

# INTERFACING IBM MICROCOMPUTERS AND SAS SOFTWARE

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## ABSTRACT

What happens when you mix 10% IBM PC, 30% IBM PC/XT, 10% IBM PC AT, 40% IBM 3270 PC and 10% COMPAQ PLUS portable computers with SAS Software? If done properly, you will obtain the most powerful brew currently available.

As a case study this paper will cover the installation of over 100 IBM or compatible microcomputers in a corporate environment. Topics to be covered include:

- 1). Hardware and software configurations
- 2). Communications between the mainframe and the microcomputers
- 3). Problem areas to watch out for
- 4). A review of a successful SAS Software application.

The microcomputer hardware that will be covered includes the IBM PC/XT, IBM PC AT, IBM 3270 PC, and the COMPAQ PLUS.

## AVCO LYCOMING CORPORATE AND COMPUTER ENVIRONMENT

AVCO LYCOMING is a division of the FORTUNE 50 TEXTRON corporation. Headquartered in Stratford, Connecticut, AVCO LYCOMING is a manufacturer of turbine engines for both military and commercial markets. Current applications of its engines include the General Dynamics' M1 tank, the fixed wing British Aerospace BAe 146 quiet jet commuter, helicopters such as the Boeing Vertol CHINOOK, and futuristic applications such as LCAC landing crafts.

AVCO LYCOMING has two major manufacturing plants located in Stratford, Connecticut and Greer, South Carolina. In addition, there are Maintenance Operation Centers (MOC) and marketing and field support centers located throughout the world.

Running under a centralized computer environment, the heart of the computer power lies with an IBM 3081K located in Stratford. This 3081K is running under MVS/XA, with IMS, CICS, and TSO/ISPF operating environments. Major user orientated software packages include SAS Software, RAMIS II, ISSCO Software, Interactive Chart Utility, SIMPLAN, and IBM GDDM 4.

## MICROCOMPUTER COMMUNICATIONS

With the IBM 3081K mainframe acting as the central processor, AVCO LYCOMING runs an intensive and powerful computer environment (Figure 1). Employees of AVCO LYCOMING have a wide selection to pick from when accessing the mainframe via microcomputers (Figure 2). Access methods include coaxial communications via IBM 3270PC, IRMA or FORTE emulation boards; dial-up asynchronous communications via SMARTCOM, CROSSTALK, OR SYMPHONY; dial-up bisynchronous communications using IBM's SNA/SDLC package, and electronic mail capabilities via ONTIME and EASYLINK. Also, reviews of dial-up asynchronous 327x emulation using packages such as CXI's emulation is taking place.

## COAXIAL COMMUNICATIONS

In the coaxial environment (Figure 3) users may select either IBM 3270 PC's or other microcomputers equipped with FORTE or IRMA boards. Coaxial users are required to be located near a IBM 3274 controller, although this does give them channel speed communications and high-speed intelligent file transfer. Also supported is full screen (IBM 3278) emulation with all of SAS software especially SAS/FSP Software and IBM's ISPF. As an additional feature, the 3270PC and FORTE board provides (IBM 3279 S3G) graphics emulation allowing usage of SAS/GRAPH Software.

The fastest growing use of coaxial microcomputer communication is the IBM 3270PC. AVCO LYCOMING is currently replacing its 3279 B03 & S3G terminals with this workstation. In addition to traditional microcomputer capability the IBM 3270PC provides up to 4 consecutive host sessions, 2 notepads, and 1 microcomputer session all running concurrently. It also includes all 3279 capabilities with the exception of the test mode.

There are minor problems associated with the coaxial communications. The IRMA board does not support mainframe graphics, and although the FORTE board does, it can cost three times more. The FORTE board when used with IBM RGB monitors causes a slight flicker which can be resolved by installing a higher resolution monitor. The 3270PC also has drawbacks; it requires usage of the latest releases of SAS Software, lacks

additional ports for expansion, is based on the IBM PC/XT instead of the IBM PC AT, distorts PC graphics, requires a specialized controller software (IBM 3274), and should be used with GDDM 4.

#### DIAL-UP COMMUNICATIONS

In the dial-up environment (Figure 4) users may access the host by several methods. TTY 1200 baud asynchronous communications can take place with packages such as the HAYES internal Smartcom II modem. Communications error checking speed is limited to 1200 baud and low-speed screen dump file transfer is available. Full screen emulation and main frame graphics capabilities are not supported. This limits you to using Base SAS Software and packages that require using options similar to SAS/GRAPH or SAS/FSP Software. AVCO LYCOMING is currently reviewing asynchronous emulation packages and protocols to resolve these limitations.

Access is also available through dial-up SNA communications using IBM's SNA/SDLC package and the CODEX bicynchronous modem. The major advantages of this is higher speed communications (2400-4800 baud), full screen emulations (SAS/FSP Software), and improved file transfer capability. The unit acts as a Remote Job Entry (RJE) or 3278 terminal.

#### ELECTRONIC MAIL COMMUNICATIONS

In the Electronic Mail environment (Figure 5) AVCO LYCOMING uses two major electronic mail packages; ONTIME and EASYLINK. Communications with these packages is asynchronous at 300 - 2400 baud rates, with file transfer screen dump capabilities. The major advantage is the short transmission distance from your microcomputer to their local nodes which are located throughout the world. Our selection of these packages was based on two specialized needs. The first was the need for electronic mail and some type of TELEX or TWX emulation which EASYLINK supplies us. The second was easy electronic mail capability with our overseas offices which ONTIME provides. Although this does not provide direct communication with our host computer, SAS Software produces report output which can be sent to the field, modified, and re-transmitted back to Stratford.

#### MICRO COMPUTER SELECTION AND STANDARDIZATION

Over two years ago AVCO LYCOMING selected IBM or IBM compatible computers as the standard for the division. Based on AVCO LYCOMING's experience most new microcomputers installations include IBM AT, IBM XT, IBM 3270PC model 6, or

COMPAQ PLUS microcomputers, with internal hard drives, and EPSON or IBM dot matrix printers. Purchasing is done either locally or through VPA agreements with IBM. All equipment is given on-site maintenance support, some loaned equipment is necessary to augment the existing base. Software for the equipment includes DOS 2.1 or 3.0, SYMPHONY, dBASEIII, and either MULTIMATE or WORDSTAR. Optional software could include WORDSTAR 2000, and MICROSOFT FORTRAN OR COBOL. Optional Hardware could include Polaroid Palette, IBM color dot matrix printer, HP 4 or 6 pen plotters, HP LASERJET or THINKJET printers, NEC letter quality printers, IRMA or FORTE 327x emulation boards, and IBM SNA/SDLC communication packages with CODEX modems. The following sections presents a detailed hardware configuration of equipment currently being installed.

#### IBM PC/XT

Current new purchases of IBM PC/XT are limited to overseas installations, where IBM PC AT's are not available or practical. Normally the IBM PC/XT is configured with 640K ram, ten megabyte internal harddrive, IBM RGB color monitor with graphics, QUADRAM multifunction boards, Hayes Smartcom II internal modems, and EPSON FX-100+ dot matrix printers.

#### IBM PC AT

The current standard stand alone microcomputer is the IBM PC AT enhanced, with 640K ram, 20 megabyte internal hard drive, IBM RGB color monitor with graphics, Hayes Smartcom II internal modems, and EPSON FX-100+ dot matrix printers.

#### COMPAQ PLUS

When transportability is needed, normally a COMPAQ PLUS is installed. The unit is configured with 640K ram, ten megabyte internal hard drive, QUADRAM multifunction boards, Hayes Smartcom II internal modems, and EPSON FX-80 dot matrix printers.

#### IBM 3270PC

The current standard coaxial microcomputer is the IBM 3270PC. AVCO LYCOMING currently has standardized on the 3270PC model 6, which includes, 640K of ram, 10 megabyte internal hard drive, IBM color monitor, All Points Addressable (APA) PC graphics board, program symbols board for mainframe graphics, 3270 PC control program, and IBM dot matrix printers.

SAS SOFTWARE - MICROCOMPUTER APPLICATION

AVCO LYCOMING has developed several applications using SAS Software and microcomputers to save many hours of work. One of the major advantages of SAS Software is it's ability to reformat or produce output in many different formats. One example is the following:

The Cost Accounting Department had data located on the IBM mainframe computer. They, like many other departments were also using microcomputers and had partial data in a LOTUS 1-2-3 spreadsheet. They needed to take an extract of the mainframe database (flat file), convert it to a layout that LOTUS 1-2-3 could understand, transfer it to a microcomputer and load it into LOTUS 1-2-3 so that they could perform spreadsheet analysis off-site.

Most of the steps, although tedious, were easy. Transfer of data to the

microcomputer could be done quickly and easily with the IBM 3270PC file transfer program. Once the data was in a format LOTUS 1-2-3 could understand, loading it into LOTUS 1-2-3 via the IMPORT command was used. A problem remained in converting the file structure to one LOTUS 1-2-3 could recognize. This was resolved using SAS Software.

LOTUS 1-2-3, SYMPHONY, DBASE II, and DBASE III will recognize delimited data for loading purposes. This means that the data should have a delimiter such as a comma between each field, and alphanumeric data should be enclosed in quotations. Since SAS Software allows you to format data as needed this task can be accomplished by creating a DATA STEP, INPUTing the data, and PUTing the data back out with the delineators. The following are examples of the file extract, the SAS Software code, and the resulting file that would be read into LOTUS 1-2-3.

EXAMPLE OF INPUT DATA

12345	HUTCHINSON, KARIN P.	GENERAL DYNAMICS	23010185
22222	SMITH, I. R.	PSA	22020185
33222	TOPPING, Y. LLOYD	US ARMY	21030185
69696	TAYLOR, DONALD A.	BAE	22040185

EXAMPLE OF SAS SOFTWARE DATA STEP

```

DATA SUGI85;
  INPUT
    @01 ACCOUNT 5.0
    @06 VEN_NAME $25.
    @31 COMPANY $18.
    @49 CODE 2.0
    @51 INV_MM $2.
    @53 INV_DD $2.
    @55 INV_YY $2.;
  INV_DATE = INV_MM||'/'||INV_DD||'/'||INV_YY;
  FILE PRINT;
PUT
  @01 ACCOUNT
  @06 ', "'
  @08 VEN_NAME
  @33 ', "'
  @36 COMPANY
  @54 ', "'
  @56 CODE
  @58 ', "'
  @60 INV_DATE
  @68 '";
CARDS;
...
...
;
```

EXAMPLE OF RESULTING LOTUS DELIMITED FILE

12345,	"HUTCHINSON, KARIN P.	", "GENERAL DYNAMICS	", 23, "01/01/85"
22222,	"SMITH, I. R.	", "PSA	", 22, "02/01/85"
33222,	"TOPPING, Y. LLOYD	", "US ARMY	", 21, "03/01/85"
69696,	"TAYLOR, DONALD A.	", "BAE	", 22, "04/01/85"

# AVCO LYCOMING COMPUTER NETWORK

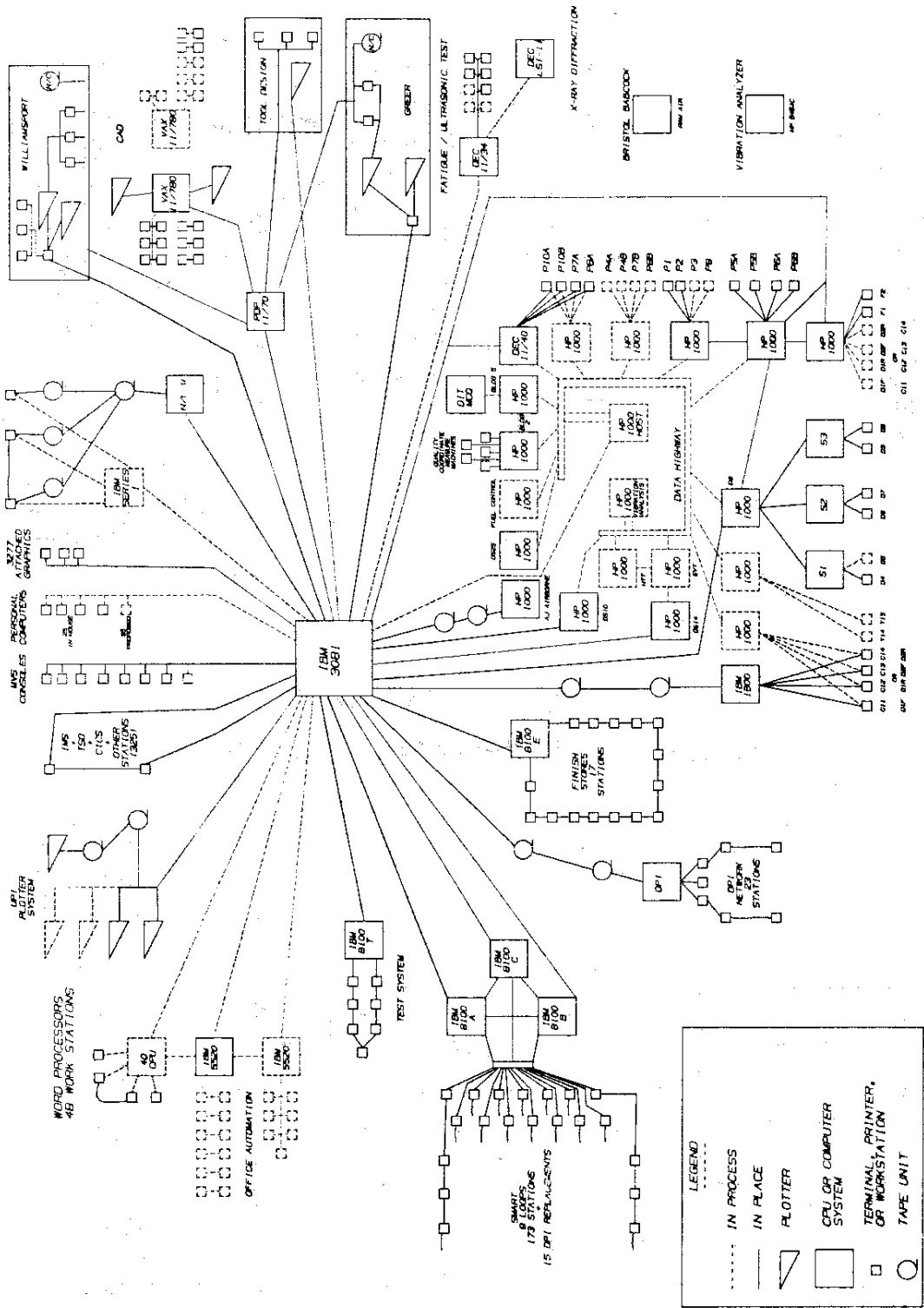


Figure 1

## AVCO LYCOMING MICROCOMPUTER COMMUNICATIONS

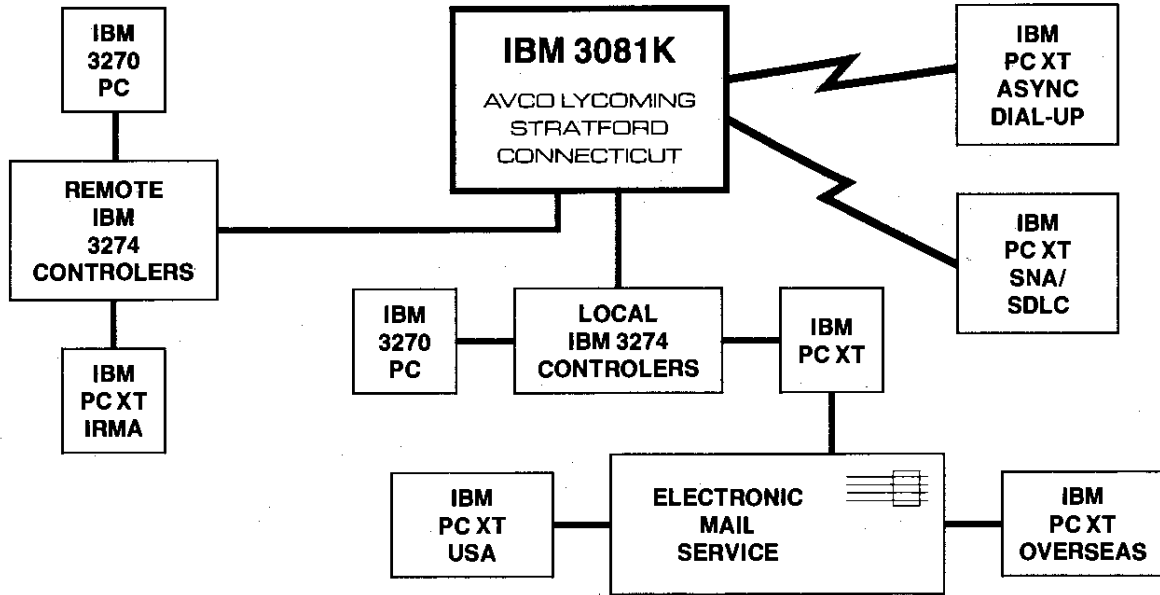


Figure 2

## AVCO LYCOMING COAXIAL COMMUNICATION

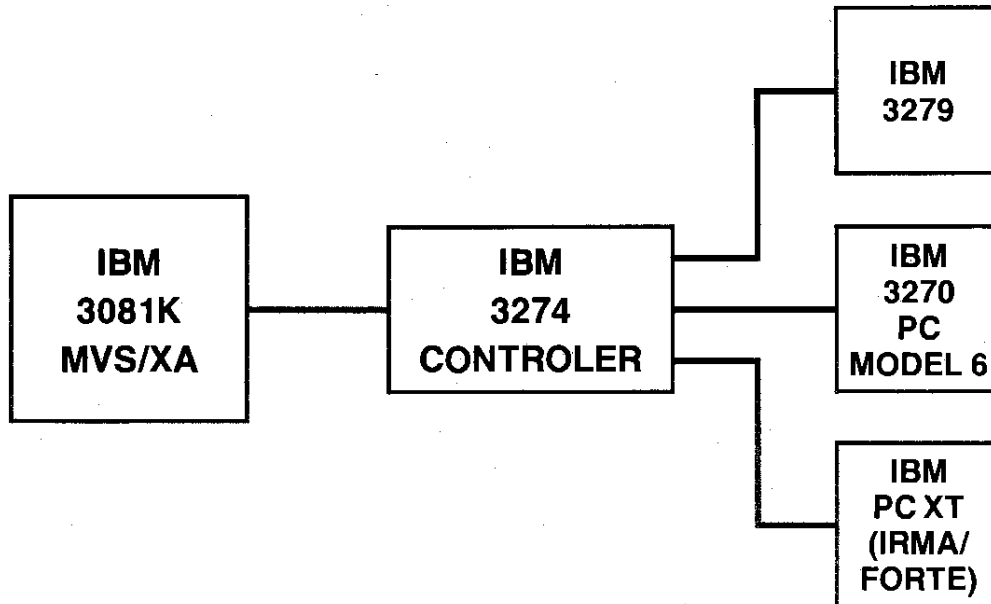


Figure 3

## AVCO LYCOMING DIAL-UP COMMUNICATIONS

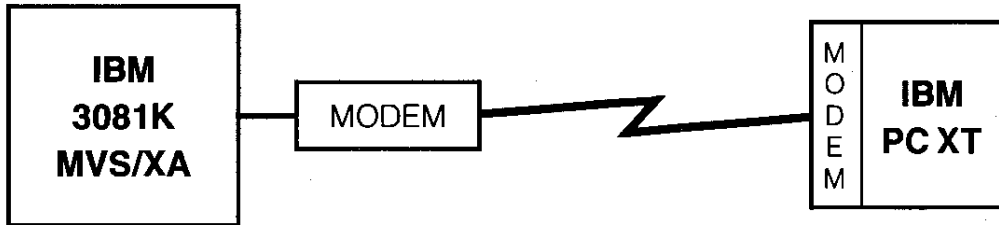


Figure 4

## AVCO LYCOMING ELECTRONIC MAIL COMMUNICATIONS

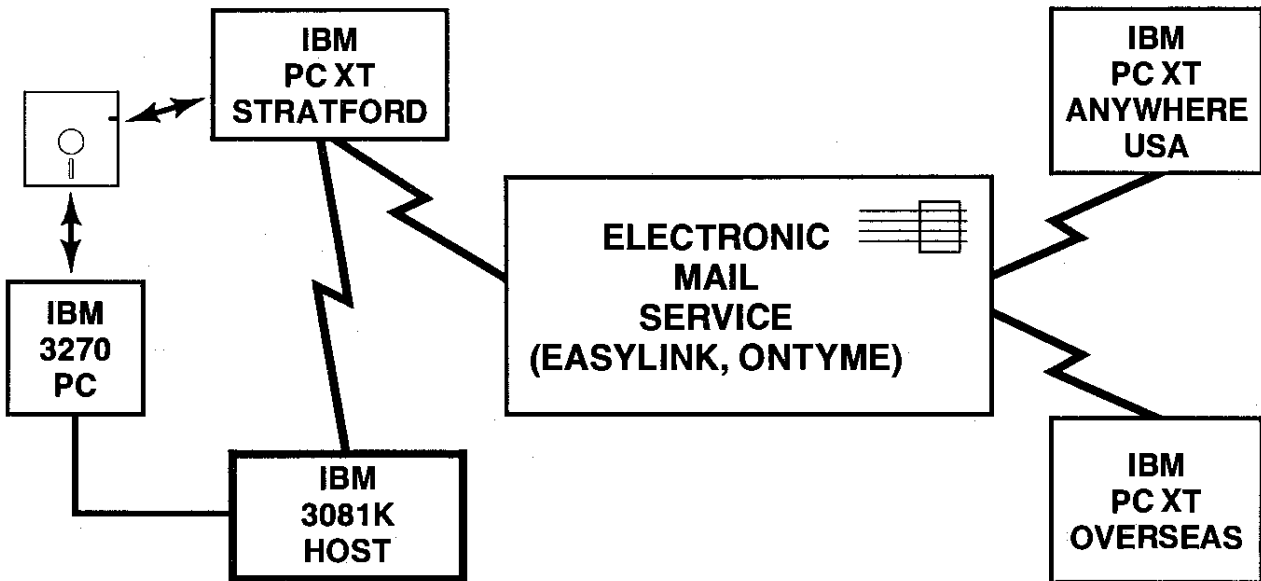


Figure 5

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