Bendix
Aerospace Systems Division

Array E Calibration Curves

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This ATM summarizes the scope and contents of the calibration curve data book and calibration magnetic tape which will be supplied to the MCC for ALSEP Array E downlink data conversion. Certain of the Array data channels require special conversions which are out of scope of the Apollo/Saturn Calibration Tape Format Mod 1; special reference to these channels is contained herein.

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REFERENCES:

1. ATM-799, "Calibration Curves and Calibration Tapes". A. Bedford, September 10, 1968.

2. ATM-808, "Machine Plotting of the ALSEP Calibration Curves". A. Bedford, September 27, 1968

3. ALSEP-SE-33, "Measurements Requirements Document - Array E", Revision A; March, 1972.

INTRODUCTION:

A calibration curve data book and calibration magnetic tape will be supplied to the MCC for ALSEP Array E downlink data conversion purposes. The data book and magnetic tape will be prepared in the same format as those for earlier arrays, as described in References 1 and 2.

Due to the extensive revision of the Central Station design and the incorporation of four new experiments, the scope and contents of the Array E calibration data are significantly different to the earlier ALSEP Arrays. This ATM has been prepared primarily to summarize and document the scope and contents of the Array E data book and magnetic tape. In addition, a description of certain refinements to the procedures described in Reference 1 for producing the calibration tape is given in Appendix A.

THE CALIBRATION CURVE NUMBERS:

As described in Reference 1, a special calibration curve number is assigned to each calibration data record. This number has a logical format which defines the relationships between the individual calibration curve and any similar calibration curves applicable to other data channels of the ALSEP system. It is used to automate the handling of related channels while preparing the calibration tape; thereby reducing the amount of data which has to be input manually.

A slight change must be made in this number to permit the new experiments to be accommodated. The new format will be:

ABB-CCC-DD-EE-FG

where:

A is the applicable flight number,
A = 0 all flights,
A = 6 Array E data;

BB denotes the subsystem,
00 = Central Station,
05 = HFE,
10 = LMS,
11 = LEAM,
12 = LSP,
13 = LSG;

CCC is a serial number used to designate a particular calibration curve, or sub-set of curves. This number is allocated arbitrarily, as each additional calibration curve is required to describe a new channel. Due to the duplication of transducers of the same type, one basic calibration curve can apply to more than one channel;

DD-EE is used to clarify the relationship between individual channels and basic cal curves;

EE is the total number of channels to which the curve BB-CCC applies;

DD is the sequence number of a particular channel in EE;

F is a variant number;

G is the revision letter of the curve; dash, A, B, C and upwards.

THE CONTENTS OF THE ARRAY E CALIBRATION CURVE BOOK

Tables 1 through 8 below have been prepared to establish the scope of the calibration curve book, and provide a detailed breakdown of the data which must be collated for each subsystem, both for the calibration curve book and the final magnetic tape.

In the final column of each table, the form of the mathematical function which will be used in the MCC computer to effect the data conversion to engineering units is shown. The abbreviations used in this column are:

1L	Linear function of one variable;
1NL	Non-linear function of one variable;
2L	Linear function of two variables:
2NL	Non-linear function of two variables;
STEP	Step function, either bi-level or multi-level, requiring special processing;
2 STEP	Step functions of two variables;
3 STEP	Step functions of three variables.

Functions of two variables will be processed by using a set of characteristics for each channel. Each member of these sets will be represented by a variant record on the calibration tape. These, and other special cases are described below.

CENTRAL STATION HOUSEKEEPING

The calibration curves for the Array E Central Station Housekeeping Channels telemetered in ALSEP Word #33 are listed in Table 1. The DA-08 Reserve Current Channel, ALSEP Word #63, is also contained in Table 1.

Six of the Central Station Electrical Channels require two-variable processing:

AE-04 PCU Input Current.
Two transducers are used, and selected according to the operating PCU. The two variant records will be defined as: -6, PCU #1; -7, PCU #2.

AE-11 -12 Volts.
The transducer is sensitive to the +12 Volt line voltage. Three records will be provided: -6, 11.75 V; -7, 12.0 V; -8, 12.25 V.

AE-15 Transmitter A, 17-Volt Regulator Current,
AE-16 Transmitter B, 17-Volt Regulator Current.
The transmitter's current sensor is temperature dependent. Five temperature variants will be provided, referenced to thermal plate temperature: -1, -10°F; -2, +10°F; -3, +77°F; -4, +110°F; -5, +146°F.

AE-19 Receiver A, Input Signal Level,
AE-20 Receiver B, Input Signal Level.
The receiver AGC voltage, from which these channels are derived is temperature dependent. Five characteristics will be provided: -1, -10°F; -2, +10°F; -3, +77°F; -4, +110°F; -5, +146°F.

Four of the Central Station Status signal require two-variable processing:

AB-04 Power Distribution Status Experiments 1 and 2,
AB-05 Power Distribution Status Experiments 3 and 4.
Both of these channels are sensitive to switching the LSPE power from OFF, or standby, to ON. Two variant curves will be provided: -6, LSPE OFF; -7, LSPE ON.

AB-06 Uplink A/B and Power Routing Status,
AB-17 ADP X/Y and Power Routing Status.
The interpretation of both these channels is dependent on whether the system power is being converted by PCU #1 or PCU #2. Two variant records will be provided: -6, PCU #1; -7, PCU #2.

In addition, special processing is required to compute:
Input Power,
Reserve Power,
APM Power;
from the telemetered PC Input Voltages and power system currents.

TABLE 1

ARRAY E CENTRAL STATION HOUSEKEEPING CHANNELS (ALSEP WORD #33)

Symbol		Channel	Cal Curve	Function
	Structural/Thermal Temperatures			
AT-01	Sunshield #1 (Top)	27	000-001-01-10	All housekeeping
AT-02	Sunshield #2 (Underside)	42	000-001-02-10	temperature sensors
AT-03	Thermal Plate #1	4	000-002-01-16	outputs are non-linear
AT-04	Thermal Plate #2	28	000-002-02-16	functions of one variable
AT-05	Thermal Plate #3	43	000-002-03-16	
AT-06	Thermal Plate #4	58	000-002-04-16	
AT-07	Thermal Plate #5	71	000-002-05-16	
AT-08	Vertical Structure #1 (Side #1)	59	000-001-03-10	
AT-09	Vertical Structure #2 (Side #2)	87	000-001-04-10	
AT-10	Bottom Structure	15	000-001-05-10	
AT-11	External Power Module	88	000-001-06-10	
AT-12	Thermal Bag Inner	60	000-001-07-10	
AT-13	Thermal Bag Outer	72	000-001-08-10	
AT-14	Front Structure	46	000-001-09-10	
AT-15	Rear Structure	47	000-001-10-10	

TABLE 1 (CONT)

ARRAY E CENTRAL STATION HOUSEKEEPING CHANNELS (ALSEP WORD #33)

Symbol		Channel	Cal Curve	Function
	Electronic Temperature			
AT-23	Transmitter A, Power Amplifier	18	600-004-01-01	All 1 NL
AT-24	Transmitter A, Case	19	600-005-01-01	
AT-25	Transmitter B, Power Amplifier	31	600-006-01-01	
AT-26	Transmitter B, Case	32	600-007-01-01	
AT-27	Data Processor Base	33	000-002-06-16	
AT-28	Data Processor Internal	34	000-002-07-16	
AT-31	Decoder B Demodulator	48	000-002-08-16	
AT-32	Decoder A Demodulator	49	000-002-09-16	
AT-34	PDU #1	62	000-002-10-16	
AT-35	PDU #2	63	000-002-11-16	
AT-38	PCU Regulator #1	77	000-002-12-16	
AT-39	PCU Regulator #2	78	000-002-13-16	
AT-40	Receiver Case (uplink A only)	16	600-039-01-01	
AT-41	APM #1	61	000-002-14-16	
AT-42	APM #2	64	000-002-15-16	

Total of 30 Central Station Temperatures

TABLE 1 (CONT.)

ARRAY E CENTRAL STATION HOUSEKEEPING CHANNEL (ALSEP WORD # 33)

Symbol		Channel	Cal Curve	Function
	Central Station Electrical			
AE-01	ADC Lo-Calibration, 0.25 Volts	2	000-030-01-02	1L
AE-02	ADC Hi-Calibration, 4.75 Volts	3	000-030-02-02	1L
AE-03	PCU #1 Input Voltage	8	600-008-01-01	1L
AE-04	PCU Input Current	5	600-009-01-01	2NL
AE-07	+29 Volts	20	600-012-01-01	1L
AE-09	+12 Volts	50	600-014-01-01	1L
AE-10	+5 Volts	65	600-015-01-01	1L
AE-11	-12 Volts	79	600-016-01-01	2NL
AE-15	Transmitter A, 17-Volt Regulator Current	51	600-042-01-01	2L
AE-16	Transmitter B, 17-Volt Regulator Current	66	600-043-01-01	2L
AE-17	Transmitter A, 23-Volt Regulator Output	81	600-044-01-02	1L
AE-18	Transmitter B, 23-Volt Regulator Output	22	600-044-02-02	1L
AE-19	Receiver A, Input Signal Level	21	600-040-01-01	2NL
AE-20	Receiver B, Input Signal Level	36	600-041-01-01	2NL
AE-21	APM #1 Current	35	600-045-01-02	1L
AE-22	APM #2 Current	56	600-045-02-02	1L
AE-23	PCU #2 Input Voltage	11	600-046-01-01	1L
AE-24	Reserve Current	30	600-047-01-02	1NL
DA-08	Reserve Current (ALSEP Word #63)		600-047-02-02	1NL
	RTG Temperatures			
AR-01	Hot Frame #1	6	600-026-01-01	1NL
AR-02	Hot Frame #2	37	600-032-01-01	1NL
AR-03	Hot Frame #3	52	600-027-01-01	1NL

TABLE 1 (CONT.)

ARRAY E CENTRAL STATION HOUSEKEEPING CHANNELS (ALSEP WORD # 33)

Symbol		Channel	Cal Curve	Function
	RTG Temperatures			
AR-04	Cold Frame #1	7	600-028-01-01	1NL
AR-05	Cold Frame #2	67	600-029-01-01	1NL
AR-06	Cold Frame #3	82	600-031-01-01	1NL
	Central Station Status			
AB-04	Power Distribution Status Experiments 1 and 2	12	600-024-01-01	2 Step
AB-05	Power Distribution Status Experiments 3 and 4	14	600-025-01-01	2 Step
AB-06	Uplink A/B and Power Routing Status	26	600-048-01-01	2 Step
AB-08	Receiver A, Command Subcarrier Status	9	600-037-01-02	Step
AB-09	Receiver B, Command Subcarrier Status	17	600-037-02-02	Step
AB-10	Digital Data Processor X/Y Status	70	600-038-01-01	Step
AB-11	Power Distribution Status Experiment 5 (LSPE)	73	600-049-01-01	Step
AB-13	Automatic Power Management (APM) Status	76	600-050-01-01	Step
AB-14	7W/14W External Load Status	80	600-051-01-01	Step
AB-15	Periodic Commands Enable/Inhibit Status	86	600-052-01-01	Step
AB-16	PC Auto Switch Status	13	600-053-01-01	Step
AB-17	ADP X/Y and Power Routing Status	90	600-054-01-01	2 Step
AB-18	Uplink Switch Delay Status	1	600-055-01-01	Step

HEAT FLOW EXPERIMENT DATA PROCESSING

The data processing and associated calibration curves for Array E will be identical to those for experiments in earlier arrays. The HFE Housekeeping Channels are summarized in Table 2, and the HFE Sequence Status Channels in Table 3.

Two housekeeping channels require two-variable processing:
AH-02 Supply Voltage #2,
AH-04 Supply Voltage #4.

Both of these channels monitor negative supply voltages, using circuits which are sensitive to the HFE +15V line. Three variants curves will be provided for each channel: -7, +14.0V; -8, +15.0V, -9, +16.0V.

The DH-91 Measurement ID Channel is associated with special processing in the MCC. A family of records, -1 through -6, is supplied to document the inter-relationships between the experiment P, M, and H registers and the Measurement ID.

The special HFE science data processing and displays will be identical to those for previous ALSEPs. The data reduction program requires certain calibration constants applicable to individual HFE models. These constants will be supplied to MCC in an ATM.

LUNAR MASS SPECTROMETER DATA PROCESSING

The calibration data to be supplied for processing the LMS Housekeeping Channels is described in Table 4. There are two channels which require two-variable processing:
AM-11 Emission Current,
AM-44 Sweep High Voltage.

Both of the sensors are temperature dependent, and a set of five characteristic variants, -1 through -5, will be supplied for these channels.

TABLE 2

ARRAY E HEAT FLOW EXPERIMENT HOUSEKEEPING CHANNELS
(ALSEP WORD # 33)

Symbol		Channel	Cal Curve	Function
AH-01	Supply Voltage #1	29	605-001-01-01	1L
AH-02	Supply Voltage #2	45	605-002-01-01	2L
AH-03	Supply Voltage #3	55	605-003-01-01	1L
AH-04	Supply Voltage #4	74	605-004-01-01	1L
AH-06	High Conductivity Heater Power Status	57	005-006-01-02	Step
AH-07	Low Conductivity Heater Power Status	75	005-006-02-02	Step

TABLE 3

HEAT FLOW EXPERIMENT SEQUENCE STATUS CHANNELS

Symbol		Cal Curve	Function
DH-90	Mode Register M1 M2 M3	005-008-01-01	Step
DH-91	Measurement ID	005-009-01-01	3 Step
DH-92	HFE Word Numbers, R2 R1	005-011-01-01	Step
DH-93	Measurement ID, H Register H4 H3 H2 H1	005-010-01-01	Step

TABLE 4

ARRAY E LUNAR MASS SPECTROMETER HOUSEKEEPING CHANNELS
(ALSEP WORD # 33)

Symbol		Channel	Cal Curve	Function
AM-01	Marker ID (Eight 1's)	40	NA	NA
AM-02	Experiment Current	40	610-001-01-01	1L
AM-03	Ion Pump Current	40	610-002-01-01	1NL
AM-04	Ion Pump Voltage	40	610-003-01-01	1L
AM-05	Baseplate Temperature	40	610-004-01-01	1L
AM-06	Ion Source Temperature	40	610-005-01-01	1L
AM-07	+12 VDC Supply Voltage	40	610-006-01-01	1L
AM-08	+5 VDC Supply Voltage	40	610-007-01-01	1L
AM-09	-12 VDC Supply Voltage	40	610-008-01-01	1L
AM-10	-15 VDC Supply Voltage	40	610-009-01-01	1L
AM-11	Emission Current	40	610-010-01-01	2NL
AM-12	Filament #1 Current	40	610-011-01-01	1NL
AM-13	Filament #2 Current	40	610-012-01-01	1NL
AM-14	Multiplier High Voltage	40	610-013-01-01	1NL
AM-15	LV Power Supply Termperature	40	610-014-01-01	1NL
AM-16	Spare	40	NA	NA
AM-41	Electronics Temperature	41	610-015-01-01	1NL
AM-44	Sweep High Voltage	44	610-016-01-01	2L

Also note that the Ion Pump Current, AM-03, is monitored by a sensor which possesses a logarithmic characteristic, to cover the required measurement range of 0.01 to 100 microamps. A multi-segment linear conversion curve will be supplied to approximate the logarithmic characteristic; the standard calibration tape format will accommodate up to 20 segments. In order to accommodate the measurement range on the high-speed printer display without resorting to floating point numbers, a NNN.NNN number format, e.g. FORTRAN F7.3, will be required.

The LMS Digital Status Channels are considered to be out-of-scope of the Apollo/Saturn Calibration Tape Format; and it is not proposed to supply any calibration records for these channels. Specifically the standard tape format is not adaptable to handling individual bits or to alpha interpretation of the flag bits, in contrast to numeric values. It is also considered that these channels are adequately described in SE-33 for specifying the special purpose programs required to directly display the flag data.

Additional special processing will be required to detect the twenty-three valid entries in the Command Readback Status register, and to interpret them for display, as described in SE-33.

Science Data number conversions and display formatting and synchronization, for channels DM-03, DM-04 and DM-05, are also considered to be out-of-scope of the standard tape format. The design of the science data displays is being coordinated by the MSC Mission Planning Meetings.

LUNAR EJECTA AND METEORITE EXPERIMENT DATA PROCESSING

The LEAM Housekeeping Channel calibration data is summarized in Table 5. The data conversions to be performed on all these channels are simple and do not require further discussion here.

It is intended to display the LEAM Science data in a binary format for each of the experiment measurements. The LEAM data format which must be decommutated to obtain the individual measurements is adequately described in SE-33 and no useful purpose would be served if calibration records in the standard tape format were provided for these measurements.

TABLE 5

ARRAY E LUNAR EJECTA AND METEORITE EXPERIMENT HOUSEKEEPING CHANNELS (ALSEP WORD #33)

Symbol		Channel	Cal Curve	Function
AJ-01	+5 Volt Supply	83	011-001-01-01	1L
AJ-02	Sensor Dust Covers Status	83	011-002-01-02	STEP
AJ-03	Mirror Dust Cover Status	83	011-002-02-02	STEP
AJ-04	Power Supply Monitor	83	011-003-01-01	STEP
AJ-05	Bias Voltages Monitor	83	011-004-01-01	STEP
AJ-06	Up Microphone Temperature	84	011-005-01-04	INL
AJ-07	East Microphone Temperature	84	011-005-02-04	INL
AJ-08	West Microphone Temperature	84	011-005-03-04	INL
AJ-09	Central Electronic Temperature	84	011-005-04-04	INL
AJ-10	-5 Volt Supply	84	011-006-01-01	1L
AJ-11	Survival Temperature	85	011-007-01-01	INL

In addition special processing will be required to achieve analog housekeeping sub-commutation synchronization from Synchronization ID bit contained in the LEAM Word #10. The behaviour of the Synchronization ID bit is described in SE-33.

LUNAR SEISMIC PROFILING EXPERIMENT DATA PROCESSING

The calibration records which will be supplied for LSPE Measurements data conversions are listed in Table 3.

Two log decompression characteristics for the science data displays will be provided, one for low amplitude geophone signals and the other covering the full range of geophone outputs.

Analog housekeeping conversions are all simple. The Central Station channels telemetred in the LSPE format require identical conversion to those applied in the Central Station format.

It is not proposed that any calibration records will be supplied for the digital status channels DP-17 through DP-21. All of these require special processing, in accordance with the description of these channels contained in SE-33.

The LSPE Electronics Internal Temperature is also telemetred in the Central Station data format, and requires the conversion shown in Table 7.

LUNAR SURFACE GRAVIMENT DATA PROCESSING.

The calibration data and processing necessary to display the LSG Housekeeping data are listed in Table 8. The processing of all channels except AG-05 will be simple, the Instrument Housing Pressure measurement is temperature dependant and may require two-variable processing.

The LSG Housekeeping Status Data is considered to be adequately described in SE-33, and with one exception there is no apparent advantage to be gained by supplying standard format calibration tape records for these channels. Special processing is required to implement the signal interpretations defined in SE-33. The exception is the Temperature Relay Register Status which can be readily interpreted via a conventional polynomial fit into the equivalent stabilization temperature of the sensor.

TABLE 6

LUNAR SEISMIC PROFILING EXPERIMENT MEASUREMENTS

Symbol		Channel	Cal Curve	Function
DP-01	Geophone #1 Data	1	012-001-01-04	2NL
DP-02	A/D Calibration #1	2	012-002-01-02	1L
DP-03	DC/DC Convertor Output	3	012-003-01-01	1L
DP-05	A/D Calibration #2	5	012-002-02-02	1L
DP-06	Geophone #2Data	6	012-001-02-04	2NL
D0-10	Geophone Calibration Pulse Amplitude	10	012-004-01-01	1L
DP-11	Geophone #3Data	11	012-001-03-04	2NL
DP-14	Electronics Temperature	14	012-005-01-01	1NL
DP-16	Geophone #4 Data	16	012-001-04-04	2NL
DP-17	Frame Synchronization	-	-	STEP
DP-18	Geophone Calibration Pulse Status	-	-	STEP
DP-19	Geophone Amplifier Gain Status	1	-	STEP
DP-20	RF Fire Pulses Status	-	-	STEP
DP-21	Subframe Identification	-	-	STEP
AT-16	Thermal Plate #6	8	000-002-16-16	1NL

Note: In addition to the channels described above, Central Station Housekeeping Measurements AB-04, AB-05, AE-03, AE-04 and AE-24 are also telemetered in the LSPE format. Refer to Table 1 for a description of the calibration curves applicable to these channels.

TABLE 7

ARRAY E LUNAR SEISMIC PROFILING EXPERIMENT
HOUSEKEEPING CHANNEL (ALSEP WORD #33)

Symbol		Channel	Cal Curve	Function
AP-01	Electronics Internal Temperature	25	012-006-01-01	1NL

TABLE 8

ARRAY E LUNAR SURFACE GRAVIMETER HOUSEKEEPING CHANNESL (ALSEP WORD #33)

Symbol		Channel	Cal Curve	Function
AG-02	Tide Signal	10	013-001-01-01	1L
AG-03	Free Mode Oscillation Signal	23	013-002-02-02	1L
AG-01	Seismic Signal	39	013-002-01-02	1L
AG-04	Sensor Temperature	68	613-003-01-01	1NL
AG-05	Instrument Housing Pressure	89	613-004-01-01	2NL
AG-06	Mass Position Error Signal	54	613-005-01-01	1L
AG-07	Oscillator Amplitude	24	613-006-01-01	1L
AG-08	Power Converter (+15V)	38	613-007-01-01	1L
AG-09	Power Converter (-15V)	53	613-008-01-01	1L
AG-10	Power Converter (+5V)	69	613-009-01-01	1L

Science data processing is considered to be out-of-scope of the standard tape format. The number conversion required on the science data channels DG-D1, DG-02 and DG-03 is described in SE-33. The design of the science data displays and High Speed Printer Formats is being co-ordinated by the MSC Mission Planning Meetings.

APPENDIX A

PREPARATION OF THE CALIBRATION TAPE

INTRODUCTION

Preparation of the calibration tape and associated data book is discussed in references 1 and 2. Refinements of the procedures used at BxA which have been introduced since the publication of reference 1 are briefly described below.

THE SEVEN-TRACK CALIBRATION TAPE

The statement in section 4.0 of reference 1 that a packed nine-track tape is supplied to MSC is incorrect. The IBM seven-to-nine track tape convertor, which is a "hardware" unit incorporating hard-wired logic, is not available at BxA. Duplication of the conversion in software to permit the calibration tape to be read and verified prior to delivery to MSC would have involved extensive programming. It was agreed that supply of calibration tapes in the seven-track Apollo/Saturn Calibration Tape Format was more economical to the ALSEP program, as this obviated the format conversion programming effort.

EXTENSION OF THE CALTAPE 1 PROGRAM FACILITIES

To assist in the preparation of tapes for new flight systems, two additional operations have been incorporated in CALTAPE 1; FLCOPY and SDLETE.

An existing tape can be copied using the FLCOPY operation, and the flight number in the calibration curve number simultaneously updated to a new value. By using repeated FLCOPY operations, existing tapes and card decks can be merged as required to generate a new basic tape.

SDLETE, i.e., subsystem delete, may be used to delete all records with any given flight-plus--subsystem number from the file. Its principal use is to eliminate redundant experiment records from a newly created flight system tape produced by a FLCOPY operation.

THE EDTP2 CARD EDITING PROGRAM

Preparation of a calibration tape for a new flight system, after copying an existing tape as has just been described, typically requires a deck of about 2000 cards to be entered to introduce new records and update existing records. A significant disadvantage of the CALTAPE 1 program soon became apparent in practical use; the input card formats are so complex that preparing and verifying the input decks is unduly tedious. Further, trivial input card errors could cause CALTAPE 1 runs to bomb-out.

An editing program was written to ease the card preparation for CALTAPE 1. This program, EDTP2, accepts cards in a relatively straight forward "English" format and punches on output deck edited into CALTAPE 1 format, flagging error card input to the printer. EDTP2 was written in PL 1 language, as this language contains the wide range of instructions necessary to perform the editing efficiently, and also permits control of the computer interrupts so that recovery from input card errors.can be accomplished. The main editing functions of EDTP2 are briefly described below:

Control cards: e.g. ADD, MODIFY

Prescence of the name of a valid control operation in the first six columns is verified.

Record cards: e.g. 000-001-01-10-0-and other numeric control cards.

The length of the field on the card is verified to be one of the valid lengths, the absence of alpha or special characters is verified, and also correct positioning of the dashes is confirmed.

Data Cards: containing data to be entered into the calibration records.

The word positions are accepted in one of two ways:

1. The first word may be indicated in columns 2 - 4 of the card and the number of words in column 6; or

2. A mnemonic name of up to 6 characters length starting in column 2 may be entered. This will be translated by EDTP2 into the word position and number of words, e.g. "TITLE" = "3 8".

EDTP2 differentiates between the word positions which contain alpha-numeric data and those which contain floating - point data on the final tape. Alpha-numeric data is centered into EDTP2 in a continuous string, the program splits the string into six character words, and inserts two blanks so as so as to right-justify the words on the CALTAPE 1 input cards.

Numeric data is entered in a free format using commas as separators. EDTP2 verifies that the correct number of numeric words is entered, and right justifies them into the CALTAPE 1 input cards as indicated by the separators. Use of a "$" on the EDTP2 input signifies that existing calibration tape data in this word position is to be retained, and EDTP2 will produce a suitable output deck.

Repeated Output Cards.

EDTP2 also contains facilities for repeatedly outputting data from a single input card, obviating a certain amount of key-punching. A set of nine psendo-registers is provided, known as HERE1 through HERE9, each of which can be used to store one input card. These registers can be loaded, accessed or reloaded at any time during an EDTP2 run. There are no restriction on the data which may be stored.

A register will be loaded by the next input card which follows an EDTP2 control card containing HEREN = in columns 2 through 7, where N = 1 through 9.

The stored card will also be processed and output. Repeated output is obtained by inputing HEREN* in columns 2 through 7 at the required place in the input deck.