

OPERATIONS MANUAL PCM-MODEM56K

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REVISION HISTORY

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ORIGINATED	081216	Preliminary

FCC Notice

This equipment complies with part 68 of the FCC rules. On this equipment is a label that contains the FCC registration number and Ringer Equivalence Number (REN) for this equipment. You must upon request, provide this information to your telephone company.

If your telephone equipment causes harm to the telephone network, the Telephone Company may discontinue your service temporarily. If possible, they will notify in advance. But, if advance notice isn't practical, you will be notified as soon as possible. You will be informed of your right to file a complaint with the FCC.

Your telephone company may make changes at its facilities, equipment, operations, or procedures that could affect proper operation of your equipment. If they do you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.

The FCC prohibits this equipment to be connected to party lines or coin-telephone service. In the event that this equipment should fail to operate properly, disconnect the equipment from the phone line to determine it is causing the problem. If the problem is with the equipment, discontinue use and contact your dealer or vendor.

The Telephone Consumer Protection Act of 1991 makes it unlawful for any person to use a computer or any other electronic device, including fax machines, to send any messages unless such message clearly contains in a margin at the top or bottom of each transmitted page or on the first page of the transmission, the date and time it is sent, and identification of the business or other entity, or other individual sending the message, and the telephone number of the sending machine or of such business, other entity, or individual. (The telephone number provided may not be a 900 number or any other number for which charges exceed local or long distance transmission charges.)

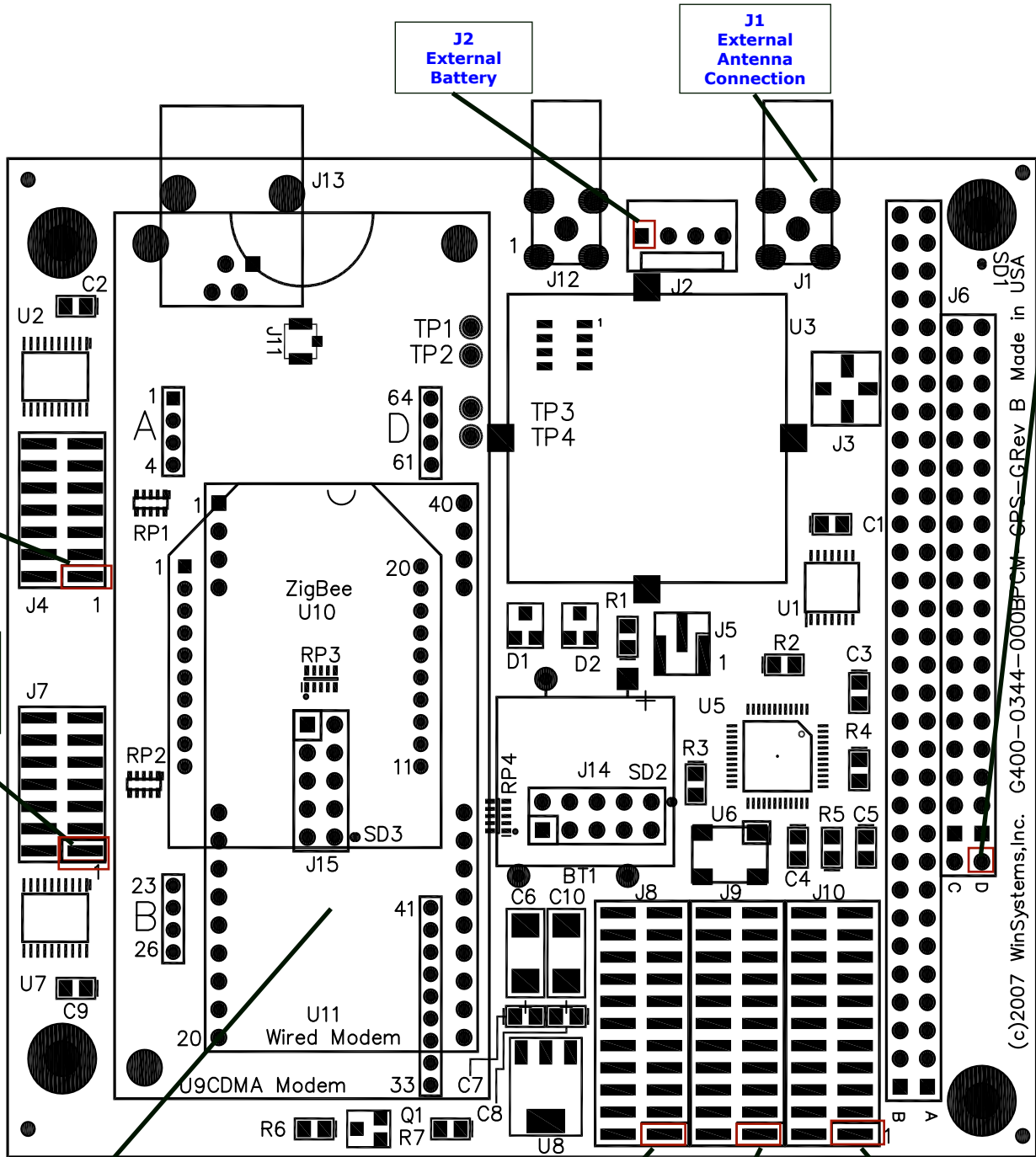
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Visual Index – Quick Reference

Top View - Connectors

For the convenience of the user, a Visual Index has been provided with direct links to connector and jumper configuration data.



NOTE: The reference line to each component part has been drawn to Pin 1, where applicable. Pin 1 is also highlighted with a red square, where applicable.

Introduction

This manual is intended to provide the necessary information regarding configuration and usage of the PCM-MODEM56K board. WinSystems maintains a Technical Support Group to help answer questions regarding usage or programming of the board. For answers to questions not adequately addressed in this manual, contact Technical Support at (817) 274-7553, Monday through Friday, between 8 AM and 5 PM Central Standard Time (CST).

General Information

Features

Modem

- DSP-based hardware PC/104 56 kbps modem

Data Mode

- Data Mode line speeds of 56 kbps (V.90) with auto fallback (56K to 300 bps)

Error Control

- V.42, MNP Class2-4 error correction

Data Compression

- V.42bis, MNP 5 compression

Modem Operation

- Integrated DAA provides compliance to global telephone standards
- Built-in fuse and SiDactor
- Caller ID detection
- Parallel phone detection
- DTMF dialing

GPS Support (optional)

- Trimble Lassen[®] receiver module
- TSIP, TAIP and NEMA 0183 protocols supported
- Pulse output support for accurate time standard
- External power antenna connection via a Standard SMA

Power

- +5V required, 100 mA typical

Industrial Operating Temperature Range

- -40°C to 85°C

Form Factor

- PC/104-compliant
- 3.60 in x 3.80 in (90 mm x 96 mm)

Additional Specifications

- RoHS compliant
- Software compatible with AT command set
- Replaces WinSystems' Products: PCM-33.6

General Description

The PCM-MODEM56K from WinSystems is a PC/104 compatible module designed to directly connect to dial-up telephone lines. It supports data rates up to 56000 bps plus supports MNP error correction and data compression. The modem uses the industry standard AT command set to control the operation of the modem and its internal register settings. The PCM-MODEM56K is a direct replacement for WinSystems' PCM-33.6 modem module. It will operate over an industrial temperature range from -40°C to 85°C.

Functional Capability

Serial Interface

A 16C552-compatible, Dual-UART converts the PC/104 signals into a serial asynchronous data stream needed for the modem module. Each channel has a 16-byte transmit and receive FIFO to decrease the CPU resources required to service interrupts generated by the module. The PCM-MODEM56K has two ports. One port is terminated at **U3** (GPS) and the other port is terminated at **U11** (MODEM).



I/O Address Selection

The modem module requires eight consecutive I/O Addresses in the processor's I/O space. The jumper blocks at **J7** (modem) allow for selection of the primary and secondary serial port I/O addresses, respectively. The illustration below shows the relationship between the address bits and the jumper position and a sample jumpering for an address of 300H (jumpered = 0, open = 1).



J7

1 <input type="checkbox"/> 2	A3 (8H)
3 <input type="checkbox"/> 4	A4 (10H)
5 <input type="checkbox"/> 6	A5 (20H)
7 <input type="checkbox"/> 8	A6 (40H)
9 <input type="checkbox"/> 10	A7 (80H)
11 <input type="checkbox"/> 12	A8 (100H)
13 <input type="checkbox"/> 14	A9 (200H)

I/O Base Address Select jumper
J7 shown jumpered for 300H

To disable a port, place a jumper on all 7 positions (Address = 000H). Following are some sample jumperings for various base addresses.

J7
(3E8)

1 <input type="checkbox"/> 2	A3 (8H)
3 <input checked="" type="checkbox"/> 4	A4 (10H)
5 <input type="checkbox"/> 6	A5 (20H)
7 <input type="checkbox"/> 8	A6 (40H)
9 <input type="checkbox"/> 10	A7 (80H)
11 <input type="checkbox"/> 12	A8 (100H)
13 <input type="checkbox"/> 14	A9 (200H)

J7
(2E8)

1 <input type="checkbox"/> 2	A3 (8H)
3 <input checked="" type="checkbox"/> 4	A4 (10H)
5 <input type="checkbox"/> 6	A5 (20H)
7 <input type="checkbox"/> 8	A6 (40H)
9 <input type="checkbox"/> 10	A7 (80H)
11 <input checked="" type="checkbox"/> 12	A8 (100H)
13 <input type="checkbox"/> 14	A9 (200H)

J7
(3F8)

1 <input type="checkbox"/> 2	A3 (8H)
3 <input type="checkbox"/> 4	A4 (10H)
5 <input type="checkbox"/> 6	A5 (20H)
7 <input type="checkbox"/> 8	A6 (40H)
9 <input type="checkbox"/> 10	A7 (80H)
11 <input type="checkbox"/> 12	A8 (100H)
13 <input type="checkbox"/> 14	A9 (200H)

J7
(2F8)

1 <input type="checkbox"/> 2	A3 (8H)
3 <input type="checkbox"/> 4	A4 (10H)
5 <input type="checkbox"/> 6	A5 (20H)
7 <input type="checkbox"/> 8	A6 (40H)
9 <input type="checkbox"/> 10	A7 (80H)
11 <input checked="" type="checkbox"/> 12	A8 (100H)
13 <input type="checkbox"/> 14	A9 (200H)

Interrupt Routing

Most communication software will require an interrupt be routed to the CPU. Interrupts can be generated by the UART which routes to jumper blocks on the board. The jumper blocks at **J8, J9 and J10** allow for routing of the interrupts for the modem, the GPS serial output, and the PPS source respectively. Verify you have chosen an interrupt that is free from conflict with other devices, and is supported by your communications software.

The PCM-MODEM56K can be configured to use any of the following IRQs:3, 4, 5, 6, 7, 9, 10, 11, 12, 14, or 15.



J8/J9/J10

- J8** - SocketModem®
- J9** - GPS
- J10** - PPS Interrupt (GPS)

1 0 0 2	IRQ3
3 0 0 4	IRQ4
5 0 0 6	IRQ5
7 0 0 8	IRQ6
9 0 0 10	IRQ7
11 0 0 12	IRQ9
13 0 0 14	IRQ10
15 0 0 16	IRQ11
17 0 0 18	IRQ12
19 0 0 20	IRQ14
21 0 0 22	IRQ15

Modem Interface

The PCM-MODEM56K supports the enhanced AT command set and is compatible with many PC communications software packages. The **U11** position provides support for Wintec®'s 56 kbps modem. This modem supports data rates up to 56,000 bps, MNP error correction and data compression.

This module is a DSP-based hardware modem, which is different from a software modem and is independent of the host processor. In addition to data transfer, it supports caller ID detection, parallel phone detection and global line interface.

Telephone Line Interface

The connection to the phone line is through an RJ-11C jack at **J13**. An on-board FCC Part 68 registered DAA provides the required isolation and protection for connection to dial-up lines. The PCM-MODEM56K modules includes a DAA (Data Access Arrangement) device that meets international telephone line requirements with compliance to FCC, CTR21 and other country-specific PTT specifications.

Over-current Protection

Over-current protection up to 70V and 200 mA protects the unit from if it is accidentally plugged into a digital phone line. Many digital PBX lines have a low impedance with a high current voltage source across the two terminals of the RJ-11 jack that is normally TIP and RING on an analog phone line. When an analog modem is plugged into a digital line, it goes off-hook and draws excessive current and could damage the hook switch components.

The modem can detect the over-current condition and generate an interrupt for the host to force the modem into a high-impedance or on-hook mode before damage occurs.

Error Control

The PCM-MODEM56K support V.42 and MNP2-4 error correction. This error correction protocol ensures the error-free delivery of asynchronous data sent between the host and the remote end. The module also supports V.42bis and MNP5 data compression protocols.

GPS Antenna

The PCM-MODEM56K utilizing the GPS option requires an external antenna with a clear view of the sky in order to receive and track satellites in the GPS constellation. **J1** is a standard SMA connector for attachment of the antenna. It must be an active antenna powered by the 3.3V supplied by the GPS and with a typical gain of 28 dB. WinSystems offers an optional magnetic mount antenna P/N ANTENNA-MAGNETIC built by Trimble® for this module. Other antennas meeting the above specifications should work as well.



Visual Index



Visual Index



Visual Index



Visual Index



Visual Index

PC/104 Bus Interface

The PCM-MODEM56K is a 16-bit, PC/104 stackthrough card with a 10-bit, I/O port mapped interface. Standard PC/104 I/O cards can be populated on the PCM-MODEM56K's PC104 bus, located at **J6**. The data path to the module is 8-bits.



Refer to the [PC/104 Bus Specification](#) for specific signal and mechanical specifications.

GND	D0 o o C0	GND	IOCHK#	A1 o o B1	GND
MEMCS16#	D1 o o C1	SBHE#	SD7	A2 o o B2	RESET
IOCS16#	D2 o o C2	LA23	SD6	A3 o o B2	+5V
IRQ10	D3 o o C3	LA22	SD5	A4 o o B4	IRQ9
IRQ11	D4 o o C4	LA21	SD4	A5 o o B5	-5V
IRQ12	D5 o o C5	LA20	SD3	A6 o o B6	DRQ2
IRQ15	D6 o o C6	LA19	SD2	A7 o o B7	-12V
IRQ14	D7 o o C7	LA18	SD1	A8 o o B8	SRDY#
DACK0#	D8 o o C8	LA17	SD0	A9 o o B9	+12V
DRQ0	D9 o o C9	MEMR#	IOCHRDY	A10 o o B10	KEY
DACK5#	D10 o o C10	MEMW#	AEN	A11 o o B11	SMEMW#
DRQ5	D11 o o C11	SD8	SA19	A12 o o B12	SMEMR#
DACK6#	D12 o o C12	SD9	SA18	A13 o o B13	IOW#
DRQ6	D13 o o C13	SD10	SA17	A14 o o B14	IOR#
DACK7#	D14 o o C14	SD11	SA16	A15 o o B15	DACK3#
DRQ7	D15 o o C15	SD12	SA15	A16 o o B16	DRQ3
+5V	D16 o o C16	SD13	SA14	A17 o o B17	DACK1#
MASTER#	D17 o o C17	SD14	SA13	A18 o o B18	DRQ1
GND	D18 o o C18	SD15	SA12	A19 o o B19	REFRESH#
GND	D19 o o C19	KEY	SA11	A20 o o B20	BCLK
			SA10	A21 o o B21	IRQ7
			SA9	A22 o o B22	IRQ6
			SA8	A23 o o B23	IRQ5
			SA7	A24 o o B24	IRQ4
			SA6	A25 o o B25	IRQ3
			SA5	A26 o o B26	DACK2#
			SA4	A27 o o B27	TC
			SA3	A28 o o B28	BALE
			SA2	A29 o o B29	+5V
			SA1	A30 o o B30	OSC
			SA0	A31 o o B31	GND
			GND	A32 o o B32	GND

= Active Low Signal

NOTES:

1. Rows C and D are not required on 8-bit modules.
2. B10 and C19 are key locations. WinSystems uses key pins as connections to GND.
3. Signal timing and function are as specified in ISA specification.
4. Signal source/sink current differ from ISA values.

AT Command Set Summary

Basic AT Commands

Command	Function
A/	Re-execute command
A	Go off- hook and at tempt to answer call
B0	Select V.22 connection at 1200 bps.
B1	Select 212A connection at 1200 bps.
C1	Return OK message.
Dn	Dial Modifier (T, P)
E0	Turn off command echo
E1	Turn on command echo
F0	Select auto- detect mode (equivalent to N1)
F1	Select V.21 or Bell 103
F2	Reserved
F3	Select V.23 line modulation.
F4	Select V.22 or Bell 212A bps line speed.
F5	Select V.22bis line modulation
F6	Select V.32bis or V.32 4800 line modulation
F7	Select V.32bis 7200 line modulation
F8	Select V.32bis or V.32 9600 line modulation
F9	Select V.32bis 12000 line modulation
F10	Select V.32bis 14400 line modulation
H0	Initiate a hang-up sequence
H1	If on- hook, go off- hook and enter command mode
I0	Report product code.
I1	Report pre computed check sum.
I2	Report OK.
I3	Report firmware revision, model, and interface type.
I4	Report response programmed by an OEM
I5	Report the country code parameter
I6	Report modem data pump model and code re vision
I7	Reserved
L0	Set low speaker volume
L1	Set low speaker volume
L2	Set medium speaker volume.
L3	Set high speaker volume.
M0	Turn speaker off.
M1	Turn speaker on during hand shake and turn speaker off while receiving carrier.
M2	Turn speaker on during hand shake and while receiving carrier.
M3	Turn speaker off during dialing and receiving carrier and turn speaker on during answering
N0	Turn off auto mode detection
N1	Turn on auto mode detection
O0	Go on- line
O1	Go on- line and initiate a retrain sequence
P	Force pulse dialing
Q0	Allow result codes to DTE
Q1	Inhibit result codes to DTE
Sn	Select S-Register a default
Sn?	Return the value of S-Register n.
=V	Set de fault S-Register to value v.
?	Return the value of de fault S- register
T	Force DTMF dialing

Command	Function
V0	Report short form (terse) result codes.
V1	Report long form (verbose) result codes.
W0	Report DTE speed in EC mode.
W1	Report line speed, EC protocol and DTE speed.
W2	Report DCE speed in EC mode.
X0	Report basic call progress result codes, i.e. OK, CONNECT, RING, NO CARRIER, NO ANSWER, ERROR.
X1	Report basic call progress result codes and connection rate, i.e. OK, CONNECT, RING, NO CARRIER, NO ANSWER, CONNECT XXX and ERROR.
X2	Report basic call progress result codes and connection rate, i.e. OK, CONNECT, RING, NO CARRIER, NO ANSWER, CONNECT XXX and ERROR.
X3	Report basic call progress result codes and connection rate, i.e. OK, CONNECT, RING, NO CARRIER, NO ANSWER, CONNECT XXX , BUSY, and ERROR.
X4	Report basic call progress result codes and connection rate, i.e. OK, CONNECT, RING, NO CARRIER, NO ANSWER, CONNECT XXX , BUSY, NO DIALTONE, and ERROR.
Y0	Disable long space disconnect before on- hook
Y1	Enable long space disconnect before on- hook
Z0	Restore stored pro file 0 after warm re set.
Z1	Restore stored pro file 1 after warm re set.
&C0	Force RLSD active regardless of carrier state.
&C1	Allow RLSD to follow carrier state.
&D0	Interpret DTR ON- OFF transition per Qn
	&Q0, &Q5, &Q6 The modem ignores DTR
	&Q1, &Q4 The modem hangs up
	&Q2, &Q3 The modem hangs up
&D1	Interpret DTR ON- to-OFF transition per Qn
	&Q0, &Q1, &Q4, &Q5, &Q6 Asynchronous escape
	&Q2, &Q3 The modem hangs up
&D2	Interpret DTR ON- to-OFF transition per Qn
	&Q0 through &Q6 The modem hangs up
&D3	Interpret DTR ON- to-OFF transition per Qn
	&Q0, &Q1, &Q4, &Q5, &Q6 The modem performs soft reset
	&Q2, &Q3 The modem hangs up
&F0	Restore factory con figuration 0.
&F1	Restore factory con figuration 1
&G0	Disable guard tone
&G1	Disable guard tone
&G2	Enable 18000 Hz guard tone
&J0	Set S- Register response only for compatibility
&J1	Set S- Register response only for compatibility
&K0	Disable DTE/DCE flow control.

Command Function

&K3	Enable RTS/CTS DTE/DCE flow control
&K4	Enable XON/XOFF DTE/DCE flow control
&K5	Enable trans parent XON/XOFF flow control
&K6	Enable both RTS/CTS and XON/XOFF flow control
&L0	Select dial up line operation
&P0	Set 10 pps pulse dial with 39%/61% make/break
&P1	Set 10 pps pulse dial with 33%/67% make/break
&P2	Set 20 pps pulse dial with 39%/61% make/break
&P3	Set 20 pps pulse dial with 33%/66% make/break
&Q0	Select direct asynchronous mode
&Q4	Select Hayes Auto Sync mode
&Q5	Modem negotiates and error corrected link
&Q6	Select asynchronous operation in nor mal mode
&R0	CTS tracks RTS (async) or acts per V.25 (sync).
&R1	CTS is al ways active
&S0	DSR is al ways active.
&S1	DSR acts per V.25
&T0	Terminate any test in progress.
&T1	Initiate local analog loop back,
&T2	Return ER ROR result code.
&T3	Initiate local digital loop back
&T4	Allow re mote digital loop back
&T5	Disallow remote digital loop back request.
&T6	Request and RDL with out self-test
&T7	Request and RDL with self- test.
&T8	Initiate local analog loop with self- test.
&V	Display current configuration
&W0	Store the active pro file in NVRAM pro file 0.
&W1	Store the active pro file in NVRAM pro file 1.
&X0	Select internal timing for the transmit clock.
&X1	Select external timing for the transmit clock
&X2	Select slave receive timing for the transmit clock.
&Y0	Recall stored profile 0 upon power up.
&Y1	Recall stored profile 1 upon power up.
&Zn=x	Store dial string x (to 34) to location n (0 to 3).
%E0	Disable line quality monitor and re train.
%E1	Enable line quality monitor and fall back/fall for ward
%L	Return received line signal level
%Q	Report the line signal quality
%Ttn	PTT certification test signals
\Kn	Control break handling during three states :

1. When modem receives a break from the DTE :
 - \K0,2,4 Enter on-line command mode, no break sent to the remote modem
 - \K1 Clears buffers and send break to remote modem
 - \K3 Send break to remote modem immediately
 - \K5 Send break to remote modem in sequence with transmitted data
2. When modem receives \B in on-line command state :
 - \K0,1 Clears buffers and send break to remote modem
 - \K2,3 Send break to remote modem immediately
 - \K4,5 Send break to remote modem in sequence with transmitted data
3. When modem receives break from the remote modem

Command Function

\K0,1	Clears buffers and send break to DTE
\K2,3	Send a break immediately to DTE
\K4,5	Send a break with received data to DTE
\N0	Select normal speed buffered mode.
\N1	Select direct mode
\N2	Select reliable link mode
\N3	Select auto reliable mode
\N4	Force LAPM mode.
\N5	Force MNP mode
\V0	Connect messages are controlled by the command settings X, W, and S95
\V1	Connect messages are displayed in the single line for mat.
+MS	Select modulation
+H0	Disable RPI
+H1	Enable RPI and set DTE speed to 19200
+H2	Enable RPI and set DTE speed to 38400
+H3	Enable RPI and set DTE speed to 57600
+H11	Enable RPI+ mode
**0	Download to flash memory at last sensed speed
**1	Download to flash memory at 38.4 kbps
**2	Download to flash memory at 57.6 kbps
-SDR=0	Disable Distinctive Ring
-SDR=1	Enable Distinctive Ring Type 1.
-SRD=2	Enable Distinctive Ring Type 2.
-SRD=3	Enable Distinctive Ring Type 1 and 2.
-SRD=4	Enable Distinctive Ring Type 3.
-SRD=5	Enable Distinctive Ring Type 1 and 3.
-SRD=6	Enable Distinctive Ring Type 2 and 3.
-SRD=7	Enable Distinctive Ring Type 1, 2, and 3.
-SSE=0	Disable DSVD
-SSE=1	Enable DSVD

ECC Commands

%C0	Disable data compression
%C1	Enable MNP5 data compression
%C2	Enable V.42bis data compression
%C3	Enable both V.42bis and MNP5 compression.
VA0	Set maximum block size in MNP to 64
VA1	Set maximum block size in MNP to 128
VA2	Set maximum block size in MNP to 192
VA3	Set maximum block size in MNP to 256
\Bn	Send break of n X 100 ms.

MNP 10 Commands

-K0	Disable MNP10 extended services
-K1	Enable MNP10 extended services
-K2	Enable MNP10 extended services detection only.
-SEC=0	Disable MNP10- EC.
-SEC=1,[tx level]	Enable MNP10- EC and set transmit level 0 to 30 (0 dBm to -30 dBm).

Command Function

Caller ID Commands

#CID=0 Disable Caller ID

#CID=1 Enable Caller ID with for matted presentation

#CID=2 Enable Caller ID with unformatted presentation

FAX Class 1

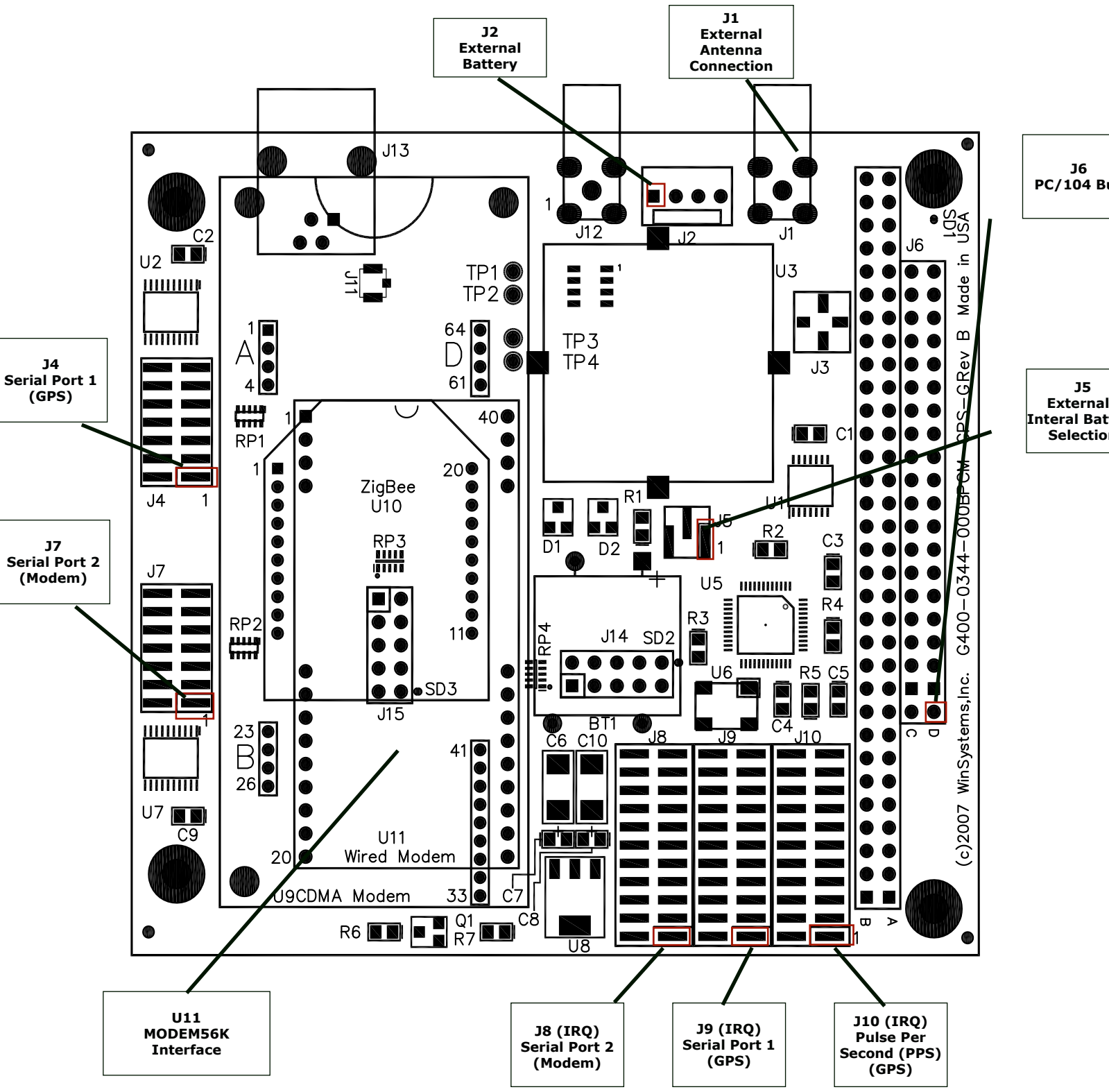
+FCLASS=n Service class.
+FAE=n Data/Fax auto answer
+FRH=n Receive data with HDLC framing.
+FRM=n Receive data
+FRS=n Receive silence
+FTH=n Transmit data with HDLC framing
+FTM=n Transmit data
+FTS=n Stop transmission and wait.

FAX Class 2

+FCLASS=n Service class.
+FAA=n Adaptive answer.
+FAXERR Fax error value
+FBOR Phase C data bit order
+FBUF? Buffer size (read only).
+FCFR Indicate confirmation to receive.
+FCLASS= Service class
+FCON Facsimile connection response
+FCIG Set the polled station identification
+FCR Capability to receive
+FCR= Capability to receive
+FCSI: Report the called station ID.
+FDCC= DCE capabilities parameters.
+FDCS: Report current session
+FDCS: Current session results
+FDIS: Report remote capabilities
+FDIS= Current session parameters
+FDR Begin or continue phase C receive data
+FDT= Data transmission
+FDTC: Report the polled station capabilities.
+FET: Post page message response.
+FET=N Transmit page function
+FHNG Call termination with status.
+FK Session termination
+FLID= Local ID string
+FLPL Document for polling
+FMDL? Identify model
+FMFR? Identify manufacturer.
+FPHCTO Phase C time out.
+FPOLL Indicates polling request
+FPTS: Page transfer status
+FPTS= Page transfer status
+FREV? Identify revision.
+FSPL Enable polling
+FTSI: Report the transmit station ID.

Jumper Reference

Drawings ONLY - for more detailed information on these parts, refer to the descriptions shown previously in this manual.



Software Drivers & Examples

This board supports any V.92 for various operating systems.

Specifications

Electrical

Bus Interface :PC/104 16-Bit, stackthrough
Data modem line speeds :Up to 56 kbps
Fax modem line speeds :Up to 14400 bps
VCC :+5V required, 100 mA typical ()
 :+53 required, 26 mA typical (modem only)
Ringer Equivalence :0.6B
FCC Certification No. :WTIMMO1BSLM24

Communications

Data Modem :V.32bis, V.32, V.22 bis, V.22A/B, V.23, V.21, and V.34; Bell 212A and 103
ECC :V.42 LAPM & MNP 2-4 error correction, V.42bis and MNP 5 data compression, MNP 10 data throughput enhancement
Fax Modem Dialing :V.33, V.17, V.29, V.27 ter, and V.21 channel 2
 :Tone (DTMF) supported

Mechanical

Dimensions :3.6" X 3.8" (90 mm x 96 mm)
PC/104 :64-pin, 0.100" (32-pin double row)
 :40-pin, 0.100" (20-pin double row)
Weight :2.4 oz

Connectors

Telephone :RJ-11C (**J13**)
GPS Antenna :SMA (**J1**)

Environmental

Operating Temperature :-40°C to +85°C
Noncondensing humidity :5% to 95%

WARRANTY REPAIR INFORMATION

WARRANTY

(<http://www.winsystems.com/company/warranty.cfm>)

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WARRANTY SERVICE

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2. You must send the product postage prepaid and insured. You must enclose the products in an anti-static bag to protect from damage by static electricity. WinSystems is not responsible for damage to the product due to static electricity.