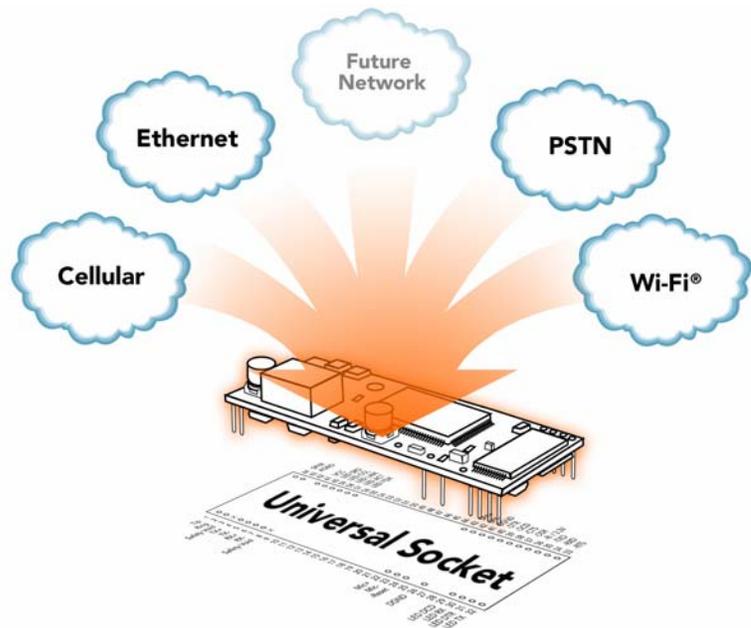

Universal Socket Connectivity

Embedded Device Networking Solutions



Hardware Guide for Developers

Universal Socket Connectivity Hardware Guide for Developers, PN S000342H, Version H For the following products:

SocketModem® – MT5600SMI
 SocketModem® – MT5656SMI
 SocketModem® – MT5634SMI
 SocketModem® – MT9234SMI
 SocketModem® – MT2492SMI
 SocketModem® – MT2456SMI-22
 SocketModem® IP – MT2456SMI-IP
 SocketModem® IP – MT5656SMI-IP
 SocketEthernet IP® – MTXCSEM
 SocketEthernet IP® – MT100SEM
 SocketModem® ISDN – MT128SMI
 SocketModem® GPRS – MTSMC-G
 SocketModem® CDMA – MTSMC-C
 SocketModem® EDGE – MTSMC-E
 SocketWireless® Wi-Fi® – MT800SWM
 SocketWireless® Bluetooth® – MTS2BTSMI

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Patents

This device covered by one or more of the following patents: 6,031,867; 6,012,113; 6,009,082; 5,905,794; 5,864,560; 5,815,567; 5,815,503; 5,812,534; 5,809,068; 5,790,532; 5,764,628; 5,764,627; 5,754,589; 5,724,356; 5,673,268; 5,673,257; 5,644,594; 5,628,030; 5,619,508; 5,617,423; 5,600,649; 5,592,586; 5,577,041; 5,574,725; 5,559,793; 5,546,448; 5,546,395; 5,535,204; 5,500,859; 5,471,470; 5,463,616; 5,453,986; 5,452,289; 5,450,425; 5,355,365; 5,309,562; 5,301,274. Other Patents Pending.

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Chapter 1

Universal Socket Connectivity

Chapter 1 - Universal Socket Connectivity

Multi-Tech Embedded Solutions

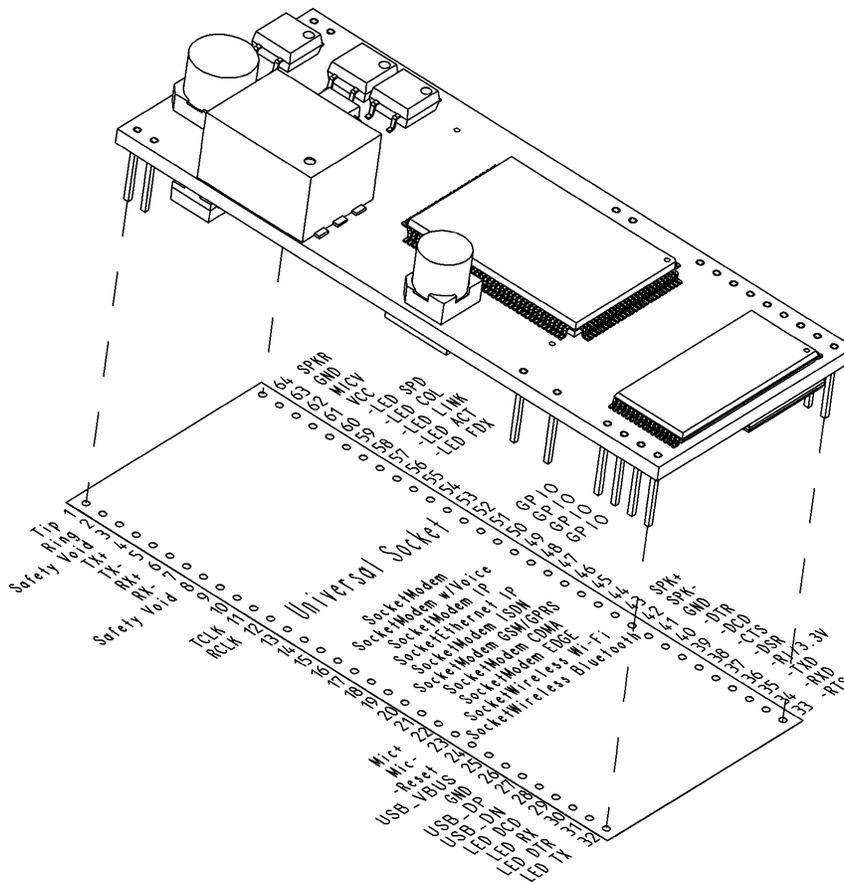
Multi-Tech's embedded device networking solutions instantly add communication ability to your existing or new product with minimal engineering effort giving you an edge on your competition while accelerating your time-to-market. Our universal socket family of embedded solutions is designed around a flexible comm-port architecture to provide analog or ISDN dial-up, cellular, Wi-Fi or Bluetooth wireless, or Ethernet socket connectivity with interchangeable modules. This means you can utilize one system design and populate it with your preferred connectivity option giving you flexibility and a seamless migration path to future technologies.

Universal Socket Connectivity Features

- Flexible comm-port architecture
- Interchangeable socket modules
- Cost-effective system design
- Easy migration to future technologies
- Complete global compliance

The Universal Socket Design

Each pin on a SocketModem corresponds to a particular function. The universal socket design provides a universal location for each function pin. This allows each SocketModem to be used in a common board.



Universal Developer Kit Contents

All products covered in this document can be evaluated using the MTSMI-UDK (Universal Developer Kit).

- One MTSMI-UDK Developer Board
- One 100-240V 9V-1A power supply w/IEC-320 connector
- One IEC-320 power cord w/US type plug
- One IEC-320 power cord w/EURO type plug
- One IEC-320 power cord w/UK type plug
- One RJ-45 cable (CARJ45NK-RJ45 7'8C non-keyed)
- One 7 foot RJ-11 cable plug - plug/4C
- One SMA jack to MMCX plug antenna cable (for CDMA and GPRS antennas)
- One RSMA jack to MMCX plug antenna cable (for Bluetooth antenna)
- One antenna 850/1900, right angle, 3-stripe (for CDMA and GPRS modules)
- One antenna 900/1800, right angle 4-stripe (for GPRS modules)
- One 2.4GHz ½ WAVE antenna with reverse polarity (for SocketWireless Bluetooth and SocketWireless Wi-Fi)
- One DB9F-DB25M 6 foot modem serial cable
- One generic CDMA Activation Notice
- One Verizon Activation Notice
- One Spring Activation Notice
- One Cingular Activation Notice
- One Universal Socket Connectivity Developer CD with BVRP Mobile PhoneTools
- One Promo Screwdriver

AT Commands Are Included on the Developer CD

AT Commands

Multi-Tech provides Reference Guides for each SocketModem's AT commands, fax commands, and voice commands. These reference guides are available on the CD included in the Developer Kit. They are also available by email at <mailto:oemsales@multitech.com> or by using the *Developer Guide Request Form* on Multi-Tech's Web site.

Fax Commands

Fax Commands are included in the AT Command Reference Guide when applicable to the product. They are available on the CD included in the Developer Kit.

Note: Fax Commands supported by product:

- SocketModem MT5600SMI supports Class 1 & 1.0
- SocketModem MT5656SMI supports Class 1 & 2 (not 2.0/2.1)
- SocketModem MT9234SMI supports all Class 1 and Class 2 commands (Class 1, 1.0, 2, 2.0/2.1)
- SocketModem MT5634SMI supports all Class 1 and Class 2 commands (Class 1, 1.0, 2, 2.0/2.1)
- Wireless SocketModem GPRS MTSMC-G supports Class 1 core commands only (defined by ITU T.31)
- Wireless SocketModem CDMA MTSMC-C supports Class 2.0 Group 3
- Wireless SocketModem EDGE MTSMC-E supports Class 1 Group 3

A List of AT Commands Reference Guides for Embedded Products

Products	Reference Guides – Title and Document Product Number	Fax Commands	Voice Commands
SocketModem (MT5600SMI)	MT5600/5656SMI AT Commands Reference Guide (S000306x)	Applicable Fax Commands included in S000306x	See S000306x
SocketModem (MT5634SMI)	MT5634SMI AT Commands Reference Guide (S000263x)	Applicable Fax Commands included in S000263x	See S000263x
SocketModem (MT9234SMI)	MT9234SMI AT Commands Reference Guide (S000434x)	See separate Guides: Class 1 S000262x ; Class 2 S000239x	See S000434x
SocketModem (MT2492SMI)	SocketModem MT2492SMI AT Commands Reference Guide (S000435x)	Fax Not Supported	Voice Not Supported
SocketModem (MT2456SMI-22)	SocketModem MT2456SMI-22 AT Commands Reference Guide (S000281x)	Fax Not Supported	Voice Not Supported
SocketModem IP (MT2456SMI-IP)	Multi-Tech IP Connectivity Command Line Interface and Application Examples Reference Guide (S000368x)	Fax Not Supported	Voice Not Supported
SocketModem (MT5656SMI-IP)	SocketModem MT5656RJ and MT5656SMI-IP AT Commands Reference Guide (S000364x)	Fax Not Supported	Voice Supported in Modem Mode. See RJModem Commands
SocketEthernet IP (MTXCSEM)	Serial-to-Ethernet IP Command Line Interface Guide and Application Examples (S000278x)	Fax Not Supported	Voice Not Supported
SocketEthernet IP (MT100SEM MT5656SMI-IP)	SocketEthernet IP AT Commands Reference Guide (S000426x)	Fax Not Supported	Voice Not Supported
SocketModem ISDN (MT128SMI)	MT128SMI AT Commands Reference Guide and Application Examples (S000352x)	Fax Not Supported	Voice Not Supported
SocketModem GPRS (MTSMC-G-F1/F2/F4)	GPRS AT Commands Reference Guide (for F1/F2/F4) (S000293x)	Applicable Fax Commands included in S000293x	Applicable Voice Commands included in S000293x
SocketModem GPRS IP Stack Commands (MTSMC-G-F1/F2)	Wireless GPRS-F1/F2 Modems with IP Connectivity Reference Guide – AT Commands and Application Examples (S000333x)	Fax Not Supported	Voice Not Supported
SocketModem GPRS IP Stack Commands (MTSMC-G-F4)	Wireless GPRS-F4 Modems with IP Connectivity Reference Guide (S000437x)	Fax Not Supported	Voice Not Supported
SocketModem CDMA (MTSMC-C)	CDMA AT Commands Reference Guide (S000294x)	Applicable Fax Commands included in S000294x	Applicable Voice Commands included in S000294x
SocketModem EDGE (MTSMC-E)	SocketModem EDGE AT Commands Reference Guide (S000371x)	Applicable Fax Commands included in S000371x	Applicable Voice Commands included in S000371x
SocketWireless Bluetooth (MTS2BTSMI)	SocketWireless Bluetooth AT Commands Reference Guide (S000360x)	Fax Not Supported	Voice Not Supported
SocketWireless Wi-Fi (MT800SWM)	SocketWireless Wi-Fi AT Commands Reference Guide (S000425x)	Fax Not Supported	Voice Not Supported

Universal Socket Configuration

(I/O) Tip	1	○		○	64	SPKR (O)
(I/O) Ring	2	○		○	63	GND (I)
Safety Void	3	×		○	62	MICV (I)
(O) TX+	4	○		○	61	VCC (I)
(O) TX-	5	○		○	60	-LED SPD (O)
(I) RX-/RX+	6	○		○	59	-LED COL (O)
(I) RX+/RX-	7	○		○	58	-LED LINK (O)
Safety Void	8	×		○	57	-LED ACT (O)
	9			○	56	-LED FDX (O)
	10		Universal Socket		55	
(O) TCLK	11	○			54	
(O) RCLK	12	○	Standard Serial Pinout		53	
	13				52	
	14		SocketModem	○	51	GPIO (I/O)
	15		SocketModem w/Voice	○	50	GPIO (I/O)
	16		SocketModem IP	○	49	GPIO (I/O)
	17		SocketEthernet IP	○	48	GPIO (I/O)
	18		SocketModem ISDN		47	
	19		SocketModem GPRS		46	
	20		SocketModem CDMA		45	
	21		SocketModem EDGE		44	
(I) Mic+	22	○	SocketWireless Wi-Fi	○	43	SPK+ (O)
(I) Mic-	23	○	SocketWireless Bluetooth	○	42	SPK- (O)
(I) -Reset	24	○		○	41	GND (I)
(I) USB_VBUS	25	○		○	40	-DTR (I)
(I) GND	26	○		○	39	-DCD (O)
(I/O) USB_DP	27	○		○	38	-CTS (O)
(I/O) USB_DN	28	○		○	37	-DSR (O)
(O) LED DCD	29	○		○	36	-RI (O)
(O) LED RX	30	○		○	35	-TXD (I)
(O) LED DTR	31	○		○	34	-RXD (O)
(O) LED TX	32	○		○	33	-RTS (I)

Top View – Universal SocketModem Pinout

Note: Pin 6 is RX- for the SocketEthernet IP. For ISDN, Pin 6 is RX+.
Pin 7 is RX+ for the SocketEthernet IP. For ISDN, Pin 7 is RX-.

Universal Pin Descriptions

Pin	Signal Name	In Out	Description
1	Tip	I/O	Tip Signal from Telco. Tip connection to the phone line (RJ-11 Pin 4). The SocketModem is Tip/Ring polarity insensitive.
2	Ring	I/O	Ring Signal from Telco. Ring connection to the phone line (RJ-11 Pin 3). The SocketModem is Tip/Ring polarity insensitive.
3	Safety Void	NA	Safety Clearance. 2.5 mm is required between TNV circuits and SELV circuits.
4	TX+	O	Transmit Outputs (TX+ and TX-). Differential transmit outputs for Ethernet and ISDN.
5	TX-	O	Transmit Outputs (TX+ and TX-). Differential transmit outputs for Ethernet and ISDN.
6	RX- (Ethernet) RX+ (ISDN)	I	Receive Inputs (RX+ and RX-). Differential receive input pins for Ethernet and ISDN. Dummy pin for MT800SWM.
7	RX+ (Ethernet) RX- (ISDN)	I	Receive Inputs (RX+ and RX-). Differential receive input pins for Ethernet and ISDN.
8	Safety Void	NA	Safety Clearance. 2.5 mm is required between TNV circuits and SELV circuits.
9	Dummy		Dummy pin for EDGE.
11	TCLK	O	Transmit Data Sync Clock. TX synchronous data clock for ISDN sync data mode.
12	RCLK	O	Receive Data Sync Clock. RX synchronous data clock for ISDN sync data mode.
22	MIC+	I	Microphone positive input. See microphone sections in GPRS, CDMA, EDGE chapters.
23	MIC-	I	Microphone negative input. See microphone sections in GPRS, CDMA, EDGE chapters.

Pin	Signal Name	In/Out	Description																																												
24	–RESET*	I	<p>Device Reset (with pull-up). The active low –RESET input resets the device logic and returns the configuration of the device to the original factory default values or "stored values" in the NVRAM. –RESET is tied to VCC through a time-constant circuit for "Power-on-Reset" functionality. The module is ready to accept commands after a fixed amount of time ("X" Time) after power-on or reset.</p> <table border="1"> <thead> <tr> <th>Model</th> <th>Time Constant</th> <th>"X" Time</th> <th>Minimum Reset Pulse*</th> </tr> </thead> <tbody> <tr> <td>MT5600/5656SMI</td> <td>250 ms</td> <td>6 seconds</td> <td>100us</td> </tr> <tr> <td>MT5634/9234SMI</td> <td>400 ms</td> <td>6 seconds</td> <td>100us</td> </tr> <tr> <td>MT2456SMI-22</td> <td>250 ms</td> <td>6 seconds</td> <td>100us</td> </tr> <tr> <td>MT2456SMI-IP</td> <td>250 ms</td> <td>6 seconds</td> <td>100us</td> </tr> <tr> <td>MTXCSEM</td> <td>250 ms</td> <td>6 seconds</td> <td>100us</td> </tr> <tr> <td>MT100SEM</td> <td>250 ms</td> <td>6 seconds</td> <td>100us</td> </tr> <tr> <td>MT128SMI</td> <td>200 ms</td> <td>6 seconds</td> <td>100us</td> </tr> <tr> <td>MTSMC-G</td> <td>250 ms</td> <td>6 seconds</td> <td>100us</td> </tr> <tr> <td>MT800SWM</td> <td>250 ms</td> <td>6 seconds</td> <td>100us</td> </tr> <tr> <td>MTS2BTSMI</td> <td>250 ms</td> <td>6 seconds</td> <td>100us</td> </tr> </tbody> </table> <p>*The SocketModem device may respond to a shorter reset pulse.</p> <p>Reset Line Interface for the MT5656SMI, MT2456SMI, MT2456SMI-IP. The modem's reset line employs a .01uF cap and a 10K pull up resistor. Care must be taken to ensure the system the modem is place into is not affected by the added capacitance of the reset line. It is not advisable to use an open collector driver in the embedded system's reset circuitry to drive a reset signal to the embedded modem and other I.C.s in the customer's design. Rather, if an open collector driver is to be used, run that output to the modem only and use a separate driver for other embedded components. The modem's reset signal may also be driven by a circuit that both sinks and sources current if desired.</p> <p>It is also important to note that these modems do not require an external reset. They have their own internal reset circuitry and voltage monitor and will function correctly even if the reset input is open.</p> <p>Reset GPRS and CDMA (MTSMC-G and MTSMC-C). This signal is used to force a reset procedure by providing low level during reset of at least 500us. The signal is considered an emergency reset only. A reset procedure is already driven by internal hardware during the power-up sequence. If no external reset is necessary, this input can be left open. If used (emergency reset), it has to be driven by an open collector or an open drain.</p> <p>Reset EDGE with pull-up (MTSMC-E). The active low –RESET input resets the device logic and returns the configuration of the device to the original factory default values of "stored values" in the NVRAM. –RESET is tied to VCC through a time-constant circuit for "Power-on-Reset" functionality. The module is ready to accept commands after a fixed amount of time after power-on or reset.</p>	Model	Time Constant	"X" Time	Minimum Reset Pulse*	MT5600/5656SMI	250 ms	6 seconds	100us	MT5634/9234SMI	400 ms	6 seconds	100us	MT2456SMI-22	250 ms	6 seconds	100us	MT2456SMI-IP	250 ms	6 seconds	100us	MTXCSEM	250 ms	6 seconds	100us	MT100SEM	250 ms	6 seconds	100us	MT128SMI	200 ms	6 seconds	100us	MTSMC-G	250 ms	6 seconds	100us	MT800SWM	250 ms	6 seconds	100us	MTS2BTSMI	250 ms	6 seconds	100us
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MT800SWM	250 ms	6 seconds	100us																																												
MTS2BTSMI	250 ms	6 seconds	100us																																												
25	USB_VBUS	I	USB Voltage Sense. Senses the voltage level of the USB to determine if the bus is available.																																												
26	GND	GND	Logic Ground.																																												
27	USB_DP	I/O	USB Data Positive. Positive pin of the USB data pair.																																												
28	USB_DN	I/O	USB Data Negative. Negative pin of the USB data pair.																																												
29	LED DCD	O	DCD (Active High). Output from 74LCX14 with a 1000 Ohms resistor in series. SocketWireless Bluetooth (MTS2BTSMI): When lit, indicates a connection. No series resistor.																																												
30	LED RX	O	RX (Active High). Output from 74LCX14 with a 1000 Ohms resistor in series. SocketWireless Bluetooth (MTS2BTSMI): No series resistor.																																												
31	LED DTR	O	DTR (Active High). Output from 74LCX14 with a 1000 Ohms resistor in series. SocketWireless Bluetooth (MTS2BTSMI): No series resistor.																																												
32	LED TX	O	TX (Active High). Output from 74LCX14 with a 1000 Ohms resistor in series. SocketWireless Bluetooth (MTS2BTSMI): No series resistor.																																												
33	–RTS	I	Request to Send (Active Low). –RTS is controlled by the DTE to indicated whether or not the DTE is ready to receive data. –RTS ON (low) indicates that the DTE is ready to receive data from the modem on RXD. –RTS OFF indicates to the module that it should not transfer data on the RXD. In the command state, the modem ignores –RTS. Note: When the –RTS pin is not in use, it should be tied low.																																												

* **RESET – A Design Consideration:** Allowing the host processor to control the RESET line of the module provides the benefit of allowing the host to reset the device in the event of a failure to respond normally. Resetting the module will return it to a known functional state.

Pin	Signal Name	In/Out	Description
34	-RXD	O	Received Data. The module uses the RXD line to send data to the DTE and to send module responses to the DTE. In command mode, -RXD data presents the module responses to the DTE. Module responses take priority over incoming data when the two signals are in competition for -RXD. When no data is transmitted, the signal is held in mark condition.
35	-TXD	I	Transmitted Data. The DTE uses the -TXD line to send data to the module for transmission or to transmit commands to the module. The DTE holds this circuit in mark state when no data is being transmitted or during intervals between characters.
36	-RI	O	RING (Active Low). Incoming ring signal from phone. Ring Indicate. -RI output ON (low) indicates the presence of an ON segment of a ring signal on the telephone line. The modem will not go off-hook when -RI is active; the modem waits for -RI to go inactive before going off-hook. SocketWireless Bluetooth (MTS2BTSMI). Strobes 1/sec for slave indication.
37	-DSR	O	Data Set Ready (Active Low). -DSR indicates module status to the DTE. -DSR OFF (high) indicates that the DTE is to disregard all signals appearing on the interchange circuits except Ring Indicator (-RI). It reflects the status of the local data set and does not indicate an actual link with any remote data equipment.
38	-CTS	O	Clear to Send (Active Low). -CTS is controlled by the module to indicate whether or not the module is ready to transmit data. -CTS ON indicates to the DTE that signals on TXD will be transmitted. -CTS OFF indicates to the DTE that it should not transfer data on TXD.
39	-DCD	O	Data Carrier Detect (Active Low). -DCD output is ON (low) when a data connection is established and the module is ready to send/receive data.
40	-DTR	I	Data Terminal Ready (Active Low). The -DTR input is turned ON (low) when the DTE is ready to communicate. -DTR ON prepares the modem to be connected, and, once connected, maintains the connection. -DTR OFF places the modem in the disconnect state under control of the &Dn and &Qn commands. Note: When the -DTR pin is not in use, it should be tied low.
41	GND	GND	Logic Ground.
42	SPK-	O	Wireless GPRS, CDMA, and EDGE. Negative analog speaker output.
43	SPK+	O	Wireless GPRS, CDMA, and EDGE. Positive analog speaker output.
48	GPIO	I/O	General Purpose Input/Output. User-configurable input or output pin.
49	GPIO	I/O	General Purpose Input/Output. User-configurable input or output pin.
50	GPIO	I/O	General Purpose Input/Output. User-configurable input or output pin.
51	GPIO	I/O	General Purpose Input/Output. User-configurable input or output pin.
56	-LED FDX	O	LED Full Duplex (Active Low). LED Output. During normal operation, this pin lights the FDX LED to indicate a full duplex mode.
57	-LED ACT	O	LED Active (Active Low). LED Output. During normal operation, this pin lights the Activity LED when transmitting or receiving. It flashes at a rate of 50ms high and 50ms low when active.
58	-LEDLINK	O	LED LINK (Active Low). LED Output. During normal operation, this pin lights the LINK LED to indicate a good link is detected.

Pin 58 LED Mode	Operating Status
Note: This pin may or may not be available on some EDGE/GPRS/CDMA modules currently shipping.	
Off	Subscriber Carrier Mode is Off or running in SLEEP mode or Alarm mode.
600 ms ON / 600ms OFF	No SIM card inserted or no PIN entered, or network search in progress, or ongoing user authentication, or network login in progress.
75 ms ON / 75 ms OFF / 75 ms ON 3 s OFF Flashing	One or more EDGE/GPRS/CDMA contexts activated. Indicates EDGE/GPRS/CDMA data transfer: When a transfer is in progress, the LED goes on within 1 second after data packets were exchanged. Flash duration is approximately 0.5 s.
ON	Depending on type of call: Voice Call: Connected to remote party. Data Call: Connected to remote party or exchange of parameters while setting up or disconnecting a call.

59	-LEDCOL	O	LED Collision (Active Low). LED Output. During normal operation, this pin lights the COL LED to indicate a collision. It flashes at 50ms high and 50ms low when active.
60	-LEDSPD	O	LED Speed (Active Low). LED Output. During normal operation, this pin lights the SPEED LED to indicate 100Mbps is selected.
61	VCC	PWR	DC Input Power. 3.3V or 5VDC power, depending upon the build.

Pin	Signal Name	In/Out	Description
62	MICV	I	Single-Ended Microphone. Single-ended microphone input for dial-up SocketModem speakerphone and TAM functions.
63	AGND	GND	Analog Ground. Analog ground is tied common with DGND on the SocketModem. To minimize potential ground noise issues, connect audio circuit return to AGND.
64	SPKR	O	Speaker. Dual purpose output for call progress signals or speakerphone functions. Call Progress signaling on MT5600SMI, MT5656SMI, MT2492SMI, and MT2456SMI-22 is a square wave output that can be optionally connected to a low-cost single-ended speaker; e.g., a sounducer or an analog speaker circuit. Call progress on the MT9234SMI and the MT5634SMI is an analog output. Speakerphone Output on the MT5656SMI is under the control of +FCLASS. This is a single-ended analog output. SPKR is tied directly to the CODEC. One side of a differential AC output coupled through a 6.8K ohm resistor and capacitor.

Design Considerations

Noise Suppression Design Considerations

Engineering noise-suppression practices must be adhered to when designing a printed circuit board (PCB) containing the SocketModem module. Suppression of noise is essential to the proper operation and performance of the modem itself and for surrounding equipment.

Two aspects of noise in an OEM board design containing the SocketModem must be considered: on-board/off-board generated noise that can affect digital signal processing. Both on-board and off-board generated noise that is coupled on-board can affect interface signal levels and quality. Of particular concern is noise in frequency ranges affecting modem performance.

On-board generated electromagnetic interference (EMI) noise that can be radiated or conducted off-board is a separate, but equally important, concern. This type of noise can affect the operation of surrounding equipment. Most local government agencies have stringent certification requirements that must be met for use in specific environments.

Proper PC board layout (component placement, signal routing, trace thickness and geometry, etc.) component selection (composition, value, and tolerance), interface connections, and shielding are required for the board design to achieve desired modem performance and to attain EMI certification.

Other aspects of proper noise-suppression engineering practices are beyond the scope of this designer guide. The designer should consult noise suppression techniques described in technical publications and journals, electronics and electrical engineering text books, and component supplier application notes.

PC Board Layout Guidelines

In a 4-layer design, provide adequate ground plane covering the entire board. In 4-layer designs, power and ground are typically on the inner layers. All power and ground traces should be 0.05 inches wide.

The recommended hole size for the SocketModem pins is 0.036 in. +/-0.003 in. in diameter. Spacers can be used to hold the SocketModem vertically in place during the wave solder process. A spacer should be placed on pin 32 and pin 64 of the SocketModem. A suggested part number for the spacer is BIVAR 938-0.130 for P1 (0.310in) option SocketModems. The spacers can be left on permanently and will not effect operation.

All creepages and clearances for the SocketModem have been designed to meet requirements of safety standards EN60950 or EN60601. The requirements are based on a working voltage of 125V or 250V. When the recommended DAA* circuit interface is implemented in a third party design, all creepage and clearance requirements must be strictly followed in order to meet safety standards. The third party safety design must be evaluated by the appropriate national agency per the required specification.

User accessible areas: Based on where the third party design is to be marketed, sold, or used, it may be necessary to provide an insulating cover over all TNV exposed areas. Consult with the recognized safety agency to determine the requirements.

Note: Even if the recommended design considerations are followed, there are no guarantees that a particular system will comply with all the necessary regulatory requirements. It is imperative that specific designs be completely evaluated by a qualified/recognized agency.

*DAA stands for Data Access Arrangement. DAA is the telephone line interface of the module.

Electromagnetic Interference (EMI) Considerations

The following guidelines are offered to specifically help minimize EMI generation. Some of these guidelines are the same as, or similar to, the general guidelines but are mentioned again to reinforce their importance. In order to minimize the contribution of the SocketModem-based design to EMI, the designer must understand the major sources of EMI and how to reduce them to acceptable levels.

1. Keep traces carrying high frequency signals as short as possible.
2. Provide a good ground plane or grid. In some cases, a multilayer board may be required with full layers for ground and power distribution.
3. Decouple power from ground with decoupling capacitors as close to the SocketModem module power pins as possible.
4. Eliminate ground loops, which are unexpected current return paths to the power source and ground.
5. Decouple the telephone line cables at the telephone line jacks. Typically, use a combination of series inductors, common mode chokes, and shunt capacitors. Methods to decouple telephone lines are similar to decoupling power lines; however, telephone line decoupling may be more difficult and deserves additional attention. A commonly used design aid is to place footprints for these components and populate as necessary during performance/EMI testing and certification.
6. Decouple the power cord at the power cord interface with decoupling capacitors. Methods to decouple power lines are similar to decoupling telephone lines.
7. Locate high frequency circuits in a separate area to minimize capacitive coupling to other circuits.
8. Locate cables and connectors so as to avoid coupling from high frequency circuits.
9. Lay out the highest frequency signal traces next to the ground grid.
10. If a multilayer board design is used, make no cuts in the ground or power planes and be sure the ground plane covers all traces.
11. Minimize the number of through-hole connections on traces carrying high frequency signals.
12. Avoid right angle turns on high frequency traces. Forty-five degree corners are good; however, radius turns are better.
13. On 2-layer boards with no ground grid, provide a shadow ground trace on the opposite side of the board to traces carrying high frequency signals. This will be effective as a high frequency ground return if it is three times the width of the signal traces.
14. Distribute high frequency signals continuously on a single trace rather than several traces radiating from one point.

Electrostatic Discharge Control

All electronic devices should be handled with certain precautions to avoid damage due to the accumulation of static charge.

See the ANSI/ESD Association Standard (ANSI/ESD S20.20-1999) – a document “for the Development of an Electrostatic Discharge Control for Protection of Electrical and Electronic Parts, Assemblies and Equipment.” This document covers ESD Control Program Administrative Requirements, ESD Training, ESD Control Program Plan Technical Requirements (grounding/bonding systems, personnel grooming, protected areas, packaging, marking, equipment, and handling), and Sensitivity Testing.

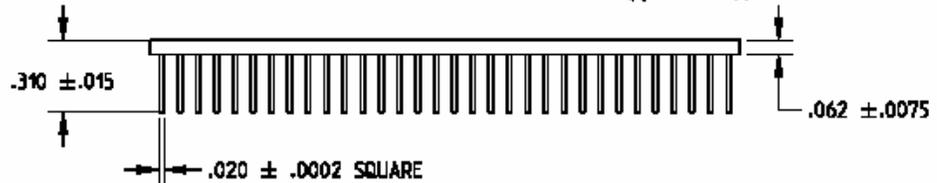
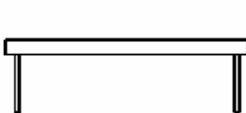
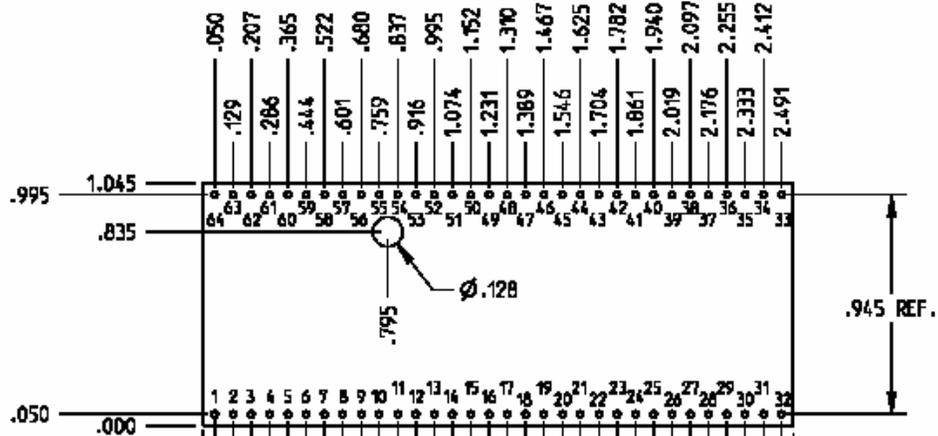
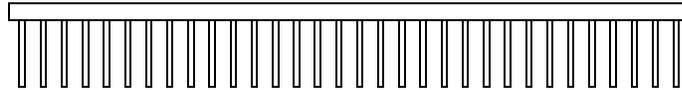
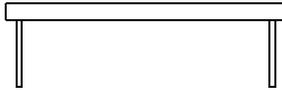
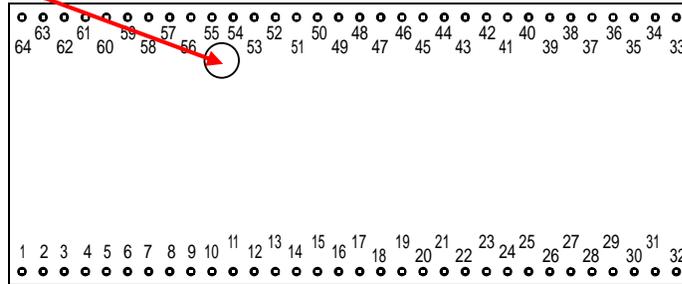
Multi-Tech Systems, Inc. strives to follow all of these recommendations. Input protection circuitry has been incorporated into the Multi-Tech devices to minimize the effect of this static buildup, proper precautions should be taken to avoid exposure to electrostatic discharge during handling.

Multi-Tech uses and recommends that others use anti-static boxes that create a faraday cage (packaging designed to exclude electromagnetic fields). Multi-Tech recommends that you use our packaging when returning a product and when you ship your products to your customers.

Mechanicals and Schematics

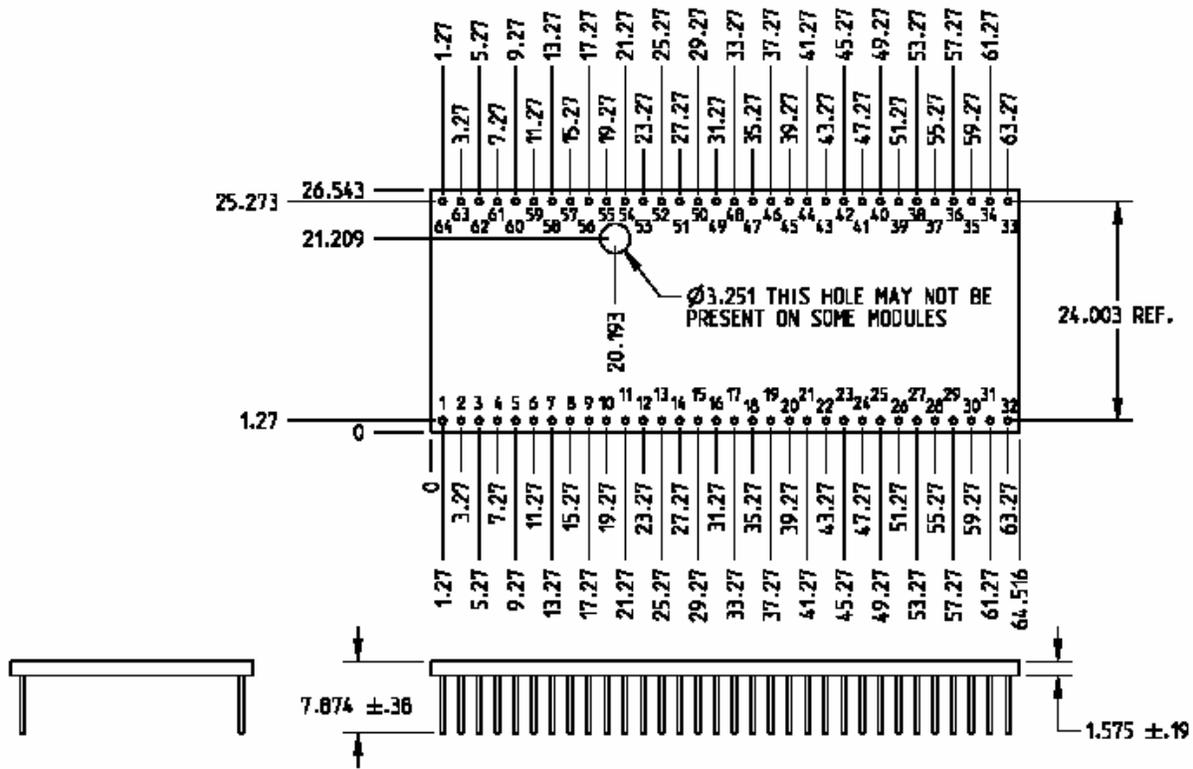
Mechanical Dimensions in Inches

Note: This tooling hole is not on all models.



Dimensions Are Shown in Inches

Mechanical Dimensions in Millimeters



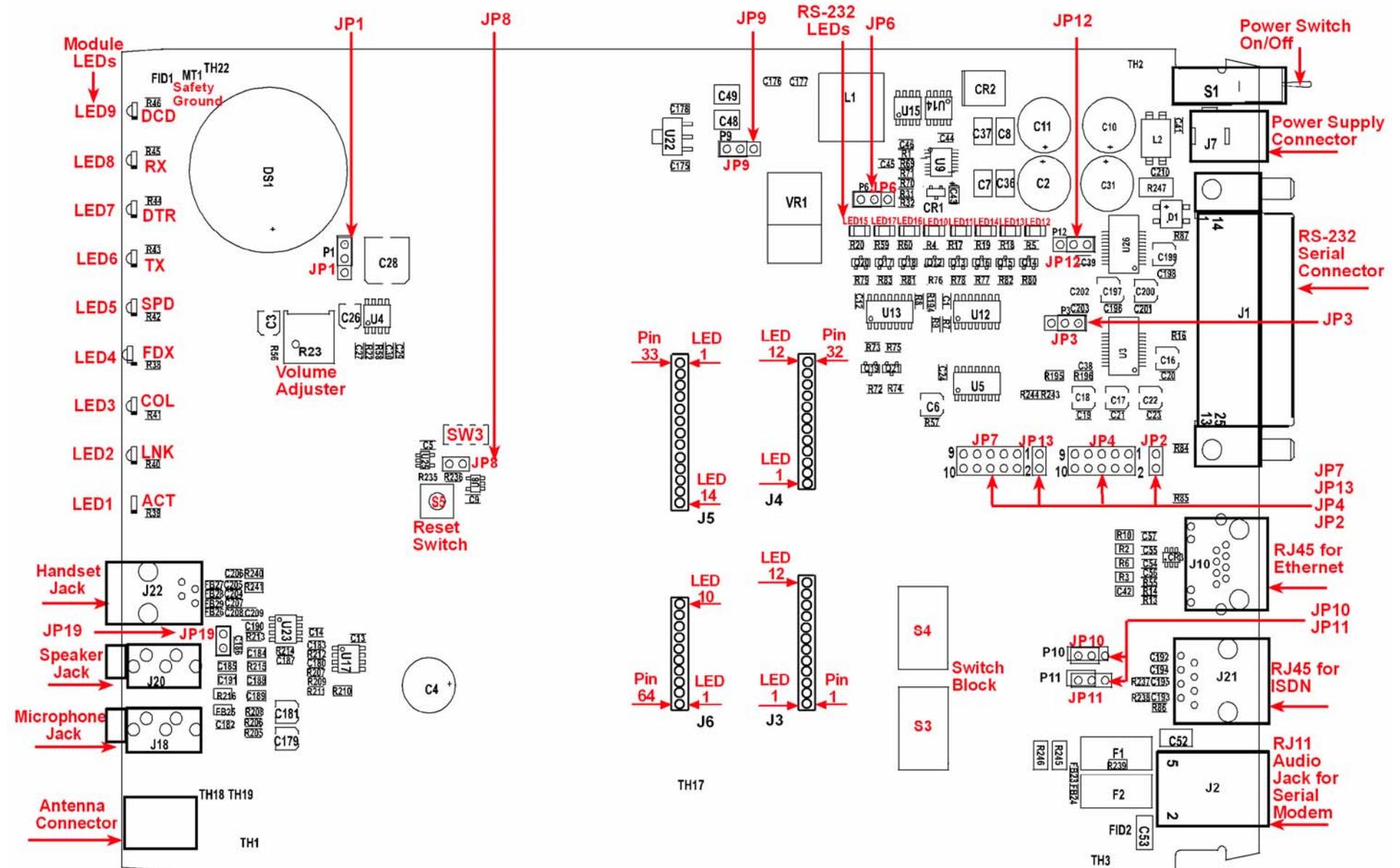
Dimensions Are Shown in Millimeters

Maximum Component Height

Product	Measurement from top of board to highest topside component	Measurement from bottom of board to lowest bottom-side component
SocketModem – MT5600SMI	.110 inches (2.794 mm)	.110 inches (2.794 mm)
SocketModem – MT5656SMI	.212 inches (5.384 mm)	.110 inches (2.794 mm)
SocketModem – MT5634SMI	.290 inches (7.366 mm)	.114 inches (2.895 mm)
SocketModem – MT9234SMI	.290 inches (7.366 mm)	.114 inches (2.895 mm)
SocketModem – MT2492SMI	.177 inches (4.495 mm)	NA
SocketModem – MT2456SMI	.212 inches (5.384 mm)	.110 inches (2.794 mm)
SocketModem IP – MT2456SMI-IP	.228 inches (5.791 mm)	.114 inches (2.895 mm)
SocketModem IP – MT5656SMI-IP	.212 inches (5.384 mm)	.110 inches (2.794 mm)
SocketEthernet IP – MTXCSEM	.315 inches (8.001 mm)	.075 inches (1.905 mm)
SocketEthernet IP – MT100SEM	.341 inches (8.661 mm)	.110 inches (2.794 mm)
SocketModem ISDN – MT128SMI	.299 Inches (7.594 mm)	.069 inches (1.752 mm)
SocketModem GPRS – MTSMC-G	.153 inches (3.886 mm)	.118 inches (2.997 mm)
SocketModem CDMA – MTSMC-C	.238 inches (6.045 mm)	.118 inches (2.997 mm)
SocketModem EDGE – MTSMC-E	.253 inches (6.426 mm)	.118 inches (2.997 mm)
SocketWireless Wi-Fi – MT800SWM	.202 inches (5.130 mm)	NA
SocketWireless Bluetooth – MTS2BTSMI	.089 inches (2.260 mm)	NA

SocketModem Developer Board

This developer board drawing shows the major board components for all SocketModems.



See the next page for description of Board Components

Board Components

Jumper	Description
JP1	Mutes the speaker. Default positions are 1 and 2 (speaker is not muted).
JP2 & 4	Testing interface (debugging) for the RS-232 signals.
JP3	Changes the speed of the driver. For Multi-Tech use only. Default positions are 1 and 2 (transceiver operates normally).
JP6 & JP9	JP6 & JP9 are the 5V / 3.3V regulators. The operating voltage factory default setting is 3.3V. JP1 jumper must be set to 3.3V. Warning – Be sure to that 5V / 3.3V jumper is set to match the requirements of your SocketModem. If this jumper is set incorrectly, damage to the SocketModem and/or the Test/Demo card could result. Caution – Use only the provided Multi-Tech Systems, Inc. transformer with the Test/Demo board. Use of any other power source will void the warranty and will likely damage the Test/Demo board and the SocketModem. The transformer connector is keyed to prevent improper connection to the Test/Demo board.
JP7 & JP13	Testing interface (debugging) for the serial TTL signals.
JP8	Enables/disables the Watchdog interface.
JP10 & JP11	100 OHM terminator for ISDN. Default positions are 1 and 2 (off).
JP12	Ties the TX and RX clock lines together. Default positions are 1 and 2 (transmit and receiver clock act independently).
JP19	Allows a stereo jack feed. Default is ON. If ON, then left and right stereo channels are combined and form a mono channel.
Switch 3	Sets the alternate ISDN clock. Default position is OFF (the alternate ISDN clock is off).
Switch Block	Set the switch to the product being used.

Pins and Corresponding Signals

J4 and J7			
10	PWR	9	RI
8	CTS	7	RTS
6	DSR	5	GND
4	DTR	3	TXD
2	RXD	1	DCD

J2 and J13			
2	RXC	1	TXC

Recommended Parts

Recommended Parts for Non-Wireless Modules

Disclaimer: Multi-Tech Systems makes no warranty claims for vendor product recommendations listed below. Other vendor products may or may not operate satisfactorily. Multi-Tech System's recommended vendor products only indicate that the product has been tested in controlled conditions and were found to perform satisfactorily.

Surface mount ferrites are used on T&R (Tip and Ring) to mitigate emission levels out the RJ-11 cable. 220pF capacitors are also used on T&R to reduce the common mode emissions that may be present in certain systems. The ferrite and capacitors also aid in reducing the effects of transients that may be present on the line.

Note: These parts are RoHS compliant.

Recommended Ferrite (SMT)

Manufacturer – Associated Component Technology (ACT) Part # CBZ1206-202-30-LF
 Manufacturer – Murata Erie Part # BLM31AJ601SN1L

Recommended Ferrite (Thru-Hole)

Manufacturer – Associated Component Technology (ACT) Part # WB2-2.OT

Recommended Capacitor (SMT)

Manufacturer – NOVACAP Part # ES2211N221K502NXT
 Manufacturer – Murata Erie Part # GA355DR7GC221KY02L

Recommended Capacitor (Thru-Hole)

Manufacturer – Ever Grace Electronic Industrials Part # YP221K2EA7PS-8.0
 Manufacturer – Murata Erie Part # DE2B3KH221KA3B

Note: Capacitors used on T&R must have the Y2 safety rating.

Recommended Connector

Manufacturer – Stewart Part # SS-64600-006F

Recommended Sidactor

Manufacturer – Teccor Electronics (Littelfuse) Part # P3100SAL
 Manufacturer – ST Microelectronics Part# SMTPA270
 Manufacturer – ST Microelectronics Part # SMP100LC-270

Recommended Poly Switch Thermal Fuse (SMT)

Manufacturer – RayChem (Tyco Electronics) Part # TS600-170F

Recommended Poly Switch Thermal Fuse (Thru-Hole)

Manufacturer – RayChem (Tyco Electronics) Part# TRF600-150

Note: The Fuse & Sidactor are required in order to comply with UL60950 for protection against over-voltages from power line cross. Fuse can be reset type.

Common Mode Choke

Manufacturer – TDK Part # ZJYS51R5-2PT-01

Recommended Transceiver

Manufacturer – Analog Devices Part # ADM207EARZ

SIP Connector

Manufacturer – Neltron Industrial Co. (<http://www.neltron.com.tw/>) Part #2209S-xxSG
 4-Pin 2.0mm SIP Socket (2 Each)
 10-Pin 2.0mm SIP Socket (2 Each)

Telecom

The RJ-11 connector must meet FCC Part 68 requirements. Refer to FCC Part 68 section 68.500 subpart F for connector specifications. A self-healing fuse is used in series with line to help prevent damage to the DAA circuit. This fuse is required in order to comply with FCC Part 68 compliance regulations.

Note: See *Application Notes* at the end of each SocketModem chapter.

Safety Notices and Warnings

Note to OEMs: The following safety statements may be used in the documentation of your final product applications.

Telecom Safety Warning

1. Never install telephone wiring during a lightning storm.
2. Never install a telephone jack in wet locations unless the jack is specifically designed for wet locations.
3. This product is to be used with UL and cUL listed computers.
4. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
5. Use caution when installing or modifying telephone lines.
6. Avoid using a telephone during an electrical storm. There may be a remote risk of electrical shock from lightning.
7. Do not use a telephone in the vicinity of a gas leak.
8. To reduce the risk of fire, use only 26 AWG or larger telecommunication line cord.
9. This product must be disconnected from its power source and telephone network interface when servicing.

Wireless Safety

General Safety

The modem is designed for and intended to be used in fixed and mobile applications. “Fixed” means that the device is physically secured at one location and is not able to be easily moved to another location. “Mobile” means that the device is designed to be used in other than fixed locations.

Caution: Maintain a separation distance of at least 20 cm (8 inches) is normally maintained between the transmitter’s antenna and the body of the user or nearby persons. The Modem is not designed for or intended to be used in portable applications within 20 cm. (8 inches) of the body of the user.

RF Interference Issues

It is important to follow any special regulations regarding the use of radio equipment due in particular to the possibility of radio frequency, RF, interference. Please follow the safety advice given below carefully.

- Switch OFF your Wireless MultiModem when in an aircraft. The use of cellular telephones in an aircraft may endanger the operation of the aircraft, disrupt the cellular network and is illegal. Failure to observe this instruction may lead to suspension or denial of cellular telephone services to the offender, or legal action or both.
- Switch OFF your Wireless MultiModem when around gasoline or diesel-fuel pumps and before filling your vehicle with fuel.
- Switch OFF your Wireless MultiModem in hospitals and any other place where medical equipment may be in use.
- Respect restrictions on the use of radio equipment in fuel depots, chemical plants or where blasting operations are in progress.
- There may be a hazard associated with the operation of your Wireless MultiModem close to inadequately protected personal medical devices such as hearing aids and pacemakers. Consult the manufacturers of the medical device to determine if it is adequately protected.
- Operation of your Wireless MultiModem close to other electronic equipment may also cause interference if the equipment is inadequately protected. Observe any warning signs and manufacturers’ recommendations.

Vehicle Safety

- Do not use your MultiModem while driving.
- Respect national regulations on the use of cellular telephones in vehicles. Road safety always comes first.
- If incorrectly installed in a vehicle, the operation of Wireless MultiModem telephone could interfere with the correct functioning of vehicle electronics. To avoid such problems, be sure that qualified personnel have performed the installation. Verification of the protection of vehicle electronics should be part of the installation.
- The use of an alert device to operate a vehicle's lights or horn on public roads is not permitted.

Maintenance of Your Modem

Your Wireless MultiModem is the product of advanced engineering, design, and craftsmanship and should be treated with care. The suggestions below will help you to enjoy this product for many years.

- Do not expose the Wireless MultiModem to any extreme environment where the temperature is above 50°C or humidity is above 90% noncondensing.
- Do not attempt to disassemble the Wireless MultiModem. There are no user serviceable parts inside.
- Do not expose the Wireless MultiModem to water, rain, or spilled beverages. It is not waterproof.
- Do not place the Wireless MultiModem alongside computer discs, credit or travel cards, or other magnetic media. The phone may affect the information contained on discs or cards.
- The use of accessories not authorized by Multi-Tech or not compliant with Multi-Tech's accessory specifications may invalidate the warranty of the Wireless MultiModem.
- In the unlikely event of a fault in the Wireless MultiModem, contact Multi-Tech Tech Support.

Your Responsibility

This Wireless MultiModem is your responsibility. Please treat it with care respecting all local regulations. It is not a toy. Therefore, keep it in a safe place at all times and out of the reach of children.

Try to remember your Unlock and PIN codes. Become familiar with and use the security features to block unauthorized use and theft.

Upgrading Firmware

Your modem is controlled by semi-permanent firmware, which is stored in flash memory. Multi-Tech's firmware is nonvolatile; that is, it remains stored in memory when the modem is turned off and can be upgraded as new features are added.

Multi-Tech's *Flash Wizard* can be downloaded from Multi-Tech's FTP site and is available on CD. Use this Flash Wizard for upgrading your firmware. Documentation for using the Flash Wizard is included with the wizard.

The following table shows you which products support the Flash Wizard.

SocketModem MT5600SMI	No Flash Upgrade. Can use ASCII upload via terminal emulator; i.e., HyperTerminal.
SocketModem MT5656SMI	No Flash Upgrade. Can use ASCII upload via terminal emulator; i.e., HyperTerminal.
SocketModem MT5634SMI	Flash Wizard Software for Windows®, Mac OSX, Linux Multi-Tech Flash Protocol
SocketModem MT9234SMI	Flash Wizard Software for Windows®, Mac OSX, Linux Multi-Tech Flash Protocol
SocketModem MT2492SMI	No Flash Upgrade.
SocketModem MT2456SMI	No Flash Upgrade. Can use ASCII upload via terminal emulator; i.e., HyperTerminal.
SocketModem IP MT5656SMI-IP	Flash Wizard Software for Windows®, Mac OSX, Linux Can use ASCII upload via terminal emulator; i.e., HyperTerminal.
SocketModem MT2456SMI-IP	XMODEM serial port upgrade or TFTP Ethernet upgrade. See the next page for information about using the XMODEM upgrade.
SocketEthernet IP MTXCSEM	XMODEM serial port upgrade or TFTP Ethernet upgrade. See the next page for information about using the XMODEM upgrade.
SocketEthernet IP MT100SEM	Flash Wizard Software for Windows®, Mac OSX, Linux Can use ASCII upload via terminal emulator; i.e., HyperTerminal.
SocketModem ISDN MT128SMI	Flash Wizard Software for Windows®, Mac OSX, Linux Multi-Tech Flash Protocol
SocketModem GPRS MTSMC-G	Do not use the Flash Wizard for the wireless modems. Contact Multi-Tech for wireless modem firmware upgrade directions.
SocketModem CDMA MTSMC-C	Do not use the Flash Wizard for the wireless modems. Contact Multi-Tech for wireless modem firmware upgrade directions.
SocketModem EDGE MTSMC-E	Do not use the Flash Wizard for the wireless modems. Contact Multi-Tech for wireless modem firmware upgrade directions.
SocketWireless Wi-Fi MT800SWM	XMODEM serial port upgrade. See the next page for information about using the XMODEM upgrade.
SocketWireless Bluetooth MTS2BTSMI	Do not use the Flash Wizard for the wireless modems. Contact Multi-Tech for wireless modem firmware upgrade directions.

Flash Wizard Software for Windows®: <ftp://ftp.multitech.com/Utilities/FlashWizard/>

Flash Wizard Software for Linux: <http://mtflashwiz.sourceforge.net/>

XMODEM Serial Port Upgrade

The SocketEthernet IP Module, for example, contains a 2 MB flash wherein the boot image, the firmware and configuration files are stored in a compressed format. The flash can easily be upgraded both locally as well as remotely.

Serial Port Upgrade

The flash of the SocketEthernet IP can be upgraded locally through serial port using the upload feature of serial applications.

Serial Port Configuration

The default serial port parameters should be:

Data length – 8 bits

Parity – None

Stop bits – 1

Baud-rate of the serial port to which the SocketEthernet IP Module is connected should be set to 115200 bps for proper operation.

Example of a Serial Flash Upgrade

Following steps explain the procedure to upgrade a flash using the serial COM port (serial flash upgrade).

Connect the SocketEthernet IP Module to a PC COM Port.

- Open an application through which we can access the serial device (e.g., Meterm, zoc, hyperterm).
- Reboot the SocketEthernet IP Module.
- Wait for the boot message and prompt “press d to download” to appear.
- Press **d** when prompted.
- Select the **XMODEM** Protocol from the Terminal application.
- Choose a file (MTXCSEM-TFTP-...) file to be uploaded.
- Perform a file upload.

The SocketEthernet IP Module reboots and will be up after a few seconds (10-15 seconds).



TFTP Ethernet Upgrade

The flash can be upgraded remotely through the Ethernet using TFTP.

The SocketEthernet IP Module flash contains two main files, which are required for an upgrade.

1. **Binary File**
The binary file contains the firmware of the Module.
The name of this binary file would be in the following format.
MTXCSEM-TFTP-v<version>w-<date in ddMmmyyy format>
2. **Gun-zipped http.tar.gz File**
This contains the HTML pages of the serial device and other files related to it, such as **http-host-param (http page configuration file)**.
The name of this tar file would always be **http.tar.gz**

Enabling TFTP Server

Enable TFTP server on SocketEthernet IP Module by issuing the following command:

```
# set ip tftp enable
OK
```

Example of an Ethernet Flash Upgrade

The IP module can be remotely upgraded over a network. Make sure a TFTP client is already installed on the machine. The following steps explain the method to perform flash upgrade from Ethernet.

- Make sure the SocketEthernet IP Module is reachable on the LAN.
- Perform a TFTP to the SocketEthernet IP Module from a TFTP client.
 - Set binary mode ON. **Note:** This step is very important.
 - Binary
- Put the binary file.
 - put <binary filename>
- Exit the TFTP session.
 - Quit

The SocketEthernet IP Module reboots after it has been successfully upgraded.

Account Activation for Wireless Products

Pre-Configured Multi-Tech Products

Each Multi-Tech wireless product (except for the MTCBA-C-N1 and N9) has been pre-configured to operate on a specific wireless network, such as Sprint, Verizon, and Cingular.

However, before you can begin to use the modem, you must set up a wireless data account with your wireless network provider. Then, follow the activation procedures covered on the Activation Notices available from Multi-Tech.

Certifications, Approvals, Compliance, and Requirements

Wireless Approvals (GSM, CDMA)

The Multi-Tech SocketModem is Industry and/or Carrier Approved as an End Product modem. When integrated and used with an antenna system that was part of the Multi-Tech modem certification, no additional approvals or certification are required (however, CDMA has a few exceptions) for the device you develop as long as the following are met:

- **PTCRB Requirements:**
The antenna system **cannot** be altered.
- **Model Identification:**

IMPORTANT

When the wireless carrier asks you to provide the modem's model identification, give the Multi-Tech wireless model identification, not the identification of the host device. See the label example below.

The Multi-Tech model identification allows the carrier to verify the modem as one of its approved models.

This information is located on the modem's label.

Example:

The following is an example of Multi-Tech's wireless model identification:

MTSMC-G-F2 – Multi-Tech wireless GPRS model identification.

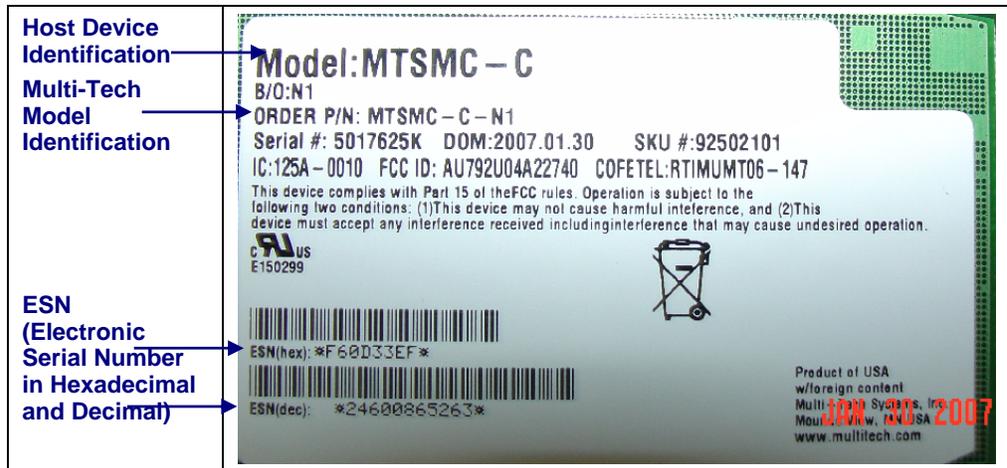
MTSMC-C – Multi-Tech wireless CDMA model identification.

MTSMC-E – Multi-Tech wireless EDGE model identification.

The following is an example of an end product GPRS modem label:



The following is an example of a CDMA label:



- **Other Information the Wireless Carrier Asks You to Provide:**

For CDMA modules: The modem's 8-character ESN (Electronic Serial Number) number printed next to the barcode on the modem. The ESN may vary in format by various CDMA carriers; some use a decimal number while others use a hexadecimal number.

For GSM modules: The modem's 15-character IMEI (International Mobile Equipment Identity) number printed on the modem's label.

Note: See the antenna section in Chapter 1 for qualified antenna systems.

Telecom Approvals for Analog Dial-up

Multi-Tech's Analog Dial-up Global* SocketModems are designed and approved for connection to the public switched telephone network in more than 50 countries or regions worldwide. Multi-Tech's SocketModems have been approved as host independent, which means our certification efforts can be transferred directly to your end product with proper labeling on the OEM equipment. Multi-Tech supports our approvals by supplying our customers with supporting documentation and offering a compliance label with country or regional approval logos and approval numbers to be attached to an end product.

The following is a list of countries or regions that Multi-Tech completes testing and obtains** certification test reports or certificates at or near the initial release of the product. After the initial release, the product may be tested and certified for other countries or regions. Check the Multi-Tech Systems, Inc. Web site at

<http://www.multitech.com/products/info/approvals/smi.asp> or contact Multi-Tech at [OEMSALES@MULTITECH.COM](mailto: OEMSALES@MULTITECH.COM) to obtain a current list of approvals for the SocketModem.

Countries or Regions			
Argentina	France	Liechtenstein	Singapore
Australia	Germany	Lithuania	Slovakia Republic
Austria	Greece	Luxembourg	Slovenia
Belgium	Hong Kong, S.A.R. of China	Malaysia	South Africa
Brazil	Hungary	Malta	Spain
Bulgaria	Iceland	Mexico	Sweden
Canada	India	Netherlands	Switzerland
Chile	Indonesia	New Zealand	Taiwan
China	Ireland	Norway	Thailand
Cyprus	Israel	Philippines	Turkey
Czech Republic	Italy	Poland	United Kingdom
Denmark	Japan	Portugal	United States
Estonia	Korea	Romania	
Finland	Latvia	Russia	

The above list is our target set of countries or regions in which the global* SocketModems are approved. Many of the approvals are completed at the time the product is released to market; whereas, others may take additional months to complete the approval.

* Refer to each chapter for Product Ordering Information identifying the modem as Global or Regional.

** Some countries or regions have special import requirements that require us to facilitate additional paperwork application in partner with our customers. Contact Technical Support or Multi-Tech at [OEMSALES@MULTITECH.COM](mailto: OEMSALES@MULTITECH.COM) for more information.

Note About Setting Country/Regional Codes: Country or Regional Codes are usually set through AT Commands. See each product's AT Command guide.

Labeling Requirements

United States Labeling Requirements (for Dial-Up Modems)

Telecom does not apply to all products. For example, this is not applicable for the SocketModem GPRS and CDMA products.

Approved terminal equipment and approved protective circuitry shall prominently display the following information using the format shown below:

- Responsible party
- Product Identification
- Equipment Code
- Ringer Equivalence
- Ringer Type
- Indication that the product meets the requirements of FCC Part 68

The information required by the first five items shall correspond to the records in the ACTA (America's Carriers Telecommunications Association) database of approved equipment. The required information shall be encoded in the following format:

US: AAAEQ##TXXX

Where:

US: Is a fixed field that indicates the equipment meets all requirements of 47 CFR Part 68, including the requirements published by ACTA (America's Carriers Telecommunications Association).

AAA is the responsible party's Grantee Code obtained previously from the FCC's Common Carrier Bureau or currently from ACTA.

EQ Is an Equipment Code indicating to the Service Provider any special signal handling or billing requirements. The Equipment codes are listed in Annex A (normative).

is the Ringer Equivalence Number without a decimal point (e.g. REN of 1.0 = 10, REN of 0.3 = 03). In the case of a "Z" ringer, ZZ shall appear. In the case of approved equipment without a network interface and equipment not connecting to circuits with analog ringing supplied then "NA" shall appear.

T is the ringer type letter associated with the Ringer Equivalence Number, in accordance with the technical requirements. In the case of approved equipment without a network interface and equipment not connecting to circuits with analog ringing supplied, the letter "N" shall appear.

XXX Is a product identifier, unique when combined with the responsible party's Grantee Code, of at least one and up to nine alphanumeric characters (including one or more dashes (-) if desired. A dash shall not appear as the first or last character nor shall the identifier consist entirely of dashes). The responsible party shall define this identifier.

Label Physical Characteristics

The information required above shall be permanently affixed and legible without magnification. It may be etched, engraved, stamped, indelibly printed, or otherwise permanently marked.

Alternatively, the required information may be permanently marked on a nameplate of metal, plastic or other material fastened to the enclosure by welding, riveting or with a permanent adhesive. Such a nameplate shall be able to last for the expected lifetime of the equipment and shall not be readily detachable.

Labeling Continuity and Changes

The labeling content and format requirements in effect when a product was approved shall be effective for the life of the product. The labeling content and format requirements in effect at approval shall also continue to be effective for modified products. However, the responsible party shall have the option of conforming a product's labeling to current content and format requirements at any time.

Other Label Requirements

The label shall be placed in one of the following locations in a location where it can be found after installation:

- on an outside surface
- inside a readily available access door or panel
- on another readily accessible surface

For example, the label should not be placed on the rear of a permanently wall-mounted device in a manner such that it is not readily accessible.

Canadian Labeling Requirements (for Dial-Up Modems)

The following requirements are established under section 69.3 of the *Telecommunications Act* for purposes of section 5 of the *Telecommunications Apparatus Regulations*.

Registered equipment shall bear the following identifying marks, and the Declaring Party shall ensure that these marks are permanently affixed to the equipment:

- (a) The registration number — Specifications of this mark are given in the document: *Self-Marking of the Certification/Registration Number on Terminal Equipment — Application Procedure and Agreement*; and
- (b) The model identification number under which the product was registered.

A statement of compliance with Industry Canada requirements, such as the one given below, shall accompany each unit of equipment whether registered under this procedure or previously certified:

"This product meets the applicable Industry Canada technical specifications"

For terminal equipment intended for connection to loop-start or ground-start interfaces, the Ringer Equivalence Number (REN) must be calculated as per Section 1.8 of CS-03, Part I. A REN higher than that determined may be assigned by manufacturers to allow for production variations. The REN must be marked on the terminal equipment itself or added to the note below. A note similar to the following shall accompany each unit of equipment whether registered under this procedure or previously certified:

"The Ringer Equivalence Number is an indication of the maximum number of devices allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the RENs of all the devices does not exceed five".

Pursuant to section 69.3 of the *Telecommunications Act*, certified or self-declared TE will bear a valid identifying certification number or registration number. The marking of the certification or registration number on the product shall be as follows:

- (a) TAC holder/DP will be responsible for permanently affixing the certification/registration number on the TE. The certification/registration number (see example below) identifies Certified or self-declared TE to the public, representatives of the telecommunications common carriers, the Department, and other interested parties. The letter height must be no less than 1.5 mm and the letters must be legible without magnification.
- (b) For integrated devices, e.g. a modem or one that is intended to become a sub-assembly of host equipment e.g. a data terminal, computer etc. that are designed to interface directly with the network, the certification/registration number shall be affixed to the integrated device itself.
- (c) The certification/registration number for a packaged TE will denote that the total package has been registered. However, the marking will normally be placed on that unit of the package which connects to the network; e.g., in a PBX the marking will be placed on the common equipment which connects to the network, rather than on plug-in components which may be added later. The Terminal Equipment List will show the common equipment but not the standard station apparatus or any proprietary station apparatus.
- (d) The marking format of the certification/registration number is as follows:

IC: XXXXXX-YYYYYYYY

Where:

- The letters "IC" have no other meaning or purpose than to identify the Industry Canada certification/registration number, and
- "XXXXXX-YYYYYYYY" is the certification/registration number; "XXXXXX" is the Company Number¹ (CN); it consists of up to six alphanumeric characters (A-Z, 0-9) assigned by Industry Canada; and "YYYYYYYY" is the Unique Product Number (UPN); it consists of up to eight alphanumeric characters (A-Z, 0-9) assigned by the applicant. Other characters, (such as & # *-) may not be used. Alphabetic characters must be capitalized.

¹ **Note:** The Company Number of registered equipment ends with an alphabetic character.

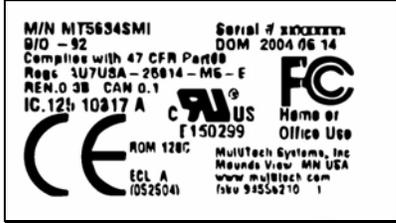
- (e) Certification Numbers granted prior to the implementation of the above marking format are grandfathered.
 - (i) For previously certified TE, the self-marking format shall consist of the old certification number preceded by "IC:" For example, if the certification number is "123 1234 A", then the self-mark would read "IC: 123 1234 A".
 - (ii) For a new model that is registered to a family of previously certified TE, the self-marking format shall be: IC: XXXXXX-ZZZZZZZZ

Where:

- "XXXXXX" is the Company Number, as in (d) above; and
- "ZZZZZZZZ" is either the old certification number minus the old company number, or a new Unique Product Number assigned by the applicant. For example, if a new model is registered to the family of products with certification number "123 1234 A", and that the Company Number for the registration is "123A", then the self-mark for this new model would read "IC: 123A-1234 A". If the applicant decides to replace "1234 A" with a new UPN, say "5678", then the self-mark would read "IC: 123A-5678".

Label Examples (for Dial-Up Socket Modems)

Note: These do not apply to the Wireless GPRS and CDMA products.

 <p>M/N MT5634SMI Serial # 4000000 B/O - 92 DOM 2004 06 14 Complies with 47 CFR Part 68 Regs. 1U7USA-26014-M6-E REN.0 3B CAN 0.1 IC:125 10217 A CE CULUS Home or Office Use ROM 128C MultiTech Systems, Inc ECL A (052504) Mounds View MN USA www.multitech.com fax 9555210 1</p>	<p>This label shows the modem model (M/N), build option (B/O), date of manufacture (DOM), serial number, and North America and European Union regulatory information.</p>
<p>Regulatory Label for Internal Socket Modem: MT5600SMI Date of manufacture (DOM) is printed on Socket Modem. SKU# 20043750</p> <p>This device complies with one or more of the following parts: 4 651 012; 4 612 113 4 612 114; 5 191 111; 5 084 144; 5 016 101; 5 116 125; 5 012 104; 5 015 101; 5 100 101 5 700 110; 5 701 111; 5 754 109; 5 331 130; 5 311 134; 5 071 104; 5 070 107; 5 041 104 5 070 108; 5 019 101; 5 017 122; 5 000 101; 5 002 101; 5 077 001; 5 074 125; 0 374 112 5 300 110; 5 040 111; 5 005 111; 5 000 101; 5 071 070; 5 002 010; 5 000 100; 5 157 101 5 000 100; 0 241 111; 0 355 110; 0 300 101; 0 155 100; 0 350 111; 5 055 105 5 000 102; 5 001 111; 5 050 102; 0 241 111 Other Parts Pending</p> <p>Complies with Part 68 FCC Rules & Regs Reg No AU7USA-46014-MD-E REN 0 1B For Home or Office Use CANADA 0 1B Minister Łączności Świadectwo Homologacji Nr 6772(X)(X) IC:125 11142 A</p> <p>Chile SUNTEL 3050 Turkey ADUM-2002 169 Mexico TTOM/MT02-290</p> <p>Argentina ENC-53-2580 Philippines NTC-EGD-CPE-0200494 India TEC/R/UM00-08/01/009 JUN03</p> <p>ANATEL Agência Nacional de Telecomunicações 011787999029300917</p> <p>CCC Минсвязи России Сертификат № ОС.1-ТФ-507</p> <p>型号 MT5600SMI 摩迪尔克系统有限公司 美国明尼苏达州亨茨维尔市 伍戴尔路2205号, 邮政编码55112</p> <p>合規證號: T-A23-C0-1142</p> <p>TELEPERMIT This Multi-Tech MT5600SMI modem is Approved for Connection to the Telecom Network PTC 211/02/151 RN=0.1</p> <p>Certified to meet HKTA 2011 specifications for connection to the Public Telecommunications Network of Hong Kong 證明符合接駁香港公共電訊網絡所需達至的 HKTA 2011 及 證號 SL 300083</p> <p>Office of the Telecommunications Authority 電訊管理局</p>	<p>This is a Telecom compliance label.</p>

Regulatory Compliance Statements



EMC, Safety, and R&TTE Directive Compliance

The CE mark is affixed to this product to confirm compliance with the following European Community Directives:

Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility;

and

Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits;

and

Council Directive 1999/5/EC of 9 March on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

International Modem Restrictions

Some dialing and answering defaults and restrictions may vary for international modems. Changing settings may cause a modem to become non-compliant with national telecom requirements in specific countries. Also note that some software packages may have features or lack restrictions that may cause the modem to become non-compliant.

EMC Requirements for the United States

FCC Part 15 Regulation

This equipment has been tested and found to comply with the limits for a **Class B** digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Plug the equipment into an outlet on a circuit that is different from the one used by the receiver.

Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC rules. Operation of this device is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference that may cause undesired operation.

WARNING – Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

EMC Requirements for Industry Canada

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement Canadien sur le matériel brouilleur.

New Zealand Telecom Warning Notice

1. The grant of a Telepermit for any item of terminal equipment indicates only that Telecom has accepted that the item complies with minimum conditions for connection to its network. It indicates no endorsement of the product by Telecom, nor does it provide any sort of warranty. Above all, it provides no assurance that any item will work correctly in all respects with another item of Telepermitted equipment of a different make or model, nor does it imply that any product is compatible with all of Telecom's network services.
This equipment is not capable under all operating conditions of correct operating conditions of correct operation at the higher speed which it is designated. 33.6 kbps and 56 kbps connections are likely to be restricted to lower bit rates when connected to some PSTN implementations. Telecom will accept no responsibility should difficulties arise in such circumstances.
2. Immediately disconnect this equipment should it become physically damaged, and arrange for its disposal or repair.
3. This modem shall not be used in any manner which could constitute a nuisance to other Telecom customers.
4. This device is equipped with pulse dialing, while the Telecom standard is DTMF tone dialing. There is no guarantee that Telecom lines will always continue to support pulse dialing. Use of pulse dialing, when this equipment is connected to the same line as other equipment, may give rise to 'bell tinkle' or noise and may also cause a false answer condition. Should such problems occur, the user should NOT contact the Telecom Faults Service.
The preferred method of dialing is to use DTMF tones, as this is faster than pulse (decadic) dialing and is readily available on almost all New Zealand telephone exchanges.
5. Warning Notice: No '111' or other calls can be made from this device during a mains power failure.
6. This equipment may not provide for the effective hand-over of a call to another device connected to the same line.
7. Some parameters required for compliance with Telecom's Telepermit requirements are dependent on the equipment (PC) associated with this device. The associated equipment shall be set to operate within the following limits for compliance with Telecom's Specifications:
For repeat calls to the same number:
 - There shall be no more than 10 call attempts to the same number within any 30 minute period for any single manual call initiation, and
 - The equipment shall go on-hook for a period of not less than 30 seconds between the end of one attempt and the beginning of the next attempt.
 For automatic calls to different numbers:
 - The equipment shall be set to ensure that automatic calls to different numbers are spaced such that there is no less than 5 seconds between the end of one call attempt and the beginning of another.
8. For correct operation, total of the RN's of all devices connected to a single line at any time should not exceed 5.

South African Statement

This modem must be used in conjunction with an approved surge protection device.

Other

The above country-specific examples do not cover all countries with specific regulations; they are included to show you how each country may differ. If you have trouble determining your own country's requirements, check with Multi-Tech's Technical Support for assistance.

Waste Electrical and Electronic Equipment Statement

Note to OEMs: The statement is included for your information and may be used in the documentation of your final product applications.

WEEE Directive

The WEEE directive places an obligation on EU-based manufacturers, distributors, retailers, and importers to take-back electronics products at the end of their useful life. A sister Directive, ROHS (Restriction of Hazardous Substances) complements the WEEE Directive by banning the presence of specific hazardous substances in the products at the design phase. The WEEE Directive covers all Multi-Tech products imported into the EU as of August 13, 2005. EU-based manufacturers, distributors, retailers and importers are obliged to finance the costs of recovery from municipal collection points, reuse, and recycling of specified percentages per the WEEE requirements.

Instructions for Disposal of WEEE by Users in the European Union

The symbol shown below is on the product or on its packaging, which indicates that this product must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of their waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or where you purchased the product.

July, 2005



Restriction of the Use of Hazardous Substances (RoHS)



Multi-Tech Systems, Inc. Certificate of Compliance 2002/95/EC

Multi-Tech Systems Inc. confirms that its embedded products now comply with the chemical concentration limitations set forth in the directive **2002/95/EC** of the European Parliament (Restriction Of the use of certain Hazardous Substances in electrical and electronic equipment - **RoHS**)

These Multi-Tech Systems, Inc. products do not contain the following banned chemicals:

- Lead, [Pb] < 1000 PPM
- Mercury, [Hg] < 1000 PPM
- Hexavalent Chromium, [Cr+6] < 1000 PPM
- Cadmium, [Cd] < 100 PPM
- Polybrominated Biphenyl, [PBB] < 1000 PPM
- Polybrominated Diphenyl Ether, [PBDE] < 1000 PPM

Moisture Sensitivity Level (MSL) =1
Tin Whisker Growth = None detected
Maximum Soldering temperature = 260C (wave only)

Notes:

1. Lead usage in some components is exempted by the following RoHS annex; therefore, higher lead concentration would be found in some modules (>1000ppm).
 - a. Lead in high melting temperature type solders (i.e., tin-lead solder alloys containing more than 85% lead).
 - b. Lead in electronic ceramic parts (e.g., piezoelectronic devices).
2. Moisture Sensitivity Level (MSL) – Analysis is based on the components/material used on the board.
3. Tin Whisker Study was done per NEMI guidelines (Elevated temperature cycle of 60°C and non-condensing relative humidity of 87% exposed to this environment for 1000 hours).

Information on HS/TS Substances According to Chinese Standards

In accordance with China's Administrative Measures on the Control of Pollution Caused by Electronic Information Products (EIP) # 39, also known as China RoHS, the following information is provided regarding the names and concentration levels of Toxic Substances (TS) or Hazardous Substances (HS) which may be contained in Multi-Tech Systems Inc. products relative to the EIP standards set by China's Ministry of Information Industry (MII).

Name of the Component	Hazardous/Toxic Substance/Elements					
	Lead (PB)	Mercury (Hg)	Cadmium (CD)	Hexavalent Chromium (CR6+)	Polybrominated Biphenyl (PBB)	Polybrominated Diphenyl Ether (PBDE)
Printed Circuit Boards	O	O	O	O	O	O
Resistors	X	O	O	O	O	O
Capacitors	X	O	O	O	O	O
Ferrite Beads	O	O	O	O	O	O
Relays/Opticals	O	O	O	O+	O	O
ICs	O	O	O	O	O	O
Diodes/ Transistors	O	O	O	O	O	O
Oscillators and Crystals	X	O	O	O	O	O
Regulator	O	O	O	O	O	O
Voltage Sensor	O	O	O	O	O	O
Transformer	O	O	O	O	O	O
Speaker	O	O	O	O	O	O
Connectors	O	O	O	O	O	O
LEDs	O	O	O	O	O	O
Screws, Nuts, and other Hardware	X	O	O	O	O	O
AC-DC Power Supplies	O	O	O	O	O	O
Software / Documentation CDs	O	O	O	O	O	O
Booklets and Paperwork	O	O	O	O	O	O
Chassis	O	O	O	O	O	O

- X** Represents that the concentration of such hazardous/toxic substance in all the units of homogeneous material of such component is higher than the SJ/Txxx-2006 Requirements for Concentration Limits.
- O** Represents that no such substances are used or that the concentration is within the aforementioned limits.

Information on HS/TS Substances According to Chinese Standards (in Chinese)

依照中国标准的有毒有害物质信息

根据中华人民共和国信息产业部 (MII) 制定的电子信息产品 (EIP)

标准—中华人民共和国《电子信息产品污染控制管理办法》(第 39 号), 也称作中国

RoHS, 下表列出了 Multi-Tech Systems, Inc. 产品中可能含有的有毒物质 (TS) 或有害物质 (HS) 的名称及含量水平方面的信息。

成分名称	有害/有毒物质/元素					
	铅 (PB)	汞 (Hg)	镉 (CD)	六价铬 (CR6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板	○	○	○	○	○	○
电阻器	X	○	○	○	○	○
电容器	X	○	○	○	○	○
铁氧体磁环	○	○	○	○	○	○
继电器/光学部件	○	○	○	○	○	○
IC	○	○	○	○	○	○
二极管/晶体管	○	○	○	○	○	○
振荡器和晶振	X	○	○	○	○	○
调节器	○	○	○	○	○	○
电压传感器	○	○	○	○	○	○
变压器	○	○	○	○	○	○
扬声器	○	○	○	○	○	○
连接器	○	○	○	○	○	○
LED	○	○	○	○	○	○
螺丝、螺母以及其它五金件	X	○	○	○	○	○
交流-直流电源	○	○	○	○	○	○
软件/文档 CD	○	○	○	○	○	○
手册和纸页	○	○	○	○	○	○
底盘	○	○	○	○	○	○

X 表示所有使用类似材料的设备中有害/有毒物质的含量水平高于 SJ/Txxx-2006 限量要求。

○ 表示不含该物质或者该物质的含量水平在上述限量要求之内。

Multi-Tech Warranty Statement

Multi-Tech Systems, Inc., (hereafter “MTS”) warrants that its products will be free from defects in material or workmanship for a period of two, five, or ten years (depending on model) from date of purchase, or if proof of purchase is not provided, two, five, or ten years (depending on model) from date of shipment.

MTS MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by Customer or any party without MTS’s written authorization, or used in any manner inconsistent with MTS’s instructions.

MTS’s entire obligation under this warranty shall be limited (at MTS’s option) to repair or replacement of any products which prove to be defective within the warranty period or, at MTS’s option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS’s factory — transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES, AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PRICE FOR DEFECTIVE PRODUCTS.

Repair Procedures for U.S. and Canadian Customers

In the event that service is required, products may be shipped, freight prepaid, to our Mounds View, Minnesota factory:

Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, MN 55112 U.S.A.
Attn: Repairs, Serial # _____

A Returned Materials Authorization (RMA) is not required. Return shipping charges (surface) will be paid by MTS to destinations in U.S. and Canada.

Please include, inside the shipping box, a description of the problem, a return shipping address (must have street address, not P.O. Box), your telephone number, and if the product is out of warranty, a payment in advance is required. Acceptable means of payment include credit card, wire transfer or a check in U.S. dollars drawn on a U.S. Bank.

For out of warranty repair charges, go to [COMPANY/Policies/warranty/](#)

Extended two-year overnight replacement service agreements are available for selected products. Please call MTS customer service at (888) 288-5470 or visit our web site at [/PARTNERS/Programs/overnight_replacement/](#) for details on rates and coverages.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department at (800) 972-2439 or email support@multitech.com. Please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at (800) 328-9717 or (763) 717-5631, or email mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

Repair Procedures for International Customers (Outside U.S.A. and Canada)

Your original point-of-purchase Reseller may offer the quickest and most economical repair option for your Multi-Tech product. You may also contact any Multi-Tech sales office for information about the nearest distributor or other repair service for your Multi-Tech product. The Multi-Tech sales office directory is available at www.multitech.com/PARTNERS/Channels/offices/

In the event that factory service is required, products may be shipped, freight prepaid to our Mounds View, Minnesota factory. Recommended international shipment methods are via Federal Express, UPS or DHL courier services, or by airmail parcel post; shipments made by any other method will be refused. Please include, inside the shipping box, a description of the problem, a return shipping address (must have street address, not P.O. Box), your telephone number, and if the product is out of warranty, a payment in advance is required. Acceptable means of payment include credit card, wire transfer or a check in U.S. dollars drawn on a U.S. Bank. Repaired units shall be shipped freight collect, unless other arrangements are made in advance.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department nearest you or email support@multitech.com. When calling the U.S., please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at +(763) 717-5631 in the U.S.A., or email mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

Repair Procedures for International Distributors

International distributors should contact their MTS International sales representative for information about the repair of Multi-Tech product(s).

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our International Technical Support department at +(763)717-5863. When calling the U.S., please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at +(763) 717-5631 in the U.S.A. or email mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

Multi-Tech Systems, Inc., (hereafter "MTS") warrants that its products documented in the *Developer Guide* will be free from defects in material or workmanship for a period of two years from date of purchase; or, if proof of purchase is not provided, two years from date of shipment.

MTS MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by Customer or any party without MTS's written authorization, or used in any manner inconsistent with MTS's instructions.

MTS's entire obligation under this warranty shall be limited (at MTS's option) to repair or replacement of any products which prove to be defective within the warranty period or, at MTS's option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS's factory — transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES, AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PRICE FOR DEFECTIVE PRODUCTS.

Chapter 12

SocketWireless[®] Wi-Fi[®]

MT800SWM

Chapter 12 – SocketWireless Wi-Fi (MT800SWM)

Introduction

The SocketWireless Wi-Fi device server connects serial devices to an IP network via 802.11b wireless networking. It enables you to build wireless networking into virtually any device allowing for remote monitoring, control and configuration. The space efficient module (1" x 2.5") integrates a complete TCP/IP protocol stack. It can make your existing and next generation device, machine or system, IP-ready while you focus on developing its core features.

Ordering Information

Product	Description	Region	Order this Product ✓
MT800SWM	802.11b Device Server, 5V	Regional	
MT800SWM-L	802.11b Device Server, 3.3V	Regional	
Developer Kit			
MTSMI-UDK	Universal Developer Kit	Regional	

How to Read the Product Codes in the Table Above:

L 3.3V
UDK Universal Developer Kit

Other Product Codes:

The complete product code will end in **.Rx**. For example, MT800SWM.Rx
"R" indicates product revision. "x" is the revision number.

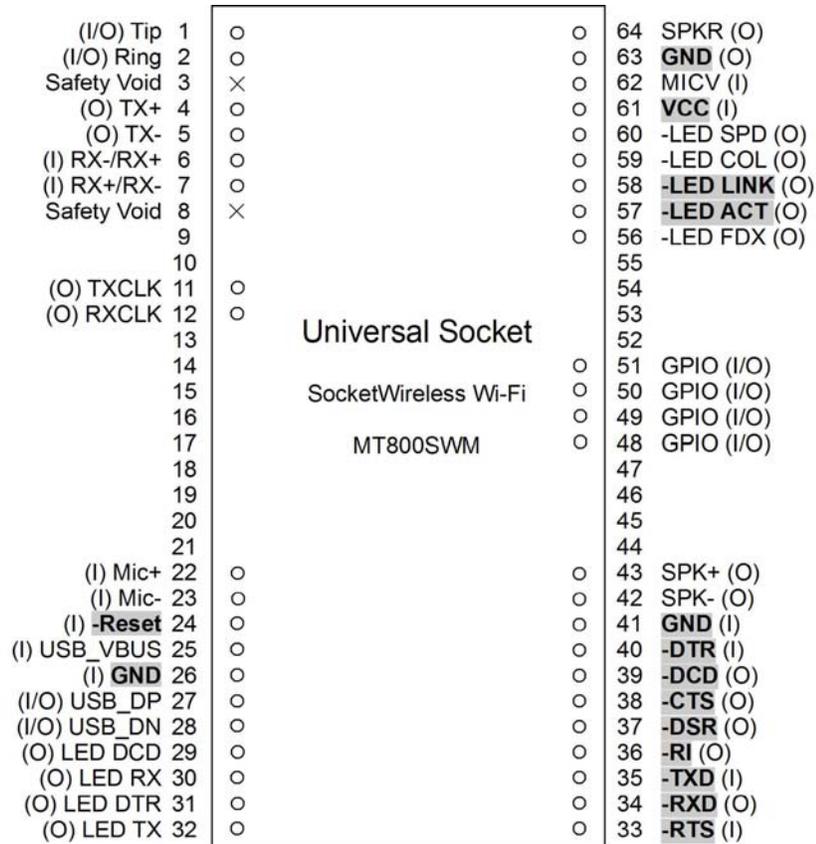
Technical Specifications

The SocketWireless Wi-Fi meets the following specifications:

Category	Description
Standard	Internet Interface: 802.11b
Frequency Range	2.400 to 2.484 GHz
Data Format	Serial, asynchronous, 3.3V
Character Format	8N1
Data Rate	Software selectable: 1200 bps to 230K bps
Antenna Connector	MMCX
Maximum Transmit Power	16 dBm
Receiver Sensitivity	-82 dBm
Dimensions	2.541" L x 1.045" W x 0.512" (6.45 cm x 2.65 cm x 1.30 cm)
Weight	0.6 oz. (0.017 kg.)
Power Consumption	<p>3.3 Volt Inrush current at power-on is 740mA With active Wi-Fi connection, the current draw is 230mA</p> <p>5 Volt Inrush current at power-on is 1.1 amp With active Wi-Fi connection, the current draw is 247mA</p>
Operating Temperature	-30° to +70° C (FCC Certified -20° to +55° C)
Storage Temperature	-40° to +85° C
Humidity	20% to 90% (non-condensing)
Operating Voltage	3.3VDC or 5VDC
Certifications & Approvals	<p>Safety Certifications: UL 60950 cUL 60950 EN 60950 AS/NZS 60950:2000</p> <p>EMC Approvals: FCC Part 15 Subpart C Canada RSS-210 EN 300 328 EN 301 489-17</p>
Intelligent Features	<p>Complete serial-to-Wi-Fi wireless connectivity solution including network processor, media access controller, and air interface</p> <p>Wi-Fi Security using 64/128 bit WEP</p> <p>Supports Ad Hoc and Infrastructure Mode</p> <p>Network Protocols Supported: ARP, DHCP client, FTP client, ICMP (PING), IP, POP3, SMTP client, TCP, UDP</p> <p>Configuration and Management via AT Commands</p> <p>Flash memory to update firmware with the latest enhancements</p>
Warranty	Two years

SocketWireless Wi-Fi Configuration

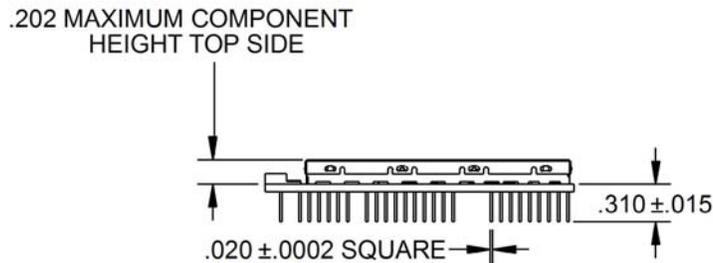
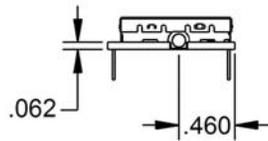
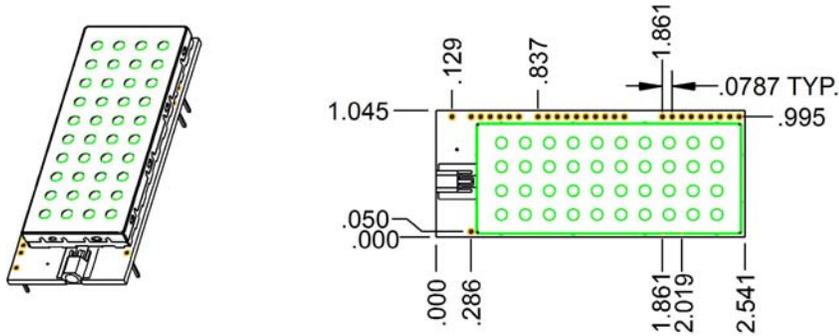
The SocketModem Wi-Fi uses a 15-pin interface that provides an 802.11b wireless network connection to provide a complete serial-to-Wi-Fi connectivity solution.



SocketWireless Wi-Fi Pinout

For pin descriptions, see the *Universal Pinout Descriptions* in Chapter 1.

Mechanical Dimensions



Electrical Characteristics

3.3V Serial

3.3VDC Characteristics ($V_{DD} = 3.3V \pm 0.3V$) $V_{DDMAX} = 3.6V$

Digital Inputs –DTR (40), –TXD (35), –RTS (33), –RESET (24)	Input High Min 2.52V	Input Low Max 0.8V	
Digital Outputs –DCD (39), –CTS (38), –DSR (37), –RI (36), –RXD (34)	Output High Min. 2.3V	Output Low Max 0.4V	Current Drive 2mA
Digital Input Capacitance			5 pF

5V Serial

5VDC Characteristics ($V_{DD} = 5V \pm 0.25V$) $V_{DDMAX} = 5.25V$

Digital Inputs –DTR (40), –TXD (35), –RTS (33), –RESET (24)	Input High Min 2.52V	Input Low Max .0.8V	
Digital Outputs –DCD (39), –CTS (38), –DSR (37), –RI (36), –RXD (34)	Output High Min. 2.3V	Output Low Max 0.4V	Current Drive 2mA
Digital Input Capacitance			5 pF

Note: All digital inputs/outputs are 3.3V only.

Application Notes

RF Interface

Radio Characteristics

Frequency	2402 – 2480MHz
Modulation	DSSS
Number of Channels	1 to 14
Transmission Rate	1, 2, 5.5, 11Mbps
RF Receive Sensitivity	-82dBm typical
RF Transmit Power	16 dBm

Default Power Up Settings

Baud Rate = 115200 bps
Data Bits = 8 bits
Parity = None
Stop bits = 1 bit
Hardware Flow Control RTS/CTS = Disabled

Sources for Peripheral Devices

Antenna Requirements

Frequency Range	2.4-2.5 GHz
Impedance	50 ohm nominal
VSWR	<2.0:1
Gain	5 dBi
Radiation	Omni
Polarization	Vertical
Connector	Reverse Polarity SMA Plug

Antenna Source:

Part Number	Description
RFA-02-5-F7M3	2.4 GHz 5dBi Swi-Reverse-F Antenna

The antenna can be ordered from the following manufacturer:

Aristotle Enterprises <http://www.aristotle.com.tw/>

Antenna Cable

See Chapter 1 for information on the antenna cable and connectors.

Approved Antenna Cable Parts

GC Protronics	20930C
Samtec	ASP-116785-01
Coax Cable	RG-178/U

Regulatory Requirements for the Antenna

This section covers how to use the modular transmitter in order to maintain the modular transmitter approval and RF exposure compliance.

Conditions to Satisfy Modular Transmitter Approval

This device is intended only for use by OEM integrators under the following 3 conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and the end user for all installations.
- 2) The transmitter module may not be co-located with any other transmitter or antenna.
- 3) The communications device is approved using the FCC "unlicensed modular transmitter approval" method. Therefore, the communication device must only be used with the originally approved antennas.

As long as the 3 conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements with this communication device installed (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE: In the event that any of these conditions CANNOT be met (for example certain laptop configurations, co-location with another transmitter, or use of a different type antenna), then the FCC authorization for the communications device is no longer considered valid and the FCC ID CANNOT be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

RF Exposure Statements Developers Must Include in the Their User Manual for Their End Users

The user manual for consumers must include the following information in a prominent location:

IMPORTANT NOTE: To comply with FCC RF safety exposure limits, the antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter."

Regulatory Requirements for End Product Labeling

Suggested End Product Labeling

This transmitter module is authorized only for use in devices where the antenna may be installed in such a way that 20 cm may be maintained between the antenna and the users (for example access points, routers, wireless ASDL modems, and similar equipment). The final end product must be labeled in a visible area on the exterior of the enclosure with the following or similar text: "Contains TX FCC ID: AU792U07B06821".

FCC & IC Information to Consumers

The user manual for the consumer must contain the statements required by the following FCC and IC regulations: 47 C.F.R. 15.19(a)(3), 15.21, 15.101 and RSS-Gen Issue 2 dated June 2007, Sections 7.1.4 and 7.1.5.

Additional Information That Must be Provided to OEM Integrators

The end user should NOT be provided any instructions on how to remove or install the modular transmitter.

