Application Note #155:

@T® Command Set Description and Usage for CH2124/60 iModem Products

INTRODUCTION

Cermetek has created a set of **@T®** command extensions for control of the internet communication function. These commands operate in the same fashion as the industry standard Hayes AT commands. This common command syntax allows users familiar with the Hayes AT command set to quickly adapt to the **@T®** command extensions.

Application Note 155 describes the allowed syntax for all **@T®** command. Refer to Application Note # 156, CH2124/60 iModem Default Configuration Profile, for a complete description of the default configuration parameters.

@T® COMMAND SET

Description of @T® Command Set. The allowed **@T®** commands are summarized in Attachment I of this application note. Most **@T®** commands have a query function associated with the command. The allowed query commands are summarized in Attachment II.

IMPORTANT NOTE

AS DELIVERED FROM THE FACTORY, All **@T®** Commands sent from the host (DTE) must be sent at **57600bps**, **N81** (no parity, 8 data bits and 1 stop bit) for CH2160 products and **2400bps**, **N81** for CH2124 products. Although the **@TK10** command allows the DTE communication speed of the CH2160 iModem devices to be changed, the user must ensure that the DTE communication speed selected is actually supported by the DTE. Failure to due so could adversely affect communication with the iModem device or, worst case, inadvertently disable communication with the iModem device.

The iModem requires all commands to be issued in serial fashion. Only one **@T®** command is allowed per line.

@T® Command Syntax. The **@T®** command syntax is identical to the industry standard Hayes AT command syntax. For the purposes of this document, the following conventions will be observed:

<CR> is used to denote carriage return (equivalent to HEX 0D).
<LF> is used to denote line feed (equivalent to HEX 0A).
Enter: is used to denote the command string to be sent to the iModem.
Result: is used to denote the response sent (or action taken) by the iModem.

Any information listed in bold is a required portion of the command string. Brackets [] not in bold are intended to serve as delimiters only and are not part of the required command string. All embedded spaces are ignored except in the data field.

Each command line has the following format:

@T[**command**][**=data field**]**<CR>**

Where: **@T®** is the iModem command attention sequence. Upper or lower case **T** is acceptable.
[**command**] is the specific command. Upper or lower case characters are acceptable.
[**=data field**] is the data field. Any ASCII character is acceptable (including blank spaces). The **=** sign must precede the information entered in the data field (except for the case query commands). Use **?** in the data field for the case of query commands. An **=** sign is not required for queries.
<CR><LF> is the termination sequence for all commands except for the **@TM1** command as indicated below.
@T[**M1**][**=data field**]**<CR><LF>.<CR><LF>**.

DISCUSSION OF iMODEM SEND MESSAGE CAPABILITY

Email Message Types. The CH2124/60 iModem family of products supports has two basic types of email messages: the User Defined message and the Input Port Status message. These are described below.

Input Port Status: The ASCII character configuration of the body of the Input Port Status email message is not user modifiable. However, the input port status reported can be changed at will by the user by changing the voltage applied to the input ports. The port voltage is reported in the message body as either HIGH or LOW.

User Defined: With the User Defined email message, the ASCII character configuration of the message body is user modifiable. However, the input port status cannot be reported in this message type.

Email Message Send Commands. The iModem command set contains two commands for sending email messages. These commands are **@TD** and **@TDM1**, and are described below.

@TD Command: The **@TD** command only sends the Input Port Status email message.

@TDM1 Command: The **@TDM1** command only sends the User Defined email message. The ASCII character configuration of the email message body sent by the **@TDM1** command is limited to 125 ASCII characters. The iModem will automatically terminate data entry when the maximum message length is reached. Each occurrence of spaces, **<CR>** and **<LF>** counts as 1 ASCII character. The **@TDM1** command DOES NOT report the input port status.

IMPORTANT NOTE

The iModem family of products allows a maximum total message length of 125 ASCII characters including all spaces, **<CR>** and **<LF>.**

The **@TM1** command is used to construct the user definable email message sent with the **@TDM1** command. The **@TM1** command will accept any ASCII character (including blanks, spaces, **<CR>** and **<LF>**) in the data field. Note that the termination sequence for the **@TM1** command is **<CR><LF>.<CR><LF>** and not **<CR><LF>**. Strictly speaking, **<CR>.<CR>** is an acceptable termination sequence but is not very practical when using terminal emulation software because the **ENTER** key automatically inserts a **<CR><LF>** sequence.

Email Message Subject Line. Regardless of the type of email message, the user has the ability to define the content of the subject line associated with the email message. The **@TS1** command is used to set the content of the subject line. The subject line is limited to 16 ASCII characters. Blanks or spaces are allowed and each occurrence counts as 1 character. Note that currently the same subject line is used for both email messages.

Refer to Cermetek Application Note #158, Cermetek iModem Caveats and Definitions, for a summary of iModem conditions and requirements.

The SEND PIN (Pin # 6). The CH2124/60 iModem is delivered from the factory with the User Defined message as the default message sent when the SEND PIN (Pin # 6) is activated.

For iModem Firmware Revisions before 1.262, executing the **@TJ0** will cause the Input Port Status message to be sent when the SEND PIN is activated. Executing the **@TJ1** command will cause the User Defined email message to be sent when the SEND PIN is activated.

For iModem Firmware Revisions 1.262 and greater, the **@TJn** command has been replaced with the **K8** parameter. Executing **@TK8=30** will cause the Input Port Status message to be sent when the SEND PIN is activated. Executing the **@TK8=31** command will cause the User Defined email message to be sent when the SEND PIN is activated.

Refer to Cermetek Application Note #158, Cermetek iModem Caveats and Definitions, for a summary of iModem conditions and requirements.

IMPORTANT NOTE

For iModem Firmware Revisions 1.262 and greater:

1. The **@TDM1** command always sends the User Defined email message.
2. The **@TD** command always sends the Input Port Status email message.
3. Executing the **@TK8=30** parameter command will cause the Input Port Status message to be sent when the SEND PIN (Pin # 6) is activated.
4. Executing the **@TK8=31** parameter command will cause the User Defined email message to be sent when the SEND PIN (Pin # 6) is activated.

DISCUSSION OF iMODEM RETRIEVE MESSAGE CAPABILITY

Unlike the send email SMTP server, the retrieve email POP3 server needs to know the number of the message the user wishes to retrieve. This number is specified as **n** in the **@TDGn** retrieve email command.

The **@TDGn** command directs the iModem to connect to the internet, retrieve email message number **n** and then terminate the internet connection when the message has been retrieved. Currently, the iModem will accept email message numbers from 1 to 99 (inclusive). The following iModem ISP parameters are utilized to uniquely identify the email message to be retrieved:

1. The ISP login name as specified by the **@TL1** command.
2. The POP3 login name as specified by the **@TLM** command.
3. The EMAIL FROM internet account as specified by the **@TE1** parameter.
4. The POP3 server as specified by the **@TOP1** parameter.

The **@TDGn** command reports the total number of email messages available on the POP3 server as well as retrieves the contents of email message **n**. **@TDGn** will retrieve only one message per command issuance. After the specified email has been retrieved, the iModem terminates the internet connection. Additional emails must be retrieved by issuing additional **@TDGn** commands.

If the POP3 server cannot find email message **n**, **@TDGn** still reports the total number of messages present on the POP3 server BUT does not retrieve the contents of any of the existing emails.

The POP3 server orders the existing emails beginning with integer number 1 and proceeds in ascending numerical order. New emails received are added starting with the next available number. Integer numbers ARE NOT skipped. When an email message is deleted, POP3 renumbers all subsequent emails downward to use the newly available email message number.

Refer to Cermetek Application Note #158, Cermetek iModem Caveats and Definitions, for a summary of iModem conditions and requirements.

DISCUSSION OF iMODEM DELETE MESSAGE CAPABILITY

Just as for the case of retrieve email, the email POP3 server needs to know the number of the message the user wishes to delete. This number is specified as **n** in the **@TDKn** delete email command.

The **@TDKn** command directs the iModem to connect to the internet, delete email message number **n** and then terminate the internet connection when the message has been deleted. Currently, the iModem will accept email message numbers from 1 to 99 (inclusive). The following iModem ISP parameters are utilized to uniquely identify the email message to be deleted:

1. The ISP login name as specified by the **@TL1** command.
2. The POP3 login name as specified by the **@TLM** command.
3. The EMAIL FROM internet account as specified by the **@TE1** parameter.
4. The POP3 server as specified by the **@TOP1** parameter.

Like the **@TDGn** command, the **@TDKn** command reports the total number of email messages available on the POP3 server as well as deleting email message **n**. The number of email messages is reported BEFORE email message **n** is deleted. **@TDKn** command can delete a single message, a range of messages or all messages. After the specified messages have been deleted, the iModem terminates the internet connection. Additional emails must be deleted by issuing additional **@TDKn** commands.

Refer to Cermetek Application Note #158, Cermetek iModem Caveats and Definitions, for a summary of iModem conditions and requirements.

DISCUSSION OF iMODEM QUERY CAPABILITY

Most **@T®** commands have query options that allow the user to review the current status of the configuration profile. Refer to Attachment II for a summary of the allowed query commands.

iMODEM @T® Result Messages. In addition to the standard **AT** command result codes and messages, there are several result messages associated strictly with iModem **@T®** command execution. The available iModem **@T®** result messages are summarized in Attachment III.

DISCUSSION OF REMOTE DIAL-UP ACCESS CAPABILITY

Firmware Revision 1.293 and greater support the Remote Dial-up Access feature. With this feature, users may access iModem devices by direct dialing the iModem's PSTN phone number. Remote dial-up addresses the need to update the ISP parameters, for example, or to change the email message after the iModem system has been placed into service.

Access is controlled with a user definable password. Once accessed in this manner, the user may issue various **@T** commands or place the iModem in modem mode. Refer to Application Note # 152, CH2124/60 Remote Dial-up Access.

IMPORTANT NOTE

The Remote Dial-up Access feature must be used with extreme care. The user is cautioned that **@T** commands issued while in Remote Dial-up Access mode will behave in the same manner as **@T** commands issued when communicating via the RS232 serial port. Consequently, any **@T** commands issued by the user that modify parameters stored in the iModem will change these parameters permanently until subsequent modification. The user must take special precautions so as not to disable desired features or functions, or to inadvertently modify parameters that control access (such as passwords).

DISCUSSION OF iMODEM DEFAULT PROFILE

iModem Default Configuration. The CH2124/60 iModem is delivered with a default configuration profile that will allow transmission of emails "right out of the box." Application Note # 156, CH2124/60 iModem Default Configuration Profile, explains in detail each of the default configuration parameters.

The default configuration is provided as a convenience to Cermetek's iModem customers and it enables the user to demonstrate proper operation of the iModem without the need for additional personalization or customization of the iModem ISP parameters.

The factory installed default configuration can be modified by the user as desired. For those not familiar with the CH2124/60 iModem, however, Cermetek recommends a phased strategy starting with simple tasks and building to more elaborate personalized/customized emails.

The iModem default destination email address is **<username@userdomian.com>**. Where **username** is the user supplied email box name and **userdomain** is the user specified domain name.

The following configuration profile information is preprogrammed into the iModem:

1. ISP account ID and password.
2. Local user dial-up ISP (Internet Service Provider's) access phone number.
3. Email destination address.
4. Email subject line.
5. Email message.

For a complete description of the default configuration profile, refer to Application Note # 156. Refer to Cermetek Application Notes #149, 157, 158, 159 and 160 for detailed discussions and examples covering a range of topics including: terminal emulation program setup, ISP configuration profile modifications, send email and retrieve email.

Changing the Default Internet Configuration Profile. The iModem automatically saves all (except as noted below) configuration profile modifications invoked by the **@T®** commands to internal flash memory when the command is executed. These modifications constitute a permanent change to the user profile and will not be lost when power is removed.

IMPORTANT NOTE

For the case of user definable email messages (i.e., messages sent using the **@TDM1** command), the **@TM1** must be the last ISP parameter modification command executed prior to executing the **@TDM1** the command. This means the **@TM1** must be executed after the **@TA1**, **@TE1, @TS1** and **@TU1** commands. This programming sequence is necessary because the **@TM1** command causes the iModem to compose the entire message and then store the complete message (including headers) into flash memory prior to initiating ISP dialup. It is the stored message that is transmitted. Failure to do this will cause unpredictable results.

The **@TM1** command execution requirements DO NOT apply for the case of Input Port Status email messages (i.e., messages sent using the **@TD** command).

TELECOMMUNICATIONS SOFTWARE

When using commercial telecommunications software packages to program the iModem, the user must be careful NOT to attempt to use character editing unless the software package specifically indicates that editing is supported.

If character editing is not supported, using the backspace key to perform character editing will cause the backspace character (HEX 08) to be included in the data stream. Unfortunately, the user may be lead to believe that character editing is allowed because the cursor will backspace when the backspace key is depressed. However, the terminal emulation program is simply reacting to the HEX 08 character. In this case, the HEX 08 character will become part of the data stream and will cause considerable debugging headaches.

@T® Command Data Entry. Terminal emulation software packages HyperTerminal and PROCOMM DO NOT support editing. DO NOT use the backspace character (HEX 08) to edit during data entry. Use either **<CR>** or **<CR><LF>.<CR><LF>**, as appropriate, to terminate data entry and then re-enter the entire data stream. Refer to Application Note #157, Using MS Windows HyperTerminal with iModem Products or Application Note #160, Using PROCOMM with CH2124/60.

Cermetek's telecommunications software program **iNetWizard®** DOES support editing. Therefore, when using **iNetWizard®** to program the iModem, the backspace key may be employed to perform character editing. Refer to Cermetek Application Note # 159, Using **iNetWizard®** with CH2124/60.

CAUTION

DO NOT use the backspace key (backspace character HEX 08) to perform editing functions during data entry unless the software package being used specifically states that editing is supported. Failure to do so will cause the backspace HEX character to become part of the data stream and lead to considerable debugging headaches.

@T® EXAMPLES

The first example displays the iModem's preprogrammed configuration profile.

Example 1: Review the preprogrammed ISP configuration profile.

Enter: **@T[V][]<CR><LF>** Review the preprogrammed ISP configuration profile.
Response:
ISP Number (@TN1=n): 14089908604
LOGIN NAME (@TL1=n): username@imodem.net
POP3 LOGIN ID (@TLM=n): username
LOGIN PASSWORD (@TP1=n): userpassword
POP3 PASSWORD (@TPM=n): userpassword
SMTP ADDRESS (@TOS1=n): C7AB36F7
POP3 ADDRESS (@TOP1=n): 18D6D210

FROM (@TE1=n): username@imodem.net
NAME (@TU1=n): DeviceName
TO (@TA1=n): username@imodem.net
SUBJECT (@TS1=n): iModem Test
MESSAGE (@TM1=n, end with <CR>.<CR>):

This Message has been sent courtesy of
Cermetek Microelectronics, using the
CH21XX iModem.

OK

The second example modifies the ISP access phone number while retaining the remaining preprogrammed configuration profile parameters unchanged. An email is sent using the new configuration profile.

Example 2: Initiate dialup using a local ISP access phone number different from the preprogrammed number. Complete the email transmission using the preprogrammed ISP account ID, password and destination email address. Send the USER DEFINED email message using the appropriate **@T** command.

Enter: **@T[N1][=5551212]<CR><LF>** New Phone Number.
Result: **OK**

Enter: **@T[V][]<CR><LF>** Review the changed ISP configuration profile.
Result: **ISP Number (@TN1=n): 5551212**
LOGIN NAME (@TL1=n): username@imodem.net
POP3 LOGIN ID (@TLM=n): username
LOGIN PASSWORD (@TP1=n): userpassword
POP3 PASSWORD (@TPM=n): userpassword
SMTP ADDRESS (@TOS1=n): C7AB36F7
POP3 ADDRESS (@TOP1=n): 18D6D210
FROM (@TE1=n): username@imodem.net
NAME (@TU1=n): DeviceName
TO (@TA1=n): username@imodem.net
SUBJECT (@TS1=n): iModem Test
MESSAGE (@TM1=n, end with <CR>.<CR>):

This Message has been sent courtesy of
Cermetek Microelectronics, using the
CH21XX iModem.

OK

Enter:	**@T[DM1][]<CR><LF>**	Send USER DEFINED email message.
Result:	**<LF><CR>**	Audible modem negotiation with ISP modem.
	CONNECT	Successful connection to ISP. DCD (Pin 17) active TTL LOW.
	PASSWORD OK	Successful Logon to ISP email account. RXD (Pin 11) and TXD (Pin 10) active.
	MESSAGE ACCEPTED	Email message accepted by ISP. SENT response pulse (Pin 8) sent from CH2124/60.
	HANGING UP	Termination of ISP Logon session.

FOLLOWING IS THE FULL CONTENT OF THE EMAIL SENT

Subject: **iModem Test**
Date: **Day: XX Mon Year Time** The exact date/time of the email transmission is reported here.
From: **DeviceName <username@imodem.net>** Where **DeviceName** is the Modem ID.
To: **<username@imodem.net>**

This message has been sent courtesy of Cermetek Microelectronics, using the CH21XX iModem.

In a slightly more complex example, both the ISP access phone number and the destination email address are overridden. Also, the default Input Port Status email message is sent using the **@TD**.

Example 3: Override the preprogrammed ISP local access phone number and default preprogrammed destination email address. For all other parameters, use the preprogrammed configuration profile. Send Input Port Status email message using the **@TD** command. When **@T** commands are used, the value of parameter **K8** is ignored.

Enter: **@T[N1][=5551212]<CR><LF>** New Phone Number.
Result: **OK**
Enter: **@T[A1][=imodem@customer.com]<CR><LF>** New email destination address.
Result: **OK**
Enter: **@T[V][]<CR><LF>** Review the changed ISP configuration profile.
Result:
ISP Number (@TN1=n): 5551212
LOGIN NAME (@TL1=n): username@imodem.net
POP3 LOGIN ID (@TLM=n): username
LOGIN PASSWORD (@TP1=n): userpassword
POP3 PASSWORD (@TPM=n): userpassword
SMTP ADDRESS (@TOS1=n): C7AB36F7
POP3 ADDRESS (@TOP1=n): 18D6D210
FROM (@TE1=n): username@imodem.net
NAME (@TU1=n): DeviceName
TO (@TA1=n): imodem@customer.com
SUBJECT (@TS1=n): iModem Test
MESSAGE (@TM1=n, end with <CR>.<CR>):

This Message has been sent courtesy of Cermetek Microelectronics, using the CH21XX iModem.

OK

Enter: **@T[V1][]<CR><LF>** Review the Input Port Status message.
Result: **EMAIL MESSAGE:**

Remote product message

Input 1 HIGH Depends on status of Input 1: either TTL HIGH or TTL LOW.
Input 2 HIGH Depends on status of Input 2: either TTL HIGH or TTL LOW.

Enter: **@T[D][]<CR><LF>** Send Input Port Status email message.
Result: **<LF><CR>** Audible modem negotiation with ISP modem.
CONNECT Successful connection to ISP. DCD (Pin 17) active TTL LOW.
PASSWORD OK Successful Logon to ISP email account. RXD (Pin 11) and TXD

(Pin 10) active.

MESSAGE ACCEPTED Email message accepted by ISP. SENT response pulse (Pin 8) sent from CH2124/60.

HANGING UP Termination of ISP Logon session.

FOLLOWING IS THE FULL CONTENT OF THE EMAIL SENT

Subject: iModem Test
Date: Day: XX Mon Year Time The date/time of the email transmission is reported here.
From: DeviceName <username@imodem.net> Where **DeciveName** is the iModem Name or ID.
To: <imodem@customer.com>

Remote product message

Input 1 LOW Depends on status of Input 1: either TTL HIGH or TTL LOW
Input 2 HIGH Depends on status of Input 2: either TTL HIGH or TTL LOW

The fourth example modifies additional preprogrammed configuration profile parameters. Further, this example illustrates the use of the CH2124/60 Send Pin (Pin # 6) to send an email.

Example 4: Override default preprogrammed ISP account ID, Password, email destination address, local access phone number and email message. Send the Input Port Status email by applying a TTL LOW pulse to the CH2124/60 SEND PIN (Pin # 6). The **K8** parameter must be changed to specify the Input Port Status message.

Enter: **@T[L1][=user@isp.com]<CR><LF>** New user name.
Result: **OK**
Enter: **@T[P1][=password]<CR><LF>** New user account Password.
Result: **OK**
Enter: **@T[OS1][=D5556678]<CR><LF>**
New ISP mail server address.
Note: Address MUST be in HEXIDECIMAL.
Result: **OK**
Enter: **@T[N1][=5551212]<CR><LF>** New Phone Number.
Result: **OK**
Enter: **@T[S1][=Loc 7549 Status]<CR><LF>**
New email subject line.
Note: Subject line limited to 16 ASCII characters.
Result: **OK**
Enter: **@T[A1][=iappliance@tsupport.com]<CR><LF>**
New email destination address.
Result: **OK**
Enter: **@T[K8][=30]<CR><LF>** Change to Input Port Status message.
Result: **OK**
Enter: **@T[V]<CR><LF>** Review the changed ISP configuration profile.
Result:
ISP Number (@TN1=n): 5551212
LOGIN NAME (@TL1=n): user@isp.com
POP3 LOGIN ID (@TLM=n): username
LOGIN PASSWORD (@TP1=n): password
POP3 PASSWORD (@TPM=n): userpassword
SMTP ADDRESS (@TOS1=n): D5556678
POP3 ADDRESS (@TOP1=n): 18D6D210
FROM (@TE1=n): username@imodem.net
NAME (@TU1=n): DeviceName
TO (@TA1=n): iappliance@tsupport.com
SUBJECT (@TS1=n): Loc 7549 Status

MESSAGE (@TM1=n, end with <CR>.<CR>):

This Message has been sent courtesy of Cermetek Microelectronics, using the CH21XX iModem.

OK

Action:	**TTL LOW Pin 6**	Apply TTL LOW (at least 50ms) to Pin 6 of CH2124/60 to send email.
Result:	**<LF><CR>**	Audible modem negotiation with ISP modem.
	CONNECT	Successful connection to ISP. DCD (Pin 17) active TTL LOW.
	PASSWORD OK	Successful Logon to ISP email account. RXD (Pin 11) and TXD (Pin 10) active.
	MESSAGE ACCEPTED	Email message accepted by ISP. SENT response pulse (Pin 8) sent from CH2124/60.
	HANGING UP	Termination of ISP Logon session.

FOLLOWING IS THE FULL CONTENT OF THE EMAIL SENT

Subject:	**Loc 7549 Status**	
Date:	**Day: XX Mon Year Time**	The exact date/time of the email transmission is reported here.
From:	**DeviceName <username@imodem.net>**	Where **DeviceName** is the Modem ID.
To:	**<iappliance@tsupport.com>**	

Remote product message

Input 1	**LOW**	Depends on status of Input 1: either TTL HIGH or TTL LOW
Input 2	**HIGH**	Depends on status of Input 2: either TTL HIGH or TTL LOW

Example 4 illustrates that activating the SEND PIN (Pin # 6) will send the User Defined email message unless modified by the user via the **@TK8** command.

In the fifth example, a new email message is created. Further, the message sent when the CH2124/60 SEND PIN (Pin # 6) is activated is changed from the Input Port Status message back to the User Defined Message. Send the new message by activating the SEND PIN (Pin # 6).

Example 5: Change User Defined email message. Override default preprogrammed ISP account ID and Password, email destination address, local access phone number, and save changes as new configuration profile. Redefine the email message sent when the SEND PIN is activated. Send email by activating the CH2124/60 SEND PIN.

Enter:	**@T[L1][=username@isp.com]<CR><LF>**	New user name.
Result:	**OK**	
Enter:	**@T[P1][=password]<CR><LF>**	New user account Password.
Result:	**OK**	
Enter:	**@T[OS1][=C5556678]<CR><LF>**	New ISP mail server address. Note: Address MUST be in HEXIDECIMAL.
Result:	**OK**	
Enter:	**@T[N1][=5551212]<CR><LF>**	New Phone Number.
Result:	**OK**	
Enter:	**@T[A1][=iappliance@tsupport.com]<CR><LF>**	New email destination address.
Result:	**OK**	

Enter:	**@T[S1][=Loc 7549 Status]<CR><LF>**	New email subject line. Note: Subject line limited to 16 ASCII characters.
Enter:	**@T[K8][=31]<CR><LF>**	User Defined email message to be sent when CH2124/60 SEND PIN activated.
Result:	**OK**	
Enter:	**@T[M1][=Schedule system maintenance.]<CR><LF>.<CR><LF>**	New User Defined email message. Note: Message limited.
	OK	
Enter:	**@T[V]<CR><LF>**	Review the changed ISP configuration profile.
Result:	**ISP Number (@TN1=n): 5551212** **LOGIN NAME (@TL1=n): user@isp.com** **POP3 LOGIN ID (@TLM=n): username** **LOGIN PASSWORD (@TP1=n): password** **POP3 PASSWORD (@TPM=n): userpassword** **SMTP ADDRESS (@TOS1=n): D5556678** **POP3 ADDRESS (@TOP1=n): 18D6D210** **FROM (@TE1=n): username@imodem.net** **NAME (@TU1=n): DeviceName** **TO (@TA1=n): iappliance@tsupport.com** **SUBJECT (@TS1=n): Loc 7549 Status** **MESSAGE (@TM1=n, end with <CR>.<CR>):** **This Message has been sent courtesy of Cermetek Microelectronics, using the CH21XX iModem.** **OK**	
Action:	**TTL LOW Pin 6**	Apply TTL LOW (at least 50ms) to Pin 6 of CH2124/60 to send email.
Result:	**<LF><CR>**	Audible modem negotiation with ISP modem.
	CONNECT	Successful connection to ISP. DCD (Pin 17) active TTL LOW.
	PASSWORD OK	Successful Logon to ISP email account. RXD (Pin 11) and TXD (Pin 10) active.
	MESSAGE ACCEPTED	Email message accepted by ISP. SENT response pulse (Pin 8) sent from CH2124/60.
	HANGING UP	Termination of ISP Logon session.

FOLLOWING IS THE FULL CONTENT OF THE EMAIL SENT

Subject:	**Loc 7549 Status**	
Date:	**Day: XX Mon Year Time**	The exact date/time of the email transmission is reported here.
From:	**DeviceName <username@imodem.net>**	Where **DeviceName** is the Modem ID.
To:	**<iappliance@tsupport.com>**	

Schedule system maintenance.

The sixth example demonstrates the use of the CH2160 to retrieve email messages. Example 6 retrieves the email sent in Example 5.

Example 6: Use the CH2160 to retrieve email message # 1.

Enter: **@T[V][]<CR><LF>** Review the current ISP configuration profile.
Result: **ISP Number (@TN1=n): 5551212**
LOGIN NAME (@TL1=n): user@isp.com
POP3 LOGIN ID (@TLM=n): user
LOGIN PASSWORD (@TP1=n): password
POP3 PASSWORD (@TPM=n): userpassword
SMTP ADDRESS (@TOS1=n): C5556678
POP3 ADDRESS (@TOP1=n): 18D6D210
FROM (@TE1=n): username@imodem.net
NAME (@TU1=n): DeviceName
TO (@TA1=n): iappliance@tsupport.com
EMAIL SUBJECT (@TS1=n): Loc 7549 Status
EMAIL MESSAGE (@TM1=n, end with <CR>.<CR>):
Schedule system maintenance.

OK

Enter:	**@T[DG][1]<CR><LF>**	Retrieve email message 1.
Result:	**<LF><CR>**	Audible modem negotiation with ISP modem.
	CONNECT	Successful connection to ISP. DCD (Pin 17) active TTL LOW.
	PASSWORD OK	Successful Logon to ISP email account. RXD (Pin 11) and TXD (Pin 10) active.
	Y Messages	Where **Y** is the number of email messages available.
Date: Day: XX Mon Year Time		The exact date/time of the email transmission is reported here.
From: DeviceName <username@imodem.net>		Where **DeviceName** is the Modem ID.
Subject: iModem Test		

Schedule system maintenance.

.

RETRIEVAL COMPLETE	Message retrieved successfully.
SERVER CLOSED	POP3 server closed.
HANGING UP	PSTN line connection released.

The seventh example demonstrates the use of the CH2160 to delete a single email messages.

Example 7: Use the CH2160 to delete email message # 5.

Enter: **@T[V][]<CR><LF>** Review the current ISP configuration profile.
Result: **ISP Number (@TN1=n): 5551212**
LOGIN NAME (@TL1=n): user@isp.com
POP3 LOGIN ID (@TLM=n): user
LOGIN PASSWORD (@TP1=n): password
POP3 PASSWORD (@TPM=n): userpassword
SMTP ADDRESS (@TOS1=n): C5556678
POP3 ADDRESS (@TOP1=n): 18D6D210
FROM (@TE1=n): username@imodem.net
NAME (@TU1=n): DeviceName
TO (@TA1=n): iappliance@tsupport.com
EMAIL SUBJECT (@TS1=n): Loc 7549 Status
EMAIL MESSAGE (@TM1=n, end with <CR>.<CR>):

Schedule system maintenance.
OK

Enter:	**@T[DK][5]<CR><LF>**	Delete email message 5.
Result:	**<LF><CR>**	Audible modem negotiation with ISP modem.
	CONNECT	Successful connection to ISP. DCD (Pin 17) active TTL LOW.
	PASSWORD OK	Successful Logon to ISP email account. RXD (Pin 11) and TXD (Pin 10) active.
	Y Messages	Where **Y** is the number of email messages available.
	MESSAGE DELETED	Message deleted.
	SERVER CLOSED	Termination of ISP Logon session.
	HANGING UP	PSTN line connection released.

The eighth example demonstrates the use of the CH2160 to delete multiple email messages.

Example 8: Use the CH2160 to delete email messages 1-5 (inclusive) for total of 6 messages.

Enter: **@T[V][]<CR><LF>** Review the current ISP configuration profile.
Result:
ISP Number (@TN1=n): 14089908604
LOGIN NAME (@TL1=n): username@imodem.net
POP3 LOGIN ID (@TLM=n): username
LOGIN PASSWORD (@TP1=n): userpassword
POP3 PASSWORD (@TPM=n): userpassword
SMTP ADDRESS (@TOS1=n): CEA50684
POP3 ADDRESS (@TOP1=n): 18D6D210
FROM (@TE1=n): username@imodem.net
NAME (@TU1=n): DeviceName
TO (@TA1=n): sendmemail@company.com
EMAIL SUBJECT (@TS1=n): iModem Test
EMAIL MESSAGE (@TM1=n, end with <CR>.<CR>):
Schedule system maintenance.
OK

Enter:	**@T[DK][1-5]<CR><LF>**	Delete email messages 1-5.
Result:	**<LF><CR>**	Audible modem negotiation with ISP modem.
	CONNECT	Successful connection to ISP. DCD (Pin 17) active TTL LOW.
	PASSWORD OK	Successful Logon to ISP email account. RXD (Pin 11) and TXD (Pin 10) active.
	Y Messages	Where **Y** is the number of email messages available.
	MESSAGE DELETED	Message deleted.
	MESSAGE DELETED	Message deleted.
	MESSAGE DELETED	Message deleted.
	MESSAGE DELETED	Message deleted.
	MESSAGE DELETED	Message deleted.
	SERVER CLOSED	Termination of ISP Logon session.
	HANGING UP	PSTN line connection released.

The ninth example demonstrates the use of the auto-redial feature. This feature may be used for quick re-dial attempts as well as to test the ISP connectivity of a system.

Example 9: Set the iModem to auto-redial 2 times. Wait 30 minutes between re-dial attempts. Set the number of MESSAGE ACCEPTEDs to allow for the maximum number of re-dial attempts. While auto-redial is active, the CH2124/60 iModem will NOT respond to commands issued on the RS232 serial port or activation of the SEND PIN (Pin 6, CH2124/60).

Enter: **@T[K1=][03]<CR><LF>** Set Total attempts to 3: The Initial attempt + 2 re-dial attempts.

Result:	**OK**	
Enter:	**@T[K2=][1E]<CR><LF>**	Set time between attempts to 30 minutes: **1E** is 30 in HEX.
Result:	**OK**	
Enter:	**@T[K3=][03]<CR><LF>**	Set number of MESSAGE ACCEPTEDs to 3 before auto-redial
Result:	**OK**	terminates. Any number less than the number of re-dial attempts will cause the auto-redial function to terminate before all attempts are made.
Enter:	**@T[DM1][]<CR><LF>**	Send USER DEFINED email message.
Result:	**<LF><CR>**	Audible modem negotiation with ISP modem.
	CONNECT	Successful connection to ISP. DCD (Pin 17) active TTL LOW.
	PASSWORD OK	Successful Logon to ISP email account. RXD (Pin 11) and TXD (Pin 10) active.
	MESSAGE ACCEPTED	Email message accepted by ISP. SENT response pulse(Pin 8) sent from CH2124/60.
	HANGING UP	Termination of ISP Logon session.
Result:	**REDIAL 01/01**	**01** Redial Attempts/**01** Message Accepteds
	CONNECT	Successful connection to ISP. DCD (Pin 17) active TTL LOW.
	PASSWORD OK	Successful Logon to ISP email account. RXD (Pin 11) and TXD (Pin 10) active.
	MESSAGE ACCEPTED	Email message accepted by ISP. SENT response pulse
	HANGING UP	Termination of ISP Logon session.
Result:	**REDIAL 02/02**	**02** Redial Attempts/**02** Message Accepteds
	CONNECT	Successful connection to ISP. DCD (Pin 17) active TTL LOW.
	PASSWORD OK	Successful Logon to ISP email account. RXD (Pin 11) and TXD (Pin 10) active.
	MESSAGE ACCEPTED	Email message accepted by ISP. SENT response pulse (Pin 8) sent from CH2124/60.
	HANGING UP	Termination of ISP Logon session.

IMPORTANT NOTE

During auto-redial, the CH2124/60 iModem will NOT respond to commands issued on the RS232 port or activation of either the SEND PIN (Pin # 6).

The user must activate the RST PIN (Pin # 21) to prematurely terminate auto-redial during the auto-redial activity.

The tenth and final example illustrates how to change the DTE communication speed.

Example 10: Change the DTE communication speed to 9600 baud.

Enter:	**@T[K10=][13]<CR><LF>**	Set DTE communication speed to 9600 baud.
Result:	**OK**	
Action:	**Momentarily depress the Reset Button**	Reset the iModem.
Enter:	**AT<CR><LF>**	Verify that the iModem has properly executed the reset.
Result:	**OK**	
Enter:	**AT"?<CR><LF>**	Query iModem for current DTE communication speed.
Result:	**13000000**	The first two (i.e., **13** digits are the code for the DTE speed. Referring to Table I in Attachment I, code **13** corresponds to **9600** baud.

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Table 1. Summary of Allowed @T® Commands.

Command	Notes	Description
@T[A1][=n]	1,2,3,4	Enter destination email address, **n**. Maximum length is 34 ASCII characters.
@T[D][]	1,2,7,12	Dialup ISP and send pre-configured Input Port Status email. Message type sent is specified by **@TJn** command or by **K8** parameter for firmware versions 1.262 or greater.
@T[DG][n]	1,2,12	Dial preprogrammed ISP and Retrieve mail message from preprogrammed email address. Message number must be specified, **n=1** to **99**.
@T[DK][n]	1,2,12	Dial preprogrammed ISP and Delete mail message n. **n=aa** Where **aa** is the message number. **n=aa-bb** will delete message number **aa** through **bb** (inclusive). **n=*** will delete all messages.
@T[DM1][]	1,2,3,4, 7,12	Dialup ISP and send user defined email message regardless of message type specified by **@TJn** command.
@T[E1][=n]	1,2,3,4	Enter local or "FROM:" email address, **n**.
@T[H][]	1,2	Directs remotely accessed iModem connected via Remote Dial-up Access to terminate access session and hang-up.
@T[J][0]	1,2,7,12	Establish email message type to be sent when iModem SEND pin is activated or the **@TD** command issued. **J0** will select the Input Port Status message or by **K8** parameter for firmware versions 1.262 or greater.
@T[J][1]	1,2,7,12	Establish email message type to be sent when iModem SEND pin is activated or the **@TD** command issued. **J1** will select the User Defined message or by **K8** parameter for firmware versions 1.262 or greater.
@T[K0][=n]	1,2,6	Select PAP Authentication Protocol: **n=01** allows PAP only. (DEFAULT) **n=7D** allows CHAP or PAP. (CHAP NOT SUPPORTED)
@T[K1][=n]	1,2,6	Set the number of dial-up attempts. Auto re-dial enabled for **K1>01**. Specified in HEX. **n=01** allows initial dial-up attempt only (default). **n=0E** allows 15 dial-up attempts (maximum per FCC).
@T[K2][=n]	1,2,6	Set the number of minutes, **n**, between auto-redials. Specified in HEX. **n=01** 1 minute between re-dial attempts (default). **n=FF** 255 minutes between re-dial attempts (maximum).
@T[K3][=n]	1,2,6,10	Set the number of MESSAGE ACCEPTEDs required to exit auto-redial mode. Specified in HEX. **n=01** 1 MESSAGE ACCEPTEDs to exit auto re-dial (default). **n=FF** 255 "accepted message" to exit auto re-dial (maximum).
@T[K4][=n]	1,2,6,8	Select login method for User Defined message. **K4** affects the currently ACTIVE ISP CONFIGURATION profile only: **n=01** PPP login only. PPP protocol used for email data packets. **n=02** Enables ASCII Text Login. PPP protocol used for email data packets. Message sent using TCP/IP. **n=03** Unix Shell login. No PPP protocol.
@T[K8][=n]	1,2,6	Select Email Message type to be sent when SEND PIN is set TTL low. Replaces **@TJ0** and **@TJ1** for firmware revisions 1.262 and greater: **n=30** Send Input Port Status message. **n=31** Send User Defined message. (Default)

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Table 1. Summary of Allowed @T® Commands

Command	Notes	Description
@T[**K10**][**=n**]	1,2,6,9	Select DTE Baud rate: **n=01** Select DTE baud rate **115200**. **n=02** Select DTE baud rate **57600**. (Default CH2160, CH2161) **n=11** Select DTE baud rate **38400**. **n=12** Disabled. **n=13** Select DTE baud rate **9600**. **n=14** Select DTE baud rate **4800**. **n=15** Select DTE baud rate **2400**. (Default CH2124) **n=16** Disabled.
@T[**K11**][**=n**]	1,2,6,9, 14	Enable/Disable Remote Dial-up Access. For **n** greater than 00, Remote Dial-up Access is enabled and **n** specifies the number of rings required before iModem will answer the incoming call. Specified in HEX. **n=00** Disable Remote Dial-up Access. **n=02** Enable Remote Dial-up Access to answer after 2 ring (minimum allowed) (Default) **n=FF** Enable Remote Dial-up Access to answer after 255 rings (maximum allowed).
@T[**LM**][**=n**]	1,2	Enter POP3 Login name, **n**.
@T[**L1**][**=n**]	1,2	Enter ISP Login name, **n**.
@T[**M1**][**=n**]	1,2	Enter user defined email message, **n**. End with **<CR><LF>.<CR><LF>**. The mail message must be entered after all other ISP parameters have been set. Additionally, any carriage return **<CR> (HEX ØD)** included in the message is interpreted as a carriage return **<CR>** line feed **<LF> (HEX ØD ØA)**. This is for compatibility with commercial terminal emulation programs. The message length is currently limited to 125 ASCII characters. Blanks or spaces are allowed and count as 1 character per each occurrence. The entered message is stored in message memory location **M1**.
@T[**N1**][**=n**]	1,2	Enter local access phone number for ISP, **n**.
@T[**OP1**][**=n**]	1,2	Enter POP3 server IP HEXIDECIMAL address, **n**.
@T[**OS1**][**=n**]	1,2	Enter SMTP server IP HEXIDECIMAL address, **n**.
@T[**PW**][**=n**]	1,2	Enter Dialup Password. Maximum length is 15 alphanumeric ASCII characters.
@T[**PM**][**=n**]	1,2	Enter POP3 Password. Maximum length is 16 alphanumeric ASCII characters.
@T[**P1**][**=n**]	1,2	Enter password for ISP, n. Blanks or spaces are not allowed.
@T[**Q**][**=n**]	1,2,3,4	Terminate iModem mode of remotely accessed iModem during Remote Dial-up Access session. Switch to standard analog modem mode while maintaining current Remote Dial-up Access session.
@T[**S1**][**=n**]	1,2,3,4	Enter email subject line, n. The subject line length is currently limited to 16 ASCII characters. Blanks or spaces are allowed and count as 1 character per each occurrence. The same subject line is used for both the **Input Port Status** message and the **User Defined** message.
@T[**U1**][**=n**]	1,2	Enter iModem Device Name. No special characters allowed (i.e., %, *). Maximum length is 16 alpha-numeric ASCII characters.
@T[**Z**][]	1,2,11	Restores factory set profile (i.e., phone number, username, password, SMTP mail server address, iModem local email address subject and message body).
@T[**Z**][**n**]	1,2,11	Set current ACTIVE ISP profile (i.e., phone number, username, password, SMTP mail server address, iModem local email address subject and message body) from factory set profiles. **n=0** Restore factory set ISP profile. Same as **@TZ**.

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Note Summary For Table 1: Summary of Allowed @T® Commands.

1. Use the exact syntax as indicated in Table 1 above.

2. Each command line has the following format:
   @T[**command**][**=data field**]**<CR><LF>**
   Any information listed in bold is a required portion of the command string. Brackets [] not in bold are intended to serve as delimiters only and are not part of the required command string. All embedded spaces are ignored except in the data field.

3. For the case of the User Defined email message (i.e., message sent using the **@TDM1** command), the **@TM1** must be the last ISP parameter modification command executed prior to executing the **@TDM1** the command. This means the **@TM1** command must be executed after the **@TA1**, **@TE1**, **@TS1** and **@TU1** commands. This programming sequence is necessary because the **@TM1** command forces the iModem to compose the entire message and store the complete message (including headers) into flash memory prior to initiating ISP dialup. Failure to do this will cause unpredictable results.

4. For the case of the Input Port Status email message (i.e., message sent using the **@TD** command). When the message type selection is **@TJ0** (or **@TK8=30,** as appropriate), the **@TM1** command execution requirements of Note 3 above DO NOT apply.

5. Parameter must be specified as one ASCII alphanumeric character.

6. Parameter must be specified as two alphanumeric characters. Use a leading 0, if necessary.

7. Effective with iModem Firmware Revisions 1.262 or greater, the **@TJ0** and **@TJ1** commands have been replaced with **K8** parameter modifiable with the **@TK8** command.

8. Dial-up Unix Shell account access is NOT currently supported on the **iModem Network** ISP.

9. Although the **@TK10** command allows the DTE communication speed of the CH2160 iModem devices to be changed, the user must ensure that the DTE communication speed selected is actually supported by the DTE. Failure to due so could inadvertently disable communication with the iModem device.

10. If the maximum number of MESSAGE ACCEPTEDs is set to a value greater than the number of auto re-dial attempts, the iModem will auto re-dial the number of re-dial attempts specified by the auto re-dial parameter (**K1**). Under no circumstances will auto re-dial exceed the number of re-dial attempts specified by parameter **K1**.

11. The **@TM1** command must be executed after the **@TZ**, **@TZ0** and **@TZ1** commands. This is required to "rebuild" the email message including headers. Failure execute the **@TM1** command will cause errors in the header creating leading to unpredictable email transmission results.

12. NOT supported during Remote Dial-up Access session.

13. Must set **K11=00** to allow the CH2124/60 product to answer as a remote modem. This disables the Remote Dial-up Access feature.

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Table 2. Summary of Allowed @T® Query Commands.

Command	Notes	Description
@T[A1][?]	1,2,3	Show email subject line.
@T[E1][?]	1,2,3	Show iModem email address.
@T[I][]	1,2,4	Show product type and firmware revision.
@T[J][?]	1,2,3,5,6	Show which email message is to be sent when iModem SEND pin is activated. Not active for firmware versions 1.262 or greater.
@T[K][?]	1,2,3	Show all **K** parameters.
@T[LM][?]	1,2,3	Show POP3 Login ID.
@T[L1][?]	1,2,3	Show iModem ISP Login ID.
@T[M1][?]	1,2,3	View User Defined email message.
@T[M1][??]	1,2,4	Display message ID, subject line & Message Body.
@T[N1][?]	1,2,3	Show ISP dial-up phone number.
@T[OP1][?]	1,2,3	View POP3 server HEX IP address.
@T[OS1][?]	1,2,3	View SMTP server HEX IP address.
@T[P1][?]	1,2,3	View ISP password.
@T[PM][?]	1,2	Show POP3 password.
@T[PW][?]	1,2	Show dial up password.
@T[S1][?]	1,2,3	View email subject line.
@T[U1][]	1,2,4	View email recipient.
@T[V][]	1,2,4	View ISP configuration profile and view User Defined email message.
@T[V][0]	1,2,4	Same as **@TV**.
@T[V][1]	1,2,4	View Input Port Status email message. Can also be used to determine status of input ports in real time.

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Note Summary For Table 2: Summary of Allowed @T® Query Commands.

Notes:

1. Use the exact syntax as indicated in Table 2 above.

2. Each command line has the following format:
   @T[**command**][**=data field**]**<CR><LF>**
   Any information listed in bold is a required portion of the command string. Brackets [] not in bold are intended to serve as delimiters only and are not part of the required command string. All embedded spaces are ignored except in the data field.

3. All commands that are used to input values require a **?** in the command **data field** to activate the query function.

4. Stand alone query commands do not require a **?** in the command **data field**.

5. Effective with iModem Firmware Revision 1.262 or greater, the **@TJ0** and **@TJ1** commands have been replaced with **K8** parameter modifiable with the **@TK8** command.

6. NOT supported during Remote Dial-up Access session.

Attachment III

Table 3. Summary of iModem @T® Result Messages.

Result Message	Explanation of Result Message
BAD MESSAGE NUMBER	1. Occurs during retrieval (**@TGn** command) or during deletion (**@TDKn** command) when message number specified does not exist on POP3 server.
CHAP ERROR	1. Occurs when CHAP protocol error occurs during login. (Not Supported).
CONNECT	1. Successful dialup and ISP connection.
ERROR	1. Occurs when errors in data field are encountered.
HANGING UP	1. Occurs after PSTN line release.
MAILBOX BUSY	1. Occurs when POP3 server connection is in use by another device logged in using the same User ID. 2. Occurs when POP3 server connection was not properly terminated and user attempts to reconnect within 12 minutes of previous connection. 3. Occurs when POP3 server detects error in specified POP3 Login and/or Password.
MESSAGE ACCEPTED	1. Occurs after successful email transmission and after receipt of MESSAGE ACCEPT status from ISP SMTP mail server.
MESSAGE DELETED	1. Occurs after successful deletion of specified message number(s).
NO CONNECT	1. Occurs when PSTN line is released after unsuccessful dialup and/or unsuccessful ISP negotiation and/or unsuccessful SMTP server negotiation.
NO DIALTONE	1. Occurs after unsuccessful dialup and iModem determines that cause of unsuccessful dialup is lack of dial tone.
NOT IN IMODEM MODE	1. Occurs when verbose result message responses are disabled. When in this state, **@T** commands will not be executed.
OK	1. Successful execution of **@T** commands except **@TD** and **@TDM1**.
PASSWORD ERROR	1. Occurs when error in specified password is detected.
PASSWORD OK	1. Occurs after successful logon to specified ISP account.
POP3 REQUESTS TERMINATION	1. Occurs when the POP3 server determines that the user is already connected to the POP3 server. POP3 requests that the user terminate attempted POP3 connection.
RETRIEVAL COMPLETE	1. Occurs after successful retrieval of specified POP3 message number.
SERVER CLOSED	1. Occurs when POP3 server connection is terminated.
BUSY	1. Occurs when called POP is busy.

Attachment IV

Procedure to Determine DTE Communication Speed.

This procedure provides the user a simple method to determine the DTE communication speed should the iModem fail to respond to commands after execution of the **@TK10** command. Once the DTE speed is known, the user should adjust the telecommunications software package to match the determined DTE speed. This will re-establish communication with the iModem.

Enter:	**AT<CR><LF>**	Modem Attention command.
Result:	**OK**	
Enter:	**AT"?<CR><LF>**	Query iModem for DTE Speed.
Result:	**11000000**	The first two (i.e., **11**) digits are the code for the DTE speed.

Referring to Table 1 in Attachment I, it can be seen under the Description column in the **@TK10** command row that code **11** corresponds to a DTE speed of **38400** baud.

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