PRO MATE®/PRO MATE® II
DEVICE SUPPORT

NOTES:

PRO MATE/PRO MATE II DEVICE SUPPORT

Table of Contents

NOTES:

Chapter 1. Socket Modules

Introduction

This document lists the part numbers for the socket modules that support each device and discusses the life expectancy and cleaning procedures for the different socket types. These sockets work on both PRO MATE and PRO MATE II.

Note: The information listed in this document is current as of this printing. If you are using a device not listed, refer to the PRO MATE README.PRO file located on the MPLAB distribution diskette for the latest socket module information.

For socket modules with 2 sets of screws, the longer screws are for PRO MATE, the shorter screws are for PRO MATE II.

Highlights

This document contains the following information:

- Currently supported devices and socket modules
- Socket Contact Cleaning Procedures

Currently Supported Devices and Socket Modules

The following table lists the part numbers for the socket modules that support each device.

Model Name/ Device #	Pin Count	DIP	SOIC	SSOP	PLCC	MQFP	TQFP
24CXX24LCXX	8	AC004001	AC004002				
93CXX/93LCXX	8	AC004001	AC004002				
HCS200	8	AC004001	AC004002				
HCS300	8	AC004001	AC004002				
HCS301	8	AC004001	AC004002				
HCS360	8	AC004001	AC004002				
HCS361	8	AC004001	AC004002				
HCS500	8						
HCS509	8						
HCS512	8						
PIC12C508	8	AC124001	AC124001				

Note: When using a 28-pin device in a 40-pin socket, align pin 1 to the pin 1 indicator (socket is top justified). Shaded area indicates not applicable.

PRO MATE/PRO MATE II DEVICE SUPPORT

Model Name/ Device #	Pin Count	DIP	SOIC	SSOP	PLCC	MQFP	TQFP
PIC12C509	8	AC124001	AC124001				
PIC14C000	28	AC144001	AC144002	AC144002			
PIC16C52	18/20	AC164001	AC164002	AC164015			
PIC16C54	18/20	AC164001	AC164002	AC164015			
PIC16C54A	18/20	AC164001	AC164002	AC164015			
PIC16C55	28	AC164001	AC164002	AC164015			
PIC16C554	18/20	AC164010	AC164010	AC164018			
PIC16C558	18/20	AC164010	AC164010	AC164018			
PIC16C56	18/20	AC164001	AC164002	AC164015			
PIC16C57	28	AC164001	AC164002	AC164015			
PIC16C58A	18/20	AC164001	AC164002	AC164015			
PIC16C61	18	AC164010	AC164010				
PIC16C620	18/20	AC164010	AC164010	AC164018			
PIC16C621	18/20	AC164010	AC164010	AC164018			
PIC16C622	18/20	AC164010	AC164010	AC164018			
PIC16C62A	28	AC164012	AC164017	AC164021			
PIC16C63	28	AC164012*	AC164017	AC164021			
PIC16C642	28	AC164012	AC164017				
PIC16C64A	40/44	AC164012			AC164013	AC164014	AC164020
PIC16C65A	40/44	AC164012			AC164013	AC164014	AC164020
PIC16C65A	40/44	AC164012			AC164013	AC164014	AC164020
PIC16C66	28	AC164012	AC164017	AC164021			
PIC16C662	40/44	AC164012			AC164013	AC164014	AC164020
PIC16C67	40/44	AC164012			AC164013	AC164014	AC164020
PIC16C71	18	AC164010	AC164010				
PIC16C710	18	AC164010	AC164010	AC164018			
PIC16C711	18	AC164010	AC164010	AC164018			
PIC16C715	18	AC164010	AC164010	AC164018			
PIC16C72	28	AC164012	AC164017	AC164021			
PIC16C73A	28	AC164012	AC164017				
PIC16C74A	40/44	AC164012			AC164013	AC164014	AC164020
PIC16C76	28	AC164012	AC164017	AC164021			
PIC16C77	40/44	AC164012			AC164013	AC164014	AC164020
PIC16C923	64/68	AC164025			AC164022		AC164023

Note: When using a 28-pin device in a 40-pin socket, align pin 1 to the pin 1 indicator (socket is top justified). Shaded area indicates not applicable.

Model Name/ Device #	Pin Count	DIP	SOIC	SSOP	PLCC	MQFP	TQFP
PIC16C924	64/68	AC164025			AC164022		AC164023
PIC16F83	18	AC164010	AC164010				
PIC16F84	18	AC164010	AC164010				
PIC17C42A	40/44	AC174001			AC174002	AC174004	AC174005
PIC17C43	40/44	AC174001			AC174002	AC174004	AC174005
PIC17C44	40/44	AC174001			AC174002	AC174004	AC174005
PIC17C756	68/64	AC174009			AC174007		AC174008

Note: When using a 28-pin device in a 40-pin socket, align pin 1 to the pin 1 indicator (socket is top justified). Shaded area indicates not applicable.

The following table defines the acronyms for the microcontroller device packages.

Device Package Names:

DIP	Dual Inline Package	MQFP	Metric Quad Flat Pack
SOIC	Small Outline Integrated Circuit	ZIF	Zero Insertion Force
SSOP	Shrink Small Outline Package	TQFP	Thin Quad Flat Pack
PLCC	Plastic Leaded Chip Carrier		

Socket Life Expectancy and Cleaning Procedures

Microchip uses socket types from manufacturers including: Aries, AMP, 3M Textool, and Yamaichi. Each socket module has different cleaning and insertion times. Look at the socket module to determine the name of the manufacturer. The Yamaichi socket is not labeled; identify a Yamaichi socket by looking for the letters IC51- (as the prefix to a part number) on the socket.

Socket Life Expectancy

The expected life for manual insertions has been found to be less than the manufacturer's reported number. The number of manual insertions depends on the socket condition and how often the socket is cleaned.

The following table gives the expected life (in number of automatic insertions) for each socket module as reported by the manufacturer. The expected life of a socket module is normally listed as the number of automatic insertions.

Careless insertions or dirty socket conditions can bring the number of insertions down to less than 5,000. Cleanliness and care in inserting devices into a socket are most important with surface mount devices as the socket contactors must remain planar to function properly.

Any bent or non-planar contacts will result in a failure. Non-planar socket module contacts occur earlier in the life of a socket module when devices are inserted manually into a socket module. Early contact failure from manual insertions is due to the non-repeatability of the manual insertion method.

Therefore, the listed number of insertions may not be reached for sockets where devices are inserted manually. No good method exists to ensure that the contacts are planar.

Table 1: Socket Life Expectancy and Cleaning Method

Manufacturer	Insertions	Cleaning
Aries(28 pin)	10,000	Not Recommended
AMP (18 pin)	25,000	Not Recommended
3M Textool	10,000	Methyl Alcohol
AMP (Dip)	25,000	Not Recommended
3M Textool(SOIC)	10,000	Methyl Alcohol
Aries	10,000	Not Recommended
Yamaichi	25,000	Methyl Alcohol

Socket Contact Cleaning Procedure

Methyl Alcohol:

Clean with methyl alcohol, and then blow off the contacts with dry compressed air.

WARNING: ***Methyl alcohol is highly flammable. Use methyl alcohol in a well ventilated area away from sparks, flames, or any other source of ignition.***

Methyl alcohol is poisonous and may cause blindness if taken internally. Avoid inhaling methyl alcohol vapor.

Not Recommended

There is no cleaning procedure for this socket type. If contacts get extremely contaminated, replace the socket module.

Chapter 2. Programming KEELOQ Encoders

Programming of KEELOQ Encoders requires 4 steps.

(1) Select the encoder

(2) Enter the manufacturer's code

(3) Select the decoder

(4) Select the encoder options.

A KEELOQ encoder can be selected as you would any other device supported by PRO MATE.

Figure 2.1 – Programmer Status Dialog

The next step is to click on the Program button. The user will then be prompted for two 20-bit custodian keys. These are combined to form the manufacturer's key. The manufacturer's key is used in key generation as described further in the document.

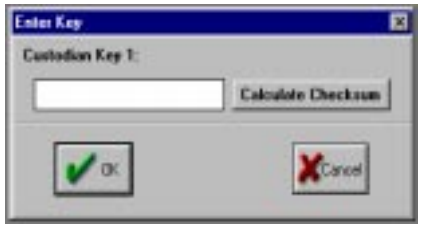

Figure 2.2 – Custodian Key Dialog

The appropriate dialog for the selected device will be displayed. The user should then select a decoder. Some of the decoders have multiple key generation methods. If the selected decoder has different key generation options the user will be prompted to select these options at this time. After this the user should select the encoder options as desired. These options are described further in the document. Programming can now begin. As seen in the different data sheets there are a multitude of interdependent options available to the user. These options are automatically set by the software to allow the encoder to be compatible with the selected decoder.

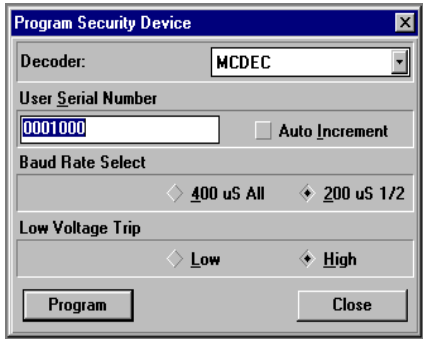

Figure 2.3 – HSC200 Dialog

Key Generation

The key generation options and process is described in detail in the Tech Brief “Secure Learning RKE Systems Using KEELOQ Encoders,” document number DS40144. A summary is given below.

KEELOQ encoder transmissions have 2 parts. The unencrypted portion consists of the encoder’s serial number and other status bits such as button status. The second portion (HOP code) is encrypted and contains information such as the synchronization counter, counter overflow bits and discrimination values.

Every KEELOQ encoder has it’s own encryption and decryption key pair. Key generation has 3 parts as shown in Figure 4 below. The first part, the manufacturer’s code, is an input to the key generation algorithm. The manufacturer’s code (64 bits) customizes the key generation algorithm to a specific manufacturer. This means that if two manufacturers use the same algorithm, and same source (e.g. serial number of 123) the key pairs generated will be different. The encoders produced by one manufacturer won’t be learnable on decoders produced by a second manufacturer and prevents the cloning of transmitters by competitors. The second part is also an input to the key generation algorithm. This second part is called the Source of the key generation. This can either be the encoder’s serial number or the encoder’s seed. The third part of key generation is the key generation algorithm.

The algorithm and source are automatically selected when the user selects a decoder as shown in Figure 4. If, as in the HCS512, the key generation source or algorithm can be changed the user will be shown the options when the decoder is selected. This allows the user to select the key generation method being used in the system.

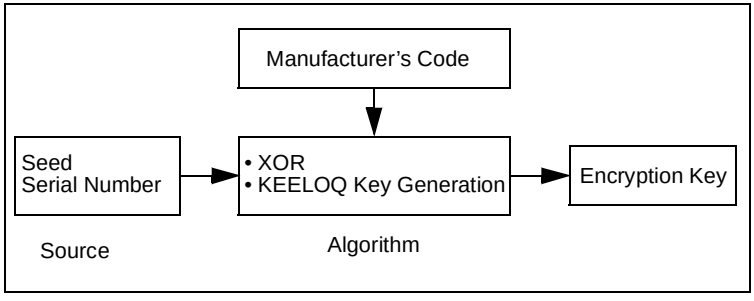

Figure 2.4 – KEELOQ Key Generation

Manufacturer's Code

When an HCS product is selected as the device to be programmed by the PRO MATE programmer, the 'Enter Key' dialog box is displayed when 'Program' is pressed. As mentioned in the previous paragraph the manufacturer's code is very important to prevent cloning of transmitters and should be carefully guarded. To ensure that the manufacturer's code remains secret two trusted people, key custodians, should be given a 20-digit number each. This prevents the entire manufacturer's code being entrusted to a single person. The two custodian keys are XORed to form the manufacturer's code.

Entering the Manufacturer's Code

Each of two key custodians are required to enter their custodian key an HCS part is first selected. The two custodian keys, if entered correctly, are used to generate the manufacturer's code. The first 16 digits entered by each custodian are used to generate the manufacturer's code and the last 4 digits are a checksum which prevent the custodian entering an incorrect manufacturer's code as this directly influences the encryption keys generated. If the checksum entered does not match the key entered, the custodian will be asked to re-enter the key.

It is only possible to enter the manufacturer's code once during each session, when Program is first selected. This prevents the manufacturer's code being inadvertently changed during a programming session.

Calculating Custodian Key Checksum

The user should enter the 16-digit portion used to calculate the manufacturer's code and press the 'Calculate Checksum' button. This will allow the program to generate a checksum for the user. The checksum will be calculated and the complete 20-digit custodian key displayed on the screen. The key should be written down and stored securely.

Changing the Manufacturer's Code

It is possible that a manufacturer would like to have different manufacturer's codes for different product lines. It is not possible to change the manufacturer's code during a programming session. This prevents the manufacturer's code being inadvertently changed during a programming session.

If the user needs to change the manufacturer's code he should exit PRO MATE, and enter the new manufacturer's code when the program is restarted.

Key Generation Source and Algorithms

The key generation source and algorithms are selected when the user selects a decoder. The souce and algorithm selected for each decoder is given in the table below.

Decoder	Source		Algorithm	
	Serial Number	Seed	Decryption	Algorithm
SIMDEC*	No key generation. The simple decoder uses the manufacturer's code			
MCDEC*	X		X	
MCSLRN*		X	X	X
HCS512	X	X	X	X

Table 2.1: KEELOQ Decoder Key Generation Methods

*The MCDEC, MCSLRN and SIMDEC decoders are software decoders. These decoders have been written as a 'quick start' to a customer who would like to write a custom decoder. The source code for the decoders and application note describing each of the decoders is available by ordering DS40149 from your local Microchip representative.

HCS200 Options

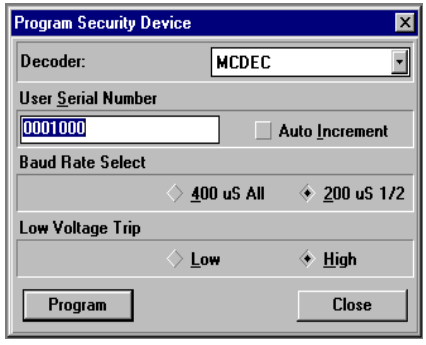

Figure 2.5 – HSC200 Dialog

Option	Description
Serial Number	The encoder's 28-bit (7-hex digits) serial number should be entered here. See Note 1.
Baud Rate Select	400us All: Basic Pulse Width (BPW) of 400 µs with all the code words transmitted. 200us 1/2: BPW of 200 µs and one in two code words transmitted.
Low Voltage Trip	Low: VLOW bit in transmission set at V_{DD}=4V. High: VLOW bit in transmission set at V_{DD}=8V.

Note: If the Auto Increment check box is selected the serial number and/or user seed will be automatically incremented when an encoder is successfully programmed.

HCS200 Options Automatically Set

Option	Set to:
SEED	The 32-bit SEED is a randomly generated number.
EN_KEY	The 16-bit envelope key is set to 0000 and envelope encryption is disabled in the configuration word.
Discrimination Bits	The discrimination bits in the configuration word are set to mirror the 12 least significant bits of the serial number
EENC	Envelope Encryption Select bit in the configuration word is automatically cleared as none of the decoders currently support envelope encryption.

HCS300/301 Option

Figure 2.6 – HSC300 Dialog

Option	Description
Serial Number	The encoder's 28-bit (7-hex digits) serial number should be entered here. See Note.
Counter Overflow	None: None of the overflow bits are set. Once: One of the overflow bits are set. Twice: Both overflow bits are set.
Low Voltage Trip	Low: VLOW bit in transmission set when V_{DD}=3.5V (HCS300) and V_{DD}=8V (HCS301). High: VLOW bit in transmission set when V_{DD}=2.2V (HCS300) and V_{DD}=3.5V (HCS301).
Baud Rate Select	400us All: Basic Pulse Width (BPW) of 400 µs with all the code words transmitted. 200us 1/2: BPW of 200 µs and one in two code words transmitted. 100us 1/2: BPW of 100 µs and one in two code words transmitted. 100us 1/4: BPW of 100 µs and one in four code words transmitted.
Auto-shutoff Timer	The automatic shutoff can be enabled preventing the battery of a transmitter going flat if the transmitter is accidentally pressed in a pocket or purse.

Note: If the Auto Increment check box is selected the serial number and/or user seed will be automatically incremented when an encoder is successfully programmed.

HCS300 Options Automatically Set

Option	Set to:
SEED	The 32-bit SEED is a randomly generated number.
EN_KEY	The 16-bit envelope key is set to 0000 and envelope encryption is disabled in the configuration word.
Discrimination Bits	The discrimination bits in the configuration word are set to mirror the 12 least significant bits of the serial number.
EENC	Envelope Encryption Select bit in the configuration word is automatically cleared as none of the decoders currently support envelope encryption.

HCS360 Options

Figure 2.7 – HSC360 Dialog

Option	Description
Serial Number	The encoder's 32-bit (8-hex digits) serial number should be entered here. See Note.
Modulation Format	If this is enabled the transmitted string is Manchester modulated, if the option is not enabled Pulse Width Modulation (PWM) is used.
Baud Rate Select	See Table Below.
Code Word Blanking	Every alternate code word can be blanked out thereby increasing the amount of power transmitted per transmission if needed.
Delayed Mode	If this is enabled the encoder will transmit a delayed transmission after a time, see the data sheet for more details.
Auto Shutoff Timer	If this bit is enabled the encoder will automatically shutoff after about a time (dependent on the transmission speed) preventing the battery of a transmitter going flat if the transmitter is accidentally pressed in a pocket or handbag.
Counter Overflow	If this is enabled the overflow bit will be set.

Note: If the Auto Increment check box is selected the serial number and/or user seed will be automatically incremented when an encoder is successfully programmed.

HCS360 Options Automatically Set

Option	Set to:
SYNC_A	Counter set to 0
SEED_0, SEED_1, SEED2	The 48 bit SEED is a randomly generated number.
SEED	The SEED bit in the configuration word is set if a decoder that uses secure learn is selected.
IND	The IND bit in the configuration word always cleared disabling independent mode.
USRA0, USRA1	The USRA bits in the configuration words are set equal to the serial number bits 9 and 10 extending the discriminator to 10 bits.
USRB0, USRB1	The USRB bits in the configuration word are set to 00.
XSER	The XSER bit in the configuration word is always set to 00.
TMPSD	The TMPSD bit in the configuration word is always set to 0.

Transmission Speed Options

Option	PWM, used when 'Enable Manch…' is cleared	Manchester Transmissions, used when 'Enable Manch…' is set
400 800	400 µs Basic Pulse Width (BPW)	800 µs BPW.
200 400-Long Timeout	200 µs BPW with a time-out value of about 30s if time-out is enabled.	400 µs BPW with a time-out value of about 60s if time-out is enabled.
200 400-Short Timeout	200 µs BPW with a time-out value of about 15s if time-out is enabled.	400 µs BPW with a time-out value of about 20s if time-out is enabled.
100 200	100 µs BPW.	200 µs BPW.

HCS361 Options

Figure 2.8 – HSC361 Dialog

Option	Description
Serial Number	The encoder's 32-bit (8-hex digits) serial number should be entered here. See Note.
Modulation Format	This selects between PWM and VPWM modulation of data.
Transmission Format	If this option is enabled and Enable Variable Pulse width modulation is cleared a 1/6;2/6 transmission format is used, otherwise a wakeup pulse train is transmitted before the first transmission.
Baud Rate Select	Slow: Basic pulse width of 400 µs Fast: Basic pulse width is 200 µs
Code Word Blanking	Every alternate code word can be blanked out thereby increasing the amount of power transmitted per transmission if needed.
Delayed Mode	If this is enabled, the encoder will transmit a delayed seed transmission after about 3 seconds. See the data sheet for more details.

Option	Description
Auto Shutoff Timer	If this bit is enabled, the encoder will automatically shutoff after a time (dependent on the transmission speed) preventing the battery of a transmitter going flat if the transmitter is accidentally pressed in a pocket or handbag.
Counter Overflow	If this is enabled the overflow bit will be set.

Note: If the Auto Increment check box is selected the serial number and/or user seed will be automatically incremented when an encoder is successfully programmed.

HCS361 Options Automatically Set

Option	Set to:
SYNC_A	Counter set to 0
SEED_0, SEED_1, SEED2	The 48 bit SEED is a randomly generated number.
SPM	The SPM bit in the configuration word is always set to 1.
SEED	The SEED bit in the configuration word is set if a decoder that uses secure learn is selected.
IND	The IND bit in the configuration word always cleared disabling independent mode.
USRA0, USRA1	The USRA bits in the configuration words are set equal to the serial number bits 9 and 10 extending the discriminator to 10 bits.
USRB0, USRB1	The USRB bits in the configuration word are set to 00.
XSER	The XSER bit in the configuration word is always set to 00.
TMPSD	The TMPSD bit in the configuration word is always set to 0.

Chapter 3. Programming Microchip Memory Parts

Programming Microchip Memory Parts

PRO MATE supports many of Microchip's Memory devices, specifically the 24 and 93 series Serial EEPROMs.

The data displayed in the Program Memory window will be in by-16 for those parts that support a by-16 mode, and by-8 for those devices that only support by-8. The HEX file format is standard INHX8M format for either the by-8 or by-16 devices.

Device selection is done via the Programmer Status Dialog interface. Once a device is selected, there may be additional selections for the *Smart Serial*™ devices. These additional options allow the user to select the High Endurance Block, the Write Protect Starting Block and the Number of Write Protect Blocks.

All programming/verifying is done at 5 volts V_{DD}, and the user can perform the standard functions, Read, Blank Check, Programming, and Verification.

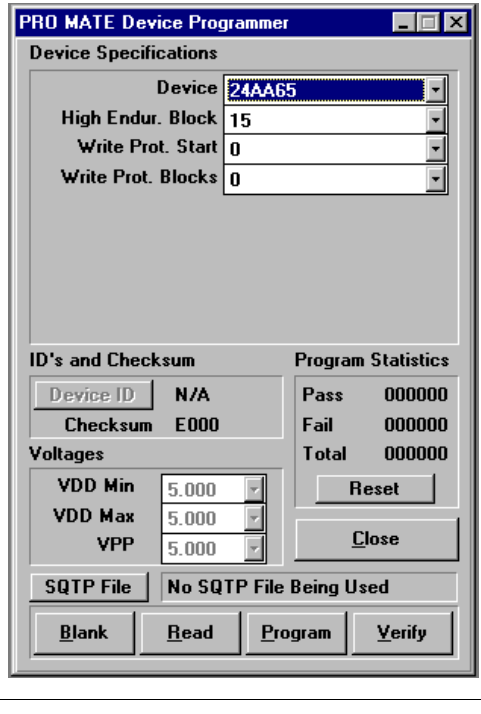

Figure 8: Programmer Status Dialog for Smart Serial EEPROMs

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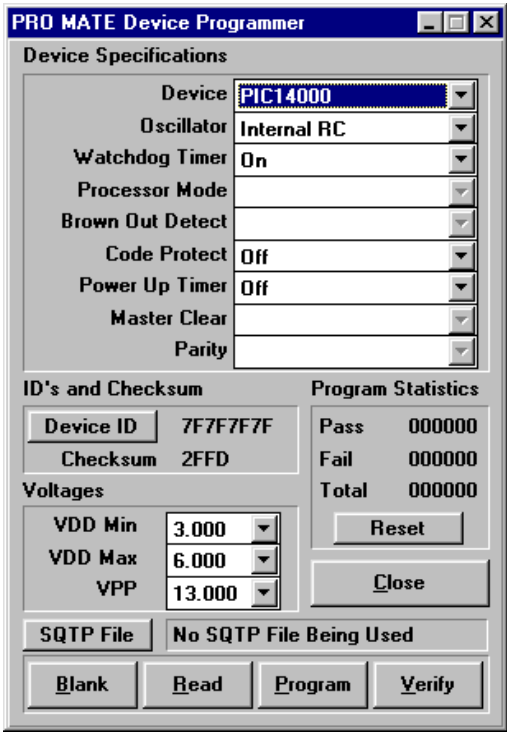
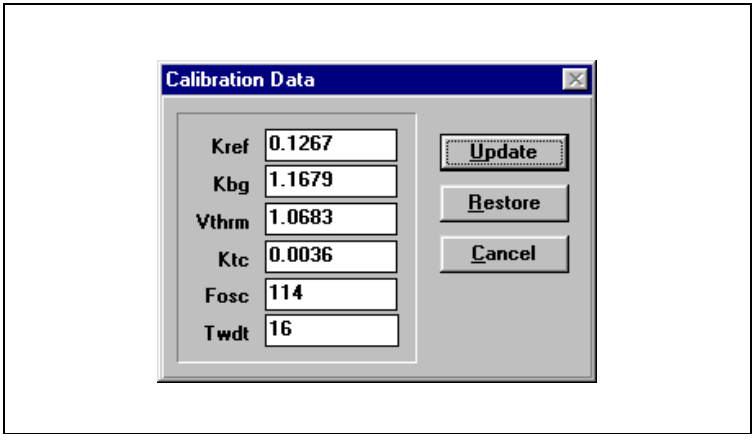
Chapter 4. PIC14C000 Support

PIC14C000 Support

Configuration bits and program memory are the same as any other high end PIC. The calibration data is displayed in a separate window by selecting *Window > Calibration Data.*

On windowed devices, the calibration data should be read out of the device and stored in a file prior to first use. Once saved, calibration files may be loaded using the IMPORT command on the FILE menu.





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Благодаря развитой сети поставщиков, помогаем в поиске и приобретении экзотичных или снятых с производства компонентов.

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