#391

Earth Sc

NIMBUS 4

IRIS RADIANCE TAPES

70-025A-03A

Table of Contents

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1. INTRODUCTION:

The documentation for this data set was originally on paper, kept in NSSDC's Data Set Catalogs (DSCs). The paper documentation in the Data Set Catalogs have been made into digital images, and then collected into a single PDF file for each Data Set Catalog. The inventory information in these DSCs is current as of July 1, 2004. This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system. The information existing in the DSCs is now not needed for locating the data files, but we did not remove that inventory information.

The offline tape datasets have now been migrated from the original magnetic tape to Archival Information Packages (AIP's).

A prior restoration may have been done on data sets, if a requestor of this data set has questions; they should send an inquiry to the request office to see if additional information exists.

2. ERRATA/CHANGE LOG:

NOTE: Changes are made in a text box, and will show up that way when displayed on screen with a PDF reader.

When printing, special settings may be required to make the text box appear on the printed output.

Version	Date	Person	Page	Description of Change
01				
02				

3 LINKS TO RELEVANT INFORMATION IN THE ONLINE NSSDC INFORMATION SYSTEM:

http://nssdc.gsfc.nasa.gov/nmc/

[NOTE: This link will take you to the main page of the NSSDC Master Catalog. There you will be able to perform searches to find additional information]

4. CATALOG MATERIALS:

a. Associated Documents To find associated documents you will need to know the document ID number and then click here. http://nssdcftp.gsfc.nasa.gov/miscellaneous/documents/

b. Core Catalog Materials

REQ. AGENT	RAND NO.	ACQ. AGENT
BCD GWM	RC7835	CMP

NIMBUS 4
IRIS RADIANCE TAPES
70-025A-03A ESAD-00022

This data set has been restored from 1600 to 6250 BPI. There are 214 input tapes stacked to 29 output tapes. These tapes are binary. The format, timespans, and original NSSDC D number are listed below.

DR#	DS#	ORIG. D#	ORBITS	FILE	TIME SPAN
DR00178	DS00178	D-29413	19-22	1	04/09/70
		D-29411	26-35	2	04/10/70
		D-29412	56-65	3	04/11/70 - 04/13/70
		D-29414	78-90	4	04/13/70 - 04/15/70
		D-29435	91-102	5	04/15/70 - 04/17/70
		D-29572	106-119	6	04/16/70 - 04/18/70
		D-29417	119-133	7	04/19/70 - 04/20/70
		D-29418	146-160	8	04/20/70 - 04/21/70
DR00179	DS00179	D-29423	159-173	1	04/20/70 - 04/21/70
		D-29422	173-186	2	04/20/70 - 04/22/70
		D-29444	186-196	3	04/21/70 - 04/22/70
		D-29438	200-213	4	04/23/70 - 04/24/70
		D-29571	226-237	5	04/25/70
		D-29443	267-280	6	04/27/70 - 04/29/70
		D-29440	280-290	7	04/29/70
		D-29442	294-304	8	04/30/70
DR00180	DS00180	D-29441	307-317	1	05/01/70
		D-29439	334-347	2	05/02/70 - 05/04/70
		D-29427	361-375	3	05/04/70 - 05/06/70
		D-29428	374-384	4	05/06/70
		D-29424	388-402	5	05/07/70 - 05/08/70
		D-29425	402-415	6	05/08/70
		D-29426	414-425	7	05/09/70
DR00181	DS00181	D-29434	428-441	1*	05/09/70 - 05/11/70
		D-29433	441-452	2	05/11/70
		D-29432	455-468	3**	05/11/70 - 05/13/70
		D-29431	468-478	4	05/13/70
		D-29430	482-488	5	05/14/70
		D-29429	495-509	6	05/15/70 - 05/16/70
		D-29374	508-519	7	05/16/70
DR00182	DS00182	D-29416	522-535	1	05/16/70 - 05/18/70
		D-29415	536-546	2	05/18/70
		D-29420	549-562	3	05/18/70 - 05/20/70
		D-29419	562-573	4	05/20/70 - 05/21/70
		D-29377	576-586	5	05/21/70
		D-29375	602-613	6	05/23/70
		D-29573	616-629	7	05/23/70 - 05/25/70

* D-29434 lost record 65 during restoration.

** D-29432 lost records 10, 11, 78, 1292, and 1477 during restoration.

DR00183	DS00183	D-29376	629-640	1*	05/25/70
		D-29378	645-653	2	05/25/70 - 05/26/70
		D-29466	656-670	3	05/27/70 - 05/28/70
		D-29467	670-680	4	05/28/70
		D-29468	684-697	5	05/29/70 - 05/30/70
		D-29473	696-707	6	05/30/70
		D-29469	710-720	7	05/30/70 - 05/31/70
DR00184	DS00184	D-29471	723-737	1	06/01/70
		D-29470	750-764	2	06/03/70 - 06/04/70
		D-29472	764-774	3	06/04/70
		D-29474	780-787	4	06/05/70
		D-29372	794-801	5	06/06/70
		D-29373	806-815	6	06/07/70 - 06/08/70
		D-29368	820-828	7	06/08/70
		D-29369	831-844	8	06/09/70 - 06/10/70
DR00185	DS00185	D-29370	847-858	1	06/10/70 - 06/11/70
		D-29371	859-868	2	06/11/70
		D-29574	871-885	3	06/11/70 - 06/13/70
		D-29365	884-895	4	06/13/70
		D-29367	898-912	5	06/13/70 - 06/15/70
		D-29366	911-922	6	06/15/70
		D-29488	925-939	7	06/15/70 - 06/17/70
		D-29489	951-962	8	06/17/70 - 06/18/70
DR00186	DS00186	D-29516	992-1005	1	06/20/70 - 06/22/70
		D-29493	1005-1016	2	06/22/70
		D-29492	1019-1032	3	06/22/70 - 06/24/70
		D-29479	1032-1046	4	06/24/70 - 06/25/70
		D-29477	1059-1073	5	06/25/70 - 06/27/70
		D-29491	1072-1083	6	06/27/70
		D-29490	1099-1110	7	06/29/70
DR00187	DS00187	D-29449	1113-1124	1	06/29/70 - 07/01/70
		D-29465	1126-1137	2	07/01/70 - 07/02/70
		D-29460	1153-1164	3	07/03/70 - 07/04/70
		D-29485	1166-1177	4	07/04/70
		D-29486	1180-1193	5	07/04/70 - 07/06/70
		D-29487	1194-1207	6	07/06/70 - 07/07/70
		D-29482	1207-1221	7	07/06/70 - 07/08/70
DR00188	DS00188	D-29478	1220-1231	1	07/08/70
		D-29480	1247-1263	2	07/10/70 - 07/11/70
		D-29481	1260-1271	3	07/11/70
		D-29476	1273-1283	4	07/11/70 - 07/12/70
		D-29494	1287-1301	5	07/13/70
		D-29404	1301-1314	6	07/13/70 - 07/15/70
		D-29448	1329-1338	7	07/16/70
DR00189	DS00189	D-29464	1340-1352	1	07/16/70 - 07/18/70
		D-29462	1407-1418	2	07/21/70 - 07/23/70
		D-29461	1434-1446	3	07/23/70 - 07/25/70
		D-29463	1448-1459	4	07/25/70
		D-29453	1462-1476	5	07/25/70 - 07/27/70
		D-29452	1476-1486	6	07/27/70 - 07/28/70
		D-29454	1529-1543	7	07/31/70 - 08/01/70

* D-29376 lost record 32 during restoration.

DR00190	DS00190	D-29455	1543-1556	1	08/01/70 - 08/02/70
		D-29456	1557-1567	2	08/01/70 - 08/03/70
		D-29457	1569-1580	3	08/03/70 - 08/04/70
		D-29579	1610-1623	4	08/06/70 - 08/07/70
		D-29589	1636-1650	5	08/08/70 - 08/09/70
		D-29591	1650-1664	6*	08/08/70 - 08/10/70
		D-29583	1663-1677	7	08/10/70 - 08/11/70
		D-29585	1677-1687	8	08/11/70
DR00191	DS00191	D-29587	1690-1709	1	08/12/70 - 08/13/70
		D-29588	1704-1714	2	08/13/70
		D-29586	1716-1728	3	08/13/70 - 08/15/70
		D-29580	1730-1741	4	08/15/70
		D-29581	1761-1771	5	08/17/70 - 08/18/70
		D-29389	1784-1798	6	08/18/70 - 08/20/70
		D-29570	1812-1821	7	08/21/70
		D-29405	1838-1849	8	08/22/70 - 08/24/70
		D-29407	1932-1942	9	08/29/70 - 08/30/70
DR00192	DS00192	D-29565	1959-1972	1	09/01/70 - 09/02/70
		D-29458	1999-2010	2	09/04/70 - 09/05/70
		D-29408	2012-2024	3	09/05/70 - 09/06/70
		D-29459	2026-2037	4	09/05/70 - 09/07/70
		D-29388	2039-2050	5	09/07/70 - 09/08/70
		D-29385	2053-2066	6	09/08/70 - 09/09/70
		D-29386	2066-2080	7	09/08/70 - 09/10/70
		D-29383	2106-2117	8**	09/12/70
		D-29381	2120-2134	9	09/13/70 - 09/14/70
DR00193	DS00193	D-29382	2133-2143	1	09/14/70
		D-29475	2144-2160	2	09/14/70 - 09/16/70
		D-29394	2160-2174	3	09/16/70 - 09/17/70
		D-29393	2174-2184	4	09/17/70
		D-29582	2214-2228	5	09/20/70 - 09/21/70
		D-29396	2281-2295	6	09/25/70 - 09/26/70
		D-29391	2294-2305	7	09/26/70
		D-29379	2321-2331	8	09/28/70
		D-29390	2334-2348	9	09/28/70 - 09/30/70
DR00194	DS00194	D-29392	2348-2359	1	09/30/70 - 10/01/70
		D-29450	2374-2385	2	10/02/70
		D-29402	2390-2398	3	10/03/70
		D-29401	2404-2412	4	10/04/70
		D-29400	2418-2425	5	10/05/70
		D-29568	2429-2440	6	10/06/70
		D-29399	2441-2453	7	10/06/70 - 10/08/70
DR00195	DS00195	D-29451	2456-2469	1	10/08/70 - 10/09/70
		D-29437	2535-2547	2	10/13/70 - 10/14/70
		D-29403	2549-2560	3	10/15/70
		D-29436	2564-2574	4	10/15/70 - 10/17/70
		D-29584	2589-2600	5	10/17/70 - 10/18/70
		D-29398	2616-2627	6	10/19/70 - 10/20/70
		D-29397	2630-2640	7	10/21/70

* D-29591 lost record 3774 during restoration.
** D-29383 lost record 3452 during restoration.

DR00196	DS00196	D-29500	2657-2671	1	10/22/70 - 10/24/70
		D-29410	2670-2681	2	10/24/70
		D-29496	2684-2695	3	10/24/70 - 10/26/70
		D-29498	2697-2707	4	10/26/70
		D-29499	2724-2738	5	10/27/70 - 10/29/70
		D-29497	2737-2748	6	10/29/70
DR00197	DS00197	D-29501	2790-2801	1	11/01/70 - 11/02/70
		D-29556	2804-2815	2	11/03/70
		D-29555	2817-2828	3	11/04/70
		D-29541	2862-2869	4	11/07/70
		D-29540	2872-2882	5	11/08/70
		D-29578	2886-2895	6	11/08/70 - 11/09/70
		D-29577	2911-2922	7	11/11/70
DR00198	DS00198	D-29539	2925-2936	1	11/11/70 - 11/12/70
		D-29530	2936-2949	2	11/13/70
		D-29529	2951-2963	3	11/13/70 - 11/14/70
		D-29528	2979-2989	4	11/15/70 - 11/16/70
		D-29526	2992-3003	5	11/17/70
		D-29527	3006-3016	6	11/18/70
		D-29517	3019-3030	7	11/18/70 - 11/19/70
		D-29518	3033-3043	8	11/20/70
DR00199	DS00199	D-29519	3045-3057	1	11/20/70 - 11/21/70
		D-29520	3060-3070	2	11/22/70
		D-29521	3073-3083	3	11/22/70 - 11/23/70
		D-29522	3087-3097	4	11/24/70
		D-29532	3126-3137	5	11/27/70
		D-29533	3141-3150	6	11/27/70 - 11/28/70
		D-29534	3153-3164	7	11/29/70
		D-29535	3166-3177	8	11/29/70 - 11/30/70
DR00200	DS00200	D-29525	3181-3191	1	12/01/70
		D-29553	3193-3202	2	12/02/70
		D-29554	3206-3218	3	12/02/70 - 12/03/70
		D-29557	3247-3258	4	12/06/70
		D-29558	3260-3271	5*	12/06/70 - 12/07/70
		D-29559	3287-3298	6	12/09/70
		D-29560	3329-3338	7	12/11/70 - 12/12/70
		D-29562	3342-3352	8	12/13/70
DR00201	DS00201	D-29563	3358-3365	1	12/14/70
		D-29564	3384-3392	2	12/16/70
		D-29561	3397-3406	3	12/17/70
		D-29524	3410-3419	4	12/18/70
		D-29536	3436-3446	5**	12/20/70
		D-29513	3450-3459	6	12/21/70
		D-29537	3464-3473	7	12/22/70
		D-29538	3476-3486	8	12/22/70 - 12/23/70
DR00202	DS00202	D-29502	3491-3500	1	12/24/70
		D-29505	3504-3514	2	12/25/70 - 12/26/70
		D-29504	3532-3540	3	12/27/70
		D-29503	3543-3553	4	12/27/70 - 12/28/70
		D-29506	3558-3567	5	12/29/70
		D-29507	3572-3584	6	12/30/70 - 12/31/70
		D-29508	3585-3594	7	12/31/70

* D-29558 lost records 71,77,79,305,391,590,591,592,595.
** D-29536 lost record 2974 during restoration.

DR00203	DS00203	D-29523	3612-3621	1	01/02/71
		D-29547	3626-3637	2	01/03/71 - 01/04/71
		D-29550	3638-3647	3	01/04/71
		D-29549	3648-3661	4	01/04/71 - 01/05/71
		D-29551	3665-3674	5	01/06/71
		D-29552	3707-3715	6*	01/09/71
		D-29548	3812-3822	7	01/17/71
DR00204	DS00204	D-29545	3824-3835	1	01/17/71 - 01/18/71
		D-29512	3852-3862	2	01/20/71
		D-29544	3864-3875	3	01/21/71
		D-29543	3878-3889	4	01/22/71
		D-29509	3905-3917	5	01/24/71 - 01/25/71
		D-29542	3919-3929	6	01/25/71
		D-29514	3932-3943	7	01/26/71
DR00205	DS00205	D-29515	3959-3970	1	01/28/71
		D-29510	3973-3983	2	01/29/71
		D-29511	3985-3997	3	01/30/71
DR02155	DS02155	D-29406	1865-1876	1	08/24/70 - 08/25/70
		D-29409	1851-1865	2	08/24/70 - 08/25/70
		D-29576	3234-3244	3	08/26/70 - 08/27/70 ←
		D-29445	1945-1959	4	08/31/70 - 09/01/70
		D-29446	1972-1986	5	09/01/70 - 09/03/70
		D-29380	2308-2322	6	09/26/70 - 09/28/70
		D-29495	2777-2788	7	11/01/70 - 11/01/70
		D-29531	3114-3124	8	11/25/70 - 11/26/70

* D-29552 lost record 20 during restoration.

NOTE: NSSDC Original Tape D-29447 was lost during restoration.

SECTION 4

THE INFRARED INTERFEROMETER SPECTROMETER (IRIS) EXPERIMENT

By
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Goddard Space Flight Center

The purpose of this section is to describe the nature and format of the IRIS "D" data so researchers in the field may be prepared to interpret and use the data as soon as they become available through the National Space Science Data Center.

The IRIS instrument is, in many respects, similar to the instrument which was flown on Nimbus III. The prime differences are in construction details of the instrument which permitted an increase in spectral resolution from 5 to 2.8 wave numbers, improvements in the signal to noise ratio, and an extension of the spectral range towards longer wave length. While the first two improvement factors have been implemented, the extension of the spectral range to 50 microns is, at the present time, questionable. The prime instrument presently on the spacecraft has a potassium bromide beamsplitter which restricts the long wave length response of the instrument to 25 microns as in the case of Nimbus III.

4.1 Scientific Objectives

The IRIS experiment is to provide information on the vertical structure of the atmosphere and the emissive properties of the surface. In the spectral region covered, water vapor, carbon dioxide, and ozone bands are available in addition to spectral features associated with minor constituents as methane and nitrous oxide. The specific intensity measured in the absorption bands and in the more transparent "windows" may be used to derive vertical profiles of temperature, water vapor and ozone, in addition to other parameters of meteorological interest.

The techniques used to recover the temperature, water vapor and ozone profiles are described, for example, by Wark and Fleming, 1966, and Conrath, 1969 (References 1, 2). Results from a similar instrument flown on Nimbus III

are discussed by Hanel and Conrath, Prabhakara et al, Conrath et al (References 3, 4, 5). The Nimbus III interferometer description can be found in a paper by Hanel et al (Reference 6). Typical results are shown in Figure 4-1.

For convenience, the objectives of IRIS may be divided into the following categories:

1. Derivation of atmospheric temperature and humidity structure on a global scale to be used in numerical studies of the general circulation

2. Observation of temperature, water vapor, and ozone fields for synoptic meteorological studies

3. Collection of spectra for research studies in meteorology, in radiative transfer, and for nonmeteorological purposes

4.2 The IRIS Instrument

The instrument is a Michelson interferometer constructed by Texas Instruments Inc. The optical module is shown in Figure 4-2. Table 4-1 summarizes the more important parameters and Figure 4-3 shows a simplified diagram of the instrument.

The essential part of the interferometer is the beam splitter which divides the incoming radiation into two approximately equal components. After reflection on the fixed and moving mirrors, respectively, the two beams interfere with each other with a phase difference proportional to the optical path difference between both beams. The recombined components are then focused onto the bolometer detector where the intensity is recorded as a function of path difference, δ. Since the mirror motion is phase locked to the spacecraft clock, the mirror path difference is also proportional to time. For quasi-monochromatic radiation, a circular fringe pattern appears at the focal plane of the condensing mirror. The detector size is chosen to cover just the smallest central fringe for the highest wave number of interest. The aperture at the detector and the interferometer mirrors constitute the limiting apertures and determine the 5° field of view of the instrument.

The central fringe may be light or dark depending on the path difference δ between the two beams. For polychromatic radiation and neglecting constant terms the signal at the detector, called the interferogram, is

$$i(\delta) = \int_0^\infty K_\nu (B_\nu - B_\nu(T_{instr})) \cos(2\pi\nu\delta - \phi_\nu)\, d\nu \qquad (1)$$

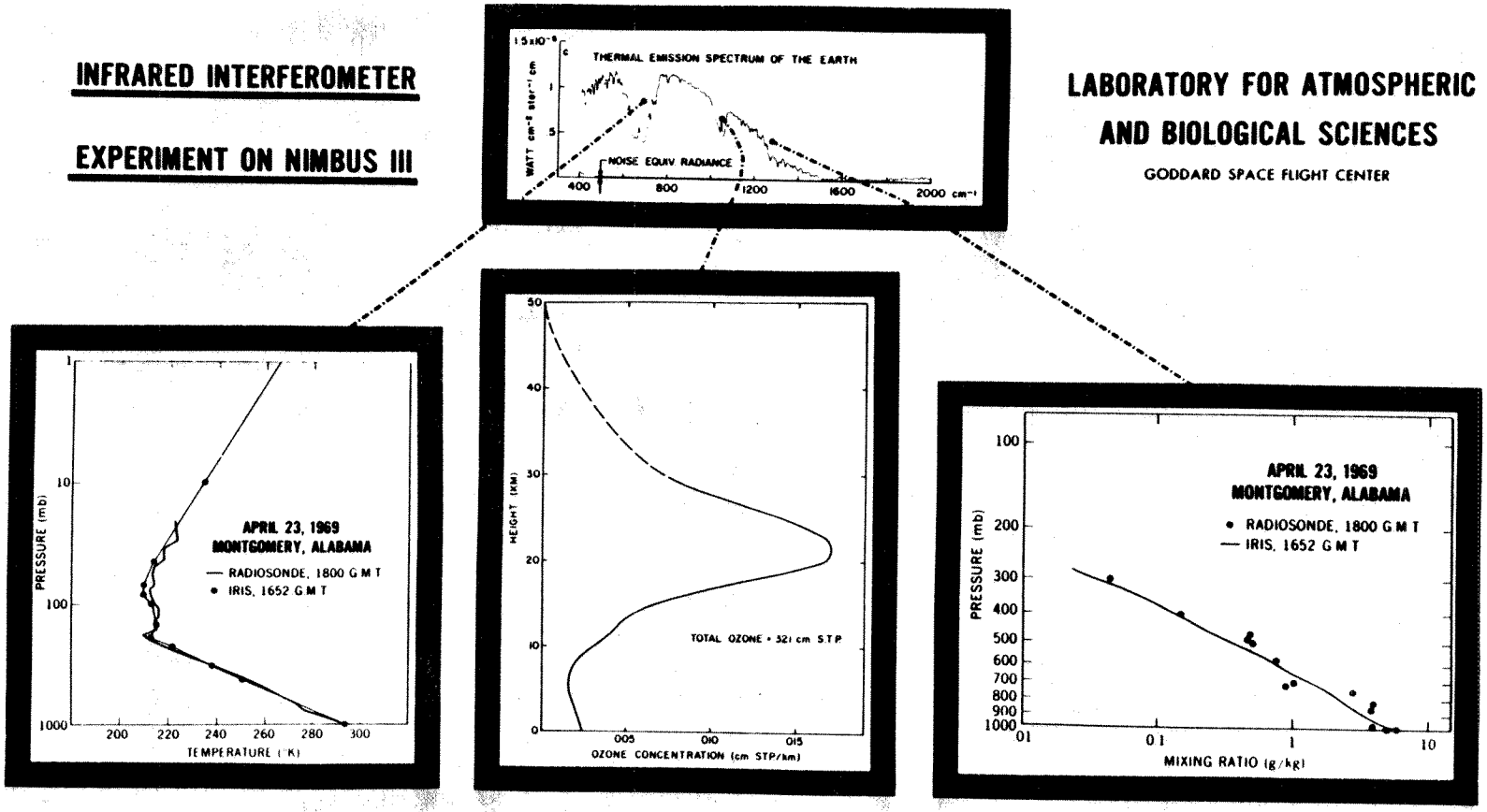


Figure 4-1. Typical Results of the Infrared Interferometer Experiment on Nimbus III

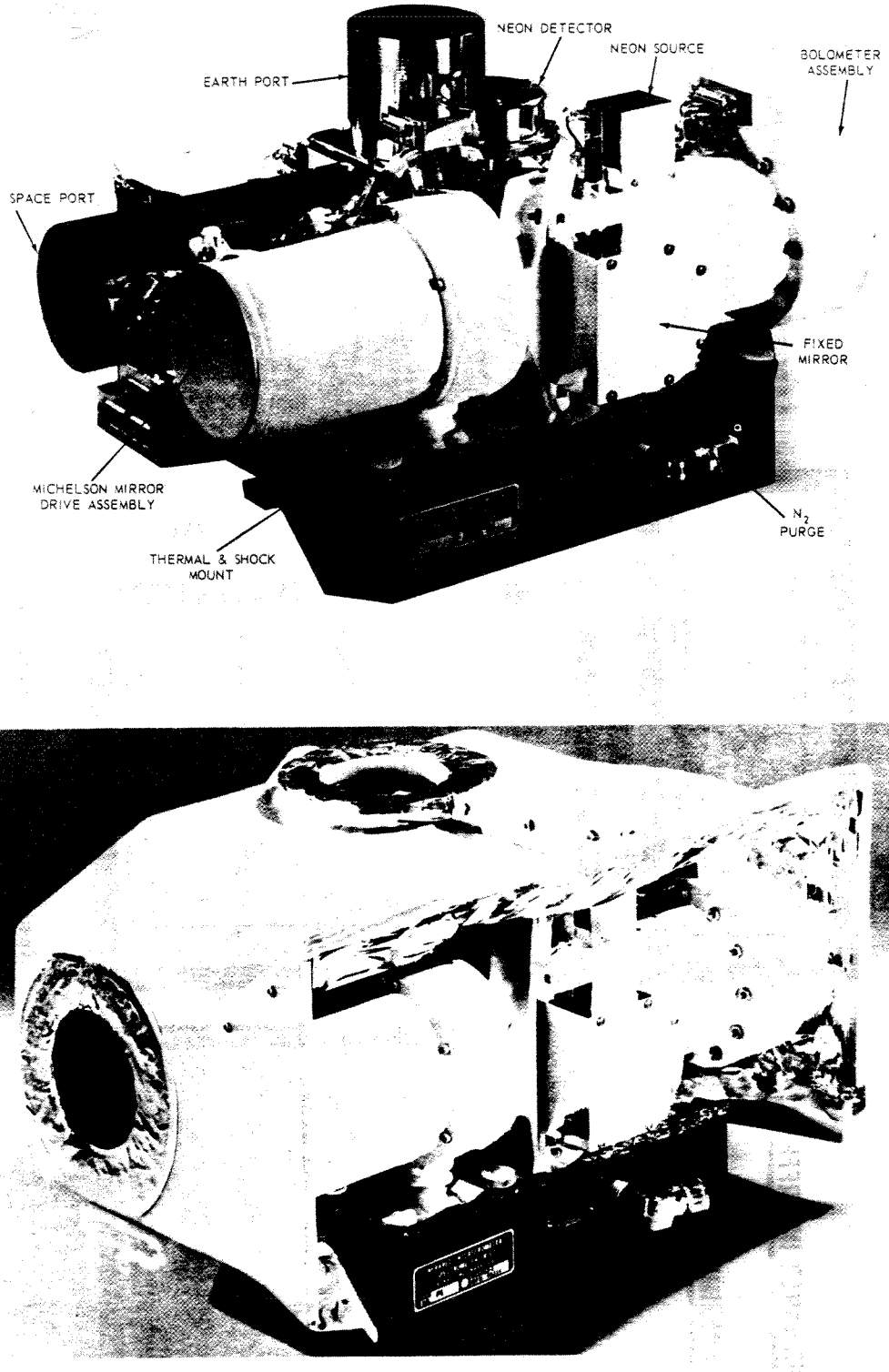


Figure 4-2. Optical Module of the IRIS Instrument with and without Thermal Shroud

Table 4-1
Summary of the More Important Parameters of the IRIS "D" KBr Version

Nominal Spectral Range	400 to 2000 cm^{-1} (5 - 25μ)
Spectral Resolution Element (apodized)	2.8 cm^{-1}
Spectral Resolution (unapodized)	1.4 cm^{-1}
Field of view	Circular, 2.5° half angle
Diameter of view area from 1100 km altitude	Approx. 94 km
Motion of moving mirror	0.36 cm
Velocity of moving mirror	0.0275 cm/sec
Duration of interferogram	13.107 sec
Wavelength of fringe control	0.5852μ
Data Words per interferogram	4096
Word Rate	312.5 Words/sec
Bits per Word	12 (2 Sync, 1 Gain, 9 Data)
Bit rate	3.75 k bits/sec
IMCC rotation rate	0.4 deg/sec
Operating temperature of	
Optical Module	250±2.5°K
Electronic Module	298±25°K
Weight	
Optical Module	32.1 lbs
Electronic Modules (2)	9.8 lbs. (4/0), 6.8 lbs (2/0)
Total	48.7 lbs
Dimensions	
Optical Module	11.0 × 17.3 × 15.3 inches
Electronic Modules (2)	8 × 6 × 6.5 and 4 × 6 × 6.5 inches
Power consumption	28 Watts average, 32 Watts peak

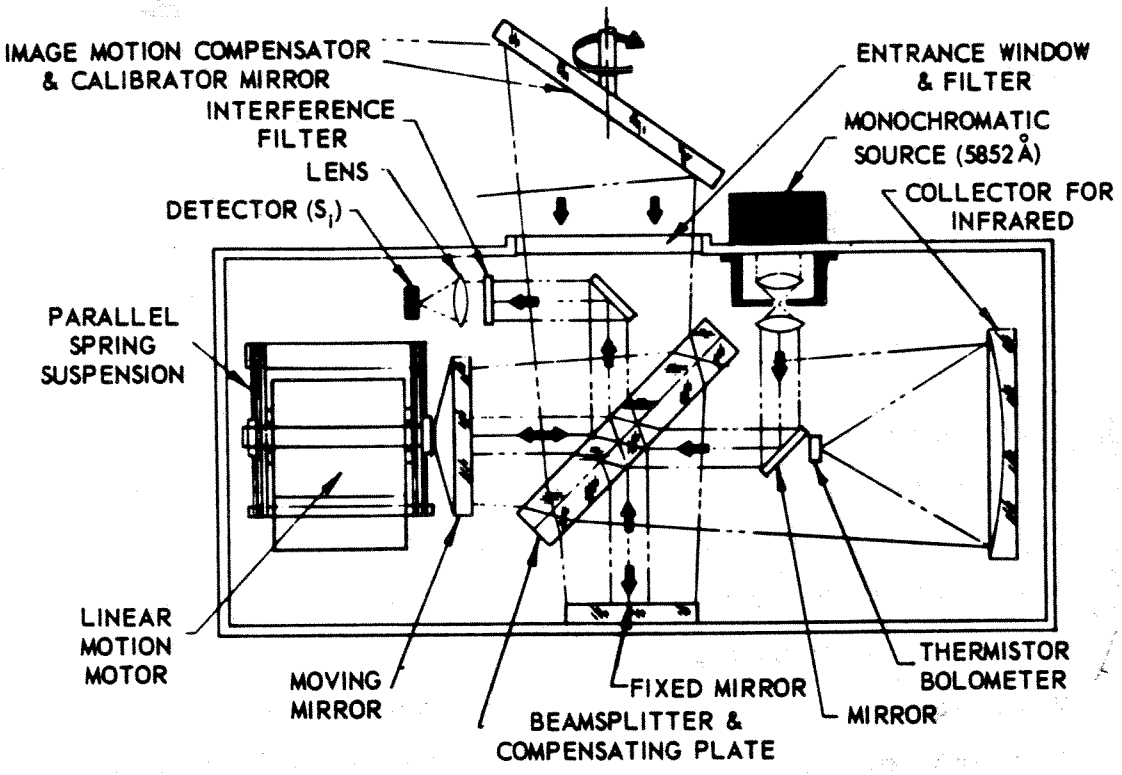


Figure 4-3. Schematic Diagram of Michelson Interferometer. The Monochromatic Source is a Neon Discharge Tube

The amplitude is proportional to a responsivity factor $K(\nu)$ and the difference in radiance between the scene within the field of view B_ν and the instrument $B_\nu(T_{instr})$. The phase is defined with respect to a point chosen as close as possible to, but not necessarily at, the zero path difference point. Imperfect optical compensation and residual phase shift in the analog part of the data channel cause the angle ϕ to depend on the wave number. Reconstruction of the spectrum by a ground based computer will be discussed later. A detailed block diagram of the instrument is shown in Figure 4-4.

The beamsplitter, made of potassium bromide (KBr) and supplied by Perkin-Elmer, is polished optically flat to a fraction of a visible fringe. It has a multi-layer dielectric coating which is optimized to the 5-25μ region except for a small area in the center where it is coated to perform well in the visible. In this center region the fringe control interferometer operates. It utilizes not only the same beam-splitter but also the prime infrared interferometer mirrors. The fringe control interferometer generates a sine wave of 937.5 Hz at the silicon diode detector from a nearly monochromatic spectral line (0.5852μ) of a

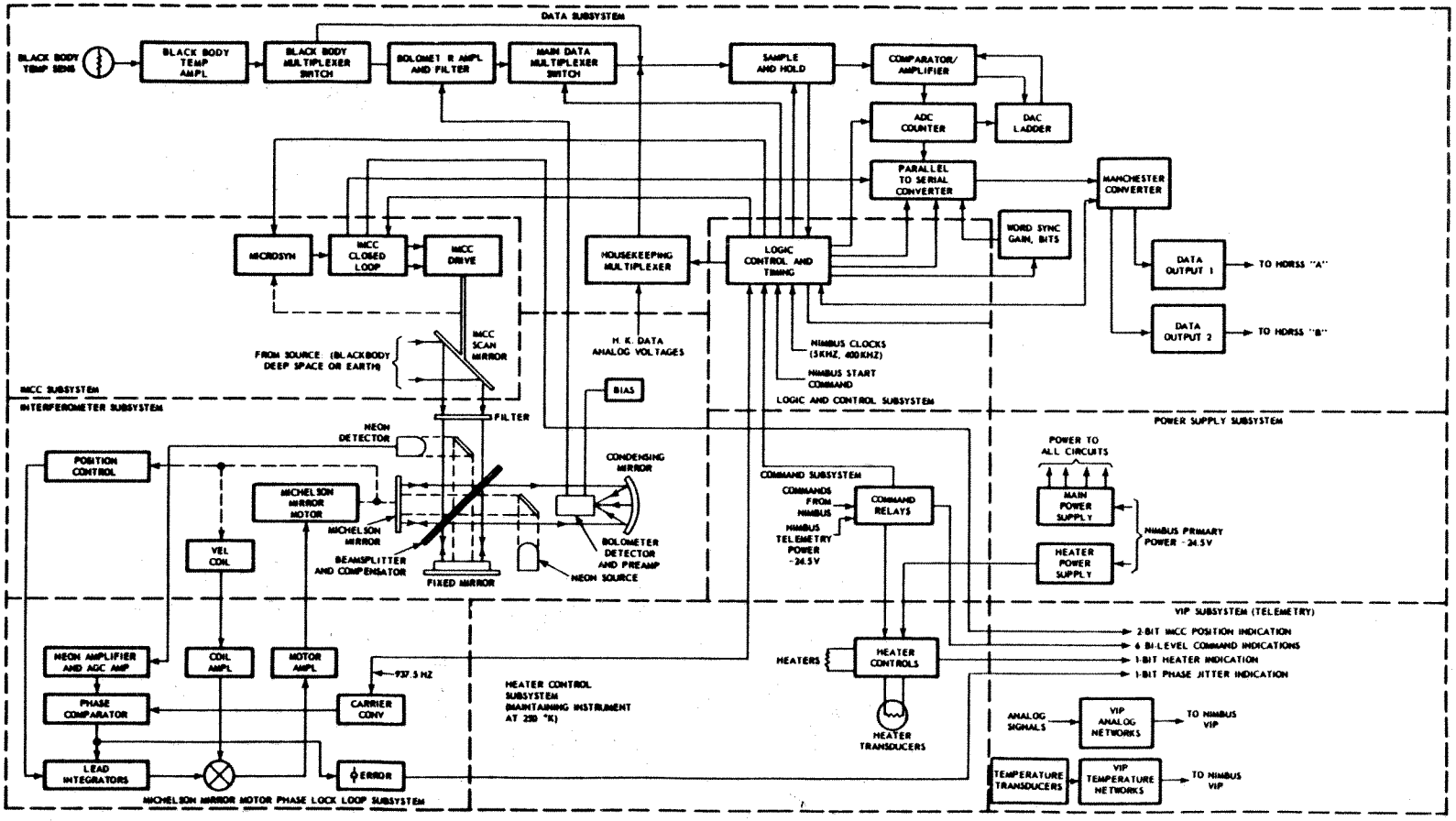


Figure 4-4. Simplified Block Diagram of the IRIS System

neon discharge lamp. The line is isolated by an interference filter. The 937.5 Hz signal serves two purposes. First, after being divided by three, it serves as a sample command and assures equal distance sampling. Secondly, it is compared in phase to a spacecraft clock derived frequency to provide the error signal for the phase locked loop.

The Michelson mirror assembly has an electromagnetic drive coil and also a pick-up coil to generate a voltage proportional to mirror velocity. The velocity signal is also used in a feedback arrangement to provide electrical damping and to make the system less sensitive to external vibration. The phase locked condition of the Michelson mirror provides a constant mirror velocity and permits a constant data rate; moreover the data stream is synchronized with the spacecraft clock.

The Image Motion Compensation and Calibration system channels radiation from several sources to the interferometer. After 14 interferograms are taken in the operating mode, one is taken from a built-in blackbody kept at spacecraft temperature followed by an interferogram from outer space which is considered a nearly zero degree sink. The interferograms from the hot blackbody and cold interstellar background serve calibration purposes. The inflight calibration will be discussed later. During the normal mode where the earth is in the field of view, the IMCC mirror rotates slowly at a rate of 0.4 degree/sec to assure image motion compensation. The calibration mode is prohibited near the north polar region where danger of viewing the sun exists.

Typical interferograms recorded by the Nimbus III IRIS are shown in Figure 4-5. The large central peak is reduced in a signal conditioner. The transfer function of the signal conditioner is shown in Figure 4-6. The inverse function must be applied in the computer. The purpose of the signal conditioner is to preserve dynamic range to 9 bits in the analog to digital converter without a great sacrifice in accuracy. A tenth bit, the gain bit, indicates that the signal exceeded ±1.25 volts input to the range standardization transfer curve.

The instrument generates main data and housekeeping data. Some of the housekeeping data are multiplexed with the main data and are then transmitted just before and just after an interferogram. This set of housekeeping data is required in the computer for the data reduction process. Another set of housekeeping data is transmitted via the Nimbus VIP subsystem. It is needed for engineering evaluation. Table 4-2 lists the housekeeping information recorded together with the interferogram and Table 4-3, the housekeeping channel available for performance evaluations.

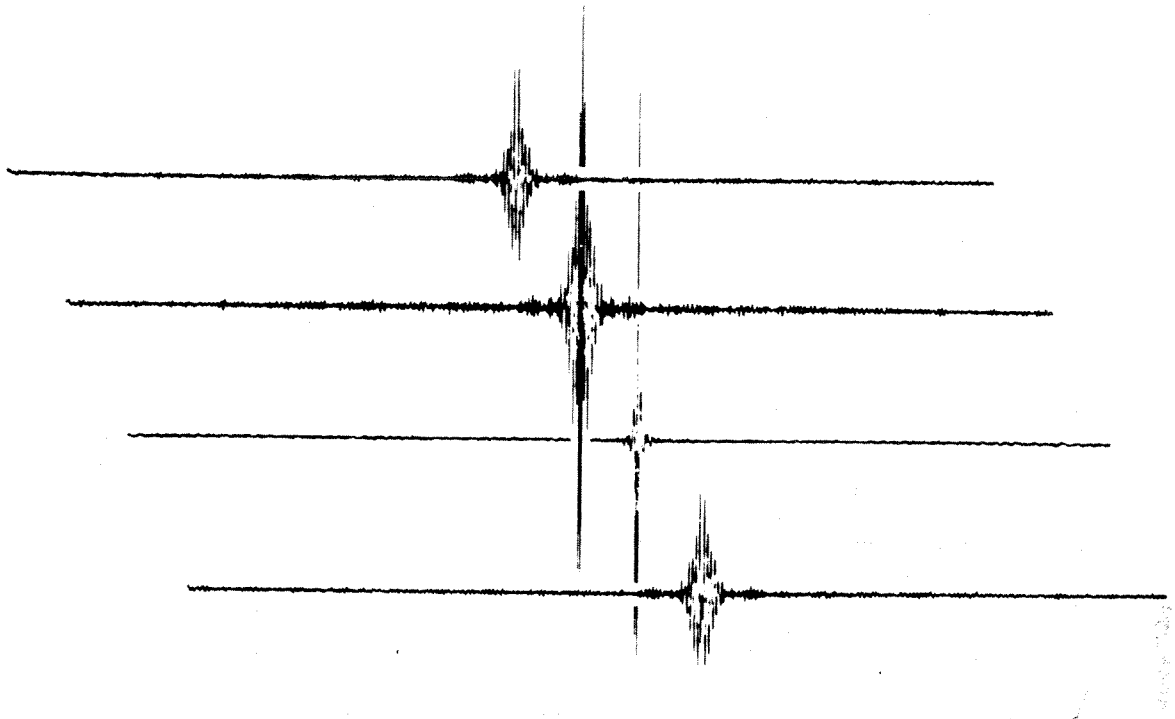


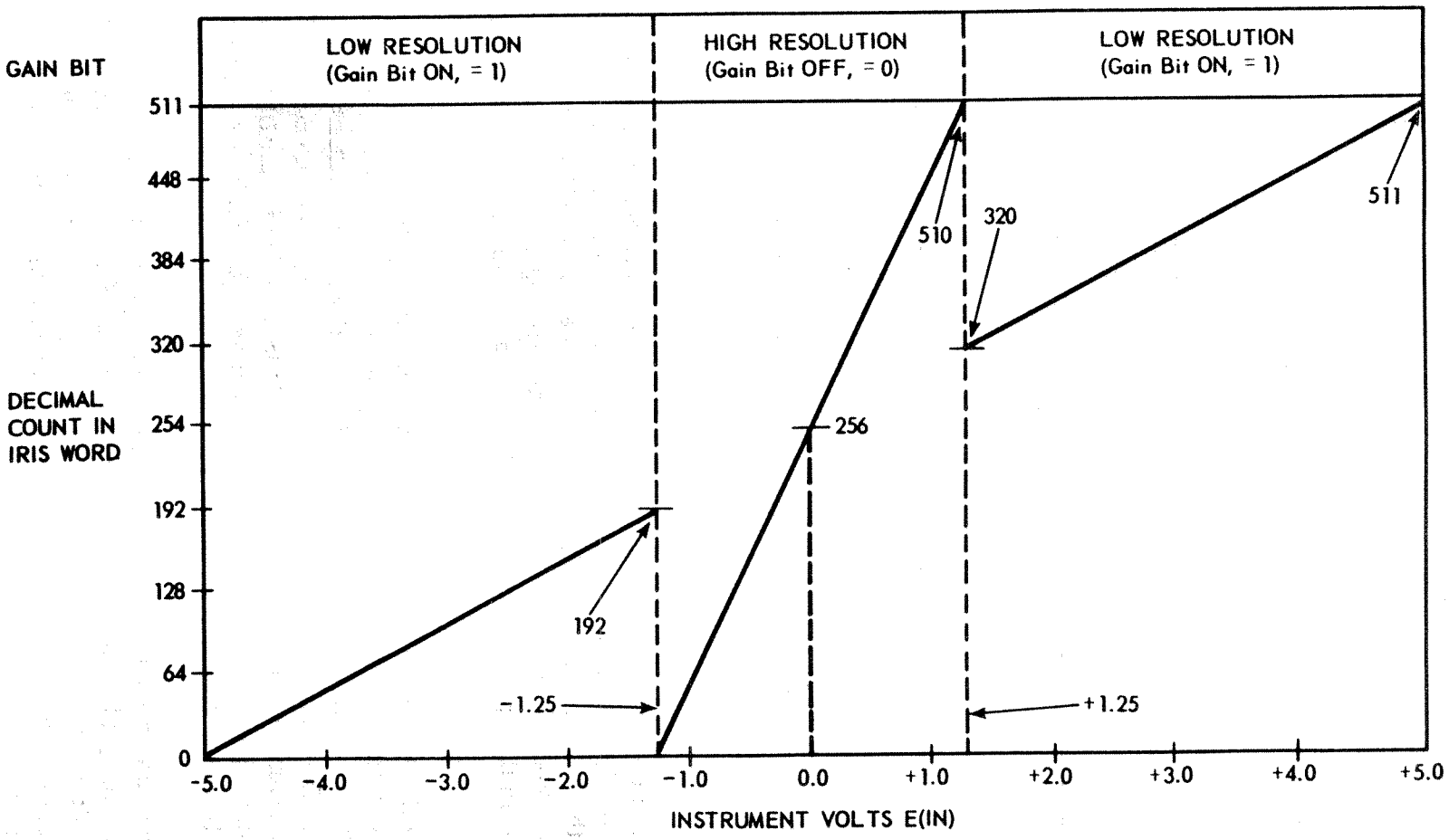
Figure 4-5. Typical Interferograms Recorded by the Nimbus III IRIS

4.3 Data Flow

The main bit stream of data is recorded at one of the HDRSS recorders in the spacecraft. Real time transmission capability exists also via the VIP subsystem and the beacon transmitter. Another channel of the HDRSS recorder carries a time code signal. The data format and timing is shown in Figure 4-7. The data flow in the spacecraft is shown in Figure 4-8 and on the ground in Figure 4-9.

At STADAN Data Acquisition Facility, the receiver output is demultiplexed and recorded on tape. The IRIS data are transmitted from ALASKA by a land-line data link to the Nimbus Data Handling System (NDHS) at GSFC. In some cases, a small fraction is transmitted from ROSMAN via the microwave links when transmission time is available. At the NDHS a Telemetric 670 computer formats the data, performs several checks, such as parity checks etc., and produces an IBM 360 compatible digital tape.

The NDHF also displays the housekeeping data for engineering purposes and provides weekly plots of the on-off time of the IRIS experiment and tables of height and position of the spacecraft as well as a table of the ascending and descending nodes. The IBM compatible digital tape is then carried to the LABS IBM-360 computer where the actual data reduction takes place.



$$E(IN) = \frac{1}{4^A}\left[\frac{N}{512}(10.000) - 5.000\right]$$

where N = base 10 equivalent of 9 binary data bits
A = 0 for low resolution
A = 1 for high resolution

Figure 4-6. Range Standardization Transfer Curve and Conversion Equation

Table 4-2
IRIS Telemetry (HDRSS)

Channel No.	Channel No.
0. Sync Word	8. 0.0 Volt Calibration
1. Blackbody temp. (fine)	9. Transducer Calibration
2. Bolometer temp.	10. Blackbody temp. (coarse)
3. Beamsplitter temp.	11. -0.6 Volt Calibration
4. MMDA Housing temp.	12. Spare
5. +0.6 Volt Calibration	13. Spare
6. IMCC Drive temp.	14. IMCC Position & Phase Lock Condition
7. Radiating Surface temp.	15. Sync Word

Table 4-3
IRIS Telemetry (PCM Subsystem)

Analog	B1-Level
1. Reference Interferometer amplitude	1. IMCC Stowage (Blackbody Position Command Relay Monitor)
2. IMCC Earth Scan Indicator	2. Heater Power Command Relay Monitor (on or off)
3. Bolometer Temperature	3. IRIS Power Command Relay Monitor (on or off)
4. Blackbody Temperature	4. Calibration Mode Command Relay Monitor (Manual or Auto)
5. Radiating Surface Temperature	5. Calibration Command Relay Monitor (Inhibit or Enable)
6. Electronics Module Temperature (4/0)	6. Calibration Switch (Auto) Relay Monitor (Inhibit or Enable)
7. Electronics Module Temperature (2/0)	7. IMCC Mirror Position (2 Adjacent Channels coded for Position)
8. 0.6 Volt Zener Reference	8. Heater Output (on or off)
	9. Phase Lock Condition

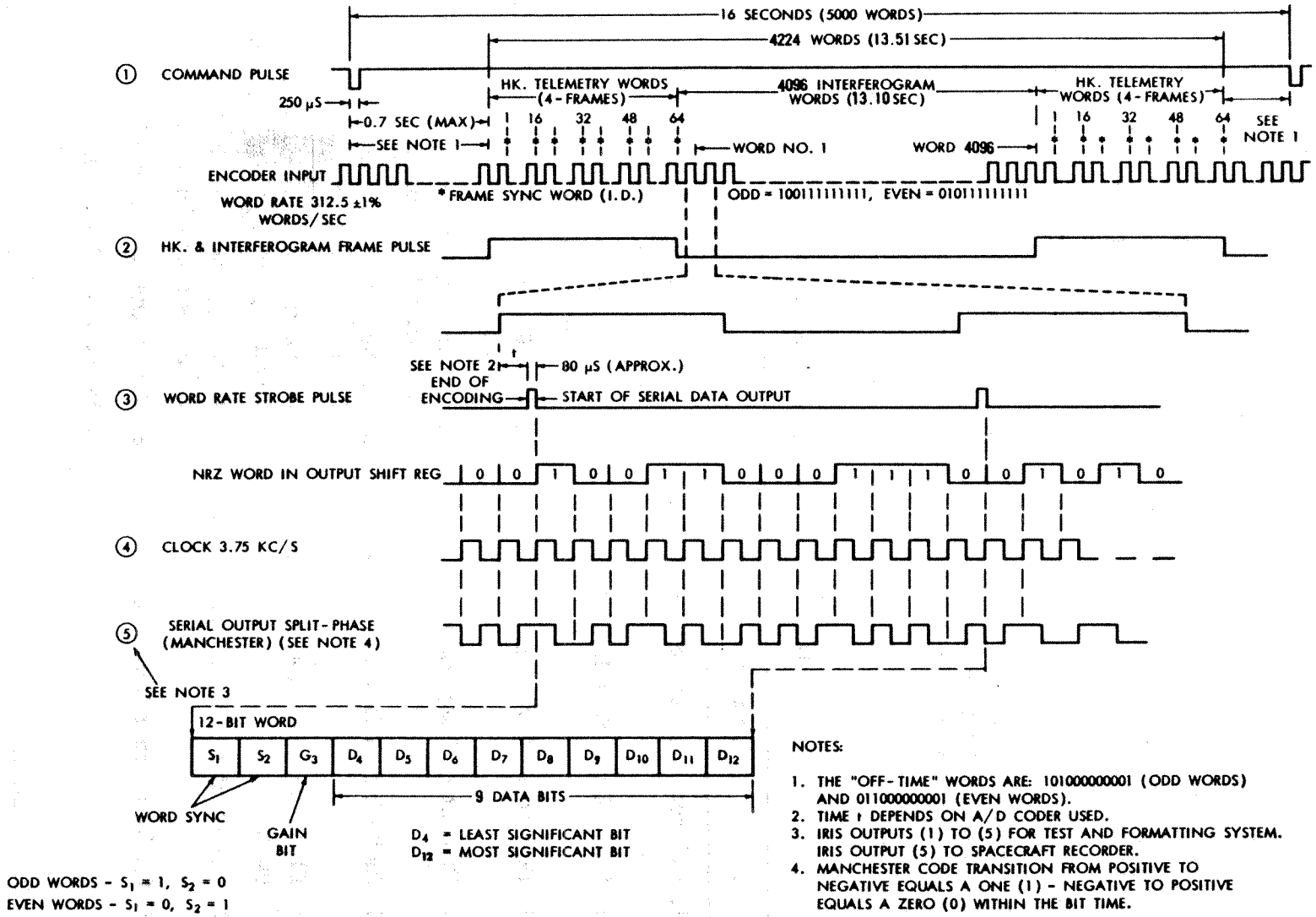


Figure 4-7. Timing Diagram of a Single Frame of Data

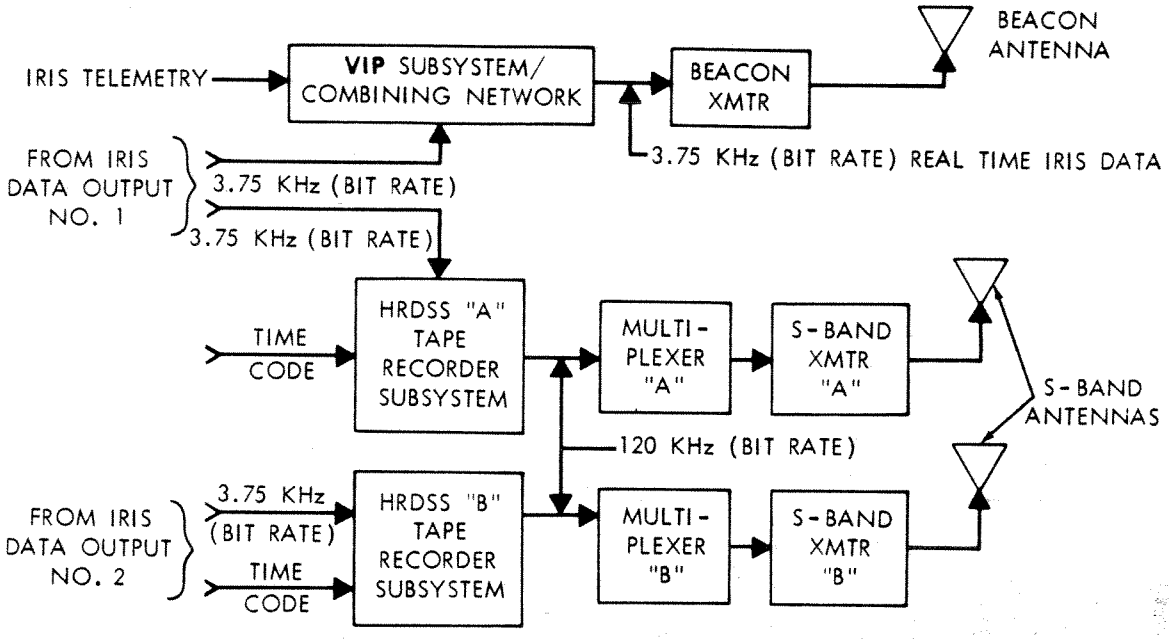


Figure 4-8. Flow Diagram of IRIS Data in the Nimbus Satellite

4.4 Data Reduction in the IBM-360 Computer

The data reduction process consists of four steps:

1. A check of consistency and completeness of input tape and processing of housekeeping information

2. Fourier transformation of each interferogram including consideration of phase

3. Application of calibration procedure

4. Production of IRIS archival tape containing the calibrated spectra, housekeeping information and orbital parameters

In the check of consistency and completeness, the total number of words per interferogram and the value, sign and position of the peak word in each interferogram are determined. Furthermore, a scan for gain switch pulses outside the central region of the interferogram and errors in the word sync bits are performed and the results printed out. Only interferograms which show a number of sync errors less than some upper limit will be processed further. This upper limit will be established in operation.

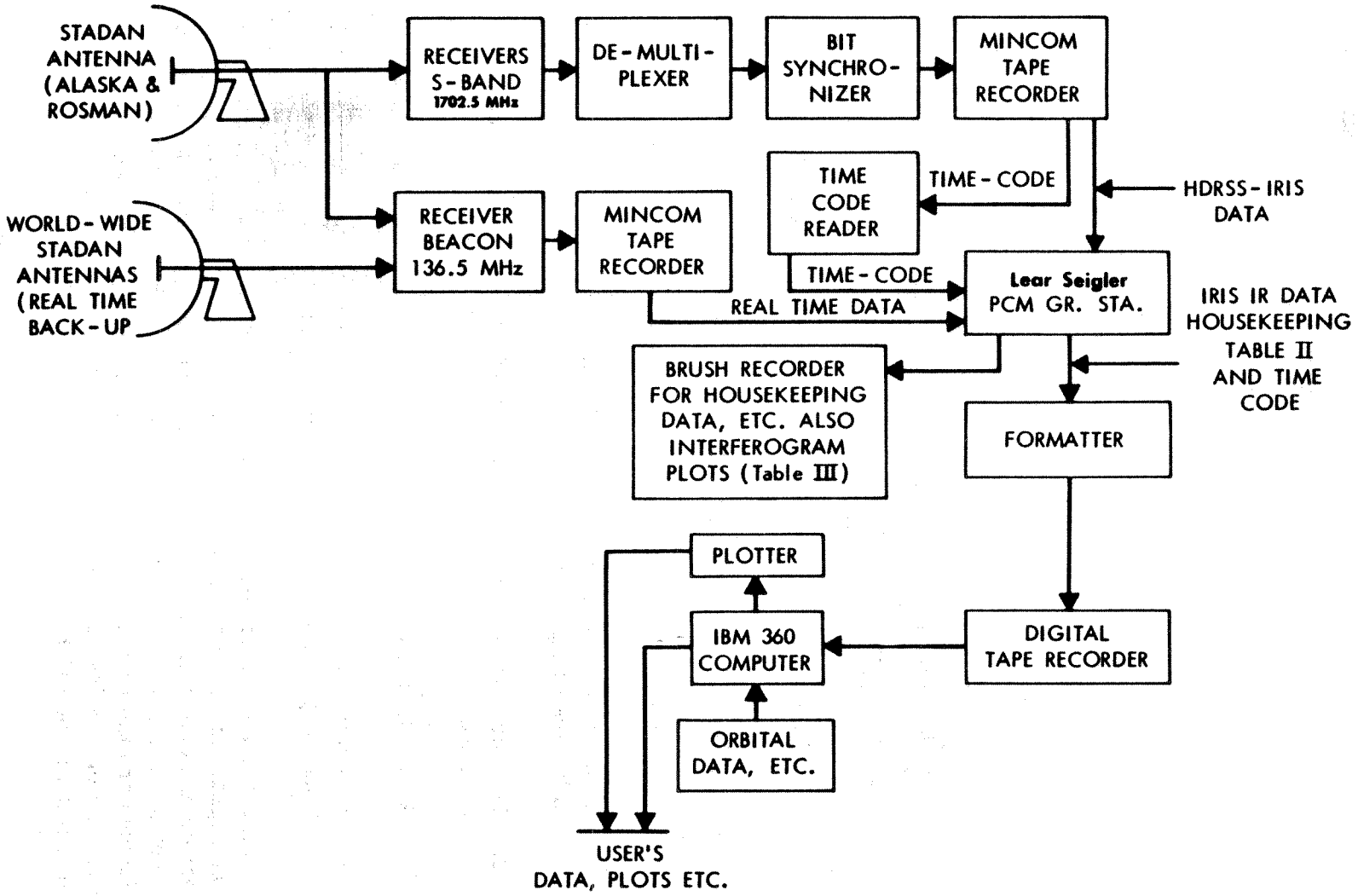


Figure 4-9. Flow Diagram of the Ground Station System and Computer Complex

Housekeeping data are converted into engineering units such as temperatures by application of conversion tables established during preflight calibrations.

Interferograms which passed the screening procedure mentioned above will be transformed by the means of the Cooley - Tukey method (References 7 and 8). A smoothing or apodization function is applied to each interferogram prior to transformation in order to reduce side lobes of the instrument function. The particular apodization function to be applied is the same one which was used on Nimbus III.

It is

$$0.54 + 0.46 \cos 2\pi \tau / T$$

where τ is the distance from the center and T is the total length of interferogram. This apodization function and its effects are discussed by Blackman and Tukey, 1958 (Reference 9). Should a researcher need unapodized spectra, they can be made available in limited numbers.

The Fourier transformation yields two amplitudes

$$a_\nu = \int_{-\infty}^{\infty} A(\delta)\, i(\delta) \cos 2\pi \nu \delta \, d\delta$$

and

$$b_\nu = \int_{-\infty}^{\infty} A(\delta)\, i(\delta) \sin 2\pi \nu \delta \, d\delta$$

where $A(\delta)$ is the apodisation function. From a_ν and b_ν a magnitude and phase is computed

$$c_\nu' = \sqrt{a_\nu^2 + b_\nu^2}$$

and $\phi_\nu = \arctan b_\nu / a_\nu$. The location of the pronounced central peak of the calibration interferograms is taken as the phase reference point. For atmospheric interferograms which may or may not have a strong central peak, the average phase reference point of several calibration interferograms is used.

The phase information is required to distinguish between a target radiance larger (warmer) or smaller (colder) than the radiance corresponding to the

instrument temperature. Wherever the brightness temperature of the target changes from colder to warmer than 250°K or vice versa, a 180° change in phase of the particular frequency component takes place.

Between 640 cm^{-1} and 690 cm^{-1}, the strongest portion of the CO_2 band, only brightness temperatures colder than 250°K are to be expected. In that spectral interval the phase is therefore taken equal to 180° and the magnitude c_ν is assigned a negative sign; wherever the phase changes by ±90°, the sign is alternated.

The slope of the phase curve versus wave number between 640 and 690 cm^{-1} is also used as a check on the selection of the proper phase reference point. In contrast to the interferometer on Nimbus III, this instrument has better control of the position of the central peak. Typical amplitude and phase spectra are shown in Figure 4-10.

After the proper sign of each amplitude is established, the calibration is performed. The instrument is exposed every 16th frame to a built-in calibration blackbody, and to the interstellar background, considered to be near zero, by rotation of the IMCC mirror. The calibration interferograms are processed in the same manner as the interferograms obtained while viewing the atmosphere. The amplitude c_ν in the spectrum is proportional to the difference in radiance between the instrument and the target.

$$c_\nu = r_\nu (B_{target} - B_{instrument}).$$

The factor of proportionality is the responsivity of the instrument. The dimensions of the responsivity are count per count maximum per radiance or just per radiance.

One obtains a set of three equations; one for the target (index 1), one for the cold blackbody (index 2), and one for the warm blackbody (index 3).

$$C_1(\nu) = r_\nu (B_1 - B_i)$$

$$C_2(\nu) = r_\nu (B_2 - B_i)$$

$$C_3(\nu) = r_\nu (B_3 - B_i).$$

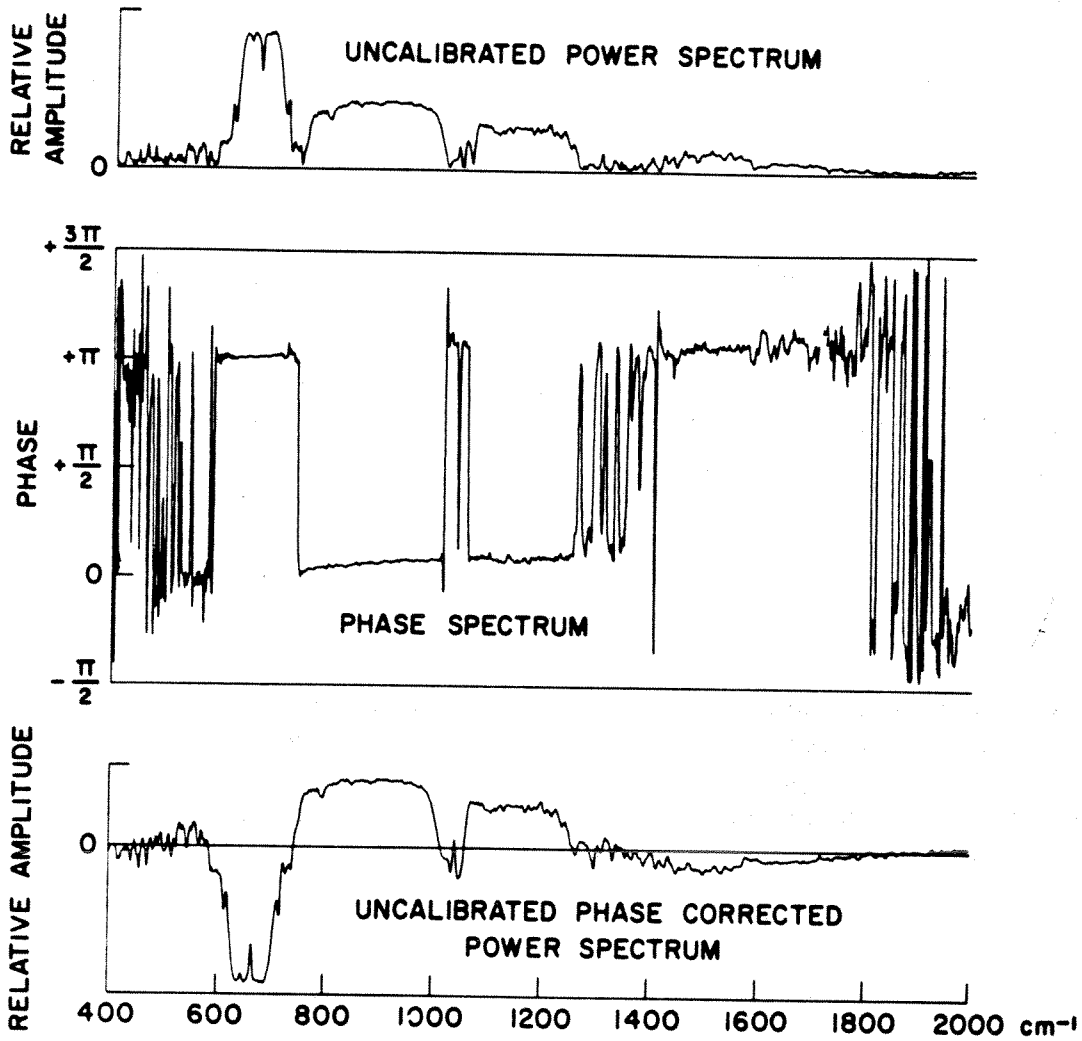


Figure 4-10. Power Spectra and Phase Plot Derived from Nimbus III Interferograms

Under the assumption that the responsivity, r_ν, is independent of the target brightness and that the detection and amplification is a linear process, the 3 equations may be solved to yield B_1 as well as r_ν and B_i. If one uses the interstellar background as the cold reference (~4°K), then B_2 is for all practical purposes zero and the equations simplify to

$$B_1 = B_3 \frac{C_2 - C_1}{C_2 - C_3},$$

$$r_\nu = \frac{C_2 - C_3}{-B_3},$$

$$B_i = B_3 \frac{C_2}{C_2 - C_3},$$

The equation for B_1 is used to reduce the spectra. Neither the responsivity nor the instrument temperature are contained explicitly in this equation. The calibration spectra C_2 and C_3 are the average of about 25 individual spectra so that the random effects in these spectra are greatly reduced. Then the sample standard deviation s of the responsivity is determined for each orbit.

$$s = \left(\frac{\sum_{i=1}^{k} (r_i - \bar{r})^2}{k - 1} \right)^{1/2}$$

The r_i are the responsivities computed from each calibration pair (hot and cold blackbody). The average responsivity per orbit is called $\bar{r}$ and k is the number of calibration pairs per orbit. Instead of tabulating the standard deviation of the responsivity the noise equivalent radiance (NER) calculated from the calibration spectra is employed. The NER is calculated from

$$NER = \frac{\sqrt{2}\, s\, B_3}{\bar{r}}$$

The same level of the NER may be expected to exist in the individual atmospheric spectra.

The NER gives the short time repeatability of the instrument and a comparison of the average orbital responsivity for each spectral interval from orbit to orbit, and from day to day yields the long term drift.

The instrument temperature, T_i, which is calculated from B_i and the instrument temperature measured by the thermistors imbedded in the housing should be in close agreement. A deviation from this agreement is used as a caution flag which calls for a special investigation if it should occur.

Figure 4-11 shows the average warm and cold calibration spectra, responsivity and Noise Equivalent Radiance, all from Nimbus III IRIS.

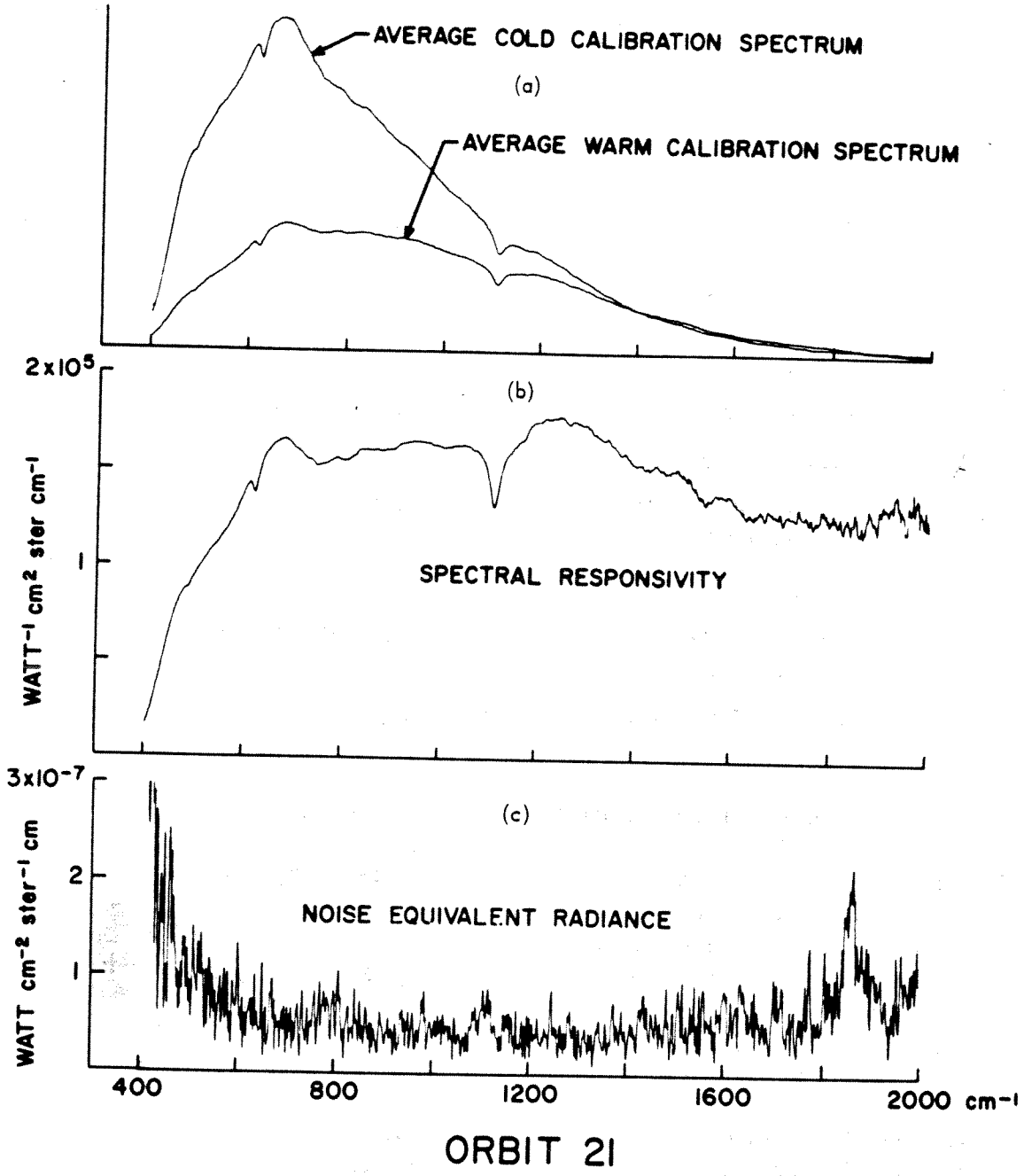


Figure 4-11. Average Cold and Warm Calibration Spectra (a), Spectral Responsivity (b) and Noise Equivalent Radiance (c) Derived from Nimbus III IRIS Data

4.5 Format of the IRIS Archival Tape

The IRIS Archival Tape will be the basic repository for radiation data from the Nimbus Infrared Interferometer Spectrometer (IRIS). This tape will be generated on the IBM 360 System with 9 track recording in binary mode at 1600 bits per inch, and will be available to the scientific community through the NSSDC several months after launch.

The IRIS Archival Tape contains one file for each readout orbit of data processed from the Nimbus spacecraft. Within each file there are several types of records. These are listed below and each type is described in detail in the following tables 4-4 through 4-12.

Record Type	Description
1	Documentation information for each file (Table 4-4)
2	Average cold reference calibration spectrum (Table 4-5)
3	Average warm reference calibration spectrum (Table 4-6)
4	Average Responsivity, R_ν, calculated from the calibration spectra (Table 4-7)
5	Noise Equivalent Radiance (Table 4-8)
6	Average instrument temperature, T_i, calculated from calibration spectra (Table 4-9)
7	Standard Deviation of T_i (Table 4-10)
8	Calibrated Atmospheric Spectrum (Table 4-11)
9	Summary for each orbital pass (Table 4-12)

The Type 1 documentation record will consist of 18 32 bit words. All other records in the data file will consist of 1080 32 bit words, or 960 36 bit words, or 576 60 bit words. The End of File Mark will be recorded at the end of each playback orbit, and will be repeated at least twice following the last readout orbit on any reel of tape.

Ninety degrees are added to all latitudes to eliminate negative signs.

Final formats of any computer printouts obtainable from the archival tapes cannot be defined at present, and will be included in a future Nimbus IV data catalog.

Table 4-4
Documentation Record

Word No.	Quantity	Units	Scaling	Remarks
1	Record Type	–	B31	Type = 1 indicates this record contains documentation data for this file.
2	Satellite I.D.	–	B31	Nimbus IV = 4
3	Orbit Number	–	B31	Readout Orbit No.
4	Day	Days	B31	Time for first calibrated spectrum in this orbit.
5	Hour	Z Hours	B31	
6	Minute	Z Minutes	B31	
7	Second	Z Seconds	B31	
8	Day	Days	B31	Time for last calibrated spectrum in this orbit.
9	Hour	Z Hours	B31	
10	Minute	Z Minutes	B31	
11	Second	Z Seconds	B31	
12	Initial Wave No.	cm^{-1}	Fl. Pt.	Initial wave number for each calibrated spectrum. Normally $\nu_1 \simeq 200\ cm^{-1}$
13	Final Wave No.	cm^{-1}	Fl. Pt.	Final wave number for each calibrated spectrum. Normally $\nu_{1051} \simeq 1660\ cm^{-1}$.
14	Wave No. Increment	cm^{-1}	Fl. Pt.	The wave number increment. Normally $\Delta\nu \simeq 1.39052333\ cm^{-1}$.
15	Spare			
16	Spare			
17	Spare			
18	Spare			

Table 4-5
Cold Reference Calibration Spectra

Word No.	Quantity	Units	Scaling	Remarks
1	Record Type	–	B31	Type = 2 indicates this record contains the average cold reference calibration spectrum.
2	Orbit No.	–	B31	Readout orbit over which the average cold reference calibration spectrum was computed.
3	Number of Cold reference calibration spectra	–	B31	Number of cold reference calibration spectrum averaged.
4	Average peak value	–	Fl. Pt.	Average peak value of the cold reference calibration interferograms.
5	Standard Deviation of Peak Value	–	Fl. Pt.	Standard deviation of peak values from the cold reference calibration interferograms.
6	Average Position of Peak Value	–	Fl. Pt.	Average location of peak values in the cold reference calibration interferograms.
7	Standard Deviation of Position of Peak Value	–	Fl. Pt.	Standard deviation of the location of peak values in the cold reference calibration interferograms.
8 . . . 29	Spares			
30	Averaged Cold Reference Calibration Spectrum Intensity Count	–	Fl. Pt.	Spectral intensity for the averaged cold reference calibration spectrum at $\nu_1 \simeq 200\ cm^{-1}$.

Table 4-5
Cold Reference Calibration Spectra (Continued)

Word No.	Quantity	Units	Scaling	Remarks
31	Averaged Cold Reference Calibration Spectrum Intensity Count		Fl. Pt.	Spectral intensity for the Averaged cold reference calibration spectrum at $\nu_1 \simeq 200$ cm^{-1}. $\nu_2 = \nu_1 + \Delta\nu$.
.	"		"	"
.	"		"	"
.	"		"	"
.	"		"	"
1080	Averaged Cold Reference Calibration Spectrum Intensity Count	–	Fl. Pt.	Spectral intensity for the Averaged cold reference calibration spectrum at $\nu_{1051} \simeq 1660$ cm^{-1}.

Table 4-6
Warm Reference Calibration Spectra

Word No.	Quantity	Units	Scaling	Remarks
1	Record Type	–	B31	Type = 3 indicates this record contains the average warm reference calibration spectrum.
2	Orbit No.	–	B31	Readout orbit over which the average warm reference calibration spectrum was computed.
3	Number of warm reference calibration spectra	–	B31	Number of warm reference calibration spectrum averaged.
4	Averaged Peak Value	–	Fl. Pt.	Average Peak value of the warm reference calibration interferograms.
5	Standard Deviation of Peak Value	–	Fl. Pt.	Standard deviation of peak values from the warm reference calibration interferograms.
6	Average position of Peak Value	–	Fl. Pt.	Average location of peak values in warm reference calibration interferograms.
7	Standard deviation of the position of Peak Value	–	Fl. Pt.	Standard deviation of the location of peak values in the warm reference calibration interferograms.
8 . . . 29	Spares			
30	Average warm reference calibration spectrum intensity count	–	Fl. Pt.	Spectral Intensity for the Averaged warm reference calibration spectrum at $\nu_1 \simeq 200\ cm^{-1}$.
31	Average warm reference calibration spectrum intensity count			Spectral intensity for Averaged warm reference calibration spectrum $\nu_2 = \nu_1 + \Delta\nu$.

Table 4-6
Warm Reference Calibration Spectra (Continued)

Word No.	Quantity	Units	Scaling	Remarks
.	Average warm reference calibration spectrum intensity count		"	"
.	Average warm reference calibration spectrum intensity count		"	"
.	Average warm reference calibration spectrum intensity count		"	"
1080	Averaged warm reference calibration spectrum intensity count	–	Fl. Pt.	Spectral intensity for the averaged warm reference calibration spectrum at $\nu_{1051} \simeq 1660\ cm^{-1}$.

Table 4-7
Average Responsivity

Word No.	Quantity	Units	Scaling	Remarks
1	Record Type	–	B31	Type = 4 indicates this record contains the average responsivity for the orbit.
2	Orbit No.	–	B31	Readout orbit over which the average responsivity was calculated.
.	Spares			
.	Spares			
.	Spares			
.	Spares			
.	Spares			
.	Spares			
29				
30	Average responsivity for the orbit at a given ν.	(watts cm^{-1} $ster.^{-1})^{-1}$	Fl. Pt.	Average responsivity for the orbit at $\nu_1 \simeq 200$ cm^{-1}.
.	"	"	"	"
.	"	"	"	"
.	"	"	"	"
1080	Average responsivity for the orbit at a given ν.	(watts cm^{-1} $ster.^{-1})^{-1}$	Fl. Pt.	Average responsivity for the orbit at $\nu_{1051} \simeq$ 1660 cm^{-1}.

Table 4-8
Noise Equivalent Radiance

Word No.	Quantity	Units	Scaling	Remarks
1	Record Type	–	B31	Type = 5 indicates this record contains the standard deviation of the responsivity for the orbit.
2	Orbit No.	–	B31	Readout orbit over which the standard deviation of the responsivity was calculated.
3	Spare			
.	Spare			
.	Spare			
.	Spare			
.	Spare			
29	Spare			
30	Noise Equivalent Radiance at given ν.	–	Fl. Pt.	NER at $\nu_1 \simeq 200$ cm^{-1}.
.	"		"	"
.	"		"	"
.	"		"	"
.	"		"	"
.	"		"	"
1080	NER at given ν.	–	Fl. Pt.	NER at $\nu_{1051} \simeq 1660$ cm^{-1}.

Table 4-9
Average Instrument Temperature

Word No.	Quantity	Units	Scaling	Remarks
1	Record Type	–	B31	Type = 6 indicates this record contains the average instrument temperature.
2	Orbit No.	–	B31	Readout orbit over which the average instrument temperature was calculated.
3	Spare			
.	Spare			
.	Spare			
.	Spare			
.	Spare			
.	Spare			
29	Spare			
30	Average Instrument Temperature at a given ν.	Degrees Kelvin	Fl. Pt.	Average instrument temperature at $\nu_1 \simeq 200$ cm^{-1}.
.	"	"	"	"
.	"	"	"	"
.	"	"	"	"
1080	Average Instrument Temperature at a given ν.	Degrees Kelvin	Fl. Pt.	Average instrument temperature at $\nu_{1051} \simeq$ 1660 cm^{-1}.

Table 4-10
Standard Deviation of the Instrument Temperature

Word No.	Quantity	Units	Scaling	Remarks
1	Record Type	–	B31	Type = 7 indicates this record contains the standard deviation of the instrument temperature.
2	Orbit No.	–	B31	Readout orbit over which the standard deviation of the instrument temperature was computed.
3	Spare			
.	Spare			
.	Spare			
.	Spare			
.	Spare			
29	Spare			
30	Standard Deviation of the instrument temperature at given ν.	–	Fl. Pt.	Standard deviation of the instrument temperature at $\nu_1 \simeq 200$ cm^{-1}.
.	"	"	"	"
.	"	"	"	"
.	"	"	"	"
1080	Standard Deviation of the instrument temperature at given ν.	–	Fl. Pt.	Standard deviation of instrument temperature at $\nu_{1051} \simeq 1660$ cm^{-1}.

Table 4-11
Calibrated Atmospheric Spectrum

Word No.	Quantity	Units	Scaling	Remarks
1	Record Type	–	B31	Type = 8 indicates this record contains a calibrated atmospheric spectrum.
2	Orbit No.	–	B31	Readout orbit in which the calibrated spectrum was calculated.
3	Spectrum No.	–	B31	Sequential number assigned to a given spectrum in a given orbit.
4	Day	Days	B31	Time associated with this interferogram.
5	Hour	Z Hours	B31	
6	Minute	Z Minutes	B31	
7	Second	Z Seconds	B31	
8	Latitude	Degrees	Fl. Pt.	Latitude and Longitude of the center of the viewed area
9	Longitude	Degrees	Fl. Pt.	
10	Height of satellite	Kilometers	Fl. Pt.	Height of the satellite at the time stated in words 4-7.
11	Bolometer Temperature	Degrees K	Fl. Pt.	Bolometer temperature (average of two readings before and after interferograms).
12	Bolometer temperature redundant sensor	Degrees K	Fl. Pt.	Bolometer temperature from redundant sensor (average before and after interferogram).
13	Blackbody Temperature	Degrees K	Fl. Pt.	Blackbody temperature (average before and after interferogram).
14	Blackbody temperature from redundant sensor	Degrees K	Fl. Pt.	Blackbody temperature from redundant sensor (average before and after interferogram).
15	Beamsplitter Temperature	Degrees K	Fl. Pt.	Temperature of IRIS instrument beamsplitter.
16	Temperature of Michelson mirror drive motor	Degrees K	Fl. Pt.	IRIS Michelson mirror drive motor temperature.

Table 4-11
Calibrated Atmospheric Spectrum (Continued)

Word No.	Quantity	Units	Scaling	Remarks
17	IMCC Temperature	Degrees K	Fl. Pt.	IMCC Temperature
18	Temperature of cooling surface	Degrees K	Fl. Pt.	Cooling surface temperature
19	IMCC Position	–	B31	IMCC Position (2 bits digital) 0 = Warm Ref. 2 = Earth 3 = Cold Ref.
20	+0.6 Volt Calibration	–	Fl. Pt.	+0.6 Volt Calibration
21	0 Volt Calibration	–	Fl. Pt.	0 Volt Calibration
22	-0.6 Volt Calibration	–	Fl. Pt.	-0.6 Volt Calibration
23	Calibration Transducer	–	–	Calibration Transducer
24	Solar Elevation Angle	Degrees	Fl. Pt.	Solar deviation angle at the viewed point.
25	Number of sync bits errors	–	Fl. Pt.	Number of interferogram sync pulse errors.
26	Spare	–		
27	Number of Gain Pulses Outside Center	–	Fl. Pt.	Number of gain pulses outside center region of the interferogram.
28	Time Indicator	–	–	= 0, time code from raw data tape
29	Spare Position	–	–	= 1, time computed
30	Specific Intensity	watts cm^{-1} $ster^{-1}$	Fl. Pt.	Specific intensity at $\nu_1 \simeq 200$.
31	"	"	"	"
.	"	"	"	"
.	"	"	"	"
1080	Specific Intensity	watts cm^{-1} $ster^{-1}$	Fl. Pt.	Specific intensity at $\nu_{1051} \simeq 1660$.

Table 4-12
Summary Record For the Orbit
(Last Record in File)

Word No.	Quantity	Units	Scaling	Remarks
1	Record Type	–	B31	Type = 9 indicates this record is a summary for the orbit.
2	Orbit Number	–	B31	Readout Orbit No.
3	Number of Spectra per orbit	–	Fl. Pt.	Number of calibrated spectra computed for the orbit.
4	Day	Day	B31	Time of the first calibrated spectrum computed for the orbit
5	Hour	Z Hour	B31	
6	Minute	Z Minute	B31	
7	Second	Z Second	B31	
8	Day	Day	B31	Time of the last calibrated spectrum computed for the orbit
9	Hour	Z Hour	B31	
10	Minute	Z Minute	B31	
11	Second	Z Second	B31	
12	Orbital Mean of Bolometer Temperature	Degrees K	Fl. Pt.	Mean bolometer temperature for the orbit
13	Sample Standard Deviation of Bolometer Temperature	–	Fl. Pt.	–
14	Orbital Mean of Blackbody Temperature	Degrees K	Fl. Pt.	–
15	Sample Standard Deviation of Blackbody Temperature	–	Fl. Pt.	–
16	Orbital Mean Beamsplitter Temperature	Degrees K	Fl. Pt.	–
17	Sample Standard Deviation of Beamsplitter Temperature	–	Fl. Pt.	–

Table 4-12
Summary Record For the Orbit
(Last Record in File) (Continued)

Word No.	Quantity	Units	Scaling	Remarks
18	Orbital Mean Temperature of Michelson mirror drive motor	Degrees K	Fl. Pt.	–
19	Sample Standard Deviation of Michelson mirror motor temperature	–	Fl. Pt.	–
20	Orbital Mean IMCC Temperature	Degrees K	Fl. Pt.	–
21	Sample Standard Deviation of IMCC Temperature	–	Fl. Pt.	–
22	Orbital Mean Temperature of Cooling Surface	Degrees K	Fl. Pt.	–
23	Sample Standard Deviation of Temperature of Cooling Surface	–	Fl. Pt.	–
24	Number of Interferograms containing sync pulse errors	–	Fl. Pt.	Number of interferograms in the orbit containing sync pulse errors.
25	Number of Interferograms containing bits parity errors	–	Fl. Pt.	Number of interferograms in the orbit containing word parity errors.
26	Number of Interferograms containing gain switch pulses outside central region	–	Fl. Pt.	Number of interferograms in orbit containing gain pulses outside central region.

Table 4-12
Summary Record For the Orbit
(Last Record in File) (Continued)

Word No.	Quantity	Units	Scaling	Remarks
27	Number of warm calibration spectra used	—	Fl. Pt.	Number of warm calibration spectra used in the average to compute calibrated spectra.
28	Number of cold calibration used	—	Fl. Pt.	Number of cold calibration spectra used in the average to compute.
29	Spare	—	—	—
1080	Spare	—	—	—

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REQ. AGENT	RAND NO.	ACQ. AGENT
BCD	RC7835	CMP

NIMBUS 4

IRIS RADIANCE TAPES

70-025A-03A

This data set contains 218 tapes. Approximately 10% or 24 tapes were data set processed. The tapes are 9-track, Binary, 1600 BPI, with 1 file per tape. The format, D, C and L numbers, orbits and time spans are on the following pages.

L#	D#	C#	TIME SPAN	ORBITS
L3965	D-29365	C-19149	06/13/70 - 06/13/70	884 - 895
L3944	D-29375	C-19150	05/23/70 - 05/23/70	602 - 613
L0154	D-29386	C-19151	09/08/70 - 09/10/70	2066 - 2080
L0170	D-29396	C-19152	09/25/70 - 09/26/70	2281 - 2295
L0137	D-29405	C-19153	08/22/70 - 08/24/70	1838 - 1849
L3939	D-29415	C-19154	05/18/70 - 05/18/70	536 - 546
L3929	D-29425	C-19155	05/08/70 - 05/08/70	402 - 415
L3906	D-29435	C-19156	04/14/70 - 04/15/70	91 - 102
L0145	D-29445	C-19157	08/31/70 - 09/01/70	1945 - 1959
L0115	D-29455	C-19158	08/01/70 - 08/02/70	1543 - 1556
L3983	D-29465	C-19159	07/01/70 - 07/02/70	1126 - 1137
L0160	D-29475	C-19160	09/14/70 - 09/16/70	2147 - 2160
L3986	D-29485	C-19161	07/04/70 - 07/04/70	1166 - 1177
L0207	D-29495	C-19162	11/01/70 - 11/01/70	2777 - 2788
L0261	D-29505	C-19163	12/25/70 - 12/26/70	3504 - 3514
L0295	D-29515	C-19164	01/28/71 - 01/28/71	3959 - 3970
L0237	D-29525	C-19165	12/01/70 - 12/01/70	3181 - 3191

NIMBUS 4

IRIS RADIANCE TAPES

70-025A-03A

D#	L#	ORBIT#	TIME SPAN
D-29366	L-3967	911- 922	6/15/70
D-29367	L-3966	898- 912	6/13/70 - 6/15/70
D-29368	L-3960	820- 828	6/08/70
D-29369	L-3961	831- 844	6/09/70 - 6/10/70
D-29370	L-3962	847- 858	6/10/70 - 6/11/70
D-29371	L-3963	859- 868	6/11/70
D-29372	L-3958	794- 801	6/06/70
D-29373	L-3959	806- 815	6/07/70 - 6/08/70
D-29374	L-3937	508- 519	5/16/70
D-29376	L-3946	629- 640	5/25/70
D-29377	L-3942	576- 586	5/21/70
D-29378	L-3947	645- 653	5/25/70 - 5/26/70
D-29379	L-0173	2321-2331	9/28/70
D-29380	L-0172	2308-2322	9/26/70 - 9/28/70
D-29381	L-0158	2120-2134	9/13/70 - 9/14/70
D-29382	L-0159	2133-2143	9/14/70
D-29383	L-0157	2106-2117	9/12/70
D-29385	L-0153	2053-2066	9/08/70 - 9/09/70
D-29388	L-0152	2039-2050	9/07/70 - 9/08/70
D-29389	L-0133	1784-1798	8/18/70 - 8/20/70
D-29390	L-0174	2334-2348	9/28/70
D-29391	L-0171	2294-2305	9/26/70
D-29392	L-0175	2348-2359	9/30/70 - 10/01/70

D#	L#	ORBIT#	TIME SPAN
D-29393	L-0162	2174-2184	9/17/70
D-29394	L-0161	2160-2174	9/16/70 - 9/17/70
D-29397	L-0196	2630-2640	10/21/70
D-29398	L-0195	2616-2627	10/19/70 - 10/20/70
D-29399	L-0182	2441-2453	10/06/70 - 10/08/70
D-29400	L-0180	2418-2425	10/05/70
D-29401	L-0179	2404-2412	10/04/70
D-29402	L-0178	2390-2398	10/03/70
D-29403	L-0190	2549-2560	10/15/70
D-29404	L-3996	1301-1314	7/13/70 - 7/15/70
D-29406	L-0139	1865-1876	8/24/70 - 8/25/70
D-29407	L-0144	1932-1942	8/29/70 - 8/30/70
D-29408	L-0150	2012-2024	9/05/70 - 9/06/70
D-29409	L-0138	1851-1865	8/24/70 - 8/25/70
D-29410	L-0199	2670-2681	10/24/70
D-29411	L-3901	26- 35	4/10/70
D-29412	L-3903	56- 65	4/11/70 - 4/13/70
D-29413	L-3900	19- 22	4/09/70
D-29414	L-3905	78- 90	4/13/70 - 4/15/70
D-29416	L-3938	522- 535	5/16/70 - 5/18/70
D-29417	L-3908	119- 133	4/16/70 - 4/18/70
D-29418	L-3910	149- 160	4/19/70 - 4/20/70
D-29419	L-3941	562- 573	5/20/70 - 5/21/70
D-29420	L-3940	549- 562	5/18/70 - 5/20/70
D-29422	L-3912	173- 186	5/20/70 - 5/22/70
D-29423	L-3911	159- 173	5/20/70 - 5/21/70
D-29424	L-3928	388- 402	5/07/70 - 5/08/70

67

D#	L#	ORBIT#	TIME SPAN
D-29426	L-3930	414- 425	5/09/70
D-29427	L-3926	361- 375	5/04/70 - 5/06/70
D-29428	L-3927	374- 384	5/06/70
D-29429	L-3936	495- 509	5/15/70 - 5/16/70
D-29430	L-3935	482- 488	5/14/70
D-29431	L-3934	468-478	5/13/70
D-29432	L-3933	455- 468	5/11/70 - 5/13/70
D-29433	L-3932	441- 452	5/11/70
D-29434	L-3931	428- 441	5/09/70 - 5/11/70
D-29436	L-0191	2564-2574	10/15/70 - 10/17/70
D-29437	L-0189	2535-2547	10/13/70 - 10/14/70
D-29438	L-3914	200- 213	4/23/70 - 4/24/70
D-29439	L-3924	334- 347	5/02/70 - 5/04/70
D-29440	L-3920	280- 290	4/29/70
D-29441	L-3922	307- 317	5/01/70
D-29442	L-3921	294- 304	4/30/70
D-29443	L-3919	267- 280	4/27/70 - 4/29/70
D-29444	L-3913	186- 196	4/21/70 - 4/22/70
D-29446	L-0147	1972-1986	9/01/70 - 9/03/70
D-29447	L-0132	~~1771-1782~~ 1771-1790	~~9/18/70 - 9/19/70~~ 8/26/70 -
D-29448	L-3998	1329-1338	7/16/70
D-29449	L-3982	1113-1124	6/29/70 - 7/01/70
D-29450	L-0177	2374-2385	10/02/70
D-29451	L-0183	2456-2469	10/08/70 - 10/09/70
D-29452	L-0110	1476-1486	7/27/70 - 7/28/70
D-29453	L-0109	1462-1476	7/25/70 - 7/27/70
D-29454	L-0114	1529-1543	7/31/70 - 8/01/70

D#	L#	ORBIT#	TIME SPAN
D-29456	L-0116	1557-1567	8/01/70 - 8/03/70
D-29457	L-0117	1569-1580	8/03/70 - 8/04/70
D-29458	L-0149	1999-2010	9/04/70 - 9/05/70
D-29459	L-0151	2026-2037	9/05/70 - 9/07/70
D-29460	L-3985	1153-1164	7/03/70 - 7/04/70
D-29461	L-0107	1434-1446	7/23/70 - 7/25/70
D-29462	L-0105	1407-1418	7/21/70 - 7/23/70
D-29463	L-0108	1448-1459	7/25/70
D-29464	L-3999	1340-1352	7/16/70 - 7/18/70
D-29466	L-3948	656- 670	5/27/70 - 5/28/70
D-29467	L-3949	670- 680	5/28/70
D-29468	L-3950	684- 697	5/29/70 - 5/30/70
D-29469	L-3952	710- 720	5/30/70 - 5/31/70
D-29470	L-3955	750- 764	6/03/70 - 6/04/70
D-29471	L-3953	723- 737	6/01/70
D-29472	L-3956	764- 774	6/04/70
D-29473	L-3951	696- 707	5/30/70
D-29474	L-3957	780- 787	6/05/70
D-29476	L-3994	1273-1283	7/11/70 - 7/12/70
D-29477	L-3978	1059-1073	6/25/70 - 6/27/70
D-29478	L-3990	1220-1231	7/08/70
D-29479	L-3976	1032-1046	6/24/70 - 6/25/70
D-29480	L-3992	1247-1263	7/10/70 - 7/11/70
D-29481	L-3993	1260-1271	7/11/70
D-29482	L-3989	1207-1221	7/06/70 - 7/08/70
D-29483	* L-3990	1220-1231	7/08/70
D-29486	L-3987	1180-1193	7/04/70 - 7/06/70

✓ - dup of D-2948

duplicate same as D-2947

D#	L#	ORBIT#	TIME SPAN
D-29487	L-3988	1194-1207	7/06/70 - 7/07/70
D-29488	L-3968	925- 939	6/15/70 - 6/17/70
D-29489	L-3970	951- 962	6/17/70 - 6/18/70
D-29490	L-3981	1099-1110	6/29/70
D-29491	L-3979	1072-1083	6/27/70
D-29492	L-3975	1019-1032	6/22/70 - 6/24/70
D-29493	L-3974	1005-1016	6/22/70
D-29494	L-3995	1287-1301	7/13/70
D-29496	L-0200	2684-2695	10/24/70 - 10/26/70
D-29497	L-0204	2737-2748	10/29/70
D-29498	L-0201	2697-2707	10/26/70
D-29499	L-0203	2724-2738	10/27/70 - 10/29/70
D-29500	L-0198	2657-2671	10/22/70 - 10/24/70
D-29501	L-0208	2790-2801	11/01/70 - 11/02/70
D-29502	L-0260	3491-3500	12/24/70
D-29503	L-0264	3543-3553	12/27/70 - 12/28/70
D-29504	L-0263	3532-3540	12/27/70
D-29506	L-0265	3558-3567	12/29/70
D-29507	L-0266	3572-3584	12/30/70 - 12/31/70
D-29508	L-0267	3585-3594	12/31/70
D-29509	L-0291	3905-3917	1/24/71 - 1/25/71
D-29510	L-0296	3973-3983	1/29/71
D-29511	L-0297	3985-3997	1/30/71
D-29512	L-0287	3852-3872	1/20/71
D-29513	L-0257	3450-3459	12/21/70
D-29514	L-0293	3932-3943	1/26/71
D-29516	L-3973	992-1005	6/20/70 - 6/22/70

148

D#	L#	ORBIT#	TIME SPAN
D-29517	L-0225	3019-3030	11/18/70 - 11/19/70
D-29518	L-0226	3033-3043	11/20/70
D-29519	L-0227	3045-3057	11/20/70 - 11/21/70
D-29520	L-0228	3060-3070	11/22/70
D-29521	L-0229	3073-3083	11/22/70 - 11/23/70
D-29522	L-0230	3087-3097	11/24/70 duplicate same as D-29515
D-29523	L-0269	3612-3621	1/02/71
D-29524	L-0254	3410-3419	12/18/70
D-29526	L-0223	2992-3003	11/17/70
D-29527	L-0224	3006-3016	11/18/70
D-29528	L-0222	2979-2989	11/15/70 - 11/16/70
D-29529	L-0220	2951-2963	11/13/70 - 11/14/70
D-29530	L-0219	2938-2949	11/13/70
D-29531	L-0232	3114-3124	11/25/70 - 11/26/70
D-29532	L-0233	3126-3137	11/27/70
D-29533	L-0234	3141-3150	11/27/70 - 11/28/70
D-29534	L-0235	3153-3164	11/29/70
D-29536	L-0256	3436-3446	11/20/70
D-29537	L-0258	3464-3473	12/22/70
D-29538	L-0259	3476-3486	12/22/70 - 12/23/70
D-29539	L-0218	2925-2936	11/11/70 - 11/12/70
D-29540	L-0214	2872-2882	11/08/70
D-29541	L-0213	2862-2869	11/07/70
D-29542	L-0292	3919-3929	1/25/71
D-29543	L-0289	3878-3889	1/22/71
D-29544	L-0288	3864-3875	1/21/71
D-29547	L-0270	3626-3637	1/03/71 - 1/4/71
D-29548	L-0284	3812-3822	1/17/71

D#	L#	ORBIT#	TIME SPAN
D-29549	L-0272	3711-3661	1/04/71 - 1/05/71
D-29550	L-0271	3638-3647	1/04/71
D-29551	L-0273	3665-3674	1/06/71
D-29552	L-0276	3707-3715	1/09/71
D-29553	L-0238	3193-3202	12/02/70
D-29554	L-0239	3206-3218	12/02/70 - 12/03/70
D-29556	L-0209	2804-2815	11/03/70
D-29557	L-0242	3247-3258	12/06/70
D-29558	L-0243	3260-3271	12/06/70 - 12/07/70
D-29559	L-0245	3287-3298	12/09/70
D-29560	L-0248	3329-3338	12/11/70 - 12/12/70
D-29561	L-0253	3397-3406	12/17/70
D-29562	L-0249	3342-3352	12/13/70
D-29563	L-0250	3358-3365	12/14/70
D-29564	L-0252	3384-3392	12/16/70
D-29568	L-0181	2429-2440	10/06/70
D-29570	L-0135	1812-1821	8/21/70
D-29571	L-3916	226- 237	4/25/70
D-29572	L-3907	106- 119	4/15/70 - 4/17/70
D-29573	L-3945	616- 629	5/23/70 - 5/25/70
D-29574	L-3964	871- 885	6/11/70 - 6/13/70
D-29576	L-0241	3234-3244	8/26/70 - 8/27/70
D-29577	L-0217	2911-2922	11/11/70
D-29578	L-0215	2886-2895	11/08/70 - 11/09/70
D-29579	L-0120	1610-1623	8/06/70 - 8/07/70
D-29580	L-0129	1730-1741	8/15/70
D-29581	L-0131	1761-1771	8/17/70 - 8/18/70

D#	L#	ORBIT#	TIME SPAN
D-29582	L-0165	2214-2228	9/20/70 - 9/21/70
D-29583	L-0124	1663-1677	8/10/70 - 8/11/70
D-29584	L-0193	2589-2600	10/17/70 - 10/18/70
D-29586	L-0128	1716-1728	8/13/70 - 8/15/70
D-29587	L-0126	1690-1709	8/12/70 - 8/13/70
D-29588	L-0127	1704-1714	8/13/70
D-29589	L-0122	1636-1650	8/08/70 - 8/09/70
D-29590	* L-0129	1730-1741	8/15/70 duplicate same as D-29580

211

L#	D#	C#	TIME SPAN	ORBITS
L0236	D-29535	C-19166	11/29/70 - 11/30/70	3166-3177
L0285	D-29545	C-19167	1/17/71 - 1/18/71	3824-3835
L0210	D-29555	C-19168	11/04/70 - 11/04/70	2817-2828
L0146	D-29565	C-19169	9/01/70 - 9/02/70	1959-1972
L0230	D-29575	C-19170	11/24/70 - 11/24/70	3087-3097
L0125	D-29585	C-19171	8/11/70 - 8/11/70	1677-1687
L0123	D-29591	C-19172	8/08/70 - 8/10/70	1650-1664

Duplicate of D-29535

IRIS 4 ARCHIVAL TAPE LISTING

11/27/72

TAPE	ORBITS	TIMES		YEAR/DAY
L3900	19 - 22	99: 16: 47: 35	99: 23: 13: 27	70099
L3901	26 - 35	100: 5: 7: 3	100: 22: 24: 23	70100
L3903	56 - 65	101: 23: 25: 11	103: 0: 40: 55	70102
L3905	78 - 90	103: 23: 40: 23	105: 0: 50: 31	70104
L3906	91 - 102	104: 22: 52: 39	105: 22: 4: 39	70105
L3907	106 - 119	105: 22: 8: 7	107: 1: 11: 51	70106
L3908	119 - 133	106: 23: 9: 43	108: 0: 27: 19	70107
L3909	133 - 146	107: 22: 24: 23	109: 1: 27: 50	70108
L3910	146 - 160	109: 1: 24: 6	110: 0: 40: 7	70109
L3911	159 - 173	110: 0: 38: 47	111: 1: 41: 59	70110
L3912	173 - 186	110: 23: 41: 27	112: 0: 56: 23	70111
L3913	186 - 196	111: 22: 54: 47	112: 22: 6: 31	70112
L3914	200 - 213	113: 0: 6: 31	114: 1: 12: 7	70113
L3915	213 - 227	113: 23: 10: 15	115: 0: 25: 59	70114
L3916	226 - 237	115: 0: 22: 15	115: 23: 23: 19	70115
L3917	240 - 254	116: 1: 24: 23	117: 0: 41: 27	70116
L3918	253 - 264	117: 0: 37: 11	117: 23: 41: 27	70117
L3919	267 - 280	117: 23: 59: 35	119: 0: 57: 59	70118
L3920	280 - 290	119: 0: 54: 15	119: 22: 8: 23	70119
L3921	294 - 304	120: 0: 7: 35	120: 23: 8: 23	70120
L3922	307 - 317	121: 1: 8: 39	121: 22: 23: 19	70121
L3924	334 - 347	122: 23: 25: 43	124: 0: 41: 11	70123
L3926	361 - 375	124: 23: 42: 31	126: 0: 56: 55	70125
L3927	374 - 384	126: 0: 54: 31	126: 22: 9: 43	70126
L3928	388 - 402	127: 0: 9: 43	128: 1: 15: 3	70127
L3929	402 - 415	128: 5: 3: 51	129: 0: 29: 43	70128
L3930	414 - 425	129: 0: 26: 15	129: 23: 27: 51	70129
L3931	428 - 441	129: 23: 28: 23	131: 0: 43: 19	70130
L3932	441 - 452	131: 0: 40: 39	131: 23: 41: 59	70131
L3933	455 - 468	131: 23: 42: 47	133: 0: 57: 27	70132
L3934	468 - 478	133: 0: 53: 11	133: 22: 7: 51	70133
L3935	482 - 488	134: 0: 7: 35	134: 15: 52: 7	70134
L3936	495 - 509	135: 0: 36: 39	136: 0: 26: 31	70135
L3937	508 - 519	136: 0: 23: 3	136: 23: 26: 31	70136
L3938	522 - 535	136: 23: 27: 19	138: 0: 41: 43	70137
L3939	536 - 546	138: 4: 28: 23	138: 23: 41: 27	70138
L3940	549 - 562	138: 23: 42: 15	140: 0: 57: 11	70139
L3941	562 - 573	140: 0: 53: 11	141: 0: 11: 35	70140
L3942	576 - 586	141: 0: 7: 35	141: 23: 10: 31	70141
L3943	588 - 603	141: 23: 13: 11	143: 0: 30: 15	70142
L3944	602 - 613	143: 0: 25: 59	143: 23: 27: 51	70143
L3945	616 - 629	143: 23: 29: 59	145: 0: 45: 27	70144
L3946	629 - 640	145: 0: 41: 27	145: 23: 42: 15	70145
L3947	645 - 653	145: 23: 44: 23	146: 22: 54: 15	70146
L3948	656 - 670	147: 0: 54: 15	148: 0: 12: 7	70147
L3949	670 - 680	148: 0: 8: 7	148: 23: 8: 39	70148

IRIS 4 ARCHIVAL TAPE LISTING

TAPE	ORBITS	TIMES		YEAR/DAY	
L3950	684 - 697	149: 5: 3: 35	150: 0: 28: 7	70149	
L3951	696 - 707	150: 0: 23: 51	150: 23: 26: 31	70150	
L3652	710 - 720	150: 23: 27: 3	151: 22: 39: 51	70151	
L3953	723 - 737	152: 0: 39: 19	152: 23: 56: 39	70152	
L3954	737 - 750	152: 23: 54: 31	154: 0: 57: 27	70153	
L3955	750 - 764	154: 0: 55: 3	155: 0: 11: 35	70154	
L3956	764 - 774	155: 0: 9: 11	155: 23: 10: 47	70155	
L3957	780 - 787	156: 8: 23: 19	156: 22: 17: 27	70156	
L3958	794 - 801	157: 9: 23: 19	157: 23: 28: 39	70157	
L3959	806 - 815	158: 7: 0: 23	159: 0: 42: 31	70158	
L3960	820 - 828	159: 7: 55: 3	159: 23: 41: 11	70159	
L3961	831 - 844	160: 1: 43: 3	161: 0: 58: 47	70160	
L3962	847 - 858	161: 8: 15: 19	162: 0: 11: 51	70161	
L3963	859 - 868	162: 5: 46: 31	162: 23: 12: 7	70162	
L3964	871 - 885	162: 23: 13: 27	164: 0: 28: 7	70163	
L3965	884 - 895	164: 0: 25: 11	164: 23: 26: 15	70164	
L3966	898 - 912	164: 23: 27: 3	166: 0: 44: 39	70165	
L3967 no g	911 - 922	166: 0: 40: 23	166: 23: 42: 15	70166	
L3968	925 - 939	166: 23: 42: 47	168: 1: 0: 7	70167	
L3969	938 - 949	168: 0: 56: 7	168: 23: 57: 43	70168	
L3970	951 - 962	168: 23: 59: 19	169: 23: 11: 51	70169	bad lat/long
L3972	978 - 989	171: 0: 24: 23	171: 23: 25: 43	70171	
L3973	992 - 1005	171: 23: 27: 35	173: 0: 43: 35	70172	
L3974	1005 - 1016	173: 0: 39: 35	173: 23: 42: 31	70173	
L3975	1019 - 1032	173: 23: 43: 3	175: 0: 59: 3	70174	
L3976	1032 - 1046	175: 0: 55: 19	176: 0: 13: 59	70175	
L3977	1046 - 1056	176: 0: 10: 31	176: 23: 11: 35	70176	bad lat/long
L3978	1059 - 1073	176: 23: 12: 7	178: 0: 28: 23	70177	
L3979	1072 - 1083	178: 0: 24: 23	178: 23: 27: 35	70178	
L3980	1086 - 1100	178: 23: 28: 7	180: 0: 43: 35	70179	bad lat/long
L3981	1099 - 1110	180: 0: 39: 35	180: 23: 40: 23	70180	
L3982	1113 - 1124	180: 23: 43: 19	182: 0: 59: 35	70181	
L3983	1126 - 1137	182: 0: 56: 23	183: 0: 14: 31	70182	
L3984	1140 - 1153	183: 0: 11: 3	184: 1: 24: 23	70183	
L3985	1153 - 1164	184: 1: 12: 39	185: 0: 28: 7	70184	
L3986	1166 - 1177	185: 0: 25: 11	185: 23: 28: 55	70185	
L3987	1180 - 1193	185: 23: 30: 15	187: 0: 53: 27	70186	
L3988	1194 - 1207	187: 4: 35: 19	188: 0: 6: 31	70187	
L3989	1207 - 1221	187: 23: 55: 3	189: 1: 2: 15	70188	
L3990	1220 - 1231	189: 0: 58: 15	189: 23: 56: 55	70189	
L3991	1232 - 1244	189: 23: 58: 15	190: 23: 12: 23	70190	
L3992	1247 - 1263	191: 1: 12: 23	192: 0: 35: 35	70191	
L3993	1260 - 1271	192: 0: 29: 43	192: 23: 28: 23	70192	
L3994	1273 - 1283	192: 23: 33: 11	193: 20: 53: 27	70193	
L3995	1287 - 1301	194: 0: 44: 23	194: 23: 59: 3	70194	
L3996	1301 - 1314	194: 23: 59: 35	196: 0: 58: 47	70195	bad lat/long
L3998	1329 - 1338	197: 5: 47: 51	197: 23: 11: 3	70197	
L3999	1340 - 1352	197: 23: 17: 43	199: 0: 33: 43	70198	

IRIS 4 ARCHIVAL TAPE LISTING

TAPE	ORBITS	TIMES		YEAR/DAY
L105	1407 - 1418	202: 23: 1: 59	204: 0: 17: 27	70203
L107	1434 - 1446	204: 23: 19: 3	206: 0: 32: 55	70205
L108	1448 - 1459	206: 0: 29: 11	206: 23: 26: 15	70206
L109	1462 - 1476	206: 23: 32: 55	208: 0: 48: 23	70207
L110	1476 - 1486	208: 4: 34: 15	209: 0: 2: 31	70208
L114	1529 - 1543	212: 1: 17: 27	213: 0: 33: 43	70212
L115	1543 - 1556	213: 4: 20: 23	214: 1: 44: 39	70213
L116	1557 - 1567	213: 23: 43: 19	215: 0: 48: 23	70214
L117	1569 - 1580	215: 0: 45: 11	216: 0: 2: 15	70215
L119	1596 - 1610	216: 23: 2: 47	218: 0: 18: 47	70217
L120	1610 - 1623	218: 0: 16: 7	219: 3: 23: 3	70218
L122	1636 - 1650	220: 0: 30: 47	221: 1: 31: 35	70220
L123	1650 - 1664	220: 23: 29: 27	222: 0: 49: 59	70221
L124	1663 - 1677	222: 0: 46: 15	223: 0: 2: 15	70222
L125	1677 - 1687	223: 0: 0: 23	223: 22: 55: 51	70223
L0126	1690 - 1709	224: 1: 0: 7	225: 0: 17: 27	70224
L0127	1704 - 1714	225: 0: 13: 59	225: 23: 11: 3	70225
L128	1716 - 1728	225: 23: 16: 39	227: 0: 33: 12	70226
dup L129	1730 - 1741	227: 0: 33: 12	227: 23: 28: 24	70227
L0130	1744 - 1751	227: 23: 33: 44	228: 17: 23: 36	70228
L0131	1761 - 1771	229: 9: 40: 40	230: 0: 4: 24	70229
L132	1771 - 1782	230: 0: 0: 56	231: 1: 4: 56	70230
L133	1784 - 1798	230: 23: 2: 32	232: 0: 19: 20	70231
L0135	1812 - 1821	233: 5: 8: 8	233: 22: 29: 12	70233
L0137	1838 - 1849	234: 23: 43: 36	236: 0: 49: 12	70235
L0138	1851 - 1865	236: 0: 41: 12	237: 0: 0: 8	70236
L139	1865 - 1876	236: 23: 59: 20	238: 1: 4: 24	70237
L0140	1878 - 1886	238: 1: 0: 40	238: 18: 37: 44	70238
L0143	1918 - 1929	241: 0: 30: 48	241: 23: 28: 8	70241
L0144	1932 - 1942	241: 23: 33: 28	242: 22: 42: 16	70242
L0145	1945 - 1959	243: 0: 48: 8	244: 0: 5: 28	70243
L0146	1959 - 1972	244: 3: 27: 4	245: 1: 4: 40	70244
L0147	1972 - 1986	244: 23: 1: 60	246: 0: 19: 4	70245
L0149	1999 - 2010	247: 1: 16: 24	248: 0: 33: 44	70247
L0150	2012 - 2024	248: 2: 14: 16	249: 1: 45: 60	70248
L0151	2026 - 2037	248: 23: 44: 56	250: 0: 49: 28	70249
L0152	2039 - 2050	250: 2: 27: 52	251: 0: 2: 48	70250
L0153	2053 - 2066	251: 0: 0: 24	252: 1: 4: 40	70251
L0154	2066 - 2080	251: 23: 2: 32	253: 0: 18: 16	70252
L0155	2080 - 2090	253: 0: 14: 32	253: 23: 12: 24	70253
L0156	2093 - 2107	254: 0: 17: 28	255: 0: 33: 28	70254
L157	2106 - 2117	255: 0: 29: 12	255: 23: 28: 40	70255
L158	2120 - 2134	256: 1: 24: 40	257: 0: 49: 28	70256
L0159	2133 - 2143	257: 0: 44: 56	257: 21: 53: 60	70257
L0160	2144 - 2160	257: 23: 48: 40	259: 1: 5: 28	70258

bad lat/long

IRIS 4 ARCHIVAL TAPE LISTING

TAPE	ORBITS	TIMES		YEAR/DAY
L0161	2160 - 2174	259: 1: 0: 56	260: 0: 22: 16	70259
L0162	2174 - 2184	260: 3: 50: 48	260: 23: 13: 28	70260
L0165	2214 - 2228	263: 3: 18: 16	264: 0: 44: 24	70263
L0170	2281 - 2295	268: 1: 10: 48	269: 0: 35: 52	70268
L0171	2294 - 2305	269: 0: 30: 32	269: 23: 28: 56	70269
L0172	2308 - 2322	269: 23: 35: 4	271: 0: 49: 12	70270
L0173	2321 - 2331	271: 0: 45: 12	271: 21: 55: 20	70271
L0174	2334 - 2348	271: 23: 28: 40	273: 1: 0: 40	70272
L0175	2348 - 2359	273: 1: 1: 44	274: 0: 17: 12	70273
L0177	2374 - 2385	275: 0: 36: 8	275: 22: 27: 52	70275
L0178	2390 - 2398	276: 7: 13: 44	276: 21: 41: 44	70276
L0179	2404 - 2412	277: 8: 5: 60	277: 22: 45: 28	70277
L0180	2418 - 2425	278: 8: 2: 16	278: 21: 55: 4	70278
L0181	2429 - 2440	279: 1: 47: 4	279: 1: 48: 8	70279
L0182	2441 - 2453	279: 23: 27: 52	281: 0: 18: 48	70280
L183	2456 - 2469	281: 0: 16: 40	282: 1: 22: 16	70281
L0188	2525 - 2533	286: 7: 16: 8	286: 22: 57: 45	70286
L0189	2535 - 2547	286: 23: 3: 21	288: 0: 23: 5	70287
L0190	2549 - 2560	288: 1: 58: 17	288: 23: 12: 41	70288
L191	2564 - 2574	288: 23: 18: 1	290: 0: 36: 9	70289
L0193	2589 - 2600	290: 23: 35: 37	291: 22: 42: 49	70291
L194	2603 - 2613	292: 2: 26: 1	292: 21: 56: 57	70292
L195	2616 - 2627	292: 23: 50: 49	293: 23: 0: 41	70293
L196	2630 - 2640	294: 2: 13: 13	294: 22: 11: 5	70294
L0197	2642 - 2654	294: 23: 30: 49	295: 23: 13: 45	70295
L0198	2657 - 2671	295: 23: 18: 49	297: 0: 35: 5	70296
L199	2670 - 2681	297: 0: 33: 13	297: 23: 29: 13	70297
L0200	2684 - 2695	297: 23: 34: 49	299: 0: 50: 17	70298
L201	2697 - 2707	299: 0: 46: 17	299: 21: 55: 53	70299
L203	2724 - 2738	300: 23: 2: 33	302: 0: 19: 53	70301
L0204	2737 - 2748	302: 1: 56: 25	302: 23: 14: 33	70302
L0207	2777 - 2788	305: 0: 43: 5	305: 22: 42: 1	70305
L208	2790 - 2801	305: 23: 58: 49	306: 21: 55: 37	70306
L209	2804 - 2815	307: 0: 50: 49	307: 22: 56: 57	70307
L210	2817 - 2828	308: 0: 13: 45	308: 22: 10: 49	70308
L213	2862 - 2869	311: 9: 26: 33	311: 23: 32: 41	70311