B07021

NSSDC INFORMATION PACKET

EXPERIMENT SECTION

61-015B-02

Prepared by
Julius J. Brecht

Spacecraft Common Name	INJUN 1
Spacecraft Alternate Name	1961 Omicron 2, 61-015B
Experiment Name	NSSDC/Cadmium Sulfide Detectors (61-015B-02)

January 1971

Spacecraft Name INJUN 1

Experiment Name NSSDC/Cadmium Sulfide Detectors (61-015B-02)

General Experiment Information

Scientific Success	Success
Instrument Performance	Normal
Date of First Useful Data	06/30/61
Date of Last Useful Data	08/31/62
Date Abandoned	---
Original Experiment Institution	University of Iowa
Experiment Status	Inoperable

Experiment Personnel

Principal Investigator/Dr. J.A. Van Allen/University of Iowa/ Iowa City, Iowa
Other Investigator/Dr. J.W. Freeman/Rice University/Houston, Texas

Experiment Brief Description

A set of five directional CdS crystal energy flux detectors was used to study the flux of low energy protons and ions trapped in the inner radiation belt. Two of the detectors (CdS total energy detectors oriented at 90 and 180 deg with respect to the satellite symmetry axis) had no physical obstruction between space and the crystal and were sensitive to electrons (200 ev to 500 kev) and protons (1 kev to 10 Mev). The second two CdS detectors (CdS proton energy detectors oriented at 90 and 180 deg with respect to the satellite symmetry axis) were identical to the total energy detectors but included small broom magnets which swept electrons with energies E < 500 kev from the beam incident on the crystal. The magnets provided a field of 500 gauss and subtended a solid angle of 0.5 ster at the crystal. The fifth CdS detector (optical monitor oriented at 90 and 180 deg with respect to the satellite symmetry axis) was identical to the other four but was, in addition, fitted with a 0.5 gm/cm^2 transparent quartz window and hence served as a light and X-ray detector. All five detectors had direct current outputs proportional to the incident charged corpuscular energy flux. The detectors were sampled at least once every second, and the detector accumulation times ranged from 9/64 to 61/64 sec (spacecraft had a complex spin-and-tumble motion with an ill defined and variable period of several minutes). The experiment performed nominally throughout the life of the spacecraft.

Objectives of Experiment

The experiment was designed to detect trapped protons and trapped electrons separately in the inner zone using single crystal cadmium sulfide detectors and small magnets. The experiment was designed to detect these particles down to an energy of 1 kev. After INJUN 1 began its unintended spin-tumble motion, the optical monitor cadmium sulfide detectors was also used to determine when several of the other detectors on the satellite were viewing the sun.

Full Description of Experiment

These detectors consisted of bare single crystals of CdS across which 200 v were applied. When ionization was produced in the crystals, whether by particles or photons, a small current flowed and was used to charge a condenser, which ultimately flashed a neon tube in a pulse generating circuit. The pulse rate was then proportional to the ionization rates (J. A. Freeman, "A Satellite Borne Cadmium Sulfide Total Corpuscular Energy Detector," University of Iowa Research Report 61-2, unpublished, February 1961). Each of these five detectors was mounted in a separate cylindrical lead shield situated behind a series of beam collimating and light-baffling apertures.

Two of the detectors (CdS total energy detectors) had no physical obstruction between space and the crystal and were sensitive to energy fluxes in the range 1 to 10,000 erg/cm^2 sec ster (electrons from 200 ev to 500 kev, protons from 1 kev to 10 Mev, or ions of corresponding energies). The efficiency with which lower energy electrons and protons were detected decreased rapidly. The upper limits quoted are for penetrating particles and correspond to the beginning of declining sensitivity. Laboratory calibrations using 100-ev to 100-kev electrons and 1-kev to 100-kev protons revealed that above about 10 kev for electrons and 20 kev for protons the crystal efficiency was nearly independent of particle energy. A detailed description of the characteristics of these two crystals as well as the other three CdS crystals was given by Freeman in 1961 (reference cited above). A discussion of the data is given by B. J. O'Brien and C. D. Laughlin in J. Geophys. Res., 67, 2667, July 1962.

There were two other CdS detectors (the CdS proton energy detectors) identical to the two described above except that they included small broom magnets (500-gauss fields) that swept out electrons of energies less than 500 kev from the incident beam on the crystals. Laboratory tests showed that these detector geometries reduced the electron flux from a Tl 204 source by 90%.

Full Description of Experiment (continued)

The fifth CdS detector (the optical monitor) was geometrically the same as the other four with the addition of a 2-mm thick transparent quartz window. This detector was then sensitive to light and X rays.

The optical monitor along with one each of the CdS total energy and proton energy detectors was oriented at 90 deg to the spacecraft symmetry axis while the two remaining detectors (total energy and proton energy) were oriented at 180 deg to the spacecraft symmetry axis. A discussion of experimental results from these detectors is given by J. W. Freeman in J. Geophys. Res., 67, 921, March 1962.

The counts from each CdS detector on INJUN 1 were accumulated by a separate 12-bit shifting accumulator. The accumulation interval for each of the proton energy detector accumulators, the optical monitor accumulator, and one of the total energy detector (oriented at 90 deg) accumulators was 61/64 sec once every second. The other total energy detector accumulator was sampled at four different times per second so that the fine structure of the outer zone and of the auroral precipitation could be studied. The accumulation intervals for this detector were 16/64, 15/64, 12/64, and 9/64 sec. None of the CdS detectors was prescaled. The accumulator contents were shifted out serially at least once each second and were used to frequency modulate the transmitter at 4096 Hz (a binary "1") or 3073 Hz (a binary "0"). Data were telemetered by command from a ground station. Since there was no recording instrumentation aboard the satellite, the data were taken in real time only.

An onboard single-component magnetometer was used to measure the component of the magnetic flux antiparallel to the CdS detectors oriented at 90 deg with respect to the satellite symmetry axis. The satellite spin axis was supposed to be oriented parallel to the local magnetic field. An algorithm has been devised (A. F. Brisken, "Undirectional Flux Densities of Geomagnetically Trapped Particles, INJUN 1," M.S. thesis at St. Louis University, 1967, TRF document B06836) to determine the angle between the magnetometer axis and the local geomagnetic field lines enabling determination of the angle between the local magnetic field lines and the CdS detectors.

Experiment Performance Summary

Because of the random motion of the satellite, the CdS detectors pointed at the sun occasionally. At these times, there was a large increase in the counting rate of the photosensitive CdS detector (optical monitor). The saturation of this CdS detector was presumed to be due to sunlight. Count rate data are available from June 30, 1961, to August 31, 1962.

Output From NSSDC TRF System

Comments -- The following computer listing consists of the NSSDC Space Science Bibliography for the following:

Experiment Name - NSSDC/Cadmium Sulfide Detectors (61-015B-02)

NSSDC SPACE SCIENCE BIBLIOGRAPHY
ORDERED BY ID KEYWORD

61-015B-02

B02422 AHLUWALIA,H.S., SOLAR COSMIC RAYS OF JULY 13, 1961, J. GEOPHYS. RES., 74, 1230-1237, MAR. 1969.

B00445 FREEMAN,J.W., DETECTION OF AN INTENSE FLUX OF LOW-ENERGY PROTONS OR IONS TRAPPED IN THE INNER RADIATION ZONE, J. GEOPHYS. RES., 67, 921-928, MAR. 1962.

B00062 HULTQVIST,B., AURORA AND THE LOWER IONOSPHERE IN RELATION TO SATELLITE OBSERVATIONS OF ELECTRON PRECIPITATION, SPACE RES., 5, 91-117, 1965. (PROC. 5TH INT. SPACE SCI. SYMP., FLORENCE, ITALY, MAY 12-16, 1964).

B03161 O'BRIEN,B.J., LAUGHLIN,C.D., AND VAN ALLEN,J.A., PRELIMINARY STUDY OF THE GEOMAGNETICALLY-TRAPPED RADIATION PRODUCED BY A HIGH-ALTITUDE NUCLEAR EXPLOSION ON JULY 9, 1962, SUI RPT. UNNUMBERED, AUG. 1962.

B00449 O'BRIEN,B.J., AND LAUGHLIN,C.D., EXTREMELY INTENSE ELECTRON FLUX AT 1000-KILOMETER ALTITUDE IN THE AURORAL ZONE, J. GEOPHYS. RES., 67, 2667-2672, JULY, 1962.

B00442 O'BRIEN,B.J., LAUGHLIN,C.D., VAN ALLEN,J.A., AND FRANK,L.A., MEASUREMENTS OF THE INTENSITY AND SPECTRUM OF ELECTRONS AT 1000-KILOMETER ALTITUDE AND HIGH LATITUDES, J. GEOPHYS. RES., 67, 1209-1225, 1962.

B07020

NSSDC INFORMATION PACKET

DATA SET SECTION

61-015B-02A

Prepared by
Julius J. Brecht

Spacecraft Common Name	INJUN 1
Spacecraft Alternate Names	1961 Omicron 2, 61-015B
Experiment Name	NSSDC/Cadmium Sulfide Detector (61-015B-02)
Data Set Name	NSSDC/Master Magnetic Tape, Cadmium Sulfide Counts (61-015B-02A)

January 1971

Spacecraft Name	INJUN 1
Experiment Name	Cadmium Sulfide Detectors
Data Set Name	NSSDC/Master Tape, CdS Counts (61-015B-02A) EXPER/INJUN 1 Merge W/KP OTHER/INJUN 1 B & L Merge
Period Covered by Data Set	06/30/61 to 08/31/62

General Data Set Information

Data Set Availability/Status	Data at NSSDC - Ready for Distribution
Data Set Form	Magnetic Tape
Size of Data Set at NSSDC	17 Tapes

Data Set Personnel

Contact/Mr. R. Brechwald/U. of Iowa/Iowa City, Iowa

Data Set Brief Description

The data set consists of a time-ordered master science file for INJUN 1 of reduced data on seventeen 7-track, IBM 7094, BCD magnetic tapes written at 800 bpi with 204 characters per logical record and 10 logical records per physical record. The data on this set of tapes consist of detector counting rates for this experiment as well as the experimental data from the rest of the INJUN 1 experiments, with the exception of experiment 7. In addition, the following data are given: time (UT and local time), longitude, latitude, altitude, model magnetic field, McIlwain's L parameter, and B/Bo. This set of tapes is referenced as data sets 61-015B-01B, -02A, -03A, -04A, -05A, and -06A.

Potential Scientific Uses of Data

This data set was submitted by the experimenter to provide a complete set of data containing time and all the telemetered experiment data in a time ordered format on magnetic tape. Orbital information is included.

Data Set Full Description (continued)

detector oriented at 180 deg (CDSB8) and the optical monitor (CDSOPMON). The total energy detector oriented at 180 deg was sampled four times per second (in contrast to one time per second for the other four detectors) so that the fine structure of the outer zone and of the auroral precipitation could be studied. The accumulation intervals for this detector were 16/64 sec, 15/64 sec, 12/64 sec, and 9/64 sec. The first three accumulations correspond to CDSSUM, CDS2, and CDS3 in the data format. For some reason, the 9/64-sec accumulation does not appear in the format. None of the detector accumulators was prescaled. Some calibration information is available. (See Full Description of Experiment 61-015B-02.)

The data format (see TRF document B06967) also includes experimental data from all of the other INJUN 1 detectors except for experiment 61-015B-07 along with the following: time (UT and local time), epoch number, satellite tracking station number (station list is available in TRF document B06965), satellite orbit revolution number (the change from December 31, 1961, to January 1, 1962, occurred during the change from satellite orbit revolution number 2569 to 2570), longitude (deg), latitude (deg), altitude (km), magnetometer reading (counts/sec for which a calibration to the units of gauss is available in TRF unpublished document B06965), model magnetic field (G.), McIlwain's L parameter and I parameter (earth radii), Kp (3-hr index), KpSUM (daily average of 3-hr Kp indices), and B/Bo.

The field labeled "LTIME" in the format contains the satellite clock time (0 - 999 sec) and "HTIME" contains the high order decimal places, e.g., the time 1001 sec would correspond to "LTIME" and "HTIME" of "00001" in the magnetic tape format.

The digital fields (counts/sec) labeled "PARA" and "PARB" in the format are used for various inflight calibration checks, e.g., A-D converters, transmitter voltage, tuning fork temperature, satellite skin temperature, encoder temperature, CdS total energy detector temperature, and photometer temperature. That is, four complete data frames are needed to make six measurements (transmitter voltage, temperatures) and two calibrations (A-D converters). This constitutes one complete cycle of the commutator. Two commutator calibrate voltages were used: one high (98 counts for data channel B (94 for data channel C) corresponding to +12.3 v) and one low (17 counts corresponding to 2.98 v). The calibrate voltage is alternated every four frames. Hence, the data sequence for one of the two A-D converters is -- three measurements low calibrate, three measurements high calibrate, three measurements low calibrate, etc. The measurements to which these outputs correspond can be found by observing the identity

Data Set Full Description (continued)

code ("ID" in the magnetic tape format) and using a conversion table which is available. (See TRF unpublished document B06967.) Calibration curves for the various temperature measurements (counts/sec vs temperature (deg C)) and calibration and transmitter voltage measurements (counts/sec vs temperature) are available (TRF unpublished document B06965).

Finally, a "bad bit indicator" in the format denotes those data records for which incorrect bits were observed during the Barker word search (each telemetry frame began with a fixed identification sequence of eight bits, 11100100, called the Barker word). In general, one should treat these data as being of questionable value to the point of even totally eliminating them from the file.

Data Set Quality

The data set consists of 17 magnetic tapes covering the time period from June 30, 1961, to August 31, 1962 (active life of satellite). The tapes have been checked for parity errors. Points where the data are out of time order have been listed along with the start and stop times of each tape in the data set. The spacecraft clock went through several periods of inaccuracy. However, the universal time was recorded for each data frame and is considered reliable. The probable cause of transmission termination was radiation damage caused by the Starfish nuclear blast. Data transmission amounted to about 3 hr per day.

Data Set Accession Units

Accession Units	Time Covered (Comments)
DD5036	06/30/61 - 07/21/61
DD5037	07/21/61 - 08/12/61
DD5038	08/12/61 - 08/30/61
DD5039	08/30/61 - 09/28/61
DD5040	09/28/61 - 10/31/61
DD5041	10/31/61 - 12/04/61 (parity error in record 294)
DD5042	12/04/61 - 01/08/62
DD5043	01/08/62 - 01/26/62
DD5044	01/26/62 - 02/14/62

DD5045	02/14/62 - 03/09/62	
DD5046	03/09/62 - 03/20/62	
DD5047	03/20/62 - 03/30/62	(parity error in records 305, 306)
DD5048	03/30/62 - 04/11/62	
DD5049	04/11/62 - 04/27/62	
DD5050	04/27/62 - 06/16/62	
DD5051	06/16/62 - 08/12/62	(parity error in record 32)
DD5052	08/12/62 - 08/31/62	

Output From NSSDC TRF System

Comments -- The following computer listing consists of the NSSDC Space Science Bibliography for the following:

Data Set Name NSSDC/Master Magnetic Tape,
Cadmium Sulfide Counts
(61-015B-02A)

61-015H-02A

B06967 MAGNETIC TAPE DATA FORMAT FOR ALL INJUN 1 (61-015H) EXPERIMENTS. UNPUBLISHED. UNNUMBERED. JAN. 1971.

B07D19

1019

NSSDC INFORMATION PACKET

EXPERIMENT SECTION

61-015B-03

Prepared by
Julius J. Brecht

Spacecraft Common Name	INJUN 1
Spacecraft Alternate Name	1961 Omicron 2, 61-015B
Experiment Name	NSSDC/Electron Differential Energy Spectrometer (61-015B-03) EXPER/Magnetic Spectrometer

January 1971

Spacecraft Name	INJUN 1
Experiment Name	NSSDC/Electron Differential Energy Spectrometer (61-015B-03) EXPER/Magnetic Spectrometer

General Experiment Information

Scientific Success	Success
Instrument Performance	Normal
Date of First Useful Data	06/30/61
Date of Last Useful Data	08/31/62
Date Abandoned	---
Experiment Affiliation	University of Iowa
Experiment Status	Inoperable

Experiment Personnel

Principal Investigator/Dr. J.A. Van Allen/U. of Iowa/Iowa City, Iowa
Other Investigator/Dr. C.D. Laughlin/McDonald Observatory/ Fort Davis, Texas

Experiment Brief Description

This experiment was designed to aid in the study of auroral and radiation zone phenomena using three end-window type 213 directional GM counters. Small magnets were used to focus electrons with energies between 40 and 50 kev into one of the GM counters and electrons with energies between 90 and 100 kev into another counter. The third GM counter served as a monitor of penetrating X rays and energetic protons. The detector accumulators were sampled once per second, and the accumulation time for each detector was 61/64 sec (the spacecraft had a complex spin-and-tumble motion with an ill defined and variable period of several minutes). The experiment performed nominally throughout the lifetime of the spacecraft.

Objectives of Experiment

This experiment was intended to aid in the study of auroral and radiation zone phenomena using three end-window Geiger tubes and small broom magnets.

Full Description of Experiment

The spectrometer was composed of three Anton type 213 GM tubes housed in a 3 gm/cm sq cylinder of lead mounted in an aluminum housing. The electrons of energies between 45 and 60 kev were focused into one

Full Description of Experiment (continued)

GM tube (SPL) while electrons between 80 and 110 kev were focused into a second GM tube (SPH) by means of focusing magnets. The third GM tube (SPB) was completely shielded in order to serve as a background counter.

The areas to which the electrons in SPH and SPL were focused were covered by a common 12/10,000 gm/cm^2 mica window with a nominal transmission efficiency of 80% for electrons in the above energy ranges. SPB had a ceramic button in place of the mica and was designed to measure the particles or bremsstrahlung which contaminate SPL and SPH. C. D. Laughlin ("A Satellite Borne Magnetic Electron Spectrometer," University of Iowa Research Report 60-14, unpublished, August 1960) determined that the maximum contribution to the spectrometer counting rates by bremsstrahlung would be a factor of 1/1000 of the count rates due to penetrating particles.

J. W. Freeman ("The Morphology of the Electron Distribution in the Outer Radiation Zone and Near the Magnetospheric Boundary as Observed by Explorer 12," J. Geophys. Res., 69, 1961, May 1, 1964) has shown that the stopping power of the shield of SPB for penetrating electrons may exceed 10 Mev, and hence, the contributions of direct penetrations is very much smaller than that due to bremsstrahlung in the outer belt. Direct measurements of the bremsstrahlung efficiency for an arrangement similar to SPB were made using a 10-millicurie Sr 90 source (0.0- to 2.24-Mev beta particles) with effective mean energy of 1 Mev. The SPB efficiency was 3/10,000 count/sec-electron-cm^2 for 10-Mev monoenergetic electrons and approximately 1/10,000 for the fission electron spectrum. Below this energy the estimated electron efficiency falls monotonically to 1/100,000 at 2 Mev. Protons (E > 40 Mev) were detectable with high efficiency.

The field of view for SPL and SPH was a cone of approximately 3 deg full angle, and all three detectors were oriented perpendicular to the spacecraft symmetry axis which was supposed to be oriented parallel to the local magnetic field. An algorithm has been devised (A. F. Brisken, "Unidirectional Flux Densities of Geomagnetically Trapped Particles, INJUN 1," M.S. thesis at Saint Louis University, 1967) to determine the angle between the magnetometer axis and the local geomagnetic field lines enabling one to determine the angle between the local magnetic field lines and the viewing direction of SPL and SPH.

Efficiency curves (counts/electron vs electron energy) are available for SPL and SPH (B. J. O'Brien et al., J. Geophys. Res., 1209, April 1962). The only correction required to the raw counting rates SPL and SPH according to O'Brien et al. in 1962 (reference cited

Full Description of Experiment (continued)

above), is to subtract the SPB counting rate that is due to particles and bremsstrahlung that penetrate the 3.5 gm/cm sq of lead shielding these detectors. Generally, the SPB counting rate was much less than the SPL or SPH rates. The Explorer 12 spectrometer was the back-up detector for INJUN 1 (B. J. O'Brien et al., J. Geophys. Res., 67, 397, January 1962). A detailed description of a single energy spectrometer of similar design was given by C. D. Laughlin in 1960 (reference cited above).

Data were telemetered by command from a ground station. Since there was no recording instrumentation aboard the satellite, the data were taken in real time only. The accumulator contents were shifted serially at least once each second and were used to frequency modulate the transmitter at 4096 Hz (a binary "1") or 3072 Hz (a binary "0").

Experiment Performance Summary

Because of the complex spin-tumble motion of the satellite, the spectrometer pointed at the sun occasionally. At these times, there was a large increase in the counting rate. A companion CdS particle detector, which had a slightly smaller field of view aligned parallel to the spectrometer, became saturated. The saturation of the CdS detector was presumed to be due to sunlight. Count rate data are available from June 30, 1961, to August 31, 1962.

Output From NSSDC TRF System

Comments -- The following computer listing consists of the NSSDC Space Science Bibliography for the following:

Experiment Name NSSDC/Electron-Differential Energy Spectrometer (61-015B-03)

B07018

NSSDC INFORMATION PACKET

DATA SET SECTION

61-015B-03A

Prepared by
Julius J. Brecht

Spacecraft Common Name	INJUN 1
Spacecraft Alternate Names	1961 Omicron 2, 61-015B
Experiment Name	Electron Differential Energy Spectrometer (61-015B-03)
Data Set Name	NSSDC/Master Tape, Electron Counts (61-015B-03A) EXPER/INJUN 1 Merge W/KP OTHER/INJUN 1 B & L Merge

January 1971

Spacecraft Name	INJUN 1
Experiment Name	Electron Differential Energy Spectrometer
Data Set Name	NSSDC/Master Tape, Electron Counts (61-015B-03A) EXPER/INJUN 1 Merge W/KP OTHER/INJUN 1 B & L Merge
Period Covered by Data Set	06/30/61 to 08/31/62

General Data Set Information

Data Set Availability/Status	Data at NSSDC-Ready for Distribution
Data Set Form	Magnetic Tape
Size of Data Set at NSSDC	17 Tapes

Data Set Personnel

Contact/Mr. R. Brechwald/U. of Iowa/Iowa City, Iowa

Data Set Brief Description

The data set consists of a time ordered master science file for INJUN 1 of reduced data on seventeen 7-track, IBM 7094, BCD magnetic tapes written at 800 bpi with 204 characters per logical record and 10 logical records per physical record. The data on this set of tapes consist of detector counting rates for this experiment as well as the experimental data from the rest of the INJUN 1 experiments, with the exception of experiment 7. In addition, the data include time (UT and local time), longitude, latitude, altitude, model magnetic field, McIlwain's L parameter, and B/Bo. This set of tapes includes data sets 61-015B-01B, -02A, -03A, -04A, -05A, and 06A.

Potential Scientific Uses of Data

This data set was submitted by the experimenter to provide a complete set of data containing time and all the telemetered experiment data in a time-ordered format on magnetic tape. Orbital information is included.

Data Set Full Description

The data are on 7-track master file magnetic tapes written at 800 bpi in an IBM 7094 BCD time-ordered format with 204 characters per logical record and 10 logical records per physical record. There is one file per tape. The count rate data from the three Anton type 213 GM tubes composing the spectrometer (SPB, SPL, SPH) are recorded as prescaled counts/accumulation period (61/64 sec) and have not been dead time corrected. The detector accumulators for SPL and SPH are prescaled by a factor of 4, whereas the accumulator for SPB (background) is not prescaled. Some calibration information is available (see Full Description 61-015B-03). The data format (see TRF document B06967) also includes experimental data from all of the other INJUN 1 detectors except for experiment 61-015B-07 along with the following -- time (UT and local time), epoch number (year-1970), satellite tracking station number (station list is available in TRF unpublished document B06965), satellite orbit revolution number (the change from December 31, 1961, to January 1, 1962, occurred during the change from satellite orbit revolution number 2569 to 2570), longitude (deg), latitude (deg), altitude (km), magnetometer reading (counts/sec for which a calibration to the units of gauss is available in TRF unpublished document B06965), model magnetic field (gauss), McIlwain's L parameter and I parameter (earth radii), Kp (3-hr index, KpSUM (daily average of 3-hr Kp indices), and B/Bo.

The field labeled "LTIME" in the format contains the satellite clock time (0 - 999 sec), and "HTIME" contains the higher order decimal places, e.g., the time 1001 sec would correspond to "LTIME" of "001" and "HTIME" of "00001" in the magnetic tape format. The digital fields (counts/sec) labeled "PARA" and "PARB" in the format are used for various inflight calibration checks, e.g., A-D converters, transmitter voltage, tuning fork temperature, satellite skin temperature, encoder temperature, CdS total energy detector temperature, and photometer temperature. That is, four complete data frames are needed to make six measurements (transmitter voltage, temperatures) and two calibrations (A-D converters). This constitutes one complete cycle of the commutator. Two commutator calibrate voltage were used -- one high (98 counts for data channel B, 94 for data channel C) corresponding to 12.3 v) and one low (17 counts corresponding to 2.98 v). The calibrate voltage was alternated every four frames. Hence, the data sequence for one of the two A-D converters is -- three measurements in the low calibrate mode, three measurements in the high calibrate mode, three measurements in the low calibrate mode, etc. The measurements to which these outputs correspond can be found by observing the identity code ("ID" in the format) and using a conversion table which is available (see TRF unpublished document B06967). Calibration curves for the various temperature measurements (counts/sec vs temperature (deg C)) and calibration and transmitter voltage measurements (counts/sec vs temperature) are available. (See TRF unpublished document B06965.)

Data Set Full Description (continued)

Finally, a "bad bit indicator" in the format denotes those data records for which incorrect bits were observed during the Barker word search (each telemetry frame began with a fixed identification sequence of eight bits, 11100100, called the Barker word). In general one should treat these data as being of questionable value to the point of even totally eliminating them from the file.

Data Set Quality

The data set consists of 17 magnetic tapes covering the time period from June 30, 1961, to August 31, 1962 (active life of satellite). The tapes have been checked for parity errors. Points where the data are out of time order have been listed along with the start and stop times of each tape in the data set. The spacecraft clock went through several periods of inaccuracy. However, the universal time was recorded for each data frame and is considered reliable. The probable cause of transmission termination was radiation damage caused by the Starfish nuclear blast. Data transmission amounted to about 3 hr per day.

Data Set Accession Units

Accession Units	Time Covered (Comments)
DD5036	06/30/61 - 07/21/61
DD5037	07/21/61 - 08/12/61
DD5038	08/12/61 - 08/30/61
DD5039	08/30/61 - 09/28/61
DD5040	09/28/61 - 10/31/61
DD5041	10/31/61 - 12/04/61 (parity error in record 294)
DD5042	12/04/61 - 01/08/62
DD5043	01/08/62 - 01/26/62
DD5044	01/26/62 - 02/14/62
DD5045	02/14/62 - 03/09/62
DD5046	03/09/62 - 03/20/62
DD5047	03/20/62 - 03/30/62 (parity error in records 305, 306)

Data Set Accession Units (continued)

Accession Units	Time Covered (Comments)
DD5048	03/30/62 - 04/11/62
DD5049	04/11/62 - 04/27/62
DD5050	04/27/62 - 06/16/62
DD5051	06/16/62 - 08/12/62 (parity error in record 32)
DD5052	08/12/62 - 08/31/62

Output From NSSDC TRF System

Comments -- The following computer listing consists of the NSSDC Space Science Bibliography for the following:

Data Set Name - NSSDC/Master Magnetic Tape, Electron Counts (61-015B-03A)

B07D17

NSSDC INFORMATION PACKET

DATA SET SECTION

61-015B-01A

Prepared by
Julius J. Brecht

Spacecraft Common Name	INJUN 1
Spacecraft Alternate Names	1961 Omicron 2, 61-015B
Experiment Name	NSSDC/GM Counter (61-015B-01)
Data Set Name	NSSDC/Tabulation of 2- to 12-A Solar Soft X-Ray Data (61-015B-01A)

January 1971

Spacecraft Name INJUN 1

Experiment Name NSSDC/GM Counter

Data Set Name NSSDC/Tabulation of 2- to 12-A Solar Soft X-Ray Data (61-015B-01A)

Period Covered by Data Set 06/29/61 to 08/12/62

General Data Set Information

Data Set Availability/Status - Data in Published Report

Data Set Form - Tabular Form on Hard Copy

Size of Data Set at NSSDC - One Sheet of Paper

Data Set Personnel

Contact/Dr. C. D. Wende/NASA-GSFC/Greenbelt, Md.

Data Set Brief Description

This is a reduced data set on one sheet of paper in the form of a table of GM tube counting rates (counts/sec) due to solar X rays in the 2- to 12-A range, date (month, day, yr), and time (UT) chronologically ordered. The X-ray counting rates were distinguished from particle counting rates by observing when the CdS optical monitor detector (NSSDC experiment number 61-015B-02) pointed toward the sun. This latter detector was aligned parallel to the GM tube. Data are available from June 29, 1961, to August 12, 1962.

Potential Scientific Uses of Data

This data set was submitted by the experimenter to provide an overall view of the X-ray data in tabular form arranged chronologically.

Data Set Full Description

The data are on one sheet of paper in tabular form and consist of counting rates due to solar X rays (counts/sec), date (month, day, yr), and time (UT). The data were collected from the tracking stations by the University of Iowa and decoded with an IBM 7070 computer. The data were then searched for times when the CdS detector became saturated and when the GM tube simultaneously showed a distinct peak. For these times, the differences (in counts/sec) between the peak and background rates for the GM tube were determined.

Data Set Quality

The data are on one sheet of paper in tabular form. The soft X-ray observations were made at sporadic intervals from June 29, 1961, to August 12, 1962. The complete data set appears in the appendix of an NSSDC Data Users' Note (NSSDC 69-08).

Data Set Accession Units

Accession Unit	Time Covered
B06864	06/29/61 to 0 /12/62

Output From NSSDC TRF System

Comments -- The following computer listing consists of the NSSDC Space Science Bibliography for the following:

Data Set Name — NSSDC/Tabulation of 2- to 12-A Solar Soft X-Ray Data (61-015B-01A)

61-015R-01A

B06964 WENDE,C.D., AND MCHUGH,P.S., INJUN 1 (1961 OMICRON 2) SOFT X-RAY EXPERIMENT, NATIONAL SPACE SCIENCE DATA CENTER, DATA USERS' NOTE 69-08, AUG. 1969.

B07017

B5 76 6

EXPERIMENT SECTION

61-015B-01

Prepared by
Julius J. Brecht

Spacecraft Common Name	INJUN 1
Spacecraft Alternate Names	1961 Omicron 2, 61-015B
Experiment Name	NSSDC/GM Counter (61-015B-01)

January 1971

Spacecraft Name INJUN 1

Experiment Name NSSDC/GI Counter (61-015B-01)

General Experiment Information

Scientific Success	Success
Instrument Performance	Normal
Date of First Useful Data	06/30/61
Date of Last Useful Data	08/31/62
Date Abandoned	--
Experiment Affiliation	University of Iowa
Experiment Status	Inoperable

Experiment Personnel

Principal Investigator/Dr. L. A. Frank/U. of Iowa/Iowa City, Iowa

Other Investigator/Dr. J. A. Van Allen/U. of Iowa/Iowa City, Iowa

Experiment Brief Description

An Anton type 213 directional Geiger tube detector was used to detect solar X rays in the 2- to 12-A range, electrons ($E \geq 40$ kev) and protons ($E \geq 0.5$ Mev). The detector was sampled every second, and the accumulation time for the detector was 61/64 sec (the spacecraft had a complex spin-and-tumble motion with an ill defined and variable period of several minutes). The soft X-ray observations were made at sporadic intervals from June 29, 1961, through August 12, 1962 (about 74 min of data). The experiment performed nominally throughout the life of the spacecraft.

Objectives of the Experiment

The experiment was designed to detect electrons ($E \geq 40$ kev) and protons ($E \geq 0.5$ Mev) using an Anton type 213 GM tube. The instrument was also used to detect solar X rays in the 2- to 12-A range.

Full Description of Experiment

The detector was a shielded, end window, Anton type 213 Geiger tube with a mica window nominally 1.2 mg/sq cm thick. The lead shielding was 4.5 gm/sq cm thick. The field of view of the detector was a circular cone with a full angle of 30 deg.

The 213 GM tube was sensitive to electrons ($E \geq 40$ kev), protons ($E \geq 500$ kev), and X rays (in the bandpass 2 to 12 A). The detector was capable of counting up to approximately 20,000 counts/sec. Due to the relatively large cone of acceptance for the tube, L. A. Frank and J. A. Van Allen ("Intensity of Electrons in the Earth's Inner Radiation Zone," University of Iowa Research Report 62-27, December 1962) estimate that the computed fluxes are approximately 30% low. To avoid this error, one would have to know the response of the GM tube as a function of the angle between the viewing axis of the tube and the incoming particle flux. A dead-time correction curve is available. (See TRF unpublished document B06966.)

Because of the complex spin-tumble motion of the satellite, the Geiger tube, which was oriented normal to the spacecraft symmetry axis, pointed at the sun only occasionally. At these times, there was a large increase in the counting rate. A companion photosensitive CdS particle detector (NSSDC experiment identification 61-015B-02), which had a slightly smaller field of view and was aligned parallel to the GM tube, became saturated. The saturation of the CdS detector was presumed to be due to sunlight; the increase in the GM tube count rate (above the background) was presumed to be due to solar X rays.

An onboard single-component magnetometer was used to measure the component of the magnetic flux perpendicular to the satellite symmetry axis which itself was supposed to be parallel to the ambient magnetic field. An algorithm has been devised (A. F. Brisken, "Unidirectional Flux Densities of Geomagnetically Trapped Particles, INJUN 1," M.S. Thesis at Saint Louis University, 1967, NSSDC TRF document B06836) to determine the angle between the magnetometer axis and the local geomagnetic field lines enabling one to determine the angle between the local magnetic field lines and the 213 GM tube.

The GM tube was not calibrated for soft X-ray response prior to launch. A GM tube of similar design, an EON type 6213, was later calibrated by comparing its counting rate with that of a standard GM tube (EON type 6231) while both traversed a monochromatic X-ray beam. From experience gained in cross-correlating the counting rates from the three EON 6213 GM tubes flown on Explorer 33 with one on Explorer 35, a maximum uncertainty in the overall X-ray fluxes (or counting rates) of less than a factor of 2 is expected.

Full Description of Experiment (continued)

The counts from each detector in INJUN 1 were accumulated by a separate 12-bit shifting accumulator. The 213 GM counter was prescaled by a factor of 8, and counts were accumulated for 61/64 sec. The accumulator contents were shifted out serially once each second and used to frequency modulate the transmitter at 4096 Hz (a binary "1") or 3072 Hz (a binary "0"). Data were telemetered by command from a ground tracking station. Since there was no recording instrumentation aboard the satellite, data were taken in real time only.

Experiment Performance Summary

Because of the complex spin-tumble motion of the satellite, the GM tube pointed at the sun only occasionally. At these times, there was a large increase in the counting rate. A companion photosensitive CdS particle detector, which had a slightly smaller field of view and was aligned parallel to the GM tube, became saturated. The saturation of the CdS detector was presumed to be due to sunlight; the increase in the GM tube count rate (above the background) was presumed to be due to solar X rays.

Soft X-ray observations were made at sporadic intervals during the lifetime of the experiment (June 29, 1961, to August 12, 1962). The total accumulated time during which the experiment sent back useful X-ray information was about 74 min. Useful particle count rate data are available from June 30, 1961, to August 31, 1962.

Output From NSSDC TRF System

Comments -- The following computer listing consists of the NSSDC Space Science Bibliography for the following:

Experiment Name • NSSDC/GM Counter (61-015B-01)

B07015

B07015

NSSDC INFORMATION PACKET

DATA SET SECTION

61-015B-01B

Prepared by
Julius J. Brecht

Spacecraft Common Name	INJUN 1
Spacecraft Alternate Names	1961 Omicron 2, 61-015B
Experiment Name	NSSDC/GM Counter (61-015B-01)
Data Set Name	NSSDC/Master Tape, GM Counts (61-015B-01B) EXPER/INJUN 1 Merge W/KP OTHER/INJUN 1 B & L Merge

January 1971

Spacecraft Name INJUN 1

Experiment Name NSSDC/GM Counter

Data Set Name NSSDC/Master Tape, GM Counts (61-015B-01B)
EXPER/INJUN 1 Merge W/KP
OTHER/INJUN 1 B & L Merge

Period Covered by Data Set 06/30/61 to 08/31/62

General Data Set Information

Data Set Availability/Status - Data at NSSDC - Ready for Distribution

Data Set Form - Magnetic Tape

Size of Data Set at NSSDC - 17 Tapes

Data Set Personnel

Contact/Mr. R. Brechwald/U. of Iowa/Iowa City, Iowa

Data Set Brief Description

The data set consists of a time ordered master science file for INJUN 1 of reduced data on seventeen 7-track, IBM 7094, BCD magnetic tapes written at 800 bpi with 204 characters per logical record and 10 logical records per physical record. The data on this set of tapes consist of detector counting rates for this experiment as well as the experimental data from the rest of the INJUN 1 experiments, with the exception of experiment 7. In addition, the following data are given - time (UT and local time), longitude, latitude, altitude, model magnetic field, McIlwain's L parameter, and B/Bo. This set of tapes is referenced as data sets 61-015B-01B, -02A, -03A, -04A, -05A, and -06A.

Potential Scientific Uses of Data

This data set was submitted by the experimenter to provide a complete set of data containing time and all the telemetered experiment data in a time-ordered format on magnetic tape. Orbital information is included.

Data Set Full Description

The data are on 7-track master file magnetic tapes written at 800 bpi in an IBM 7094, BCD, time-ordered format with 204 characters per logical record and 10 logical records per physical record. There is one file per tape. The count rate data from the 213 GM tube

Data Set Full Description (continued)

are recorded as counts/accumulation period (61/64 sec) and have not been dead-time corrected. A dead-time correction curve and a transmission curve (counts/incident electron vs electron energy) are available for the 213 GM tube data (see TRF unpublished document B06966). The detector accumulator was prescaled by a factor of 8. The data format (see TRF unpublished document B06967) also includes experimental data from all of the other INJUN 1 detectors, except for experiment 61-015B-07, along with the following -- time (UT and local time), epoch number (year -- 1900), satellite tracking station number (station list is available in TRF unpublished document B06965), satellite orbit revolution number (the change from December 31, 1961, to January 1, 1962, occurred during the change from satellite orbit revolution number 2569 to 2570), longitude (deg), latitude (deg), altitude (km), magnetometer reading (counts/sec for which a calibration to the units of gauss is available in TRF unpublished document B06965), model magnetic field (gauss), McIlwain's L parameter and I parameter (earth radii), Kp (3-hr index, KpSUM, daily average of 3-hr Kp indices), and B/Bo.

The field labeled "LTIME" in the format contains the satellite clock time (0 - 999 sec), and "HTIME" contains the higher order decimal places, e.g., the time 1001 sec would correspond to "LTIME" of "001" and "HTIME" of "00001" in the magnetic tape format. The digital fields (counts/sec) labeled "PARA" and "PARB" in the format are used for various inflight calibration checks, e.g., A-D converters, transmitter voltage, tuning fork temperature, satellite skin temperature, encoder temperature, CdS total energy detector temperature, and photometer temperature. That is, four complete data frames are needed to make six measurements (transmitter voltage, temperatures) and two calibrations (A-D converters). This constitutes one complete cycle of the commutator. Two commutator calibrate voltages were used -- one high (98 counts for data channel B, 94 for data channel C corresponding to +12.3 v) and one low (17 counts corresponding to 2.98 v). The calibrate voltage was alternated every four frames. Hence, the data sequence for one of the two A-D converters is -- three measurements in the low calibrate mode, three measurements in the high energy calibrate mode, three measurements in the low calibrate mode, etc. The measurements to which these outputs correspond can be found by observing the identity code ("ID" in the format) and using a conversion table which is available (see TRF unpublished document B06967). Calibration curves for the various temperature measurements (counts/sec vs temperature (deg C) and calibration and transmitter voltage measurements (counts/sec vs voltage) are available (see spacecraft section, TRF unpublished document B06965).

Data Set Full Description (continued)

Finally, a "bad bit indicator" in the format denotes those data records for which incorrect bits were observed during the Barker-word search (each telemetry frame began with a fixed identification sequence of eight bits, 11100100, called the Barker word). In general, one should treat these data as being of questionable value to the point of even totally eliminating them from the file.

Data Set Quality

The data set consists of 17 magnetic tapes covering the time period from June 30, 1961, to August 31, 1962 (active life of satellite). The tapes have been checked for parity errors. Points where the data are out of time order have been listed along with the start and stop times of each tape in the data set. The spacecraft clock went through several periods of inaccuracy. However, the universal time was recorded for each data frame and is considered reliable. The probable cause of transmission termination was radiation damage caused by the Starfish nuclear blast. Data transmission amounted to about 3 hr per day.

Data Set Accession Units

Accession Units	Time Covered (Comments)
DD5036	06/30/61 - 07/21/61
DD5037	07/21/61 - 08/12/61
DD5038	08/12/61 - 08/30/61
DD5039	08/30/61 - 09/28/61
DD5040	09/28/61 - 10/31/61
DD5041	10/31/61 - 12/04/61 (parity error in record 294)
DD5042	12/04/61 - 01/08/62
DD5043	01/08/62 - 01/26/62
DD5044	01/26/62 - 02/14/62
DD5045	02/14/62 - 03/09/62
DD5046	03/09/62 - 03/20/62
DD5047	03/20/62 - 03/30/62 (parity error in records 305, 306)
DD5048	03/30/62 - 04/11/62
DD5049	04/11/62 - 04/27/62
DD5050	04/27/62 - 06/16/62
DD5051	06/16/62 - 08/12/62 (parity error in record 32)
DD5052	08/12/62 - 08/31/62

Output From NSSDC TRF System

Comments -- The following computer listing consists of the NSSDC Space Science Bibliography for the following.

Data Set Name(s) NSSDC/Master Tape, GM Counts (61-015B-01B)

61-0158-01B

B06967 MAGNETIC TAPE DATA FORMAT FOR ALL INJUN 1 (61-0158) EXPERIMENTS. UNPUBLISHED, UNNUMBERED, JAN. 1971.

B07015

B07014

B07014

NSSDC INFORMATION PACKET

SPACECRAFT SECTION

61-015B

Prepared by
Julius J. Brecht

Spacecraft Common Name	INJUN 1
Spacecraft Alternate Names	1961 Omicron 2, 61-015B

January 1971

Spacecraft Common Name INJUN 1

Spacecraft Alternate Names 1961 Omicron 2, 61-015B

Spacecraft Dates

Launch Date and Time	06/29/61 0420
Date Last Usable Spacecraft Data Recorded	08/31/62
Date Last Spacecraft Data Recorded	03/06/63
Designed Lifetime of Spacecraft Systems	12 mo.
Decay Date	-
Spacecraft Weight in Orbit	18 kg
Launch Country/Site	USA/Cape Kennedy
Spacecraft Operational Status Code	Inoperable

Spacecraft Orbital Parameters

Epoch Date and Time	06/29/61 0448
Apogee (radial distance, km)	7377
Perigee (radial distance, km)	7260
Period (min)	103.9
Inclination (deg)	66.82
Eccentricity	0.008
Apogee Local Time	-
Orbit Type	Geocentric

Spacecraft Personnel

Project Manager/Dr. J.A. Van Allen/U. of Iowa/Iowa City, Iowa

Project Scientist/Dr. B.J. O'Brien/U. of Sydney/Sydney, Australia

General Contact/Project Engineer/Dr. D.A. Gurnett/U. of Iowa/
Iowa City, Iowa

Brief Description

The satellite INJUN 1 was the first of a series of spacecraft designed and built by the University of Iowa to study the natural and artificial trapped radiation belts, aurorae and airglow, and other geophysical phenomena. INJUN 1 was launched simultaneously with Transit 4-A and GREB 3. Transit 4-A successfully separated from INJUN 1, but GREB 3 did not. INJUN 1 was designed to be magnetically aligned. However, since GREB 3 blocked the view of the photometer, it was impossible to keep the satellite constantly oriented on the terrestrial magnetic field throughout an orbit. A single axis fluxgate magnetometer was used to monitor the orientation of the spacecraft with respect to the local magnetic field. INJUN 1 had a complex spin-and-tumble motion with an ill defined and variable period of several minutes. The satellite sent radiation data until March 6, 1963, and is expected to be in orbit for about 900 yr.

Spacecraft Mission Objectives

The INJUN 1 experiments were designed primarily to investigate auroral and radiation zone (both natural and artificial) phenomena including both precipitated and trapped particles. It was intended that several of the particle detectors would measure particles that initiated aurorae while the photometer would measure the intensity of auroral light generated as these particles penetrated into the atmosphere. INJUN 1 was also designed to monitor solar proton phenomena and survey the weak and permanent airglow. Some experiments were not able to meet their objectives because of the failure of GREB 3 to separate from INJUN 1.

Full Description of Spacecraft

Spacecraft Configuration

INJUN 1 was an 18-kg, 16-sided parallelepiped 13 in. high and about 16 in. in diameter. The main structural parts included a top plate, a bottom plate, and a cylindrical center column between the two plates. Twelve of the sides were used for mounting solar cells and four for mounting the antenna. These last four side plates also had openings for the particle detectors.

Full Description of Spacecraft (continued)

INJUN 1 carried an Alnico dipole magnet (parallel to the center column), which should have aligned the satellite parallel to the local magnetic field lines. The satellite also had 12 permalloy hysteresis damping rods. The antenna system of the satellite consisted of two pairs of bent dipole antennas (122.7 cm long) in planes perpendicular to each other and both planes containing the cylindrical axis of the center column of the satellite.

Power System

Power was provided by 960 Hoffman type 5M120C - 6% nominal efficiency solar cells (80 cells/panel, 12 panels). The basic power system consisted of a single pack of 15 Gulton nickel-cadmium VOD-S cells in series which were trickle charged by the solar cells. Each VOD-S cell had a voltage of 1.20 v at 10% discharge by about 5% during the average transmission period, so that nominally the trappings would supply +19.5 v, +13.0 v, and +6.5 v called V3, V2, and V1, respectively. The output voltage, V3, of the battery pack was continuously monitored to determine the power supply status. A deck within the center column provided regulated voltages for the command receiver, the CdS array, the aspect sensor, and the analog channels, e.g., temperature measurements at various points in the satellite. Also available as a separate output on each of the two CdS 200-v supplies was a 30-v regulated voltage which was used as a bias for the solid-state detectors.

Onboard Propulsion System

None.

Telemetry System

The telemetry of INJUN 1 was based on a carrier frequency of 136.5 MHz modulated by a subcarrier oscillator between two states of 3072 and 4096 Hz. The radiated power of the telemetry transmitter was 100 mw. Data were transmitted in the form of data frames, one per second. Each frame consisted of 256 bits of 64 four-bit words and was loaded one word at a time from the analog-to-digital converters and shift registers. The loading process started with channel 1 or word 1 and proceeded to channel 64 or word 64 in ascending order and then restarted. The information contained in a data frame is available. (See TRF unpublished document B06965.)

Each detector requiring an accumulation of counts was connected (for less than a second) to an accumulator. During the remaining part of the second, the detector was disconnected from the accumulator.

Full Description of Spacecraft (continued)

The data were removed from the accumulators to shift registers for transmission, and then the counter was reconnected to the emptied accumulator to repeat the cycle. Sensors provided a continuous output voltage to the analog-to-digital converters which in turn continuously had a number available for loading on the telemetry frame.

One-sec time pulses from the satellite clock were accumulated on a nondestruct shift register of 24 bits. This shift register was read out during each transmitted telemetry frame thus providing a unique serial identification of that frame. The shift register was designed to run up to 16,777,216 sec (194 days, 4 hr, 20 min, 16 sec) and then start again from zero. Each telemetry frame began with a fixed identification sequence of eight bits, 11100100 (Barker word). This sequence in conjunction with the clock words was used to synchronize the automatic data decoder which converted the data to computer format for use with the University of Iowa IBM 7070 computer.

Attitude Control System

The spacecraft was supposed to be magnetically aligned using a large bar magnet oriented along the satellite symmetry axis. However, due to the nonseparation of INJUN 1 and GREB 3, INJUN 1 was never really magnetically aligned with the local magnetic field.

Attitude Sensors

A single axis Schonstedt fluxgate magnetometer was used as a null instrument to check the satellite's alignment. The magnetometer was mounted so as to point normal to the magnetic field vector and had a range of 0 to 0.5 G. Measurements were made at the rate of one per second with every fourth measurement being a calibration. The calibration curve for the magnetometer is available. (See TRF unpublished document B06965.)

Two calibrations of the magnetometer were used alternately. Hence, the data sequence was three measurements in the low calibrate mode (113 counts corresponding to 0.00 v), three measurements in the high calibrate mode (215 counts corresponding to +1.56 v), three measurements in the low calibrate mode, etc. The frame in which a calibration occurs can be determined from the temperature and voltage measurement identity code (ID in magnetic tape format, see TRF unpublished document B06967). The magnetometer calibration occurred during the same frame in which the temperature and voltage measurements were calibrated. Due to an electrical design error, the first measurement in the sequence of three measurements is in error. The recorded count is low. The conversion equation from magnetometer volts to magnetic field strength, in gauss, is V/B = 5.25 v/G.

Full Description of Spacecraft (continued)

The magnetometer axis was parallel to the axes of all 90-deg detectors except for two of the p-n junction detectors. The sense of the magnetometer was such that a positive voltage output indicated that the detectors whose axes were parallel to it were viewing particles backscattered from lower altitudes when in the northern hemisphere.

The cadmium sulfide optical monitor (experiment 61-015B-02) was used to determine when the detectors were pointing toward the sun.

Command System

The INJUN 1 command system consisted of a VHF receiver, tone decoder, and a set of digital logic. This arrangement allowed ground stations to load "turn on" commands containing digital information about the duration of the transmitter "on" interval. Three "on" intervals were available including 8-min, 32-min, and $2^1/_4$-hr modes. For an average of about 10 commands per day, the total transmitting time amounted to over 3 hr per day. A quiescent operational state was also available in which power was supplied only to the command system and the payload clock.

Onboard Data Storage

Accumulators were incorporated into the encoder to accommodate the experiments having digital outputs. There was no onboard tape recorder.

Onboard Data Processing

An onboard analog-to-digital converter was used to monitor satellite voltages, temperatures, and other analog data.

Spacecraft Performance Summary

INJUN 1 was launched simultaneously with Transit 4-A and GREB 3. Transit 4-A successfully separated from INJUN 1, but GREB 3 did not. INJUN 1 was designed to be magnetically aligned. However, due to the presence of GREB 3 (which blocked the view of the photometer, experiment 61-015B-04), it was impossible to keep the satellite constantly oriented on the terrestrial magnetic field throughout an orbit. INJUN 1 had a complex spin-tumble motion with an ill defined and variable period of several minutes. The satellite sent back radiation data until March 6, 1963, and is expected to be in orbit for about 900 yr. The failure of several of the detectors later on in the flight has been attributed to radiation damage by the "Starfish" nuclear blast.

Output From NSSDC TRF System

Comments -- The following computer listing consists of the NSSDC Space Science Bibliography for the following -

Spacecraft Name — INJUN 1 (1961 Omicron 2, 61-015B)

61-015B

B04672 UNIDIRECTIONAL AND OMNIDIRECTIONAL FLUX DENSITIES OF TRAPPED PARTICLES. INJUN 1 AND EXPLORER 4 SATELLITES. FINAL REPORT. SAINT LOUIS U.. UNNUMBERED. FEB. 1968. DASA RPT. 2052.

B04700 INJUN COOKBOOK. UNPUBLISHED. UNNUMBERED. UNDATED.

B06965 SPACECRAFT PARAMETERS AND CALIBRATIONS FOR INJUN 1 (61-015B). UNPUBLISHED. UNNUMBERED. JAN. 1971.

B06838 FENNELL.J.F.. AND BRISKEN.A.F.. SAINT LOUIS UNIVERSITY INJUN 1 COOKBOOK. PART 1. SAINT LOUIS U.. PHYSICS DEPARTMENT. APPENDIX 2. FEB. 1967. DASA REPORT NO. 2052-2.

B06839 FENNELL.J.F.. SAINT LOUIS UNIVERSITY INJUN 1 COOKBOOK. PART 2. SAINT LOUIS U.. PHYSICS DEPARTMENT. APPENDIX 3. SEPT. 1967. DASA REPORT NO. 2052-3.

B07014