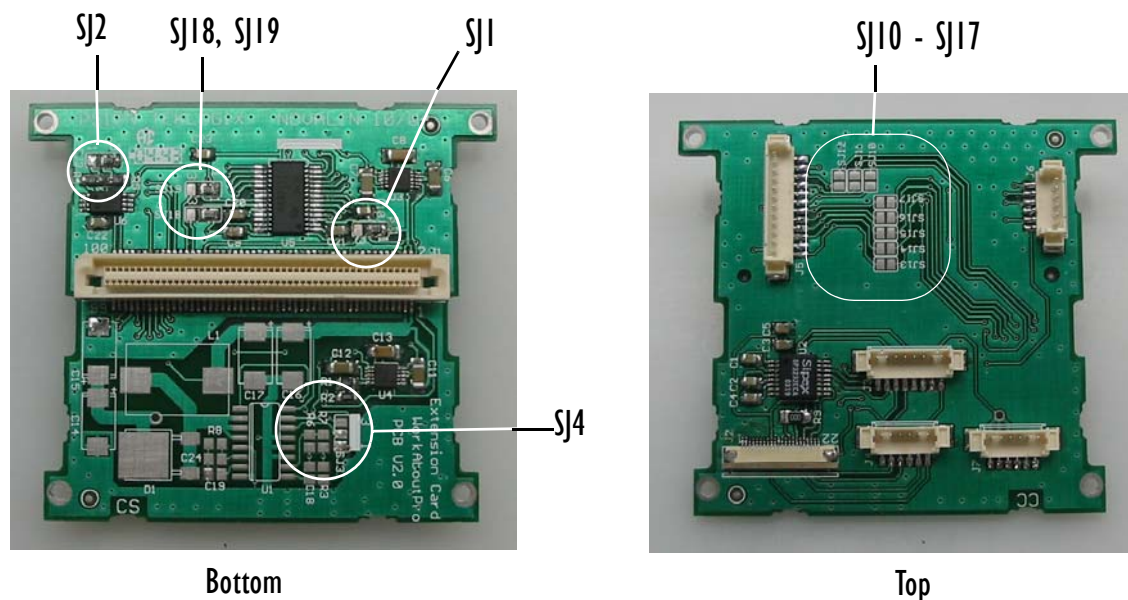


Figure 12.1 Location Of Configuration Jumpers And Resistors

The jumpers and resistors configure the following options:

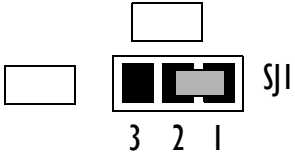
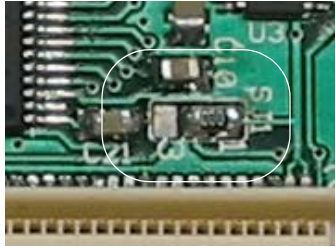
- Enable or disable software control of power to the expansion module. (See Section 12.4.1 on page 131.)
- Select write control for the EEPROM. (See Section 12.4.2 on page 131.)
- Configure the output voltage for the high-power option. (See Section 12.4.3 on page 132.)
- Configure the output voltage for the standard-power option. (See Section 12.4.4 on page 132.)
- Configure the FORCEON and FORCEOFF/ control signals for the RS232 converter on the FFUART port. (See Section 12.4.5 on page 133.)
- Connect the TTL-level signals from the WORKABOUT PRO's motherboard directly to the FFUART output connector (J5). (See Section 12.4.6 on page 133.)

Locations for these jumpers and resistors are implemented as pads on the module's circuit board. To use them, solder the appropriate resistance (zero-ohm for a jumper) between the desired pads.

### 12.4.1 Slot Power Control

Jumper SJ1 enables or disables control by the WORKABOUT PRO of the power to the expansion module.

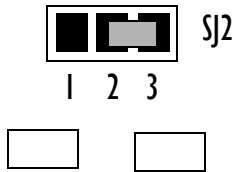
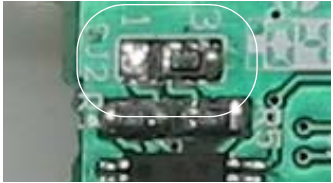
Jumper Between	State	Notes
no jumper	power not enabled	
jumper between 1 and 2	power controlled by SLOT_PWR_EN	
jumper between 2 and 3	power always enabled	Pad 2 is pulled up to +VIN.



### 12.4.2 EEPROM Write Control

Jumper SJ2 selects write control for the module's EEPROM.

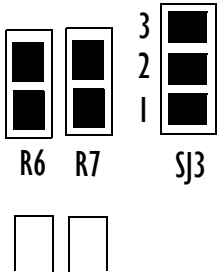
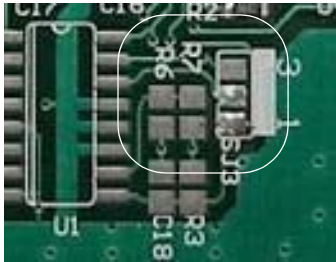
Jumper Between	State	Notes
no jumper	The write behaviour depends on the type of EEPROM installed.	
jumper between 1 and 2	writing to the EEPROM is disabled	Pad 2 is pulled down to ground.
jumper between 2 and 3	writing to the EEPROM is enabled	Pad 2 is pulled up to +3V3.



### 12.4.3 Voltage Configuration For High-Power Output

Jumper SJ3, along with R6 and R7, set the output voltage for the Expansion Module's high-power supply option.

Desired Voltage	Jumper Between	R6	R7
3.3V	2 and 3	jumpered (zero-ohm resistor)	open
5V	1 and 2	jumpered (zero-ohm resistor)	open
Configurable voltage	2 and 3	see text	



**Important:** Use these resistors and jumpers *ONLY* if U1 and its associated components for the high-power output supply are installed. These components are indicated as “Option High Power (HP)” on the schematic. See “Schematic - Multi-I/O Expansion Module” on page 4.

To determine the values of R6 and R7, given the desired output voltage  $V_{out}$ :

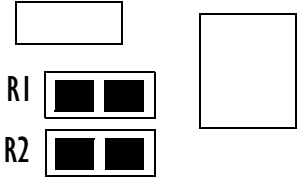
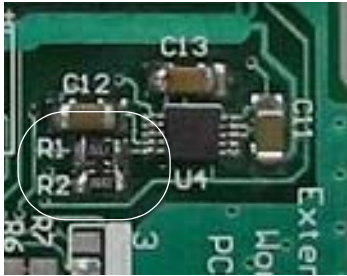
1. Select a value for R6. (R6 should be less than 50 kilohms.)
2. R7 can be found according to the following equation:

$$R7 = R6 \left( \frac{V_{out}}{1.24} - 1 \right)$$

### 12.4.4 Voltage Configuration For Standard-Power Output

R1 and R2 set the output voltage for the Expansion Module's standard-power supply option.

Desired Voltage	R1	R2
3.3V	open	jumpered (zero-ohm resistor)
5V	261 kilohms	86.6 kilohms
Configurable voltage	see text	



**Important:** Use these resistors and jumpers *ONLY* if U4 and its associated components for the standard-power output supply are installed. These components are indicated as “Option Standard Power (SP)” on the schematic. See “Schematic - Multi-I/O Expansion Module” on page 4.

To determine the values of R1 and R2, given the desired output voltage  $V_{out}$ :

1. Select a value for R2. (R2 should be between 50 and 100 kilohms.)
2. R1 can be found according to the following equation:

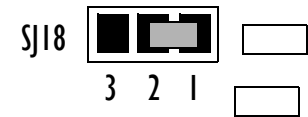
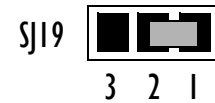
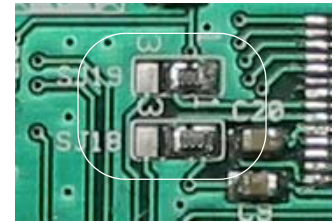
$$R2 = R1 \left( \frac{V_{out}}{1.235} - 1 \right)$$

## 12.4.5 Control Signals For FFUART Level Converter

Jumper SJ18 and SJ19 configure the FORCEON and FORCEOFF/ control signals for the MAX3243 RS232 level-converter that handles the signals from the FFUART to J5.

Jumper Between	SJ18 Signal State
no jumper	FORCEON signal not connected.
1 and 2	FORCEON signal controlled by GPIO43 (pin 74 on the 100-pin connector)
2 and 3	FORCEON signal tied to 3.3V.

Jumper Between	SJ19 Signal State
no jumper	FORCEOFF/ signal not connected.
1 and 2	FORCEOFF/ signal controlled by GPIO44 (pin 76 on the 100-pin connector)
2 and 3	FORCEOFF/ signal tied to 3.3V.



**Note:** Refer to the datasheet for the MAX3243 for the use of these signals.

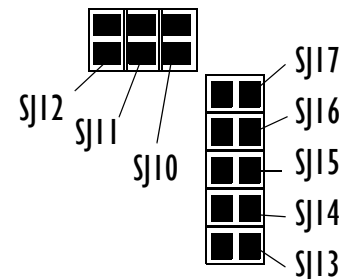
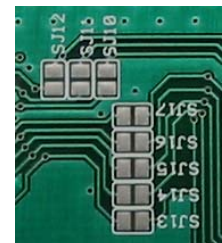
## 12.4.6 TTL Output Option For Scanner Serial Port

Jumpers SJ10 through SJ17 connect the TTL-level serial lines for the scanner serial port from J2 directly to their output connector J5.



**Important:** U5 (the MAX3243 RS232 level convertor), and its associated components, **MUST NOT** be mounted on the board if these jumpers are to be used. These components are indicated as “Option 232” on the schematic. See [CHANGE].

Jumper State	State
no jumper (default)	Signal input on J2 is NOT connected directly to output on J5.
jumper present	Signal input on J2 is connected directly to output on J5.



The jumpers are assigned to individual signal lines as follows:

Jumper Number	SJ10	SJ11	SJ12	SJ13	SJ14	SJ15	SJ16	SJ17
Signal Line	FF_TXD	FF_DTR	FF_RTS	FF_RXD	FF_CTS	FF_DCD	FF_DSR	FF_RI

## 12.5 Block Diagram

The Multi-I/O Expansion Module version 2 sits in the WORKABOUT PRO system as follows:

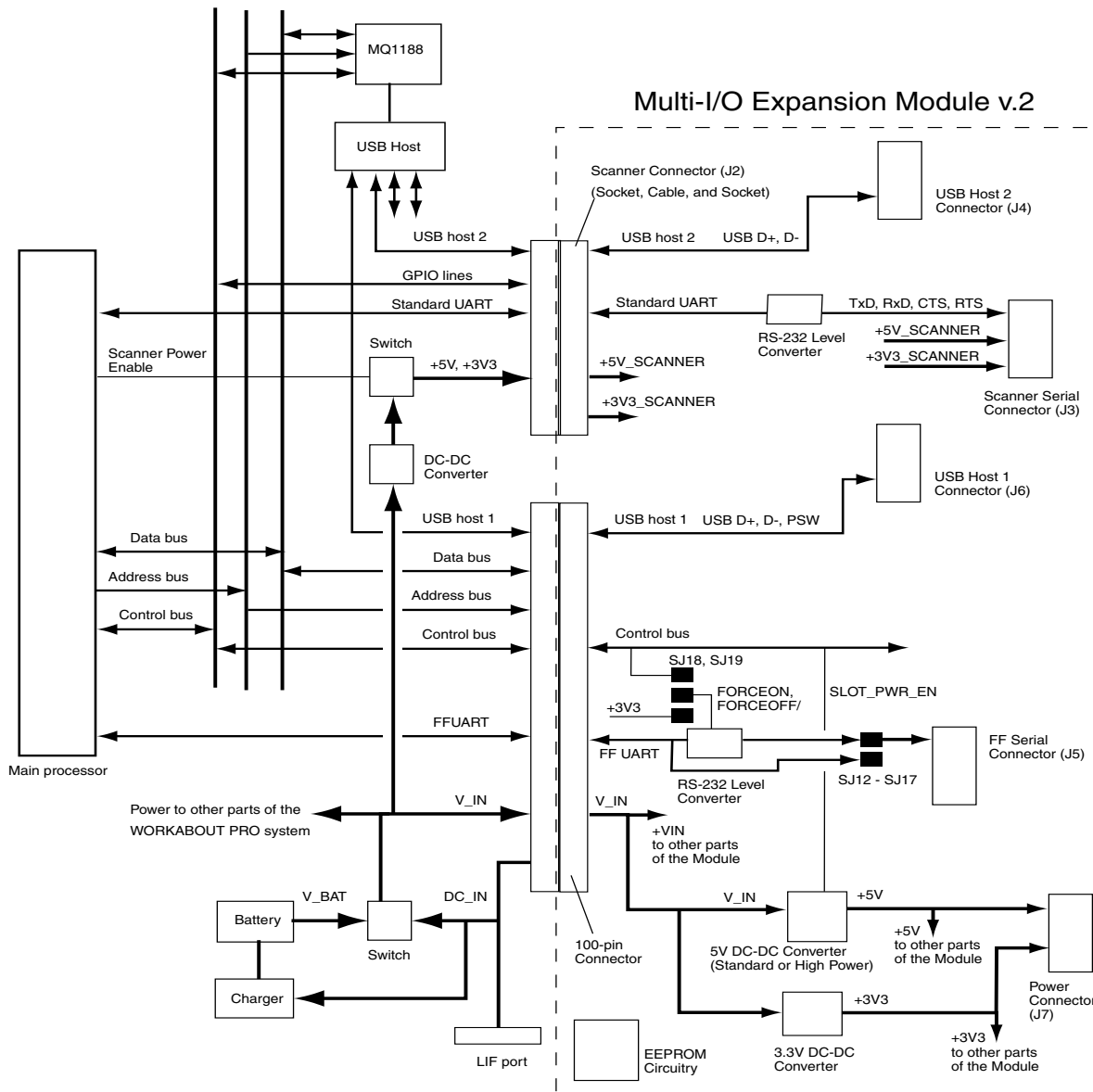


Figure 12.2 WORKABOUT PRO And Multi-I/O Expansion Module v.2 (Block Diagram)

## 12.6 Electrical

### 12.6.1 Unused Host Signals

The Multi-I/O Expansion Module does not use the following signals on the WORKABOUT PRO's 100-pin expansion connector:

- the system data bus (SD0 through SD15; pins 5, 7, 9, 11, 13, 15, 17, 19, 23, 25, 27, 29, 31, 33, 35, 37).
- the system address bus (A0 through A25; pins 6, 8, 10, 12, 14, 16, 18, 20, 24, 26, 28, 30, 32, 34, 36, 38, 42, 44, 46, 48, 50, 52, 54, 56, 60, 62).
- the PCMCIA signals (pins 41, 43, 45, 47, 49, 51, 53, 55, 59, 61, 63, 65, 67, 69, 70, 72, 73, 75).
- RDY (pin 68).
- MQ\_GPIO20 (pin 71).
- MQ\_GPIO43 (pin 74).
- MQ\_GPIO44 (pin 76).
- nSLOT\_WAKEUP (pin 79).
- pin 86, which is not connected.
- SSPCLK (pin 90).
- SSPSRM (pin 92).
- SSPTXD (pin 94).
- SSPRXD (pin 96).

These pins comprise the WORKABOUT PRO's system address and data buses, the PCMCIA control signals, and a number of general-purpose inputs and outputs.

The Multi-I/O Expansion Module does not use the following signals on the scanner connector:

- nBAR\_TRIG (pin 3).
- pin 4 (not connected on WORKABOUT PRO).
- nBAR\_WKUP (pin 5).
- BAR\_TYPE (pin 6).
- BAR\_PWRDWN (pin 7).
- KB\_SCAN\_C0A (pin 8).
- KB\_SCAN\_R7 (pin 10).
- pin 13 (not connected on WORKABOUT PRO).

These pins include the trigger-switch connections from the keyboard matrix and control signals for scanners.

### 12.6.2 Power And Ground

The WORKABOUT PRO provides the following power and ground connections to the Multi-I/O Expansion Module:

Through the scanner connector (J2):

- Ground (pins 1, 2, 11, 12, 15).
- +5V\_SCANNER (pins 21 and 22).  
This voltage is +5V from a DC-DC converter fed by V\_IN, the WORKABOUT PRO's main supply. It is switched by the scanner power enable signal.
- +3V3\_SCANNER (pin 9)  
+3.3V from the WORKABOUT PRO's internal DC-to-DC converter.

Through the 100-pin connector (J1):

- Ground (pins 21, 22, 39, 40, 57, 58, 77, 78, 84).
- +VIN (pins 1, 2, 3, 4).  
This voltage is the WORKABOUT PRO's unregulated DC supply.

Ground for both these connectors is tied together.

These voltages have the following specifications:

Supply	Nominal Voltage	Minimum Voltage	Maximum Voltage	Continuous Current	Peak Current	Max Peak Duration
+V5_SCANNER	5V			300mA	700mA	100mS
+3V3_SCANNER	3.3V			100mA	100mA	N/A
VIN		2V	5V			

**Table 12.6 Voltages Supplied To The Multi-I/O Expansion Module**

The voltage VIN is fed by a diode OR of V\_BAT (the DC voltage supplied by the WORKABOUT PRO's battery), and DC\_IN, the DC power input to the terminal. VIN feeds a DC-to-DC converter; the output of the converter is switched by [CHANGE] and is known as V+5\_BAR.

When the terminal is powered by a DC power supply, VIN will be at 5V minus a diode drop. When the terminal is powered by the battery, VIN will be at whatever voltage the battery is at, minus a diode drop. (Nominal battery voltage is 3.7V.) VIN has a minimum of 2V and a maximum of 5V.

+5V\_SCANNER is maintained by the WORKABOUT PRO's DC-to-DC convertor at 5V.

+5V\_SCANNER can be switched on and off by software while the WORKABOUT PRO is running, but is disabled when it is suspended.

+3V3\_SCANNER remains powered when the WORKABOUT PRO is suspended.



# APPENDIX

# A

## SUPPORT SERVICES AND WORLDWIDE OFFICES

Psion Teklogix provides a complete range of product support services to its customers worldwide. These services include technical support and product repairs.

### A.1 Technical Support

Technical Support for Mobile Computing Products is provided via e-mail through the Partner Program website. To reach the website, go to [www.psionteklogix.com](http://www.psionteklogix.com) and click on the Partner Program link, which takes you to the Partner Program page. Then click on the **Log-in** button or the **Register** button, depending on whether you have previously registered for Teknet or the Partner Program. (Your UserID and password are the same for TekNet and the Partner Program.) Once you have logged in, search for the “Support Request Form”.

### A.2 Product Repairs

#### *International*

For product repairs, please contact your local Psion Teklogix office listed on our worldwide website: <http://www.psionteklogix.com>

Click on the heading labelled “Contacts” to choose a Psion Teklogix technical support representative closest to you.

#### *Canada/U.S.A*

Canadian and U.S. customers can receive access to repair services by calling the toll-free number below, or via our secure website (see *Technical Support*, above).



**Note:** *Customers calling the toll-free number should have their Psion Teklogix customer number or trouble ticket number available.*

Voice: 1 800 387-8898 (press option “2”)

Fax: 1 905 812-6304

Web Site: <http://service.psionteklogix.com>

## A.3 Worldwide Offices

### **COMPANY HEADQUARTERS And Canadian Service Centre**

#### **Psion Teklogix Inc.**

2100 Meadowvale Blvd.  
Mississauga, Ontario  
Canada L5N 7J9  
Tel: +1 905 813 9900  
Fax: +1 905 812 6300  
E-mail: salescdn@psion.com

### **NORTH AMERICAN HEADQUARTERS AND U.S. SERVICE CENTRE**

#### **Psion Teklogix Corp.**

1810 Airport Exchange Boulevard  
Suite 500  
Erlanger, Kentucky  
USA 41018  
Tel: +1 859 371 6006  
Fax: +1 859 371 6422  
E-mail: salesusa@psion.com

### **INTERNATIONAL SUBSIDIARIES**

#### **Psion Teklogix S.A.**

La Duranne  
135 Rue Rene Descartes  
BP 421000  
13591 Aix-En-Provence  
Cedex 3; France  
Tel: +33 4 42 90 88 09  
Fax: +33 4 42 90 88 88  
E-mail: tekeuro@psion.com

For a complete listing of international offices, please refer to: *[www.psionteklogix.com](http://www.psionteklogix.com)*

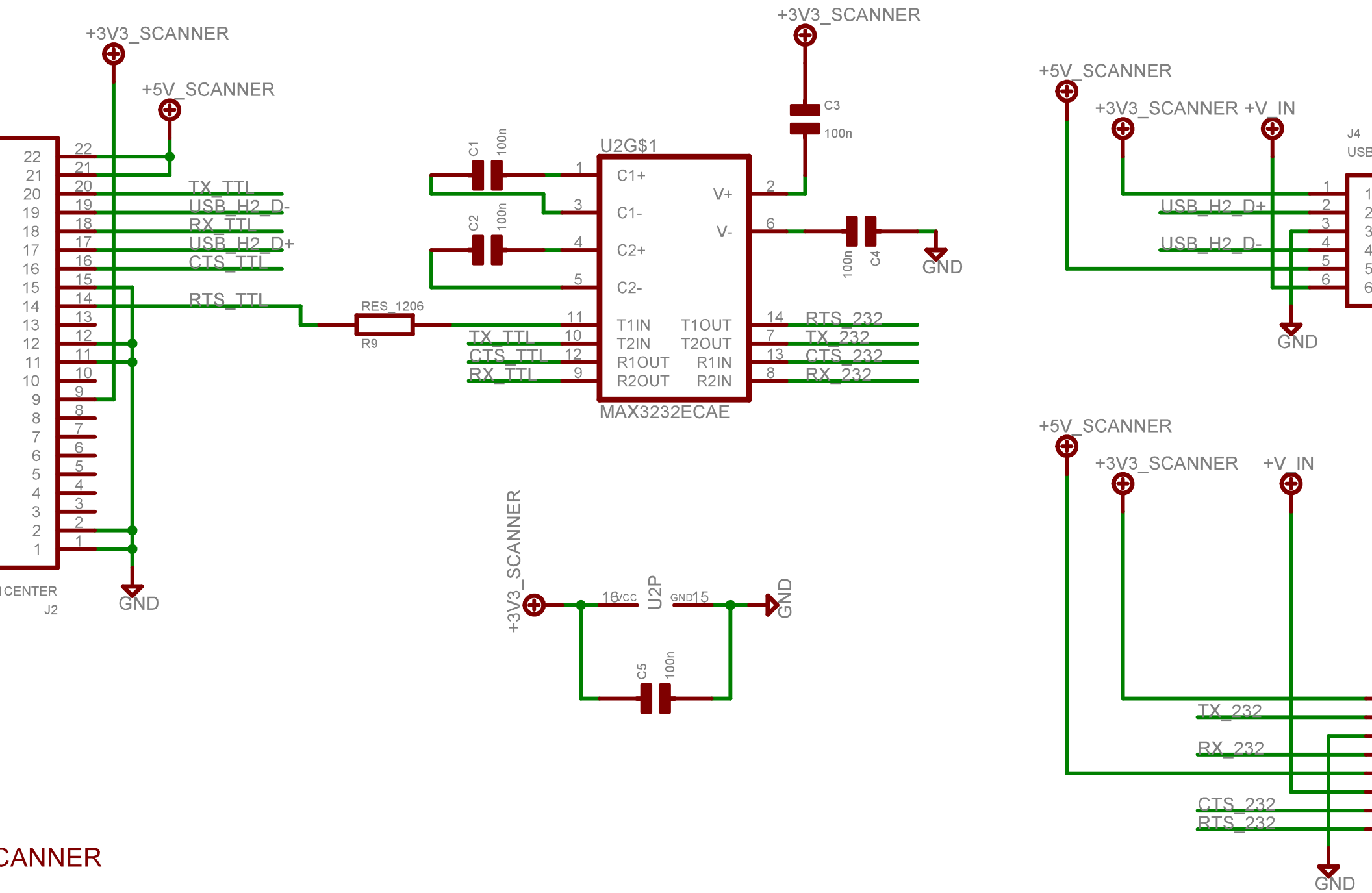
# APPENDIX **B**

## SCHEMATICS

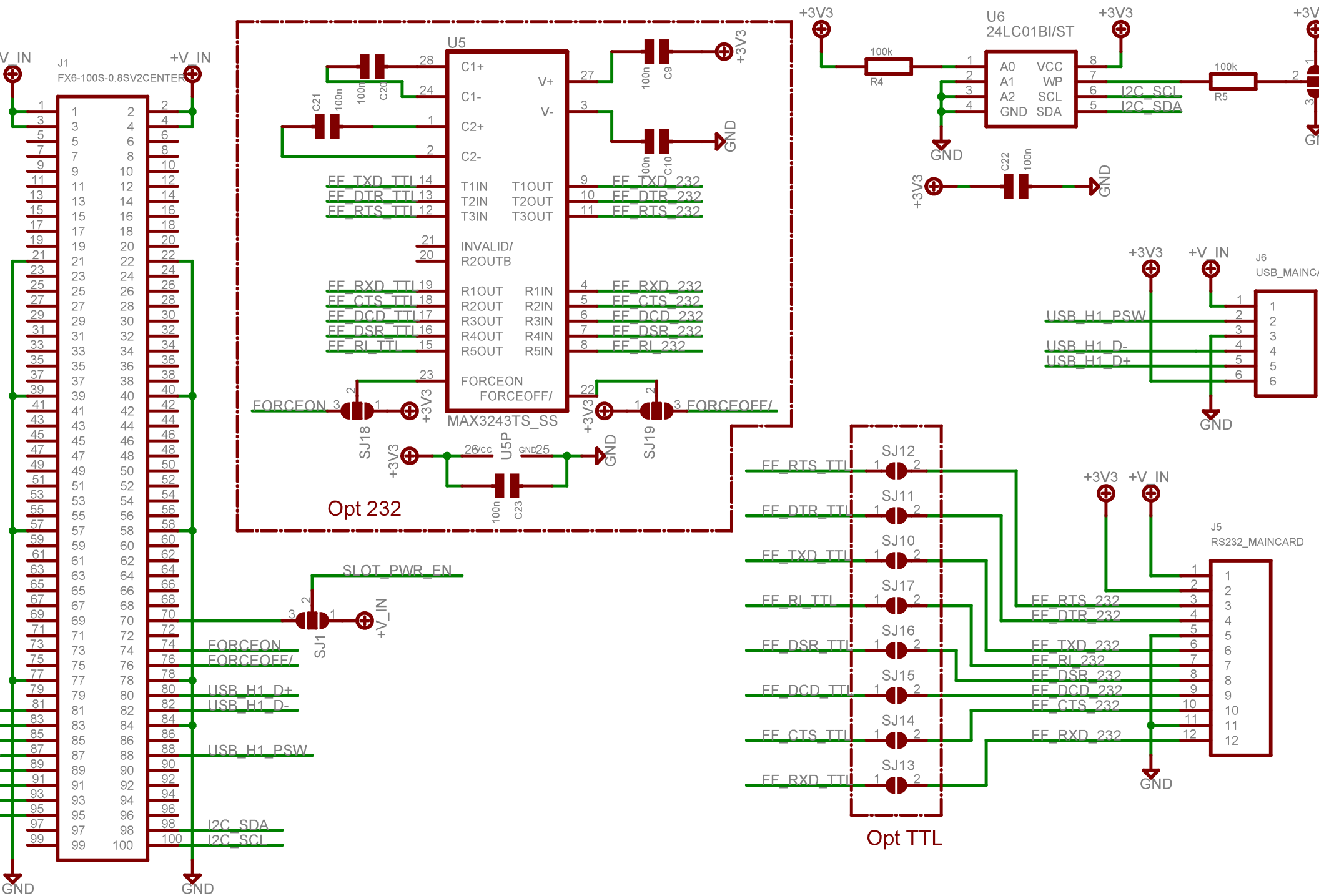
B.1 Schematic - Multi-I/O Expansion Module. . . . .	4
B.2 Schematic - PCMCIA Expansion Module. . . . .	7
B.3 Serial Scanner Converter Board For Symbol And Intermec Scanners . . . . .	10
B.4 USB Scanner Convertor Board For Symagery And HHP Scanners . . . . .	11
B.5 Backplate Mechanical . . . . .	12
B.6 Internal Frame Mechanical . . . . .	13
B.7 Top Assembly Mechanical. . . . .	14
B.8 Card Stop For PCMCIA And CF Cards Mechanical . . . . .	15
B.9 Standard Endcap Mechanical . . . . .	16
B.10 Body Mechanical . . . . .	17
B.11 Stylus Sealing Casket Mechanical . . . . .	18







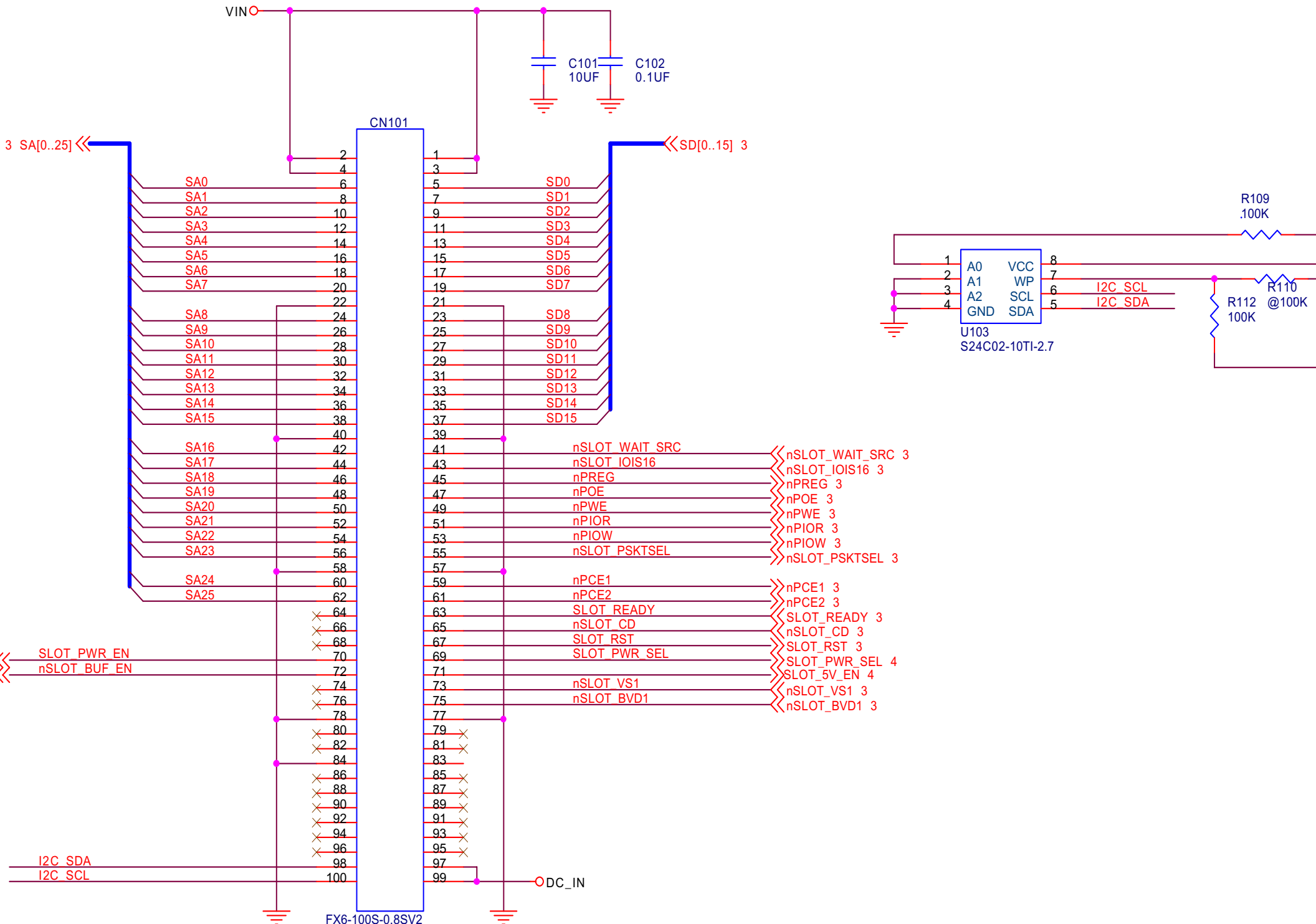


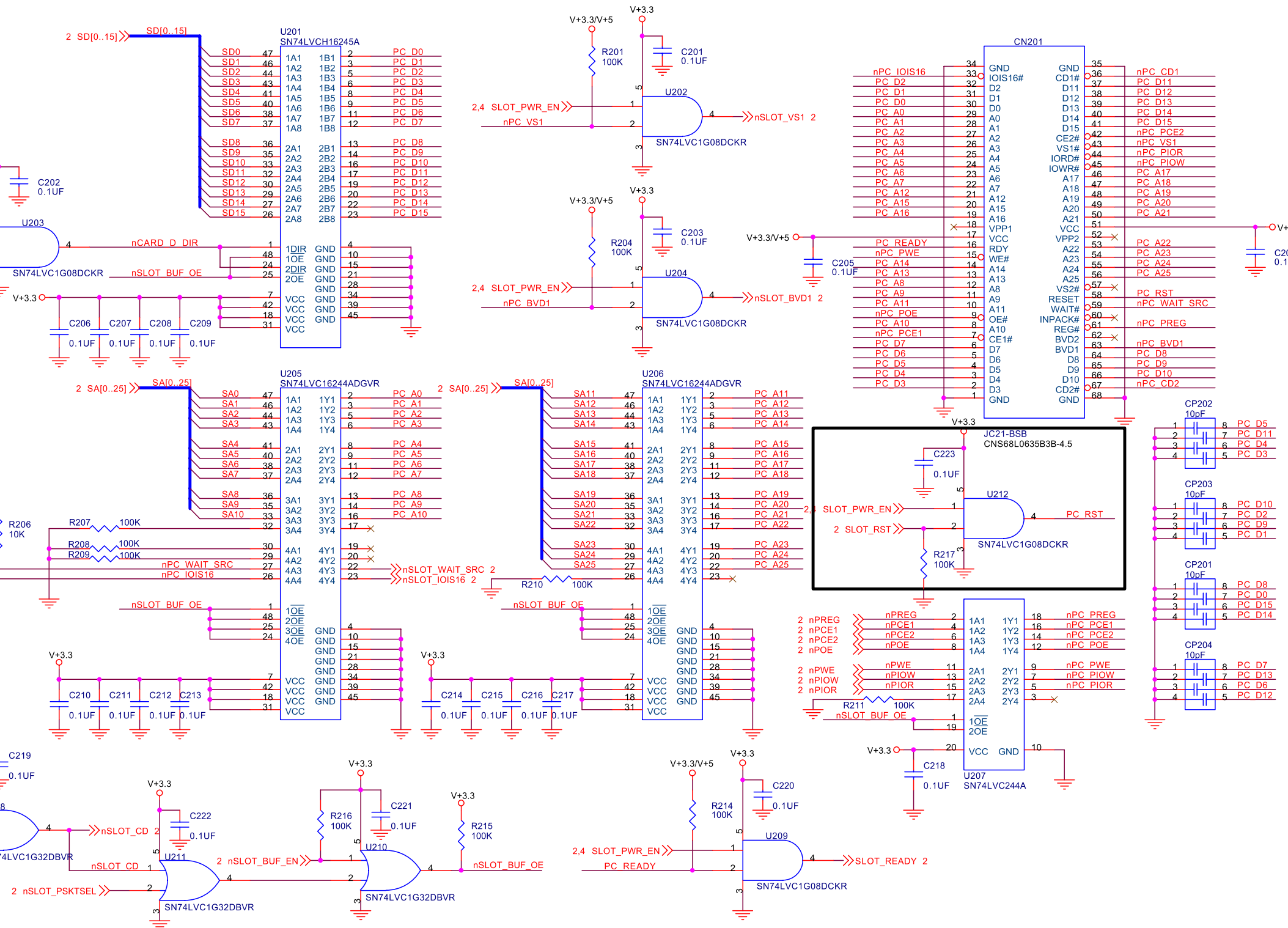


U5 from MAX3241 to MAX3243, EN/ to FORCON, SHDN/ to FORCEOFF/



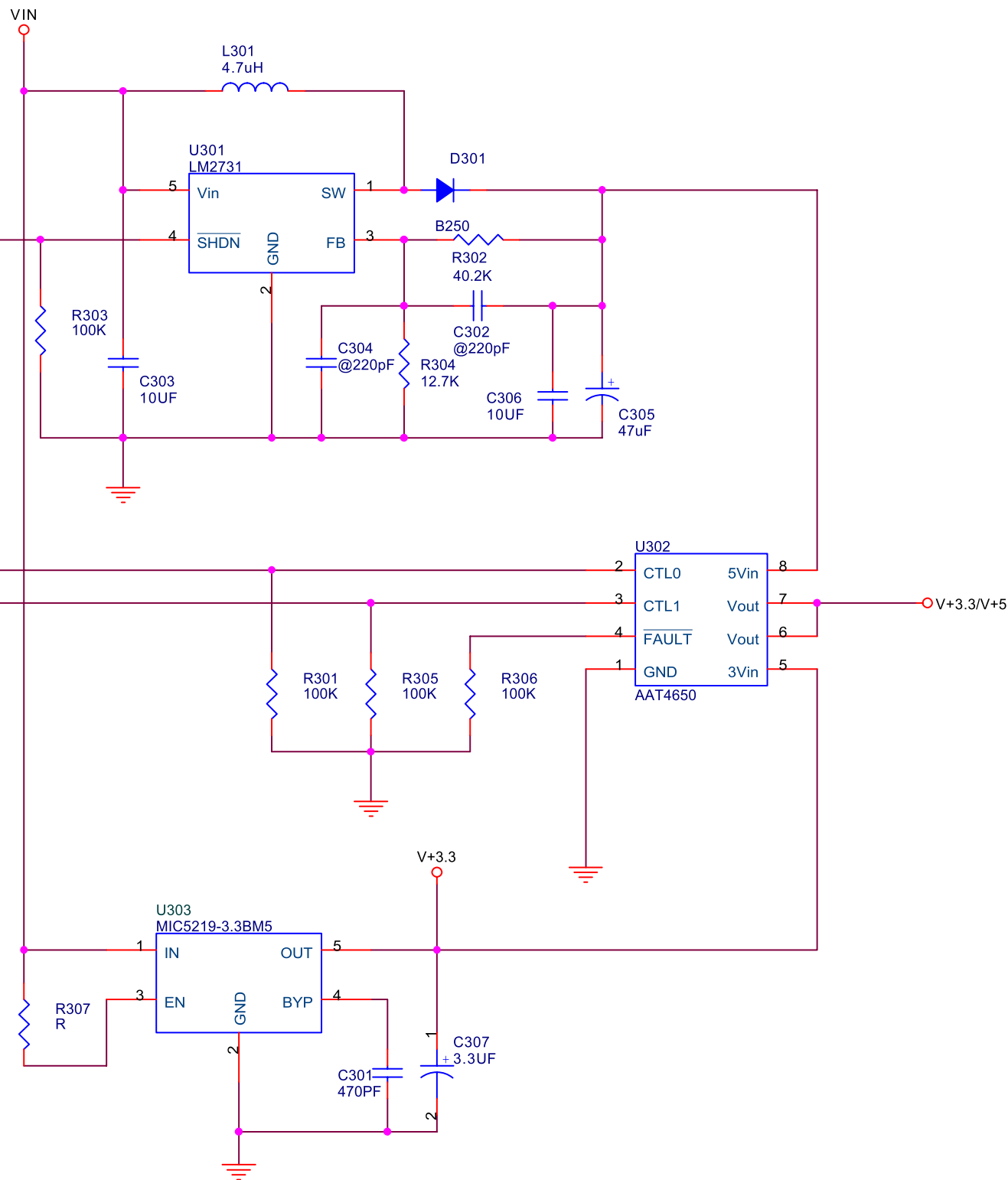
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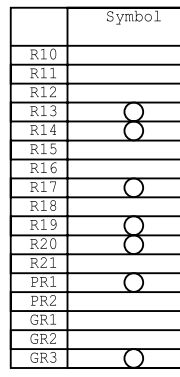




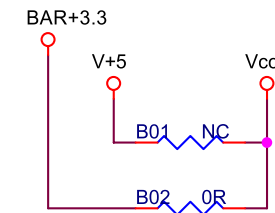
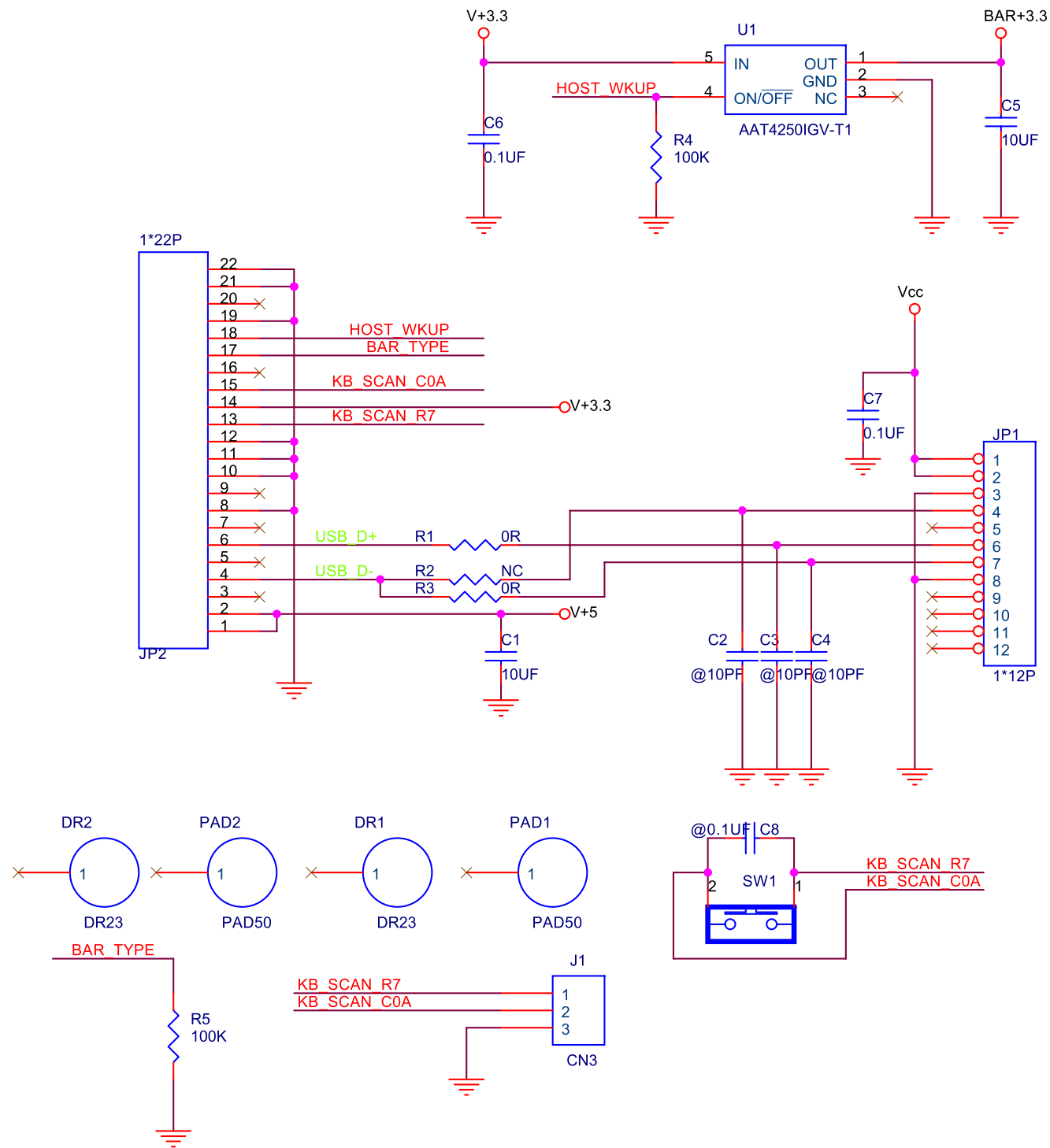
2 SLOT\_5V\_EN >>  
2 SLOT\_PWR\_SEL >>

SLOT_PWR_SEL (CTL1)	SLOT_5V_EN (CTL0)	V+3.3/V+5
0	0	OFF
0	1	5v
1	0	3v
1	1	HiZ





# Inverter Board For Symagery And HHP Scanners

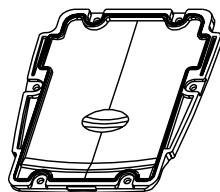


	Symagery 5390	HHP 4080
B01		○
B02	○	
R1	○	○
R2		○
R3	○	

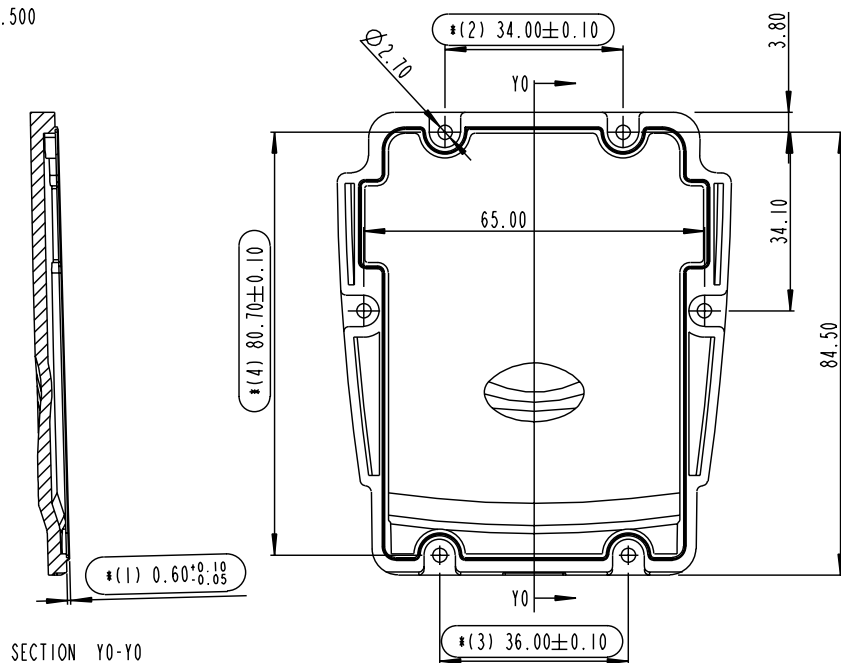
1.BODYCOVER-

SIT 1  
OF 1

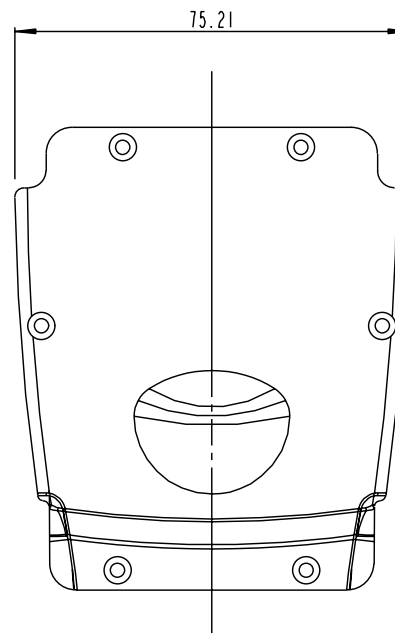
REVISION	LOC	CHANGE	DATE	BY
-	-	-	++-	-



SCALE 0.500



SECTION Y0-Y0

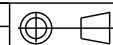


## Notes:

1. Unspecified Round: 0.2R
2. Unspecified Draft Angle: 0.5°
3. Unspecified Tolerance: Please follow the Tolerance Table
4. Circled or Mark "\*" inspectable dimension.

TOLERANCE TABLE	
DIMENSION	TOLERANCE
L<60	±0.1
60<L<120	±0.15
L>120	±0.3
DEG	0.5°

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**DO NOT SCALE  
IF IN DOUBT ASK**SCALE 1:1000  
DIMS IN MMMATERIAL GE C1200  
COLOR BLACK  
FINISH TEXTURE:AT-IM002, 0.035 MM DEEP

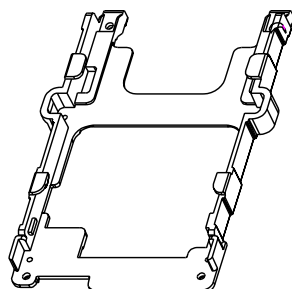
DATE 14-Oct-04

TOLERANCE UNLESS OTHERWISE STATED  
DEC 1 10 100 ANGULAR  
TOL ±0.5°PSION  
PSION TEKLOGIX (UK) LTD.  
3 MILTON PARK,  
ABINGDON  
OXFORDSHIRE OX14 4RN  
TEL: +44 (0) 1235 63000  
FAX: +44 (0) 1235 44300PROJECT  
TITLE BACKPLATEPART NUMBER  
A3 PC321.BODYCOVER-B  
SIT 1  
OF 1

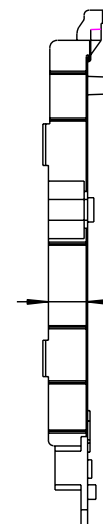
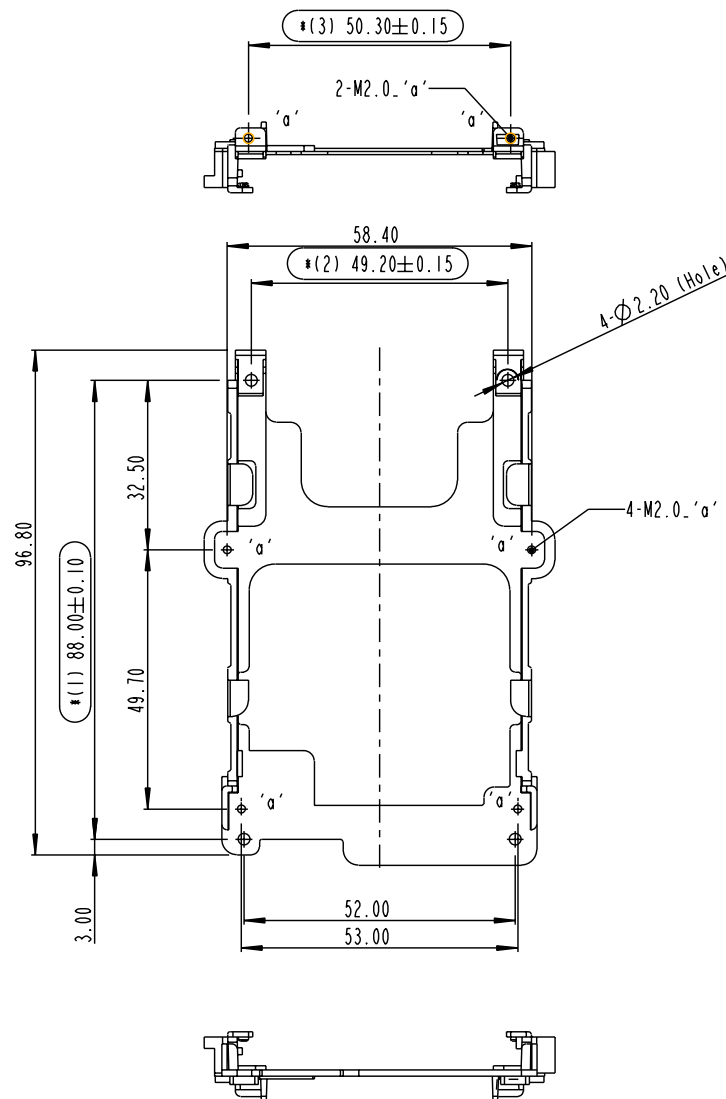
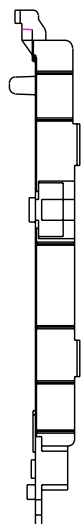
A8C321.PCCARD-FRAME

SHEET 1  
OF 1

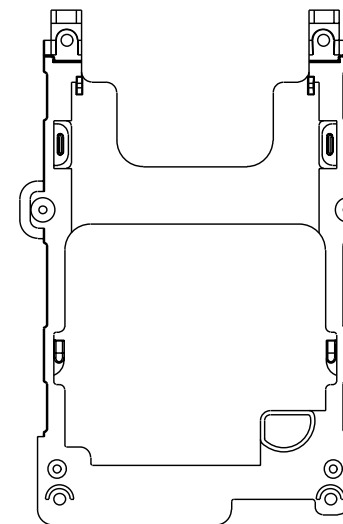
REVISION	LOC	CHANGE
-	-	-



SCALE 0.700



7.30



Notes:

1. Circled or "\*" inspectable dimension.
2. Unspecified tolerance:  $\pm 0.15$  mm

TOLERANCE TABLE	
DIMENSION	TOLERANCE
$L \leq 60$	$\pm 0.1$
$60 < L \leq 120$	$\pm 0.15$
$L > 120$	$\pm 0.3$
DEG	$0.5^\circ$

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DO NOT SCALE  
IF IN DOUBT A

SCALE 1:000  
 DIMS IN MM

MATERIAL ALLOY ADC-12

COLOR

FINISH CR ACID SURFACE TREAT

DATE 14-Oct-04

DATE

DATE

TOLERANCE UNLESS OTHERWISE STATED

DEC 1 10 100

TOL

PSION TEKLOOK  
 3 MILTON PARK,  
 ABBINGDON,  
 OXFORDSHIRE OX11 7SR

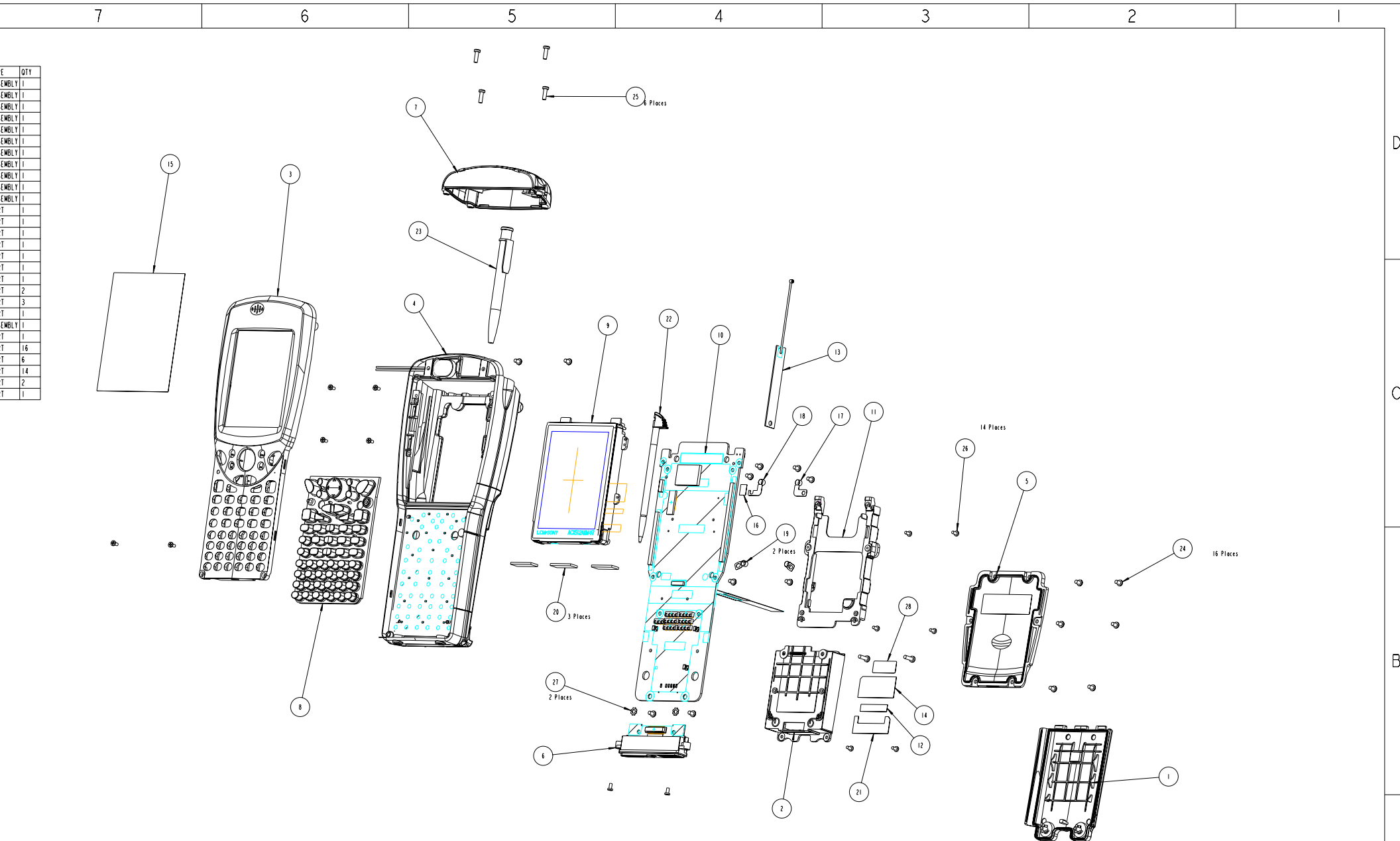
TEL: +44 (0) 1235  
 FAX: +44 (0) 1235

PROJECT

TITLE

PROJECT NUMBER

A8C321.PCCARD-FRAME



Refer to the latest SOP document, P/N P/N 1030307  
Terminal into plastic bag (Provided by Askey)  
Terminal into separate bubble bag (Provided by Askey)  
Terminal with Item 1, into box (Provided by Askey)  
Start guide (P/N 0000025) into box with terminal  
(001975) to be loaded onto assembled main terminal before  
the box

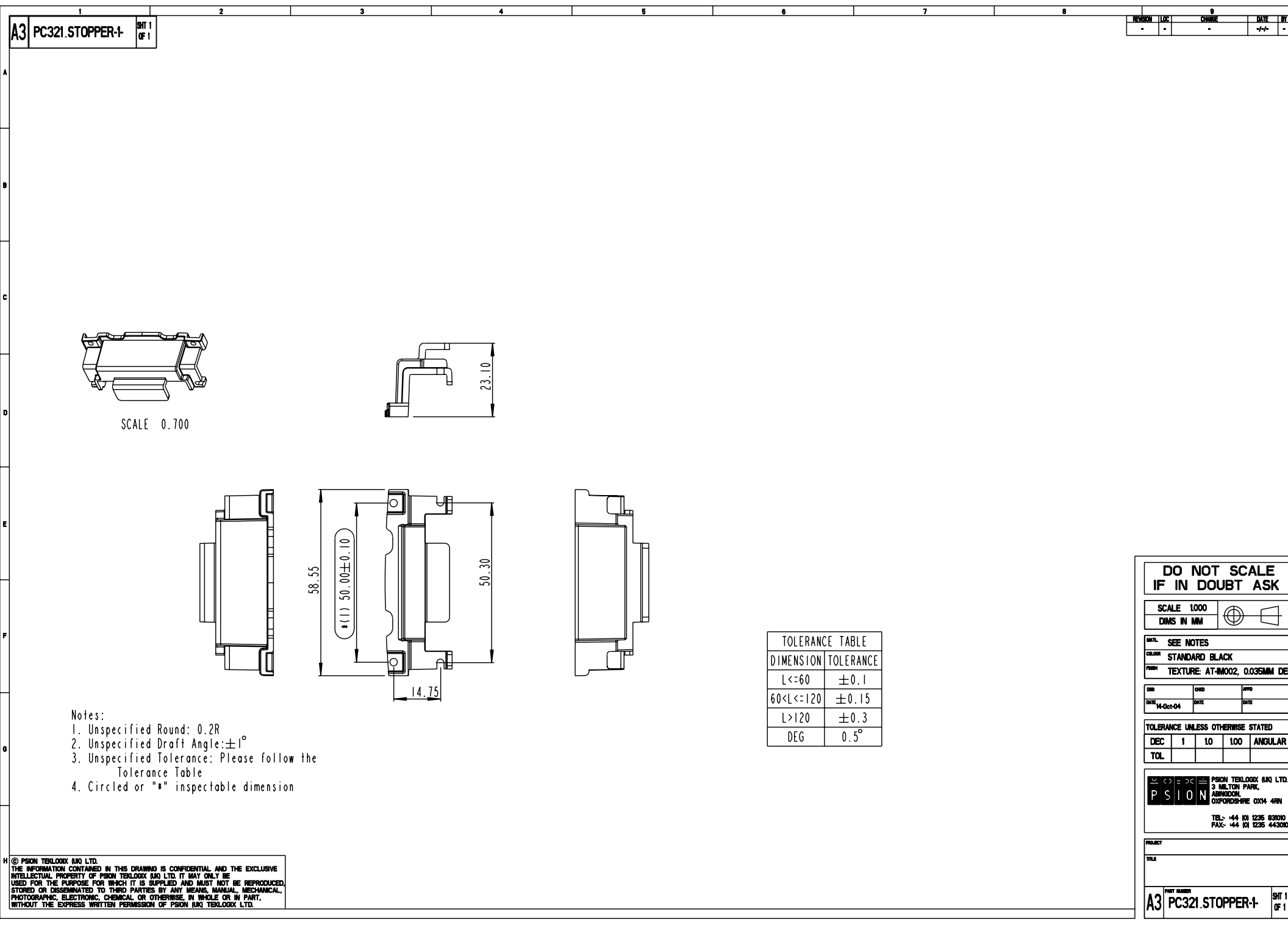
SCALE 0.700

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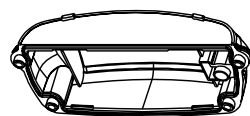
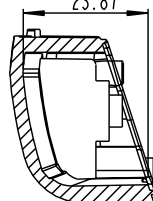
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MILLIMETERS		APPROVALS		DATE	
TOLERANCES: X.XX X.XXX ANGLES A		CHKD. BY: DATE: APPROVED BY:		PSION TEKLOGIX	
3.0		PROD. ENG.:		CODE IDENT. No. 38481	
DO NOT SCALE DRAWING		ELEC. ENG.:		SIZE D	
FINISH:		MECH. ENG.:		DRAWING NO.	
EDR/EDO No.:		REL. DATE:		REV.	
SCALE		SHEET		OF	

ITEM GROUP	
PRODUCT TYPE	
PART NO. STATUS	
OBsolete	
ENGINEERING ONLY	
PRE-PILOT	
BETA	
RELEASED	

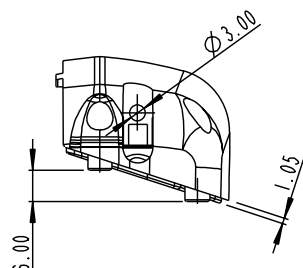
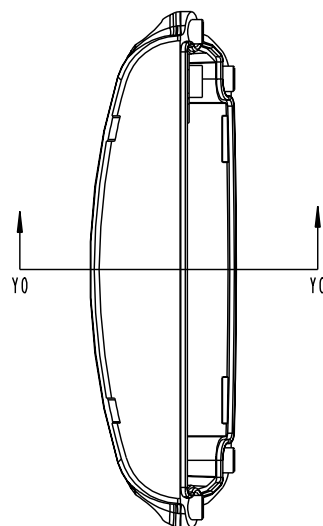




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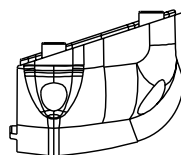
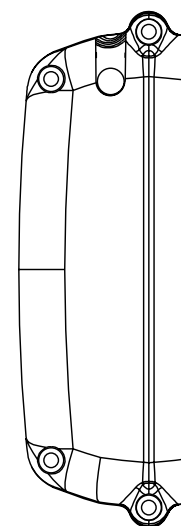
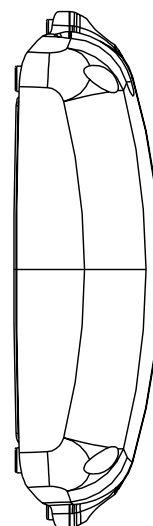
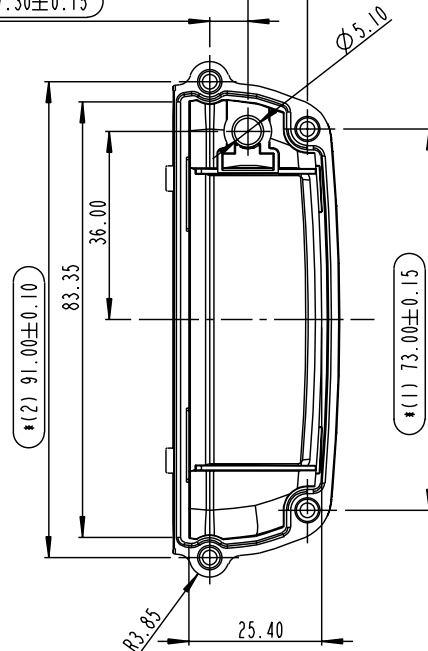
A3 PC321.ENDCAP-  
SHT 1  
OF 1REVISION LAC CHANGE  
- - -SCALE 0.500  
23.87

SECTION Y0-Y0



\*(3) 11.40±0.10

\*(4) 7.30±0.15



## Notes:

1. Unspecified Round: 0.2R
2. Unspecified Draft Angle: 0.5°
3. Unspecified Tolerance: Please follow the Tolerance Table
4. Circled or Mark "\*" inspectable dimension.

TOLERANCE TABLE	
DIMENSION	TOLERANCE
L<=60	±0.1
60<L<=120	±0.15
L>120	±0.3
DEG	0.5°

DO NOT SCALE  
IF IN DOUBTSCALE 1000  
DIMS IN MMMTRL GE C1200  
COLOUR black  
FINISH texture: AT-IM002, 0.REV CHG  
DATE 14-Oct-04 DATE

TOLERANCE UNLESS OTHERWISE

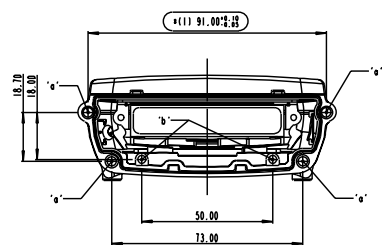
DEC	1	10	100
TOL	±0.5	±0.2	±0.1

PSION TEKLOGIX  
PSION  
3 MILTON  
ABINGDON,  
OXFORDSHIRE  
TEL: 444  
FAX: 444

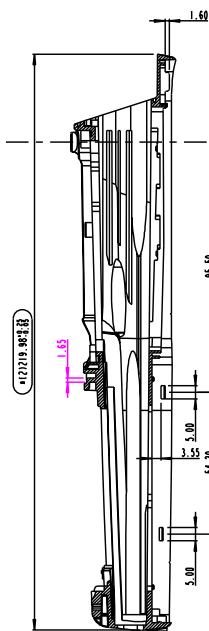
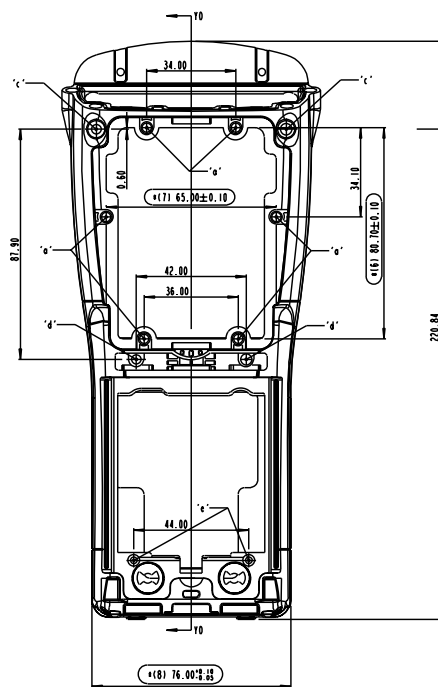
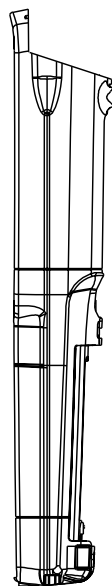
PROJECT

TITLE

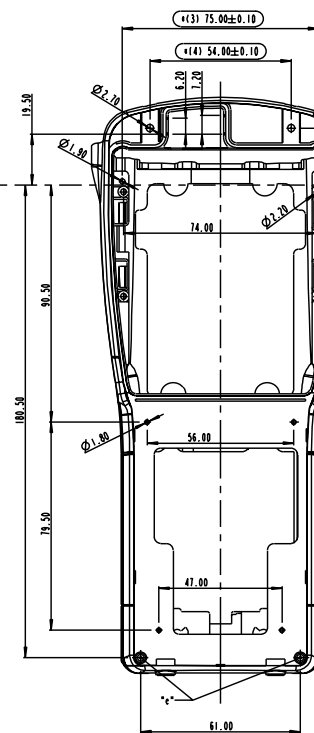
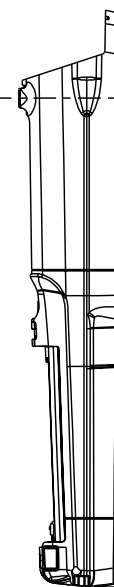
A3 PC321.ENDCAP



SCALE 0.500

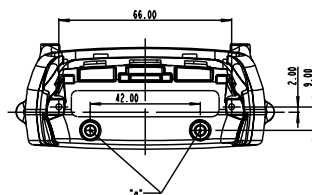


SECTION YO-YO



Notes:

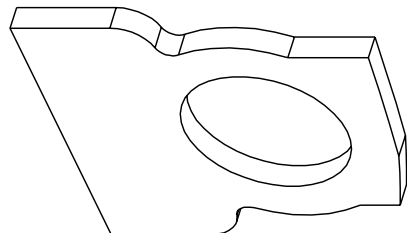
1. Average Thickness: 3.2 mm
2. Unspecified Round: 0.2R
3. Unspecified Draft Angle: 1°
4. Unspecified Tolerance: Please follow the Tolerance Table
5. Circled or "+" insepectible dimension.
6. Work "a": berying sul M2.6x5.5(4.3)+0L, 0L
7. Work "b": berying sul M2.6x5.5(4.3)+0.3x0.3
8. Work "c": mold-in sul M2.6x5.5(4.3)+0L, T-type
9. Work "d": mold-in sul M2.6x5.5(4.3)+0.6L, T-type
10. Work "e": berying sul M2.6x5.5(4.3)+0.3x0.3



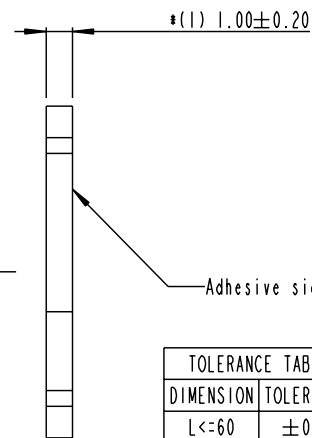
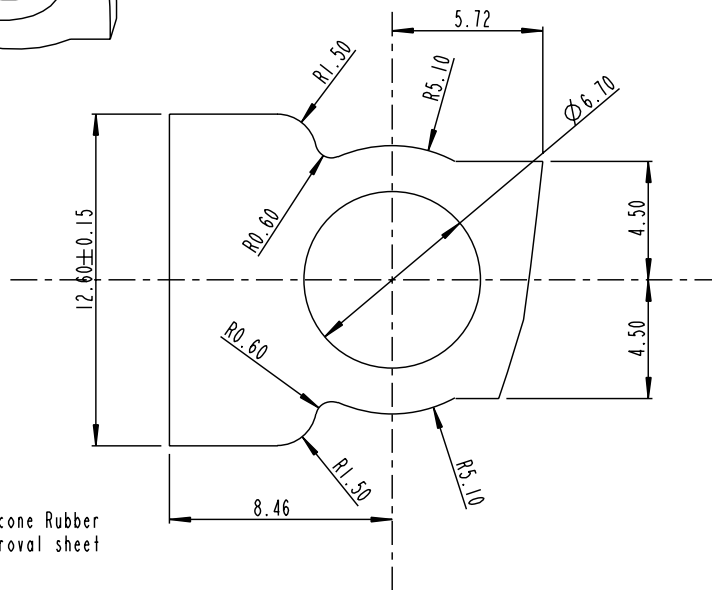
TOLERANCE TABLE	
DIMENSION	TOLERANCE
L<60	±0.1
60<L<120	±0.15
L>120	±0.3
DEG	0.5°

A8C321.STYLUSRUBBER SHIT 1 OF 1

REVISION	LOC	CHANG
-	-	-



SCALE 5.000



TOLERANCE TABLE	
DIMENSION	TOLERANCE
L≤60	±0.1
60<L≤120	±0.15
L>120	±0.3
DEG	0.5°

- Notes:
1. Material: Toshiba TSE2185U Silicone Rubber (Detailed spec. refer to Askey Approval sheet)
  2. Hardness: 50 (Durometer A)
  3. Adhesive: 3M 467MP, t=0.05 mm (Detailed spec. refer to Askey Approval sheet)
  4. Circled or "\*" inspectable dimension.
  5. Unspecified tolerance: ±0.15 mm

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DO NOT SCALE  
IF IN DOUBT

SCALE 5.000  
DIMS IN MM

MATL SILICONE RUBBER TSE2185U  
COLOR BLACK  
FINISH

DRN	CHD	APPD
DATE 14-Oct-04	DATE	DATE

TOLERANCE UNLESS OTHERWISE ST  
DEC 1 10 100  
TOL ±0.5 ±0.2 ±0.1

PSION TEKLOGIX  
3 MILTON PARK  
ABINGDON  
OXFORDSHIRE OX14 3SH  
TEL: +44 (0) 1235 831111  
FAX: +44 (0) 1235 831112

PROJECT

TITLE  
STYLUS RUBBER

PART NUMBER  
A8C321.STYLUSRUBBER

# APPENDIX C

## HDK LICENSE AGREEMENT

C.1	HARDWARE DEVELOPER KIT LICENSE AGREEMENT . . . . .	3
1.	GRANT OF LICENSE . . . . .	3
2.	DESCRIPTION OF REQUIREMENTS, RESTRICTIONS, RIGHTS AND LIMITATIONS. . . . .	3
3.	HIGH RISK ACTIVITIES. . . . .	4
4.	DISCLAIMER OF WARRANTY . . . . .	4
5.	LIMITATION OF LIABILITY . . . . .	4
6.	COPYRIGHTS, OWNERSHIP AND PROPRIETARY RIGHTS . . . . .	5
7.	CONFIDENTIALITY. . . . .	5
8.	ENDING THIS AGREEMENT. . . . .	5
9.	GENERAL . . . . .	5



## C.I HARDWARE DEVELOPER KIT LICENSE AGREEMENT

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**Boldface** indicates a parameter, menu or sub-menu name.

## D

- datecode
  - displaying for OS 47
- displaying OS datecode 47
- docking station kit
  - part number 15
- download
  - SDK 19

## F

- files
  - installed 19

## H

- header files 19

## I

- installation 19
  - location 19
  - WORKABOUT PRO HDK 19

## M

- main operating system
  - image part numbers 46
  - replacement using RS232 serial 50

## O

- operating system
  - displaying datecode 47
  - replacement using USB 47, 49

## P

- part number
  - docking station kit 15
  - main OS image 46
- ports
  - on 7535 13

## R

- release versions 19
- replacement
  - of main OS 50
  - of OS 47, 49
- RS232 serial
  - main OS replacement using 50

## S

- SDK
  - download 19
- Setup.exe 19

## U

- USB
  - OS replacement using 47, 49

