INTERTECHNIQUE which manufactures the TM 77.600, I.R.I.G. format decommutator, has had to extend the PCM message acquisition performance range to the DANIEL format, and has thus developed the TM 78.420.

The TM 78420, capable therefore of acquiring both DANIEL and IRIG PCM messages, meets the requirements of the users of the Avions Marcel Dassault methods service telemetering station at Istres.

This equipment provides for the acquisition and display, in different forms and in real time, of values of parameters contained in a PCM message.

The following values can be displayed simultaneously on five cathode screens:

- 128 parameters in analog form, bar-graph type
- 32 parameters in digital form, in physical magnitudes.

The values of 16 parameters can be restored in the form of analog voltages and those of four parameters in binary form.

An operator terminal, consisting of a display console/alphanumeric keyboard unit, prepares the deswitching program and monitors the equipment in general. The system consists of the following subassemblies;

- 4 analog display terminals designated as A, B, C, D
- 1 alphanumeric terminal unit E
- 1 logging rack
- 1 operator terminal

2. ANALOG DISPLAY TERMINALS (A, B, C, D)

Each terminal consists of a cathode tube terminal and 5 key keyboard providing for the selection of among five deswitching programs residing in the decommutator memory.

1. Decommutator

The system opens an analysis window of 32 consecutive words of the incident PCM message.

2. Display

The bar-graphs are white on a black background. Aligned vertically they occupy the whole width of the screen. The bar-graph lines are not contiguous (analog with PAM - RZ) and have no identification.

A reticle consisting of horizontal lines one tenth of the full scale part, facilitates reading of the parameters’ value, this reticle is obtained by scanning.

The resolution is 1/256th of the full scale (the digital/analog conversion is obtained on 8 bits).

An alignment of 8 consecutive bits is possible out of the 16 possible input bits, this alignment is the same for the 32 parameters on a unit.

Refreshing is obtained at the rate of the video frame (i.e., 1/25 seconds).

The first parameter selected is located to the left of the screen.

3. Access to Program

The user has a five key keyboard at his disposal, providing for a choice between five display program preselected from the operator terminal.

In operation there are 20 progarms residing in memory (A1 to A5, B1 to B5, etc.) each terminal having access to five of them.
3. ALPHANUMERIC DISPLAY TERMINAL (E)

1. Decommutator

The system decommuts 32 parameters located in any way in the format.

Each of the parameters is selected by the designation:

in IRIG PCM - of the address of the word in the short cycle and the address of the short cycle in the long cycle for the subswitched parameters

the address of the word in the short cycle for the switched parameters

in DANIEL - the code of the area and address of the word in the area.

2. Display

- The image is displayed on TV monitor.

- The writing is white on a black background;

- The screen is divided into two columns and 16 lines.

- A 16 character label identifies the parameter at the start of a half line.

- The data refresh rate is around 20 Hz.

3. Program Selection

Display on terminal E is fully monitored by the operator terminal from which the 32 numeric channels displayed are allocated.

4. Processing of Parameters

a. Presentation

The parameters can be:

- in binary on 16 bits maximum

- in decimal on 5 digits
- in signed decimal on 5 digits plus the sign
- in hexadecimal on 4 digits.

b. **Linear arithmetical operation**

The presentation in physical units can be obtained by the following processing:

\[ A \times 10^n_1 \times X + B \times 10^n_2 \]

and

\[ \frac{A \times 10^n_1}{X} + B \times 10^n_2 \]

where X corresponds to the value of the telemetering word received. The values of parameters a and b are acquired in scientific notation with a 4 digit mantissa comprised between -9999 and + 9999 and a single digit exponent comprised between -9 and +9.

The result is displayed there with 5 digits plus sign either in scientific notation or in fractionary number form.

**4. OPERATOR TERMINAL**

1. **Operating**

The operator terminal:

a. programs and controls the system via an alphanumeric console

b. displays on this screen the values of the 32 parameters displayed on terminal E

c. displays on a separate monitor an analog display program type A, B, C or D (terminal V).

This monitor being generally associated to the operator terminal.

d. prepares a supplementary program for one of the displays A, B, C or D in real time, without halting the decommutator.

e. prepares and checks the deswitiching of a 33rd parameter in real time, without halting decommutator.
f. has the capacity to replace one of the 32 parameters of display E by the 33rd parameter thus defined

g. prepares a new program

h. manages two floppy disk units on which the user’s programs can be recorded.

2. Programming

The menu of the nine functions available on the system appears on the operator terminal screen when initializing the system, each one being preceded by its order number.

The operator must key in the number of the function selected on the keyboard.

a. Function 1 - editing mode

This function prepares programs through the acquisition of the different deswitching parameters.

A program is written in conversational mode.

The text:

NAME OF PROGRAM:

appears at the top of the screen.

The operator must then key in the name of the program which can have six characters maximum.

The frame of the upper program array then appears and concerns the bar-graph analog channel. The array is as follows:

NAME OF PROGRAM XXXX
TERMINAL NO. PROG. NO. SHORT C. NO. WORD ALIGN. SGN

INPUT A
The parameters are acquired by the INPUT line which is split up into acquisition areas, corresponding to the frame of the array.

At the end of line write, the operator can either cancel what he has written or validate it, the contents of the input line transferred to the corresponding line of the array.

The operator can thus write or correct each line in the array.

The other arrays in the program (digital channels, analog channels, etc.), are accessed by actuating the “Upwards arrow” or “downwards arrow” key.

The write principle is identical to all the arrays.

The array frames are specific to each type of channel are are displayed in the appendix.

b. **Function 2** - initiation or halting decommutator. When decommutator is active write on floppy disk is inhibited.

c. **Function 3** - log listing

This function provides for display of the names of all the programs recorded on the floppy disk.

d. **Function 4** - suppression of a logged program.

e. **Function 5** - floppy disk formatting.

f. **Function 6** - floppy disk duplication

g. **Function 7** - selection of a program in view of operator terminal bar-graph display (terminal V).

h. **Function 8** - display on operator terminal.

This function provides for the display of 32 numeric parameters allocated with their label on the operator screen.
**FUNCTION 8**

1 2 3 4 5 (result channel 33)

<table>
<thead>
<tr>
<th>INPUT NO.</th>
<th>CHANNEL</th>
<th>LABEL NO.</th>
<th>SHORT C. NO.</th>
<th>WORD NO.</th>
<th>PROC. A.</th>
<th>B</th>
</tr>
</thead>
</table>

With the input line it is possible to program a 33rd channel, check its operating and allocate this new program to one of the 32 channels.

i. **Function 9** - data listing

This function can display the contents of 32 consecutive words of an area or of a short cycle from a given word number.

5. **Decomutator RACK**

The following subassemblies are integrated into this rack:

- decomutator and peripherals management subrack

- digital/analog conversion subrack - 16 channels and binary channels restore

- 2 floppy disk units.

1. **Deswitching Subrack**

This subrack performs the following functions:

a. The acquisition, deswitching of PCM messages from a format synchronizer and the generation of video signals (to the CCIR standards) for terminals A, B, C, D and E, are obtained by the following subassemblies of the deswitching subrack:

- “DANIEL” or IRIG address generator

- decomutator of 32 consecutive parameters in ans area or short cycle, and generator of the video signal for the bar graph display associated to the operator terminal.
Generator of the video signal for terminal E (alphanumeric display).

- subassembly of two deswitchers of 32 consecutive parameters and generator of video signals for terminals C and D
- deswitcher of any 32 parameters in the format
- deswitcher of any 20 parameters in the format
- 16 analog channels
- 4 binary channels.

b. Management of the operator terminal via SERIE V 24 link.

c. Management of the two floppy disk units.

d. Presentation of the deswitched data to the digital/analog conversion subrack.

e. Programming via 16 bit channel of a format synchronizer.

2. Numeric/Analog Conversion Subrack

This subrack firstly provides for the digital/analog conversion on 8 bits, of 16 parameters from the deswitcher.

An alignment of 8 consecutive bits amongst the 16 possible input bits can be obtained, this alignment is specific to each of the parameters deswitched, and secondly, 4 parameters are restored in binary form.

3. Floppy disk Units

A sequence of different programs can be printed out from the operator terminal and logged on diskettes. This program is identified by an alphanumeric label with 16 characters maximum.

In this way more than 50 different programs can be stored.

The system provides for diskette duplication.
4. Presentation of the Menu

FUNCTION SELECTION

- Editing/display: 1
- Initiation/halt deswitch: 2
- Log listing: 3
- Log suppression: 4
- Disk formatting: 5
- Disk duplication: 6
- ANA. program selection: 7
- Output on O.T. 8
- Area listing: 9

***Function selected

Programming of bar-graph channels.

1. DANIEL Format

NAME OF PROGRAM:

TERMINAL/PROG. AREA WORD SIGN TRANS. PART ALIGN.

INPUT
A1

2. IRIG Format

NAME OF PROGRAM:

TERMINAL/PROG. SHORT C. WORD SIGN ALIGN.
Programming of alphanumeric channels

1. DANIEL Format

   NAME OF PROGRAM:
   ALPHANUMERIC CHANNELS

   CHANNEL LABEL AREA WORD SIGN TRANS. PAR PROC. A B

   INPUT

2. IRIG Format

   NAME OF PROGRAM:
   ALPHANUMERIC CHANNELS

   CHANNEL LABEL SHORT C. WORD SIGN PROC. A B

   INPUT

Analog channel programming

1. DANIEL Format

   NAME OF PROGRAM:
   ANALOG CHANNELS

   CHANNEL AREA WORD SIGN TRAN. PAR ALIGN

   INPUT
2. IRIG Format

<table>
<thead>
<tr>
<th>CHANNEL</th>
<th>SHORT C.</th>
<th>WORD</th>
<th>SIGN</th>
<th>ALIGN</th>
</tr>
</thead>
</table>

INPUT