

North American Response Centers

HP 3000 APPLICATION NOTE #22

ASYNCHRONOUS MODEMS



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ASYNCHRONOUS MODEMS

The Response Centers receive many questions on modems. The first section of this Application Note provides background on this topic. This includes the theory behind the modem's operation and interface, the process of establishing a call, and call disconnection. The next section discusses modem configuration. The final section is a guide to help you trouble shoot modem problems.

THEORY OF OPERATION

Asynchronous modems are used for data communications over voice grade telephone lines. The term modem is actually a contraction of the two words MODulation and DEModulation. The modulation portion of the modem converts digital pulses to analog waveforms for transmission over a telephone line and the demodulation portion of the modem converts the analog signal back to digital in a form used by the terminal or computer. Modulation and demodulation are necessary because it is impossible to transmit digital 1's and 0's through the analog spectrum of the voice grade channel. The voice grade channel can be represented by the frequency range of 300 - 3300 Hz. used for voice transmission.

Various modulation techniques are employed to convert the digital signals to analog. These include frequency, amplitude, phase, and quadrature modulation. To transfer data successfully between two points the modems must use the same modulation technique as well as meet other compatibility requirements specific to any given modulation scheme. The Hewlett Packard Support Link modems use frequency shift keyed (FSK) modulation and adhere to Bell 103 compatibility requirements at 300 bits per second and Bell 212A compatibility requirements at 1200 bits per second. This modem specification is common within the data communications industry today.

Asynchronous modems are used primarily for asynchronous Data Terminal Equipment (DTE) where the speed of character generation is random (that is, the delay between characters is random) and detection is through start and stop bits. HP 3000 DTE which use asynchronous transmission include the ATP and ADCC as well as all terminals and printers connected to these ports. Another characteristic of asynchronous transmission is that clocking signals are not used to clock data at precise rates, instead the modem clocks ON data. Clocking ON data is when the modem transmits the logical condition of a mark or space (0 or 1) over the communication channel (phone line) as long as it is present on the interface from the DTE. Hewlett-Packard does not support synchronous modems used on asynchronous ports.

Hewlett Packard packages and sells two asynchronous modems for use with the HP 3000. These are the older "HP Support Link" manufactured by Racal Vadic and the "HP Support Link II" manufactured by Andersen Jacobsen. The Support Link II is the modem presently being shipped with each HP 3000 for remote telesupport, HPTrend, and Predictive Maintenance. Both of these modems are Bell 212A and Bell 103 compatible providing full-duplex 300 bps asynchronous operation in the low speed (103) mode and full-duplex 1200 bps asynchronous operation in the high speed (212) mode. Other modems can be used in conjunction with the HP Support Link modems only if they are Bell 103 or 212A compatible modems which operate in full duplex mode. Full duplex refers to the fact that data can travel from local to remote or vice-versa simultaneously as opposed to half-duplex where data can only travel in one direction at a time.

MODEM INTERFACE

In order for the DTE to communicate properly with the DCE, (Data Communications Equipment or modem), the two must follow some kind of interface rules. Hewlett Packard asynchronous transmission adheres to the RS-232C interface standard as presented by the Electronics Interface Association. RS-232 defines the electrical, mechanical and functional aspects of the interface between DTE and DCE. Part of this recommendation is the definition of the 25 RS-232 signals. These signals each have a defined use. However, not all of these pins are required to establish and conduct DTE to DCE communication and vice versa. The modem (data set) end of the 30062B cable matches the RS-232 standard pin-outs as listed below:

SIGNAL GROUND	Pin 7 is the ground reference for interface signals.
TRANSMITTED DATA	Pin 2 on the DTE is used to send data. This signal is held high or at mark when the line is idle.
RECEIVED DATA	Pin 3 on the DTE is used to receive data. This signal is held to a mark when the modem is idle or carrier detect is off.
CARRIER DETECT	Pin 8 is raised by the DCE to show that data carrier is being received from the distant modem.
DATA SET READY	Pin 6 is raised by the DCE to show the DTE that the modem is on and connected to the telephone line.
DATA TERMINAL READY	Pin 20 on the DTE is provided by the DTE to allow the modem to enter and remain in the data mode. When on, it allows the modem to automatically answer an incoming call. When it goes off it commands the modem to disconnect the line at the end of the call.
REQUEST TO SEND	Pin 4 on the DTE is used to tell the modem to prepare for transmission and is used to indicate that the DTE wants to transmit data. RTS is always held high in full duplex operation.
CLEAR TO SEND	Pin 5 on the DCE is raised to tell the DTE it can transmit. CTS is always held high in full duplex operation and is not monitored by the HP 3000 with subtype 1 but is monitored with subtype 9.

Note: Refer to the *Data Communication Handbook* (Part No. 5957-4634) for a complete diagram on the pin-out for the 30062B cable.

Establishing a Call

The process of establishing a call consists of dialing the telephone number of the remote modem, raising the appropriate RS-232 signals and transferring control from the DCE to DTE where communication must ultimately start or end. The RS-232 signals required by an HP 3000 asynchronous port and remote device before communication can begin are DSR (data set ready) and CD (carrier detect). In addition, the modem requires DTR (data terminal ready), and RTS (request to send). Many modems can be strapped to keep the CD and DSR signal high. This may be helpful in applications such as auto calling. In order to raise the RS-232 signals in the correct order special timers are used by the modem. If the signals are not raised in this order the remote or local modem may interpret a situation incorrectly and drop the connection. In addition, modems must send special frequencies to disable echo suppressors, initiate telco

billing and communicate call establishment state. For further discussion on call establishment see the "HP Data Communications Testing" manual which documents call establishment and disconnection.

Call Disconnection

Call disconnection begins when the initiating DTE drops DTR for at least 50 ms. The responding modem will then drop DSR and CD after a timer has expired. Soon after DSR and CD on the initiating modem will also drop. This ensures proper disconnection of the responding modem and closes the the HP 3000 port. If DSR and CD are held high as in the case of auto dialing, the HP 3000 will have no way of knowing a session should be aborted if the modem disconnects before the user types BYE. As a result the next call to the modem will log right into the last users active session. Therefore, HPtrend users and Predictive Maintenance users who have auto dial configurations on their modems should consider configuring this modem for originate only or should disable auto answer capability.

MODEM CONFIGURATION

Modem configuration differs for various modem applications. For simple remote telesupport or user applications the factory default settings for the modem are most likely sufficient. For HPtrend and Predictive Maintenance use however, the modem must be configured carefully. The "HPTREND Users Guide" documents correct modem configuration for HPTREND use. Predictive Maintenance configuration is done by an HP representative, usually the account CE. Keep in mind that these configurations may be using auto dial and therefore pose a possible security threat.

The HP 3000 port configuration will look like any asynchronous device using the port except for the subtype parameter. The subtype determines speed sensing characteristics as well as what modem and timing signals will be needed. The configuration for an asynchronous terminal and an explanation of all the possible subtypes are given below:

LOG DEV #	DRT #	U N I T	C H A N N E L	T Y P E	SUB T Y P E	TERMINAL T Y P E	SPEED	REC W I D T H	OUTPUT D E V	MODE	DRIVER N A M E	DEVICE C L A S S E S
<i>t t t</i>	<i>u</i>	<i>u u</i>	<i>0</i>	<i>16</i>	<i>z z</i>	<i>10</i>	<i>120</i>	<i>40</i>	<i>u u u</i>	<i>JAID</i>	<i>xxxxxxxxxxxx</i>	<i>yyyyyyyyyy</i>

t t t logical device number of the modem port

u appropriate DRT for the modem port

u u appropriate unit number for the modem port

u u u output device number (same as the logical device)

xxxxxxxxxxxx driver name for your type of terminal hardware and operating system

yyyyyyyyyy any device class name such as MODEM

z z modem subtypes

Modem Subtypes:

- 1 Used with asynchronous full duplex modems. Compatible with Bell 103, 202T, 212A and CCITT V.21 modems requiring speed sensing. ATP and ADCC (HIOTERM2) require DSR (data set ready), and CD (data carrier detect).
- 5 Identical to subtype 1 except that automatic speed sensing is disabled. This subtype is *not* supported on ATP ports running ATP software prior to G. 50. 83. It *is* supported on the ADCC *prior* to MPE V/E and *after* ADCC version G. 50. 85.
- 9 Supported on ATP and ADCC (HIOTERM2) ports. Asynchronous CCITT modem that requires monitoring CTS (Clear to Send), otherwise identical to subtype 1. Monitoring Clear To Send will allow the DTE to transmit data only when CTS is high. This is required in several European countries.
- 10 Supported on the ATP only (G. 50. 83, UB-Mit version, and above). This subtype is the same as subtype 1 except no speed sense timer is started when DSR and CD are raised.
- 11 Identical to subtype 10, except that automatic speed sensing is disabled.
- 15 Modem subtype for asynchronous printers, otherwise identical to subtype 1.

ASYNCHRONOUS MODEM TROUBLE SHOOTING

Trouble shooting an asynchronous modem port can be done in a systematic and timely manner. If a connection to the HP 3000 can not be made you must identify all the devices and software needed to create the connection and you must test each one alone and in conjunction with the others. If your problem is with Hptrend or Predictive Maintenance, keep in mind that your problem may be related to the software needed to use these products. The Response Center will be happy to help you through any portion of the trouble shooting process.

The first step in trouble shooting is verification. That is, making sure everything is configured and set up correctly. A surprising amount of modem related problems are solved by simply verifying configuration and checking to make sure devices are powered on, ready for use and correctly attached to the proper port. It is a good idea to perform a quick inspection of all connections. Verify that the proper cable is being used and that it is connected properly. Configuration can be verified by consulting the appropriate manual. The HP 3000 System Operation and Resource Management Reference Manual can be used to verify I/O configuration. To verify modem configuration you should have a manual for your modem with the required configuration parameters penciled in or have the needed parameters written down. This is a good idea because modem manuals can be confusing to a non-data communication expert and modem configurations often change depending on what application you are using, (ie. HPTrend). If you don't have a manual for your modem it would be a good idea to get one. The part number for the HP Support Link users guide is 35141-90001 and the part number for the HP Support Link II Users Guide is 35031-90001.

If you are reasonably sure that everything is correct, the next step is to get an idea of where the problem is occurring. Is the modem dialing out? Is the remote modem answering? Can you get a colon prompt? Many times the modems themselves are working fine but you can not establish communication between the modem and the computer port. Other times the modems may work fine but the terminal itself is not communicating properly with the remote modem. To find out where you are in the call process take a look at the remote modem first. Is the modem dialing out? If not, your problem is with the remote terminal or modem. If the modem seems to be dialing out properly according to lights on the modem or on a breakout box, check to see if the modem on the computer port is answering. If not, you may have a bad phone line or local modem configuration. Finally, if the local modem answers the call but no connection can be established, you could be dialing into an incompatible modem or improperly configured port. Look into factors such as port speed and configured parity. Also, you should concentrate on the HP 3000 and the local modem connection. The next section is a guide to follow when trouble shooting modem problems.

SYMPTOM:

- Your remote modem is not dialing out.

PROBLEM SOLVING STEPS:

1. Verify the modem configuration.
2. If you dial out from the terminal, verify that your terminal is in remote mode and set at the correct baud rate. Also verify that you have the correct cable.
3. Make sure you can get a dial tone on the phone line. If your modem is auto dial, plug in the appropriate phone type to the (pulse or tone) RJ-11 jack, and see if you can call someone.
4. Test the modem with self test and local analog loopback tests as documented in your modem manual.

SYMPTOM:

- Your remote modem is dialing out but the local modem is not answering, or it answers then immediately drops the connection.

PROBLEM SOLVING STEPS:

1. Make sure you have the correct phone number.
2. Verify modem configurations.
3. Make sure you can get a dial tone on the local phone line. Plug in the appropriate phone type to the RJ-11 jack and see if you can call someone.
4. Try dialing out to another computer port.
5. Try performing remote digital loopback from the remote side. If this is possible it will be documented in your modem manual.
6. Check the lights on the modem, DTR must be on.

7. Run TERMDSM to determine if the port is "broken". (Refer to Application Note #9, *Port Failures, Terminal Hangs, TERMDSM* for a complete description on using TERMDSM.)

SYMPTOM:

- Your local modem answers but you can't get a colon prompt.

PROBLEM SOLVING STEPS:

1. Verify the HP3000 I/O configuration is correct and that you have the correct cable (and that it is not connected backwards!). The HP recommended cable type is number 30062B (Part No. 30062-60022 or 30062-60023).
2. Do a :SHOWDEV on the port. To be able to log on, the results must be: 21 A AVAIL or 21 J AVAIL. The "A" indicates the port is JOB and DATA accepting, the "J" indicates JOB accepting only. If the port is "AVAIL" but neither "J" or "A" appears, issue an :ACCEPT ldev. If the port is down, issue the :UP ldev command from the console. If the port is "21 UNAVAIL SYS" the port has received a modem signal interrupt (ie., DSR and/or CD becoming high) or the <CR> has been sensed. The port should be in the process of logging on. If the port shows "21 UNAVAIL #528,2 FILES" a session already owns that port.
3. Verify modem configuration by checking the actual configuration against a configuration listing.
4. If possible, try another cable or HP 3000 port.
5. Verify the remote terminal has the correct baud rate and parity. For a terminal on a subtype 10 port the baud rate should be set to match the baud rate configured on the port and the parity should be 0's. If the port is set to 120 cps. then the terminal should be set to 1200 baud.
6. Make sure the local modem is working properly. The modem should have a self test that is documented in the manual. In addition you can disconnect the modem from the port and attach it to a terminal with a straight through cable, and perform an analog loopback test as documented in the modem manual. This tests the modems ability to convert digital to analog and vice versa.
7. Run TERMDSM to see if the port is broken.

READER COMMENT SHEET

North American Response Centers
HP 3000 Application Note #22: Asynchronous Modems
RC Questions & Answers (February 15, 1987)

We welcome your evaluation of this Application Note and attached RC Questions & Answers Sheet. Your comments and suggestions help us to improve our publications. Please explain your answers under Comments, below, and use additional pages if necessary.

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 **HEWLETT
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HP 3000 Questions Commonly Received by the North American Response Centers

Q. I just updated to MPE version G.02.01 (UB-Delta-1) and now I am getting SPOOLEE I/O ERROR %53. Do you know what the problem is?

A. Yes. There is a problem with the ATP/ADCC software that was shipped with UB-Delta-1 which will cause intermittent port failures accompanied by console messages such as ATP FAILURE 6706 and SPOOLEE I/O ERROR %53. A patch which corrects the problem will be shipped to those who received the defective software. If you receive the patch you should install it on your system.

Included with the patch will be a letter covering the installation instructions. Following are further comments to assist you with the installation:

1. Restore all files to PUB.SYS (there are 11 files)

Before beginning the installation ensure that you have a backup of @.PUB.SYS.

Use the RESTORE command to restore all files on the tape into the PUB group of the SYS account. Note that there are 11 files. Save the file list.

2. :STREAM J05J196A

Use the EDITOR to insert the appropriate passwords in the jobstream J05J196A.PUB.SYS. The job will log on as MANAGER.SYS. Make sure MANAGER.SYS is homed to the PUB group.

STREAM the J05J196A.PUB.SYS job. This job will PURGE the TERMDSM program, so if the job aborts, make sure that the TERMDSM program is RESTORED from a backup tape.

3. This jobstream will create an update tape.

4. Update your system with this tape.

Update your system with a COLDSTART.

5. Verify that the patch has been successfully installed by:

- a) running TERMDSM.PUB.SYS
- b) The ATP version listed will be G.87.89
- c) The ADCC version listed will be G.87.19

If you do not want the patch files to be in PUB.SYS, you may remove them.

The patch has been incorporated in the release of future UB-Delta-1 (Version G.A2.01) shipments. If the label on the UB-Delta-1 tape has a VUF of G.A2.01 then you will *not need* to install the patch. You can verify that you have the correct software by following step 5 above.

Q. After updating to MPE version G.02.B0 (UB-MIT) I can no longer use NS/LAN. I get the message

MISSING DADCONF.NET.SYS CONFIGURATION FILE (DSERR 661)

when I issue NSCONTROL START.

A. For UB-MIT and later installations of the NS/3000 and OfficeShare LAN/3000 products (HP 32344 and HP 30240), you need an additional configuration file. After completing the normal sequence of NS/LAN 3000 product configuration steps you should :STREAM CONFJOB.NET.SYS to create DADCONF.NET.SYS.

Q. I just had a power failure and now everything is printing four inches to the right on my printer, the left margin is in four inches. How do I fix this?

A. To reset the margin on your printer, issue the following command at your console:

:DOWNLOAD *ldev*;MARGIN=1

where *ldev* is the logical device number of your printer.

Q. I used FCOPY to copy COMMAND.PUB.SYS to my terminal screen. I noticed that it contained several entries for accounts which had been deleted. How can I clean up COMMAND.PUB.SYS?

A. When your users are off the system, do the following:

**1. Log on as Manager.Sys, Pub.
:HELLO MANAGER.SYS,PUB**

**2. Purge the COMMAND.PUB.SYS file.
:PURGE COMMAND.PUB.SYS**

**3. Use the BULDACCT job, which is located in the TELESUP account, to create a job stream called JOBCUDC.
:RUN BULDACCT.PUB.TELESUP**

Note: BULTACCT will also create two other job streams: JOBACCT and JOBACCTB. Be sure to purge these jobs since they contain password information and they are not needed.

**4. Rebuild the COMMAND.PUB.SYS file.
:BUILD COMMAND.PUB.SYS;REC=128,1,F,BINARY;DISC=1023,8,2**

**5. Stream JOBCUDC to add entries into COMMAND.PUB.SYS.
:STREAM JOBCUDC**

**6. Use FCOPY to view the contents of COMMAND.PUB.SYS. You will see that the file has, indeed, been cleaned up.
:FCOPY FROM=COMMAND.PUB.SYS;TO=**