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Chapter 4: ***HYDRA 3000*** Conventions, Configuration, and Management

Chapter 4 provides general instructions on connecting terminal devices to your ***HYDRA 3000***, then configuring it to match your host operating system definitions and to support the required ASCII asynchronous devices.

If you have not already performed the system generation operations needed to accomodate the ***HYDRA 3000***, you may want to refer to Chapter 2, "**System Generation"** before proceding with this chapter. ***HYDRA 3000*** configuration can take place, however, prior to installation on the host channel.

HYDRA 3000 can be configured in two ways: 1) from a device attached to any asynchronous port; 2) from the mainframe through use of the **H3000UTL** utility program, after initial configuration of at least one channel address using the first method. This chapter deals strictly with the first method. In it we outline the process of configuration, refering briefly to various records of the configuration file system that may need to be modified to accomodate your environment and planned usage. For a complete description of each type of record and of each field of a record, refer to Chapter 5, "**Local Services Reference**". See Chapter 6, "**H3000UTL",** for a discussion of the mainframe configuration utility program.

Chapter 4 is divided into six major sections:

- Basic ***HYDRA 3000*** operation
- Local Services conventions and use
- Configuration Basics
- Configuration outline
- Configuration of different devices and features
- Management features

Basic *HYDRA 3000* Operation

These sections describe how to connect a device to a ***HYDRA 3000*** port, attention the port, and select a terminal type, in preparation for performing the initial configuration.

Connecting a Terminal or PC for Configuration

For purposes of initial configuration of ***HYDRA 3000*** , we strongly recommend you use a direct-attached terminal or personal computer; attempting this initial connection over a dial-up line often leads to unnecessary complications and frustration if the modems are not properly set up. Note that neither our use of the term “personal computer”, nor of the abbreviation “PC”, is intended to imply that an IBM® Personal Computer or compatible is required. The terminal or PC that you attach must only support RS-232C serial, asynchronous communication using the standard ASCII character set. ***HYDRA 3000*** ports use a 9-pin male connector. The terminal device’s RS-232C interface will generally use either a 25-pin or a 9-pin connector, male for a PC, female for most terminals. The factory default settings for ***HYDRA 3000*** support display stations on all ports. All ports are configured to dynamically adjust to the baud rate of the attached device, from 2400 to 38400 bps. No password is required at connection time, but must be entered for access to configuration functions. ***HYDRA Systems*** provides a set of sample cables with each ***HYDRA 3000*** (see Chapter 3) to connect different device types. Select the correct sample cable and connect your terminal or PC to one of the standard ***HYDRA 3000*** ports. If your PC has a 9-pin serial interface, you will need an adaptor or special cable. **Do not connect your terminal or PC to Control Port 0 or 1 for initial configuration, unless your *HYDRA 3000* does not have an Asynchronous Interface Module installed. In this case, a special gateway will allow configuration from a Control Port; contact *HYDRA Systems* Support for help.**

Terminal Emulation Software

To communicate with ***HYDRA 3000*** using a PC, you must use terminal emulation software. Most terminal emulation software is capable of emulating one of the terminal types already defined to ***HYDRA 3000***. Refer to Chapter 1 for a list of currently supported terminal emulation software packages. If the terminal emulation software you are using is not supported, contact ***HYDRA Systems Support***; we can assist you in designing a custom Terminal Definition (**TDF**) to support it.

RS-232C Setup

Set the RS-232C options for the terminal or terminal emulation software to the following:

- Baud Rate - set at your discretion up to 38.4 Kbps
- Bits per character - 8
- Number of stop bits - 1
- Parity - none

You may need to power the terminal off, then on again before the new settings take effect; check the procedures required in your terminal’s documentation.

Required Function Keys; Default Function Keys

For the configuration process, you will need to know what keys to hit to emulate PF1-PF11, PA2, and Enter. The arrow keys and Tab key must also work correctly**.** Since many ASCII terminals and emulations are not designed for 3270 functionality, ***HYDRA 3000*** has a default set of keystrokes to realize some of the special IBM 3270 terminal functions. Note: The default keys may be overridden by the **TDF** you select. Pressing the **Ctrl** key together with the keys listed below will generate these functions; on some terminals, the **Alt** key is used in place of the **Ctrl** key. If you have questions about key mapping, please call ***HYDRA Systems Support***.

Function	**Terminal Keys**
Back-Space	Ctrl-H
Back-Tab	Ctrl-B
Clear	Ctrl-C
Delete Char	Ctrl-D
Disconnect	Ctrl-@ or Break
Down Arrow	Ctrl-J
Duplicate	Ctrl-W
Enter	Ctrl-M
Erase-EOF	Ctrl-F
Erase-Input	Ctrl-E
Home	Ctrl-V
Insert Char	Ctrl-A
Insert Mode (toggle on/off)	Ctrl-G
Keyboard Restore/Reset	Ctrl-R
Left Arrow (Back-space)	Ctrl-H
Local Screen Print	Ctrl-P
New-Line	Ctrl-N
Right Arrow	Ctrl-L
Screen Refresh	Ctrl-Z
Sys-Request	Ctrl-U
Tab	Ctrl-I
Up Arrow	Ctrl-K
XOff/XOn	Ctrl-S/Ctrl-Q
Local Services/Test Mode	Ctrl-Y

Note that Ctrl-Q (XON), Ctrl-S (XOFF), and Ctrl-X are reserved values, and must not be remapped or appear in any key sequence in any TDF.

Selecting a Terminal Type

Press **Enter** or the equivalent key to begin baud rate synchronization between ***HYDRA 3000*** and the terminal or PC. The key you press must produce the ASCII Carriage Return character (**Ctrl-M** or x'**0D**'). A single hit of the key should suffice for synchronization.

When baud rate synchronization completes, ***HYDRA 3000*** presents its Terminal Selection menu, which will include:

```
1178 - LSI ADM 1178                 FTRM - IBM FTTERM 3270
3101 - IBM 3101 MOD. 10             H1500 - HAZELTINE 1500
3151 - IBM 3151 Native              HNET - JDS HNET COLOR
3151N - IBM 3151 NUM KB             I207 - INFORMER 207
3161 - IBM 3161 & 3151              KRMT - KERMIT VT100 2.3
3162 - IBM 3162                     MACT - MACTERMINAL 3278
3162W - IBM 3162 AS WY-50           MOD2 - IBM Mod. 3101-20
3163 - IBM 3163                     MTEM - TEMPUS MTINASYN
3164 - IBM 3164 (COLOR)             PC31 - PC 3101 EMULATOR
7101 - C.ITOH 7101                  PCOMP - PROCOMM + 3270
7103A - C.ITOH 7103A                RAND - RANDOM COLLEAGUE
8178 - Lee Data 8178                RANDC - RANDOM COMPANION
A132 - ANSI DUAL SCREEN             RCMC - CVI RCOM COLOR
A615 - AT&T 615 MT                  RCMM - CVI RCOM MONO
AD12 - LSI ADM/12                   RCMM2 - CVI RCOM MONO2
ADDS - ADDS VIEWPOINT               REBS - REBUS 3000
ADM3A - LSI ADM 3A                  REBSK - REBUS 3000 DE
ANSI - GENERIC ANSI VDT)            RLY24 - RELAY 24X80 MODE
BROWN - BROWN U. TERM               TV100 - TANDY TV 100
C132 - CONX 27 X 132                TVPT - Televideo p.t.
CANSI - COLOR ANSI (PC              TVPT2 - Televideo p.t.2
CDCAD - CDC ADVAN.MODE              V100H - VT100 HYII STYLE
CNXC - ICR CONX COLOR               VP90 - ADDS VIEWPOINT90
CNXM - ICR CONX MONO                VT100 - REAL DEC VT-100
D211A - DATA GEN 211 ANSI           VT220 - REAL DEC VT-220
DG211 - DG D210 & D211              VT52 - DEC VT-52
DIAL - DDR/DIALOG EMUL              WY50P - WYSE WY50, WY50+
DT100 - TANDY DT 100                WY60 - WYSE 60 TERMINAL
DT110 - TANDY DT 110                WY60A - Wyse 60 Nat. AT
E1078 - EXECUTIVE 10/78             WY60E - WY-60 W/ENH KBD
ESPR - ESPRIT I & II                WY99 - WYSE-99GT
FTM2 - IBM FTTERM2 7171             X820 - XEROX 820 I & II
FTM2C - FTTERM2 COLOR               XTAL - XTALK XVI/VT100
```

At the prompt, type the name of the entry that best describes your terminal or terminal emulation software and press **Enter**. (Note: the prompt for terminal type is configurable; see Chapter 5, "**Asynchronous Interface**".)

If there is no entry that exactly fits your terminal, try one that seems close. After entering the selection for your terminal, the screen should be cleared, and the ***HYDRA 3000*** copyright message should appear at the top of the screen. If this message is not readable, or contains "garbage characters", or is not properly positioned on a cleared screen, the Terminal Definition (**TDF**) you selected does not match your terminal or emulation. If you are unable to find a **TDF** that presents you with a clean image of the Copyright screen, call ***HYDRA Systems Support*** for assistance.

The *HYDRA* Copyright Lines

The two lines of the copyright message appear on all screens displayed while in **Local Services** mode (see below for an explanation of **Local Services**). They are also displayed whenever the terminal is in an "unowned" state, that is, when not in SSCP or PLU state or otherwise associated with a mainframe session. In addition to the announcement of copyright protection, these lines also contain information about the microcode version and release levels and about the port, LU, session, and host link of your current connection, as explained below.

r: shows the level of ***HYDRA 3000*** microcode in your unit.

Port: shows the number of the port to which your display station is connected.

Logical Terminal: shows the number of the current terminal session.

Link: displays the number of the Channel Interface (**CI**) module connecting you to the host.

Host: gives ID configured for that **CI** board.

NAU: specifies the Network Addressable Unit for this session.

At this point in the connection process, the normal user would be ready for access to the mainframe system. As soon as he has entered the terminal type (and ***HYDRA 3000*** password, if required), the mainframe operating would be notified of the connection and would present its sign-on screen.

Using Local Services

Local Services refers to the configuration and unit management routines of the ***HYDRA 3000*** micrcode. This section introduces you to conventions of keyboard usage, instructs you how to select a configuration or management option, how to select or create or delete a configuration record, and how to modify fields within a record.

Local Services Conventions

Function Keys

The standard 3270 cursor movement and editing keys (e.i., Cursor Up/Down, Right/Left, Tab, BackTab, Home, NewLine, Insert, Delete, EraseEOF, EraseInput, etc.) all work in their normal fashion under Local Services.

In addition, at the bottom of most configuration screens you will see a PF/PA-key menu of possible actions for that configuration function. While not all actions are supported for every function, PF- and PA-keys are used in a consistent manner throughout Local Services. Therefore, in those screens which, due to space limitations, ***HYDRA 3000*** can not display the menu (for example, the EBCDIC-to-ASCII and ASCII-to-EBCDIC translation records), appropriate PF/PA-key actions are still available. A list of all PF-keys used by Local Services functions follows, together with descriptions of their actions.

PF1 and PF2: Allow you to scroll backwards and forwards through all valid selections for fields where such an action is appropriate, for example, in the KEY field, to select an existing record, or in a field within a record, to select from a fixed list of options.

PF3: Recovers the current stored record, for example, if you decide to abandon your work and want to revert to the last stored version of this record.

PF4: Loads the factory default record (if you want to start from scratch).

PF5: Deletes the currently displayed record from memory; you must hit PF5 a second time to confirm. Even then, the record, as displayed, can be saved with PF6 if you should change your mind.

PF6: Saves the currently displayed record under the name displayed in the KEY field.

PF7 and PF8: Allow you to scroll through all records of this type. If you have forgotten to save changes to a record, you will be warned, and will need to hit PF6 to save, or PF7 or PF8 again to abandon changes.

PF9 and PF10: Allow you to page backwards and forwards through multiple screens belonging to the same record. This action automatically wraps from the last to the first screen, or vice versa.

PF11: Provides an expanded view of LUT and RCE assignments. It also expands TDF attribute assignments and allows you to dynamically change them. See the LUT, RCE, and TDF sections in Chapter 5 for details.

PA2: Takes you from the current record or menu back one level in the menu structure; if changes to a record have not been saved, a warning is issued, and you can then either hit PF6 to save or another PA2 to abandon changes and exit.

Enter: 1) If you overtype or scroll the KEY field, **Enter** displays the chosen record if it exists, or uses the currently displayed record as a template for a new record; 2) for other fields within a record, **Enter** validates each field, updates the screen and upshifts as needed.

Test-Request: Selects Local Services while in a host session. It also causes an immediate exit from any Local Services screen back to the host screen; note that all configuration changes will be abandoned without warning if you exit Local serives by hitting the Test-Request key. **Ctrl-Y** is the default Test-Request key.

Selecting Local Services: Test-Request (^Y)

To configure a ***HYDRA 3000***, you must first enter **Local Services** mode. The default Test-Request key to enter and exit **Local Services** is **Ctrl-Y**. After pressing Ctrl-Y, you will be presented with the **Test Selection Menu**. This is the initial menu of the **Local Services** functions that control the configuration process. While the **Test Selection Menu** may vary somewhat from one release level to the next, you should see the following choices:

SYSTEM CONFIGURATION: (highest level module/port/LU assignments)
EMULATOR CONFIGURATION: (lower level port and device setup)
SECURITY CONFIGURATION: (general access privilege; passwords)
Enter Password (PAS): (presents the password prompt)
Route Selection: (requests the Data Routing menu)
UNIT CONTROL: (special management and diagnostic tools)
Remote System Selection (RSS): (access to a Distributed Function Unit)

Entering a Password

You must enter a valid password before you may use any other service listed on the **Test Selection Menu**. For initial configuration, the ***HYDRA*** factory default password, 'HYDRASNA', will fulfill this requirement; you can change the password later, as part of the configuration process.

- Press **PF4** or type **PAS** and **Enter** for the **Enter Password** function.
- At the prompt, type **HYDRASNA** or **hydrasna**.
- Press **Enter**.

After the password is accepted, ***HYDRA 3000*** again presents the **Test Selection Menu**. You are now ready to begin using ***HYDRA 3000*** Local Services.

Selecting a Menu Item: PF-Key vs. Keyword

A PF-Key is associated with each menu option. Selection of a particular option will either take you directly to that function or cause the next level of menu to be displayed. Some options of the Test Selection Menu and all options on second-level menus have a three-character quick-access keyword (mnemonic) assigned. Instead of PF-Key selection, you may type this keyword from the home position on any screen, and hit **Enter** to go directly to the function. Keywords are listed in the Table of Contents for Chapter 5.

Selecting a Record

When you select an option from one of the menus, ***HYDRA 3000*** displays the first stored record of that type. Note that records are stored in alphabetical order. If you wish to select another existing record of the same type, you may:

1) overtype the name of that record in the KEY field and hit Enter; or
2) use PF1 or PF2 in the KEY field to scroll through the list of record names, then hit Enter to select and display the desired record; or
3) use PF7 or PF8 to scroll through existing records in search of the desired record.

If you forget to hit Enter in methods 1 or 2, then hit PF6 to save your work, ***HYDRA 3000*** posts a warning at the bottom of the screen that you are about to overwrite an existing record; you may use PA2 (or Ctrl-Y) to back out without saving.

Creating a new Record

To create a new record, use one of the above methods to display the record on which you wish to base the new record, then type the name of the new record over the existing name in the KEY field, and hit Enter. You should see a message at the bottom of the screen indicating that this is indeed a new record; if you do not see that message, the name you chose already existed, and there is a risk of unintentially overwriting the existing record.

Configuration Basics

The next three major sections of this chapter present a basic course in ***HYDRA 3000*** configuration and management. In this, the "Configuration Basics" section, we look at the menu-driven configuration routines, their associated File System, and how things are "named", for internal cross-reference purposes. In "An Outline of the Configuration Process", we walk you through the basic steps of a typical initial configuration. In "Configuration of Specific Devices", we discuss the terminals, printers, modems, security options, audit trail, Distributed Function Units, and the QICC module (SDLC and Bisync). More detailed information on all these topics can be found in Chapter 5, "Configuration/Local Sevices Reference".

Overview

This section offers a broad overview of the configuration functions available through Local Services. We assume that by now you have successfully connected a terminal or PC with terminal emulation to a port of the ***HYDRA 3000***, have chosen a terminal type from the menu, have hit the Test-Request key appropriate to your terminal or emulation, and have selected the Enter Password option and entered the HYDRASNA password. If not, please read the sections above entitled "Basic ***HYDRA 3000*** Operation" and "Using Local Services" for instructions on how to get to this point.

The Configuration Menus

The **Test Selection Menu** offers several direct options (you have already used the "Enter Password (PAS)" option), and several secondary menu options. The first three of these secondary menus, System Configuration, Emulator Configuration, and Security Configuration, handle all configuration functions. We will list the broad categories of items handled under each of the three secondary menus, along with the abbreviation associated with each option. Use these abbreviations to find precise information in Chapter 5 about each option as you read the sections below in this chapter for progressively more detailed information about how to proceed with configuration.

System Configuration

In broad terms, System Configuration options define:

- Channel addresses (**BDF.CI**)
- Final Serial Interface module port setup (**BDF.AI**)
- Token Ring and EtherNet parameters (**BDF.NI**)
- Fixed links between mainframe sessions and ***HYDRA 3000*** ports (**LUT**)
- Dynamic links between the users and destinations (**RCE**, and **RCM**)
- System-wide parameters and record assignments (**SYS**)
- IP parameters (**DND** and **SYS**)

Emulator Configuration

Emulator Configuration options define:

- Serial port RS-232 characteristics and modem setup (**MDF**)
- ASCII terminal characteristics (**TDF**)
- ASCII printer characteristics (**PDF**)
- Mainframe device emulations (**LDV**)
- Translations between EBCDIC and ASCII (**ETA** and **ATE**)
- Serial port characteristics (**APD**)
- Communications categories (**CDF**)
- Channel device categories (**CDD**)

Security Configuration

Security Configuration options define:

- User access capabilities and alternate session assignments (**SDF**)
- Passwords (**PWE**), dial-back; special session 3 assignments

The File System

Before you begin configuring the ***HYDRA 3000***, you may find it helpful to have an overview of the configuration File System, its structure and hierarchy, and the function of each type of record. You can then see how records of different types, and the information in them, are linked to build the final configuration.

File System Hierarchy

The following chart shows the top-down hierarchy of record types. When actually configuring the ***HYDRA 3000***, keep in mind that records must be defined before you make any reference to them, so that the process is more "bottom-up" than "top-down".

The first section below defines the System Configuration, i.e., channel access, port characteristics, LAN node characteristics, and generic user access capabilities. The second section independently defines the end-user's connection and access capabilities, which can override the generic capabilities defined through System Configuration.

You will notice below what seem to be redundant references to certain types of records; this was done to show that records of these types can be used in different ways. For example, a particular terminal may require custom ETA and ATE translation records, which would be assigned to an XLT record, in turn assigned to the appropriate TDF. The custom ETA/ATE records would override the XLT and associated ETA/ATE records assigned to the port (APD) when that TDF is selected.

Each type of record listed below is discussed in detail under its own heading in Chapter 5, "Local Services Reference", including information on record and field cross-references.

Configuration File System Record Hierarchy

SYS = System Configuration record (only one record exists)
- **LUT** = LU (or CUU)-to-port/session assignments (only one record is active)
- **DND** = Domain Name Definition record (one active record)
- **BDF** = Board Definition record class, with subtypes CI, NI, and AI
  - **CI** = Channel Interface records (1-12 records; 1-12 address ranges/record)
    - **CDD** = Channel Device Definition (1 per address range)
  - **NI** = Network Interface records (1-12 records; 1-8 node definitions/record)
    - **APD** = Asynchronous Port Definition record (optional; see below)
  - **AI** = Asynchronous Interface records (or QICC) (1-16 records)
    - **APD** = Asynchronous Port Definition records (1 APD reference/port)
      - **LDV** = Logical Device Definition records (1-4 records(sessions)/port)
      - **XLT** = Translation Table record (optional)
        - **ETA** = EBCDIC-to-ASCII translation records (1-8 records/XLT)
        - **ATE** = ASCII-to-EBCDIC translation records (1-8 records/XLT)
      - **TDF** = Terminal Definition record (optional)
        - **PDF** = Printer Definition record (optional)
        - **XLT** = Translation Table record (optional)
          - **ETA** = EBCDIC-to-ASCII translation records
          - **ATE** = ASCII-to-EBCDIC translation records
      - **PDF** = Printer Definition record (optional)
        - **XLT** = Translation Table record (optional)
          - **ETA** = EBCDIC-to-ASCII translation records
          - **ATE** = ASCII-to-EBCDIC translation records
      - **MDF** = Modem Definition record (optional)
      - **CDF** = Communications Definition record (required)
      - **SDF** = Security Definition record (optional)
        - **RCM** = Route Control Menu record (optional)
          - **RCE** = Route Control Element records (1-20 records/menu, plus optional start-up assignments for all sessions/connections)
            - **LDV** = Logical Device Definition records (optional)

Record Hierarchy relating to End-user Capabilities

PWE = Password Entry records (as required)
- **SDF** = Security Definition record (optional)
  - **RCM** = Route Control Menu record (optional)
    - **RCE** = Route Control Element records (1-20 records/menu, plus optional start-up assignments for all sessions/connections)
      - **LDV** = Logical Device Definition records (optional)

The Naming System

HYDRA 3000 uses a system of names to identify various objects for purposes of configuration and unit management. For example, there is a unique name assigned to each Asynchronous Interface port, each defined Physical Unit (PU), and each HydraNet channel link. Internally, routing codes associated with names allow ***HYDRA 3000*** to establish a pathway between endpoints. Attached to information, the routing code makes sure the information arrives at its intended destination. Names have significance to the configuration process as well; they allow the system manager to specify links between different objects. For example, a user-supplied **NAME** in a Channel Interface record, referred to in the **NAME** field of a Network Interface record, provides the link between a channel address and a Token Ring DSPU. In addition to their importance to the configuration, names play a vital role in ***HYDRA 3000*** unit management functions: **Display Screen**, **Port Reset**, and **Trace** all use names to identify the target object.

Default Names

Whenever a full system reset is performed, ***HYDRA 3000*** generates a default name for any configuration entity that must be known at the time, for example, for all asynchronous ports and PUs. The default names are constructed so that the type and location of the object are fully and uniquely defined. All default names begin with the underscore ("_") character, followed by a 3-character type identifier, 2-digit system number, one-character board type, one-digit board number, a period ".", and 2-digit sub-board identifier, as follows:

_TTTssBb.0p/i where

TTT = the **T**ype of entity (e.g., **AIP** for Asynchronous Interface Port, **SPU** for SNA Physical Unit)
ss = **s**ystem number (**00-3F**) - from the **SYSTEM NUMBER** field of the **System Configuration** (**SYS**) record;
B = Board type
b = board number (**0-F**) **-** from the **AI *b*** or **CI *b*** field of the **SYS** record;
p = port number **(0-F) -** from the **APD *p*** field of the **Asynchronous Interface** record assigned to this board, or;
i = identification number **(0-F) -** from the right digit of the **ID** field of the **Channel Interface** record.

Examples

The examples that follow are generic in nature, in that the system number, board and port number, and ID are not explicit:

Port name: _AIPssAb.0p
This name illustrates the general structure of default names: **_AIP** identifies the type of object as **A**synchronous **I**nterface **P**ort; its location is system **ss, A**synchronous board **b,** port **0p**. The unused zero digit is reserved for future use. A port name would be required by the **Display Screen** (**DSC**), **Port Reset** (**PRS**), and **Trace** (**TRC**) commands.

LU traffic: _AILssAb.0p

_AILssAb.0p refers to all LU services (EBCDIC/3270 traffic) on **A**synchronous board **b** for port **p**. **It does not name a specific LU (session) for the port.** An **LU traffic** name is used exclusively for tracing all LU-type activity for a port.

PU name: _SPUssCb.0i

_SPUssCb.0i declares this to be an **S**NA **PU** object, which resides on **C**hannel board **b** and includes all PU definitions with ID = **0i** in the Channel Interface record.

HydraNet: _HYDRANET.DIRECT

_HYDRANET.DIRECT is the default name for any HydraNet channel connection. Since names must be unique, you must provide alternate names if you wish to configure more than one HydraNet connection (see **User-defined Names** below).

User-defined Names

In addition to the default names, the system manager can create an alternate set of names. In most cases these are aliases that coexist and can be used interchangeably with the default names (e.g., all port and most PU names). A user-defined name for a HydraNet Direct connection, on the other hand, replaces the default name. User-defined names become active after the appropriate level of reset. **Caution: *HYDRA 3000* does not cross-check names for uniqueness; duplicate names will cause incorrect operation in some cases. It is the responsibility of the system manager to make sure names and aliases are unique where required.** ***HYDRA Systems*** strongly recommends that the system manager create user-defined names according to a system that minimizes the possibility of duplicate names. Please be aware, as well, that user-defined port names require that each Asynchronous Interface board be assigned a distinct Asychronous Interface record, even if the pattern of port usage is the same from one board to the next. Finally, the Explicit Connection (XCON) feature pre-empts use of port aliases, since XCON uses the port alias field for its own purposes.

Reserved Characters

System-generated names all begin with an underscore ("_") character, thus underscore must not be used as the first character of a user-defined name, but may be used elsewhere in the name. Several other characters are used in the construction or internal handling of name lists and ranges, and must not be used in any position of a user-defined name. These reserved characters are:

space (" "),
hyphen ("-"),
comma (","),
curly braces ("{" and "}"),
the pound sign ("#").

Constructing a List or Range of Names

In the process of defining certain configuration options (see **Dynamic Session Selection** and **Alternate-Port Dial-Back** below), or in using certain system management functions, you may need to provide a list or range of names. The rules are as follows:

- **Ranges**: Use a **hyphen** to indicate a range. For example:
  PORT00-PORT03 and **PORT00-3** both indicate user-defined port names PORT00, PORT01, PORT02, and PORT03;
  _AIP00A0.08-F indicates a range of eight system-generated port names, from port _AIP00A0.08 through _AIP00A0.0F;
  _SPU00C0.00-2xx.xx specifies three system-generated PU names, where only the system number is changed, i.e., _SPU00C0.00, _SPU01C0.00, and _SPU02C0.00; and
  _AIP00A0.00-3.x7 specifies ports 00 through 37, inclusive.

  Note the shorthand used in each of the examples, where only the digit or digits to be augmented need to be listed as the endpoint of the range. When the digit is embedded within the name, use a non-hexadecimal character such as "x" to indicate characters to be skipped over. Caution: all hexadecimal digits (0-9 and A-F) are subject to augmentation in a name range, even if the result makes no sense, as in: _AIP0A0.00-C0.00.

- **Lists**: Use a **comma** to indicate a list. For example:
  PORT00,2,4,6,8 specifies five user-defined names (presumably for asynchronous ports 00, 02, 04, 06, and 08, but not necessarily so, since user-defined names can be assigned at will). Once again, you need only list the digits that change, i.e., PORT00,1 is equivalent to PORT00,PORT01. Do not use a space after the comma (see the next item).

- Use a **space** to indicate the end of one name list or range and the beginning of the next. For example:
  _AIP00A0.00-7 _AIP00A3.08,A,C specifies two separate sets of ports.

- Avoid using a **comma** and a **space** together; it may lead to unexpected results, since comma takes precedence over space. For example: **PORT38, A, 4C** seems to specify PORT38 A 4C, but, in fact, specifies PORT38 PORT3A PORT4C.

If unsure about the full implications of a name range or list, you can put your proposed range or list in the SELECTION SEQ field of a temporary RCE record, and use the View function (PF11) to expand the range or list.

An Outline of the Configuration Process

The following sections cover the major areas of configuration. The order of these sections roughly follows the order of initial configuration of a ***HYDRA 3000***. The discussion in these sections is of a general nature, with the intention of providing an overview of the process of configuration. Refer to the sections below under the heading "Configuration of Specific Devices and Features" for a checklist of steps for configuring individual devices, and to Chapter 5 for details regarding functions, records, and fields governed by Local Services (the set of internal functions which handle configuration and management of ***HYDRA 3000***).

Defining Channel Addresses

The first order of business in configuring a ***HYDRA 3000*** is to define the channel address or addresses to which the Channel Interface module (or modules) will respond. This is accomplished through a Board Definition record of type Channel Interface (**BDF.CI**). A separate **BDF.CI** record is required for each Channel interface module; each **BDF.CI** record must be assigned to a **CI n** field of the System Configuration (**SYS**) record.

The supplied file system includes a ready-to-use **BDF.CI** record called CI.0, with no channel address assignment, and the default **SYS** record has a reference to this record. Use this record as a starting point. If another record is needed, copy CI.0 by renaming and saving it.

Each line in a **BDF.CI** record defines a range of one or more consecutive channel addresses. Each address must be identified as to type, by assigning the appropriate Channel Device Definition (**CDD**) record. The supplied file system also contains sample Channel Device Definition (**CDD**) records for every supported device type. In the case of SNA addresses, each address represents one PU. In the case of non-SNA addresses, several addresses may be grouped under a single pseudo-PU (since PU is really an SNA concept). This includes the possibility of grouping several lines in a **BDF.CI** record under one non-SNA pseudo-PU by using a shared **ID** value (see below); for example, non-SNA terminals could be defined on one line, and non-SNA printers on another, with the same **ID** number for both. SNA and non-SNA entries must have distinct **ID** values.

The **ID** field provides an internal link between the **BDF.CI** address entries and records of other types, for example, the Logical Unit Translation (**LUT**) records that assign mainframe sessions to ***HYDRA 3000*** ports and sessions. The **ID** fields for different SNA PUs must be distinct from one another, and from any non-SNA entry, therefore, in order to unambiguously determine ownership of Logical Units (LUs).

HYDRANET server addresses provide channel access to the server disk on the host system. The **ID** field is ignored for this type of address. The (optional) **PU NAME** field provides an opportunity to define a custom name for the PU (see the "Names" section above). Other fields in the **BDF.CI** record can almost always be left at their default values. See the section on Board Definition/ Channel Interface (**BDF.CI**) in Chapter 5 for a detailed discussion of fields.

The following steps outline the process of configuring addresses in a Board Definition record of type Channel Interface (abbreviated **BDF.CI**); refer to the appropriate sections of Chapter 5 for details of BDF.CI fields:

- From the Test Selection Menu, go to Board Definition (**BDF**), under the System Configuration sub-menu.
- Use PF8 to select the default Channel Interface record, CI.0. If you wish to create a custom record, rename this record by over-typing the record name.
- Starting with the first line of your **BDF.CI** record, key the sub-channel address (right-most two digits) into the CUU field.
- Key the number of addresses in the range in the COUNT field (right aligned); all addresses of a range must be of the same type.
- Key a unique hexadecimal value between 00 and 0F in the ID field. Keep in mind that the ID value is automatically incremented for successive addresses of a range of SNA addresses.
- In the CDD field, assign the appropriate **CDD** record to define the type of address. You can do this by either typing the name of the record, or by using PF2 to scroll through available names.
- Repeat the above steps on subsequent lines for additional addresses or addresses of other types.
- Hit PF6 to save your changes.
- Go to the System Configuration (**SYS**) record under the System Configuration sub-menu, and make sure your BDF.CI record is assigned in the appropriate field in the right-hand CI column.
- Go on to other configuration tasks, or reset at this point to test. After a reset, you should be able to vary addresses online.

Defining Serial Port and Device Characteristics

The next order of business is to identify serial devices to ***HYDRA 3000***, first, regarding the type of mainframe device they will emulate, and second, regarding their behavior as serial devices. Asynchronous Port Definition (**APD**) records serve as a collection point for records that define various aspects of device behavior; for example, Terminal Definition (**TDF**) records define the characteristics of terminals, and Logical Device Definition (**LDV**) records define the emulated mainframe devices. Other records that can be attached to an APD record, depending on need, are Printer Definitions (**PDF**s), Translation Tables (**XLT**s), Security Definitions (**SDF**s), Modem Definitions (**MDF**s), and Communications Definitions (**CDF**s). APD records also contain direct communications and port behavior specifications.

The supplied file system contains sample records that cover many common situations. Examine the sample records in each category, use those that are closest to your requirements, either directly, or as templates for new records, then make adjustments as required.

Please note that although the Asynchronous Port Definition record was designed originally to handle only asynchronous connections, it now also serves to define synchronous SDLC and bisync connections made through the new QICC high-speed serial communications module.

After creating APD records to match site requirements, assign these records to actual ports in Board Definition records of type Asynchronous Interface (**BDF.AI**). Use the supplied record, AI.0, as a template for other records as required by the number of installed Asynchonous or QICC Interface modules and the pattern of usage on these modules.

Finally, assign the **BDF.AI** records to positions in the chassis in the System Configuration (**SYS**) record.

Defining Connection Endpoints

After defining channel and port characteristics, you will need to connect mainframe sessions with ***HYDRA 3000*** ports and sessions.

HYDRA 3000 offers three methods for determining connection endpoints:

- Fixed assignment through the Logical Unit Translation (**LUT**) record;
- Dynamic assignment through the Route Control structure (**RCE/RCM**);
- Explicit connection using the XCON feature.

We discuss each of these methods below.

Fixed Association of LU/CUUs to Ports and Sessions

You can define a fixed association of LUs or CUUs to ports and sessions through the LU-to-PD Translation (**LUT**) record, a free-form collection of formulas that define the associations. There is only one active **LUT** record, assigned in the LUT field of the System Configuration (**SYS**) record. The **LUT** record may contain no formula at all if the association is to be completely dynamic; the maximum number of formulas is determined by the number that will fit in six lines of 72 characters each, where successive formulas must be separated by at least one space, and formulas can wrap from one line to the next. Each formula must uniquely and unambiguously specify the set of LUs or CUUs to be assigned (source), and the collection of ports and sessions to which they will be assigned (destination). Source specifications must include starting LU/CUU, the total number of LUs/CUUs, and the PU, channel board, and unit to which they belong; destination specifications must include unit, board, port and session information. The formulas are parsed when the record is created to detect conflicts; the actual attachments are attempted at reset time. Since the structure of **LUT** formulas is somewhat complicated and requires knowledge of other configuration structures, we strongly recommend that you read the sections of Chapter 5 pertaining to Board Definition/Channel Interface (**BDF.CI**) and LU-to-PD Translation (**LUT**) before attempting to build an LUT record.

In broad outline, construct an **LUT** formula as follows:

- ❑ Decide how you want to distribute LUs from the SNA PU or CUUs if non-SNA. If you want to assign multiple sessions to ports, determine how you want to distribute the available LUs or CUUs.
- ❑ Select one of the sample records as a starting point (“NSNA” for non-SNA, or “SNA”) and rename it as desired.
- ❑ Construct formulas as described in Chapter 5, under the **LUT** heading.
- ❑ Reset.

Dynamic Session Selection

HYDRA 3000 microcode provides configuration structures that allow dynamic access to a mainframe 3270 session, async-to-async connection, or HYDRANET server, with automatic start-up assignments for each category. Route Control Element (**RCE**) records define dynamic connections. Route Control Menu (**RCM**) records, with references to the **RCE** records, create

menus of dynamic connection possibilities for terminals. **RCM** records also specify a set of start-up connections, for both terminals and printers.

Assignments made via **RCE** and **RCM** definitions override the fixed assignments of the **LUT** record. Note that it is possible when configuring a mix of fixed and dynamic asignments to create conflicting or insufficient LU or CUU assignments, in which case a user may have no possible connection endpoint, if, for example, his fixed assignment has been pre-empted by another port or user with dynamic assignment.

- Create Route Control Element (**RCE**) records:
  Specify the type of connection (TYPE) (e.g., TERM SN TO LU/CUU for SNA or non-SNA sessions);
  Select the PU or PUs where endpoints are located (SELECTION **SEQ**);
  Specify an LU or CUU range (RANGE START/STOP) as required;
  Specify a device type (DEVICE REF) if required.

- Create Route Control Menu (**RCM**) records:
  Each **RCM** will present a menu of twenty connection options to the users.

- Assign **RCE** records in the Route Control Menu (**RCM**) records:
  In the first screen of the **RCM**, there are twenty fields, correcponding to PF-keys 1-20; make assignments by typing or toggling **RCE** record names into these fields. The user will hit the appropriate PF-key to select a new destination. A user may have one 3270 destination and one Data Routing connection at any time, on any of four sessions per port; selection of a new 3270 or Data Routing destination for the session automatically breaks the previous connection.

- Make initial connection assignments:
  In the second screen of the **RCM**, there are fields for assigning four 3270 and Data Routing sessions (one of the 3270 connections may be a printer), a shared printer, and a HydraNet server (described in separate documentation).

- Assign the **RCM** records to Security Definition (**SDF**) records:
  Type or toggle **RCM** record names into the ROUTING MENU field.

- Specify automatic presentation of the Route Control Menu:
  If desired, set the ROUTING MENU AT CONNECT field to YES in the **SDF** record. Subsequent user access to the menu is provided either from the Test Selection Menu (Ctrl-Y, then PF5) or by defining special Session Toggle and Session Disconnect keys in the appropriate Terminal Definitions (**TDF**s). You may also need to define a Binary Mode key for binary file transfers over an async-to-async connection. See Chapter 7, “Terminal Definitions”, for details.

- Attach the **SDF** records to a **port** or to a **user**:
  Assign the **SDF** record to the SDF field of an Asynchronous Port Definition (**APD**) record to attach the menu and initial connections to a port;
  Assign the **SDF** record to the SDF field of a Password Entry (**PWE**) record to attach the menu and initial connections to a user.
  Assignments made via **PWE** override those made via **APD**.

Explicit Connection (XCON)

Explicit Connection (XCON) provides a method for making LU/CUU assignments on the fly, without requiring a full reset of the ***HYDRA 3000***. The XCON feature uses the second field of each line of the Asynchronous Interface record (**BDF.AI**) to make Explicit Connection assignments. In non-XCON mode, this field specifies the port alias, hence use of the XCON feature precludes use of port aliases.

- Enable the Explicit Connection feature:
  Set the XCON field to YES on all Asynchronous Interface Board Definition (**BDF.AI**) records where the feature will be required.

- Make an Explicit Connection assignment:
  Select the appropriate **BDF.AI** record and **APD** assignment line and configure the port as required in the first field. Then type the PU name and LU (or CUU) that you would like to assign to this port into the second field of that line, in the format: PUname,LU (or PUname,CUU), for example, _SPU00C0.00,4C. The PU name can be the system-generated name or an alias you have assigned in the Channel Interface record under the NAME field.

- Make necessary physical connections:
  Disconnect and connect RS232 cables as required.

- Activate the XCON assignment:
  If this LU or CUU has not been previously assigned to another port, invoke the Port Reset (**PRS**) command, key in the port name, and hit Enter; see the "**Names**" section above regarding naming conventions.
  If you are reassigning the LU or CUU from another port (due to hardware failure, for example), that port will still "own" the LU, so you will need to first disable the old port by assigning it an **APD** record in which both DIAL-IN PORT and DIAL-OUT PORT are set to NO. Use **PRS** to reset first this port, then the replacement port.

Defining a Token Ring Down-Stream PU

HYDRA 3000 supports both SNA and non-SNA terminals and printers on a Token-Ring-attached Down-Stream Physical Unit (DSPU). Since ***HYDRA 3000*** passes the 3270 Data Stream to the DSPU gateway for further processing without the need to format the display or read the keyboard, no terminal emulation is required, and the configuration here is limited to the channel and network links, and there is no need for further discussion of specific devices.

- Define channel addresses in a Board Definition (**BDF.CI**) record:
  SNA DSPU:
  Specify the VTAM node address in the CUU field, with a COUNTof 1.
  Toggle the CDD field until the supplied record called DSPU appears.
  Configure a unique ID between 00 and 0F.
  Enter an PU name in the NAME field, to be used in the next step to link this address to the DSPU definition in the Network Interface record. This step is optional, since the system-generated name can be used here.
  (See **BDF.CI** in Chapter 5, and "Names" above.)

  Non-SNA DSPU:
  Specify the non-SNA address range via the CUU and COUNT fields.
  Toggle the CDD field until the appropriate supplied record appears. Use NDSP for non-SNA 327x and 328x devices; use SPD for 1403/3211-type printers.
  Enter a unique PU name in the NAME field, to be used in the next step to link this address to the DSPU definition in the Network Interface record.
  Establish a correspondence between the non-SNA addresses and the SNA LUs of the DSPU by setting the ID field to the first LU of the DSPU (usually 02) to be assigned to the **CUU** range; the assignement will be sequential from that point.
  You may combine several sets of non-SNA devices (on separate lines of the **BDF.CI** record) under one PU by having them share the NAME.
  (See **BDF.CI**, especially the discussion of the ID and NAME fields; see also "Names" above.)

- Define network parameters in a Board Definition (**BDF.NI**) record:
  Assign the PU name, either the system-generated name (valid only for an SNA DSPU), or the name provided in the NAME field, in a Board Definition record of type Network Interface. Define network addresses and other network parameters. (See **BDF.NI**.)

- Assign the **BDF.CI** and **BDF.NI** records:
  In the System Configuration (**SYS**) record provide a reference under the appropriate board slot fields to the Board Definition . (See **SYS**.)

- Perform a unit reset.

Configuration of Specific Devices and Features

The following sections cover the configuration various devices supported by ***HYDRA 3000***. The discussion in these sections is of a more detailed nature than in the previous section, with the intention of providing check lists for specific devices. Refer to Chapter 5, **Configuration/Local Services Reference**, for the most detailed discussion of records, fields, and functions associated with the ***HYDRA 3000*** configuration file system.

Terminals

To the host system, a ***HYDRA 3000*** terminal session emulates one of several IBM terminals and models (3277-79, Mod 2-5). ***HYDRA 3000*** fully supports the Extended Attribute and Alternate Character Set features. Terminals and PCs can be linked to host 3270 sessions via ***HYDRA 3000*** in the following ways:

1) through an Asynchronous Interface or QICC port;
2) as a node on a Token Ring through a Network Interface module via DSPU (DownStream Physical Unit) support;
3) as a node on a Token Ring through an NI module via HydraNet/PC ASCII transport support (PC only; no DSPU);
4) as a 3270 terminal on a remote controller or DSPU over an SDLC link (requires the QICC Interface module); and
5) via a TelNet connection.

For the first and third options, ***HYDRA 3000*** transforms the outbound 3270 EBCDIC Data Stream into a sequence of ASCII data bytes and screen control commands according to the active EBCDIC-to-ASCII (**ETA**) translation table, and to the Terminal Definition (**TDF**) selected. This allows ***HYDRA 3000*** to format the display screen as a 3270 look-alike for a wide variety of ASCII terminals and PC terminal emulations. Input from the terminal or PC keyboard is interpreted and translated according to the **TDF** and the active ASCII-to-EBCDIC (**ATE**) table.

For the second and fourth options, the 3270 Data Stream is passed intact to and from the remote controller or DSPU.

In addition to the above three types of host 3270 connections, ***HYDRA 3000*** also supports terminals in:

6) asynchronous-to-asynchronous Data Routing connections; and
7) HydraNet/PC-to-HydraNet/MF links providing virtual disk access for the HydraNet/PC user. (Note: HydraNet/PC and HydraNet/MF software are extra-cost options; their use will be discussed in a separate manual.)

The configuration of terminals on ***HYDRA 3000*** depends on the type of connection. In the following sections we outline the process for those types listed above which do not require HydraNet/PC. For detailed information on each aspect of the setup, refer to the cited sections of this chapter and to the sections in Chapter 5 corresponding to the function abbreviations in bold type.

Terminals on Asynchronous Interface Ports

In defining terminal connections to asynchronous ports, you must consider host emulation for each session, terminal screen and keyboard handling, port security, and the method of connection to the port. One of the host sessions (but not Session 0) may be a printer (see "Printers" below). Data Routing (async-to-async) connections are handled later in this section.

- Describe channel connections in a Board Definition record (**BFD.CI**):
  Specify the channel address of the SNA PU or the range of non-SNA addresses in the **CUU** and **COUNT** fields; specify the type of address in the **CDD** field; specify the PU **ID**.
  (See **BDF.CI** in Chapter 5; see the section above entitled "Channel Addresses and Physical Units".)

Assign LUs or CUUs to terminal sessions:
(See **LUT** or **RCE/RCM/SDF** in Chap. 5; see the section above, "Defining Connection Endpoints".)

- Describe device characteristics:
  Define the type and features of the 3270 terminal to be emulated to the host system for all sessions. (See **LDV** and **APD**; see also **TDF** in Chap. 5, and Chap. 7, "Terminal Definitions", for Model 3-5 or Extended Attribute support.)

- Define custom translations between EBCDIC and ASCII if required:
  The default records will almost always suffice here. (See **XLT**, **ETA** and **ATE**, and **APD**.)

- Define characteristics, screen control and keyboard for terminals:
  The asynchronous, ASCII device must look and act like a 3270 terminal. The supplied Terminal Definitions cover most terminals and emulations. (See **TDF** and **APD**; see also Chapter 7, "Terminal Definitions".)

- Define the asynchronous connection:
  Specify connection pinouts, baud rate, parity, flow control, and modem initialization between the ***HYDRA 3000*** port and the ASCII device. (See **MDF**, **SDF**, **PWE**, and **APD**.)

- Define port security:
  (See **SDF** and **PWE** in Chapter 5 and the sections below on security.)

- Define port characteristics:
  Build Asynchronous Port Definition records for all types of connections and terminals. (See **APD**.)

- Assign the **APD** records to ports in **BDF.AI** records:
  Define individual ports by assigning **APD** records in Board Definition records of type Asynchronous Interface (**BDF.AI**) and assign those records to AI board slots in the System Configuration record. (See **BDF.AI** and **SYS**.)

- Reset the ***HYDRA 3000***.
  (See "Activating New Configurations" below

Asynchronous-to-Asynchronous Data Routing

Asynchronous-to-asynchronous Data Routing connections require separate configurations for the source and destination ports. Configure destination ports via the Asynchronous Port Definition (**APD**), Board Definition (**BDF.AI**), and System Configuration (**SYS**) records. Configure the source (user connection options) using the Route Control Element (**RCE**), Route Control Menu (**RCM**), and Security Definition (**SDF**) structure. Make sure the necessary Data Routing keys are defined in all appropriate Terminal Definitions (**TDF**s).

- Create a Data Routing **APD** record:
  Set the DATA ROUTING PORT field set to YES.
  Set other destination port characteristics as desired
  (See APD and MDF.)

- Assign this **APD** to a set of ports in the appropriate **BDF.AI** record.

- Make sure the **BDF.AI** record is assigned in the **SYS** record.

- Create an **RCE** record of type **ASYNC TO ASYNC**:
  Specify the destination port name or names (defined above) under the **SELECTION SEQ** field.

- Create an **RCM** record:
  In the **RCM** record, assign the above **RCE** record to one of the 20 fields corresponding to PF-1 through PF-20.

- Link the **RCM** record to an **SDF** record:
  Assign the **RCM** record in the **ROUTING MENU** field of this **SDF** record.
  Set access priveleges as required.

- Link the **SDF** record to an **APD** or **PWE** record:
  The SDF can be either hard-assigned to source ports (**SDF** field of **APD** records) or assigned to Password Entry (**PWE**) records for dynamic assignment at connect time.

- Perform a full unit reset.

TelNet 3270 (TN3270)

TelNet 3270 access to your mainframe from a Local Area Network (LAN) or the InterNet is now possible via a ***HYDRA 3000*** EtherNet or Token Ring Interface module. This feature requires TN3270 client software on the remote user's PC.

You can assign users to mainframe sessions from a general pool of sessions or from discrete pools tied to ***HYDRA 3000*** passwords. The sessions can be LUs from an SNA PU, or non-SNA CUUs, or a mix of SNA and non-SNA. You can assign up to four 3270 sessions per TN3270 user. After deciding on general pool versus password pools, and SNA versus non-SNA, follow these steps to set up TN3270 access:

- Define one or more channel addresses for mainframe access.
  In the Channel Interface Board Definition (**BDF.CI**) record, add an SNA PU address, or a set of non-SNA addresses (or both, as required), following the steps outlined in the "Defining Channel Addresses" section of this chapter. LUs (or CUUs) will be assigned when each user connects.

In the next steps, you will create at least one Route Control Element (**RCE**), one Route Control Menu (**RCM**), and one Security Definition (**SDF**) record and link **RCE** to **RCM**, and **RCM** to **SDF** to provide a pool of mainframe sessions for TelNet users. Refer to the "Dynamic Session Selection" section for further help.

- Create and configure a Route Control Element (**RCE**) record:
  In the **RCE** record, toggle the TYPE field to TERM SN TO LU/CUU. Enter the name of the PU you created in the previous step in the SELECTION SEQ field; this name will be either a system-generated name, such as _SPU00C0.00, or the alias you provided in the NAME field of the **BDF.CI** record.
  In the RANGE START and RANGE STOP fields, enter the first and last LU or CUU of the pool.

- Create and configure a Route Control Menu (**RCM**) record:
  In the second screen of the **RCM** record (start-up assignments), under the 3270 session 0 field, toggle in the **RCE** record you created. If you want to provide more than one start-up session, you may assign the same **RCE** to sessions 1-3, or you may create another **RCE** for a different PU or range of LUs or CUUs and assign it to the other sessions. If you wish to provide fully dynamic session selection, **RCE**s can be assigned to PF-keys in the first screen of the **RCM** record.

- Create and configure a Security Definition (**SDF**) record:
  In the **SDF** record, set SYSTEM ACCESS to YES; set access privileges to configuration functions as required. In the ROUTING MENU field, toggle in the **RCM** you created.

- Create an **APD** record for TN3270 pseudo-port access.
  Set DYNAMIC TERMINAL, PASSWORD REQUIRED, and AUTO MENU as desired; if DYNAMIC TERMINAL is set to NO, specify a Terminal Definition (**TDF**) of type TN3270 in the TDF field.

- For general pool assignment:
  If you wish to have sessions assigned from a general pool, assign the **SDF** record you created to the SDF field in this **APD** record.

- For password-based pool assignment:
  If you wish to have session assignments tied to passwords, you will probably want to create additional **RCE**, **RCM** and **SDF** records to provide alternate pools. Create Password Entry (**PWE**) records as required, and assign the desired **SDF** record to the SDF field of each **PWE** record.

- Create a Route Control Element (**RCE**) record.
  In the SELECTION SEQ field, key in "_AIPssCn.00-pp", where ss is the system number (from the previous step), n is the position assigned to the Lan Interface module in the previous step, and pp is the number of allowable simultaneous TelNet connections (maximum is x'3F').
  If this record exists already, confirm that the SELECTION SEQ field specifies the correct system, LAN board, and number of connections.

- Define the LAN Interface module in a Board Definition, of type Network Interface (**BDF.NI**).
  For EtherNet:
  Toggle LAN TYPE to ETHERNET (or 4- or 16-MHz TokenRing).
  Enter a NODE ADDRESS that is unique within your LAN.
  Toggle LINK TYPE to LAN/IP TO HYDRA.
  Set L.SAP and R.SAP to x'AA' and E.SIZE to 1500.
  Enter the address assigned by your LAN or InterNet Service Provider (ISP) administrator into the IP ADDRESS field.
  Set the SUB NET field to 255 255 255 0 or greater.
  Assign the **APD** record you created above to the APD field.
  Set MAX to the decimal equivalent of pp from the previous step.
  Assign the **RCE** record you just created in the RCE REF field.

- Make required assignments in the System Configuration (**SYS**) record.
  Assign the **BDF.NI** record to the left-hand field of the appropriate CI n field.
  In the second screen of the SYS record set the IP MNGR field to this CI n.
  Note the SYSTEM NUMBER.

- Perform a full unit reset.

Users should select one of the provided Terminal Definitions (**TDF**s), such as T3270B or T3270F. If you wish to create other TDFs, contact ***HYDRA Systems Support*** for help.

Printers

HYDRA 3000 emulates several types of mainframe printers, both SNA and non-SNA. The actual printer can be attached to an asynchronous port, either directly or via modems, multiplexers, etc.; or it can be attached as a node on a network (DSPU support). The printer can have a dedicated connection, as the only session on a port; or the printer output can be multiplexed over a connection to a PC or ASCII terminal via the parallel or serial port of the PC, or the auxiliary port of the terminal, using ***HYDRA 3000***'s multi-session support.

Asynchronous 328x Printers (LU Type 3.0)

HYDRA 3000 emulates 3286/7 printers in either SNA or non-SNA mode. Configuration differences are limited to the channel address definitions.

- Specify the channel address of the SNA PU, or the range of non-SNA addresses (there is no distinction in the Channel Interface record between non-SNA 328x printers and 327x terminals); specify the type of address in the **CDD** field; specify the PU **ID**. (See **BDF.CI** in Chapter 5; see the sections above entitled "Channel Addresses and Physical Units" and "Terminals".)
- Assign the printer LUs or CUUs to ports and sessions. The assignment may be either fixed or dynamic. Use session 0 for a dedicated printer, session 1-3 for a multiplexed printer session. (See **LUT** or **RCE/RCM/SDF** in Chap. 5; see the section above, "Defining Connection Endpoints".)
- To designate a fixed printer LU (using **LUT**), assign a Logical Device (**LDV**) record of **TYPE** 3286 (either the default record or a custom one) to the appropriate session (**LD 0** for dedicated printers; **LD 1-3** for multiplexed printers) in an Asynchronous Port Device (**APD)** record; define other port characteristics as required. Assign that **APD** to a port according to the **LUT** definition created in the step above using the same process as for 327x terminals. (See **LDV**, **APD**, **MDF**, **BDF.AI**, and **SYS** in Chap. 5; see also "Terminals", above.)
- For a dynamic assignment (using **RCE/RCM/SDF**), terminal and printer LUs/CUUs are assigned at the time of connection according to the active **SDF** and availability. It is also possible to assign a specific printer LU to a user through the **SN-3 AUTO LINK** field of the Password Entry (**PWE**) record for the user.

LU Type 1 Printers

Configuration for LU Type 1 printers (SNA only) is identical to that for 328x printers; ***HYDRA 3000*** knows from the VTAM Bind how to distinguish them.

1403/3211 Printers

1403/3211 printers, inherently non-SNA, require a special category in the Channel Interface record.

- For 1403/3211 address(es), select the 3211 **CDD** record in the **CDD** field of the Channel Interface record. (See **BDF.CI** in Chap. 5.)

- Assign to ports, users, and sessions as for 328x printers (see above).

Modems

Proper modem setup and cabling is crucial to reliable ***HYDRA 3000*** operation. In the section of Chapter 3 entitled "Using Modems", we discussed some general considerations about modem setup; cable specifications were discussed in an earlier section of Chapter 3. In this chapter we discuss the use of the Local Services Modem Definition (**MDF**) as a modem management tool.

Modem Setup using the MDF

The Modem Definition (**MDF**) attached to the Asynchronous Port Definition (**APD**) record can be used to set up the modem attached to the port. The four 32-character fields for modem setup provided in the **MDF** should be sufficient to handle the setup of any model of modem. At reset and other appropriate times, the commands contained in these fields are sent to the modem in sequence, separated by the delay specified in the **MDF**. The required delay time will be dependent on the brand and model of modem, as well as on the specific commands contained in the setup sequences, and can only be determined empirically.

In addition to the setup strings, The **MDF** contains information about which pins of the RS-232C interface are active (wired), how long to wait before transmitting data after an RS-232C control signal has been asserted, and how to manage dial-back.

The default configuration shipped with a new ***HYDRA 3000*** contains several sample **MDF** records for common brands of modems, with setups for either software (XON/XOFF) flow control or hardware (RTS/CTS) flow control.

General Asynchronous Modem Setup Requirements

In the following, we list the setup requirements for good interaction between the ***HYDRA 3000*** port and the attached modem and give the standard "AT" command to set the feature as required (if there is a standard command). The first section applies to all brands and models; the second only to those which support error correction, data compression, fixed DTE rate, and flow control. Since there are no standard commands for some of these features, you must rely on documentation from the manufacturer of the brand and model of modem you intend to use.

Basic Commands

- Normal Data Carrier Detect (DCD) handling (&C1)
- Reset or normal Data Terminal Ready (DTR) handling (&D3 or &D2)
- Auto-Answer enabled (S0=1)
- Command Echo disabled (E0)
- Command Results disabled (Q1)

Setup for Advanced Features

- Fixed DTE (serial) baud rate, up to 38,400 bps (brand-dependent command)
- Bi-directional flow control (brand-dependent command); RTS/CTS (preferred), or XON/XOFF
- Auto-Reliable mode (brand-dependent command)
- Auto-Compression mode (brand-dependent command)

Security

Access to the ***HYDRA 3000***'s configuration and management services and to the host system is controlled by a port's active Security Definition (**SDF**). **SDF** records are attached to Asynchronous Port Definitions (**APD**), for fixed port security, and optionally to Password Entry (**PWE**) records; the **SDF** of the active **PWE** overrides that of the **APD**. In addition to access security, ***HYDRA 3000*** handles session cleanup at disconnect time.

HYDRA 3000 offers many types and levels of security at connection time. Access to the system or to configuration functions can be regulated on a port-by-port basis. If Password Security is not invoked, the port is protected by the Security Definition assigned to the port. If password entry is required, the system manager may select simple password or UserId plus user-modifiable password, case-insensitive or mixed case, straight-through or dial-back. Dial-back can be set up as same-port or alternate-port. A convenience dial-back feature, Dial-back-on-the-Fly, allows a qualified user to enter a dial-back number after connecting and entering his password. Access to Local Services can be blocked entirely on a port-by-port basis.

In addition to controlling access, when a user disconnects, ***HYDRA 3000*** automatically signs off mainframe sessions by issuing "Notify Power Down" and "Term-Self with Force Option" sense codes to VTAM (SNA sessions) or by issuing a Device End plus Intervention Status to the operating system (non-SNA sessions).

The following paragraphs describe briefly how to configure each option. Refer to the section in Chapter 5 indicated by the three-character keyname in bold type for details about any Local Services screen. Keep in mind that access is controlled by a combination of Security Definitions, Password Entries, and other associated records.

Creating and Modifying Security Definitions and Passwords

- The Security Definition (**SDF**) and Password Entry (**PWE**) records can both be found under the **SECURITY CONFIGURATION** sub-menu.
- Create or modify **SDF** records to determine the type of access for each user or group of users, e.g., whether or not access is to be allowed to the mainframe system, or to configuration services.
- Create or modify **PWE** records for each user or group of users and link them to the appropriate **SDF** records via the SDF field of the **PWE**.

Requiring Passwords

- To require password security for access to a port, set the PASSWORD REQUIRED field to YES in the **APD** record assigned to the port and perform the appropriate reset (see **Activating New Configurations** below).

User-Modifiable Passwords

- To activate this feature, set the field of this name to YES in the **SYS** record and perform a full unit reset.
- The user will then be prompted for both UserId and Password; the UserId will be displayed as it is typed, the Password will not be displayed. A New Password field on this screen allows the user the option of replacing the existing Password. The UserId is the name of a Password Entry (**PWE)** record; the user-modifiable password is contained in the **PASSWORD** field of that **PWE** record. Only those users with access to Security Configuration can add, modify, or delete a **PWE** record. **Caution:** Be sure you have created at least one Password Entry (**PWE**) record with a defined user-modifiable password (**PASSWORD** field) before performing a unit reset to activate the User-Modifiable Password feature.

Mixed-Case Passwords

- To activate this feature, set the field of this name to YES in the **SYS** record.
- Perform a full unit reset.

Users will then have to match not only the characters, but also the case of a stored password.
Caution: If this feature is not active, all passwords (**PWE** records names) must be created in uppercase. A stored **PWE** containing any lowercase characters will otherwise never match the password keyed in by a user, since the keyed password is automatically upshifted before comparison with the list of stored passwords.

Same-Port Dial-Back

- Enter a dial-back number in the **DIAL-BACK NUMBER** field of the appropriate Password Entry (**PWE**) record(s).
- Enter a dial-out string in the Modem Definition (**MDF**) tailored to your brand of modem The dial-out string you assign in the **MDF** will be **ATDT+>^M** for almost all brands of modems (see the **MDF** section in Chapter 5 for an explanation of the special symbols). Also specify the number of attempts and the time alloted for each attempt in the **MDF**.
- Assign the **MDF** to an Asynchronous Port Definition (**APD**) record.
- Assign the **APD** record in turn to the required port or ports through a Board Definition/ Asynchronous Interface (**BDF.AI**) record.
- Assign the **BDF.AI** record to the required Asynchronous Interface board slot in the **AI x** column of the System Configuration (**SYS**) record.
- Reset the port or ports using the **PRS** command, or perform a full unit reset from the Master Processor module, as required.

When the dial-back **PWE** is entered by the user at a password prompt, the user is informed that dial-back is in progress, the modem connection will be broken, and Hydra 3000 will then make the first dial-back attempt. After the dial-back connection has been made, the user is prompted to confirm the password.

Dial-Back-on-the-Fly

This feature allows the dial-up user to specify the dial-back number at password-entry time; it is more a convenience option than a dial-back security feature.

- Set the DIAL-BACK-ON-THE-FLY field to YES in the Security Definition (**SDF**) associated with a user's Password Entry (**PWE**) record; an optional default DIAL-BACK NUMBER can be entered in the **PWE** record.
- Use the same port setup as for same-port dial-back.

When prompted for a password, the user has three options: 1) accept the default dial-back number by hitting Enter; 2) overtype the field with the desired dial-back number, then hit Enter; or 3) blank out the field if necessary and hit Enter (for non-dial-back access).

Alternate-Port Dial-Back

Alternate-port dial-back offers the highest degree of port security. Modems on dial-out ports should have auto-answer disabled; you may even want to order dial-out-only telephone service for these lines. For maximum security, all passwords must be dial-back-alternate passwords.

- A single dial-in port can handle the dial-back requests for many dial-out ports. In order to promote quick entry of terminal type and password, set the keyboard (inactivity) time-out to 1 minute in the Asynchronous Port Definition (**APD**) record for this port. Set DIAL-IN PORT to YES and DIAL-OUT PORT to NO. Assign to it a Security Definition (**SDF**) record which prevents access to the host system and to all configuration functions. Assign this **APD** to the dial-in port or ports in one or more **BDF.AI** records.
- For ports to be used for dial-out, create a separate **APD** and set the DIAL-OUT PORT field to YES in that **APD** record and assign to it an **MDF** record with the dial-out command properly defined for your brand of modem, as described in the section above. Assign this **APD** to the dial-out ports in one or more **BDF.AI** records.
- Create dial-back Password Entry (**PWE**) records for each user and assign to each a Security Definition (**SDF)** record with a list or range of port names to be used for dial-back in the DIAL-OUT LIST field. Refer to the "**Names"** section above for port naming and listing conventions.
- Perform a unit reset from the Master Processor to activate the changes.

When the user enters a dial-back password, ***HYDRA 3000*** will search for the first port available for dial-back. If a dial-back port is available, the dial-in port will disconnect by lowering DTR, and ***HYDRA 3000*** will make the first dial-back attempt. From this point, the process is identical to same-port dial-back. If all dial-out ports are busy, ***HYDRA 3000*** will notify the user to try later;

Blocking Access to Local Services

- To prohibit access to Local Services, set the TEST MODE ENABLED field to NO in the active Asynchronous Port Definition (**APD**) record.
- Perform at least a Port Reset to activate the change.

When a user on this port hits the Test Mode key, his port will be placed in a locked state until he hits the Reset key.

Audit Trail

One or more asynchronous ports can be configured to collect audit information concerning connections and disconnections, dial-back events, valid and invalid passwords entry attempts, and unit configuration and reset events. Each audit record is time and date stamped. Audit records can be printed directly as they are presented or collected on a PC hard disk for later analysis or printing.

Audit Configuration

- Create a Logical Device (**LDV**) record of type **AUDIT-P** and set **AUDIT DEV PRIORITY** as required.
- Assign the **LDV** record to the **LD 0** field of an Asynchronous Port Definition (**APD**) record, with appropriate RS-232 parameters and flow control specified in the **APD** and associated **MDF** records.
- Assign that **APD** record to the desired port via a Board Definition record of type Asynchronous Interface (**BDF.AI**).
- Assign that record to the appropriate **AI n** field in the **SYS** record.
- Review and set the audit parameters in the **SYS** record as desired.
- Perform a full reset.

Distributed Function Units (DFUs); *Hydra-Link*

Hydra-Link provides support for Distributed Function Units (DFUs). DFUs are separate ***HYDRA 3000*** chassis connected through specially configured asynchronous ports. Each ***HYDRA 3000*** in a DFU network manages screen updates for all devices attached to it; DFU link traffic between units is thus minimized. A common use of this feature is the linking of a channel-attached ***HYDRA 3000*** to a remote ***HYDRA 3000*** at an offsite office. Another use might be to link multiple channel-attached ***HYDRA 3000***s, to allow users access to two or more host sites. The DFU link can be operated at up to 57.6 Kbits/second between two Asynchronous Interface modules, or at much higher speeds between two QICC modules. Each ***HYDRA 3000*** must be assigned a unique System Number to ensure proper routing of link traffic (see System Configuration (**SYS**) in Chapter 5). For improved throughput, you can configure multiple (parallel) links between units; load balancing will be performed in this situation.

DFU Configuration

In each ***HYDRA 3000*** of the network, perform the following steps:

- Define a unique SYSTEM NUMBER in the System Configuration (**SYS**) record in each ***HYDRA 3000***.
- Configure a channel address for the SNA PU (or multiple addresses for non-SNA sessions) in the Channel Interface (**BDF.CI**) record of any channel-attached ***HYDRA 3000***. Also create an SNA address for the H3000UTL utility; configurations for all units in the network can be backed up or restored over this one link by specifying the appropriate System Number in the H3000UTL jobstream.
- Create a Logical Device (**LDV**) record of TYPE DFU-LNK in each ***HYDRA 3000***.
- In each ***HYDRA 3000*** create an Asynchronous Port Definition (**APD**) record for the DFU port and assign the above LDV record to its LD 0 field. In the second screen, set the BAUD RATE as required and set DYNAMIC BAUD RATE to NO; select the **CDF** record called DFU in the CDF field.
- Assign the APD record to the appropriate port in a Board Definition (**BDF.AI**) record in each ***HYDRA 3000***.
- Make sure the BDF.AI record is assigned to the correct AI n slot in the System Configuration (**SYS**) record.
- In the **SYS** record of **each** unit, assign the EXT LINK MGR to the board on which the physical DFU link will reside. Note: EXT LINK MGR is actually two fields, a board type, and a board number, and **must be correctly assigned prior to reset**.
- Make LU or CUU assignments to ports and sessions through the **LUT** record (fixed assignment) or through the **RCE/RCM/SDF** structure (dynamic assignment). See “Defining Connection Endpoints” above and corresponding sections in Chapter 5 for details. Make sure the SYSTEM NUMBER for the ***HYDRA 3000*** from which the LU/CUUs originate is correctly specified in the **LUT** formula or **RCE** SELECTION SEQ field.
- Make the necessary physical connections between ***HYDRA 3000*** units.
- Perform full unit resets on all units.

The QICC Board

The QICC RS232 serial board, new with Release 2.3 microcode, is capable of very high speed asynchronous and synchronous data transmission. The QICC board can handle SDLC and BISYNC and other synchronous data traffic, with either internal or external clocking. QICC boards are multiple-processor interface modules. Each QICC processor handles four ports and runs independently of the other QICC processors on the board. The QICC board is currently available in two configurations, to support either eight or sixteen serial ports.

QICC Board Jumpers and Cables

Since the standard pinouts of the DE9 connector used for ***HYDRA 3000*** serial connections do not provide for signal clocking for transmitted and received data, as required for synchronous transmissions, re-assignment of one or more of the DE9 pins is necessary. This is accomplished by jumpers on the QICC Interface board. In addition, special cables are required for sychronous hook-ups. Jumper locations and meanings, and corresponding cables, are described in Chapter 3.

QICC Configuration - General

In both asynchronous and synchronous modes, QICC configuration is handled through the same structures as Asynchronous Interface configuration. QICC port characteristics are defined in one or more **APD** records, which are in turn assigned to the appropriate ports in a Board Definition of type Asynchronous Interface (**BDF.AI**). The BDF.AI record is then assigned to the proper AI slot in the System Configuration (**SYS**) record.

QICC Asynchronous Configuration

Define asynchronous QICC ports in the same way you define Asynchronous Interface ports. See the discussion earlier in Chapter 4 regarding Asynchronous Interface port and session configuration. The basic steps are:

- Define channel addresses in a **BDF.CI** record.
- Define port characteristics in one or more **APD** records:

  the CDF reference must specify an asynchronous port.
- Assign the **APD** records in one or more **BDF.AI** records.
- Assign LUs or CUUs:
  Assign static LUs or CUUs via **LUT** formulas;
  Assign dynamic LUs or CUUs via a chain of **RCE/RCM/SDF** records linked either to **APD** or **PWE** records.
- Assign the **BDF.CI**, **BDF.AI**, and **LUT** records in the **SYS** record.
- Reset.

QICC Synchronous Configuration

The setup of synchronous QICC ports uses the same general configuration structures as for asynchronous ports, but you must define channel addresses, logical device and port types, and the links between channel addresses and ports, in special ways. To aid in this setup, the default file system contains sample records for the various types of synchronous connections and protocol. Note: Dial-out Bisync and SDLC transmissions require 2.5-level microcode. Build the configuration as follows:

BISYNC (BSC) Point-to-Point and Switched (Dial-in) Connections to QICC Ports

Use either Route Control Element (**RCE**) records or the Explicit Connection XCON feature to link ports to Bisync addresses.

- Define Bisync channel addresses in the **BDF.CI** record:
  Specify addresses as BSC by toggling the supplied **CDD** record called BSC into the CDD field for the address. Give each address a unique ID and a unique NAME, observing the rules described in the "**Names**" section above.

- If using the **RCE** to link channel address to port, create **RCE** records:
  Under the SELECTION SEQ field, assign the NAME associated with that address (from the NAME field of the **BDF.CI** record in the previous step).

- Confirm that the following records exist in the default file system:
  a Logical Device (**LDV**) record named XPAR, of TYPE XPAR; and
  a Communications Definition (**CDF**) record called BSC, of TYPE BISYNC.

- Define port characteristics in one or more **APD** records:
  In the first screen of each **APD** record, select the desired **RCE** record in the RCE field (if using the RCE to link addresses to ports). Select the XPAR **LDV** record in the LD (0) field, and set DYNAMIC TERMINAL, AUTO MENU, PASSWORD REQUIRED, and UNOWNED SCREEN ID all to NO.
  In the second screen of each **APD** record: select the BSC **CDF** record in the CDF field and the SYNC **MDF** record in the MDF field. Set the serial rate as required in the BAUD RATE field; in most cases this should be EXTERNAL. Set DIAL-IN PORT to YES for dial-in (Switched) use; set DIAL-IN PORT to NO for direct-attached (Point-to-Point) devices.
  Make sure the QICC jumpers are correctly set (see the QICC section in Chapter 3). Select the proper cable to match the jumper settings.

- Assign the **APD** records to QICC ports in a **BDF.AI** record.
  Make these assignments in the first field of each line. If using the Explicit Connection (XCON) method for linking addresses to ports, set XCON to YES and type the NAME associated with the address in the second field (from the NAME field of the **BDF.CI** record in the first step).

- Assign the **BDF.CI** and **BDF.AI** records in the **SYS** record as required.

- Make connections to QICC ports.

- Reset.

Bisync Mainframe-initiated Auto-Call (ACU) Dial-out

Bisync dial-out using an Auto-Call Unit (ACU) requires two ports for each bisync line; the mainframe Dial command is passed to the ACU on the first port; the ACU dials the remote Bisync device, then passes control to the second (Bisync) port when a valid carrier is established. This second port must be on a QICC Interface module, but the dial-out port can be on an Asynchronous Interface module (if your *HYDRA 3000* includes one), for a more cost-effective use of QICC ports. The ports are linked through use of the Explicit Connection XCON feature, activated in the Board Definition/Asynchronous Interface (BDF.AI) configuration. Note: The Auto-Call Unit used must support RS232-C, asynchronous ASCII dial mode.

- Define Bisync channel addresses in the **BDF.CI** record:
  In the active Board Definition/Channel Interface (BDF.CI) record, set EXTENDED (Extended Channel Commands) to YES.
  Enter addresses either singly, on separate lines, in the CUU field, with COUNT 1, or as a range; specify them as BSC by toggling the supplied **CDD** record called BSC into the CDD field for each address or range. Give each address a unique ID and a unique NAME, or, if using a range of addresses, specify a range of unique IDs and a NAME range (e.g. BSC_C50-7), observing the rules described in the "**Names**" section above.

- Create a Modem Definition (**MDF**) record for the Auto-Call dialer:
  Set all four WIRED fields to NO and the corresponding DELAY fields to 0. Blank out the four MODEM SETUP SEQ fields. Set the DIAL TIMEOUT field (in 10ths of a second) to the auto-call unit's dial time-out value, e.g., if the ACU times out in 60 seconds, set DIAL TIMEOUT to 600. In the AUTOMATIC CALLING SEQ field, type the auto-call unit's dial command, using "+>" to indicate where the phone number sent with the mainframe dial command should be inserted (e.g., "^B+>?^C").

- Create another Modem Definition (**MDF**) record for Bisync use:
  Set DTR WIRED and DCD WIRED to YES, DSR WIRED and CTS WIRED to NO. Set DTR DELAY field to 10, DCD DELAY to 0. Set the DIAL TIMEOUT field (in 10ths of a second) to the auto-call unit's dial time-out value, as above. Blank out the four MODEM SETUP SEQ fields and the AUTOMATIC CALLING SEQ field.

- Define characteristics for the ACU port in an **APD** record:
  Create an APD record with LD (0) set to ACU; set DYNAMIC TERMINAL, AUTO MENU, PASSWORD REQUIRED, and UNOWNED SCREEN ID all to NO. In the second screen, set the speed as required, CHAR. SIZE 8-BIT, PARITY NONE, STOP BIT 1; set FLOW CONTROL to NONE. In the MDF field, select the Modem Definition you created for auto-call. Clear the CDF field (the default is asynchronous). In the remaining fields, set only DIAL IN PORT to YES. You can use the same auto-call APD for all ports with the same characteristics.

- Define characteristics for the Bisync port in an **APD** record:
  Create an APD record with LD (0) set to XPAR; set DYNAMIC TERMINAL, AUTO MENU, PASSWORD REQUIRED, and UNOWNED SCREEN ID all to NO. In the second screen, set BAUD to EXTRNL; set FLOW CONTROL to RTS-CTS. In the MDF field, select the Modem Definition you created for Bisync. Set the CDF field to BSC. Set all remaining fields to NO. You can use the same Bisync APD for all ports with the same characteristics.

- Set up pairs of ports for ACU/Bisync:
  Assign the ACU **APD** record to any Asynchronous or QICC Interface port port in the appropriate Board Definition (**BDF.AI**) record. Note: the BDF.AI record you use for this module must have the XCON field set to YES. In the field to the right of the APD n assignment field, type in the name (from the **BDF.CI** record) you gave to the address to be used for this auto-call/Bisync line.
  Assign the Bisync **APD** record to a port in the Board Definition / Asynchronous Interface (**BDF.AI**) record for any QICC Interface port. Note: the BDF.AI record you use for this module must have the XCON field set to YES. In the field to the right of the APD n assignment field, type in the same name you used above. This name provides the necessary internal link between the auto-call port and the Bisync port.

- Assign the **BDF.AI** records in the System Configuration (**SYS**) record:
  If you haven't already done so, assign the BDF.AI record or records you used in the above steps to the appropriate AI slot in the System Configuration (SYS) record.

- Reset.

- Connect the ACU and Bisync modem:
  Connect the ACU, using a standard ***HYDRA 3000***-modem cable (Chap. 3, page 3-10), and the synchronous modem, using the ***HYDRA 3000***-DCE QICC cable (Chap. 3, page 3-14), to the ports you configured above.

Bisync Same-port Dial-out; Mainframe-initiated Dial

Bisync dial-out using a single port for each Bisync line requires modems capable of automatically switching to synchronous mode after completion of the dial-out process. The mainframe Dial command is passed asynchronously to the modem, which dials the remote Bisync device, then switches to synchronous mode when a valid carrier is established. This feature works exclusively through the QICC Interface module. Use either Route Control Element (**RCE**) records or the Explicit Connection XCON feature to link ports to Bisync addresses.

- Define Bisync channel addresses in the **BDF.CI** record:
  In the active Board Definition/Channel Interface (BDF.CI) record, set EXTENDED (Extended Channel Commands) to YES.
  Enter addresses either singly, on separate lines, in the CUU field, with COUNT 1, or as a range; specify them as BSC by toggling the supplied **CDD** record called BSC into the CDD field for each address or range. Give each address a unique ID and a unique NAME, or, if using a range of addresses, specify a range of unique IDs and a NAME range (e.g. BSC_C50-7), observing the rules described in the "**Names**" section above.

- If using the **RCE** to link channel address to port, create **RCE** records:
  Create a Route Control Element (**RCE**) record for each Bisync channel address. TYPE must be SERIAL DSPU, and SELECTION SEQ must contain the name you gave in the previous step to the address in question.

- Perform the basic modem setup for asynchronous dial/synchronous mode after connection:
  Depending on the brand of modem used, this will be accomplished by some combination of front panel, dip-switch, or modem command setup. It is not possible at present to use the Modem Definition you will create in the following step to do this, but you can create **MDF** and **APD** records solely for modem setup, and assign the **APD** to ports temporarily in order to initialze modems, then assign the permanent Bisync **APD** and associated **MDF**.
  Set the modem for the following: fixed (and equal) modem and DTE speed, with speed fallback disabled; no flow control; normal DTR handling; no command echo or results; auto-answer disabled; DSR to indicate a connection. Find out what "AT" (or other) modem command will cause the modem to drop into synchronous mode after dialing a number and establishing a connection; this command will be needed for the following step.

- Create a Modem Definition (**MDF**) record for Bisync dial-out:
  Set DTR WIRED and DCD WIRED to YES, DSR WIRED and CTS WIRED to NO. Set DTR DELAY field to 10, DCD DELAY to 0. Set the DIAL TIMEOUT field (in 10ths of a second) to the modem's dial time-out value. In the first MODEM SETUP SEQ field, enter the dummy sequence "BISYNC_SAME_PORT"; blank out the other three MODEM SETUP SEQ fields. In the AUTOMATIC CALLING SEQ field, enter the command to initiate a dial-out and switch to synchronous mode; this command must end with "+>^M", "+>" to indicate the position at which to insert the phone number sent from the mainframe, and "^M" to represent a Control-M (Carriage Return) to terminate the command. For example, AT&T, Multi-Tech, UDS, and U.S.Robotics Courier modems use the command: AT&M1DT+>^M.

- Define the Dial-out/Bisync port in an **APD** record:
  Create an Asynchronous Port Definition (**APD**) record. You will need one **APD** record for each Bisync address and port if using the **RCE** method for linking addresses to ports. If you use the Explicit Connection feature to accomplish this, you may use the same **APD** record for more than one port, and create the link in the following step.

- Assign the **APD** records to QICC ports in a **BDF.AI** record:
  Create a Board Definition/Asynchronous Interface record and assign the APD records you created in the previous step to the appropriate ports of the QICC module (first field of each line). If you opted to link addresses to ports using Explicit Connection (XCON), enter the name of the address (from the Channel Interface record) in the second field of each line.

- Assign the QICC **BDF.AI** record in the **SYS** record:
  Assign the BDF.AI record you created in the previous step to the slot occupied by the QICC module.

- Connect QICC ports to dial-out modems:
  Use the ***HYDRA 3000***-DCE QICC cable (Chap. 3, page 3-14) between the ports you configured above and their modems.

- Reset.

Bisync Same-port Dial-out; Manual or DTR Dial

With Manual Dial, a handset attached to the local synchronous modem is used to place the call to the remote modem, then the local modem takes control of the line to complete the negotiation process.

With DTR dial, the modem must be pre-programmed in asynchronous mode to dial one specific number as soon as the DTR pin is raised, then to switch to synchronous mode. When the Enable command is issued by the mainframe software, the QICC port will raise DTR to start the dial-out process.

In both cases, define the address and the port as for a Switched (dial-in) connection.

SDLC DSPU Point-to-Point Connections to QICC Ports

- Define one or more channel addresses in a **BDF.CI** record:
  Specify each address (CUU) as SNA PU 2.0 RHA by toggling the supplied **CDD** record called DSPU into the CDD field for each address. Give each address a unique ID and NAME, observing the rules described in the "**Names**" section above; for a contiguous range of addresses, you may specify the first address under CUU, the number of addresses (COUNT), the first ID of a unique range, and a name range (NAME), e.g., SDLC_A0-3 to specify names SDLC_A0, SDLC_A1, SDLC_A2, and SDLC_A3..

- Create an **RCE** record of TYPE SERIAL DSPU for each address:
  Under the SELECTION SEQ field, assign the NAME associated with that address (from the NAME field of the **BDF.CI** record). In the RANGE START field, key in the multi-drop address of the device to be connected (default is X'40').

- Confirm that the following records exist in the default file system:
  a Logical Device (**LDV**) record named DSPU, of TYPE XPAR; and
  a Communication Definition (**CDF**) record called SDLC, of TYPE SYNC.

- In the set SYNC **CDF** record, set ENCODING as required.

- Define port characteristics in one or more **APD** records:
  In the first screen of each **APD** record: select the desired **RCE** record in the RCE field and the DSPU **LDV** record in the LD (0) field, and set DYNAMIC TERMINAL, AUTO MENU, PASSWORD REQUIRED, and UNOWNED SCREEN ID all to NO.
  In the second screen of each **APD** record: select the SDLC **CDF** record in the CDF field and the SYNC **MDF** record in the MDF field. Set the serial rate as required in the BAUD RATE field; in most cases this should be EXTERNAL. Set DIAL-IN PORT to YES.
  Make sure the QICC jumpers are correctly set (see the QICC section in Chapter 3). Select the proper cable to match the jumper settings.

- Assign the **APD** records to QICC ports in a **BDF.AI** record.

- Assign the **BDF.CI** and **BDF.AI** records in the **SYS** record.

- Make the appropriate connections to QICC ports.

- Reset.

SDLC DSPU Multi-Drop Connections to QICC Ports

Multi-Drop uses a single QICC port to service multiple remote controllers and terminals. Each drop (controller) will be associated with a separate VTAM PU 2.0 definition (unlike an NCP/VTAM multi-drop setup through an IBM Front End).

- Create an address entry (**BDF.CI**) and **RCE** record for each drop:
  For a multi-drop setup, each remote controller is associated with its own SNA local PU Type 2.0, hence has its own channel address. Following the general procedure for single-drop SDLC in the previous section, specify a unique address for each remote controller in the **BDF.CI** record and create an **RCE** record for each address, each with the proper polling address. To indicate that these separate PUs are to be handled on one QICC port, you must link each **RCE** record to the next using the LINK field, then specify the first **RCE** of this chain in the RCE field of the appropriate **APD** record. Note: it is easiest to create the linked **RCE** records in the order, last to first, since the LINK reference can only be made to an existing record.

- Follow the remaining steps of the previous section:
  The remainder of the configuration for Multi-Point is the same as for Point-to-Point SDLC.

HYDRA 3000 Management

The final section of Chapter 4 describes the management functions built into the ***HYDRA 3000***. Included are:

- Unit and port reset
- Setting time and date
- Displaying a user's screen
- Tracing input/output
- Displaying Distributed Function Unit pathways
- Control Ports
- Microcode upgrades

All of the above management functions require Unit Control access granted in the Security Definition (**SDF**) attached to the port or Password Entry (**PWE**).

Unit and Port Reset: Activating New Configurations

Many, but not all, configuration changes require some level of reset in order to become part of the active configuration. The following paragraphs outline the procedures for and conditions requiring the different levels of resets.

Actions requiring a full Unit Reset

A Unit Reset is performed by depressing and releasing the Reset toggle switch on the Master Processor board. This type of reset immediately severs all connections to the unit, initiates memory and code module integrity tests, reloads each board with the appropriate code module, starts each board, and re-establishes contact with the host system. As the reset proceeds, the numbers on the 7-segment displays on each board count down from **F** to **0**. **Note**: Partial, single-board resets are not allowed; only the Master Processor Reset switch should be toggled. A "soft" unit reset can be performed from a terminal attached to the active control port (see "**The Control Ports**" below), using the **RS** command; contact ***HYDRA Systems Support*** for instruction on this and other In-Field Fault Analysis Tool (IFAT) commands.

The following actions require a full unit reset.

Changes to LUT, BDF.CI, BDF.NI, PDF, XLT, ETA, ATE, and SYS records

Any change to system-wide configuration options requires a full unit reset. This includes, for example, changes to or addition of a PU definition in a Channel Interface Board Definition (**BDF.CI**) record, changes to the active **LUT** record, changes to network parameters associated with a Network Interface board (**BDF.NI**), and most changes to the **SYS** record.

Actions requiring a Port Reset

A port reset is performed from a terminal connected to any port, using the Port Reset (**PRS**) command under the Unit Control Menu. More than one port can be reset at a time by specifying a range or list of ports. See the **Names** section above for detailed discussion of port naming conventions. The user performing the Port Reset must have Unit Control capability specified in his associated Security Definition (**SDF**).

- Select Port Reset (**PRS**) from Unit Control:
- Overtype the suggested port name (your port!) with the required port name and press Enter.

The following actions require a port reset.

Changes to APD, LDV, TDF, SDF, RCM, RCE, BDF.AI, and SYS (for changes to AI assignments) records
Any change to any record involved in the configuration of an asynchronous port requires a port reset in order for the change to take effect.

The following types of records are considered shared resources: **MDF**, **PDF**. When a record of these types is used in more than one place, only one copy of the record is loaded into memory. If you make changes to this record, a Port Reset will not activate these changes, and a full reset will be required.

Actions requiring no Reset

The following configuration changes do not require a reset, but may require a user to disconnect before the changes will be effective.

Changes to PWE, SDF, RCM, and RCE records
Changes to or additions of Password Entries or their associated Security Definitions, Route Control Menus and Route Control Elements are available and effective on next access.

TDF
Changes to or additions of Terminal Definitions are available to the next user who connects. Those already connected will not be affected.

Caveat regarding Bisync Port Reset

If a Bisync line is in the Enabled state, a Port Reset (or full front-panel reset) may cause a Missing Device End (also called "Missing Interrupt") condition, blocking further I/O on that address, and potentially leading to a hung channel and CPU, especially under the DOS/VSE operating system. If this occurs, use the following procedure to clear the condition; otherwise, a full system IPL may be required.

Bisync Address and Port Reset Procedure

In the event of a hung Bisync (BSC) address (see above section), perform the following steps:

- Select Port Reset (**PRS**) from Unit Control.

- Specify the Bisync PU name:
  Overtype the suggested port name with the name given to this Bisync address in the Channel Interface record; hit Enter. This will generate a stand-alone Device End on the channel for this address, which should free up the address and system.

- Reset the Bisync port:
  Now overtype the PU name with the name of the bisync port and hit Enter to re-initialize the port and prepare it for the next action from the mainframe.

Setting Date and Time

The Master Processor module of the ***HYDRA 3000*** has an on-board clock chip that maintains the date and time. The Audit Trail and Console Log features time-stamp recorded events based on this date and time, but the operation of the ***HYDRA 3000*** is otherwise not dependent on date or time. Access to this function requires Unit Control capability, set in the active Security Definition (SDF).

To set the date and time:

- Select **Display/Set Time** (**TIM**) from the Unit Control menu.

- Key in new values and save.
  There are six fields, for month, day, year, hour, minute, and second; modify as required.
  Save the changes by hitting PF6; they will be stored in battery-backed RAM. Changes take effect immediately, so no reset is required.

Displaying a User's Screen

The **Display Screen** (**DSC**) feature is provided as a management, training, and troubleshooting tool. Access to this function requires Unit Control capability, set in the active Security Definition (SDF). Display Screen presents a snapshot of the target user's current screen. A fresh snapshot is presented each time you hit the Enter key, so you can follow the user's progress through a series of screen updates. If you require a continuous presentation of the user's actions, use the Trace function, described in the next section.

To initiate Display Screen:

- Select **Display Screen** (**DSC**) from the Unit Control menu.

- Select the target port:
  Over-type the suggested port name (yours) with the name of the port you want to observe and hit Enter. The port name can be in the suggested, system-generated format (_AIPssAb.0p), or can be an alias defined in the Board Definition/Asynchronous Interface (BDF.AI) record associated with the target port. See the "Names" section in this chapter.
  Note: If the port you have selected is not in a connected state or does not exist, you will see the error message: DISPLAY SCREEN FAILURE. In this case you can type the name of another port and hit Enter, or hit PA2 or Test-Request to exit.

- Refresh the display:
  Hit Enter for a fresh snapshot of the user's screen.

- Exit from Display Screen:
  If you selected a valid port, hit PA2 to exit back to the port name prompt. You can then type in the name of another port to display, or exit further with PA2 or Test-Request.

Tracing *HYDRA 3000* Actions

The **Start Trace** (**TRC**) function presents a continuous stream of inbound and outbound activity through various points in the ***HYDRA 3000*** internal architecture, depending on the selected target name (more about trace points and target names later). This stream can be viewed on-screen, but is usually best captured to a PC disk file for later study or transmission to ***HYDRA Systems Support*** or the Engineering staff. Trace data are presented in various formats, depending on the trace point, in both two-digit hexadecimal codes and in translated form (both ASCII and EBCDIC, although usually only one is appropriate to the selected trace). Simultaneous, multi-point traces can be run, and may be necessary when a situation cannot be repeated exactly for successive traces at different points, but such traces may produce large amounts of output that is difficult to read and interpret.

Keep in mind that the Trace function demands heavy internal resources, and has high priority, so may slow the normal operation of the unit considerably. It is usually best to schedule traces for controlled, after-hours tests. Single-port, asynchronous, ASCII traces can, however, be run in a production environment without significantly disturbing normal operations. Bear in mind also that the more general the entity you trace (e.g., PU versus single port), the higher the probability that you will find large amounts of extraneous data intermingled with pertinent trace data.

The point at which you trace is tied to names used internally by the ***HYDRA 3000*** for routing information from one point to another. These names are associated with what we call “entities” (for lack of a better word, perhaps). An asynchronous port is one such entity, its assigned LUs (collectively) are another, their SNA PU is still another, and the associated Data Link Control layer a fourth; each has a unique name to identify it. Information is transformed as it flows across the ***HYDRA 3000*** from one “entity” to another. By tracing at each point, one can monitor those transformations to identify the causes of reported problems.

It is important whenever tracing to have as much control as possible over actions related to the entity to be traced. You (and ***HYDRA Systems***) will learn little or nothing from the trace if there is traffic from extraneous LUs or CUUs, keystrokes, connections and disconnections, etc., beyond your direct control mixed in with pertinent data. If possible, develop a script beforehand and insist on strict adherence to it. Make careful notes of each test; include the general purpose of the trace, date and time (**Trace** does not time-stamp events), entity or entities traced, capture file name, test results (e.g., “no failure while tracing”), anomalies, names of others involved in the trace. Rely as little as possible as your or anybody else’s memory. Use separate capture files for separate tests.

Valid, system-generated names for traceable entities are as follows, where:

- **ss** = System number;
- **b** = Board number;
- **p** = Port number;
- **i** = Id number (second digit of the ID field in the CI record);

All numbers are zero-relative. An asterisk (*) indicates that you may use an alias name (e.g., PU name or port name). See the "Names" section in this chapter for further discussion of naming conventions and aliases.

Name	Meaning/Use
_AIP**ss**A**b**.0**p**	Port trace: traces all serial ASCII input/output for this port*;
_AIL**ss**A**b**.0**p**	LU trace: traces LU traffic for all sessions of this port;
_SPU**ss**C**b**.0**i**	PU trace: traces all SNA traffic for this Physical Unit (PU); you must specify an LU range under RANGE BEGIN/END.
_SPU**ss**C**b**.0**i**	Non-SNA channel trace: Only for non-SNA channel-level trace; specify a range of CUUs. *
_SDC**ss**C**b**.0**i**	SNA channel trace: Use for SNA channel-level traces for a PU or DSPU; specify an LU range. Note that range 00/00 will display only the basic major-node channel traffic, such as CONTROL, STATUS, etc. Use 02/FF for full LU range.
_LSM**ss**C**b**.0**1**	LAN traffic: This will trace all LAN traffic! Note: ".01" is correct, not ".0i", (due to the actual construction of Network Interface boards, where only one side is populated.
_IPT**ss**	IP task trace.
_NCL**ss**C**b**.0**i**	Channel Link trace: for channel-to-bisync, channel-to-channel, and other such QICC connections.*
_HYDRANET.DIRECT	HYDRANET Server trace (default name).*
_AIP**ss**C**b**.**pp**	Network pseudo-port asynchronous trace.
_AIL**ss**C**b**.**pp**	Network pseudo-port LU trace.

To initiate a trace:

- Select **Start Trace** (**TRC**) from the Unit Control menu.
- Select the Trace point:
  Over-type the suggested port name (yours) with the name of the entity you want to trace, including range specifications for LUs or CUUs as required to define or limit the scope of the trace. Before you hit Enter, take whatever steps are required by your PC emulation software to open a file to capture the trace data. Then hit Enter to start the trace.
  Note: If the entity you have selected to trace is not valid, or if you (or someone else) is already tracing this entity, you will see the error message: SYSTEM NOT FOUND. In this case you can type another name at the prompt and hit Enter, or hit PA2 or Test-Request to exit.
  At this point, you may specify the name of another entity to trace. Trace data will be delivered in sequence as it progresses through the unit.
- Exit from **Trace**.
  First close the PC capture file, then hit the Test-Request key key (^Y in most cases) to halt the trace and exit from Local Services.

Displaying the Status of a *Hydra-Link* Network

The **External Routing Table** (**XRT**) function was created as a management tool for sites with multiple ***HYDRA 3000*** units linked using the *Hydra-Link* Distributed Function Unit (DFU) feature. **XRT** displays *Hydra-Link* connection information from the point of view of the currently selected ***HYDRA 3000*** system. To display connection information based on one of the other ***HYDRA 3000*** units in the *Hydra-Link* network, use **Remote System Selection** (**RSS**) to select the system number of another unit. Information displayed includes the System Numbers, Domain Names, and connection pathway information for remote ***HYDRA 3000*** systems.

There are no user-modifiable fields in the **XRT** screen; they are for display only. **XRT** displays information on up to 64 systems, one system per line. Multiple screens may therefore be necessary to view the entire network. See the XRT section in Chapter 5 for a detailed description of the format of each **XRT** line.

- Select **External Routing Table** (**XRT**) from the Unit Control Menu.
- To exit, hit PA2 or the Hydra Services key (^Y).

The Control Ports

Introduction and Caveats

The Control Ports of the ***HYDRA 3000*** are two specialized asynchronous ports connected to the Master Processor module. Through either the basic ROM boot code or the much more sophisticated In-Field Fault Analysis Tool code, the Control Ports provide a window into the internal workings of the ***HYDRA 3000***. (The ROM code handles the initial start-up of the ***HYDRA 3000*** and the initial decompressing and loading of In-Field Fault Analysis Tool (IFAT) code into battery-back RAM; the In-Field Fault Analysis Tool (IFAT) code is the internal proprietary debugger of the ***HYDRA 3000***.) The two Control Ports, called Ctrl 0 and Ctrl 1, are equivalent in function and priority, but the first Control Port to attention the IFAT or ROM code then has exclusive access to it until the connection is broken. During a connection on one Control Port, the other may still serve as a pass-through port for special functions.

Making a connection to a Control Port is similar, but not identical, to making a connection to a standard Asynchronous or QICC Interface port. Control Port connectors are standard male DE9 connectors. ***HYDRA 3000*** units built with Master Processor modules based on the 68030 chip support all pins except the Ring Indicator (RI, pin 9); 68010-based units support only the DCD and DTR control pins. Not all IFAT or ROM functions can make use of RTS/CTS flow control, however, so for most purposes it is advisable to use XON/XOFF (software) flow control. The same cables used to make connections to standard DE9 port connectors can be used with the Control Ports, so you can connect ASCII terminals, PCs running emulation software, and modems to a Control Port. The preferred access is via a PC, since it offers the possibility of routing screen data to a disk file. Modems should be pre-configured for fixed DTE rate, XON/XOFF flow control, and error correction. The Control Ports will auto-baud from 2400 up to 38,400 bps at 8 data bits, 1 stop bit, no parity. Commands to the debugger can be upper- or lower-case; all commands are echoed back in uppercase.

The most common reason for Control Port access is upgrade of the microcode (see the “Microcode Updates” section at the end of the chapter). On rare occasions, an error condition may necessitate collection of pertinent information through the Control Port. In these cases, it is best to contact ***HYDRA Systems Support*** immediately for assistance. If you are called on to collect information on the failure, refer to Appendix D, “Crash Dump Procedures”; don’t forget to capture the information to a PC file.

Always keep in mind that the debugger (IFAT) has tremendous power over the ***HYDRA 3000***. In the interest of keeping the IFAT code lean and to the point, there is very little in the way of command error-checking or “Do you really want to do this?” code; the IFAT will do what you tell it to do, even if that is not really what you intended to tell it to do! Therefore use extreme caution while connected to a Control Port. Double-check every command you type before hitting the Enter key. Please read this entire section before attempting any Control Port actions! In fact, read it twice! **Call *HYDRA Systems Support* if in doubt**.

On the positive side, all potentially destructive or invasive commands require prior entry of a valid high-level password. We will group Control Port actions, therefore, into non-invasive actions (no password required), and potentially invasive or destructive actions (password required) and discuss the non-invasive ones first. Then we will discuss a subset of the invasive/destructive commands, since many are pertinent only to ***HYDRA Systems*** Engineering. But first some general remarks.

Special Conventions and Commands

There are a few special keys, commands, and conventions to keep in mind. The IFAT user interface was designed with ***HYDRA Systems***' HNet/PC software in mind. It uses HNet/PC PF-keys for shortcuts and writes certain status information to the HNet status line. Also, the microcode loading process depends entirely on use of the HNet/PC software, so in some ways this is the best software to use for Control Port access. But it was written in the days of PC DOS, as a TSR (Terminate Stay Resident) program, so isn't ideal in a Windows 95 or 98 environment. If you already have a favorite PC emulation package for Windows, it will work as well, although the status line information will not appear in the correct position unless you use an emulation completely compatible with Hnet/PC (VT52 is close).

Here are some general, emulation-independent keys and commands:

Tab:
The Tab character (^I) immediately erases the current command and redisplays the FAT: prompt.

?:
You can type ? followed by Enter to display the first Help screen of IFAT commands; hit another Enter for the second screen; hit a third Enter for the last screen.

Break:
Receipt of a Break line condition will force a logical disconnect and a DTR drop.

Control-P:
Control-P serves as an exit key, back to the FAT or ROM prompt , from several IFAT functions (e.g., CF, SY, and DL)

All numeric data is entered and displayed in hexadecimal. The IFAT code can perform arithmetic operations on hexadecimal numbers, but a hex calculator may be a handy accessory in some situations.

The IFAT supports several addressing modes for use in IFATcommands. Note that a symbol table is embedded in each code module, to allow use of source code symbolic names with IFAT commands.

Direct Addressing:
Direct addresses consist of up to 8 hexadecimal digits, which we show as "a", as for example in the command "FM 123ABC", which requests the module and offset corresponding to address x'123ABC'.

Register-based Addressing:
Register-based addressing uses the contents of one of the 8 Data or 7 Address registers, or the Supervisor Stack Pointer, or Program Counter, as in "FM (A0)", which finds module and offset for the address stored in address register A0.

Symbolic Addressing:
You may use the name of one of the code labels stored in the symbol table of the target board, as in "Q L$SM2+3E", which queries the symbol table for the absolute address of the label plus offset.

Connecting to a Control Port

The first step, after reading all of this twice, is to connect a device to a Control Port. Here's how:

- Select the correct cable.
  Use one of the supplied sample cables, labeled for terminal, PC, or modem connection. If these are not available, see the "***HYDRA 3000*** Cable Pin-outs" section of Chapter 3, or contact ***HYDRA Systems*** to order the necessary cable.

- Find the Control Ports.
  On 68010-based units, the Control Ports are located among the first group of ports (Group 0), to the left of port 7 and port F. On 68030-based units, the Control Ports are on a separate 2-port panel, whose position is dependent on the size and conformation of the unit.

- Power up the device to be connected and check its setup.
  Make sure the communications parameters are correct.
  Baud rate between 2400 and 38400, data bits 8, stop bits 1, parity none.
  Correct COM-PORT (PC).
  For a modem make sure the setup includes fixed DTE serial rate, normal DTR and DCD handling, XON/XOFF flow control, and active error correction, and that a dial-up line is provided.
  Connect the device to either Control Port using the selected cable. For modem access, dial up from a remote terminal or PC, after checking its setup.

- Attention the In-Field Fault Analysis Tool (IFAT).
  Hit Enter to autobaud the Control Port. You should see the FAT: prompt. (Note: This is not some sort of rude personal comment, but the Fault Analysis Tool identifying itself!) At this point, you are in control of the debugger; exercise caution and good judgement! If you do not see the FAT: prompt, recheck your setup or call ***HYDRA Systems Support*** for assistance.

- At the FAT prompt, type an IFAT command and hit Enter.
  At this point we're ready to discuss actual commands.

Non-protected Commands

We will first list the less risky In-Field Fault Analysis (IFAT) commands that do not require entry of a password, with a brief description of their purpose, then discuss them in more detail.

The following IFAT commands are not password-protected:

Command:	Purpose:
?	presents multi-screen command help
CF	provides access to the Test Selection Menu; actual configuration and Unit Control functions are password-protected, as they are for standard ports
CLS	clears the screen
DROP	forces a disconnect of the Control Port
FM a	finds the module name and offset for the given code address a
ID	displays code release level for all boards
MAP	displays unit layout with basic status of each board
MS	displays status of all stored code modules
NM/QM/DO	normal mode/quiet mode/debug only: command echo and error log messages/ neither/command echo only
PW e	presents password entry e for verification
S	displays status information for the currently selected board
SB tn	selects board n of type t for interrogation
SX	shows extended registers (seldom used)
SY	invokes the system gateway (used for code loads, for example)
UL	links through the other Control Port to another device

Non-protected IFAT commands, in more detail

?
Hit ? and Enter to display the online Help screeens for IFAT commands.

CF
CF is the configuration gateway. After typing this command, ***HYDRA 3000*** will present the terminal menu; make the appropriate selection and hit Enter. Hit the Local Services key (^Y in most cases), then PF4, then enter a high-level password such as the default “HYDRASNA”. From this point, you can configure or manage the ***HYDRA 3000*** as you would from any standard asynchronous port. Hit ^Y, then ^P to exit back to the FAT prompt. A second CF without disconnecting resumes where you left off; just hit ^Z to continue.

CLS
CLS causes sufficient Carriage Return/Line-feed sequences to be sent to clear the video display.

DROP
DROP causes a logical disconnect from the Control Port, coupled with a drop in the DTR signal, to force a modem on the port to hang up.

FM *a*
FM is the Find Module command. It searches the symbol table of the selected board for the code module with the closest address below the entered hexadecimal address, *a*, then reports the module name and offset from the starting address of that module.

ID
ID will display the ***HYDRA 3000*** microcode Release level and date for IFAT code and for the code running in each module.

MAP
MAP displays information about all enabled boards installed in the ***HYDRA 3000***, one board per line, in the order they are installed. Each line of information has the format:

Bn aa t MODULE: code module OFFSET: code offset-status

Bn indicates the Board type and relative number among other boards of the same type. M designates the Master Processor; C a Channel Interface (or Network) board; A an Asynchronous or QICC Interface board. For QICC boards, n is a 2-digit number indicating both the relative board number (0-F) and the relative QICC processor (0-3) on that board.

aa is the chassis slot address, a 2-digit hexadecimal number. If a module is physically installed, but the enable switch is not in the "UP" (enabled) position, the module will not appear in the MAP display, and its slot address will be skipped over.

t is the type of Motorola processor on the board; 1 for 68010, 3 for 68030.

code module and code offset indicate the location of the processor's program counter on each board at the instant the MAP command was executed.

status is the current status of each installed board.

MS
MS displays Module Status information on all stored code modules (plus free space) in the format:
MN bbbb cccccccc

MN is the 2-character module name abbreviation (see below);
bbbb is the number of blocks allocated for storage of this code module;
cccccccc is the computed checksum for this code module, stored with the module for integrity checking during microcode loads and Power-On Self-Test.

For 68010-based boards the code module abbreviations are:

BC	Master Processor (Bus Controller)
CC	Channel Interface (Channel Controller)
CF	Control File (used exclusively by H3000UTL for configuration backup and restore operations)
NC	Network Interface (both Token Ring and EtherNet)
PA, PB, PE	Power-On Self-Test (POST), for various types of boards
PC	Port Controller (Asynchronous Interface)

For 68030-based boards, the code module abbreviations are:

AE & AM	Asynchronous Interface, for standard and fast RAM
CE & CM	Channel Interface, for standard and fast RAM (includes Network Interface code)
CF	Control File
ME & MM	Master Processor, for fast and main code
PA, P3, P8	Power-On Self-Test (POST), for various types of boards

For the QICC Interface, the code module abbreviation is:

QM	QICC board (main code only)

NM/QM/DO
NM, QM, and DO set the mode of the Control Port. NM sets Normal Mode, where all Error Log Queue (ELQ) messages are displayed during a connection. QM sets Quiet Mode, which suppresses all Error Log Queue (ELQ) messages. DO sets Debug Only,

PW *e*
Type PW followed by a valid ***HYDRA 3000*** password entry, *e*, to gain access to protected IFAT commands.

S
The S command displays the current status for the selected board (see the SB command below). This command furnishes the name of the module, and the offset within that module, corresponding to the current Program Counter of the selected board's processor, and the overall board status. The S command further displays the current contents of all 8 data registers (D0-D7), 7 address registers (A0-A6), the Supervisor Stack Pointer (SSP), the Program Counter, and the Status Register. Some possible board statuses are:

RUNNING	normal state
PROGRAM BREAK	stopped at a planned trap, due to unforseen causes
BUS ERROR	an out-or-range address was encountered
ADDRESS ERROR	an illegal address was encountered

SB *tn*
SB selects board *n* of type *t* as the focus of subsequent IFAT interrogation commands. An SB command to a board in an error state will cause a Bell character (x'07') to be sent to the attached device and automatically invoke the S (Status) command.

SX
SX shows extended registers (seldom used).

SY
SY invokes the system gateway (used for code loads, for example). Control-P exits from this mode back to the FAT prompt.

UL
UL (Unit Link) causes the IFAT to link one Control-Port to the other and to pass all I/O through this link to whatever device is attached to the other Control-Port. This link has high priority, so heavy traffic through the link will seriously degrade normal performance. This feature was designed to allow use of a single modem to monitor two or more side-by-side ***HYDRA 3000***s. For this application, a null modem cable must be used between units. **Control-R** causes all Unit Links to be logically broken, sends a Bell character to the attached device, and leaves you at the FAT prompt of the base unit.

Protected Commands

In this section we present a subset of the password-protected In-Field Fault Analysis commands that we feel will be useful to the knowledgeable site manager, but have excluded many commands that are appropriate for use only by ***HYDRA*** Engineering staff. Even then, with few exceptions (the RS and XB PORT commands), we strongly recommend that you contact ***HYDRA Systems Support*** for help with protected debugger commands.

Warning: Use of some of the following commands with an out-of-range or otherwise invalid address will cause a processor error that will necessitate a full unit reset and therefore effectively terminate any problem analysis that was in progress. The range of valid addresses for a 68010-based auxiliary board is x'00000000' through x'001FFFFF'; for a 68030-based auxiliary board, the valid range is 0 - x'003FFFFF'.

The following Control Port commands are password-protected:

Command:	Purpose:
CB/CW/CL *a x*	changes one or more bytes/words/longwords starting at address *a* to hex value(s) *x*; used in rare cases to patch code; the address may be in any addressing mode
D *a* [*c*]	displays memory on the selected board from address *a* (any addressing mode) for 16 or *c* lines
FSC *0/1*	clears the File System code space (*0*) or configuration space (*1*)
FSK 1	kills the File System configuration space and forces a reload of factory configuration
KILM *mn*	permanently removes the named code module, *mn*, from battery-backed memory
Q *expression*	queries *expression*, i.e., looks it up in the symbol table, computes any offset, and reports its absolute address
RS	resets ***HYDRA 3000***;
XB MEM	displays the location and size of the seven memory areas used for microcode and configuration storage (valid for Master Processor only)
XB MMV	displays information about the current state of all memory pools on the selected board
XB PORT PORT0n	collects and displays a variety of information about the current state of port n on the selected board (valid for Asynchronous and QICC Interface ports)
XB TASKS	collects and displays a variety of information about the current state of tasks on the selected board

Protected IFAT commands, in more detail

CB/CW/CL *a x*

The Change Byte/Word/Longword commands change one or more bytes, words (2 bytes), or longwords (4 bytes) starting at address *a* from the current value to hexadecimal value(s) *x*. These commands are used in rare cases to patch code. You may specify the address in any addressing mode.

Example: The following replaces the contents of the word in code module A$74S6 at offset x‘2D1A’ with the value x‘4e71’ (No-Op).

```
FAT:CW A$74S6+2D1A 4E71
```

D *a* [*c*]

The D command displays memory on the selected board from address *a* (any addressing mode) for *c* (hexadecimal) lines of 16 bytes each; *c* defaults to 16. Each line of output gives the absolute memory location, the 16 hexadecimal byte values, and translations into both ASCII and EBCDIC.

Example 1: The following displays the current value of the system clock for the selected board; SYSCLK is set to 0 at when a full unit reset is performed.

```
FAT:D SYSCLK 1
```

Example 2: This displays the 3 lines (48 bytes) of memory starting at the address contained in the Supervisor Stack Pointer (SSP), taken from a status display on a Token Ring Interface board stopped due to a planned Program Break.

```
FAT:S
 MODULE: L$2SM7   OFFSET: 0004D4  ACTIVE BOARD: N0 -PROGRAM BREAK
D0: 00000000 D1: FFFF0204 D2: 00000012 D3: 00152433  USP: FFFF7FFF
D4: 0000FFFF D5: 00000000 D6: 0000FFFF D7: 0017C414  SSP: 0017C410
A0: 0017E3C4 A1: 0017D990 A2: 0006BF6C A3: 0017D960  PC:  0018417C
A4: 00109858 A5: 00000000 A6: 0017D878 SP: 0017C410  SR:  00B82004

FAT:D (SSP)
0017C410:00183D3A 0017BFDC 00000000 00000000  ..=:.............. ...... *........
0017C420:00000FF8 0017C43C 0017C43C 0017C43C  .......<...<...< ...8..D...D...D.
0017C430:0017C52C 00000000 0017BFDC 00000000  ...,.............. ..E....... *....
0017C440:00000000 00000000 00000000 00000000  ................. ................
SAME..
```

FSC *0/1*

The File System Clear command clears either the entire File System code space (*0*) or configuration space (*1*) and links the freed blocks of storage back into the free list. The ***HYDRA 3000*** will continue to operate normally after either of these commands is issued until a unit reset is performed. FSC is used in preparation for a major microcode upgrade. FSC is not a valid ROM code command.

FSK *1*

The File System Kill command clears the File System configuration space and forces a reload of factory configuration.

KILM *mn*
The Kill Module command permanently removes the named code module, *mn*, from battery-backed memory and returns the freed memory to the linked free list. See the MS command in the Non-protected Commands section for a list of the two-character module name abbreviations.

Q *expression*
The Query command parses *expression*, i.e., looks up any symbolic names in the symbol table of the currently selected board and substitutes the hexadecimal addresses, performs any required hex arithmetic, and reports the final result as a pure, 8-digit, hexadecimal address.

RS
RS initiates a full unit reset of the ***HYDRA 3000***. Unlike a front panel Master Processor reset, this will not cause the Control Port to disconnect.

XB MEM
The Expand Block: Memory macro displays the location and size of the seven memory areas used for microcode and configuration storage. XB MEM is valid only when the Master Processor is the selected board.

Example:

```
FAT:(SB M0)
FAT:XB MEM
AREA------              LOCATION SIZE----
(0) MEM MAP             00200000 00004000
(1) DEBUG CODE          00204000 0000C000
(2) MP CODE             00210000 00040000
(3) FILE DIRECTORY      00250000 000002A0
(4) CODE FILE (FS-0)    002502A0 000AFD60
(5) CONFIG FILE (FS-1)  00300000 0003F000
(6) OVER FLOW POOL      0033F000 00001000
```

XB MMV
The Expand Block: Memory Vectors macro displays information about the current state of all memory pools on the selected board. This includes the base address of each pool, address of the first free block, total size, total free size, number of current allocations, total allocations from this pool since the last reset, and more.

Example:

```
FAT:SB A0
```

```
FAT:XB MMV
```



```
      ALCT FREE-- FREMIN SIZE-- LK FML--- POOL-- PB MESZ W.CNT- F.CNT- ALC-TOT
IBI : 0000 00F000 00CBB8 00F000 00 00061C 00061C 10 FFFF 000000 000000 00003B36
IBO : 0000 00F000 00D9B0 00F000 00 00F61C 00F61C 10 FFFF 000000 000000 00003B86
NLIV: 0000 002000 001DF0 002000 00 024D28 024D28 10 005C 000000 000000 00005376
NLIS: 0000 002000 001980 002000 00 026D28 026D28 10 009C 000000 000000 000003E9
NLIL: 0000 00C000 007764 00C000 00 028D28 028D28 10 FFFF 000000 000000 000015CB
NLOV: 0000 002000 001DF0 002000 00 034D28 034D28 10 005C 000000 000000 00002082
NLOS: 0000 002000 001838 002000 00 036D28 036D28 10 009C 000000 000000 00000875
NLOL: 0000 00C000 00AA40 00C000 00 038D28 038D28 10 FFFF 000000 000000 00001408
DLIV: 0009 000034 000034 000400 00 0450F4 044D28 40 008C 000000 0001B7 00000035
DLIS: 002D 000128 000050 002000 00 046B38 045128 40 024C 000000 006F29 000031C6
DLIL: 0037 01642C 014EA8 019000 00 049438 047128 40 FFFF 000000 000000 00006F29
DLOV: 0000 000400 0003A8 000400 00 060128 060128 40 008C 000000 000000 00000006
DLOS: 0009 0018D4 000020 002000 00 060C54 060528 40 024C 000000 00000B 000224A5
DLOL: 0000 019000 01873C 019000 00 062528 062528 40 FFFF 000000 000000 0000000B
SI  : 000B 04299C 040620 04B000 00 080A18 07B528 04 FFFF 000000 000000 0000178C
AX  : 006C 00FF64 00F500 030800 00 0E3B74 0C6528 04 FFFF 000000 000000 000007FA
OF  : 0000 088E30 088E30 088E30 00 0F71D0 0F71D0 40 FFFF 000000 000000 00000000
OF2 : 0000 052D78 052D78 052D78 00 1AD284 1AD284 40 FFFF 000000 000000 00000000
```

XB PORT PORT0*n*

The Expand Block: Port macro collects and displays a variety of information about the current state of port *n* on the selected board (valid for Asynchronous and QICC Interface ports). The information is derived from a block of memory with the symbolic name, PORT0*n*, and includes a summary of the status of internal tasks related to the port, the state of all supported RS232 pins, SNA status, current flow control state, intervention status (printers), and error and disconnect counts since the last full reset.

Example: The following shows the status of port 0 on board AI0.

```
FAT:SB A0

FAT:XB PORT PORT00

PORT: 0

ID: ---PC---   SV --STATE--  --IX-- --MP-- --ML-- -EQ- -RQ- TKNQ --TXIT--

MT: EUMMAINW   02                                0000 0000
RT: EUSMAINW   06            0E6DB0 000000 000000 0000 0000 0000 00000000
RI:               AI_NRS2    0E6D90 000000 000000 -LCK -INS PLU
TT:                          0E7040 000000 000000 -SND -RCV -CNT -ERP
TI:               AI_NTS1    0E7040 06077A 06077B +LUACT +BOUND -INTSNT -INTERV
+TXO -RXO -LLC -BRK +DTR -DSR +DCD +RTS -CTS
     +RXA -WXA -RQXF -RXM -INTV -SXF -SXN -STP
DIAL RTN : DILDONE         EXPECTS: LLC- DCD- BRK+ DCD+
CHR-ERRS: 0000 BF-OVRNS: 0000 LOST-XON: 0000 XOFF-TMR: 82E4 KB-IDLE : 8AFF
FRAMING : 0000 PARITY : 0000 OVER-RUNS: 0000 BREAKS  : 0000 CD LOST: 0000
LL:00 DOWN:LLBREAK  UP:APTMMSG  AT:000C8784
LL:28 DOWN:SERDTAD  UP:NATDTAU  AT:000E5140
```

XB TASKS

The Expand Block: Tasks macro collects and displays a variety of information about the current state of tasks on the selected board.

Example: The following XB TASKS on board AI 0 caught normal screen update activity for the slave task for port 01; all other port tasks were waiting for work.

```
FAT:SB A0

FAT:XB TASKS

AS(0F)=EUSMAINW     AM(0F)=EUMMAINW     AS(0E)=EUSMAINW     AM(0E)=EUMMAINW
AS(0D)=EUSMAINW     AM(0D)=EUMMAINW     AS(0C)=EUSMAINW     AM(0C)=EUMMAINW
AS(0B)=EUSMAINW     AM(0B)=EUMMAINW     AS(0A)=EUSMAINW     AM(0A)=EUMMAINW
AS(09)=EUSMAINW     AM(09)=EUMMAINW     AS(08)=EUSMAINW     AM(08)=EUMMAINW
AS(07)=EUSMAINW     AM(07)=EUMMAINW     AS(06)=EUSMAINW     AM(06)=EUMMAINW
AS(05)=EUSMAINW     AM(05)=EUMMAINW     AS(04)=EUSMAINW     AM(04)=EUMMAINW
AS(03)=EUSMAINW     AM(03)=EUMMAINW     AS(02)=EUSMAINW     AM(02)=EUMMAINW
AS(01)=0250(M$L6P4M AM(01)=EUMMAINW     AS(00)=EUSMAINW     AM(00)=EUMMAINW
PI(00)=PCIMAINW     PO(00)=PCOMAINW     SM(00)=005E(M$SM6   SX(00)=SXTMAINW
```


Microcode Updates

It may be necessary at some point to update the microcode that drives the ***HYDRA 3000***, in order to incorporate improvements in the microcode, or perhaps a new feature, or to enable the ***HYDRA*** Engineering staff to properly assess a reported problem.

The microcode update process is controlled by a HydraNet/PC script, included with the necessary compressed binary code modules. These can be delivered to the customer on one or more PC floppy disks, or downloaded from the ***HYDRA Systems*** website (WWW.HYDRASYSTEMS.COM) after presentation of the appropriate password. You must have a copy of HydraNet/PC, Release 2.5, to run the update process. Some, but not all, code diskettes include HydraNet/PC, depending on the code release, which code modules are required for the update, and attendant free space on the diskette. If not on the code diskette, HydraNet/PC is available from the website or on a separate diskette from ***HYDRA Systems***.

Here's an outline of the process.

Preparing for a Code Update

- Discuss the proposed update with ***HYDRA Systems Support***.

Contact ***HYDRA Systems Support*** to discuss any problems or needs you have that may necesitate a code update and any questions you have about the process itself. Pre-arrange for support from ***HYDRA Systems Support*** (see next step).

- Schedule the code update.

Since the code load process takes total control of the ***HYDRA 3000***, you will need to schedule the update for a time when the ***HYDRA 3000*** is not in use. The actual loading of code takes about 20 minutes for a complete update, performed at 38.4 kbps; updating a single module can usually be accomplished in five minutes or less. For a full update, the peripheral tasks, such as reconfiguring the Channel Interface record, reloading the remainder of the configuration, and testing the new code, may require up to an hour, so it is usually advisable to schedule two hours of down time. Inform ***HYDRA Systems Support*** of your plans.

- Determine what code modules you will need and acquire them.

Make sure you know which type of interface boards you have, that is, which type of microprocessor is installed on each board, since this will determine which modules you will need to load (and, of course, which modules ***HYDRA Systems*** will include when shipping diskettes to you). Make arrangements with ***HYDRA Systems Support*** to receive the necessary diskettes or to download the files from the ***HYDRA Systems*** website.

- Test the Control Port connection.

The updated code modules are loaded into the ***HYDRA 3000*** battery-backed static RAM using one of the two Control Ports (see previous section). The PC used for the code load process can be connected to the Control Port directly, using a Hydra-to-PC cable, or via modem, using a Hydra-to-modem cable (see cable specifications in Chapter 3). You should make a test connection to the Control Port well in advance of your scheduled code update, using the copy of HydraNet/PC you receive with your code upgrade disk(s). Make sure the In-Field Fault Analysis Tool responds to you when you hit Enter after connecting to a Control Port; you should see the FAT: prompt. Hit Ctrl-F8 to activate the code load script; it should present the code load menu to you. Hit Escape to exit; do not select any code load options at this time.

- Back up your configuration.

The next step in the process is to back up your ***HYDRA 3000*** configuration, either via H3000UTL to the mainframe, or via the screen-capture facility of a PC emulation program (HydraNet/PC, for example), or both. If your planned upgrade is to a different major code release level, e.g., form 2.155 to 2.208, you will lose your current configuration, including any configured channel addresses, so at least that much of the configuration must be recreated "by hand" from a device attached to a port. In that case, it is advisable to screen capture at least the Channel Interface record (BDF.CI). For minor upgrades (within the same major release), the configuration will remain intact.

- Convert the configuration for the new code release.

Next, refer to Appendix C for instructions on converting the mainframe version of your configuration from your current code level to the new level. In some cases (for example, if the configuration is simple and your current code level is seriously back-leveled), it may be simpler to reconfigure from scratch after loading the new code. If you decide to convert your configuration to the standards of the new release, modify a copy of your present saved configuration according to the instructions in Appendix C, and do this a day or two prior to loading new code in order to keep the code update window to a minimum.

- Develop a fallback plan.

Just in case… Make sure you have a diskette of your original code available, and preserve the original saved configuration (make conversion changes to a copy only).

Performing the Code Update

- Review your arrangements.

Make sure all preparations are complete; once you start the update process, your ***HYDRA 3000*** will not be useable until the process is completed.

- Make sure all users are off the system. Vary PUs inactive.

Power off modems, if necessary, to prevent interrupts from asynchronous ports from disturbing the code loading process. It is not necessary to vary addresses offline.

- Connect to the Control Port and attention the IFAT.

Power up the PC, load the HydraNet/PC software, and make whatever connection to CTRL0 or CTRL1 you have planned and tested earlier. Use Shift-Shift to activate the HydraNet/PC online screen. Hit Enter to attention the In-Field Fault Analysis Tool (IFAT); you should see its prompt (FAT:).

- Enter a high-security password.

At the FAT: prompt, type "**PW *password***" and Enter, using either the default high-security password, HYDRASNA, or your replacement for it. This is required for several of the IFAT commands used below, but not for the code update itself.

A parting of the ways: If you wish to update only a single module, within the same code release you are currently running, skip to the section called "Loading a Single Module"; if you are performing a major update, continue with the following steps.

Performing a Major Update

- Delete all code modules.

At the FAT: prompt, type "**FSC 0**" and Enter; this will remove all stored code modules from the File System code space. This step is irreversible! Once you have issued this command, only the IFAT code remains, and the only direction is forward.

- Activate the code load script.

Hit Ctrl-F8 to activate the HydraNet/PC "dial-string". This script file, called H3000CL.DS, drives the code update process from a menu of loading options. **You need only hit the number of the option to invoke it; no Enter is required.**

- Check the loading options; modify as needed.

The script defaults to a system with all 68010 boards. Use Option 8 to select 68030 instead of 68010 for each type of board. Option 8 will present a series of questions to you. Respond "N" to the first question, regarding VERBOSE MODE, unless you need to diagnose a specific code load failure. Respond "1" or "3" to the other questions, depending on which type of processor your boards have, until the "ENTER SELECTION:" prompt reappears. If you have a mix of boards of the same type, you will need to load first one type of code, then the other by reselecting Option 8. If you load code directly from diskettes, you will also need to swap diskettes, since 68010 and 68030 modules are usually segregated due to space limitations. **If you exit from the script (ESC or Ctrl-F6), loading options revert to defaults.**

- Load IFAT code.

After selecting the right type of Master Processor code, select Option 3. New IFAT code will be transferred from the code diskette to Master Processor memory, and a reset will be performed to activate the new IFAT. During the loading process, the 7-segment display on the front of the Master Processor will not display the usual "0"; this is normal. The script will return to the "ENTER SELECTION" prompt when loading is complete.

- Load Power-On Self-Test (POST) code.

Select Option 4 to load POST code. As with Option 3, the script will return to the "ENTER SELECTION" prompt when loading is complete.

- Load code modules for each type of board in your *HYDRA 3000*.

Select Option 5, then select in turn the appropriate suboptions to load Master Processor and Channel, Asynchronous, Network, and QICC Interface code. Note that for 68030 systems, Channel Interface code now includes Network Interface code.

- Load the Control File for H3000UTL.

Select Option 6 to load the Control File used by H3000UTL to validate configuration record and field information and determine storage requirements.

- Load the default File System.

Select Option 7 to load the default configuration File System. This contains all standard Terminal definitions, the default system password (HYDRASNA) and its associated Security Definition, a template record for each type of Board Definition, standard definitions for each type of channel address, logical device, and serial port usage, sample records for some typical serial port applications, modem setups, etc., and the System Configuration record with generic assignments.

- Exit from the code load script and perform a reset.

Hit Escape to exit the script, hit Tab to attention the IFAT (the FAT: prompt should reappear), then type RS and Enter to initiate the reset. Wait for the reset to complete. You can use the "S" (status) command to monitor the progress of the reset.

- Configure a channel addess for the H3000UTL program.

Type CF and Enter to use the IFAT's configuration gateway. Type "HYNC" and Enter at the terminal selection prompt and reconfigure the SNA channel address you use for H3000UTL operations, as explained in the sections above ("An Outline of the Configuration Process"). Exit from configuration mode back to the IFAT by hitting first Ctrl-Y, then Ctrl-P. Use the RS command to perform another reset and wait for it to complete.

- Reload and activate your configuration.

From a terminal on the mainframe system, invoke the H3000UTL program, using the "ADD" command to reload your converted configuration. When this completes, issue a last RS to the IFAT to activate your configuration

- Re-activate PUs and test.

Vary addresses online, activate PUs, and test the new code as required by your setup, then power up modems and release the unit to your users.

Loading a Single Module

- Delete the existing module (or modules) you wish to replace.

At the FAT: prompt, type "**KILM mn**" and Enter, where **mn** is the mnemonic of the code module you wish to replace (see the "MS" section under "The Control Ports"/"Non-protected IFAT Commands" above for a list of these mnemonics).

- Activate the code load script.

Hit Ctrl-F8 to activate the HydraNet/PC "dial-string". This script file, called H3000CL.DS, drives the code update process from a menu of loading options. **You need only hit the number of the option to invoke it; no Enter is required.**

- Check the loading options; modify as needed.

The script defaults to a system with all 68010 boards. Use Option 8 to select 68030 instead of 68010 for each type of board. Option 8 will present a series of questions to you. Respond "N" to the first question, regarding VERBOSE MODE, unless you need to diagnose a specific code load failure. Respond "1" or "3" to the other questions, depending on which type of processor your boards have, until the "ENTER SELECTION:" prompt reappears. If you have a mix of boards of the same type, you will need to load first one type of code, then the other by reselecting Option 8. If you load code directly from diskettes, you will also need to swap diskettes, since 68010 and 68030 modules are usually segregated due to space limitations. **If you exit from the script (ESC or Ctrl-F6), loading options revert to defaults.**

- Load the required module or modules.

Select the desired option (4-7) and suboption (if required). See sections above under "Performing a Major Update" regarding the loading of each type of of modules.

- Exit from the code load script and perform a reset.

Hit Escape to exit the script, hit Tab to attention the IFAT (the FAT: prompt should reappear), then type RS and Enter to initiate the reset. Wait for the reset to complete. You can use the "S" (status) command to monitor the progress of the reset.

- Re-activate PUs and test.

Vary addresses online, activate PUs, and test the new code as required by your setup, then power up modems and release the unit to your users.

