DATA SET CATALOG # 116
ALOUETTE 1 - SWEEP FREQUENCY IONO 'P'

62-049A-01P 2 tapes

62-049A-01P

ALOUETTE 1, SWEEP FREQ LOAD 'P'

TAPES ARE 800 BPI, BIN, ODD, 7 track, 360/75

D#	C#	FILES	START	STOP
D-06052	C-04952	1	04/28/62	07/11/62
D-06053	C-04953	4	07/12/62	05/02/64

USERS' GUIDE FOR N(h) ANALYSIS OF CONVENTIONAL SF IONOGRAMS (PI-11D)

1. Introduction

Program PI-11D, stored in the NSSDC library, is an N(h) reduction program for converting ground based ionosonde data into vertical electron distributions. It uses the parabolic in log (N) lamination method of analysis (Doupnik and Schmerling, 1965; Jackson, 1971).

This document describes how to (a) prepare the computer input data from h'(f) data scaled from ionograms and (b) run the program. Full details on the interpretation and the scaling of the ionograms can be obtained from the "URSI Handbook of Ionogram Interpretation and Reduction" (Piggott and Rawer, 1961), and an extensive treatment of N(h) reduction techniques is given in the special issue of Radio Science, Vol 2, published in September 1967.

2. Brief description of the program

Essentially the program uses the O-trace to calculate a number (specified by the user) of trial N(h) profiles corresponding to different combinations of starting frequency and E-vally depth. A theoretical X-trace is computed for each trial N(h) profile and the standard deviation and average virtual height difference between the observed X-trace and each computed trace are calculated. The N(h) profile which

CARD

1
2

3
4
5

6

7...

k +1,

leads to the minimum error is thus the most likely solution.

It should be appreciated, however, that the accuracy of the derived electron distributions depends critically on the quality of the ionograms. It is doubtful, therefore, whether it is worth taking account of the effects of the E-valley if the E-valley cusp is poorly defined or if the ionograms can not be scaled to an accuracy of better than 0.1 MHz in frequency and 5 km in virtual height (those recorded on photographic paper, for example).

3. Data Input

The program uses data cards containing the following parameters:

CARD	PARAMETERS	FORMAT	COMMENTS
1	KZN, HTN, GN, GIN	I10.3F10.4	Remain in deck at all times; rarely changed
2	KZD, GD, GID, DELF	I10.3F10.4	
3	TITLE	20A4	Heading for printer output
4	TITLE	20A4	
5	N, IYR, MO, MD, ITI, IDY, NV, LVA	8I10	The remaining cards are supplied for each ionogram
6	HT, DIP, FHS, DLAT, DLONG, XDATA, RUN, VAL START	6F10.4, F4.1 2F8.4	
7...k	HP(I), N(I), I=1, N	8F10.4	O-trace data in pairs 4 pairs/card
k+1...k+3	HPXD (I), FXD (I), I = 1, 10	8F10.4	X-trace data in pairs. 4 pairs/card

3.1 Definition of the parameters

Night-time parameters:

- KZN — Number of trial starting frequencies - usually 8.
- HTN — Starting height - usually 150 km.
- GN — First trial starting frequency-usually 0.1 MHZ.

Day-time parameters	GIN	Increment by which starting frequency is increased-usually 0.1 MHz.
	KZD	Number of trial starting frequencies - usually 3.
	GD	First trial starting frequency-usually 0.16 MHz.
	GID	Increment by which starting frequency is increased-usually 0.1 MHz.
	DELP	Increment by which E-valley depth is increased below foE-usually 0.2 MHz.
	TITLE	Two cards are used for providing a heading to the computed results.
	N	Number of data points scaled from the O-trace.
	IYR	Year; for example, 1970 is given as 70.
	MO	Month.
	MD	Day.
	ITI	Local standard time(Hrs. Mins. Secs) eg 1720 30.
	IDY	Day of the year.
	NV	1 + number of data points scaled between f_{min} and foE inclusive.
	LVA	Number of trial valley depths, i.e., 1 + LVA profiles are computed for each starting frequency with depths of 0, DELP, 2 DELP.....LVA * DELP MHz.
	HT	Starting height. If less than 120 km. 'Daytime parameters' assumed for calculating trial N(h) profiles.
	DIP	Estimated magnetic dip at starting height: recalculated in program.
	FHS	Estimated gyrofrequency at starting height: recalculated in program.
	DLAT	Geographic latitude (north positive)

XG	Geographic longitude (east positive).
XDATA	XDATA = 0.0 if X-trace data are available. Otherwise, set XDATA = -1.0 and set all X-trace to zero on the data cards.
RUN	RUN = 1.0 for special run, in which case VAL and START must be assigned values. Otherwise, RUN, VAL, START = 0.0.
VAL	$\left[\frac{\text{Minimum electron concentration in the E-valley}}{\text{Electron concentration corresponding to foE}}\right]$
START	$\left[\frac{\text{Starting frequency}}{\text{foE}}\right]$
F(1), HP(1)	F(1) = 0.0 always. HP(1) = starting height (HT).
F(2), HP(2)	F(2) = f_{min} HP(2) = virtual height of f_{min}.
F(3), HP(3) ... F(N), HP(N)	O-trace frequencies and corresponding virtual heights scaled at any frequency interval. It is unnecessary to scale more than about 25 points.
FXI(1), HPXI(1) ... FXD(10), HPXD(10)	X-trace frequencies and corresponding virtual heights. Ten points should be scaled, five of which should be close to the E-layer cusp on the X-trace.

4. Printer output

Three pages of output are provided for each ionogram.

The first two show input data and details of the calculations.

The third is a summary of the results. This output includes:

O-trace input data
The magnetic dip and gyrofrequency at the starting height.
The electron concentration and gyrofrequency at, and the height of, the reflection point of the coded O-trace frequencies.
Extrapolated values of hmF2 and NmF2.
Extrapolated values of electron concentration at 10 km intervals between $h_{F(X)}$ and hmF2.
The computed X-trace.
A detailed comparison of the observed and computed X-traces.
Standard deviation and average difference between the observed and computed X-traces.
Interpolated electron concentration at fixed densities

Interpolated electron concentration at 10 km intervals above the E-valley.

ALOUETTE I TAPE FORMAT

	..ARACTERISTICS	Seven (7) track IBM 360 converted (TRTCH=C) tapes at 800 BPI density, variable logical records, variable physical records. The logical records contain up to a maximum of 440 bytes (characters), the physical records contain up to a maximum of 7294 bytes.
...	FORMAT: (Physical Record)	
	BDW	This word (4 bytes) is the Block Descr. Word and contains the number of bytes in the physical record including its own 4 bytes. BDW ≤ 7294.
...te	RDW	This word (4 bytes) is the Record Descriptor Word and contains the number of bytes in the logical record including its own 4 bytes. RDW ≤ 440.
Bytes 9-...	PROFNUM	Number of 4 byte data words beyond LON below. The value of this number is always 9 less the value in RDW. It indicates the number of 4-byte words beyond LON that fills up the logical record.
Bytes	12 FIRST_HT	Half-word (2 bytes) containing the height of the first data word beyond LON below.
Byte	14 DELTA-HT	Half-word (2 bytes) containing the height increment value between the data words beyond LON below.
Byt	...-16 IPAS	Half-word containing pass number
Byt	-18 LEN	The number of data words beyond LON that make up the interpolated profiles ... intervals of DELTA-HT.
Bytes 19-20	YEAR	Half-word containing the last two digits of YEAR (i.e., 63 for 1963)
	22 DAY	Half-word containing julian day of year (1-365).

Bytes 23-24	HOUR	Half-word containing hour of ionogram.
Bytes 25-26	MNT	Minute of ionogram
Bytes 27-28	SEC	Second of ionogram
By[illegible] 29-33	COMENTS CHARACTER	TX (topside extraordinary ray)
Bytes 34	CRTFRQPRES CHARACTER	Y denotes critical frequency scaled N denotes no critical frequency scaled.
Bytes 35-40	STATION CHARACTER	Station Name

All the rest of the record is in 360 4 byte full-word binary, floating point format.

B[illegible]-44	GFQ	Gryofrequency
B[illegible]-48	DIP	Magnetic dip angle
Bytes 49-52	LAT	North geographic latitude
Bytes [illegible]-56	LON	East geographic latitude
[illegible] 60		a list of data values described as follows
64_2		
.		
.		
.		
Bytes $n-3, -n_i$		

where i = PROFNUM and N $\leq$ 440

a. The first LEN of these are the interpolated real height profile with the height of the first specified by FIRST_HT and the rest of these are at heights of last he[illegible] DELTA_HT.

The rest of the PROFNUM items are pairs of words, the first of which the density, the second of which is the corresponding real heights for that density.

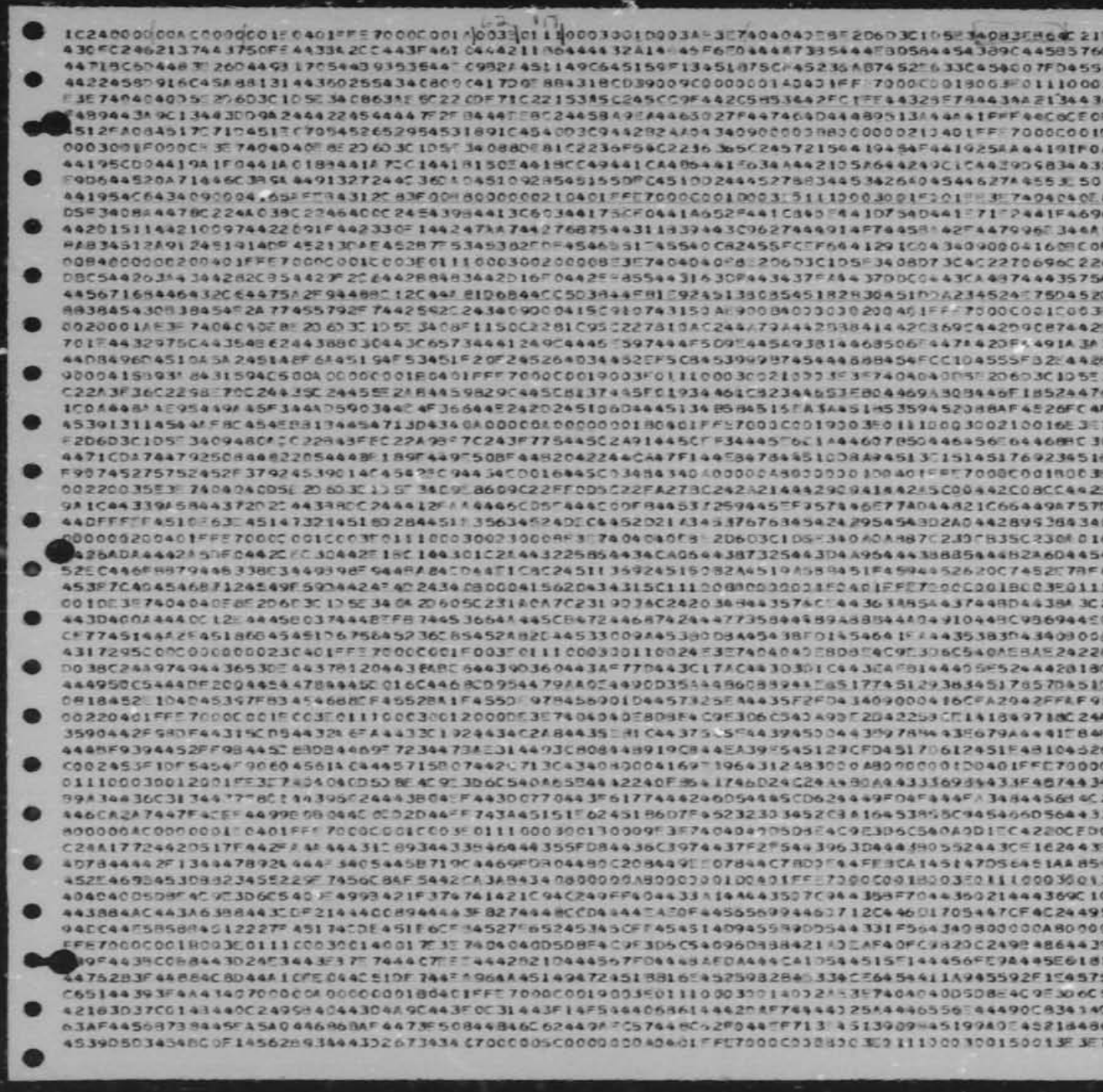
PROPRES = 'Y', the last value is not the density, but the critical (FoF2) and its corresponding extrapolated (by Chapman layer)

gth or occurence of the above data values (bytes 57-60) are variable and on the values of PROFNUM and LEN. If the value of PROFNUM is ns that the 30 4-byte full-words beginning from LON (east latitude) and ending with the end of a logical record. If the valu 26 that indicates that there are 26 words beginning from LON and contain satellite data as described in (a.). The value of PROFNUM minus LEN indicates the remainder of the data as described in (b.). Bytes 5 thru (56+n), where n=PROFNUM or the number of occurrences of the 4-byte data elements above, are considered as one logical record. The next logical record is a repetition of bytes 5 thru (56+n).

NITIONS

BYTE =	one character (in a tape hexidecimal dump one character or byte is represented as 2 hexidecimal values
=	4 bytes (IBM 360)
HALF-WORD =	2 bytes (IBM 360)
AL RECORD =	a logical unit of data ranging from one data el to a number of data elements that are meanin and are logically grouped.
YSICAL RECORD =	from 1 to n number of logical records recorded on a physical device such as a tape or disk. Records are always written or recorded in terms of a physical record.

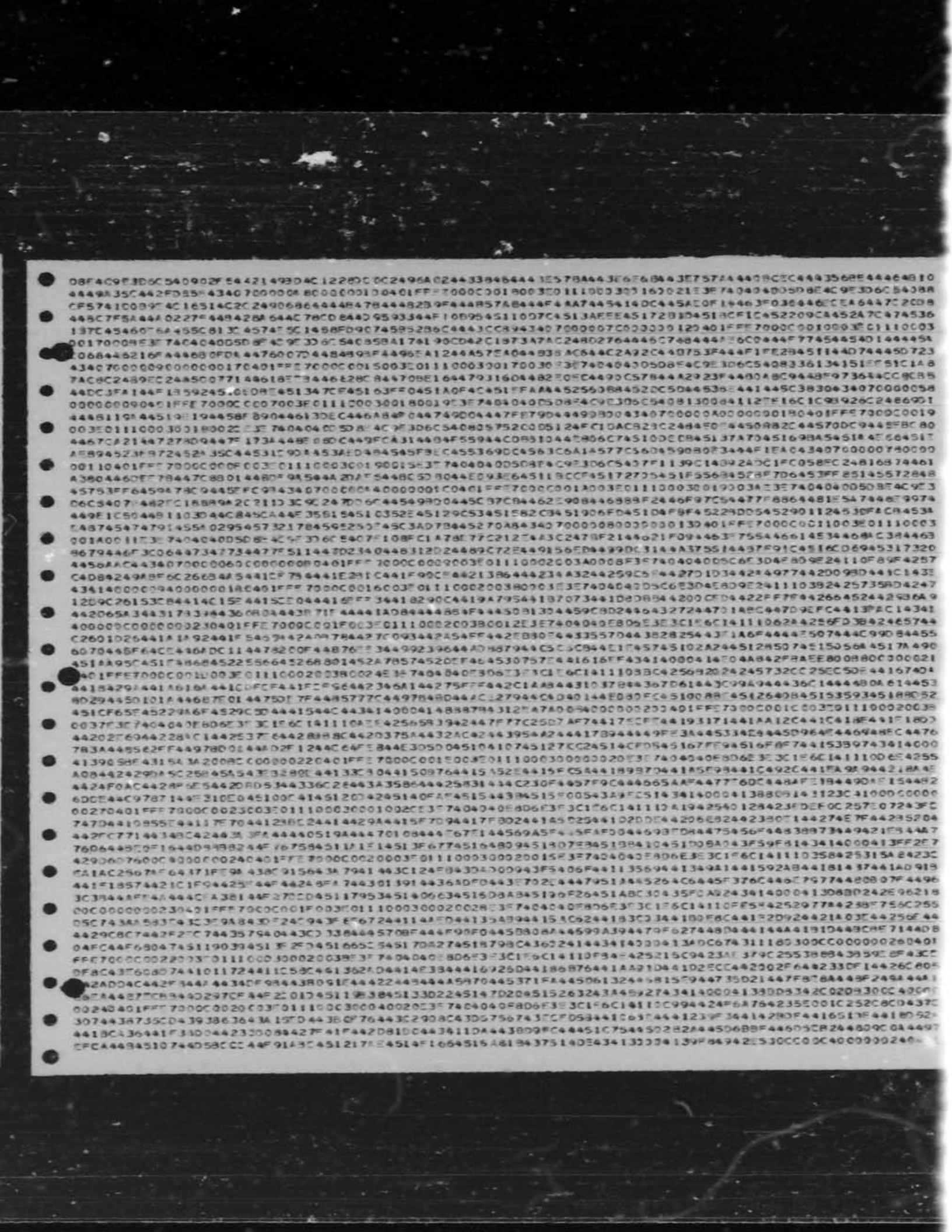
TAPE	FILE	DESCRIPTION	NO. OF PROFILES	START TIME YYDDD-HHMMSS	STOP TIME YYDDD-HHMMSS
Tape 1	1	One file, one tape	16,286	62273-032958	62347-175555
Tape 2	1	First of four files	8,050	62348-180240	63082-160106
	2	Second of four files	7,657	63083-050955	63188-025053
	3	Third of four files	6,121	63189-145315	64052-182614
	4	Fourth of four files	5,667	64061-185858	64123-115525
Tape 3	1	One file, one tape selected by ASM. PGM	1,031	62274-033247	64198-134209
Total	6		44,812		



62 117

REC 1. LENGTH 7204

4-28-62 - 7-11-62

D-04052

1st + last 5 rec of file 1