Making a special purpose terminal work in a general purpose systems environment

by DONALD J. BIRMINGHAM

NCR Data Pathing Inc.
Sunnyvale, California

THE FACTORY DATA SYSTEM

Factory Data Systems have many application requirements not normally satisfied by standard general purpose terminals. In the past twenty years there has been an evolutionary growth of job oriented terminals to satisfy the unique requirements of the factory. To maintain the pace of the current expanding system requirements, the special purpose terminals must communicate on a transaction basis with a general purpose data processing system.

A schematic of a comprehensive factory data system is shown in Figure 1. The factory terminal system has many requirements which include both general purpose and special purpose application parameters in the following areas:

• Time and Attendance
• Labor Distribution
• Job Tracking
• Material Control
  — Raw Material
  — Work in Progress
  — Finished Goods
  — Shipping and Receiving
• Inquiry
• Tool Tracking
• QA Reporting

Most of the above terminal applications must communicate directly with a large scale general purpose data processing system. This paper outlines the system implementation that Data Pathing Inc. uses to connect an interactive factory data collection system on line to a large scale IBM data processing system. DPI offers special purpose job oriented terminals, general purpose terminals, and terminals which alternately operate in a special purpose job oriented mode and a general purpose mode.

THE SYSTEM FLOW

Figure 2 presents the desired flow of transactions from the job oriented factory terminals through a DPI system control processor to a "host" general purpose data processing system. Not all transaction types have the same real time processing requirements with the host data processing system. Some of the different system requirements include:

• Immediate and Mandatory Interaction
• Queuing for Load Leveling
• Queuing for Time Dependent Processing
• Processing Off-Line for Faster Response
• Processing Off-Line for Back Up Purposes

In most systems the main plant data base is located on the host processor. A prime example of this in the large IBM environment is an IMS data base oriented system.

TYPICAL FACTORY JOB ORIENTED TERMINAL

A typical job oriented special purpose factory data collection terminal is detailed in Figure 3. This particular terminal is designed for "community" applications. A community of workers runs random or time dependent application transactions on the terminal. Examples of the transactions are as follows:

Time Dependent—Time & Attendance (In & Out)
  — Last Job Checkout (Shift Change)
Random
  — Material Move (Function Complete)
  — Material Receipt (Material Available)
  — Labor Transaction (Job Complete)

The DPI SDT 107 is a multi-function terminal which can run the transaction applications gamut from time and attendance through material move to limited inquiry. To do these transactions the terminal incorporates the following features.

• Transaction Descriptions (Applications Menu)
• Transaction Select Keys
• Operation Instruction Mask
• Function Indications
• Keyboard (Numeric and Alpha)
• Alphanumeric In Line Field Display
• Function Keys
Figure 1—A comprehensive factory data system
THE MULTI FUNCTION FACTORY TERMINAL

The growth of different application terminal requirements has led to the side by side placement of both job oriented and general purpose terminals each installed for specific applications. As new applications are added it becomes a problem as to which terminal the transactions are assigned as most applications have both general purpose and special purpose attributes. To solve this dilemma DPI developed the MIT 133 Factory terminal. This terminal can alternately operate as either a special purpose job oriented terminal or as a general purpose keyboard CRT terminal. In the general purpose mode it operates as an equivalent IBM 3277 terminal. As shown in Figure 4, it has both the main attributes of the general purpose and the job oriented special purpose terminal.

**General Purpose**
- 15 inch CRT Screen
- Alphanumeric keyboard
- Basic system indicators

**Special Purpose**
- four different screen sizes
- special job oriented layouts
- Expanded System Indicators
- Optional Badge Reader
- Optional Tab Card Reader

Figure 5 presents a point by point feature comparison between the DPI MIT 133 and the IBM 3277. Most of the added features were specifically added to allow for alternate or mixed operation in the general purpose or special purpose job oriented mode.

INTERFACE CONTROL SYSTEM

The DPI 3270 Interface Control System (ICS) is an optional system module to interface a DPI system with any host processor system that will support the IBM 3270 terminal system. The module is independent of the specific access method used in the host computer system. The applications can be programmed for interaction with IMS, CICS, TCAM, TOS or any other access method which supports the IBM 3270 general purpose CRT terminal system. Within this capability the DPI system has a full range of unique interface arrangements to enhance the power and flexibility of the terminal applications. ICS is an emulation of the IBM 3270 information display
### FEATURES

<table>
<thead>
<tr>
<th></th>
<th>DPI MIT 130</th>
<th>DEVICE BEING EMULATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIGHT PEN</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>AUDIBLE ALARM</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>KEY LOCK</td>
<td>NOT REQUIRED</td>
<td>✓</td>
</tr>
<tr>
<td>MAGNETIC CARD READER</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>SYSTEM INDICATORS</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>CHARACTER SIZES</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>PRINTER SPEED</td>
<td>120 CPS</td>
<td>66 CPS</td>
</tr>
<tr>
<td>PRINTER CABLE</td>
<td>2 WIRE</td>
<td>COAXIAL</td>
</tr>
<tr>
<td>IN-PLANT LINE USE</td>
<td>2 WIRE</td>
<td>MODEMS</td>
</tr>
<tr>
<td>EMPLOYEE BADGE READERS</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>CARD READERS</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>NON-CLERICAL KEYBOARDS</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>BLINK FIELDS</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>STANDING OPERATION</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>PLANT TIME SYNCH</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>DUAL TERMINATION</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>DATA COLLECTION</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>HOSTILE ENVIRONMENT DESIGN</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Figure 5—MIT features comparison

Two types of system configurations are supported within ICS:

- Processor system "thinks" it is controlling and the "Real System" which is being implemented by DPI.

**SPECIFIC TERMINAL OPERATION UNDER ICS**

- Under ICS DPI terminal can operate in either the "transparent" or "data collection" mode.
  - Transparent Mode is a one for one operation of a DPI
VIRTUAL SYSTEM

3277 Display, 3284
(Except Model 3)
Or 3280 Printers

3272 Control Unit

EXECUTE CHANNEL
COMMANDS

BUFFER
STORES DATA

Data Processing System

LOCAL

SYSTEM
APPLICATION
PROGRAM

"REAL" DPI SYSTEM

DPI SYSTEM

COMM PROCESSOR POWER CHANNEL ADAPT

IBM 2914 CHANNEL SWITCH
IBM CHANNEL EXTENDER

HOST SYSTEM

VIRTUAL SYSTEM

Optional

"REAL" DPI SYSTEM

Figure 6—3272 local attachment

Figure 7—3271 remote attachment
terminal as an equivalent IBM 3277 terminal. The screen format control resides in the host processor and all transaction processing from an applications standpoint is executed in the host processor.

- Data Collection Mode can be either a one for one or group operation of DPI terminals for IBM 3277 terminals. The screen format control resides in the DPI processor. Final transaction processing can be executed in either the DPI processor or the IBM host processor.

A terminal such as the DPI SDT 107 is normally applied only under the data collection mode of operation. As an example it is not uncommon for each of two hundred DPI 107 terminals to appear to an IBM system as the physical equivalent of two IBM 3277 terminals (one for input and one for output). Limited job function terminals such as a dedicated time and attendance terminals are also included under the same emulation mode. The logical terminal addressing is accomplished in the host processors applications.

The DPI MIT 133 terminal can be applied either in the "transparent" or "data collection" mode of operation. It is not unusual for the MIT 133 terminal to be applied in the mixed mode where specific transactions are transparent and others are run in the data collection mode. In this type of application a specific terminal may appear to the host processor as two different logical terminals (one transparent and the other a data collection mode terminal). In such a case the transparent mode of the multi-mode terminal mode would appear to the host as a one for one physical terminal. The data collection mode of the same terminal can appear as either a separate one-for-one physical terminal or grouped as an individual logical terminal with other data collection mode terminals under a single physical virtual terminal.

A data collection mode application can be processed against both a reference (or fast reaction) data base in the DPI processor, and the main data base in the host processor. A "work in process" (WIP) file is the typical factory environment example of the type of data base located in the DPI processor.

SUMMARY

- The concept of having a special purpose terminal system appear to a host processor as a general purpose terminal subsystem has provided a most flexible system method of interfacing factory job oriented terminals to general purpose data processing systems.
- The concept coupled with special purpose terminals such as the DPI MIT 133 designed to operate in both the general purpose and special purpose job oriented mode provides for multi-operation of software control executed from either the best system or the DPI processor.
- The IBM 3270 is an ideal emulation target for providing multi-function on-line operation of job oriented terminals.
- Potential users need not worry about obsoleting existing working 3270 CRT software in the host processor when adding or evolving to a more sophisticated interactive on-line factory terminal system.
- The implementation of virtual logical terminals frees the software writer on the host from redefining all communications devices as new applications and terminals are added or modified.