INTERNATIONAL URSIGRAM

and

WORLD DAYS SERVICE

I.U.W.D.S.

Synoptic Codes

for

Solar and Geophysical Data

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Introduction

The International Ursigram and World Days Service (IUWDS) provides information rapidly to the world scientific community to assist in the planning, coordination and conduct of scientific work in disciplines affected by the sun-earth environment. The IUWDS is a joint service of the International Union of Radio Science (URSI), International Astronomical Union (IAU) and the International Union of Geodesy and Geophysics (IUGG) and a permanent service of the Federation of Astronomical and Geophysical Data Services (FAGS).

The IUWDS was formed in 1962 as a combination of the former International World Days Service, which had been initiated in 1959 to continue many aspects of the International Geophysical Year (IGY) World Days Program, and the former URSI Central Committee on Ursigrams which represented rapid data interchange activities first begun about 1930.

Two basic mechanisms have been selected to accomplish the program of the IUWDS. First, IUWDS prepares the International Geophysical Calendar each year. This calendar gives a list of "World Days" which scientists are encouraged to use for carrying out their experiments. Second, there is the International Ursigram Service for assisting those who need a specific state of solar activity, earth atmosphere or magnetosphere at the time of their experiment. Both programs are designed to be very flexible and can be easily adjusted to fit the needs of the scientific community.

In addition, on behalf of the Committee for Space Research (COSPAR), each month IUWDS summarizes the status of satellite orbits around the earth and of space probes in the interplanetary medium in the Spacewarn Bulletin. Future launches are announced, actual launches are reported, new satellites receive an international designation, decays in the earth atmosphere are predicted and announced, and finally series of satellites useful for international participation are listed. This bulletin is produced by the World Data Center-A for Rockets and Satellites.

Regional Warning Centers

The International Ursigram Service operates through a number of Regional Warning Centers (RWC) scattered all around the world. Warning centers[1] are located in:

Beijing, China	Paris, France	Prague, Czechoslovakia	Warsaw, Poland
Boulder, USA	New Delhi, India	Sydney, Australia	
Moscow, USSR	Ottawa, Canada	Tokyo, Japan	

In its own geographic area, each RWC collects all the data and reports available concerning the state of the sun-earth environment. In some cases, these come from observatories operated directly by the Regional Warning Center. In many cases, they are gathered from regional scientific institutes and universities. The participating observing stations are listed in Appendix C.

Data Exchange

The data accessible by IUWDS are very diverse and are highly regarded by the scientific community. The types of data include:

- spectroheliograms and filtergrams
- observations of magnetic field structures on the sun
- optical observations of sunspot regions
- observations of solar coronal holes by radio and infra-red techniques
- quiet sun emissions from radio to X-ray wavelengths
- reports of flares observed by a wide variety of methods
- solar X-ray data

[1]Complete descriptions of the RWCs are found in Appendix B.

- the flux of solar particles recorded by satellites, by riometers in the polar cap and by neutron monitors
- geomagnetic activity as measured by 3-hourly K indices and by reports of sudden storm commencements
- ionospheric data giving critical frequencies of the F and E layers
- cosmic ray data and reports of Forbush decreases

These data and reports (about 150 data sets from around 100 institutes or observatories) are coded according to the IUWDS code format (Chapters 1–7) and distributed daily on request to users and to other RWCs. Data exchange is generally via a daily, or more frequent, telex message. In addition, the data are exchanged via electronic mail, facsimile transmission, and electronic transfer of images. The daily schedule for the data interchange is listed in the subsections of Appendix B.

Information transmitted through the IUWDS network is analyzed by Regional Warning Centers which produce a number of "summary" reports and forecasts. The "Geoalert" (Chapter 1), a forecast of solar-geophysical conditions for the next few days, is a particularly important one of these reports. Each RWC prepares its own forecast ("Geoalert") and sends it to the World Warning Agency (WWA) in Boulder each day. The WWA then issues a Geoalert which is distributed worldwide each day at 0300 UT through the IUWDS network and through the WMO (World Meteorological Organization) network. Many RWCs also relay the WWA Geoalert to users within their own region.

The IUWDS network is also used for the prompt distribution of the preliminary values of the International Sunspot Number which is prepared monthly at the Royal Observatory of Belgium. In addition, IUWDS relays the geomagnetic "aa" indices which are computed each week at Meudon from two antipodal stations. IUWDS contributed to the production of these indices by supplying the Royal Observatory of Belgium and the "Institut de Physique du Globe" (Paris) with some of the raw data reports.

IUWDS Cooperation

The IUWDS works very closely with other ICSU organizations involved in international cooperation in astronomical, geophysical, and space sciences. In fact, there is no sharp line between the IUWDS "program" and those arranged through other groups. The IUWDS attempts to respond to the needs of the scientific community whether these are expressed formally or informally. Thus IUWDS leaders participate in the work or meetings of the:

- International Union of Radio Science (URSI)
- International Astronomical Union (IAU)
- International Union of Geodesy and Geophysics (IUGG)—particularly IAGA and IAMAP
- Cosmic Ray Commission, International Union of Pure and Applied Physics (IUPAP)
- Committee for Space Research (COSPAR)
- Solar Terrestrial Energy Program (STEP)
- SCOSTEP
- CCIR
- World Meteorological Organization (WMO)

IUWDS and the STP World Data Centers

There is no sharp line between IUWDS work and the activities of the STP World Data Centers. The data handled in the IUWDS-sponsored activities also go to the World Data Centers; the institutions involved are usually the same, and the flow of preliminary and definitive data is thereby coordinated. Finally, it should be noted that there is no real distinction between a large part of the IUWDS program and the SCOSTEP Program-Monitoring the Sun-Earth Environment (MONSEE); in this case also, the leadership and many of the participants are common to the two undertakings. In summary, the IUWDS attempts to provide a central service to the scientific and technical community in many aspects of what might be called "active" coordination of programs involving international cooperation in astronomical, geophysical, and space science.

IUWDS Solar Terrestrial Predictions Workshops

An important function of IUWDS has been to organize a series of scientific workshops in the field of solar-terrestrial prediction. The first of this series was held in Boulder (1979), followed by meetings in Meudon (1986), Sydney (1989), and Ottawa (1992). Following each workshop, scientific papers have been collected into a "Proceedings." These publications have proven valuable to the international scientific community.

IUWDS Steering Committee

The IUWDS Steering Committee comprises representatives of the interested International Council of Scientific Unions (ICSU), as well as some regional representatives and liaison with other interested organizations like the World Meteorological Organization (WMO). The Committee gives recognition to certain national institutions for playing international roles—Regional Warning Centers, Associate Regional Warning Centers, and the World Warning Agency. The Steering Committee meets almost every year and is responsible for the direction and management of the IUWDS service. It is also responsible for cooperation between Warning Centers. An annual report on IUWDS and its operations is produced each January. This report is published by FAGS and usually appears in the URSI Information Bulletin. Members of the IUWDS Steering Committee are:

- Dr. Richard Thompson (IUWDS Chairman)
- Mr. Gary Heckman (IUWDS Secretary, Secretary for Ursigrams)
- Ms. Helen Coffey (IAU Representative)
- Dr. E. A. Tandberg-Hanssen (FAGS Representative)
- Ms. Helen Coffey (IUGG Representative, Secretary for World Days)
- Dr. B. M. Reddy (URSI Representative)
- Mr. Joseph Hirman (RWC Boulder)
- Dr. Li Qibin (RWC China)
- Prof. Meiqing Gao (RWC China)
- Dr. S. I. Adviushin (RWC Moscow)
- Dr. A. D. Danilov (RWC Moscow)
- Dr. B. M. Reddy (RWC New Delhi)
- Dr. Richard Coles (RWC Ottawa)
- Dr. Pierre Lantos (RWC Paris)
- Mr. P. Triska (RWC Prague)
- Dr. D. Cole (RWC Sydney)
- Dr. K. Marubashi (RWC Tokyo)
- Dr. T. Ogawa (RWC Tokyo)
- Dr. Z. Klos (RWC Warsaw)
- Dr. J. Green (WDC–A Rockets and Satellites)

Chapter One

Alerts, Analysis, and Forecast Codes

Alerts, Analysis, and Forecast Codes are used by RWC's in their daily data interchange. The interchange of alerts, summary data and forecasts enables the RWC's to concentrate on data from their regions, and greatly reduce the quantity of data routinely interchanged among RWC's.

Code forms:

UGEOA

UGEOE

UGEOI

UGEOR

UGEOA

Content:

Enables RWC's to send messages containing flare, magnetic, and proton event Advices (forecasts) to other RWC's and to general data users on an established schedule. The UGEOA code has a header containing the word GEOALERT. The PLAIN section is used for text information, for example, the WWA UGEOA may include special messages in the PLAIN section such as SIDC monthly sunspot values, SMM observing schedule, STRATWARM, *etc*.

The WWA UGEOA forecasts are based on RWC inputs (Advices). The WWA UGEOA message will also include the UGEOE, UGEOI, and UGEOR messages for the day. The UGEOA message schedule is:

SYD	=	0000 UT
TOK	=	0130 UT
WWA	=	0330 UT
BEI	=	0730 UT
MEU	=	1230 UT
MOS	=	1400 UT
BOU	=	2200 UT

Example:

```
GEOALERT WWA059
UGEOA  85304  90228  0330/   2122/
12042    23041  31041
99999
PLAIN
text
BT
```

Definition of symbols:

First Line—

GEOALERT	RWCDOY

GEOALERT key word comes from **GEO**Alert Advices (forecasts)

GEOALERT	**RWCDOY**

RWC = Three-letter RWC code
DOY = Julian day of year

Second Line—

UGEOA	IIIII	YMMDD	HHmm/	GSMI/

UGEOA comes from **GEO**Alert Advices (forecasts)

UGEOA	**IIIII**	YMMDD	HHmm/	GSMI/

IIIII = station indicator (see lists in Appendix C)

UGEOA—*Continued*

Second Line—Contd.

UGEOA	I I I I I	**YMMDD**	HHmm/	GSMI/

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc.*
DD = UT day of month of issue

UGEOA	I I I I I	YMMDD	**HHmm/**	GSMI/

HHmm = UT hour and minute of issue
/ = filler

UGEOA	I I I I I	YMMDD	HHmm/	**GSMI/**

G = Ground-based solar data used in forecast
- 0 = none
- 1 = radio
- 2 = solar optical
- 3 = solar magnetic
- 4 = radio and solar opitcal (no solar magnetic)
- 5 = solar optical and solar magnetic (no radio)
- 6 = radio and solar magnetic (no solar optical)
- 9 = all

S = Space-based solar data used in forecast
- 0 = none
- 1 = solar x-rays
- 2 = energetic particles
- 3 = solar x-ray images
- 4 = solar x-rays and energetic particles (no solar x-ray images)
- 5 = energetic particles and solar x-ray images (no solar x-rays)
- 6 = solar x-rays and solar x-ray images (no energetic particles)
- 9 = all

M = Magnetic data used in forecast
- 0 = none
- 1 = spaced-based magnetometers
- 2 = ground-based magnetometers
- 3 = spaced-based and ground-based magnetometers

I = Ionospheric data used in forecast
- 0 = none
- 1 = ionosondes
- 2 = neutron monitors
- 3 = riometers
- 4 = ionosondes and neutron monitors (no riometers)
- 5 = neutron monitors and riometers (no ionosondes)
- 6 = ionosondes and riometers (no neutron monitors)
- 9 = all

/ = filler

UGEOA—*Continued*

Data Lines

	1FIID	**2FIID**	**3FIID**

1 = flare forecast (whole sun) for day **II**
F = forecast
- 0 = Quiet (< 50% probability of C-class flares)
- 1 = Eruptive (C-class flares expected, probability ≥ 50%)
- 2 = Active (M-class flares expected, probability ≥ 50%)
- 3 = Major flares expected (X-class flares expected, probability ≥ 50%)
- 4 = Proton flares expected (proton flares expected, probability ≥ 50%)
- 8 = Warning condition (activity levels expected to increase, but no numeric forecast given)
- / = No forecast

II = day of start of forecast period
D = duration (days)
- / = indefinite duration

1FIID	**2FIID**	**3FIID**

2 = magnetic forecast (local conditions) for day **II**
F = forecast
- 0 = Quiet
- 1 = Active conditions expected ($A \geq 20$ or $K = 4$)
- 2 = Minor storm expected ($A \geq 30$ or $K = 5$)
- 3 = Major magstorm expected ($A \geq 50$ or $K \geq 6$)
- 4 = Severe magstorm expected ($A \geq 100$ or $K \geq 7$)
- 8 = Warning condition (activity levels expected to increase, but no numeric forecast given)
- / = No forecast

II = day of start of forecast period
D = duration (days)
- / = indefinite duration

Note: *Geomagnetic events and indices (observed and predicted), are based on local not planetary conditions.*

1FIID	**2FIID**	**3FIID**

3 = proton forecast for day **II**
F = forecast
- 0 = Quiet
- 1 = Proton event expected (10 pfu at > 10 MeV)
- 2 = Major proton event expected (100 pfu at > 100 MeV)
- 7 = Proton event in progress (> 10 MeV)
- 8 = Warning condition (activity levels expected to increase, but no numeric forecast given)
- / = No forecast

II = day of start of forecast period
D = duration (days)
- / = indefinite duration

UGEOA—*Continued*

Last Data Line—

99999	

99999 = end of data terminator; indicates that all coded data have been received

Text Lines—

PLAIN	BT

PLAIN = Plain-language text information (rationale for forecasts; for example, Mag based on recurrence). Continue to include key words; for example, MAGALERT. . . followed by rationale.

PLAIN	BT

BT = Break in transmission (end of message terminator)

Note: / is to be used for data not available.

UGEOE

Content:

Enables RWC's to send messages containing summaries of significant solar events to other RWC's and to general data users. UGEOE is issued at 0330 UT from RWC BOU. RWC BOU criteria for significant solar events are:

(a) Class M or greater x-ray burst
(b) Optical flare of importance 2B or greater
(c) Radio burst at 245 MHz ($\geq$100 solar flux units above background)
(d) 10-cm Radio burst (100% above background)
(e) Type II or Type IV sweep-frequency burst

Example:

```
UGEOE  85304  90103  0330/  02/01
10111  1020/  10401  25622  12503  24504  32120  95290
99999
PLAIN
text
BT
```

Definition of symbols:

First Line—

UGEOE	I I I I I	YMMDD	HHmm/	dd/nn

UGEOE comes from **GEO**Alert **E**vent summary

UGEOE	**I I I I I**	YMMDD	HHmm/	dd/nn

IIIII = station indicator (see lists in Appendix C)

UGEOE	I I I I I	**YMMDD**	HHmm/	dd/nn

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc.*
DD = UT day of month of issue

UGEOE	I I I I I	YMMDD	**HHmm/**	dd/nn

HHmm = UT hour and minute of issue
/ = filler

UGEOE	I I I I I	YMMDD	HHmm/	**dd/nn**

dd = UT day of month of beginning of event
/ = filler
nn = number of significant solar events (lines) that follow

UGEOE—*Continued*

Data Lines—

$\boxed{\text{HHmmt}}$	HHmm/	HHmmt	cddef	Tabpp	Fabpp	QXXYY	9RRRR	{ *repeat this line for each solar event*

HHmm = UT hour and minute of beginning of event for day **dd**
t = begin time qualifier
- 1 = exact start time of event
- 2 = first observation of event in progress at this time

Note: *The times are associated with the highest priority event according to the list on p. 1–6 in the following order: x-ray burst, optical flare, 245 MHz radio burst, 10-cm radio burst, Type II or Type IV sweep-frequency burst.*

HHmmt	$\boxed{\text{HHmm/}}$	HHmmt	cddef	Tabpp	Fabpp	QXXYY	9RRRR	{ *repeat this line for each solar event*

HHmm = UT hour and minute of maximum of event
/ = filler

HHmmt	HHmm/	$\boxed{\text{HHmmt}}$	cddef	Tabpp	Fabpp	QXXYY	9RRRR	{ *repeat this line for each solar event*

HHmm = UT hour and minute of end of event
t = end time qualifier
- 1 = exact end time of event
- 2 = last observation of event in progress at this time

HHmmt	HHmm/	HHmmt	$\boxed{\text{cddef}}$	Tabpp	Fabpp	QXXYY	9RRRR	{ *repeat this line for each solar event*

c = indicates x-ray event class
- 0 = less than Class C solar event (flux < 10^{-6} Wm^{-2})
- 1 = Class C solar event (10^{-6} Wm^{-2} ≤ flux < 10^{-5} Wm^{-2})
- 2 = Class M solar event (10^{-5} Wm^{-2} ≤ flux < 10^{-4} Wm^{-2})
- 3 = Class X solar event (10^{-4} Wm^{-2} ≤ flux)
- 4 = Class X solar event (10^{-3} Wm^{-2} ≤ flux)
- 9 = no x-ray event observed

dd = x-ray intensity from 1.0 to 9.9 (report x-ray intensity ≥9.9 as 9.9)
- // = no x-ray event observed

e = optical flare importance based upon corrected area in square degrees
- 0 = subflare (s); area ≤ 2.0 square degrees
- 1 = importance 1; 2.1 square degrees < area ≤ 5.1 square degrees
- 2 = importance 2; 5.2 square degrees < area ≤ 12.4 square degrees
- 3 = importance 3; 12.5 square degrees < area ≤ 24.7 square degrees
- 4 = importance 4; area ≥ 24.8 square degrees
- 9 = no optical flare observed

f = optical flare intensity
- 0 = faint
- 1 = normal
- 2 = bright
- 9 = unknown

UGEOE—*Continued*

Data Lines—Continued

HHmmt	HHmm/	HHmmt	cddef	$\boxed{\text{Tabpp}}$	Fabpp	QXXYY	9RRRR	{ *repeat this line for each solar event*

T = Indicates if a Type II sweep was observed and the importance of the Type II sweep
- 0 = no Type II sweep observed
- 1 = importance 1
- 2 = importance 2
- 3 = importance 3
- 9 = unknown

ab = Peak flux (10^{-22} Wm $^{-2}$ Hz $^{-1}$) of radio burst at approximately 245 MHz, where **ab** = **a.b**
pp = Power of ten to apply to "**a.b**"

Note: "**abpp**" *reported as* "**2403**" *would equal* $2.4 \times 10^3 \times 10^{-22}$ Wm $^{-2}$ Hz $^{-1}$

HHmmt	HHmm/	HHmmt	cddef	Tabpp	$\boxed{\text{Fabpp}}$	QXXYY	9RRRR	{ *repeat this line for each solar event*

F = Indicates if a Type IV sweep was observed and the importance of the Type IV sweep
- 0 = no Type IV sweep observed
- 1 = importance 1
- 2 = importance 2
- 3 = importance 3
- 9 = unknown

ab = Peak flux (10^{-22} Wm $^{-2}$ Hz $^{-1}$) of radio burst at 10-cm, where **ab** = **a.b**
pp = Power of ten to apply to "**a.b**"

Note: "**abpp**" *reported as* "**1704**" *would equal* $1.7 \times 10^4 \times 10^{-22}$ Wm $^{-2}$ Hz $^{-1}$

HHmmt	HHmm/	HHmmt	cddef	Tabpp	Fabpp	$\boxed{\text{QXXYY}}$	9RRRR	{ *repeat this line for each solar event*

Q = quadrant (heliographic coordinates) in which the event is observed
- 1 = NE (northeast) 3 = SW (southwest)
- 2 = SE (southeast) 4 = NW (northwest)

XX = distance to central meridian in degrees
YY = heliographic latitude in degrees

HHmmt	HHmm/	HHmmt	cddef	Tabpp	Fabpp	QXXYY	$\boxed{\text{9RRRR}}$	{ *repeat this line for each solar event*

9 = indicates that region number follows
RRRR = RWC region number

Note: *//// indicates no data available.*

UGEOE—*Continued*

Last Data Line—

$\boxed{\text{99999}}$

99999 = end of data terminator; indicates that all data has been received

Text Lines—

$\boxed{\text{PLAIN}}$ BT

PLAIN = Plain-language text information

PLAIN $\boxed{\text{BT}}$

BT = Break in transmission (end of message terminator)

Note: / is to be used for data not available.

UGEOI

Content:

Enables RWC's to send messages containing summaries of daily indices. UGEOI is issued at 0330 UT from RWC BOU.

Example:

```
UGEOI  85304  90103  0330/  02///
10112  21351  30302  41100  50400  62104  71203  80206  92501
99999
PLAIN
text
BT
```

Definition of symbols:

First Line—

UGEOI	I I I I I	YMMDD	HHmm/	dd / / /

UGEOI comes from **GEO**Alert Daily **I**ndices

UGEOI	**I I I I I**	YMMDD	HHmm/	dd / / /

IIIII = station indicator (see lists in Appendix C)

UGEOI	I I I I I	**YMMDD**	HHmm/	dd / / /

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc.*
DD = UT day of month of issue

UGEOI	I I I I I	YMMDD	**HHmm/**	dd / / /

HHmm = UT hour and minute of issue
/ = filler

UGEOI	I I I I I	YMMDD	HHmm/	**dd / / /**

dd = UT day of month of data
/ / / = filler

UGEOI—*Continued*

Data Lines—

1nnnn	2CCCD	3EEEF	4GGGH	5MMXX	6abpp	7abpp	8SSNN	9AAAA

1 = indicates that relative sunspot number for day **dd** follows
nnnn = sunspot number

1nnnn	2CCCD	3EEEF	4GGGH	5MMXX	6abpp	7abpp	8SSNN	9AAAA

2 = indicates that 10.7 cm radio flux for day **dd** follows
CCC = 10.7 cm radio flux
D = number of TENFLARES (solar radio-emission outbursts at 10 cm that are greater than 100% over background)

1nnnn	2CCCD	3EEEF	4GGGH	5MMXX	6abpp	7abpp	8SSNN	9AAAA

3 = indicates that Geomagnetic A-index and events observed locally for day **dd** follows
EEE = Geomagnetic A-index observed
F = important geomagnetic event observed and described as follows:
- 0 = no event
- 1 = end of geomagnetic storm
- 2 = storm in progress
- 6 = gradual storm commencement
- 7 = sudden storm commencement

Note: Geomagnetic events and indices are based on local not planetary conditions.

1nnnn	2CCCD	3EEEF	4GGGH	5MMXX	6abpp	7abpp	8SSNN	9AAAA

4 = indicates that cosmic ray intensity and events observed for day **dd** by Neutron Monitors follows
GGG = median level of cosmic ray intensity (where 1000 is the normal level)
if GGG > 500, then the median level = GGG
if GGG < 500, then the median level = GGG + 1000
GGG *reported as* **024** *would equal* **1024**
GGG *reported as* **892** *would equal* **892**
H = important cosmic-ray event observed and described as follows:
- 0 = no event
- 1 = pre-decrease
- 2 = beginning of a Forbush decrease
- 3 = Forbush decrease in progress
- 4 = end of Forbush decrease
- 5 = arrival of energetic solar particles (GLE)
- 6 = arrival of energetic solar particles (GLE) followed by Forbush decrease

1nnnn	2CCCD	3EEEF	4GGGH	5MMXX	6abpp	7abpp	8SSNN	9AAAA

5 = indicates that number of M and X flares for day **dd** follows
MM = number of M flares
XX = number of X flares

UGEOI—*Continued*

Data Lines—Continued

1AAAA	2CCCD	3EEEF	4GGGH	5MMXX	**6abpp**	7abpp	8SSNN	9AAAA

6 = indicates that x-ray background (.1-.8 nm) for day **dd** follows
ab = x-ray background (.1-.8 nm) in units of Wm^{-2} where **ab** = **a.b**
pp = Power of ten to apply to "**a.b**"

Note: "**abpp**" *reported as* "**2304**" *would equal* 2.3×10^{-4} Wm^{-2}

1AAAA	2CCCD	3EEEF	4GGGH	5MMXX	6abpp	**7abpp**	8SSNN	9AAAA

7 = indicates that particle fluence (> 10MeV) for day **dd** follows
ab = particle fluence (> 10MeV) in units of particles/cm^2-sr-day where **ab** = **a.b**
pp = Power of ten to apply to "**a.b**"

Note: "**abpp**" *reported as* "**4607**" *would equal* 4.6×10^7 particles/cm^2-sr-day

1AAAA	2CCCD	3EEEF	4GGGH	5MMXX	6abpp	7abpp	**8SSNN**	9AAAA

8 = indicates that number of spotted regions and new spot groups for day **dd** follows
SS = number of new spot groups
NN = number of spotted regions

1AAAA	2CCCD	3EEEF	4GGGH	5MMXX	6abpp	7abpp	8SSNN	**9AAAA**

9 = indicates that total sunspot area for day **dd** follows
AAAA = total sunspot area in millionths of the solar hemisphere

Last Data Line—

99999

99999 = end of data terminator; indicates that all data has been received

Text Lines—

PLAIN	BT

PLAIN = Plain-language text information

PLAIN	**BT**

BT = Break in transmission (end of message terminator)

Note: / *is to be used for data not available.*

UGEOR

Content:

Enables RWC's to send messages containing sunspot region data and forecasts to other RWC's and to general data users. RWC's send UGEOR messages as needed. UGEOR is issued at 0330 UT from RWC BOU.

Example:

```
UGEOR 85304  90103  0330/  02/24  03101
12325  20501  31596  43211  50500  60025  43020  26210
99999
PLAIN
text
BT
```

Definition of symbols:

First Line—

UGEOR	I I I I I	YMMDD	HHmm/	dd/hh	IIPnn

UGEOR comes from **GEO**Alert **R**egion summary and forecasts

UGEOR	**I I I I I**	YMMDD	HHmm/	dd/hh	IIPnn

IIIII = station indicator (see lists in Appendix C)

UGEOR	I I I I I	**YMMDD**	HHmm/	dd/hh	IIPnn

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc.*
DD = UT day of month of issue

UGEOR	I I I I I	YMMDD	**HHmm/**	dd/hh	IIPnn

HHmm = UT hour and minute of issue
/ = filler

UGEOR	I I I I I	YMMDD	HHmm/	**dd/hh**	IIPnn

dd = UT day of month of data and region location
/ = filler
hh = UT hour of region location

UGEOR	I I I I I	YMMDD	HHmm/	dd/hh	**IIPnn**

II = starting date of forecast
P = period (days) of forecast (usually 1 day)
nn = number of spotted regions
- 0 = no spotted regions (SPOTNIL)
- 1 = 1 region
- 2 = 2 regions, *etc.*

UGEOR—*Continued*

Data Lines—

1RRRR	2MMXX	3SS12	4ZPCM	5AAAA	6SSSS	QXXYY	FCMXP	{ *repeat this line for each spotted region*

1 = indicates that region number for day **dd** follows
RRRR = region number

1RRRR	**2MMXX**	3SS12	4ZPCM	5AAAA	6SSSS	QXXYY	FCMXP	{ *repeat this line for each spotted region*

2 = indicates that number of x-ray flares for region RRRR for day **dd** follows
MM = number of class M flares
XX = number of class X flares

1RRRR	2MMXX	**3SS12**	4ZPCM	5AAAA	6SSSS	QXXYY	FCMXP	{ *repeat this line for each spotted region*

3 = indicates that number of optical flares for region RRRR for day **dd** follows
SS = number of subflares
1 = number of importance 1 flares
2 = number of flares greater than importance 1

1RRRR	2MMXX	3SS12	**4ZPCM**	5AAAA	6SSSS	QXXYY	FCMXP	{ *repeat this line for each spotted region*

4 = indicates that sunspot type for region RRRR for day **dd** follows
Z = Modified Zurich classification (see fig. 1-1)
- 1 = A
- 2 = B
- 3 = C
- 4 = D
- 5 = E
- 6 = F
- 7 = H

P = Penumbra of largest spot (see fig. 1-1)
- 0 = no penumbra (x)
- 1 = rudimentary (r)
- 2 = small symmetric (s) (north to south diameter $\leq 2.5^\circ$)
- 3 = small asymmetric (a) (north to south diameter $\leq 2.5^\circ$)
- 4 = large symmetric (h) (north to south diameter $> 2.5^\circ$)
- 5 = large asymmetric (k) (north to south diameter $> 2.5^\circ$)

C = Compactness of central spots
- 0 = single spot region, no compactness (x)
- 1 = open distribution (o)
- 2 = intermediate distribution (i)
- 3 = compact distribution (c)

M = Magnetic classification
- 1 = Alpha
- 2 = Beta
- 3 = Beta-Gamma
- 4 = Gamma
- 5 = Beta/Delta
- 6 = Beta-Gamma/Delta
- 7 = Gamma/Delta

1RRRR	2MMXX	3SS12	4ZPCM	**5AAAA**	6SSSS	QXXYY	FCMXP	{ *repeat this line for each spotted region*

5 = indicates that sunspot area for region RRRR for day **dd** follows
AAAA = sunspot area in millionths of the solar hemisphere

UGEOR—*Continued*

Data Lines—Continued

1RRRR	2MMXX	3SS12	4ZPCM	5AAAA	**6SSSS**	QXXYY	FCMXP	{ *repeat this line for each spotted region*

6 = indicates that total number of sunspots for region RRRR for day **dd** follows
SSSS = total number of sunspots

1RRRR	2MMXX	3SS12	4ZPCM	5AAAA	6SSSS	**QXXYY**	FCMXP	{ *repeat this line for each spotted region*

Coded location of region RRRR for day **dd** at hour **hh**:

Q = quadrant (heliographic coordinates) of the region

1 = NE	(northeast)	3 = SW	(southwest)
2 = SE	(southeast)	4 = NW	(northwest)

XX = distance to central meridian in degrees
YY = heliographic latitude in degrees

1RRRR	2MMXX	3SS12	4ZPCM	5AAAA	6SSSS	QXXYY	**FCMXP**	{ *repeat this line for each spotted region*

F = general forecast for region RRRR for day **II**

0 =	Quiet	(< 50% probability of C-class flares)
1 =	Eruptive	(C-Class flares expected, probability ≥ 50%)
2 =	Active	(M-class flares expected, probability ≥ 50%)
3 =	Major	(X-class flares expected, probability ≥ 50%)
4 =	Proton	(Proton flares expected, probability ≥ 50%)
/ =	No general forecast available	

C = probability of class C flares divided by ten

0 = 0-9%	5 = 50-59%
1 = 10-19%	6 = 60-69%
2 = 20-29%	7 = 70-79%
3 = 30-39%	8 = 80-89%
4 = 40-49%	9 = 90-99%
/ = No probability forecast available	

M = probability of class M flares divided by ten (see list in C flares above)
X = probability of class X flares divided by ten (see list in C flares above)
P = probability of Proton flares divided by ten (see list in C flares above)

Last Data Line—

99999

99999 = end of message terminator; indicates that entire message has been received

Text Lines—

PLAIN	BT

PLAIN = Plain-language text information

PLAIN	**BT**

BT = Break in transmission (end of message terminator)

Note: / is to be used for data not available.

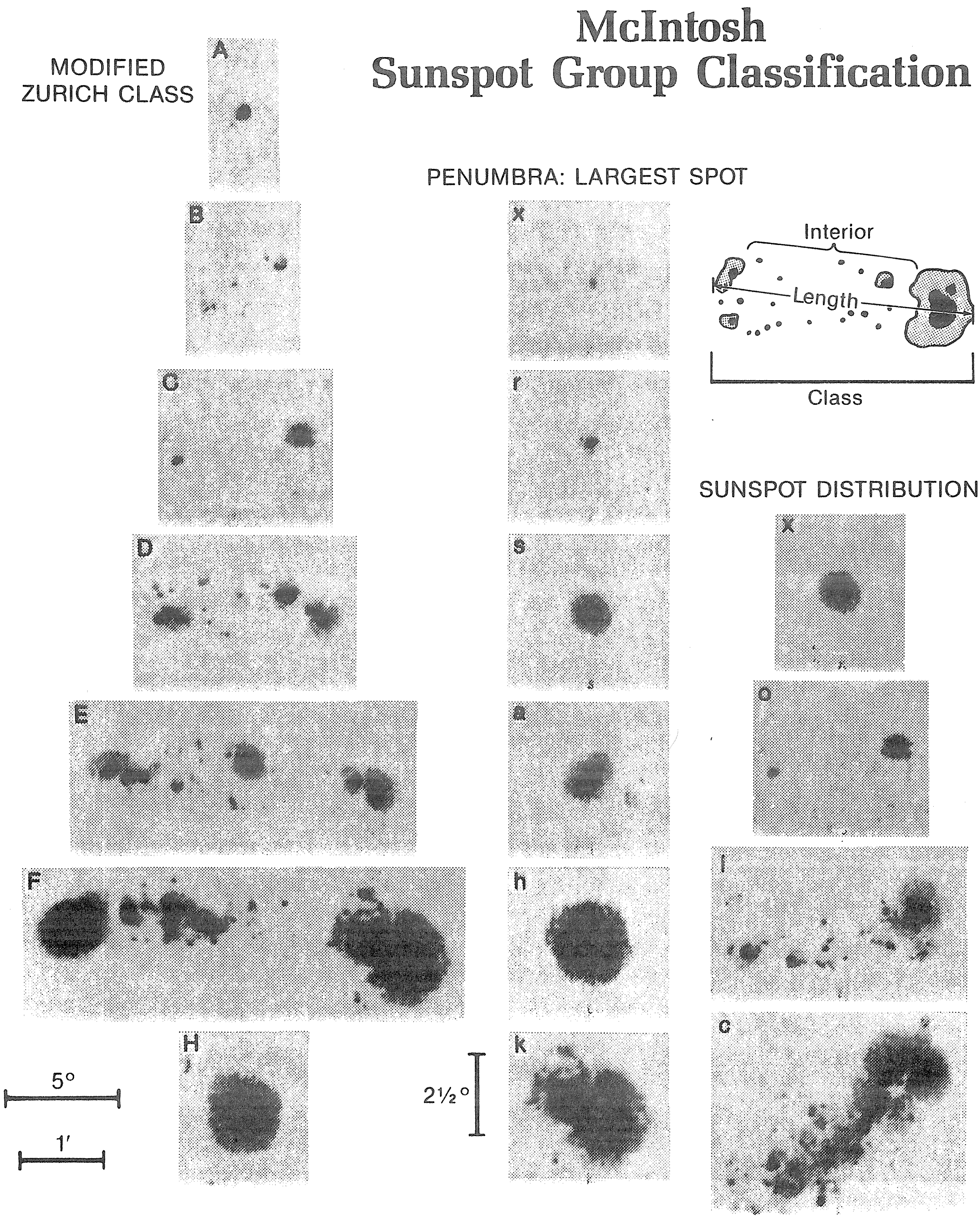


Figure 1-1.—Modified Zurich (McIntosh) Sunspot Classification.

Chapter Two

Optical Data Codes

Optical Data codes are used by observatories to report solar optical data; consisting generally of sunspots, plages, and flares.

Code forms:

UFLAE

UPATP and UPATV

UPLAK

USSPI and USSPY

USSPS

UFLAE

Content:

Position, importance, time and duration of solar flares as reported by a single optical observatory. (Importance in conformance with the recommendations of IAU Commission 10 as of 1 January 1966.)

Example:

```
UFLAE   81202   80925   26818   27280   60028   30038   80055
```

Definition of symbols:

```
[UFLAE]   I I I I I   YMMDD
```

UFLAE comes from solar **FLArEs**

```
UFLAE   [I I I I I]   YMMDD
```

IIIII	=	station indicator (see lists in Appendix C)

```
UFLAE   I I I I I   [YMMDD]
```

Y	=	last digit of year
MM	=	month of year, 01 = January, 02 = February, *etc.*
DD	=	UT day of month

```
[QXXYY]   deAAA   aHHmm   bHHmm   [bHHmm]   cHHmm   { repeat this line for each flare
```

Coded location of *each* non-quiet region:

Q = quadrant (heliographic coordinates) of the active region

1 = NE (northeast) 3 = SW (southwest)

2 = SE (southeast) 4 = NW (northwest)

XX = distance to central meridian in degrees

YY = heliographic latitude in degrees

```
QXXYY   [deAAA]   aHHmm   bHHmm   [bHHmm]   cHHmm   { repeat this line for each flare
```

d = flare importance based upon corrected area in square degrees

0 = subflare(s); area $\leq$ 2.0 square degrees

1 = importance 1; 2.1 square degrees $\leq$ area $\leq$ 5.1 square degrees

2 = importance 2; 5.2 square degrees $\leq$ area $\leq$ 12.4 square degrees

3 = importance 3; 12.5 square degrees $\leq$ area $\leq$ 24.7 square degrees

4 = importance 4; area $\geq$ 24.8 square degrees

e = flare intensity based upon relative evaluation

7 = faint

8 = normal

9 = bright

AAA = uncorrected flare area in millionths of solar disk

UFLAE—*Continued*

QXXYY	deAAA	**aHHmm**	bHHmm	[bHHmm]	cHHmm	*repeat this line for each flare*

a = start time qualifier
- 6 = start of flare
- 7 = first observation of flare in progress

HHmm = UT hour and minute of first observation of flare

QXXYY	deAAA	aHHmm	**bHHmm**	[bHHmm]	cHHmm	*repeat this line for each flare*

b = observing quality indicator
- 1 = very poor
- 2 = poor
- 3 = fair
- 4 = good
- 5 = exceptional

HHmm = UT hour and minute of flare maximum (use / / / / if unknown)

Note: Repeat group **bHHmm** *for secondary maximums*

QXXYY	deAAA	aHHmm	bHHmm	[bHHmm]	**cHHmm**	*repeat this line for each flare*

c = end time qualifier
- 8 = end of flare
- 9 = last observation of flare in progress

HHmm = UT hour and minute of end or last observation of flare

Note: Repeat groups **QXXYY deAAA aHHmm bHHmm cHHmm** *as required to describe flares observed*

Note: / is to be used for data not available.

UPATP and UPATV

Content:

Solar flare survey intervals for Hα patrols, cinematographic only (P) or visual only (V). UPATP and UPATV are sent only if the flare observations have been reduced and are being reported in the same message, although there need not be flares observed during the patrol period.

Example:

```
UPATP   30508   11311   07310
```

and

```
UPATV   30508   12216   06208
```

Definition of symbols:

$\boxed{\text{UPATP}}$ I I I I I DDUaa b b b c c [b b b c c]

UPATP comes from flare **PAT**rol hours, **P**hotographic

and

$\boxed{\text{UPATV}}$ I I I I I DDUaa b b b c c [b b b c c]

UPATV comes from flare **PAT**rol hours, **V**isual

UPATP $\boxed{\text{I I I I I}}$ DDUaa b b b c c [b b b c c]

IIIII = station indicator (see lists in Appendix C)

UPATP I I I I I $\boxed{\text{DDUaa}}$ b b b c c [b b b c c]

DD = UT day of observation
U = overall quality of observation

0	= no data	3	= fair
1	= very poor	4	= good
2	= poor	5	= exceptional

aa = check sum of all the following digits

UPATP I I I I I DDUaa $\boxed{\text{b b b c c}}$ [b b b c c]

bbb = UT time of beginning of patrol period in hours and tenths of hours
cc = UT time of end of patrol period, in hours and tenths of hours, with tens digit suppressed

Note: *Repeat* **UPATP** *(or* **UPATV)** **I I I I I DDUaa** *whenever the observing period covers two UT days. If ambiguity is possible when decoding, insert an extra group* **bbbcc**.

Note: */ is to be used for data not available.*

UPLAK

Content:

Area, importance, and intensity of calcium plages

Example:

```
UPLAK 30508  12231   21/02
43211  13520  12443
43323  12040  09023
```

Definition of symbols:

UPLAK	I I I I I	DDHHH	q d / n n

UPLAK comes from **PLA**ges, code **K**

UPLAK	**I I I I I**	DDHHH	q d / n n

IIIII = station indicator (see lists in Appendix C)

UPLAK	I I I I I	**DDHHH**	q d / n n

DD = UT day of observation
HHH = UT time of observation in hours and tenths of hours

UPLAK	I I I I I	DDHHH	**q d / n n**

q = quality of observation on a scale from 1 to 5
- 1 = very poor
- 2 = poor
- 3 = fair
- 4 = good
- 5 = exceptional

d = number of days since last message from this station
/ = filler
nn = number of plages (three 5-digit groups each) for which information will follow

UPLAK—*Continued*

e e e f g	QXXYY	i i i j k	*repeat this line for each plage region*

e e e = serial number assigned by observatory

f = importance of plage region on a scale of 1 to 3 combined with information on the stage of evolution

- 1 = importance 1, increasing stage
- 2 = importance 2, increasing stage
- 3 = importance 3, increasing stage
- 4 = importance 1, stable
- 5 = importance 2, stable
- 6 = importance 3, stable
- 7 = importance 1, decreasing stage
- 8 = importance 2, decreasing stage
- 9 = importance 3, decreasing stage
- 0 = no evaluation given

g = age of the region

- 1 = born on disk
- 2 = born on invisible hemisphere, first disk transit
- 3 = second disk transit
- 4 = third disk transit
- 5 = fourth disk transit
- 6 = fifth disk transit
- 7 = sixth disk transit
- 8 = seventh disk transit
- 9 = eighth disk transit
- 0 = no evaluation given

e e e f g	**QXXYY**	i i i j k	*repeat this line for each plage region*

Q = quadrant (heliographic coordinates) containing the plage

1 = NE (northeast)	3 = SW (southwest)
2 = SE (southeast)	4 = NW (northwest)

XX = distance to central meridian in degrees

YY = heliographic latitude in degrees

e e e f g	QXXYY	**i i i j k**	*repeat this line for each plage region*

i i i = area in millionths of the solar hemisphere, divided by 100

j = intensity

- 1 = faint
- 2 = 1.5
- 3 = 2
- 4 = 2.5
- 5 = 3
- 6 = 3.5
- 7 = 4
- 8 = 4.5
- 9 = 5 (very bright)

k = last digit of check sum of preceding 14 digits

Note: / is to be used for data not available.

USSPI and USSPY

Content:

Code USSPI is used to describe sunspots classified by magnetic characteristics.
Code USSPY is used to describe sunspots classified by magnetic field gradient.
In these codes sunspot groups are classified into four different types: UNIPOLAR, BIPOLAR, CONFIGURATION, and MUTIPOLAR (or COMPLEX) region.
The two codes are identical, except that code USSPY has one 5-digit group added to the end of the CONFIGURATION description. The extra group is used to describe the intensity and strength of the magnetic field in gauss.

Examples of USSPI codes:

Unipolar:

```
USSPI   30508   12231   42042   51310
```

Bipolar:

```
USSPI   30508   12231   13035   62111   08611
```

Configuration:

```
USSPI   30508   12231   23010   01234
```

Example of USSPY code:

Configuration:

```
USSPY   30508   12231   23010   01234   12153
```

Definition of symbols:

```
USSPI   IIIII   DDHHG
```

USSPI comes from **SunSPots**, code **I**

```
USSPY   IIIII   DDHHG
```

USSPY comes from **SunSPots**, code **Y**

```
USSPI   IIIII   DDHHG
```

IIIII = station indicator (see lists in Appendix B)

```
USSPI   IIIII   DDHHG
```

DD = UT day of observation
HH = UT hour of observation
G = quality of the seeing
- 1 = very poor
- 2 = poor
- 3 = fair
- 4 = good
- 5 = exceptional

USSPI—*Continued*

If basically *UNIPOLAR* use the following two codes:

QXXXY	K a b c d	{ *repeat this line for each UNIPOLAR sunspot group*

Q = quadrant (heliographic coordinates) in which geometric center of sunspot group is located
- 1 = NE (northeast)
- 2 = SE (southeast)
- 3 = SW (southwest)
- 4 = NW (northwest)

XX = distance to central meridian in degrees

YY = heliographic latitude in degrees

QXXXY	**K a b c d**	{ *repeat this line for each UNIPOLAR sunspot group*

K = key number
- 5 = isolated unipolar spot or large spot surrounded by small companions of opposite polarity (configurationB)

a = Zurich sunspot class
- 1 = A
- 8 = H
- 9 = J

b = diameter of the main spot umbra in degrees

c = magnetic polarity of the main spot
- 1 = north
- 2 = south
- 3 = doubtful because of its heliographic longitude)

d = configuration
- 0 = not any configuration; that is single spot or all tiny spots
- 1 = several tiny spots of opposite polarity at a distance (configuration B)
- 2 = configuration B suspected according to chromospheric data (dark filament surrounding the spot like an eyebrow)

USSPI—*Continued*

If *BIPOLAR* use the following three codes:

QXXXY	K a b b c	d d e f g	repeat this line for each BIPOLAR sunspot group

Q = quadrant (heliographic coordinates) of geometric center of bipolar group
- 1 = NE (northeast) 3 = SW (southwest)
- 2 = SE (southeast) 4 = NW (northwest)

XX = distance to central meridian in degrees
YY = heliographic latitude in degrees

QXXXY	**K a b b c**	d d e f g	repeat this line for each BIPOLAR sunspot group

K = key number
- 6 = open bipolar (the shortest distance between the edges of the main spots is equal to or greater than the diameter of the largest spot)
- 7 = closed bipolar (simple classical bipolar group and the shortest distance between the closest main spots is less than the diameter of the largest spot in the group)

a = Zurich sunspot class
- 2 = B 5 = E
- 3 = C 6 = F
- 4 = D 7 = G

b b = longitude difference in degrees between exterior edges of the main spots
c = number of 5-digit blocks used to describe configuration, if any configuration exists, or X when this bipolar group is part of a multipolar region (see K = 8)

QXXXY	K a b b c	**d d e f g**	repeat this line for each BIPOLAR sunspot group

d d = shortest distance in degrees between the interior edges of the closest spots of opposite polarities
e = diameter in degrees of the largest spot umbra
f = orientation of the inversion (neutral) line:
- 1 = the inversion line is roughly parallel (±30°) to a solar meridian and the two main spots are equivalent (Beta) or the leading spot is the larger (Beta P)
- 2 = the inversion line is roughly parallel (±30°) to a solar meridian but the following main spot is the larger (Beta F)
- 3 = the inversion line is tilted between 30° and 60° to the solar equator and the two main spots are equivalent, or the leading spot is the larger (Beta and Beta P)
- 4 = the inversion line is tilted between 30° and 60° to the solar equator but the following main spot is the larger (Beta F)
- 5 = the inversion line is roughly parallel (±30°) to the solar equator and the two main spots are equivalent, or the leading spot is the larger (Beta and Beta P)
- 6 = the inversion line is roughly parallel (±30°) to the solar equator but the following main spot is the larger (Beta F)

g = description of the polarities
- 1 = the polarities are normal in relation to the hemisphere and solar cycle
- 2 = the polarities are normal but with many tiny spots
- 3 = the polarities are reversed in relation to the hemisphere and solar cycle
- 4 = the polarities are reversed but with many tiny spots
- 5 = the two polarities are nearly at the same longitude (see f = 5 or 6)

USSPI—*Continued*

If *CONFIGURATION* exists use the following two codes (USSPI) or three codes (USSPY):

Note: *CONFIGURATION exists if two spots or many more spots of opposite polarities are very near together (for example, the distance between the interior edges of the main spots is less than or equal to the diameter of the biggest spot). The best known is the Delta configuration, where two umbra of opposite polarities are in the same penumbra (these are used to estimate the position of the highest gradient of the longitudinal magnetic component).*

QXXXY	K h i j k	*repeat this line for each CONFIGURATION sunspot group*

Q = quadrant (heliographic coordinates) of geometric center of an active configuration where
- 1 = NE (northeast)
- 2 = SE (southeast)
- 3 = SW (southwest)
- 4 = NW (northwest)

XX = distance to central meridian in degrees
YY = heliographic latitude in degrees

QXXXY	**K h i j k**	*repeat this line for each CONFIGURATION sunspot group*

K = key number
- 0 = description of active configuration

h = type of configuration and orientation of the inversion line
- 1 = a spotted configuration and the inversion line is roughly parallel (±30°) to a solar meridian
- 2 = a spotted configuration and the inversion line is titled between 30° and 60° to the solar equator
- 3 = a spotted configuration and the inversion line is roughly parallel (±30°) to the solar equator
- 4 = a Delta configuration and the inversion line is roughly parallel (±30°) to a solar meridian
- 5 = a Delta configuration and the inversion line is tilted between 30° and 60° to the solar equator
- 6 = a Delta configuration and the inversion line is roughly (±30°) parallel to the solar equator

i = diameter in degrees of the west spot (the west umbra in a Delta configuration)
j = diameter in degrees of the east spot (the east umbra in a Delta configuration)
k = distance in degrees between the interior edges of the two polarities (the two umbrae in a Delta configuration). For two polarities nearly at the same longitude there is no special order to report the spot or umbra diameters.

Include the following group when using code USSPY:

QXXXY	K h i j k	**l l m m n**	*repeat this line for each CONFIGURATION sunspot group*

l l = intensity of north polarity field (gauss divided by 100)
m m = intensity of south polarity field (gauss divided by 100)
n = evaluation of the strength of the magnetic field gradient according to the following
- 1 = weak (**n** < 0.1 gauss/km)
- 2 = large (0.1 gauss/km ≤ **n** ≤ 0.5 gauss/km)
- 3 = very large (**n** > 0.5 gauss/m)

USSPI—*Continued*

If *MULTIPOLAR or COMPLEX region* made up of several UNIPOLAR or BIPOLAR GROUPS, use the following two codes, followed by the appropriate UNIPOLAR, BIPOLAR or CONFIGURATION groups:

QXXXY	**K a a b b**	{ *repeat this line for each MULTIPOLAR or COMPLEX sunspot group*

Q = quadrant (heliographic coordinates) of geometric center of the region
- 1 = NE (northeast)
- 2 = SE (southeast)
- 3 = SW (southwest)
- 4 = NW (northwest)

XX = distance to central meridian in degrees
YY = heliographic latitude in degrees

QXXXY	**K a a b b**	{ *repeat this line for each MULTIPOLAR or COMPLEX sunspot group*

K = key number
- 8 = multipolar region which can be reported as comprising a set of unipolar and (or) bipolar groups and active configurations
- 9 = complex region

a a = longitude difference in degrees between exterior edges of the main spots
b b = latitude difference in degrees between exterior edges of the main spots

The above two groups are followed by the appropriate groups:

QXXXY **K a b c d** or QXXXY **K a b b c d d e f g** or QXXXY **K h i j k l l m m n**

QXXYY **K a b c d**	as defined under *UNIPOLAR* (p. 2 - 6)
QXXYY **K a b b c d d e f g**	as defined under *BIPOLAR* (p. 2 - 7)
QXXYY **k h i j k l l m m n**	as defined under *CONFIGURATION* (p. 2 - 8)

Note: / is to be used for data not available.

USSPS

Content:

Code USSPS is used to describe sunspot groups.

Example:

USSPS	85303	24030	03432	91001	46631	0/101	95012	32515	31313

and

Definition of symbols:

$\boxed{\text{USSPS}}$	IIIII	DDHHH	aaabc

USSPS comes from **S**un**SP**ot**S**

USSPS	$\boxed{\text{IIIII}}$	DDHHH	aaabc

IIIII = station indicator (see lists in Appendix C)

USSPS	IIIII	$\boxed{\text{DDHHH}}$	aaabc

DD = UT day of observation
HHH = UT time of observation in hours and tenths of hour

USSPS	IIIII	DDHHH	$\boxed{\text{aaabc}}$

aaa = relative sunspot number
b = seeing quality

- 1 = very poor
- 2 = poor
- 3 = fair
- 4 = good
- 5 = exceptional

c = solar disk size used for measurement

- 1 = diameter of the solar disk less than 15 cm
- 2 = diameter of the solar disk between 15 and 30 cm
- 3 = diameter of the solar disk more than 30 cm
- 4 = individual sunspot groups at very high resolution

$\boxed{\text{ddAAA}}$	QXXYY	fghii	{ *repeat this line for each sunspot group*

dd = serial number of sunspot group
AAA = area of sunspot group in tens of millionths of the solar hemisphere

ddAAA	$\boxed{\text{QXXYY}}$	fghii	{ *repeat this line for each sunspot group*

Q = quadrant (heliographic coordinates) in geometric center of sunspot groups is located

- 1 = NE (northeast)
- 2 = SE (southeast)
- 3 = SW (southwest)
- 4 = NW (northwest)

XX = distance to central meridian in degrees
YY = heliographic latitude in degrees

USSPS—*Continued*

d d AAA	QXXYY	**f g h i i**	{ *repeat this line for each sunspot group*

f = type of penumbra in the largest spot in group (see fig. 2-1)

- 0 = no penumbra (Zurich class A or B)
- 1 = rudimentary (r)
- 2 = small symmetric (s) north to south diameter $\leq 2.5°$
- 3 = small asymmetric (a) north to south diameter $\leq 2.5°$
- 4 = large symmetric (h) north to south diameter $> 2.5°$
- 5 = large asymmetric (k) north to south diameter $> 2.5°$

g = relative importance of the leading spot and density of the sunspot population

- 1 = leading spot largest and sunspot population density open
- 2 = following spot largest and sunspot population density open
- 3 = leading and following spots nearly same size and sunspot population density open
- 4 = leading spot largest and sunspot population density intermediate
- 5 = following spot largest and sunspot population density intermediate
- 6 = leading and following spot nearly same size and sunspot population density intermediate
- 7 = leading spot largest and sunspot population density compact
- 8 = following spot largest and sunspot population density compact
- 9 = leading and following spot nearly same size and sunspot population density compact

Note: **g** *= / (slant line) for unipolar spots of Zurich class A, H or J*

h = Zurich sunspot class (see fig. 2-1)

- 1 = A
- 2 = B
- 3 = C
- 4 = D
- 5 = E
- 6 = F
- 7 = G
- 8 = H
- 9 = J

Note: Normally G will be encoded as an open E or F and J will be encoded as a small H.

i i = number of spots in the group

McIntosh
Sunspot Group Classification

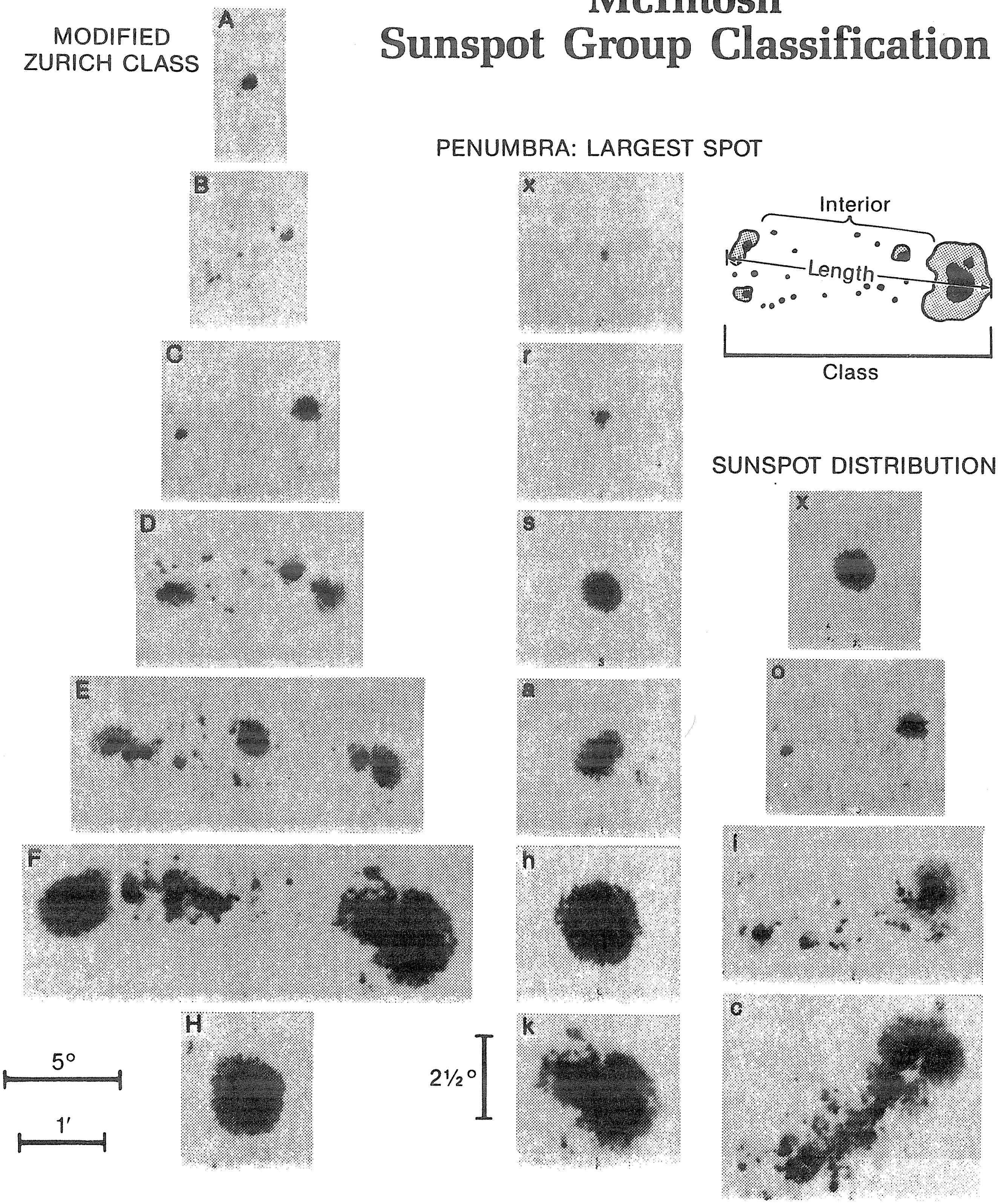


Figure 2-1.—Modified Zurich (McIntosh) Sunspot Classification.

Chapter Three

Radio Data Codes

Radio Data Codes are used by observatories to report solar radio data; radio bursts in discrete and sweep frequencies and quiet-sun levels in discrete radio frequencies.

Code forms:

URALN

URANJ

URASP

URALN

Content:

Position measurements of solar radio sources or inferred coronal holes at a discrete frequency, possibly including intensity and flux.

This code is used to report location of either coronal condensations observed above 500 MHz (approximate); for example, the "slowly" varying component, generally a = 1 or a = 2 (see definition below); or noise storms observed below 500 MHz (approximate), where total power observation of noise storm on the same frequency is not available, generally a = 1 or a = 3 (see definition below).

When total power observation is available, URANJ should be used.

Example:

URALN	**85304**	**90928**	**00692**	**02015**	**17100**	**27070**	**17010**	**18035**	**28090**

Definition of symbols:

URALN	**I I I I I**	**YMMDD**	**FFFFF**	**HHTan**

URALN comes from **RA**dio noise **L**ocation, code **N**

URALN	**I I I I I**	**YMMDD**	**FFFFF**	**HHTan**

I I I I I = station indicator (see lists in Appendix C)

URALN	**I I I I I**	**YMMDD**	**FFFFF**	**HHTan**

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc*.
DD = UT day of month

URALN	**I I I I I**	**YMMDD**	**FFFFF**	**HHTan**

FFFFF = frequency in MHz

URALN	**I I I I I**	**YMMDD**	**FFFFF**	**HHTan**

HHT = UT time nearest beginning of observation period in hours and tenths of hours
a = type of observation reported, where
- 1 = fan-beam, east-west scan using single group **d e f f f** for each source.
- 2 = detailed pencil-beam measurements in heliographic coordinates—two groups (**QXXYY b b b c c**) for each source.
- 3 = pencil-beam mapping on geocentric N-S-E-W grid; one group **Qxxyy** for each source

n = number of sources and (or) coronal holes reported

URALN—*Continued*

If **a** = 1 (fan-beam, east-west scan) use the following two groups:

d e f f f	b b b c c

d = noise source or inferred coronal hole and importance, where
- 0 = noise source, importance 0 (least importance)
- 1 = noise source, importance 1
- 2 = noise source, importance 2
- 3 = noise source, importance 3 (greatest importance)
- 4 = inferred coronal hole, importance 1 (least importance)
- 5 = inferred coronal hole, importance 2
- 6 = inferred coronal hole, importance 3 (greatest importance)

e = location of noise source or deepest depression of inferred coronal hole east or west of scan center, where
- 7 = east
- 8 = west

f f f = distance of noise source or inferred coronal hole from scan center, in percent of photospheric radius

d e f f f	**b b b c c**

b b b = maximum intensity in tens of thousands of Kelvins (or, for sources at mm wavelengths, tens of Kelvins)

c c = flux enhancement from region in 10^{-22} $Wm^{-2}Hz^{-1}$

If **a** = 2 (detailed pencil-beam measurements in heliographic coordinates) use the following two groups:

QXXYY	b b b c c

Q = quadrant (heliographic coordinates) containing the noise source, where
- 1 = NE (northeast) 3 = SW (southwest)
- 2 = SE (southeast) 4 = NW (northwest)

XX = distance to the central meridian in degrees (if above east or west limb, use 95)

YY = heliographic latitude in degrees

QXXYY	**b b b c c**

b b b = maximum intensity in tens of thousands of Kelvins (or, for sources at mm wavelengths, tens of Kelvins)

c c = flux enhancement from region in 10^{-22} $Wm^{-2}Hz^{-1}$

If **a** = 3 (pencil-beam mapping on geocentric N-S-E-W grids) use the following group for each source:

Qxxyy	[Qxxyy ... Qxxyy]

Q = quadrant containing the noise source, where
- 1 = NE (northeast) 3 = SW (southwest)
- 2 = SE (southeast) 4 = NW (northwest)

xx = distance to east or west of N-S diameter in tenths of photospheric radius

yy = distance north or south of E-W diameter in tenths of photospheric radius

Note: / is to be used for data not available.

URANJ

Content:

Single-frequency measurements of solar radio flux and events, with location of events if also measured at that frequency.

Example:

```
URANJ   85304   90928   01415   00060   14705
```

Definition of symbols:

```
[URANJ]  I I I I I   YMMDD
```

URANJ comes from **RA**dio **N**oise, code **J**

```
URANJ  [I I I I I]  YMMDD
```

I I I I I = station indicator (see lists in Appendix C)

```
URANJ   I I I I I  [YMMDD]
```

Y	=	last digit of year
MM	=	month of year, 01 = January, 02 = February, *etc.*
DD	=	day of month (UT)

```
[FFFFF] aabbc (dddee) 9HHmm gHHmm hiiii or kllll /HHmm (Qoppp) or (Qxxyy)
```

FFFFF = frequency in MHz

Note: Repeat **URANJ IIIII YMMJJ** for each frequency measured.

```
FFFFF [aabbc] (dddee) 9HHmm gHHmm hiiii or kllll /HHmm (Qoppp) or (Qxxyy)
```

aa	=	UT hour nearest beginning of observation period
bb	=	UT hour nearest end of observation period
c	=	number of significant events reported

```
FFFFF aabbc [dddee] 9HHmm gHHmm hiiii or kllll /HHmm (Qoppp) or (Qxxyy)
```

ddd	=	background flux in 10^{-22} $Wm^{-2}Hz^{-1}$, adjusted for burst effects if necessary. Divide flux by 10 if frequency greater than 20 GHz.
ee	=	nearest UT hour of flux measurement

Note: *Omit group* **dddee** *if these measurements are not made.*

```
FFFFF aabbc (dddee) [9HHmm] gHHmm hiiii or kllll /HHmm (Qoppp) or (Qxxyy)
```

9	=	9 indicates the begin time of an event report follows
HHmm	=	UT hour and minute of beginning of significant event (if in progress at beginning of observation period, use / / / /)

Note: For each new burst, start burst data with **9HHmm**

URANJ—*Continued*

FFFFF aabbc (dddee) 9HHmm **gHHmm** h i i i i or k l l l l /HHmm (Qoppp) or (Qxxyy)

g = key to type of event where
- 1 = meter-wave noise storm
- 2 = rise in base level (usually meter-wave)
- 3 = meter-wave minor burst, or microwave simple burst
- 4 = group of bursts, of fluctuations
- 5 = meter-wave major burst, or microwave complex burst
- 6 = "plus" part of "major-plus" burst, or microwave post-burst increase

HHmm = UT hour and minute of end of event (if still in progress at end of observation period, use ////)

FFFFF aabbc (dddee) 9HHmm gHHmm **h i i i i** or k l l l l /HHmm (Qoppp) or (Qxxyy)

h = key to measurement of maximum flux of event in *flux units*, where
- 5 = actual measurement
- 6 = lower limit (due to receiver saturation, aerial mistracking, *etc.*)

i i i i = peak flux of the event above pre-burst level, in 10^{-22} $Wm^{-2}Hz^{-1}$.

Note: *If the event is a noise storm, use the median flux; the time of maximum can then be replaced by ////. If peak flux is over 9999, replace by word FLUX and send flux as an extra 5-figure group immediately following* **h i i i i**.

OR

FFFFF aabbc (dddee) 9HHmm gHHmm h i i i i or **k l l l l** /HHmm (Qoppp) or (Qxxyy)

k = key to measurement of maximum flux in terms of *percent increase*, where
- 7 = actual measurement
- 8 = lower limit

l l l l = peak flux reported as percent increase over pre-burst level; for example, small bursts start from 0%, not 100%.

Note: *More than one significant maximum per burst can be reported by repeating from the* **h i i i i** *or* **k l l l l** *group. These are distinguished by their first digit 5, 6, 7 or 8, from the start of another burst which starts with a 9. One or more* **Qoppp** *or* **Qxxyy** *groups can be given with each flux maximum, to show the source position(s) contributing to that maximum. These are distinguished by the first digit being 0, 1, 2, 3, or 4. If necessary to show the motion of a moving source, later positions may be given at an arbitrary chosen time, not necessarily time of maximum flux.*

FFFFF aabbc (dddee) 9HHmm gHHmm h i i i i or k l l l l **/HHmm** (Qoppp) or (Qxxyy)

/ = filler

HHmm = UT hour and minute of maximum

URANJ—*Continued*

FFFFF aabbc (dddee) fHHmm gHHmm hiiii or kllll /HHmm **Qoppp** or (Qxxyy)

Q = 0 to signify that fan-beam measurement of E-W location of burst source follows
o = location of burst source east or west of scan center, where
 7 = east
 8 = west
ppp = distance of burst source from scan center, in percent of photospheric radius

Note: Omit group **Qoppp** *if these measurements are not made.*

OR

FFFFF aabbc (dddee) fHHmm gHHmm hiiii or kllll /HHmm (Qoppp) or **Qxxyy**

Q = quadrant containing the burst source, where
 1 = NE (northeast) 3 = SW (southwest)
 2 = SE (southeast) 4 = NW (northwest)
xx = distance to east or west of N-S diameter in tenths of photospheric radius
yy = distance north or south of E-W diameter in tenths of photospheric radius

Note: Omit group **Qxxyy** *if these measurements are not made.*

Note: / is to be used for data not available.

URASP

Content:

Spectrographic measurements of solar radio events

Example:

URASP	85303	90928	06221	00072	22450	30236	10236	35500	30645	10645

Definition of symbols:

URASP	I I I I I	YMMDD	FFGGH	a a b b c

URASP comes from **RA**dio **SP**ectral event

URASP	**I I I I I**	YMMDD	FFGGH	a a b b c

I I I I I = station indicator (see lists in Appendix C)

URASP	I I I I I	**YMMDD**	FFGGH	a a b b c

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc*.
DD = UT day of month

URASP	I I I I I	YMMDD	**FFGGH**	a a b b c

FF = lowest frequency of equipment (first two significant figures)
GG = highest frequency of equipment (first two significant figures)
H = frequency multiplication indicator, where

- 0 = indicates **FF** is to be multiplied by 1, **GG** by 1 to obtain frequencies in MHz
- 1 = indicates **FF** is to be multiplied by 1, **GG** by 10 to obtain frequencies in MHz.
- 2 = indicates **FF** is to be multiplied by 10, **GG** by 10 to obtain frequencies in MHz.
- 3 = indicates **FF** is to be multiplied by 1, **GG** by 100 to obtain frequencies in MHz
- 4 = indicates **FF** is to be multiplied by 10, **GG** by 100 to obtain frequencies in MHz
- 5 = indicates **FF** is to be multiplied by 100, **GG** by 100 to obtain frequencies in MHz
  (If the report is based on real-time output which covers less than the full frequency range of the equipment, then give frequency range of real-time output.)

URASP	I I I I I	YMMDD	FFGGH	**a a b b c**

a a = UT hour nearest beginning of observation period
b b = UT hour nearest end of observation period
c = number of significant events reported

f f g g h	dHHmm	eHHmm	{ *repeat this line for each event*

f f = lowest frequency of significant event
g g = highest frequency of significant event
h = frequency multiplication indicator for **f f** and **g g**, coded as for **H** above

URASP—*Continued*

f f g g h	**dHHmm**	eHHmm	*repeat this line for each event*

d = type of spectral activity, where

- 1 = type I storm = noise storm
- 2 = type II burst = slow-drift burst
- 3 = type III burst = fast-drift burst
- 4 = type IV = prolonged broad-band continuum, often preceded, at meter wavelengths, by a type II burst
- 5 = type V burst
- 6 = type III storm or dekametric continuum
- 7 = intermittent groups of type III bursts
- 8 = microwave burst of short (minutes) duration, usually of impulsive start
- 9 = continuum (except type IV and dekametric)
- / = unclassified activity

HHmm = UT hour and minute of start of event (if in progress at beginning of observation period use / / / /)

f f g g h	dHHmm	**eHHmm**	*repeat this line for each event*

e = importance of event, if record timing is accurate to within 2 minutes:

1 = importance 1	7 = importance 1+
2 = importance 2	8 = importance 2+
3 = importance 3	9 = importance 3+

Otherwise, if record timing is not accurate to within 2 minutes:

- 4 = importance 1
- 5 = importance 2
- 6 = importance 3

HHmm = UT hour and minute of end of event (if event is still in progress at end of observation period, use / / / /).

Note: / is to be used for data not available.

Chapter Four

Satellite Data Codes

Satellite Data Codes are used by telemetry stations, forecast centers and others to encode solar geophysical data obtained from satellite-based sensors.

Code forms:

USXRA

USPRO

UTELC

USXRA

Content:

Solar x-ray events.

Example:

```
USXRA   90005   80712
06101   01525   01545   01630   12002   9abSp
```

Definition of symbols:

USXRA	IIIII	YMMDD

USXRA comes from Solar **X-RA**y events

USXRA	IIIII	YMMDD

IIIII = station indicator (see lists in Appendix C)

USXRA	IIIII	YMMDD

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc.*
DD = UT day of month

SSENN	0HHmm	0HHmm	0HHmm	QabSp	9abSp

SS = satellite
- 06 = GOES-6
- 07 = GOES-7
- 08 = GOES-8
- 09 = GOES-9

E = energy range
- 1 = .1-.8 nm

NN = number of events

SSENN	0HHmm	0HHmm	0HHmm	QabSp	9abSp

0 = indicates that the begin time of the event follows
HHmm = UT hour and minute of beginning of event

SSENN	0HHmm	0HHmm	0HHmm	QabSp	9abSp

0 = indicates that the maximum time of the event follows
HHmm = UT hour and minute of maximum for event

SSENN	0HHmm	0HHmm	0HHmm	QabSp	9abSp

0 = indicates that the end time of the event follows
HHmm = UT hour and minute of end time of event

USXRA—*Continued*

SSENN	**0HHmm**	**0HHmm**	**0HHmm**	**$\boxed{\text{QabSp}}$**	**9abSp**

Maximum flux:

Q	=	qualifier 0 = uncertain data 1 = certain data
ab	=	x-ray flux in W m $^{-2}$ where **ab** = **a.b**
S	=	sign of the exponent to apply to **a.b** 0 = positive 9 = negative
p	=	power of ten to apply to **a.b**

Note: **abSp** *reported as* **4192** *would equal* 4.1 x 10^{-2} W m^{-2}

Note: / is to be used for data not available.

SSENN	**0HHmm**	**0HHmm**	**0HHmm**	**QabSp**	**$\boxed{\text{9abSp}}$**

Integrated flux (start thru end):

9	=	qualifier
ab		x–ray integrated flux in J m $^{-2}$ where ab = a.b
S	=	sign of the exponent to apply to **a.b** 0 = positive 9 = negative
p	=	power of ten to apply to **a.b**

Note: **abSp** *reported as* **5692** *would equal* 5.6 x 10^{-2} J m^{-2}

Note: / is to be used for data not available.

USPRO

Content:

Solar proton events.

Example:

```
USPRO   IIIII   YMMDD
SSEEE   DDHHM   DDHHM   DDHHM   9abcP   7abPP
```

Definition of symbols:

```
USPRO   IIIII   YMMDD
```

USPRO for satellite data (US) and PRO for protons.

```
USPRO   IIIII   YMMDD
```

IIIII = station indicator (20401 for Boulder)

```
USPRO   IIIII   YMMDD
```

Year, Month day of transmission

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc.*
DD = UT day of month

```
SSEEE   DDHHM   DDHHM   DDHHM   9abcP   7abPP
```

SS = satellite identifier
06 = GOES-6
07 = GOES-7
08 = GOES-8
09 = GOES–9

EEE = energy range
010 = >10 MeV
100 = >100 MeV

```
SSEEE   DDHHM   DDHHM   DDHHM   9abcP   7abPP
```

DD = UT day
HHM = indicates hour and 10's of minutes of the appropriate begin time of the event

```
SSEEE   DDHHM   DDHHM   DDHHM   9abcP   7abPP
```

DD = UT day
HHM = indicates hour and 10's of minutes of the appropriate max time of the event

```
SSEEE   DDHHM   DDHHM   DDHHM   9abcP   7abPP
```

DD = UT day
HHM = indicates hour and 10's of minutes of the appropriate end time of the event

USPRO—*Continued*

SSEEE	DDHHM	DDHHM	DDHHM	**9abcP**	7abPP

Maximum flux:

9 = indicator
abc = Proton flux in pfu's expressed as a.bc
PFU = 1 particle $cm^{-2}\ s^{-1}\ sr^{-1}$ = 10 p $m^{-2}\ s^{-1}\ sr^{-1}$
P = power of ten to raise **a.bc (always positive)**

SSEEE	DDHHM	DDHHM	DDHHM	9abcP	**7abPP**

Integrated flux (start thru end):

7 = indicator
ab integrated proton fluence expressed as a.b (particles $cm^{-2}\ sr^{-1}$)
PP = power of ten to raise **a.b (always positive)**

UTELC

Content:

Total electron content.

Example:

```
UTELC   20401   80712   01525   51203   61304
```

Definition of symbols:

```
[UTELC]   I I I I I   YMMDD   OHHmm   Habpp   [Habpp   ...]
```

UTELC comes from **T**otal **EL**ectron **C**ontent

```
UTELC   [I I I I I]   YMMDD   OHHmm   Habpp   [Habpp   ...]
```

I I I I I = station indicator (see lists in Appendix C)

```
UTELC   I I I I I   [YMMDD]   OHHmm   Habpp   [Habpp   ...]
```

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc.*
DD = UT day of month

```
UTELC   I I I I I   YMMDD   [OHHmm]   Habpp   [Habpp   ...]
```

O = indicates that the begin time of the observation follows
HHmm = UT hour and minute of beginning of observation

```
UTELC   I I I I I   YMMDD   OHHmm   [Habpp]   [Habpp   ...]
```

H = last digit of UT hour
ab = total electron content in units of electrons/m^2 where **ab** = **a.b**
pp = power of ten to apply to **a.b**

Note: **abpp** *reported as* **1202** *would equal* 1.2 x 10^2 Wm^{-2}

Note: */ is to be used for data not available.*

Chapter Five

Ionospheric Data Codes

Ionospheric Data Codes are used to describe the state of the ionosphere through direct and indirect sensors.

Code forms:

IONFM

UABSE

UFOFS, UFOFH, UMUFH, UFMNH, and UFESH

USIDS

IONFM

Content:

Hourly ionospheric data.

Example:

IONFM	**33502**	**90111**	**/1300**	**62129**	**03146**	**70130**	**01715**	**70030**	**//716**

Definition of symbols:

$\boxed{\textbf{IONFM}}$	**I I I I I**	**YMMDD**	**/HHmm**	**KFFMM**	**EEENN**

IONFM comes from **IONospheric data, Frequency Measurements**

IONFM	$\boxed{\textbf{I I I I I}}$	**YMMDD**	**/HHmm**	**KFFMM**	**EEENN**

I I I I I = station indicator (see lists in Appendix C)

IONFM	**I I I I I**	$\boxed{\textbf{YMMDD}}$	**/HHmm**	**KFFMM**	**EEENN**

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc.*
DD = UT day of month

IONFM	**I I I I I**	**YMMDD**	$\boxed{\textbf{/HHmm}}$	**KFFMM**	**EEENN**

/ = filler
HHmm = UT hour and minute of first data reported

IONFM	**I I I I I**	**YMMDD**	**/HHmm**	$\boxed{\textbf{KFFMM}}$	**EEENN**

K = double hour (UT) indicator
- 0 = 00 or 01, 20 or 21
- 1 = 02 or 03, 22 or 23
- 2 = 04 or 05
- 3 = 06 or 07
- 4 = 08 or 09
- 5 = 10 or 11
- 6 = 12 or 13
- 7 = 14 or 15
- 8 = 16 or 17
- 9 = 18 or 19

FF = F_2 critical frequency in tenths of MHz
MM = M–3000 maximum usable frequency in tenths of MHz

IONFM	**I I I I I**	**YMMDD**	**/HHmm**	**KFFMM**	$\boxed{\textbf{EEENN}}$

EEE = E_s critical frequency in tenths of MHz
NN = Fmin frequency in tenths of MHz

Note: / is to be used for data not available.

UABSE

Content:

Ionospheric absorption measurement by riometer technique or by ionospheric forward scatter or by VLF recordings.

Example:

```
UABSE  33501  05116
21200  91245  12/14
```

Definition of symbols:

UABSE	I I I I I	DDTHH

UABSE comes from ionospheric **ABS**orption, code **E**

UABSE	**I I I I I**	DDTHH

I I I I I = station indicator (see lists in Appendix C)

UABSE	I I I I I	**DDTHH**	aHHmm	9HHmm	(cc/HH)	or	(dddHH)

DD = UT day of observation
T = type of measurement
- 1 = riometer
- 2 = forward scatter
- 3 = VLF phase advance (rarely retardation which requires use of group **dddHH** instead of group **ccXHH**

HH = UT hour of message

UABSE	I I I I I	DDTHH	**aHHmm**	9HHmm	(cc/HH)	or	(dddHH)

a = type of phenomenon
- 1 = SCNA (sudden cosmic noise absorption)
  (if it is associated with a solar flare, it is normally reported by code USIDO)
- 2 = SPA (sudden phase anomaly)
  (if it is associated with a solar flare, it may be reported by code USIDO)
- 3 = Aurora—associated absorption
- 4 = PCA (polar cap absorption event) due to protons
- 5 = PCA (polar cap absorption event) due to relativistic electrons
- 6 = noise storm of solar radio emission superposed on absorption
- 7 = slowly varying ionospheric absorption—
  defines onset time of magnetospheric sub-storm at auroral zone stations near the midnight meridian (Eather and Jacka, Australia J. Physics *19*, 215, 1966).

HHmm = UT hour and minute of beginning of phenomenon

UABSE	I I I I I	DDTHH	aHHmm	**9HHmm**	(cc/HH)	or	(dddHH)

9 = indicates time of maximum follows
HHmm = UT hour and minute of maximum of event

Note: Omit group **bHHmm** *if maximum time is not known*

UABSE—*Continued*

If T = 1 or 2 in **DDTHH** use the following group:

UABSE	**I I I I I**	**DDTHH**	**aHHmm**	**9HHmm**	**cc/HH**	**or**	**(dddHH)**

cc	=	number of decibels of maximum absorption before hour indicated by next **HH**
/	=	filler
HH	=	UT hour of end time of event (if the event is still in progress at the time of the message, use / /)

If T = 3 in **DDTHH** use the following group:

UABSE	**I I I I I**	**DDTHH**	**aHHmm**	**9HHmm**	**(cc/HH)**	**or**	**dddHH**

d d d	=	phase advance (rarely retardation) in degrees
HH	=	UT hour of end time of event (if the event is still in progress at the time of the message, use / /)

Note: / is to be used for data not available.

UFOFS, UFOFH, UMUFH, UFMNH , and UFESH

Content:

The data in the UFOFS, UFOFH, UFMNH, UFESH, and UMUFH codes include:

- Critical frequencies of F2 region (foF2) as a function of time
- Maximum and minimum values of foF2 and hour of occurrence
- F–min frequencies for every 6 hours (first hours same as for first foF2 group)
- Minimum o–layer component frequency
- Critical frequency of sporatic E (foEs)

The codes are almost identical, except values are given for *6–hour intervals* in the UFOFS (xxxxS) code and for *1–hour intervals* in the UFOFH, UFMNH, UFESH, and UMUFH codes (xxxxH).

Also, the values are given for foF2 in the UFOFS and UFOFH codes and for M(3000)F2 in the UMUFH code (see **fgggh** group).

The UFESH code is used to report auroral sporadic E. It is the same as the UFOFH code, except the letter h in the group **fgggh** is defined as 6 = F, spread echoes for auroral sporadic E.

Examples:

```
UFOFS   34504   80924   /1800   9070/   0037/   3090/   6096/
```

```
UFOFH  22306   80924   /0000   0090/   1085/   2085/   3075/   4052/   5051/
 6045/  7047/   8046/   9049/   0085/   1091/   2090/   3036/   4045/   5067/
 6074/  7071/   8074/   9074/   0085/   1047/   2090/   3090/
```

```
UMUFH   34504   80924   /1800   9070/   0037/   3090/   6096/
```

Definition of symbols:

```
UFOFS   I I I I I   YMMDD   /HHmm
```

UFOFS comes from radio **FOF2**, code O (every Six hours, Universal time)

```
UFOFH   I I I I I   YMMDD   /HHmm
```

UFOFH comes from **FOF2**, code D (every Hour, Universal time)

```
UMUFH   I I I I I   YMMDD   /HHmm
```

UMUFH comes from Maximum Usable Frequency Factor (3000) F2, code D (every Hour, UT time)

UFOFS, UFOFH, UMUFH, UFMNH, and UFESH—*Continued*

UFMNH	I I I I I	YMMDD	/HHmm

UFMNH comes from Frequency MiNimum (every Hour, UT time) ???????

UFESH	I I I I I	YMMDD	/HHmm

UFESH comes from Frequency E-Sporadic (every Hour, UT time)

UFOFS	**I I I I I**	YMMDD	/HHmm

IIIII = station indicator (see lists in Appendix C)

UFOFS	I I I I I	**YMMDD**	/HHmm

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc.*
DD = UT day of month

UFOFS	I I I I I	YMMDD	**/HHmm**

/ = filler
HHmm = UT hour and minute of beginning of period

fgggh	[fgggh]	. . .	[fgggh]	MAXMI	HHppp	HHqqq

For the xxxxS codes, use the following time indicators:

f = even-hour indicator, give data for 6-hour intervals, beginning with the appropriate hour after the date:

0	= 0000 hours	6	= 1200
3	= 0600	9	= 1800

For the xxxxH codes, use the following time indicators:

f = UT hour of data reported, beginning with the appropriate hour after the date

0	= 0000	6	= 0600	2	= 1200	8	= 1800
1	= 0100	7	= 0700	3	= 1300	9	= 1900
2	= 0200	8	= 0800	4	= 1400	0	= 2000
3	= 0300	9	= 0900	5	= 1500	1	= 2100
4	= 0400	0	= 1000	6	= 1600	2	= 2200
5	= 0500	1	= 1100	7	= 1700	3	= 2300

UFOFS, UFOFH, UMUFH, UFMNH, and UFESH—*Continued*

ggg = value of foF2 (in tenths of MHz) for UFOFS and UFOFH
(report as 000 if symbols only are applicable)

= value of M(3000)F2 (in hundredths) for UMUFH
(report as 000 if symbols only are applicable

= minimum value (in tenths of MHz) of the o-layer component frequency (UFMNH)
(report as 000 if symbols only are applicable)

= value of foEs (in tenths of MHz) for UFESH
(report as 000 if symbols only are applicable)

h = descriptive letter symbol (see Piggott and Rawer, *URSI Handbook of Ionogram Interpretation and Reduction,* 1961, for full information)

X = none (use / in teletype messages)
1 = A, blanketing sporadic E
2 = B, complete absorption
3 = C, equipment trouble
4 = D, frequency higher than equipment limit
5 = E, frequency lower than equipment limit
6 = F, spread echoes
7 = G, foF2 $\leq$ foF1 (report foF1 in group **ggg** above)
8 = I or T, interpolated or smoothed value
9 = R, measurement influenced by, or impossible because of attenuation in the vicinity of a critical frequency
0 = any other

For code UFESH:

6 = F, spread echoes for auroral sproadic E

fgggh	[fgggh]	. . .	[fgggh]	MAXMI	HHppp	HHqqq

MAXMI = key word, indicating the following groups given **MAX**imum and **MI**nimum foF2 during 24–hour period reported

fgggh	[fgggh]	. . .	[fgggh]	MAXMI	HHppp	HHqqq

HH = nearest hour of maximum value
ppp = maximum value of foF2 in 24–hour period reported, in tenths of MHz

fgggh	[fgggh]	. . .	[fgggh]	MAXMI	HHppp	HHqqq

HH = nearest hour of minimum value
qqq = minimum value of foF2 in 24–hour period reported, in tenths of MHz

EFMIN	i i j j k	k l l / /

EFMIN = key word, indicating f–MIN data to follow

UFOFS, UFOFH, UMUFH, UFMNH, and UFESH—*Continued*

EFMIN **i i** j j k k l l / /

i i = f–min in tenths of MHz for time of first **fgggh** group above

EFMIN i i **j j** k k l l / /

j j = f–min in tenths of MHz for 6 hours later than **i i**

EFMIN i i j j **k k** l l / /

k k = f–min in tenths of MHz for 12 hours later than **i i**

EFMIN i i j j k k **l l** / /

l l = f–min in tenths of MHz for 18 hours later than **i i**

EFMIN i i j j k k l l **/ /**

/ / = filler

Notes: 1. In **i i j j k k l l / /** *groups, "99" will signify f–min ≥ 9.9 MHz*
2. If a symbol is to be used for f–min, encode as follows:
X1 = A X3 = C
X2 = B X5 = E
(The X's should be / in teletype messages)

Note: / is to be used for data not available.

USIDS

Content:

Type of ionospheric phenomena observed, and importance with appropriate times.

Example:

USIDS	10101	80314
11520	11540	31600

Definition of symbols:

USIDS	I I I I I	YMMDD

USIDS comes from radio **S**udden **I**onospheric **D**isturbance, code **S**

USIDS	**I I I I I**	YMMDD

I I I I I = station indicator (see lists in Appendix C)

USIDS	I I I I I	**YMMDD**

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc.*
DD = UT day of month

aHHmm	cHHmm	dHHmm	{ *repeat this line for each type of phenomena reported*

a = type of phenomena
- 0 = sudden frequency deviation (SFD)
- 1 = short wave fade–out with sudden drop out (typical S–SWF)
- 2 = short wave fade–out with slow drop out – 5 to 15 minutes with gradual recovery (slow S–SWF)
- 3 = short wave fade–out with fade irregular in drop out and recovery (G–SWF)
- 4 = sudden enhancement of atmospherics (SEA)
- 5 = sudden phase anomaly–phase advance (SPA)
- 6 = sudden cosmic noise absorption (SCNA)
- 7 = sudden enhancement of signal .15 to 200 KHz (SES)
- 8 = sudden phase anomaly–phase retardation (SPA)

Note: To report SPA by degrees, use code UABSE.

HHmm = UT hour and minute of beginning of phenomena

aHHmm	**cHHmm**	dHHmm	{ *repeat this line for each type of phenomena reported*

c = importance of phenomena

0 = importance 1–	7 = importance 1+
1 = importance 1	8 = importance 2+
2 = importance 2	9 = importance 3+
3 = importance 3	

HHmm = UT hour and minute of maximum of phenomena

USIDS—*Continued*

aHHmm	cHHmm	**dHHmm**	{ *repeat this line for each type of phenomena reported*

d = recording definitiveness and time qualifier

0 = definite		
1 = reasonable		time accuracy *is* within 2 minutes
2 = fair		
3 = questionable		
5 = definite		
6 = reasonable		time accuracy *is not* within 2 minutes
7 = fair		
8 = questionable		

HHmm = UT hour and minute of end time of phenomena

Note: / is to be used for data not available.

Chapter Six

Geophysical Data Codes

Geophysical Data Codes are used to report geomagnetic, auroral, and cosmic-ray data derived from ground-based sensors.

Code forms:

SOLMF

UCOHO

UCOSE

UMAGF

SOLMF

Content:

Observed value of the solar mean field from Stanford (RWC Boulder).

Example:

```
SOLMF   18403   80601   00039
```

Definition of symbols:

First Line—

```
SOLMF   I I I I I   YMMDD   QMMMM
```

SOLMF comes from **SOL**ar **M**ean **F**ield

```
SOLMF   I I I I I   YMMDD   QMMMM
```

IIIII = station indicator (see lists in Appendix C)

```
SOLMF   I I I I I   YMMDD   QMMMM
```

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc.*
DD = UT day of month

```
SOLMF   I I I I I   YMMDD   QMMMM
```

Q = polarity or explanation for no data
- 0 = positive value
- 1 = equipment problems
- 2 = weather problems
- 9 = negative value

MMMM = measured value of solar mean field in micro-Teslas

Note: for solar mean field of 20 report as **0020**

Note: / is to be used for data not available.

UCOHO

Content: Coronal hole data.

Example:

```
UCOHO 21304 80629 1630/ 2//01
20221 12104 12504 13020 21121 21216 12510 125// 99999
PLAIN
text
BT
```

Definition of symbols:

First Line—

UCOHO	I I I I I	YMMDD	HHmm/	T / / nn

UCOHO comes from **CO**ronal **HO**le,

UCOHO	**I I I I I**	YMMDD	HHmm/	T / / nn

IIIII = station indicator (see lists in Appendix C)

UCOHO	I I I I I	**YMMDD**	HHmm/	T / / nn

Y = last digit of year
MM = month of year, 01 = January, 02 = February, *etc.*
DD = UT day of month of observation

UCOHO	I I I I I	YMMDD	**HHmm/**	T / / nn

HHmm = UT hour and minute nearest beginning of observation
/ = filler

UCOHO	I I I I I	YMMDD	HHmm/	**T / / nn**

T = type of measurement
- 1 = 530.3 nm (FE XIV green line)
- 2 = 1083 nm (Helium)
- 3 = radio scan
- 4 = x-ray image
- 5 = EUV

nn = number of coronal holes reported

Data lines—

TNNcP	AAAnn	QXXYY	[QXXYY]	.....	[QXXYY]	c c c / /	{ repeat this line for each coronal hole

T = type
- 1 = polar north (use // in the next section for the serial number)
- 2 = polar north extension
- 3 = polar south (use // in the next section for the serial number)
- 4 = polar south extension
- 5 = isolated
- 9 = unknown (for example from E-W drift radio scan data)

NN = serial number of the coronal hole (use // for polar north or polar south)

q = certainty of the existence of the coronal hole
- 1 = uncertain
- 2 = poor
- 3 = fair
- 4 = good

P = polarity
- 1 = positive
- 2 = negative
- 3 = not determined

TNNcP	**AAAnn**	QXXYY	[QXXYY]	.....	[QXXYY]	c c c / /	{ repeat this line for each coronal hole

AAA = area in thousandths of solar hemisphere

nn = number of boundary points reported (no more than 20 points, minimum number of points is four, must include maximum east longitude, west longitude, north latitude, and south latitude for each hole)

TNNcP	AAAnn	**QXXYY**	[QXXYY]	.....	[QXXYY]	c c c / /	{ repeat this line for each coronal hole

Q = heliographic coordinates of selected boundary points (must include maximum east longitude, west longitude, north latitude, and south latitude for each hole)
- 1 = NE (northeast) 3 = SW (southwest)
- 2 = SE (southeast) 4 = NW (northwest)

XX = distance to central meridian in degrees

YY = heliographic latitude in degrees

TNNcP	AAAnn	QXXYY	[QXXYY]	.....	[QXXYY]	**c c c / /**	{ repeat this line for each coronal hole

c c c = Carrington longitude of the center of the coronal hole

/ / = filler

Last Data Line—

99999

99999 = end of data terminator; indicates that all coded data has been received

Text Lines—

PLAIN	BT

PLAIN = Plain language text information

PLAIN	**BT**

BT = Break in transmission (end of message terminator)

Note: / is to be used for data not available.

UCOSE

Content:

Bi-hourly flux values of cosmic rays, daily variations and special events.

Example:

```
UCOSE  44406  25102  68154  31048  33046  35046  37046  39042
41042  43042  45046  47048  49046  51052  53054
```

Definition of symbols:

First Line—

UCOSE	I I I I I	DDTHH	a b c c c	HHddd	[HHddd]	.....	[HHddd]	{ *repeat this group for each hour*

UCOSE comes from **COS**mic rays, code **E**

UCOSE	**I I I I I**	DDTHH	a b c c c	HHddd	[HHddd]	.....	[HHddd]	{ *repeat this group for each hour*

IIIII = station indicator (see lists in Appendix C)

UCOSE	I I I I I	**DDTHH**	a b c c c	HHddd	[HHddd]	.....	[HHddd]	{ *repeat this group for each hour*

DD = UT day of first period for which flux values are given

T = type of apparatus
- 0 = neutron monitor (IGY-Simpson type)
- 1 = high counting rate neutron monitor (IQSY-type)
- 2 = meson monitor (IGY-type)
- 3 = meson monitor (IQSY type)
- 4 = telescope, no shielding
- 5 = ionization chamber

HH = UT hour of message (normally in the UT day following the date of **DD**)

UCOSE	I I I I I	DDTHH	**a b c c c**	HHddd	[HHddd]	.....	[HHddd]	{ *repeat this group for each hour*

a = type of variation during the day
- 0 = normal daily variation
- 1 = beginning of a pre-decrease
- 2 = pre-decrease
- 3 = commencement of a Forbush decrease
- 4 = Forbush decrease
- 5 = recurrent activity
- 6 = increase
- 7 = after-effect of increase
- 8 = daily variation of large amplitude
- 9 = daily variation of anomalous phase

b = sign of daily variation (below or above arbitrary level)
- 7 = negative
- 8 = zero
- 9 = positive

c c c = average deviation expressed in steps of thousandths of an arbitrary mean level

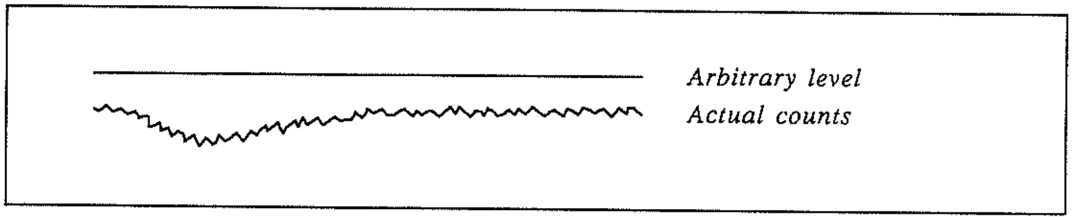
UCOSE—*Continued*

UCOSE	IIIII	DDTHH	abccc	HHddd	[HHddd]	[HHddd]	{ *repeat this group for each hour*

HH = UT hour indicator; deviation of flux from the normal value following with **ddd** refers to the interval **HH**-1 to **HH**+1 hours; if the deviation is positive, 30 is added to the hour to obtain **HH**

ddd = deviation of cosmic ray flux from level expressed by steps of thousandths of an arbitrary mean count

Note: The arbitrary level is selected so that the deviations can be specified by three digits. The arbitrary level is always chosen higher than the actual level (see example below).



Note: / is to be used for data not available.

UMAGF

Content:

Geomagnetic Ak index (allows for 3-digit value)
Geomagnetic K-indices for the period reported
Geomagnetic disturbances with time of occurrence
Time and value of minimum H-component (optional)

Example:

```
UMAGF   18403   21207   1300/
 11125   1/151   25896   37766   51407   20671
```

Definition of symbols:

First Line—

```
UMAGF  I I I I I   YMMDD  HHmm/
```

UMAGF comes from **MAG**netic activity, code **F**

```
UMAGF  I I I I I   YMMDD  HHmm/
```

I I I I I = station indicator (see lists in Appendix C)

```
UMAGF  I I I I I   YMMDD  HHmm/
```

Y = last digit of year
MM = month of year, 01 = January, 02 = February, etc.
DD = UT day of month

```
UMAGF  I I I I I   YMMDD  HHmm/
```

HHmm = UT time in hour and minute
/ = filler

Second Line—

```
DDHHa   1/bbb   2kkkk   3kkkk   cHHmm   dHHmm   (e e e e e)
```

DD = UT day of beginning 24-hour period reported
HH = UT hour of beginning 24-hour period reported
a = last digit of check sum of the Ak (bbb) and the 8 Ks.

UMAGF—*Continued*

DDHHa	**1/bbb**	2kkkk	3kkkk	cHHmm	dHHmm	(e e e e e)

1 = indicator for Ak index
bbb = Ak index for UT date If Ak is not available, use ///

DDHHa	1/bbb	**2kkkk**	3kkkk	cHHmm	dHHmm	(e e e e e)

2 = indicator Ak index
kkkk = first 4 K index

DDHHa	1/bbb	2kkkk	**3kkkk**	cHHmm	dHHmm	(e e e e e)

3 = indicator for last 4 K indices
kkkk = last 4 K index

DDHHa	1/bbb	2kkkk	3kkkk	**cHHmm**	dHHmm	(e e e e e)

c = indicator telling the time reported in HHmm is
1 = storm end
2 = bay (psc)
3 = typical crochet
4 = provisional figures
6 = gradual storm beginning
7 = sudden storm beginning
8 = very marked sudden storm beginning
9 = sudden impulse

HHmm = UT hour and minute of phenomenon indicated by **c.**
If **c**=4, **HHmm** is used for reporting up to four additional K indices (3-hour periods) following the 24-hour interval reported by the **2** and **3** groups.

DDHHa	1/bbb	2kkkk	3kkkk	cHHmm	**dHHmm**	(e e e e e)

d 5 = signifies the following time refers to absolute value of minimum reached on the horizontal component
HHmm = UT hour and minute of minimum

Note: Omit **dHHMM** group if data not available

DDHHa	1/bbb	2kkkk	3kkkk	cHHmm	dHHmm	**(e e e e e)**

e e e e e = intensity of minimum expressed in nT

Note: Omit group **e e e e e** *if these measurements are not made.*

Note: / is to be used for data not available.

Chapter Seven

Regional and Specialized Codes

Regional and Specialized Codes are more nearly associated with an RWC than with a type of solar geophysical information.

Code forms:

RWC Boulder Codes:
- **AFRED**
- **TENCM**

RWC Moscow Codes:
- **FORECAST**

RWC Tokyo Codes:
- **RATEF**

Other RWC Codes:
- **UPROP**
- **UFILA**

AFRED (RWC Boulder)

Content:

Predicted value of A-index for Fredericksburg, Virginia, for each of the next three days (RWC Boulder).

Example:

AFRED	**0 2 5 2 3**	**0 2 2 2 4**	**0 2 0 2 5**

Definition of symbols:

$\boxed{\textbf{AFRED}}$	**a a a DD**	**a a a DD**	**a a a DD**

AFRED comes from A-index for **FRED**ericksburg, Virginia.

AFRED	$\boxed{\textbf{a a a DD}}$	**a a a J J**	**a a a DD**

a a a = predicted A-index for Fredericksburg, Virginia
DD = UT day for predicted **a a a**

Note: / is to be used for data not available.

TENCM (RWC Boulder)

Content:

Predicted Ottawa 10.7 cm flux for each of the next three days (RWC Boulder).

Example:

TENCM	1 5 4 1 2	1 5 0 1 3	1 4 5 1 4

Definition of symbols:

TENCM	a a a DD	a a a DD	a a a DD

TENCM comes from **TEN-CM** flux (10-cm flux)

TENCM	**a a a DD**	a a a DD	a a a DD

a a a = predicted value of Ottawa 10-cm flux
DD = UT day for predicted **a a a**

Note: / is to be used for data not available.

FORECAST (RWC Moscow)

Content:

Five-day forecast of ionospheric and geomagnetic conditions expressed by quality figures for Moscow.

Example:

```
FORECAST 34504 26310 IONFO 00110 0////
FORECAST 34504 26310 MAGFO 00110 0////
FORECAST 38401 26310 IONFO 01000 0////
FORECAST 36401 26310 MAGFO 01000 0////
```

Definition of symbols:

FORECAST I I I I I DDJJm

FORECAST of ionospheric and geomagnetic conditions

FORECAST **I I I I I** DDJJm

IIIII = station indicator (see lists in Appendix C)

FORECAST I I I I I **DDJJm**

DD = UT day of beginning of the 5-day period to which the forecast refers
JJ = UT day of the end of the 5-day period to which the forecast refers
m = last digit of month of year (1 = January, 2 = February . . . 0 = October, 1 = November)

ION / / a a a a a (a / / / /)

ION / / = comes from **ION**ospheric conditions

ION / / **a a a a a** (a / / / /)

a a a a a = expected ionospheric conditions expressed by quality figures for corresponding date. The 6th quality figure refers to 31st day of a month.

0 = quiet $|\Delta foF2| \leq \pm 20\%$
1 = minor negative disturbance: $20\% < |\Delta foFs| < 25\%$
2 = moderate negative disturbance: $25\% < |\Delta foF2| < 35\%$
3 = major negative disturbance: $|\Delta foF2| > 35\%$
4 = minor positive disturbance: $20\% < |\Delta foF2| < 25\%$
5 = moderate positive disturbance: $25\% < |\Delta foF2| < 35\%$
6 = major positive disturbance: $\Delta foF2 > 35\%$

ION / / a a a a a **(a / / / /)**

a / / / / = expected ionospheric conditions expressed by quality figure (see above) for the 31st day of a month, otherwise omit this group.

FORECAST—*Continued*

MAG / /	b b b b b	(b / / / /)

MAG / / = comes from **MAG**netic conditions

MAG / /	b b b b b	(b / / / /)

b b b b b = expected geomagnetic conditions expressed by quality figures for corresponding date. The 6th quality figure refers to 31st day of a month (A-index for Moscow)

0	=	quiet	(A < 15)
1	=	minor disturbance	(15 < A ≤ 25)
2	=	moderate disturbance	(25 < A ≤ 80)
3	=	major disturbance	(A > 80)

MAG / /	b b b b b	b / / / /

b / / / / = expected geomagnetic conditions expressed by quality figure (see above) for the 31st day of a month, otherwise omit this group.

Note: */ is to be used for data not available.*

RATEF (RWC Tokyo)

Content:

Seven-day forecast of Radio Telecommunications, issued every Friday and Tuesday (by Hiraiso).

Example:

```
RATEF   05/11   22313   14/02   11021
```

Definition of symbols:

```
RATEF   DD / J J   a a a a a   a a / b b   b b b b b
```

RATEF comes from **RA**dio **TE**lecommunications **F**orecast for combination of circuits

```
RATEF   DD / J J   a a a a a   a a / b b   b b b b b
```

DD = UT day of beginning of the 7-day period to which forecast applies
/ = filler
J J = UT day of ending of the 7-day period to which forecast applies

```
RATEF   DD / J J   a a a a a   a a / b b   b b b b b
```

aaaaaaa = forecast quality figures for each day of the 7-day period
- 1 = very poor
- 2 = poor
- 3 = slightly poor
- 4 = good
- 5 = very good

/ = filler

```
RATEF   DD / J J   a a a a a   a a / b b   b b b b b
```

bbbbbbb = possibility of SWF for each day of the 7-day period
- 0 = nothing
- 1 = slight possibility
- 2 = high possibility

Note: */ is to be used for data not available.*

UPROP

Content:

Radio propagation indices for certain radio circuits, monitored at the observatory.

Example:

```
UPROP   31526   80730   06/50
05735   03652   02534
99999
PLAIN
text
BT
```

Definition of symbols:

First Line—

UPROP	I I I I I	YMMDD	HH / z z

UPROP comes from radio **PROP**agation

UPROP	**I I I I I**	YMMDD	HH / z z

I I I I I = station indicator (see lists in Appendix C)

UPROP	I I I I I	**YMMDD**	HH / z z

Y = last digit of year
MM = month of year, 01 = January, 02 = February, etc.
DD = UT day of month of observation

UPROP	I I I I I	YMMDD	**HH / z z**

HH = UT hour of the start of the 24-hour period for which the Propagation Index is calculated
/ = filler
z z = last two digits of check sum of all the following digits

UPROP—*Continued*

Data Lines—

a a b b c	[a a b b c] ...

a a = circuit monitored

- 01 = Tokyo, Japan
- 02 = New York, USA
- 03 = Tehran, Iran
- 04 = Oslo, Norway
- 05 = Bracknell, England
- 06 = Canberra, Australia
- 07 = Johannesburg, South Africa
- 08 = Rome, Italy
- 09 = Moscow, USSR
- 10 = Fort Collins, Colorado, USA
- 11 = Melbourne, Australia

b b = Propagation Index from 0.1 - 9.9, where 6.0 = normal.
Conditions are "normal" (index 6.0) if they correspond to the average of the preceding 27 days (1 sun rotation) Scale of Propagation Index.

- 0.1 - 1.0 = very poor
- 1.1 - 3.0 = poor
- 3.1 - 5.0 = fair
- 5.1 - 7.0 = normal
- 7.1 - 9.0 = good
- 9.1 - 9.9 = very good

c = Number of frequencies that are used to calculate the Propagation Index.

Note: The Melbourne circuit consists of five frequencies that transmit for the world-wide CCIR HF field strength measuring campaign.

Last Data Line—

99999

99999 = end of data terminator – indicates that all coded data has been received

PLAIN	BT

PLAIN = Plain language text information

PLAIN	BT

BT = Break in transmission (end of message terminator)

UFILA

Content:

Code for reporting the position, orientation, and magnitude of a filament which has disappeared. A "filament" consists of one or more dark sections which appear to lie along one magnetic inversion line. The properties of only one filament disappearance can be encoded in a single UFILA code.

Example:

```
UFILA 30508
80721 14361 80722 14251 42345 12212 43050 99999
```

Definition of symbols:

UFILA I I I I I

UFILA comes from disappearing **FILA**ment

UFILA **I I I I I**

I I I I I = station indicator (see lists in Appendix C)

YMMDD HHmmq YMMDD HHmmn QXXYY aaaed QXXYY [QXXYY aaaed QXXYY]... 99999

UT date of last observation prior to disappearance:

Y	=	last digit of year
MM	=	month of year, 01 = January, 02 = February, *etc.*
DD	=	UT day of month

YMMDD **HHmmq** YMMDD HHmmn QXXYY aaaed QXXYY [QXXYY aaaed QXXYY]... 99999

UT time of last observation prior to disappearance and character of disappearance:

HH	=	UT hour
mm	=	UT minute
q	=	general character of disappearance

- 1 = slow disappearance, taking more than a half hour
- 2 = rapid disappearance, taking less than a half hour
- / = character of disappearance not determined

YMMDD HHmmq **YMMDD** HHmmn QXXYY aaaed QXXYY [QXXYY aaaed QXXYY]... 99999

UT date of first observation after disappearance:

Y	=	last digit of year
MM	=	month of year, 01 = January, 02 = February, *etc.*
DD	=	UT day of month

YMMDD HHmmq YMMDD **HHmmn** QXXYY aaaed QXXYY [QXXYY aaaed QXXYY]... 99999

UT time of first observation after disappearance and number of filament segments:

HH	=	UT hour
mm	=	UT minute
n	=	number of filament segments encoded

UFILA—*Continued*

YMMDD HHmmq YMMDD HHmmn $\boxed{QXXYY}$ aaaed QXXYY [QXXYY aaaed QXXYY]... 99999

Coordinates (at the time of last observation) of one end of the filament or filament segment:

Q = heliographic coordinates of the point (use)

1 = NE (northeast) 3 = SW (southwest)
2 = SE (southeast) 4 = NW (northwest)
(use / / / / / if coordinates cannot be determined)

XX = distance to central meridian in degrees (longitude)

YY = heliographic latitude in degree

Note: Use */ / / / / if coordinates cannot be determined.*

The location and orientation of a filament is described by specifying two or more positions along the filaments. The first position, described above, corresponds to one endpoint. Subsequent positions, described below, refer to points of inflection where the gross orientation of the filament changes markedly. Between two consecutive points, the filament should lie approximately along a great circle arc. The final position refers to the other endpoint.

YMMDD HHmmq YMMDD HHmmn QXXYY $\boxed{aaaed}$ QXXYY [QXXYY aaaed QXXYY]... 99999

Descriptive data on filament segment:

aaa = reduction in the uncorrected area of the envelope containing the dark matter in the filament segment (in heliographic square degrees at disk center) replaced by /// if undetermined for any reason

e = extent to which the filament segment has disappeared

0 = no disappearance
1 = incomplete disappearance with section of filament segment remaining
2 = faint trace of entire filament segment remains
3 = complete disappearance
/ = not determined or not relevant

d = darkness of filament segment

1 = faint
2 = normal
3 = dark
/ = not determined or not relevant

Note: *The interval between two consecutive positions is called a "filament segment" and its characteristics are described above. The filament need not appear continuous, in the form of dark absorbing material, over the entire segment. Filament material is nearly always irregular in shape and density, which complicates the measurement of its area. Measurement of the area of a segment is made by first constructing an envelope which loosely encloses the dark matter of the filament segment. The area indicated in the code should be the reduction in the area of this envelope between the last time the filament was observed prior to disappearance and the time of the first observation after disappearance.*

UFILA—*Continued*

YMMDD HHmmq YMMDD HHmmn QXXYY aaaed $\boxed{QXXYY}$ [QXXYY aaaed QXXYY]... 99999

Coordinates of the other end of the filament or filament segment:

Q = heliographic coordinates of the point
- 1 = NE (northeast)
- 2 = SE (southeast)
- 3 = SW (southwest)
- 4 = NW (northwest)

XX = distance to central meridian in degrees (longitude)

YY = heliographic latitude in degrees

Note: Use / / / / / *if coordinates cannot be determined.*

If a filament extends from the disk to beyond the limb, then one endpoint will correspond to a disk position and the other endpoint will correspond to a limb position. If the filament lies entirely beyond the limb (prominence), only two positions indicating the limb extent of the prominence should be given. In these cases the area may include measurements made of material both on the disk and above the limb.

YMMDD HHmmq YMMDD HHmmn QXXYY aaaed QXXYY [QXXYY aaaed QXXYY]... $\boxed{99999}$

99999 = end of message terminator; indicates that entire message has been received

Note: / *is to be used for data not available.*

Appendix A

Standard Code Format

The procedure for adding new IUWDS codes is described below and an example of the Standard Code Format is shown on the next page.

When a new code is proposed, Boulder and the RWC which proposed the code will work together to design the format. When the format is worked out it will be distributed to all RWCs for suggestions. After all the ideas are considered a final format will again be distributed to the RWCs along with the date it will be implemented. New codes will always be implemented on either April 1 or October 1.

Uxxxx

First Line—

Uxxxx	IIIII	YMMDD	HHmmt	(qqqnn)

Uxxxx comes from xxxx

Uxxxx	**IIIII**	YMMDD	HHmmt	(qqqnn)

IIIII = station indicator (see lists in Appendix D)

Uxxxx	IIIII	**YMMDD**	HHmmt	(qqqnn)

Y = last digit of year
MM = month of year, 01 = January, 02 = February, etc.
DD = UT day of month

Uxxxx	IIIII	YMMDD	**HHmmt**	(qqqnn)

HHmm = UT in hour and minute
t = time qualifier

This 5-digit group is optional and may be omitted—

Uxxxx	IIIII	YMMDD	HHmmt	**(qqqnn)**

qqq data information qualifiers (if not necessary use / / /)
nn = checksum, for example it could be the number of 5-digit groups, events, or lines of data that follow prior to the **99999** line

Second and following lines contain data in five-digit groups and have fixed format—

DATAA	DATAB	DATAC	DATAD	.....

Listed below are letters which are always defined in a certain way in the codes—

HHT = UT time in hours and tenths of hours
JJ = last day (UT) of a defined period

Coded location of regions, etc.

Q = quadrant (heliographic coordinates) of the region
1 = NE (north-east) 3 = SW (south-west)
2 = SE (south-east) 4 = NW (north-west)
XX = distance to central meridian in degrees
YY = heliographic latitude in degrees
AAAA = sunspot area in millionths of solar hemisphere

OR

AAA = sunspot area in millionths of solar hemisphere
ab = flux, *etc.* where ab = a.b
pp = Power of ten to apply to a.b

Last Data Line—

99999	

99999 = end of data terminator – indicates that all coded data has been received

PLAIN	BT

PLAIN = Plain language text information

PLAIN	BT

BT = Break in transmission (end of message terminator)

Note: / is to be used for data not available.

Appendix B

Regional Warning Centers

This section concerns the major specifics of the Regional Warning Centers (RWC's). All of the real-time data available at each RWC, as well as a description of their major products is included. It also includes information concerning the person in charge, address, operating organization, telephone and telex numbers, and broadcasts that are issued from the center.

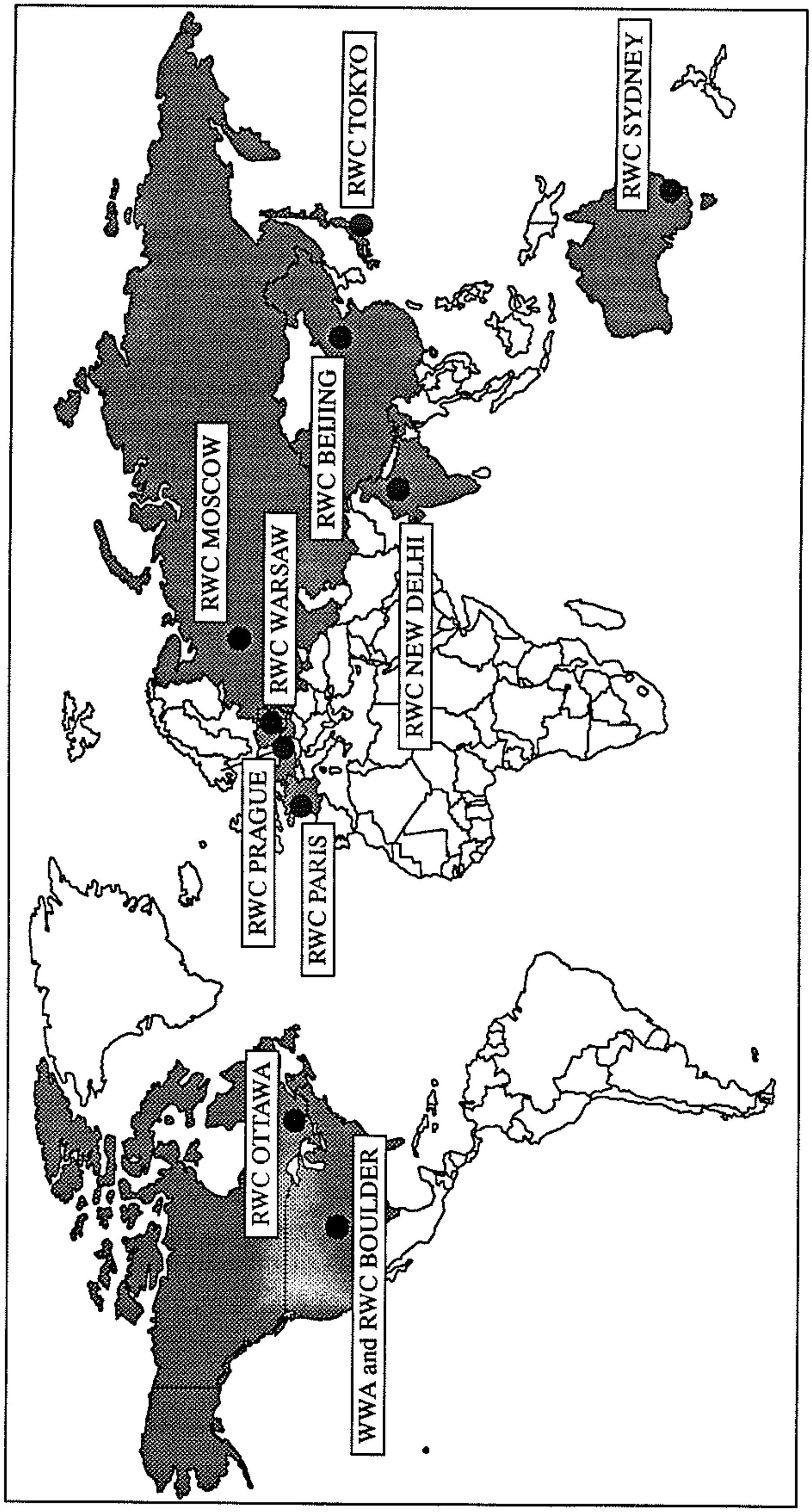


Figure B–1. International Ursigram and World Days Service (I.U.W.D.S.) Regional Warning Centers

Chinese Regional Warning Center

RWC BEIJING

Supervisory
Dr. Li Qibin

Mail address
Beijing Astronomical Observatory
Chinese Academy of Sciences
Beijing 100080
Beijing, China

Telephone
2551968

Telefax
281261

Telex
22040 (BAOAS CN)

Cable
9053

Electronic mail
INTERNET: bmabao@ica.beijing.canet.cn

Operating organization
Beijing Astronomical Observatory

Operating hours
8 hours/day 5 days/week

Outgoing messages

Data: Solar (optical and radio), ionospheric, cosmic ray, geomagnetic

Products: UGEOA, UGEOE, UGEOI, UFOFH and UCOSE, UMAGF

Observatory data collected at Beijing RWC

Solar (optical):
Huairou (Beijing), Purple Mountain (Nanjing)
Shahe (Beijing), Yunnan (Kunming)

Solar (radio):
Shahe (Beijing), Purple Mountain (Nanjing)
Yunnan (Kunming)

Solar cosmic ray (UCOSE):
Center for Space Science and Applied Research (Beijing)

Geomagnetic (UMAGF):
Beijing Geomagnetic Observational Centre

Ionospheric (UFOFH):
Beijing, Chongqing, Guangzhou, Manzhouli

Data transmitted from RWC's *to* Beijing

Time UT	Frequency of issue	From
0030	Daily	Boulder
0200	Daily	Boulder
0235	Daily	Boulder
0330	Daily	Boulder
2200	Daily	Boulder

Data transmitted to RWC's *from* Beijing

Time UT	Frequency of issue	to
0600	M–F	Boulder

Western Hemisphere Regional Warning Center

WORLD WARNING AGENCY (WWA) and RWC BOULDER

Supervisory
Gary Heckman
Forecast Center: Joseph W. Hirman
Communications Center: Kurt Carran

Mail address
Space Environment Services Center
NOAA, R/E/SE
325 Broadway, Radio Building
Boulder, Colorado 80302-3328
USA

Telephone
303–497–3171

Telefax
303–497–3137

Telex
888776 (NOAA BLDR)

U.S. military teletype
RUWTGPA

Cable
NOAA BLDR, Boulder, Colorado

Electronic mail address
INTERNET: sesc@sel.bldrdoc.gov
SPAN: selvax::sesc

Public Bulletin Board System
303–497–5000 (300, 1200 or 2400 baud)

Operating organization
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Operating hours
Forecast Center and Communications Center:
24 hours/day, 7 days/week

Outgoing messages
Data:
URSIGRAM Solar and geophysical data (issued daily at 0105UT)

Products (issued daily):
Solar Region Summary (0030UT),
Anchorage Advisory Report (0040 UT),
Solar Coronal Disturbance Report (0200),
Solar and Geophysical Activity Summary (0235 UT),
Geoalert WWA (0330 UT),
Geoalert RWC (2145 UT),
Joint USAF/NOAA Report of Solar and Geophysical Activity (2200 UT)

Products (issued weekly):
Preliminary Report and Forecast of Solar Geophysical Data
27-day outlook (10.7 cm flux, K_p, and A_p)

Services
Public Bulletin Board System (303-497-5000)
Satellite Broadcast
Space Enviroment Laboratory Data Acquisition and Display System (SDII)
Space Environment Laboratory Solar Imaging System (SELSIS)

Observatory data collected at RWC Boulder (WWA)

Solar (optical):
Boulder, Culgoora, Holloman, Kitt Peak, Learmonth, Mt. Wilson, Palehua, Ramey, San Vito

Solar (radio):
Boulder, Culgoora, Learmonth, Penticton, Palehua, Sagamore Hill, San Vito

Solar cosmic ray:
Anchorage, Thule

X–ray and particle:
GOES, NOAA (spacecraft)

Ionospheric:
Argentia, Boulder, Bermuda, Cape Canaveral, Dyess, Eielson, Eglin, Ft. Churchill, Goosebay, Hawaii, Korea, Manila, Nicosia, Ottawa, Resolute Bay, Shemya, Taiwan, Vandenberg AFB, Wallops Island

RWC BOULDER—*Continued*

Geomagnetic:
Anchorage, Arctic Village, Baker Lake, Boulder, Cambridge Bay, Cape Parry, College, Fort Churchill, Fort Yukon, Fredericksburg, Fresno, Glenea, GOES, Honolulu, Inuvik, Meanook, Narssarssuaq, Newport, Ottawa, Point Barrow, Poste de la Baleine, Resolute Bay, Sachs Harbor, St Johns, San Juan, Sitka, Talkeetna, Tucson, Victoria, Yellowknife

Data transmitted from RWC's *to* Boulder

Time UT	Frequency of issue	From
0130	Daily	Moscow, Sydney, Tokyo
0600	Daily	Moscow, Sydney, Tokyo
0900	Daily	Sydney
1100	Daily	Darmstadt[2]
1400	Daily	Moscow, Meudon[1]
1600	Daily	Moscow

[1]data is not transmitted on Sunday.
[2]data is not transmitted on Saturday or Sunday.

Data transmitted to RWC's *from* Boulder

Time UT	Frequency of issue	To
0030	Daily	Beijing, Moscow, New Delhi
0105	Daily	Moscow
0200	Daily	Beijing, Moscow, New Delhi
0235	Daily	Beijing, Moscow, New Delhi
0330	Daily	GEOALERT WWA Beijing, Moscow, New Delhi
2200	Daily	Beijing, Moscow, New Delhi

Note: URSIGRAM solar and geophysical data and all products issued by WWA Boulder are available on our SELVAX computer. The account name is SEL with no password required. Files may be downloaded at your convenience.

GEOALERT broadcasts

Content: Penticton 10.7 cm solar flux, Boulder A–index, Boulder 3–hourly K–index, current solar and geophysical data summaries and forecasts.

Methods of transmission:

WWV
Voice message every hour at 18 minutes past the hour at 2.5, 5, 10, 15, and 20 MHz. Message is changed every 3 hours at 0000, 0300, 0600, 0900, 1200, 1500, 1800, and 2100 UT.

WWVH
Voice message every hour at 45 minutes past the hour at 2.5, 5, 10, and 15 MHz. Message is changed every 3 hours at 0000, 0300, 0600, 0900, 1200, 1500, 1800, and 2100 UT.

24–hour answering service 303–497–3235 (recorded message which is changed every 3 hours at 0000, 0300, 0600, 0900, 1200, 1500, 1800, and 2100 UT.)

Eurasian Regional Warning Center

RWC MOSCOW

Supervisory
Dr. S. I. Avdiushin
Forecast Center : S. G. Frolov

Mail address
Institute of Applied Geophysics
Rostinskay 9
Moscow 129226
RUSSIA

Telex
411914 (ZEMLA SU)

Electronic Mail address
INTERNET: geophys@sovamsu.sovusa.com

Operating organization
Federal Service on the Hydrometerorology and Environment of the Russian Federation
RUSSIA

Operating hours
24 hours/day, 7 days/week

Outgoing messages

Data:
URSIGRAM Solar and geophysical data
(Issued daily at 0600, 0730, 0900, 1200, 1345UT)

Forecasts:
Solar activity and geophysical disturbances in GEOSOL at 1600UT;
Ionspheric disturbances in URSIGRAM for National Centers

Observatory data collected at Moscow RWC

Solar (optical):
Abastumani, Alma–Alta, Irkutsk, Kislovodsk Tashkent, Ussurisk.

Solar (radio): Abastumani, Dushanbe, Irkutsk, Kislovodsk, Moscow, Nijni Novgorod (Gorky).

Ionospheric:
Daily reports – Darmstadt, Juliusruh, Pruhonice
Hourly reports – Ashgabat, Archangelsk, Cape Schmidt, Dixon, Ekaterinburg, Khabarovsk, Kaliningrad, Magadan, Moscow, Murmansk, Novosibirsk, Petropavlovisk, Preobrajeniya, Podkamennaya Tungusca, Rostov–na–donu, Salekhard, St. Peterburg, Tashkent, Tomsk, Uelen.

Ionospheric (SID):
Kuhlungsborn, Norddeih, Panska Vec

Geomagnetic:
Archangelsk, Dixon, Ekaterinburg, Kalingrad, Khabarovsk, Krenkel, Moscow, Murmansk, Magadan, Novosibirsk, Petropavlovsk, Preobrajeniya, Podkamennaya Tungusca, St. Peterburg, Tiksi, Uelen.

Data transmitted from RWC's *to* Moscow

Time UT	Frequency of issue	From
0030	Daily	Boulder
0105	Daily	Boulder
0200	Daily	Boulder
0235	Daily	Boulder
0330	Daily	Boulder
0800	Darmstadt, Paris, Sydney, Tokyo, occasionally from India*	
1200	Daily	Praga*
1500	Daily	Paris*
2200	Daily	Boulder

* Data is not transmitted on Saturday or Sunday

Data transmitted to RWC's *from* Moscow

Time UT	Frequency of issue	To
0600	Daily	Boulder
0730	Daily	Beijing
0900	Daily	Boulder, Budapest, Darmstadt, India, Havana, Praga, Paris, Sydney, Tokyo, Warsaw, National Centers and Subcenters,
1200	Daily	Boulder
1345	Daily	Boulder, Budapest, Darmstadt, India, Havana, Praga, Paris, Sydney, Sofia, Tokyo, National Centers and Subcenters,

RWC MOSCOW—*Continued*

URSIGRAM broadcasts

Moscow (three times a day)
Content: current data summaries and forecasts

Time of Transmission (UT)	Call sign	Frequency kHz
0440 - 0510	RYeM-4	10275[1]
		3937.5[2]
		4565
		5780
		6980
1030 - 1100	RYeM-4	5380
		7450
		9145
		13360
2230 - 2300	RYeM-4	3937.5
		4395
		5780
		6980

[1]broadcast from March 1 to September 30
[2]broadcast from October 1 to February 28

India Regional Warning Center

RWC NEW DELHI

Supervisory
Dr. B. M. Reddy
Immediate Charge: Dr. D. R. Lakshmi

Mail address
c/o National Physical Laboratory
Dr. K. S. Krishman Rd.
New Delhi 110012, India

Telephone
5721436, 5726570

Telefax
91115752678

Telex
3177384 (RSD IN)
3177099 (NPL IN)

Electronic Mail address
INTERNET: npl@csird.ernet.in

AUTODIN
via RUEHND

Telegraph
NATPHYLAB

Operating organization
National Physical Laboratory

Operating hours
0330 – 1145 UT (Monday – Friday)

Outgoing messages

Data:
Geoalert Messages are sent from RWC Tokyo by R.T.T. Multiplex Systems to Delhi via Bombay (teleprinter line from Bombay to Delhi) at about 1100 hours I.S.T. Delhi foF2 and SID data is added to this and a consolidated message goes out daily (see URSIGRAM broadcasts).

Observatory data collected at New Delhi RWC

Solar:
Kodaikanal

Ionospheric (SID):
Delhi

Data transmitted from RWC's *to* New Delhi

Time UT	Frequency of issue	From
0000	Daily	Moscow, Sydney
0030	Daily	Boulder
0100	Daily	Sydney
0200	Daily	Boulder
0235	Daily	Boulder
0330	Daily	Boulder
0600	Daily	Moscow, Sydney
1100	Daily	Tokyo
1200	Daily	Moscow, Sydney
1800	Daily	Moscow, Sydney
2200	Daily	Boulder
after sunset	Daily	Culgoora

Data transmitted to RWC's *from* New Delhi

Weekly report of 6 hourly values of foF2 are sent to Ionospheric Prediction Section, Institute for Telecommunications Sciences, Boulder, Colorado USA and exchanged with RWC Sydney and Moscow (by Telex) on every Tuesday.

Canadian Associate Regional Warning Center

RWC OTTAWA

Supervisory
Dr. Richard Coles
Forecast Center: Dr. J. Hruska
Dr. K. L. Lam

Mail address
Geophysics Division
Geological Survey of Canada
1 Observatory Crescent
Ottawa Canada K1A OY3

Telephone
613-837-3527
613-837-4241
613-837-3033

24-hour answering service
613-992-1299 (recorded message)

Telefax
613-824-9803

Telex
0534822 (CNSC OTT)
0533117 (EMAR)

Electronic Mail address
INTERNET: hruska@geolab.emr.ca

Public Bulletin Board System
613-992-3135 (1200 baud)

Operating organization
Geological Survey of Canada

Operating hours
1200–2100 UT (Monday–Friday)

Observatory data collected at Ottawa RWC

Geomagnetic:
Baker Lake, Cambridge Bay, Churchill, Fort Glanlee, Meanook, Mould Bay, Ottawa, Poste-de-la-Baleine, Resolute Bay, St. John's, Victoria, Yellowknife

Ionospheric (UFOFH):
Beijing, Chongqing, Guangzhou, Manzhoulo

Data transmitted from RWC's *to* Ottawa

Time UT	Frequency of issue	From
none		

Data:
URSIGRAM Solar and geophysical data (issued daily at 1000 UT; except Saturdays, Sundays, and Holidays)

Western Europe Regional Warning Center

RWC PARIS

Supervisory
Dr. Pierre Lantos
Immediate Charge: Mme. J. Gapihan, Mme. G. Michet

Mail address
Ursigrammes, DASOP
Observatoire de Paris
92195 Meudon, Principal Cedex
France

Electronic mail address
INTERNET: previ@mesiob.obspm.circe.fr (130.84.200.4)
SPAN: mesiob::previ

Telephone
14507 7770 (or 7771)

Telefax
14507 7959

Telex
631812 (FCMEU X 631812)

Cable
TX 631812 FCMEU MEUDON FRANCE

Operating organization
Jointly:
Observatoire de Paris
92195 Meudon, France, and
C.N.E.T., Lannion B
BP 40 22301 Lannion Cedex, France

Operating hours
0730 – 1630 UT (Monday–Friday)
Summer 0630 – 1530 UT (Monday–Friday)
Closed Saturdays, Sundays and international holidays.

Outgoing messages

Data:
URSIGRAM Solar and geophysical data

Forecasts:
Geoalert – Solar activity and geophysical disturbances

Products:
Provisional Aa indices and Summary of solar and geophysical data and disturbances (issued weekly).

Observatory data collected at Paris RWC

Solar:
Catania, Meudon, Nancay, Tortosa, Yunnan Obs.

Solar Cosmic Ray:
Iles Kerguelen

Ionospheric:
Daily reports – Iles Kerguelen, Nijmegen (SID's), Poitiers, Juliusruh[4], Nordeich[4]
Weekly reports – Iles Kerguelen, Terre Adelie

Geomagnetic:
Chambon la Foret, Iles Kerguelen, Tamanrasset, Tortosa, Wingst[4]

Data transmitted from RWC's *to* Paris

Time UT	Frequency of issue	From
0700	Daily	occasionally from Sydney
0800	Daily	Tokyo
0900	Daily	Moscow
0900	Daily[1]	Warsaw
1100	Daily[1]	Darmstadt, Praha
1400	Daily	Moscow

[1]data is not transmitted on Saturday, Sunday, and holidays

Data transmitted to RWC's *from* Paris

Time UT	Frequency of issue	To
0800	Daily[2]	Relay of Tokyo message to Moscow, Warsaw
1000	Daily	Relay of Darmstadt Ursigram to Praha, Warsaw, Moscow
1400[3]	Daily[2]	Boulder, Moscow, Praha, Sydney, Tokyo, Warsaw

[2]data is not transmitted on Saturdays, Sundays and international holidays.
[3]1300 UT in the summer
[4] via Darmstadt

Czechoslovakia Associate Regional Warning Center

RWC PRAGUE

Supervisory
Dr. F. Blahak
Immediate Charge: Dr. J. Boska

Mail address
Czech Academy of Sciences
Geophysical Institute
Bocni II
141 31 Praha 4
Czechoslovakia

Telephone
(42–2) 762548

Telefax
(42–2) 762528

Telex
121546 IONP C

Electronic Mail address
BITNET: ion@cspgig11.bitnet

Operating organization
Geophysical Institute of the Czech Academy of Sciences

Operating hours
0600 – 1400 UT (Monday – Friday) Summer
0700 – 1500 UT (Monday – Friday) Winter

Outgoing messages

Observatory data collected at Prague RWC

Ionospheric:
Juliusruh (UFOFH, UMUFH)
Kuhlungsborn (SID)
Pruhonice (UFOFH)
Panska Ves (SID)

Data transmitted to RWC's *from* Prague

Time UT	Frequency of issue	To
1000	Daily	Darmstadt, Paris, Warsaw

Data transmitted from RWC's *to* Prague

Time UT	Frequency of issue	From
0700	Daily	Darmstadt, Moscow
1200	Daily	Darmstadt
1400	Daily	Paris

Australia and Antarctica Regional Warning Center

RWC SYDNEY

Supervisory
Mr. Geoff Robinson
Immediate Charge: Garth Patterson
Data Coordination: Richard Thompson

Mail address
IUWDS Regional Warning Centre,
IPS Radio and Space Services
P.O. Box 5606
West Chatswood, N.S.W. 2057
Australia

Location
Level 4
15 Help Street
Chatswood, N.S.W. 2067

Telephone
(61) (2) 414-8000 (switchboard)
(61) (2) 414-8329 (warning center)
(61) (2) 414-8325 (Richard Thompson)
(61) (2) 414-8335 (David Cole)
(61) (2) 414-8339 (Phil Wilkinson)
(61) (67) 959211 (Culgoora Observatory)
(61) (99) 491471 (Learmonth Solar Observatory)
(61) (2) 414-8307 (Geoff Robinson)
(61) (2) 414-8326 (Garth Ptterson)

Telefax
(61) (2) 414-8331 or (61) (2) 414-8340
(61) (67) 959266 (Culgoora Solar Observatory)
(61) (99) 491605 (Learmonth Solar Observatory)

Telex
20663 (IPSO AA20663)
66996 (IPSOLAR) Culgoora Solar Observatory
99241 (IPSOLM) Learmonth Solar Observatory

Electronic mail address (INTERNET):

Warning centre	rwc@ips.oz.au
Culgoora	culgoora@ips.oz.au
Richard Thompson	richard@ips.oz.au
Garth Patterson	garth@ips.oz.au
Geoff Robinson	geoff@ips.oz.au

Operating organization
IPS Radio and Space Services
Department of Arts and Administrative Services

Operating hours
2230 - 0600 UT (and later as required; closed from 0200 UT on Saturdays, Sundays, and Holidays)

Outgoing messages

Data:
URSIGRAM Solar and geophysical data (issued daily at 0000 UT and after sunset, occasionally at 0600 UT, and following major events)

Forecasts:
Daily forecast in 0000UT URSIGRAM and in service products.

Products:
Disturbance Warnings—Forecasts of significant events
Disturbance Alerts—Confirmations of significant disturbances
Daily Propagation Report—Summary of daily activity
Recorder Telephone Message—Condensed propagation report
Weekly Propagation Report—Summary of weekly activity
Weekly Geophysical Report—Summary of weekly magnetic activity
Monthly Solar-Geophysical Summary—Monthly summary of events and indices

Observatory data collected at Sydney RWC

Solar (optical):
Culgoora, Learmonth

Solar (Radio- fixed frequency):
Culgoora, Learmonth

Ionospheric (six-hourly data):
Davis, Macquarie Island, Mawson, Mundaring, Norfolk Island.

Ionospheric (hourly data):
Camden (Sydney), Townsville, Hobart, Canberra, Vanimo.

Ionospheric (fadeouts):
Culgoora, Camden

Geomagnetic (UMAGF):
Culgoora, Learmonth

RWC SYDNEY—*Continued*

Data transmitted from RWC's *to* Sydney

Time UT	Frequency of issue	From
0100	Daily	Beijing
0630	Daily	Tokyo
0900	Daily	Moscow
1400	Daily	Moscow
1500	Daily[1]	Meudon

[1]data is not transmitted on Sunday

Data transmitted from RWC's *from* Sydney

Time UT	Frequency of issue	To
0000	Daily	Boulder, Delhi, Tokyo, Moscow, Beijing, Czech Republic, Meudon
0300	Daily	Boulder, Delhi, Tokyo, Moscow, Beijing, Czech Republic, Meudon
0700-0900	Daily (direct from Culgoora Observatory)	Boulder, Delhi, Tokyo
0700-0900	(after sunset) Daily	Boulder, Delhi, Tokyo, Moscow, Beijing, Czech Republic, Meudon

URSIGRAM broadcasts

Message Content: Solar Geophysical Reports

Method of transmission:

24-hour answering service (61) (2)414-8330 (recorded message—Condensed propagation report.)

Western Pacific Regional Warning Center

RWC TOKYO

Supervisory
Dr. K. Marubashi
Forecast Center (Hiraiso): Dr. T. Ogawa
Immediate Charge (Hiraiso): Dr. T. Kikuchi

Mail address
Dr. K. Marubashi
Radio Science Division
Communications Research Laboratory
4-2-1, Nukuikita-machi, Koganie-shi
Tokyo 184, Japan

Forecast Center
Hiraiso Solar Terrestrial Research Center
Communications Research Laboratory
3601 Isozaki, Nakaminato-shi
Ibarski 311-12, Japan

Telephone
81-423-27-7259 (Dr. K. Marubashi)
81-292-65-7121 (Forecast Center)

Telefax
81-423-27-6677 (Dr. K. Marubashi)
81-292-65-7209 (Forecast Center)

Telex
2832611 (DEMPA J) (Dr. K. Marubashi)
3632125 (CRLHI J) (Forecast Center)

Cable
DEMPA KOKUBUNJI TOKYO

Electronic mail address
SPAN nssdca:psi%crlhi::kmarubashi
or ssl::psi%crlhi::ogawa

Operating organization
Communications Research Laboratory
Ministry of Post and Telecommunications

Operating hours
Forecast Center:
2330 - 1300 UT 7 days/week

Outgoing messages

Data:
URSIGRAM Solar and geophysical data (issued daily at 0730 UT)

Forecasts:
Solar activity and geophysical disturbance in the GEOALERT TOK message (issued daily at 0100 UT)

Radio Telecommunications Forecast for the coming 7-day period in the RATEF code issued every Friday and Tuesday.

Observatory data collected at Tokyo RWC

Solar (optical):
Hiraiso, Mitaka, Mt. Norikura

Solar (radio):
Hiraiso, Toyokawa

Solar Cosmic Ray:
Tokyo

Particle:
GMS (spacecraft)

Ionospheric (SID):
Hiraiso

Ionospheric (UFOFS):
Kokubunji, Okinawa, Wakkanai, Yamagawa

Geomagnetic:
Hiraiso, Kakioka

HF Field Strength:
Hiraiso

Stratospheric Warming alert:
Tokyo

Data transmitted from RWC's *to* Tokyo

Time UT	Frequency of issue	From
0230	Daily	Sydney
1000	Daily	Moscow, Sydney
1400	Daily	Meudon
1500	Daily	Moscow

Data transmitted to RWC's *from* Tokyo

Time UT	Frequency of issue	To
0130	Daily	Boulder
0600	Daily	Meudon, Sydney

RWC TOKYO—*Continued*

URSIGRAM broadcasts

Transmitting Station	Call sign	Frequency kHz	Class	Power kW	Time of Emission
Tokyo	JJD	10,415	A1	5	0800[1]
Tokyo	JJD2	15,950	A1	5	0800[1]

[1]Non-directional Antenna

Method of transmission:
The message begins with the word "URSIGRAM" and the text of the message is repeated twice. Broadcasting takes the following form:

1. The following are sent repeatedly five times beginning at the time of the above schedule:

VVV VVV VVV DE JJD/JJD2 JJD/JJD2 JJD/JJD2

2. Immediately after the end of the above signals, the signals and information below are sent:

CQ CQ CQ DE JJD/JJD2 JJD/JJD2 JJD/JJD2
URSIGRAM = Text of message AR RPT
= Text of message
AR VA DE JJD/JJD2

Ionospheric (UFOF):
Delhi, Kodaikanal

Geomagnetic:
Alibag, Hyderabad, Kodaikanal

Ionospheric propagation conditions:
Moscow

URSIGRAM broadcasts

Transmitted through NPL Standard Time & Frequency Service (ATA) on 5, 10, and 15 MHz daily at 0930 UT.

The message is also put on R.T.T. broadcast (by IMD) at 1805 UT. R.T.T. frequencies used are 19, 12, 7, and 3 MHz.

Outgoing messages

Data:
Forecasts of Geomagnetic Activity for up to 3 days in advance (issued daily)

Alerts:
Issued when major geomagnetic disturbance is expected

Products:
Forecasts of Geomagnetic Activity for three zones in Canada for up to 27 days in advance (issued three times a week)
Review of Geomagnetic Activity for previous 27 days (issued three times a week)

Warsaw Regional Warning Center

RWC WARSAW

Supervisory
Dr. Z. Klos
Immediate Charge: Mrs. I. Stanislawska, Mr. K. Stasiewicz

Mail address
Helio–Geophysical Prediction Service
Polish Academy of Sciences
Space Research Center
Bartycka 18A
00–716 Warsaw
Poland

Telephone
403 766

Telefax
121273

Telex
825670 (CBK PL)

Electronic Mail address
INTERNET: cbk@cbk.waw.pl
or cbk@chopin.cbk.waw.pl
BITNET: cbkpan@plearn.bitnet

Operating organization
Polish Academy of Sciences,
Space Research Center

Operating hours
0700 – 1400 UT (Monday–Friday),
0700 – 1200 UT (Saturday),
(closed Sundays and Holidays)

Outgoing messages

Data:
URSIGRAM Solar, ionospheric, and geophysical data (issued daily at 0900 UT, except Sundays and Holidays)

Observatory data collected at Warsaw ARWC

Solar (radio):
Torun

Ionospheric:
Belsk, Miedzeszyn

Geomagnetic:
Belsk

Data transmitted from RWC's *to* Warsaw

Time UT	Frequency of issue	From
0900	Daily	Sydney, Tokyo, Boulder (via Meudon)
1200	Daily	Prague
1230	Daily	Boulder, Darmstadt (via Prague)
1400	Daily	Meudon

Data transmitted to RWC's *from* Warsaw

Time UT	Frequency of issue	To
0900	Daily	Meudon, Moscow, Prague

Data is also received by broadcast from Moscow at 0500, 1100 and 2300 UT (see p. B–6).

Appendix C

Listings

The following section consists of two listings of IUWDS stations, listed numerically by station indicator and also listed alphabetically by station name. The Station number (I I I I I) is assigned by the IUWDS Secretariat using the following guidelines:

The indicator group "I I I I I" is assigned as follows in order "abcde."

a = octant of the world

1	=	0 – 100°	west,	northern hemisphere
2	=	100 – 180°	west,	northern hemisphere
3	=	0 – 100°	east,	northern hemisphere
4	=	100 – 180°	east,	northern hemisphere
5	=	0 – 100°	west,	southern hemisphere
6	=	100 – 180°	west,	southern hemisphere
7	=	0 – 100°	east,	southern hemisphere
8	=	100 – 180°	east,	southern hemisphere

b = tens position of longitude

if a = 1, 3, 5, or 7

0	=	0 – 5°	5	=	46 – 55°
1	=	6 – 15°	6	=	56 – 65°
2	=	16 – 25°	7	=	66 – 75°
3	=	26 – 35°	8	=	76 – 85°
4	=	36 – 45°	9	=	86 – 99°

if a = 2, 4, 6, or 8

0	=	100 – 105°	5	=	146 – 155°
1	=	106 – 115°	6	=	156 – 165°
2	=	116 – 125°	7	=	166 – 175°
3	=	126 – 135°	8	=	176 – 185°
4	=	136 – 145°	9	=	186 – 199°

c = tens position of latitude

0	=	0 – 5°	5	=	46 – 55°
1	=	6 – 15°	6	=	56 – 65°
2	=	16 – 25°	7	=	66 – 75°
3	=	26 – 35°	8	=	76 – 85°
4	=	36 – 45°	9	=	86 – 90°

dd = station number within position "abc" (arbitrarily assigned by IUWDS)

For example:	Boulder, Colo. NOAA	N40 W105	becomes 20401
	Boulder, Colo. University of Colo.	N40 W105	becomes 20402

NUMERICAL LISTING OF IUWDS STATIONS

1. Description:

The stations listed in this section have been assigned IUWDS station indicators and contribute data to the IUWDS data interchange.

Table 1.—Numerical Listing of IUWDS Stations

Station Indicator	Geographical Location		Location		Sensors[1]
	City, State	Country	°Lat	°Long	
10101	Ouagadougou	Upper Volta	N12	W02	I
10401	Bordeaux	France	N45	W01	R
10402	Aires/Adour	France	N44	W00	G
10501	Abinger	United Kingdom	N54	W02	G
10502	Herstmonceux	United Kingdom	N51	W00	O
10503	Jodrell Bank	United Kingdom	N53	W02	R
10504	Slough	United Kingdom	N51	W01	I
10505	Lannion	France	N48	W03	I
10506	Upper Heyford	United Kingdom	N51	W01	G
10507	Hartland	United Kingdom	N51	W04	G
10508	Eskdalemur	United Kingdom	N55	W03	G
10601	Lerwick	United Kingdom	N60	W001	G
11301	Averoes	Morocco	N33	W08	G
11302	Tiouine	Morocco	N30	W07	G
12101	Dakar	Senegal	N15	W17	G, I
12601	Reykjavik	Iceland	N64	W21	G
14601	Narssarssuaq	Greenland	N61	W45	G
15101	Paramaribo	Suriname	N06	W55	I, R
15501	St. John's, Newfoundland	Canada	N47	W52	G, I
15502	Argentia	Canada	N48	W53	I
16101	Trinidad	West Indies	N10	W61	I
16301	Bermuda	Bermuda	N32	W64	I
16501	Goose Bay, Labrador	Canada	N53	W60	G, I
17201	Ramey Air Force Base	Puerto Rico	N18	W67	O
17202	San Juan	Puerto Rico	N18	W66	G
17401	Sagamore Hill, Massachusetts	United States of America	N42	W70	R, I
17402	Wallops Island, Virginia	United States of America	N37	W75	I
17403	Prospect, Massachusetts	United States of America	N42	W71	R
17501	Loring Air Force Base, Maine	United States of America	N47	W68	G
17801	Thule	Greenland	N76	W68	G, I
18201	Jamaica	West Indies	N18	W76	I
18301	Cape Kennedy, Florida	United States of America	N28	W80	I
18401	NASA, Washington, D.C.	United States of America	N38	W77	I
18402	ERL, Washington, D.C.	United States of America	N38	W77	S
18403	Fredericksburg, Virginia	United States of America	N38	W77	G
18404	McMath–Hulbert, Pontiac, Michigan	United States of America	N42	W83	I, O
18405	Ottawa	Canada	N45	W76	G
18406	Ottawa NRC	Canada	N45	W76	R, I
18407	Ottawa CRC	Canada	N45	W76	I
18408	Pennsylvania State University, University Park, Penn.	United States of America	N41	W78	R

Table 1.—Numerical Listing of IUWDS Stations—Continued

Station Indicator	Geographical Location: City, State	Country	Location °Lat	°Long	Sensors[1]
18501	Deep River, Ontario	Canada	N46	W77	G
18502	Great Whale	Canada	N55	W77	I
18503	Poste de la Baleine	Canada	N55	W77	G
19301	Huntsville, Alabama	United States of America	N35	W87	O
19302	Dyess Air Force Base, Texas	United States of America	N32	W99	I
19303	Eglin Air Force Base, Florida	United States of America	N30	W86	I
19304	Bay St Louis, Louisiana	United States of America	N30	W90	G
19501	Aberdeen, South Dakota	United States of America	N45	W98	S
19502	Winnipeg/Kenora	Canada	N50	W94	I
19503	Glenlea	Canada	N49	W97	G
19601	Churchill	Canada	N58	W94	I
19602	Baker Lake	Canada	N64	W96	G
19701	Resolute Bay	Canada	N74	W94	I
20301	Fort Davis, Texas	United States of America	N31	W101	R
20302	Del Rio, Texas	United States of America	N30	W101	G
20401	NOAA, Boulder, Colorado	United States of America	N40	W105	G, I, O
20402	University of Colorado, Boulder, Colorado	United States of America	N40	W105	R, I
20701	Cambridge Bay	Canada	N69	W105	G
21301	Sacramento Peak, New Mexico	United States of America	N32	W105	O
21302	Tucson, Arizona	United States of America	N32	W110	G
21303	White Sands, New Mexico	United States of America	N32	W107	I
21304	Kitt Peak, Arizona	United States of America	N32	W111	O
21305	Holloman Air Force Base, Alamogordo, New Mexico	United States of America	N33	W106	O
21401	Climax, Colorado	United States of America	N39	W106	G, O
21501	Saskatoon	Canada	N52	W106	G
21502	Meanook	Canada	N54	W113	G
21601	Yellowknife	Canada	N62	W114	G
22301	La Posta, California	United States of America	N33	W118	I, R
22302	Lockheed, Burbank, California	United States of America	N34	W118	O
22303	Aerospace, California	United States of America	N31	W118	O, R
22304	Mt. Wilson, California	United States of America	N31	W118	O
22305	Port Arguello, California	United States of America	N34	W120	I
22306	Vandenberg, Air Force Base, California	United States of America	N34	W120	I
22307	Univ. of California, San Diego, California	United States of America	N33	W116	IPS
22401	Palo Alto, California	United States of America	N37	W122	G
22402	Fresno, California	United States of America	N37	W119	G
22501	Penticton, British Columbia	Canada	N49	W120	R
22502	Newport, Washington	United States of America	N48	W117	G
22503	Victoria	Canada	N49	W123	G
22701	Cape Parry	Canada	N70	W125	G, I
22702	Sachs Harbor	Canada	N72	W125	G, I
22801	Mould Bay	Canada	N76	W119	G, I
23601	Sitka, Alaska	United States of America	N57	W135	G
23701	Inuvik	Canada	N68	W133	G, I
24701	Arctic Village, Alaska	United States of America	N68	W145	G

Table 1.—Numerical Listing of IUWDS Stations—Continued

Station Indicator	Geographical Location: City, State	Geographical Location: Country	Location °Lat	Location °Long	Sensors[1]
25601	Anchorage, Alaska	United States of America	N61	W150	G, I
25602	College, Alaska	United States of America	N64	W147	G, I
25603	Fort Yukon, Alaska	United States of America	N66	W147	G, I
25604	Eielson Air Force Base, Alaska	United States of America	N64	W147	I
25605	Talkeetna, Alaska	United States of America	N63	W150	G, I
26201	Honolulu, Hawaii	United States of America	N21	W158	G
26202	Maui Haleakala, Hawaii	United States of America	N20	W157	O
26203	Maui, Hawaii	United States of America	N20	W157	I
26204	Palehua, Hawaii	United States of America	N21	W158	O, R
26205	Keakawapu Beach, Hawaii	United States of America	N20	W156	I
26701	Point Barrow, Alaska	United States of America	N71	W157	G
28501	Adak, Alaska	United States of America	N52	W177	I
28701	Cape Schmidt	Russia	N69	W179	I
30201	Tamanrasset	Algeria	N22	E05	G, I
30401	Pic-du-Midi	France	N43	E00	G, O
30402	Tortosa	Spain	N41	E00	G, I, O
30502	Toulouse	France	N44	E02	S
30503	Chambon-la-Foret	France	N48	E02	G
30504	DeBilt	Netherlands	N52	E05	I
30505	Dourbes	Belgium	N50	E05	G
30506	Garchy	France	N47	E03	G
30507	Kootwijk	Netherlands	N52	E06	I
30508	Meudon	France	N49	E02	O
30509	Nancay	France	N47	E02	R
30510	Nera	Netherlands	N52	E05	I
30511	Poitiers	France	N46	E00	I
30512	Uccle	Belgium	N50	E04	O
30513	Nijmejen	Netherlands	N52	E06	I
31401	Anacapri-G	Italy	N40	E14	O
31402	Anacapri-S	Italy	N40	E14	O
31403	Arcetri	Italy	N43	E11	O, S
31404	Bologna	Italy	N44	E11	G, R
31405	Catania	Italy	N37	E15	O
31406	Rome	Italy	N42	E12	I, O
31501	Arosa	Switzerland	N46	E09	O
31502	Berlin-Adlershof	Germany, Federal Republic of	N53	E14	R
31503	Breisach	Germany, Federal Republic of	N48	E07	I
31504	Darmstadt	Germany, Federal Republic of	N50	E09	I
31506	Juliusruh/Rugen	Germany, Federal Republic of	N54	E13	I
31507	Kanzelhohe	Germany, Federal Republic of	N46	E14	O
31508	Kiel	Germany, Federal Republic of	N54	E10	G, R
31509	Kranzbach	Germany, Federal Republic of	N48	E11	G
31510	Kuhlungsborn	Germany, Federal Republic of	N54	E12	I
31511	Lindau	Germany, Federal Republic of	N51	E10	I
31512	Ljubljana	Yugoslavia	N46	E15	O
31513	Locarno	Switzerland	N46	E09	O
31514	Luchow	Germany, Federal Republic of	N53	E11	I
31515	Neustrelitz	German Democratic Republic	N53	E13	I
31516	Ondrejov	Czechoslovakia	N50	E15	O, R
31517	Panska Ves	Czechoslovakia	N51	E15	I

Table 1.—Numerical Listing of IUWDS Stations—Continued

Station Indicator	Geographical Location: City, State	Country	Location °Lat	°Long	Sensors[1]
31518	Predigstuhl	Germany, Federal Republic of	N47	E12	G
31519	Pruhonice	Czechoslovakia	N50	E14	G
31520	Tremsdorf	Germany, Federal Republic of	N52	E13	R
31522	Wendelstein	Germany, Federal Republic of	N47	E12	O
31523	Wingst	Germany, Federal Republic of	N54	E09	G
31524	Witteveen	Netherlands	N53	E07	G
31525	Zurich	Switzerland	N47	E08	O
31526	Norddeich	Germany, Federal Republic of	N54	E07	I
31601	Alborg	Denmark	N56	E10	I
31801	Spitzbergen	Norway	N78	E15	I
31802	Hornsund-Svalbard	Norway	N77	E15	G
32001	Bangui	Central African Republic	N04	E19	G
32402	Belgrade	Yugoslavia	N45	E20	O
32403	Thessalonika	Greece	N41	E23	O
32404	San Vito	Italy	N41	E18	I, O, R
32501	Budapest	Hungary	N47	E19	I
32502	Lomnicki Stit	Czechoslovakia	N49	E20	G
32503	Skalnate Pleso	Czechoslovakia	N49	E20	O
32505	Belsk	Poland	N52	E21	G
32506	Torun	Poland	N53	E19	G
32507	Warsaw	Poland	N52,	E21	I
32601	Emmaboda	Sweden	N60	E17	I
32602	Enkoping	Sweden	N60	E17	G, I
32603	Lycksele	Sweden	N65	E19	I
32604	Nurmijarvi	Finland	N61	E25	G, I
32605	Stockholm	Sweden	N59	E18	I, O
32606	Uppsala	Sweden	N60	E18	I
32701	Andenes	Norway	N69	E16	G
32702	Kiruna	Sweden	N68	E20	I
32703	Tromso	Norway	N70	E19	G
33301	Helwan	Egypt	N30	E31	G
33302	Nicosia	Cyprus	N35	E33	I
33401	Bucharest	Romania	N44	E26	O
33603	St. Peterburg	Russia	N60	E32	I, G
33701	Ivalo	Finland	N69	E27	G
33702	Murmansk	Russia	N68	E33	I, G
33703	Sodankyla	Finland	N67	E27	I
34101	Djibouti	Djibouti	N12	E43	I
34401	Abastumani	Georgian	N41	E43	O, R
34402	Kislovodsk	Russia	N43	E42	O, R

Table 1.—Numerical Listing of IUWDS Stations—Continued

Station Indicator	Geographical Location: City, State	Country	Location: °Lat	°Long	Sensors[1]
34503	Moscow	Russia	N55	E37	G, I, O, R
34601	Archangelsk	Russia	N46	E40	G
34602	Nijni Novgorod	Russia	N56	E44	I
36401	Ashgabat	Turkmenstan	N37	E58	I
36602	Ekaterinburg	Russia	N56	E61	G, I
36801	Krenkel Polar Station	Franz Joseph Island	N80	E58	G, I
37201	Ahmedabad	India	N23	E73	I
37301	Udaipur	India	N24	E73	O
37401	Tashkent	Uzbekistan	N41	E70	O
37701	Salekhard	Russia	N66	E66	I
38101	Kodaikanal	India	N10	E77	O, I, G
38102	Thumba	India	N09	E77	I
38201	Hyderabad	India	N17	E78	O
38301	New Delhi	India	N28	E77	I
38401	Alma Ata	Kazakhstan	N43	E77	I
38501	Novosibirsk	Russia	N55	E82	I
38601	Tomsk	Russia	N56	E85	I
38701	Dixon	Russia	N74	E81	G, I
39601	Podkamennaya Tunguska	Russia	N61	E90	G
40501	Irkutsk	Russia	N52	E104	G, I, O
40801	Cape Chelyuskin	Russia	N77	E104	G
41206	Guangzhou	Peoples Republic of China	N23	E113	I
41301	Wuchang	Peoples Republic of China	N30	E114	I
41305	Chongqing	Peoples Republic of China	N29	E106	I
42101	Manila	Philippines	N14	E121	I, O, R
42102	Quezon City	Philippines	N14	E121	I, O, R
42201	Baguio	Philippines	N16	E120	O
42202	Taipei	Taiwan	N25	E121	G, I, O
42203	Taoyvan	Taiwan	N25	E121	I
42301	Nanking	Peoples Republic of China	N29	E116	O
42401	Huairou, Beijing	Peoples Republic of China	N40	E117	O
42402	Shahe, Beijing	Peoples Republic of China	N40	E116	O, R
42403	Beijing	Peoples Republic of China	N40	E116	G
42404	Beijing	Peoples Republic of China	N40	E116	I
42503	Manzhouli	Peoples Republic of China	N49	E117	I
43301	Okinawa	Japan	N26	E128	I
43302	Yamagawa	Japan	N31	E130	I
43401	Ussurisk	Russia	N43	E132	O
43402	Seoul	Korea	N38	E127	I
43403	Ussurisk	Russia	N43	E132	R

Table 1.—Numerical Listing of IUWDS Stations—Continued

Station Indicator	Geographical Location: City, State	Geographical Location: Country	Location: °Lat	Location: °Long	Sensors[1]
43404	Osan AB	Korea	N37	E127	I
43501	Khabarovsk	Russia	N48	E135	G, I
43701	Tiksi Bay	Russia	N71	E129	G
44301	Toyokawa	Japan	N35	E137	R
44401	Hiraiso	Japan	N36	E141	R
44402	Kakioka	Japan	N36	E140	G
44403	Kokubunji	Japan	N36	E139	I
44404	Mitaka	Japan	N36	E140	O
44405	Mt. Norikura TAO	Japan	N36	E138	O
44406	Tokyo	Japan	N36	E140	I
44408	Wakkanai	Japan	N45	E141	I
44409	Akita	Japan	N39	E140	I
45601	Magadan	Russia	N60	E151	G, I
46501	Petropavlousk	Russia	N52	E158	I
47501	Shemya, Alaska	United States of America	N52	E174	I
54201	Vassouras	Brazil	S22	W43	G
56301	Buenos Aires	Argentina	S35	W58	G, R
56302	San Miguel	Argentina	S34	W58	O
56303	Tucuman	Argentina	S26	W65	I
56501	Port Stanley	Falkland Islands	S52	W58	I
56601	King George Island	Antarctica	S62	W58	G
57101	Huancayo	Peru	S12	W75	G, I,O
62801	Byrd Station	Antarctica	S79	W120	G, I
65201	Tahiti	Polynesia	S18	W150	I
66201	Rarotonga	Cook Islands	S21	W159	I
70901	South Pole	Antarctica	S90	E00	I
72301	Capetown	South Africa	S34	E18	I, O
72701	Roi Baudouin	Antarctica	S70	E24	I
73001	Lwiro	Congo	S02	E28	I, R
73301	Potchefstrom	South Africa	S27	E27	G
73302	Johannesburg	South Africa	S26	E28	I
74701	Syowa Station	Antarctica	S69	E40	I
75201	Tanarive	Madagascar	S20	E48	I
76701	Mawson	Antarctica	S68	E63	I
77501	Kerguelen Island	French Austral and Antarctic Territories	S49	E70	G, I
78701	Davis	Antarctica	S69	E78	I, R
81202	Learmonth	Australia	S21	E115	G, O, R
81701	Casey	Antarctica	S66	E111	I
81801	Vostok	Antarctica	S78	E105	G
82301	Gnangara	Australia	S23	E116	G
82302	Mundaring	Australia	S32	E116	I, G
83101	Darwin	Australia	S12	E131	I
84001	Vanimo	Papua New Guinea	S03	E141	I
84701	Terre Adelie	Antarctica	S66	E141	G, I
85101	Port Moresby	Papua New Guinea	S09	E147	I

Table 1.—Numerical Listing of IUWDS Stations—Continued

Station Indicator	Geographical Location		Location		Sensors[1]
	City, State	Country	°Lat	°Long	
85201	Townsville	Australia	S19	E147	I
85301	Brisbane	Australia	S27	E153	I
85302	Canberra	Australia	S35	E149	I, G
85303	Culgoora	Australia	S30	E149	I, O, R
85304	Sydney (Fleurs)	Australia	S34	E151	I, O, R
85305	Camden	Australia	S34	E151	I
85401	Hobart	Australia	S43	E147	I
86501	Macquarie Island	Australia	S54	E159	I
87301	Norfolk Island	Australia	S29	E168	I
87401	Wellington	New Zealand	S41	E175	O
87402	Christchurch	New Zealand	S43	E172	I
87801	McMurdo	Antarctica	S77	E166	I
87802	Scott Base	Antarctica	S77	E166	I
88301	Raoul Island	Kermadec Island	S29	E178	I
90006	GOES-6, NOAA	United States of America	N00	W135	S
90007	GOES-7, NOAA	United States of America	N00	W75	S
91012	NOAA-12, NOAA	United States of America	Polar		S

[1] G = Geomagnetic, I = Ionospheric, O = Optical, R = Radio, S = Satellite.

ALPHABETICAL LISTING OF IUWDS STATIONS

1. *Description:*

The stations listed in this section have been assigned IUWDS station indicators and contribute data to the IUWDS data interchange.

Table 2.—Alphabetical Listing of IUWDS Stations

Station Indicator	Geographical Location: City, State	Geographical Location: Country	Location °Lat	Location °Long	Sensors[1]
34401	Abastumani	Georgian	N41	E43	O, R
19501	Aberdeen, South Dakota	United States of America	N45	W98	S
10501	Abinger	United Kingdom	N54	W02	G
28501	Adak, Alaska	United States of America	N52	W177	I
22303	Aerospace, California	United States of America	N31	W118	O, R
37201	Ahmedabad	India	N23	E73	I
10402	Aires/Adour	France	N44	W00	G
44409	Akita	Japan	N39	E140	I
31601	Alborg	Denmark	N56	E10	I
38401	Alma Ata	Kazakhstan	N43	E77	I
31401	Anacapri–G	Italy	N40	E14	O
31402	Anacapri–S	Italy	N40	E14	O
25601	Anchorage, Alaska	United States of America	N61	W150	G, I
32701	Andenes	Norway	N69	E16	G
31403	Arcetri	Italy	N43	E11	O, S
34601	Archangelsk	Russia	N46	E40	G, I
24701	Arctic Village, Alaska	United States of America	N68	W145	G
15502	Argentia	Canada	N48	W53	I
31501	Arosa	Switzerland	N46	E09	O
36401	Ashgabat	Turkmenistan	N37	E58	I
11301	Averoes	Morocco	N33	W08	G
42201	Baguio	Philippines	N16	E120	O
19602	Baker Lake	Canada	N64	W96	G
32001	Bangui	Central African Republic	N04	E19	G
19304	Bay St. Louis, Louisiana	United States of America	N30	W90	G
42404	Beijing	Peoples Republic of China	N40	E116	I
42403	Beijing	Peoples Republic of China	N40	E116	G
32402	Belgrade	Yugoslavia	N45	E20	O
32505	Belsk	Poland	N52	E21	G
31502	Berlin–Adlershof	Germany, Federal Republic of	N53	E14	R
16301	Bermuda	Bermuda	N32	W64	I
31404	Bologna	Italy	N44	E11	G, R
10401	Bordeaux	France	N45	W01	R
31503	Breisach	Germany, Federal Republic of	N48	E07	I
85301	Brisbane	Australia	S27	E153	I
33401	Bucharest	Romania	N44	E26	O
32501	Budapest	Hungary	N47	E19	I
56301	Buenos Aires	Argentina	S35	W58	G, R
62801	Byrd Station	Antarctica	S79	W120	G, I
20701	Cambridge Bay	Canada	N69	W105	G

Table 2.—Alphabetical Listing of IUWDS Stations—Continued

Station Indicator	Geographical Location: City, State	Country	Location: °Lat	°Long	Sensors[1]
85305	Camden	Australia	S34	E151	I
85302	Canberra	Australia	S35	E149	I, G
40801	Cape Chelyuskin	Russia	N77	E104	G
18301	Cape Kennedy, Florida	United States of America	N28	W80	I
22701	Cape Parry	Canada	N70	W125	G, I
28701	Cape Schmidt	Russia	N69	W179	I
72301	Capetown	South Africa	S34	E18	I, O
81701	Casey	Australia	S66	E111	I
31405	Catania	Italy	N37	E15	O
30503	Chambon-la-Foret	France	N48	E02	G
41305	Chongqing	Peoples Republic of China	N29	E106	I
87402	Christchurch	New Zealand	S43	E172	I
19601	Churchill	Canada	N58	W94	I
21401	Climax, Colorado	United States of America	N39	W106	G, O
25602	College, Alaska	United States of America	N64	W147	G, I
85303	Culgoora	Australia	S30	E149	I, O, R
12101	Dakar	Senegal	N15	W17	G, I
31504	Darmstadt	Germany, Federal Republic of	N50	E09	I
83101	Darwin	Australia	S12	E131	I
78701	Davis	Antarctica	S69	E78	I, R
30504	DeBilt	Netherlands	N52	E05	I
18501	Deep River, Ontario	Canada	N46	W77	G
20302	Del Rio, Texas	United States of America	N30	W101	G
38701	Dixon	Russia	N74	E81	G, I
34101	Djibouti	Djibouti	N12	E43	I
30505	Dourbes	Belgium	N50	E05	G
19302	Dyess Air Force Base, Texas	United States of America	N32	W99	I
18402	ERL, Washington, D.C.	United States of America	N38	W77	S
19303	Eglin Air Force Base, Florida	United States of America	N30	W86	I
25604	Eielson Air Force Base, Alaska	United States of America	N64	W147	I
36602	Ekaterinburg	Russia	N56	E61	G, I
32601	Emmaboda	Sweden	N60	E17	I
32602	Enkoping	Sweden	N60	E17	G, I
10508	Eskdalemur	United Kingdom	N55	W03	G
20301	Fort Davis, Texas	United States of America	N31	W101	R
25603	Fort Yukon, Alaska	United States of America	N66	W147	G, I
18403	Fredericksburg, Virginia	United States of America	N38	W77	G
22402	Fresno, California	United States of America	N37	W119	G
90005	GOES-5, NOAA	United States of America	N00	W75	S
90006	GOES-6, NOAA	United States of America	N00	W135	S
90007	GOES-7, NOAA	United States of America	N00	W75	S
30506	Garchy	France	N47	E03	G
19503	Glenlea	Canada	N49	W97	G
82301	Gnangara	Australia	S23	E116	G
16501	Goose Bay, Labrador	Canada	N53	W60	G, I
18502	Great Whale	Canada	N55	W77	I
41206	Guangzhou	Peoples Republic of China	N23	E113	I
10507	Hartland	United Kingdom	N51	W04	G
33301	Helwan	Egypt	N30	E31	G
10502	Herstmonceux	United Kingdom	N51	W00	O

Table 2.—Alphabetical Listing of IUWDS Stations—Continued

Station Indicator	Geographical Location: City, State	Country	Location °Lat	°Long	Sensors[1]
44401	Hiraiso	Japan	N36	E141	R
85401	Hobart	Australia	S43	E147	I
21305	Holloman Air Force Base, Alamogordo, New Mexico	United States of America	N33	W106	O
26201	Honolulu, Hawaii	United States of America	N21	W158	G
31802	Hornsund-Svalbard	Norway	N77	E15	G
42401	Huairou, Beijing	Peoples Republic of China	N40	E117	O
57101	Huancayo	Peru	S12	W75	G, I, O
19301	Huntsville, Alabama	United States of America	N35	W87	O
38201	Hyderabad	India	N17	E78	O
23701	Inuvik	Canada	N68	W133	G, I
40501	Irkutsk	Russia	N52	E104	G, I, O
33701	Ivalo	Finland	N69	E27	G
18201	Jamaica	West Indies	N18	W76	I
10503	Jodrell Bank	United Kingdom	N53	W02	R
73302	Johannesburg	South Africa	S26	E28	I
31506	Juliusruh/Rugen	Germany, Federal Republic of	N54	E13	I
44402	Kakioka	Japan	N36	E140	G
31507	Kanzelhohe	Germany, Federal Republic of	N46	E14	O
26205	Keakawapu Beach, Hawaii	United States of America	N20	W156	I
77501	Kerguelen Island	French Austral and Antarctic Territories	S49	E70	G, I
43501	Khabarovsk	Russia	N48	E135	G, I
31508	Kiel	Germany, Federal Republic of	N54	E10	G, R
56601	King George Island	Antarctica	S62	W58	G
32702	Kiruna	Sweden	N68	E20	I
34402	Kislovodsk	Russia	N43	E42	O, R
21304	Kitt Peak, Arizona	United States of America	N32	W111	O
38101	Kodaikanal	India	N10	E77	O, I, G
44403	Kokubunji	Japan	N36	E139	I
30507	Kootwijk	Netherlands	N52	E06	I
31509	Kranzbach	Germany, Federal Republic of	N48	E11	G
36801	Krenkel Polar Station	Franz Joseph Island	N80	E58	G, I
31510	Kuhlungsborn	Germany, Federal Republic of	N54	E12	I
22301	La Posta, California	United States of America	N33	W118	I, R
10505	Lannion	France	N48	W03	I
81202	Learmonth	Australia	S21	E115	G, O, R
10601	Lerwick	United Kingdom	N60	W001	G
31511	Lindau	Germany, Federal Republic of	N51	E10	I
31512	Ljubljana	Yugoslavia	N46	E15	O
31513	Locarno	Switzerland	N46	E09	O
22302	Lockheed, Burbank, California	United States of America	N34	W118	O
32502	Lomnicki Stit	Czechoslovakia	N49	E20	G
17501	Loring Air Force Base, Maine	United States of America	N47	W68	G
31514	Luchow	Germany, Federal Republic of	N53	E11	I
73001	Lwiro	Congo	S02	E28	I, R

Table 2.—Alphabetical Listing of IUWDS Stations—Continued

Station Indicator	Geographical Location: City, State	Country	Location °Lat	°Long	Sensors[1]
32603	Lycksele	Sweden	N65	E19	I
86501	Macquarie Island	Australia	S54	E159	I
45601	Magadan	Russia	N60	E151	G, I
42101	Manila	Philippines	N14	E121	I, O, R
42503	Manzhouli	Peoples Republic of China	N49	E117	I
26202	Maui Haleakala, Hawaii	United States of America	N20	W157	O
26203	Maui, Hawaii	United States of America	N20	W157	I
76701	Mawson	Antarctica	S68	E63	I
18404	McMath–Hulbert, Pontiac, Michigan	United States of America	N42	W83	I, O
87801	McMurdo	Antarctica	S77	E166	I
21502	Meanook	Canada	N54	W113	G
30508	Meudon	France	N49	E02	O
44404	Mitaka	Japan	N36	E140	O
34503	Moscow	Russia	N55	E37	G, I, O, R
22801	Mould Bay	Canada	N76	W119	G, I
44405	Mt. Norikura TAO	Japan	N36	E138	O
22304	Mt. Wilson, California	United States of America	N31	W118	O
82302	Mundaring	Australia	S32	E116	I, G
33702	Murmansk	Russia	N68	E33	I, G
18401	NASA, Washington, D.C.	United States of America	N38	W77	I
20401	NOAA, Boulder, Colorado	United States of America	N40	W105	G, I, O
91012	NOAA–12, NOAA	United States of America	Polar		S
30509	Nancay	France	N47	E02	R
42301	Nanking	Peoples Republic of China	N29	E116	O
14601	Narssarssuaq	Greenland	N61	W45	G
30510	Nera	Netherlands	N52	E05	I
31515	Neustrelitz	German Democratic Republic	N53	E13	I
38301	New Delhi	India	N28	E77	I
22502	Newport, Washington	United States of America	N48	W117	M
33302	Nicosia	Cyprus	N35	E33	I
30513	Nijmejen	Netherlands	N52	E06	I
34602	Nijni Norvgorod	Russia	N56	E44	I, R
31526	Norddeich	Germany, Federal Republic of	N54	E07	I
87301	Norfolk Island	Australia	S29	E168	I
38501	Novosibirsk	Russia	N55	E82	I
32604	Nurmijarvi	Finland	N61	E25	G, I
43301	Okinawa	Japan	N26	E128	I
31516	Ondrejov	Czechoslovakia	N50	E15	O, R
43404	Osan AB	Korea	N37	E127	I
18407	Ottawa CRC	Canada	N45	W76	I
18406	Ottawa NRC	Canada	N45	W76	R, I
18405	Ottawa	Canada	N45	W76	G
10101	Ouagadougou	Upper Volta	N12	W02	I
26204	Palehua, Hawaii	United States of America	N21	W158	O, R
22401	Palo Alto, California	United States of America	N37	W122	G

Table 2.—Alphabetical Listing of IUWDS Stations—Continued

Station Indicator	Geographical Location: City, State	Country	Location °Lat	°Long	Sensors[1]
31517	Panska Ves	Czechoslovakia	N51	E15	I
15101	Paramaribo	Suriname	N06	W55	I, R
18408	Pennsylvania State University, University Park, Penn.	United States of America	N41	W78	R
22501	Penticton, British Columbia	Canada	N49	W120	R
46501	Petropavlovsk	Russia	N53	E158	I
30401	Pic-du-Midi	France	N43	E00	G, O
39601	Podkamennaya Tunguska	Russia	N61	E90	G
26701	Point Barrow, Alaska	United States of America	N71	W157	G
30511	Poitiers	France	N46	E00	I
22305	Port Arguello, California	United States of America	N34	W120	I
85101	Port Moresby	Papua New Guinea	S09	E147	I
56501	Port Stanley	Falkland Islands	S52	W58	I
18503	Post de le Baleine	Canada	N55	W77	G
73301	Potchefstrom	South Africa	S27	E27	G
31518	Predigstuhl	Germany, Federal Republic of	N47	E12	G
17403	Prospect, Massachusetts	United States of America	N42	W71	R
31519	Pruhonice	Czechoslovakia	N50	E14	G
42102	Quezon City	Philippines	N14	E121	I, O, R
17201	Ramey Air Force Base	Puerto Rico	N18	W67	O
88301	Raoul Island	Kermadec Island	S29	E178	I
66201	Rarotonga	Cook Islands	S21	W159	I
19701	Resolute Bay	Canada	N74	W94	I
12601	Reykjavik	Iceland	N64	W21	G
72701	Roi Baudouin	Antarctica	S70	E24	I
31406	Rome	Italy	N42	E12	I, O
22702	Sachs Harbor	Canada	N72	W125	G, I
21301	Sacramento Peak, New Mexico	United States of America	N32	W105	O
17401	Sagamore Hill, Massachusetts	United States of America	N42	W70	R, I
37701	Salekhard	Russia	N66	E66	I
17202	San Juan	Puerto Rico	N18	W66	G
56302	San Miguel	Argentina	S34	W58	O
32404	San Vito	Italy	N41	E18	I, O, R
21501	Saskatoon	Canada	N52	W106	G
87802	Scott Base	Antarctica	S77	E166	I
43402	Seoul	Korea	N38	E127	I
42402	Shahe, Beijing	Peoples Republic of China	N40	E116	O, R
47501	Shemya, Alaska	United States of America	N52	E174	I
23601	Sitka, Alaska	United States of America	N57	W135	G
32503	Skalnate Pleso	Czechoslovakia	N49	E20	O
10504	Slough	United Kingdom	N51	W01	I
33703	Sodankyla	Finland	N67	E27	I
70901	South Pole	Antarctica	S90	E00	I
31801	Spitzbergen	Norway	N78	E15	I
15501	St. John's, Newfoundland	Canada	N47	W52	G, I
33603	St. Peterburg	Russia	N60	E32	G

Table 2.—Alphabetical Listing of IUWDS Stations—Continued

Station Indicator	Geographical Location: City, State	Country	Location °Lat	°Long	Sensors[1]
32605	Stockholm	Sweden	N59	E18	I, O
36601	Sverdlovsk	Russia	N56	E61	I
85304	Sydney (Fleurs)	Australia	S34	E151	I, O, R
74701	Syowa Station	Antarctica	S69	E40	I
65201	Tahiti	Polynesia	S18	W150	I
42202	Taipei	Taiwan	N25	E121	G, I, O
25605	Talkeetna, Alaska	United States of America	N63	W150	G, I
30201	Tamanrasset	Algeria	N22	E05	G, I
75201	Tanarive	Madagascar	S20	E48	I
42203	Taoyvan	Taiwan	N25	E121	I
37401	Tashkent	Uzbekistan	N41	E70	O
84701	Terre Adelie	Antarctica	S66	E141	G, I
32403	Thessalonika	Greece	N41	E23	O
17801	Thule	Greenland	N76	W68	G, I
38102	Thumba	India	N09	E77	I
43701	Tiksi Bay	Russia	N71	E129	G
11302	Tiouine	Morocco	N30	W07	G
44406	Tokyo	Japan	N36	E140	I
38601	Tomsk	Russia	N56	E85	I
30402	Tortosa	Spain	N41	E00	G, I, O
32506	Torun	Poland	N53	E19	G
30502	Toulouse	France	N44	E02	S
85201	Townsville	Australia	S19	E147	I
44301	Toyokawa	Japan	N35	E137	R
31520	Tremsdorf	Germany, Federal Republic of	N52	E13	R
16101	Trinidad	West Indies	N10	W61	I
32703	Tromso	Norway	N70	E19	G
21302	Tucson, Arizona	United States of America	N32	W110	G
56303	Tucuman	Argentina	S26	W65	I
30512	Uccle	Belgium	N50	E04	O
37301	Udaipur	India	N24	E73	O
20601	Yellowknife	Canada	N62	W114	G
22307	Univ. of California, San Diego, California	United States of America	N33	W116	IPS
20402	University of Colorado, Boulder, Colorado	United States of America	N40	W105	R, I
10506	Upper Heyford	United Kingdom	N51	W01	G
32606	Uppsala	Sweden	N60	E18	I
43401	Ussurisk	Russia	N43	E132	O
22306	Vandenberg, Air Force Base, California	United States of America	N34	W120	I
84001	Vanimo	Papua New Guinea	S03	E141	I
54201	Vassouras	Brazil	S22	W43	G
22503	Victoria	Canada	N49	W123	G
81801	Vostok	Antarctica	S78	E105	G
44408	Wakkanai	Japan	N45	E141	I
17402	Wallops Island, Virginia	United States of America	N37	W75	I
32507	Warsaw	Poland	N52	E21	I
87401	Wellington	New Zealand	S41	E175	O
31522	Wendelstein	Germany, Federal Republic of	N47	E12	O
21303	White Sands, New Mexico	United States of America	N32	W107	I
31523	Wingst	Germany, Federal Republic of	N54	E09	G
19502	Winnipeg/Kenora	Canada	N50	W94	I

Table 2.—Alphabetical Listing of IUWDS Stations—Continued

Station Indicator	Geographical Location		Location		Sensors[1]
	City, State	Country	°Lat	°Long	
31524	Witteveen	Netherlands	N53	E07	G
41301	Wuchang	Peoples Republic of China	N30	E114	I
43302	Yamagawa	Japan	N31	E130	I
31525	Zurich	Switzerland	N47	E08	O

[1] G = Geomagnetic, I = Ionospheric, O = Optical, R = Radio, S = Satellite.

DEPARTMENT OF THE AIR FORCE
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AFSFC PAMPHLET 105-5

22 July 1992

Weather

ASTROGEOPHYSICAL CODES

This pamphlet specifies Air Force codes used for reporting astrogeophysical data which describes various features or phenomena on the sun and environmental conditions at, or near, the earth. Although the codes are designed for computer processing, most can be readily used in a manual operation.

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CHAPTER 1

SOLAR OPTICAL CODES

1-1. Solar Flare Code (FLARE). Use this code to make event-level or routine reports of solar flares as observed with an optical telescope viewing at a wavelength of 6563A (Hydrogen-alpha).

Line 1 MANOP heading
Line 2 FLARE
Line 3 IIiii YMMDD 3//nn
Line 4 11111 qSJJJ GGggL QXXYY TIBcc GGggL 7AAAA GGggL 9NNNN FBBbb
Line 4a 22222 IBGgg 7AAAA 99999

Line 1	MANOP heading		
Line 2	FLARE	Data identifier, alphabetic character	
Line 3	IIiii	II	- World Meteorological Organization block number
		iii	- World Meteorological Organization station number
	YMMDD	Y	- Last digit of the year
		MM	- Number of the month
		DD	- Day of the month (corresponding to flare start time; see Note 1)
	3//nn	3	- Numerical filler (3rd group)
		//	- Fillers
		nn	- Number of data lines in this message
Line 4	11111	Data line indicator (see Note 1)	
	qSJJJ	q	- Quality of the observation coded according to: 1-Very poor 2-Poor 3-Fair 4-Good 5-Excellent
		S	- Status of the report coded according to: 1-Preliminary estimate 2-Final report 3-Correction 4-Deletion
		JJJ	- Local flare serial number assigned independently by each observatory (normally assigned sequentially by GMT day)
	GGggL	GGgg	- Start time (or time flare was initially observed). Record hour and minute, GMT.
		L	- Time label coded according to: 1-Exact start time 2-Flare in progress at GGgg (Begin time not observed; flare began before GGgg)
	QXXYY	Q	- Quadrant location of the flare coded according to: 1-Northeast 2-Southeast 3-Southwest 4-Northwest
		XX	- Central Meridian Distance of the flare (whole degrees)
		YY	- Latitude of the flare (whole degrees)

TIBcc	T	- Method or type of observation coded according to: 1-Visual 2-Photographic 3-Projection 4-Electronic
	I	- Flare Importance determined by International Astronomical Union standards and coded according to: 0-Subflare 1-Importance One 2-Importance Two 3-Importance Three 4-Importance Four
	B	- Flare brightness coded according to: 7-Faint 8-Normal 9-Brilliant
	c	- First flare characteristic coded according to: 0-Visible in white light 1-Greater than or equal to 20 percent umbral coverage 2-Parallel ribbon 3-Associated Loop Prominence (LPS) 4-Y-shaped ribbon 5-Several eruptive centers 6-One or more brilliant points 7-Associated high speed Dark or Bright Surge on Disk (DSD or BSD) 8-Flare followed the Disappearance of a Solar Filament (DSF) in the same region 9-H-alpha emission greater in the blue wing than in the red wing /-Filler or not applicable
	c	- Second flare characteristic coded according to the preceding table. (Note: The table lists flare characteristics in descending order of importance.)
GGggL	GGgg	- Time of the maximum brightness of the flare (hour and minutes, GMT)
	L	- Time label coded according to: 1-Exact time of maximum brightness 2-Time of area measurement (since the time of maximum brightness was not observed)
7AAAA	7	- Numerical filler (7th group)
	AAAA	- Corrected flare area in millionths of the solar hemisphere at time of maximum brightness. Use zero(s) as fill.
GGggL	GGgg	- End time (or time flare was last observed). Record hour and minute, GMT. Note: If coded message is transmitted before the flare has ended (preliminary report), encode ///// for GGggL.
	L	- Time label coded according to: 1-Exact end time 2-Flare in progress at GGgg (end time not observed; flare ended after GGgg)
9NNNN	9	- Numerical filler (9th group)
	NNNN	- SESC region number; use //// filler when number not known
FBBbb	F	- Flare threshold expressed as a bin value, i.e., the minimum brightness bin value which must have a corrected area of at least 10 millionths of the solar hemisphere to declare sampled activity a flare. Report only the ones unit (e.g., a value of "6" indicates flare threshold = 16). Report "/" if data not available.

	BB	- Flare brightness level, expressed as a bin value, used to categorize the flare as faint, normal, or brilliant. (Note: The corrected area in this brightness bin, added to the area in all bins of greater brightness, must be at least 10 millionths of the solar hemisphere.) Report "//" if data not available.
	bb	- Maximum flare brightness, expressed as a bin value, detected in the sampled activity without regard to the amount of flare area in that bin. Report "//" if data not available.
Line 4a 22222	Data continuation line indicator (see Note 2)	
IBGgg	I	- Secondary flare importance coded according to: 0-Subflare 1-Importance One 2-Importance Two 3-Importance Three 4-Importance Four
	B	- Secondary flare brightness coded according to: 7-Faint 8-Normal 9-Brilliant
	Ggg	- Time of the secondary maximum brightness of the flare (last digit of hour and minutes, GMT)
7AAAA	7	- Numerical filler
	AAAA	- Secondary corrected flare area in millionths of the solar hemisphere
99999	End of data indicator (include at end of last data line).	

NOTES:

1. Do not include data for more than one GMT day in a single message. Repeat lines 4 and 4a as often as necessary. Include data for only one flare on a single data line 4 or 4a.

2. Use line 4a to report other flare maxima (if applicable); use the IBGgg and 7AAAA groups as often as necessary, however, use no more than four secondary maxima on a single line 4a. Use the data encoded in groups TIBcc GGggL 7AAAA in line 4 to identify the largest, most energetic maximum. Use the cc, Flare Characteristics, in the TIBcc group in line 4 to describe the most significant maximum. Report secondary maxima in line 4a in chronological sequence irrespective of the time of the largest, most energetic maximum.

1-2. Solar Disk and Limb Activity Summary Code (DALAS). Use this code to make event-level and routine reports of activity on the solar disk and/or limb with an optical telescope viewing at a wavelength of 6563A (Hydrogen-alpha).

Line 1 MANOP heading
Line 2 DALAS
Line 3 IIiii YMMDD 3//nn
Line 4 11111 qSJJJ EEIRR GGggs GGgge TBRAA 9NNNN QXXYY QXXYY QXXYY
Line 4a 22222 WWW/D 3qFFF 99999

Line 1 MANOP heading		
Line 2 DALAS	Data identifier, alphabetic character	
Line 3 IIiii	II	- World Meteorological Organization block number
	iii	- World Meteorological Organization station number
YMMDD	Y	- Last digit of the year

		MM	- Number of the month
		DD	- Day of the month (corresponding to activity start time; see Note 1)
	3//nn	3	- Numerical filler (3rd group)
		//	- Fillers
		nn	- Number of data lines in this message
Line 4	11111	Data line indicator (see Note 1)	
	qSJJJ	q	- Quality of observation coded according to: 1-Very poor 2-Poor 3-Fair 4-Good 5-Excellent
		S	- Status of the report coded according to: 1-Preliminary estimate 2-Final report 3-Correction 4-Deletion
		JJJ	- Local activity serial number assigned independently by each observatory (normally assigned sequentially by GMT day)
	EEIRR	EE	- Type of activity coded according to: 01-ASR Active Surge Region (less than 0.15 solar radius) 02-APR Active Prominence Region 03-MDP Mound Prominence 04-BSL Bright Surge on Limb (0.15 solar radius or greater) 05-EPL Eruptive Prominence on Limb 06-LPS Loop Prominence System (limb or disk) 07-SPY Spray 08-AFS Arch Filament System 09-ADF Active Dark Filament 10-DSF Disappearing Solar Filament (see Note 2) 11-DSD Dark Surge on Disk 12-BSD Bright Surge on Disk 13-SSB Solar Sector Boundary (see Note 3) 14-CRN Coronal Rain 15-CAP Cap Prominence (Tandberg-Hanssen classification)
		I	- Index of activity. A subjective estimate of the level of activity for APR, EPL, ADF, or DSF activity, coded according to: 1-Active. Prominence fluctuates in brightness or changes shape. Filament varies in darkness, changes shape, or moves. 2-Non-Eruptive. Prominence or filament disappears, but does not erupt. Represents dissipation in place. 3-Eruptive. Prominence or filament erupts; filament shows strong Doppler shift. /-Not applicable. Use for other types of disk and limb activity.
		RR	- For limb activity: radial extent above the limb expressed in hundredths of the solar radius. For disk activity: encode heliographic extent (i.e., length) in whole degrees. For combined limb and disk activity: encode radial extent from the feature's point of origin to the outermost extent of the feature, expressed in hundredths of the solar radius. If the location is unclear, use plain language remarks to specify limb or disk activity.

GGggs	GGgg	- Start time (or time activity was initially observed). Record hour and minute, GMT.
	s	- Time qualifier coded according to: 1-Exact start time 2-In progress; activity started before GGgg 3-Activity started after GGgg (for features which disappear, but start time was not observed, report time last observed and this time qualifier).
GGgge	GGgg	- End time (or time activity was last observed). Record hour and minute, GMT. Note: If coded message is transmitted before the activity ended (preliminary report), encode ///// for GGgge.
	e	- Time qualifier coded according to: 1-Exact end time 2-Activity ended before GGgg (for features which disappear, but exact end time not observed, report time absence was first noticed and this time qualifier). 3-Activity ended after GGgg (end time not observed, activity was still in progress at GGgg)
TBRAA	T	- Method or type of observation coded according to: 1-Visual 2-Photographic 3-Projection 4-Electronic
	B	- Observed amount of Doppler shift in blue wing in tenths of Angstroms
	R	- Observed amount of Doppler shift in red wing in tenths of Angstroms NOTE: / indicates not measured or not applicable 0 indicates no shift 9 indicates shifts equal to or greater than 0.9 Angstroms
	AA	- Associated remarks. Use // as a filler or use any combination of the following: 1-Flare associated 2-Brilliant intensity emission for at least one-third of the time 3-Normal intensity emission for at least one-third of the time 0-No other effects
9NNNN	9	- Numerical filler
	NNNN	- SESC region number. Use //// if not applicable.
QXXYY	Q	- Quadrant location of activity coded according to: (See Note 4) 1-Northeast 2-Southeast 3-Southwest 4-Northwest
	XX	- Central Meridian Distance in whole degrees
	YY	- Latitude of the activity in whole degrees
Line 4a 22222	Data continuation line indicator (permitted only for AFS, ADF, and DSF; mandatory for DSF)	
WWW/D	WWW	- The mean width of the filament in tenths of a degree (WW.W). Generally reported to the nearest half degree.
	/	- Filler
	D	- Density. A subjective estimate of the filament's density coded according to: 1-Faint 2-Normal 3-Dark
3qFFF	3	- Numerical filler (3rd group)
	q	- Quality. The observability of the filament's fine structure coded according to: 0-Fine structure unobservable 1-Fine structure barely visible

2-Fine structure apparent
3-Fine structure distinctive

FFF - Fine structure angle. Report whole degrees measured clockwise from the filament's orientation. Encode as /// if the quality is unobservable (q = 0).

99999 End of data indicator (include at end of last data line).

NOTES:

1. Do not include data for more than one GMT day in a single message. Repeat lines 4 and 4a as often as necessary. Include data for only one phenomenon on a single data line 4 or 4a.

2. For filaments which disappear overnight: Report the last time the filament was observed as the DSF start time, with a time qualifier of s = 3, "Activity started after GGgg"; and the time the filament was first observed to be absent as the DSF end time, with a time qualifier of e = 2, "Activity ended before GGgg". Coordination with other observatories to narrow this time period is permitted. Report the location of the DSF as its position at the time the filament was last visible. As with all other DALAS messages, the date of the message (DD) must correspond to the activity start time. If the period between activity start and end exceeds 24 hours, the DALAS code can't be used to report the overnight DSF. Instead, report all relevant information about the DSF in a scheduled or unscheduled PLAIN language message.

3. For reporting Solar Sector Boundaries, use solidi (/) for I, RR, s, GGgge, TBRAA, and NNNN. The group LLLXX (reported in place of the QXXYY group) indicates the Carrington longitude and Central Meridian Distance of the neutral line/solar equator intersection. Use the first GGgg for the time of the analysis. Normally, report only sector boundaries in the western hemisphere. Should a boundary in the eastern hemisphere be deemed significant enough to report, use // for XX in the LLLXX group. Only three boundaries may be reported in a single data line (Line 4). Use another 11111 data line, with all intermediate data reported, to report more than three sector boundaries.

4. DALAS features equal to or less than 5 degrees in length may be reported with only one QXXYY group located by the centroid. As needed, up to three QXXYY groups may be used to indicate the two end points and one intermediate point. If more than three QXXYY groups are required to adequately describe a filament, either report the additional groups in an appended plain language message or divide the filament into sections and report them in separate DALAS messages.

1-3. Sunspot Code (SPOTS). Use this code to make routine reports of sunspots as observed with an optical telescope viewing in integrated (white) light. (See Note 1)

Line 1 MANOP heading
Line 2 SPOTS
Line 3 IIiii YMMDD 3GGgg 4Tqnn
Line 4 11111 2SJJJ QXXYY LLAAA //NNN 6ZPCM 9NNNN 99999

Line 1 MANOP heading
Line 2 SPOTS Data identifier, alphabetic character
Line 3 IIiii II - World Meteorological Organization block number
iii - World Meteorological Organization station number
YMMDD Y - Last digit of the year

	MM	- Number of the month
	DD	- Day of the month (corresponding to the GGgg time group)
3GGgg	3	- Numerical filler (3rd group)
	GGgg	- Time of the observation midpoint (hour and minutes, GMT)
4Tqnn	4	- Numerical filler (4th group)
	T	- Method or type of observation coded according to: 1-Visual 2-Photographic 3-Projection 4-Electronic
	q	- Quality of the observation coded according to: 1-Very poor 2-Poor 3-Fair 4-Good 5-Excellent 6-No observation, weather causes 7-No observation, equipment problem 8-No observation, other causes
	nn	- Number of data lines contained in this message.
Line 4 11111	Data line indicator (see Note 2)	
2SJJJ	2	- Numerical filler (2nd group)
	S	- Status of the report coded according to: 1-Preliminary estimate 2-Final report 3-Correction 4-Deletion
	JJJ	- Local sunspot group number assigned independently by each observatory (not necessarily reported in sequential order within a SPOTS message)
QXXYY	Q	- Quadrant location of the sunspot group coded according to: 1-Northeast 2-Southeast 3-Southwest 4-Northwest
	XX	- Central Meridian Distance of the sunspot group (whole degrees)
	YY	- Latitude of the sunspot group (whole degrees)
LLAAA	LL	- Heliographic extent (i.e., length) of the sunspot group (in whole heliographic degrees). The heliographic extent is defined as the distance between the most extreme edges of the two most widely separated spots, measured along the group's major axis, which may not necessarily be parallel to the latitude lines. (Previously referred to as longitudinal extent.)
	AAA	- Corrected total area of the sunspot group in tens of millionths of the solar hemisphere. (Example: For 20 millionths, encode 002.)
//NNN	//	- Fillers
	NNN	- Number of distinct umbra in the sunspot group. Use zero(s) as fill. (Example: Two distinct sunspots are observed. One spot has a single umbra, while the other has three umbra within the same penumbra. Encode 004.)
6ZPCM	6	- Numerical filler (6th group)
	Z	- Sunspot Class (based on modified Zurich evolutionary sequence) according to: 1-A Unipolar; no penumbra; length (normally) less than 3 heliographic degrees 2-B Bipolar; no penumbra; length (normally) 3 degrees or greater

			3-C Bipolar; penumbra on only one pole
			4-D Bipolar; penumbra on both poles; length less than or equal to 10 degrees
			5-E Bipolar; penumbra on both poles; length greater than 10, but less than or equal to 15 degrees
			6-F Bipolar; penumbra on both poles; length greater than 15 degrees
			7-H Unipolar; with penumbra
	P	-	Penumbral Class (based on largest penumbra) according to:
			0-x No penumbra
			1-r Rudimentary penumbra
			2-s Small symmetric penumbra
			3-a Small asymmetric penumbra
			4-h Large symmetric penumbra
			5-k Large asymmetric penumbra
	C	-	Sunspot Distribution within the group according to:
			/-x Single spot or unipolar spot group
			7-o Open distribution
			8-i Intermediate distribution
			9-c Compact distribution
	M	-	Magnetic classification coded according to:
			1 - Alpha
			2 - Beta
			3 - Beta-gamma
			4 - Gamma
			5 - Beta-delta
			6 - Beta-gamma-delta
			7 - Gamma-delta
9NNNN	9		Numerical filler
	NNNN		SESC region number. Use //// if not applicable.
99999	End of data indicator (include at end of last data line).		

NOTES:

1. When observations reveal no sunspots on the solar disk, transmit a truncated SPOTS report to indicate that observations were possible but no sunspots were visible. This truncated report includes all data through line 3 of the SPOTS code. A typical example of this message is:

```
HOAU3 APLM DDGGgg
SPOTS
IIiii YMMDD 3GGgg 4Tqnn 99999
NNNN
```

For a "fair" quality observation by projection technique with no visible sunspots, the 4Tqnn group would be encoded 43300.

2. Repeat line 4 as often as necessary. Include data for only one sunspot group on a single data line.

1-4. Histogram History Code (HSTRY). This code is used to make routine, automated reports of videometer box data for selected solar regions of interest. Messages contain brightness and uncorrected area data for each minute of the previous hour.

```
Line 1  MANOP heading
Line 2  HSTRY
Line 3  IIiii YMMDD 3//nn
Line 4  RRRR/ HHMM/ PPABC PPABC ..... .....
Line 4a PPABC PPABC ..... ..... 99999
```

Line 1	MANOP heading		
Line 2	HSTRY	Data identifier, alphabetic character	
Line 3	IIiii	II	- World Meteorological Organization block number
		iii	- World Meteorological Organization station number
	YMMDD	Y	- Last digit of the year
		MM	- Number of the month
		DD	- Day of the month (corresponding to the HHMM time group)
	3//nn	3	- Numerical filler (3rd group)
		//	- Fillers
		nn	- Number of data lines
Line 4	RRRR/	SESC region number	
	HHMM/	Hour and minute of first data group (GMT)	
	PPABC	PP	- Peak brightness (tens of percent of the quiet sun)
		ABC	- Plage area (A.B x 10^C millionths of the solar hemisphere)
Line 4a	PPABC		- As defined in line 4. Repeat group as necessary to code all data.
	99999	End of data indicator (include at end of last date line).	

NOTE: There are 60 PPABC groups in a routine message, one for each minute of the hour. If data are not available for that minute, ///// is encoded. If data are not available for the region, no message is transmitted. Repeat line 4 for multiple region messages.

1-5. Videometer Box Dimension Outline (BXOUT). This code is used by observatories equipped with the AN/FMQ-7 solar optical telescope to report videometer box size and position information.

```
Line 1  MANOP heading
Line 2  BXOUT
Line 3  IIiii YMMDD 3//nn
Line 4                  BOX CENTER            REGION CENTER
Line 5  RGN  HIGH WIDE P-ANGL RV    LAT LON P-ANGL RV    LAT LON SEQ
Line 5a RRRR HHHH WWWW SP.PPP R.RRR TTT NNN DDD.D  R.RRR YYY XXX VV/N
Line 6  TIME:  SSSSSSSSS.SS (DDD HHMM:SS) 99999
```

Line 1	MANOP heading		
Line 2	BXOUT	Data Identifier, alphabetic character	
Line 3	IIiii	II	- World Meteorological Organization block number
		iii	- World Meteorological Organization station number
	YMMDD	Y	- Last digit of the year
		MM	- Number of the month

		DD	- Day of the month (corresponding to the time in line 6)
	3//nn	3	- Numerical filler (3rd group)
		//	- Fillers
		nn	- Number of data lines
Line 4	BOX CENTER		Column header for box center information
	REGION CENTER		Column header for region center information
Line 5	RGN	Column header for Region ID	
	HIGH	Column header for height dimension of videometer box	
	WIDE	Column header for width dimension of videometer box	
	P-ANGL	Column header for position-angle of center of videometer box	
	RV	Column header for radius vector to center of the videometer box	
	LAT	Column header for heliographic latitude at center of videometer box	
	LON	Column header for heliographic longitude at center of videometer box	
	P-ANGL	Column header for geocentric position angle to center of region	
	RV	Column header for radius vector to region center	
	LAT	Column header for heliographic latitude at region center	
	LON	Column header for heliographic longitude at region center	
	SEQ	Column header for identifying region observing sequence position	
Line 5a	RRRR	SESC (or locally defined) region number (see Note)	
	HHHH	Height of videometer box (arc seconds)	
	WWWW	Width of videometer box (arc seconds)	
	SP.PPP	S - Sign of the position angle (M=negative, blank=positive)	
		P.PPP - Value of the position angle (radians) to box center	
	R.RRR	Value of the radius vector to box center	
	TTT	Heliographic latitude at box center (e.g., N32)	
	NNN	Heliographic longitude at box center (e.g., W60)	
	DDD.D	Geocentric position angle to center of region (degrees)	
	R.RRR	Value for the radius vector to region center	
	YY	Heliographic latitude at region center	
	XX	Heliographic longitude at region center	
	VV	Observing subsequence identifier (transmit "//" if not used)	
	/	Filler	
	N	Position in the subsequence (transmit "/" if not used)	
Line 6	TIME:	Header for time of the data	
	SSSSSSSSS.SS	Time of data in seconds since start of the year (GMT)	
	DDD	Day of the data (Julian Date)	
	HHMM:SS	Hour, minute, and second of the data (GMT)	
	99999	End of data indicator (include at end of last data line).	

NOTE: Repeat line 5a as often as necessary to include all videometer boxes. (Height refers to television screen used to display image of the sun, not to height above a point on the sun.)

CHAPTER 2

SOLAR RADIO CODES

2-1. Discrete Solar Radio Burst Code (BURST). Use this code to make event-level or routine reports of impulsive, solar radio bursts as measured on a discrete (fixed) frequency radiometer.

Line 1 MANOP heading
Line 2 BURST
Line 3 IIiii YMMDD 3ppnn
Line 4 11111 qSLJJ FFabp TUabp GGbbt GGmmt 7abpp GGeet 9abpp 99999

Line 1	MANOP heading		
Line 2	BURST	Data identifier, alphabetic character	
Line 3	IIiii	II	- World Meteorological Organization block number
		iii	- World Meteorological Organization station number
	YMMDD	Y	- Last digit of the year
		MM	- Number of the month
		DD	- Day of the month (corresponding to burst start time; see Note 1)
	3ppnn	3	- Numerical filler (3rd group)
		pp	- Highest power of p in the following FFabp peak flux groups (see Note 2)
		nn	- Number of data lines in this message
Line 4	11111	Data line indicator (see Note 1)	
	qSLJJ	q	- Quality of the data coded according to: 0-Origin of burst uncertain, possible Radio Frequency Interference (RFI) 1-Uncertain data due to interference from a solar noise storm or RFI 2-Uncertain data due to equipment problem, weather, or antenna shadowing 3-Good data, manual reduction 4-Good data, automatic reduction
		S	- Status of the report coded according to: 1-Preliminary estimate 2-Final report 3-Correction 4-Deletion
		L	- Time qualifier coded according to (see Note 3): 0-Times correct as reported 1-Start uncertain 2-Peak uncertain 3-Start and peak uncertain 4-End uncertain 5-End and peak uncertain
		JJ	- Local burst serial number assigned independently by each observatory (normally assigned sequentially by GMT day) (see Notes 4 and 5)
	FFabp	FF	- Frequency indicator coded according to: 00 - Less than 150 MHz 11 - 150 to 299 MHz 22 - 300 to 499 MHz 33 - 500 to 999 MHz

		44 - 1000 to 1999 MHz 55 - 2000 to 3999 MHz 66 - 4000 to 7999 MHz 77 - 8000 to 11999 MHz 88 - 12000 to 19999 MHz 99 - 20000 MHz or greater
	ab	- First two significant figures of the peak flux value observed at a frequency within the range indicated by FF (see Note 6)
	p	- Power of 10 applied to "a.b" to give the peak flux value in standard solar flux units (sfu) (see Note 6)
TUabp	T	- Spectral class according to: 0-Not classified 9-Castelli-U (see Note 7)
	U	- Type of burst according to: 1 - NOISE STORM or FLUCTUATIONS 2 - GRADUAL RISE AND FALL (non-impulsive) 3 - IMPULSIVE (less than 500 sfu) (see Note 8) 4 - COMPLEX (less than 500 sfu) (see Note 8) 5 - GREAT BURST (500 sfu or greater) 6 - COMPLEX GREAT (500 sfu or greater)
	ab	- First two significant figures of mean flux value (see Note 6)
	p	- Power of 10 applied to "a.b" to give the mean flux value in standard sfu units (see Note 6)
GGbbt		- Start time (or time burst was initially observed). Record hour, minute, and tenth of minute, GMT; if the start time is unknown or uncertain, use "/" for tenth of minute.
GGmmt		- Time of the burst maximum. Record hour, minute, and tenth of minute, GMT; if the maximum time is unknown or uncertain, use "/" for tenth of minute. In preliminary reports, this peak is only a provisional value.
7abpp	7	- Numerical filler (7th group)
	ab	- First two significant figures of the integrated flux value from start of burst to time of burst maximum (see Note 9)
	pp	- Power of 10 applied to "a.b" to give integrated flux value in standard sfu-sec units (see Note 9)
GGeet		- End time (or time burst was last observed). Record hour, minute, and tenth of minute, GMT; if the end time is unknown or uncertain, use "/" for tenth of minute. Note: If coded message is transmitted before the burst has ended (preliminary report), encode ///// for GGeet.
9abpp	9	- Numerical filler (9th group)
	ab	- First two significant figures of the integrated flux value from start of burst to end of burst (see Note 9)
	pp	- Power of 10 applied to "a.b" to give integrated flux value in standard sfu-sec units (see Note 9)
99999	End of data indicator (include at end of last data line).	

NOTES:

1. Do not include data for more than one GMT day in a single message. Repeat line 4 as often as necessary. Include data for only one frequency on a single data line.

2. The pp indicator in line 3 is a safeguard should any of the p values be garbled in lines 4. Repeat the highest p value assigned to any of the peak fluxes of the FFabp groups as pp in line 3. For example, if highest p value equals 2, then pp is encoded as 22.

3. This only applies to uncertainty in hours and full minutes. It does not apply to uncertainty in tenth of minutes.

4. JJ is the same number for each frequency reported that, in the analyst's judgment, gives burst information associated with the same event. Noise storms on different frequencies will have separate serial numbers assigned, to facilitate ending the noise storms independently.

5. If a distinctly separate burst is superimposed on a non-impulsive burst, a noise storm, or on the decaying stage of a large burst, treat it as a separate burst and assign a different burst serial number.

6. If, for example, the first two significant figures of a flux reading are 52, then a = 5 and b = 2. If the actual reading is 52 solar flux units (sfu) (1 sfu = 10^{-22} watt/m^2/Hz), then p = 1 and abp = 521 (for 5.2 x 10^1). Similarly, if the actual reading is 5200 sfu, then p = 3, and abp = 523 (for 5.2 x 10^3). Do not report mean flux for noise storms or fluctuations, instead encode "000". Mean flux estimates for other types of bursts are required, even during manual operations.

7. When a Castelli-U event occurs, continue to report the maximum peaks for each frequency, rather than the peaks used in defining the Castelli-U.

8. Bursts of less than 50 sfu will not normally be reported unless they are significant and/or contribute to the understanding of what is occurring. Examples: Gradual Rise And Fall bursts, or bursts that are part of a spectral group, should be reported even when their peaks are less than 50 sfu.

9. The standard unit of integrated flux is the solar flux unit-second, where 1 sfu-sec equals 10^{-22} watt-sec/m^2/Hz or 10^{-22} joule/m^2/Hz. Encode an integrated flux of 564,000 sfu-sec as 75605 (or 95605), which equals 5.6 x 10^{-17} watt-sec/m^2/Hz. Do not report integrated fluxes for noise storms or fluctuations; reporting these fluxes are optional for other types of bursts during manual operations, since they can be computed later from the time and mean flux data in the message. If an integrated flux value is not reported, replace the abpp with ////.

2-2. Spectral Solar Radio Burst Code (SWEEP). Use this code to make event-level or routine reports of the solar radio spectrum, as measured on a Swept Frequency Interferometric Radiometer (SFIR).

Line 1 MANOP heading
Line 2 SWEEP
Line 3 IIiii YMMDD 3//nn
Line 4 11111 cqSJJ GGggt TIfff FFFF/ GGggt 7vvvv PPPRR 99999

Line 1	MANOP heading		
Line 2	SWEEP	Data identifier, alphabetic character	
Line 3	IIiii	II	- World Meteorological Organization block number
		iii	- World Meteorological Organization station number
	YMMDD	Y	- Last digit of the year
		MM	- Number of the month
		DD	- Day of the month (corresponding to burst start time; see Note 1)
	3//nn	3	- Numerical filler (3rd group)

		//	- Fillers
		nn	- Number of data lines in this message
Line 4	11111	Data line indicator (see Note 1)	
	cqSJJ	c	- Certainty of sweep type identification according to: 1-Certain 2-Uncertain
		q	- Quality of sweep frequency data coded according to: 1-Certain frequency range 2-Uncertain frequency range
		S	- Status of the report coded according to: 1-Preliminary estimate 2-Final report 3-Correction 4-Deletion
		JJ	- Local sweep serial number assigned independently by each observatory (normally assigned sequentially by GMT day). (See Note 2)
	GGggt		- Start time (or time sweep was initially observed). Record hour, minute, and tenth of minute, GMT; if start time is unknown or uncertain, use "/" for tenth of minute.
	TIfff	T	- Type of the sweep coded according to: 1 - (Not Used) 2 - Type II (slow drift) burst 3 - Type III (fast drift) burst; one or more bursts over a period of less than 10 minutes 4 - Type IV (smooth broadband continuum) burst 5 - Type V (continuum tail on a Type III) burst; one or more bursts over a period of less than 10 minutes (may include some pure Type III bursts) 6 - Series of Type III bursts over a period of 10 minutes or more, with no period longer than 30 minutes without activity 7 - Series of Type III and Type V bursts over a period of 10 minutes or more, with no period longer than 30 minutes without activity 8 - Continuum (broadband continuum, possibly with Type III and/or Type V bursts superimposed) 9 - Unclassified activity
		I	- Importance of the sweep coded according to: 1-Minor 2-Significant 3-Major /-Data not available
		fff	- Low frequency end of sweep (MHz). Use zero(s) as fill.
	FFFF/	FFFF	- High frequency end of sweep (MHz). Use zero(s) as fill.
		/	- Filler
	GGggt		- End time (or time sweep was last observed). Record hour, minute, and tenth of minute, GMT; if the end time is unknown or uncertain, use "/" for tenth of minute. Note: If coded message is transmitted before the sweep has ended (preliminary report), encode ///// for GGggt.
	7vvvv	7	- Numerical filler (7th group)
		vvvv	- Estimated shock velocity for Type II bursts (km/sec). Encode //// if data are not available. Use zero(s) as fill.
	PPPRR	PPP	- Position angle of source of activity measured eastward from apparent heliographic

			north. Encode /// if data are not available.
	RR	-	Radial distance from the center of the sun to the source of activity in units of tenths of the apparent solar optical radius. Encode "//" if data are not available.
99999	End of data indicator (include at end of last data line).		

NOTES:

1. Do not include data for more than one GMT day in a single message. Repeat line 4 as often as necessary. Include data for only one spectral burst (sweep) on a single data line.

2. JJ will be a unique identification number for each spectral burst reported, even if two or more sweep types are superimposed in time. Report a superimposed sweep separately from other sweep types when it is one or two importance categories higher, or is associated with a discrete frequency burst. Assign the sweep serial numbers separately from the discrete frequency burst serial numbers.

2-3. Integrated Solar Radio Flux Code (IFLUX). Use this code to report the background component of the solar radio flux as measured on discrete (fixed) frequency radiometers at local noon daily.

```
Line 1  MANOP heading
Line 2  IFLUX
Line 3  IIiii YMMDD 3GGgg 4S/nn
Line 4  11111 FFFFF qffff FFFFF qffff FFFFF qffff FFFFF qffff
Line 4a 11111 ..... ..... ..... ..... ..... ..... ..... ..... 99999
```

Line 1	MANOP heading		
Line 2	IFLUX	Data identifier, alphabetic character	
Line 3	IIiii	II	- World Meteorological Organization block number
		iii	- World Meteorological Organization station number
	YMMDD	Y	- Last digit of year
		MM	- Number of the month
		DD	- Day of the month (corresponding to the GGgg time group)
	3GGgg	3	- Numerical filler (3rd group)
		GGgg	- Begin time of the flux measurements (hours and minutes, GMT)
	4S/nn	4	- Numerical filler (4th group)
		S	- Status of the report coded according to: 1-Preliminary estimate 2-Final report 3-Correction 4-Deletion
		/	- Filler
		nn	- Number of frequencies (i.e., data pairs "FFFFF qffff") reported in this message
Line 4	11111	Data line indicator (see Note 1)	
	FFFFF	Frequency (MHz) at which the following flux measurement was made. Use zero(s) as fill. (See Note 2)	
	qffff	q	- Quality of observation coded according to: 1-Good quality 2-Uncertain quality due to weather 3-Uncertain quality due to interference 4-Uncertain quality due to unknown causes

5-Uncertain quality due to burst in progress

ffff - Flux (1 solar flux unit (sfu) = $10^{-22}W/m^2/Hz$). Use zero(s) as fill.

99999 End of data indicator (include at end of last data line).

NOTES:

1. A full data line 4 includes 11111 followed by data for four frequencies. The final data line 4a of the message will include 11111 and data for one to four frequencies followed by 99999. Include data for only one "GGgg" time on a single data line 4 or 4a.

2. Transmit a "FFFFF qffff" data group for each operational fixed frequency. If no data are available for a particular frequency, omit the corresponding "FFFFF qffff" data group. If flux values are acquired from each antenna sequentially, vice simultaneously, send separate messages using the applicable "GGgg" times.

CHAPTER 3

IONOSPHERIC CODES

3-1. Ionospheric Code (IONSS). Use this code to make routine reports of the F2 region critical frequency (foF2), M(3000) factor, Sporadic E critical frequency (foEs), and minimum observed frequency (fmin) as determined by a vertical incidence ionospheric sounder.

```
Line 1  MANOP heading
Line 2  IONSS
Line 3  IIiii YMMDD 3//nn
Line 4  11111 SGGgg fffpp eemmq SGGgg fffpp eemmq
Line 4a 11111 ..... ..... ..... 99999
```

```
Line 1  MANOP heading
Line 2  IONSS   Data identifier, alphabetic character
Line 3  IIiii   II      - World Meteorological Organization block number
                iii     - World Meteorological Organization station number
        YMMDD   Y       - Last digit of the year
                MM      - Number of the month
                DD      - Day of the month (see Note 1)
        3//nn   3       - Numerical filler (3rd group)
                //      - Fillers
                nn      - Number of observations in report
Line 4  11111   Data line indicator (see Note 2)
        SGGgg   S       - Status of the report coded according to:
                          1-Preliminary estimate
                          2-Final report
                          3-Correction
                          4-Deletion
                GGgg    - Time of observation (hour and minutes, GMT)
        fffpp   fff     - F2 region critical frequency (foF2, tenths of MHz) (see Notes 3 and 4)
                pp      - M(3000) factor (tenths) (see Notes 3 and 4)
        eemmq   ee      - Sporadic E critical frequency (foEs, whole MHz) (see Note 4)
                mm      - Minimum observed frequency (fmin, tenths of MHz) (see Note 4)
                q       - Qualifying symbol used to describe the most significant condition present in the
                          ionogram according to:
                          1-Blanketing Sporadic E
                          2-Non-Deviative Absorption (fmin elevated)
                          3-Equipment outage
                          4-foF2 greater than upper limit of equipment
                          5-foF2 less than lower limit of equipment
                          6-Spread F
                          7-foF2 less than foF1
                          8-Interference
                          9-Deviative Absorption in the vicinity of foF2
                          0-No qualifying symbol applies
        99999   End of data indicator (include at end of last data line).
```

NOTES:

1. Do not include data for more than one GMT day in a single message.

2. Repeat line 4 as often as necessary. A full data line 4 includes 11111 followed by data for two observing times. The final data line 4a of the message includes 11111 and data for one or two observing times followed by 99999.

3. If foF2 or M(3000) is impossible to read, estimate a meaningful value by interpolating or extrapolating. In this case, before encoding, add 50 MHz to the foF2 value and/or 5.0 to the M(3000) factor, as appropriate, to indicate estimated values.

4. If any of the foF2, M(3000), foEs, or fmin is impossible to report, encode appropriate number of solidi (/).

3-2. Total Electron Content Code (TELCO). Use this code to make routine reports of the equivalent vertical total electron content (TEC) above a station, based on relative polarization angle changes of VHF signals transmitted from a geostationary satellite and recorded on a polarimeter.

```
Line 1  MANOP heading
Line 2  TELCO
Line 3  IIiii YMMDD SVVVV 4//nn
Line 4  11111 GGggq TecPP ..... ..... ..... .....
Line 4a 11111 ..... ..... 99999
```

```
Line 1  MANOP heading
Line 2  TELCO   Data identifier, alphabetic character
Line 3  IIiii   II      - World Meteorological Organization block number
                iii     - World Meteorological Organization station number
        YMMDD   Y       - Last digit of the year
                MM      - Number of the month
                DD      - Day of the month (see Note 1)
        SVVVV   S       - Status of report according to:
                          1-Preliminary estimate
                          2-Final report
                          3-Correction
                          4-Deletion
                VVVV    - Vehicle identifier (see Note 2)
        4//nn   4       - Numerical filler (4th group)
                //      - Fillers
                nn      - Number of data pairs (GGggq TecPP) reported in this message
Line 4  11111   Data line indicator (see Note 3)
        GGggq   GGgg    - Time of observation (hours and minutes, GMT)
                q       - Data qualifier according to:
                          /-Good TEC data, no scintillation data available
                          1-Doubtful TEC data
                          2-Computer malfunction
```

		3-Equipment failure
		4-No satellite signal received
		5-Good TEC data, light scintillation observed
		6-Good TEC data, heavy scintillation observed
		7-Good TEC data, no scintillation observed
TecPP	Tec	- Equivalent vertical TEC in tenths (electrons/m^2) (see Note 4)
	PP	- Power of 10 needed to express TEC to the nearest tenth (e.g., 10.1 x 10^{16} is coded 10116, see Note 4)
99999	End of data indicator (include at end of last data line).	

NOTES:

1. Do not include data for more than one GMT day in a single message.

2. Satellite vehicle identifiers are limited to four digits. Examples:

   GOS3 = Geosynchronous Operational Environmental Satellite 3
   ETS1 = Environmental Technical Satellite 1

3. Repeat line 4 as often as necessary. A full data line 4 will include 11111 followed by data for four observations. The final data line 4a of the message includes 11111 and data for up to four observations followed by 99999.

4. Any TEC value below 0.1 x 10^{16} electrons/m^2 is coded as 00116. Missing TEC data, as associated with the q = 2, 3, or 4 data qualifiers, is coded /////. Examples of coding TecPP:

TEC Units (10^{16} electrons/m^2)	Equivalent Decimal	Coded
0.134	0.134 x 10^{16}	00116
1.34	1.34 x 10^{16}	01316
13.4	13.4 x 10^{16}	13416
134.2	13.4 x 10^{17}	13417

3-3. Automated Ionospheric Data Code (IONOS). This code is used to make routine reports of standard parameter data observed by an automated vertical incidence ionosonde.

Line 1 MANOP heading
Line 2 IONOS
Line 3 IIiii YMMDD 3//nn
Line 4 GGgg0 F2F2F2H2H2 F1F1F1H1H1 EEEHEHE EsEsEsMM FmFmYeYeQ
Line 5 ZELpN SELpN AELpN BELpN CELpN DELpN EELpN FELpN GELpN HELpN
Line 6 ZF1pN SF1pN AF1pN BF1pN CF1pN DF1pN EF1pN FF1pN GF1pN HF1pN
Line 7 ZF2pN SF2pN AF2pN BF2pN CF2pN DF2pN EF2pN FF2pN GF2pN HF2pN
Line 8 99999

Line 1	MANOP heading		
Line 2	IONOS	Data identifier, alphabetic character	
Line 3	IIiii	II	- World Meteorological Organization block number
		iii	- World Meteorological Organization station number
	YMMDD	Y	- Last digit of year

		MM	- Number of month
		DD	- Day of month (corresponding to the GGgg time group)
	3//nn	3	- Numerical filler (3rd group)
		//	- Fillers
		nn	- Number of observations (see Note 1)
Line 4	GGgg0	GGgg	- Time of observation to nearest minute (GMT)
		0	- Filler
	F2F2F2H2H2		
		F2F2F2	- Value of foF2 to nearest tenth MHz
		H2H2	- True height of F2 layer maximum in tens of kilometers
	F1F1F1H1H1		
		F1F1F1	- Value of foF1 to nearest tenth MHz
		H1H1	- True Height of F1 layer maximum in tens of kilometers
	EEEHEHE		
		EEE	- Value of foEs to nearest tenth MHz
		HEHE	- True Height of E layer maximum in tens of kilometers
	EsEsEsMM		
		EsEsEs	- Value of foEs to nearest tenth MHz
		MM	- M(3000) factor to nearest tenth
	FmFmYeYeQ		
		FmFm	- Minimum detected frequency to nearest tenth MHz. An fmin value greater than 9.9 MHz will be replaced by 9.9 MHz.
		YeYe	- Half thickness of E-layer (parabolic fit) in kilometers
		Q	- Qualifier: If any of the above data are missing, the reason is indicated according to the following table. Only a reason for the first missing element will be coded. 1-Blanketing Sporadic E 2-Non-Deviative Absorption (fmin elevated) 3-Equipment outage 4-foF2 greater than equipment upper limit 5-foF2 less than equipment lower limit 6-Spread F 7-foF2 less than foF1 8-Interference 9-Deviative Absorption in vicinity of foF2 0-No qualifier applies

Line 5 Up to 10 five-character groups which define the E-region electron density profile as determined by the ionosonde's automated data reduction routine (see Notes 2 and 3).

XXXpN		- Each five-character group (XXXpN) provides a quantity required to calculate the electron density profile, using a representation by Chebychev polynomials. All five-character groups have the same structure:
	XXX	- Three most significant digits of the respective quantity expressed in scientific notation. Those three digits are represented as "X.XX".
	p	- Sign indicator of XXX and N according to: 7 - XXX and N negative 8 - XXX negative, N positive 9 - XXX positive, N negative 0 - XXX and N positive
	N	- Power of 10 to which XXX is raised
ZELpN		- Height of E-layer maximum (A_0 in Chebychev polynomials for E-layer); in kilometers,

after conversion using above rules

	SELpN	- Start frequency of E-layer; in MHz, after conversion using above rules
	AELpN	- A_1, first of up to eight coefficients which define the E-layer segment of the true height profile; in kilometers, after conversion using above rules
	BELpN-HELpN	- Are the same format as AELpN; they are the coefficients A_2, A_3, ..., A_8 in Chebychev polynomials, for E-layer
Line 6	Same as Line 5, but for F1 layer	
Line 7	Same as Line 5, but for F2 layer	
Line 8	99999	End of data indicator (include at end of last data line).

NOTES:

1. Under current polling procedures and software design, there will be data for only one ionogram per message (the last hourly or half hourly ionogram run prior to polling). Therefore, 3//nn will always be coded as 3//01.

2. The number of coefficients is variable, depending on the complexity of the true height profile. If less than eight coefficients are used for a given layer, the remaining five-character positions are filled with solidi (/).

3. If E, F1, or F2-layer electron density profile data are absent, the whole corresponding line (all ten five-character groups) will be filled with solidi (/). In the case where data for all three layers are absent, Lines 5, 6, and 7 will all be filled with solidi.

3-4. Ionospheric Height Code (IONHT). This code is used to make routine reports of the virtual height (see Note 1) of the main ionospheric echo (the ordinary, or "O", trace) as a function of frequency, as observed by an automated vertical incidence ionosondes.

Line 1 MANOP heading
Line 2 IONHT
Line 3 IIiii YMMDD 3/nnn
Line 4 GGgg0 FFFHH FFFHH FFFHH .... FFFHH
Line 4a FFFHH FFFHH 99999

Line 1	MANOP heading		
Line 2	IONHT	Data identifier, alphabetic character	
Line 3	IIiii	II	- World Meteorological Organization block number
		iii	- World Meteorological Organization station number
	YMMDD	Y	- Last digit of year
		MM	- Number of month
		DD	- Day of month (corresponding to the GGgg time group)
	3/nnn	3	- Numerical filler (3rd group)
		/	- Filler
		nnn	- Number of FFFHH data groups in this report
Line 4	GGgg0	GGgg	- Time of observation to nearest minute (GMT) (see Note 2)
		0	- Filler
	FFFHH	FFF	- Frequency of observed O-trace reflection to nearest tenth MHz
		HH	- Virtual height of O-trace reflection in tens of kilometers
Line 4a	FFFHH		- Repeat FFFHH until all groups are sent. Use ten groups per line. Never exceed 66 characters and spaces per line. (Line 4, due to the GGgg0 group, has a maximum of nine FFFHH groups.) (See Note 3)

99999 End of data indicator (include at end of last data line).

NOTES:

1. Virtual height is the apparent height of a reflecting layer. It is determined by multiplying the round trip travel time of the sounder pulse by one-half the speed of light in a vacuum.

2. Under current polling procedures and software design, there will be data for only one ionogram per message (the last hourly or half hourly ionogram run prior to polling).

3. Repeat line 4a as often as is necessary. Send as many frequency-height groups as necessary to define the virtual height profile (normally less than 300). The total number of groups sent must match the number in line 3.

3-5. Total Electron Content and Scintillation Code (TELSI). This code is used to make routine or special reports of the equivalent total electron content (TEC) and ionospheric scintillation (variability) along paths between GPS/NAVSTAR satellites and an automated Transionospheric Sensing System (TISS) instrument.

Line 1 MANOP heading
Line 2 TELSI
Line 3 IIiii YMMDD 3GGgg 4SRnn 5S1S2S3S4
Line 4 Nnnggddq tttdddeq LLLLLoLoLoLo txtxtxtytytyeq1q2 llllololo1o
Line 4a 1sssvvv 2sssvvv 3S1S1S1S2S2S2 llllololo1o tstststststs
Line 4b JJJJTTTS JxJxJxJxTxTxTxS llllolololo JnJnJnJnTnTnTnS llllolololo 8PPPPPxPxPxPnPnPn
Line 5 (Same as Line 4, but used for second satellite in field of view of ground station)
Line 5a (Same as Line 4a, but used for second satellite in field of view of ground station)
Line 5b (Same as Line 4b, but used for second satellite in field of view of ground station)
Line 6, 6a, 6b (Used for a third satellite in view of ground station)
Line 7, 7a, 7b (Used for a fourth satellite in view of ground station) 99999

Line 1	MANOP heading		
Line 2	TELSI	Data identifier, alphabetic character	
Line 3	IIiii	II	- World Meteorological Organization block number
		iii	- World Meteorological Organization station number
	YMMDD	Y	- Last digit of the year
		MM	- Number of the month
		DD	- Day of the month (corresponding to the GGgg time group)
	3GGgg	3	- Numerical filler (3rd Group)
		GGgg	- Ending time of observation period, in hours and minutes, GMT
	4SRnn	4	- Numerical filler (4th group)
		S	- Data quality indicator coded according to: 0 to 9 (TBD when critical system components are identified.)
		R	- Period of transmission of message coded according to: (See Note 1) 1-Message transmitted every 15 minutes 2-Message transmitted every 30 minutes 3-Message transmitted every 45 minutes 4-Message transmitted every 60 minutes
		nn	- Number of coded lines in message to follow

5S1S2S3S4

5	- Numerical filler (5th group)
S1	- Number of satellites reported during first 15-minute interval (coded as "0" if no satellites are present, or as "/" if the interval is not reported)
S2	- Number of satellites reported during second 15-minute interval (coded as "0" if no satellites are present, or as "/" if the interval is not reported)
S3	- Number of satellites reported during third 15-minute interval (coded as "0" if no satellites are present, or as "/" if the interval is not reported)
S4	- Number of satellites reported during fourth 15-minute interval (coded as "0" if no satellites are present, or as "/" if the interval is not reported)

Lines 4,5,6,7

Nnnggddq

N	- Line number, coded as 4 corresponding to data set for first satellite, 5 for second satellite, 6 for third satellite, and 7 for fourth satellite (see Note 2)
nn	- Identification number assigned to each GPS/NAVSTAR satellite
gg	- Ending time of the observation interval in minutes for the data set corresponding to this line. For example, if three 15-minute intervals were reported in a message with an end time of observation equal to 1700, gg would be 30 for the first line (corresponding to 1630), 45 for the second line (1645), and 60 for the third line (1700). (See Note 3)
dd	- Interval period of the data set in minutes
q	- Data quality indicator (0 to 9). TBD.

tttdddeq

ttt	- Mean equivalent vertical TEC for the interval period at the centroid Ionospheric Penetration Point (IPP) of the ray path between the satellite and the receiver measured in three significant digits to the nearest tenth (see Note 4)
ddd	- Standard deviation from the mean equivalent vertical TEC measured in three significant digits to the nearest tenth
e	- Power of ten (exponent) of the mean equivalent vertical TEC and standard deviation coded according to: (See Note 6) 5 = x 10^{15} electrons 6 = x 10^{16} electrons 7 = x 10^{17} electrons 8 = x 10^{18} electrons 9 = x 10^{19} electrons
q	- Accuracy indicator (0 to 9). TBD for mean TEC over interval.

LLLLLoLoLoLo

LLLL	- Latitude of the satellite subtrack at the midpoint of the observation period (interval) measured in degrees to the nearest tenth (see Note 5)
LoLoLoLo	- Longitude of the satellite subtrack at the midpoint of the observation period (interval) measured in degrees to the nearest tenth (see Note 5)

txtxtxtytytyeq1q2

txtxtx	- Maximum equivalent vertical TEC within the interval period measured at the IPP between the satellite and receiver in three significant digits to the nearest tenth (see Note 4)
tytyty	- Minimum equivalent vertical TEC within the interval period measured at the IPP between the satellite and receiver in three significant digits to the nearest tenth (see Note 4)
e	- Power of then (exponent) of the maximum and minimum equivalent vertical TEC coded according to: (See Note 7)

5 = x 10^{15} electrons
6 = x 10^{16} electrons
7 = x 10^{17} electrons
8 = x 10^{18} electrons
9 = x 10^{19} electrons

q1q2 - Accuracy indicators (0 to 9). TBD for max and min TEC during observation interval.

llllllololo
- llll - Latitude of IPP location coincident with TEC maximum measured in degrees to the nearest tenth (see Note 5)
- lololo - Longitude of IPP location coincident with TEC maximum measured in degrees to the nearest tenth (see Note 5)

Lines 4a,5a,6a,7a

1sssvvv
- 1 - Numerical filler (1st group) which identifies data associated with 1.2 GHz satellite signals
- sss - Mean Amplitude Scintillation Index (S4) at 1.2 GHz averaged over the observation interval measured as a ratio of the standard deviation of received signal power to the mean received power measured to nearest hundredth of a unit (s.ss) (see Note 8)
- vvv - Standard deviation of the mean Amplitude Scintillation Index (S4) at 1.2 GHz, measured to the nearest hundredth of a unit (v.vv)

2sssvvv
- 2 - Numerical filler (2nd group) which identifies data associated with 1.6 GHz satellite signals
- sss - Mean Amplitude Scintillation Index (S4) at 1.6 GHz averaged over the observation interval measured as a ratio of the standard deviation of received signal power to the mean received power measured to the nearest hundredth of a unit (s.ss) (see Note 8)
- vvv - Standard deviation of the mean Amplitude Scintillation Index (S4) at 1.6 GHz, measured to the nearest hundredth of a unit (v.vv)

3S1S1S1S2S2S2
- 3 - Numerical filler (3rd group)
- S1S1S1 - Maximum Amplitude Scintillation Index (S4) at 1.2 GHz measured to nearest hundredth of a unit (S1.S1S1)
- S2S2S2 - Maximum Amplitude Scintillation Index (S4) at 1.6 GHz measured to nearest hundredth of a unit (S2.S2S2)

llllllololo
- llll - Latitude of IPP location coincident with S4 maximum measured at 1.2 GHz in degrees to nearest tenth (see Notes 5 and 9)
- lololo - Longitude of IPP location coincident with S4 maximum measured at 1.2 GHz in degrees to nearest tenth (see Notes 5 and 9)

tstststststs - Time at which maximum S4 was observed during the observation period (HHMMSS, GMT)

Lines 4b,5b,6b,7b

JJJJTTTS
- JJJJ - Mean Phase Scintillation Index (sigma-sub-delta-phi) defined as the standard deviation of the measured differential phase in hundredth of radians (JJ.JJ) over the observation interval (see Note 8)
- TTT - Mean spectral strength obtained from measuring differential carrier phase advances between 1.6 GHz and 1.2 GHz frequencies in tenths of decibels (dB) (TT.T)
- S - Sign of spectral strength (0=positive, 1=negative)

JxJxJxJxTxTxTxS
- JxJxJxJx - Phase Scintillation Index measured in hundredths of radians (JxJx.JxJx) at the maximum

spectral strength (TxTxTx) (see Note 10)

TxTxTx - Maximum spectral strength in tenths of decibels (dB) (TxTx.Tx) (see Note 10)

S - Sign of spectral strength (0=positive, 1=negative)

llllolololo

llll - Latitude of IPP location coincident with the worst case identified by maximum spectral strength parameter (TxTxTx) measured in degrees to nearest tenth (see Note 5)

lolololo - Longitude of IPP location coincident with the worst case identified by maximum spectral strength parameter (TxTxTx) measured in degrees to nearest tenth (see Note 5)

JnJnJnJnTnTnTnS

JnJnJnJn - Phase Scintillation Index measured in hundredths of radians (JnJn.JnJn) at the minimum slope parameter (PnPnPn)

TnTnTn - Spectral strength in tenths of decibels (TnTn.Tn) for minimum slope parameter (PnPnPn)

S - Sign of spectral strength (0=positive, 1=negative)

llllolololo

llll - Latitude of IPP coincident with the worst case identified by minimum slope parameter (PnPnPn) measured in degrees to the nearest tenth (see Note 5)

lolololo - Longitude of IPP coincident with the worst case identified by minimum slope parameter (PnPnPn) measured in degrees to the nearest tenth (see Note 5)

8PPPPxPxPxPnPnPn

8 - Numerical filler

PPP - Slope parameter associated with the mean Phase Scintillation Index measured in units to nearest hundredth (P.PP)

PxPxPx - Slope parameter associated with the worst case due to maximum spectral strength (TxTxTx) measured in units to nearest hundredth (Px.PxPx)

PnPnPn - Minimum slope parameter associated with the worst measured in units to nearest hundredth (see Note 10)

99999 End of data indicator (include at end of last data line).

<u>NOTES</u>:

1. For messages sent at 15-minute periods of transmission, only one 15-minute data set would be reported. For messages transmitted every 30 minutes, only two 15-minute data sets (observation intervals) would be reported. Messages transmitted once per hour would contain four 15-minute data sets.

2. Lines 5 through 7 are only used when needed to report data from a constellation of 2, 3, or 4 satellites within the field of view of the TISS during the reporting period of the messages.

3. Lines 4 through 7 are repeated for each data set corresponding to a time interval within the message. For example, a message transmitted once per hour containing four 15-minute data sets and 4 satellites within the field of view for the entire period would have 3 lines for each 15-minute period for satellite 1 (Lines 4, 4a, 4b), 3 lines for each 15-minute period for satellite 2 (Lines 5, 5a, 5b), etc. Thus, 3 lines per satellite per period, for 4 satellites, for 4 periods, would equate to 48 lines.

4. The Ionospheric Penetration Point (IPP) is defined to be where the ray path between the GPS/NAVSTAR satellite and the TISS intersects 350 km altitude (typically in the F-region).

5. Latitudes and longitudes are expressed to the nearest tenth of a degree. Longitudes run from 0 to 359.9 degrees west of Greenwich. Latitudes run from -90.0 to +90.0, the sign being distinguished by the first coded character (0=positive, 1=negative). Examples: 0675 is 67.5N; while 1675 is 67.5S.

6. If the standard deviation (ddd) is lower by a factor of 10 from the TEC, encode ddd as 0dd (which is two significant digits to nearest tenth) in order to raise the exponent by one. For example, if TEC equals 25.2 x 10^{16} and the standard deviation is 31.1 x 10^{15}, then tttddde is 2520316. If ddd is out of range (too low or high), encode as //9 or //0 respectively.

7. If the minimum (tytyty) TEC is lower by a factor of 10 from the maximum TEC, encode tytyty as 0tyty (which is two significant digits to nearest tenth) in order to raise the exponent by one. For example, if TEC (maximum) equals 35.2 x 10^{16} and TEC (minimum) is 98.1 x 10^{15}, encode txtxtxtytytye as 3520986. If TEC (minimum) is two orders of magnitude lower, encode as 00ty to raise exponent by two; i.e., 98.1 x 10^{14} is reported as 009. If TEC minimum is out of range, encode as //9.

8. Locations of the mean Amplitude Scintillation Index (S4) and mean Phase Scintillation Index (sigma-sub-delta-phi) are assumed to be at the same location (IPP) as the mean TEC (tttddde) group in Line 4.

9. The maximum S4 measured at 1.6 GHz should be in approximately the same location as the maximum S4 at 1.2 GHz.

10. The maximum spectral strength (TxTxTx) and the minimum slope parameter (PnPnPn) derived from the differential carrier phase advances between the two satellite frequencies (1.6 GHz and 1.2 GHz) are considered the worst cases for the occurrence of phase scintillation.

CHAPTER 4

GEOMAGNETIC CODES

4-1. Geomagnetic Code (GEMAG). Use this code to make special or routine reports of the geomagnetic field variations as measured with a magnetometer.

Line 1 MANOP heading
Line 2 GEMAG
Line 3 IIiii YMMDD 3GGgg 4S/nn
Line 4 11111 20NNN 30NNN 40NNN 50NNN 60NNN 70NNN 99999

Line 1	MANOP heading		
Line 2	GEMAG	Data identifier, alphabetic character	
Line 3	IIiii	II	- World Meteorological Organization block number
		iii	- World Meteorological Organization station number
	YMMDD	Y	- Last digit of the year
		MM	- Number of the month
		DD	- Day of the month (corresponding to the GGgg time group)
	3GGgg	3	- Numerical filler (3rd group)
		GGgg	- Ending time of observation period (hours and minutes, GMT) (see Note 1)
	4S/nn	4	- Numerical filler (4th group)
		S	- Status of report, or indicator for type of report, coded according to: 6-Correction of data for period ending GGgg 7-Deletion of data for period ending GGgg 9-Data valid for 90 minute period(s)
		/	- Filler
		nn	- Number of data groups reported in this message
Line 4	11111	Data line indicator: Data for 90-minute or three-hour period ending GGgg	
	JJNNN	JJ	- Indicator for X, Y or Z sensor recorder. Minimum or maximum recorder reading is given by NNN. JJ is encoded as follows: (See Note 2) 20 - X sensor recorder minimum 30 - X sensor recorder maximum 40 - Y sensor recorder minimum 50 - Y sensor recorder maximum 60 - Z sensor recorder minimum 70 - Z sensor recorder maximum
		NNN	- Recorder reading reported to the nearest tenth of a chart division for the previously identified valid period (see Note 3)
	99999	End of data indicator (include at end of last data line).	

NOTES:

1. For a special observation, the time reported in line 3 is the GMT time that the local special criterion was observed.

2. Sensor Identification:

X sensor: Records the north-south horizontal geomagnetic field component with low sensitivity
Y sensor: Records the north-south horizontal geomagnetic field component with high sensitivity
Z sensor: Records the vertical geomagnetic field component with moderate sensitivity

3. Encode NNN as:

"///" to indicate missing data due to instrument malfunction, etc.
"400" (40.0) for maximum off-scale sensor readings
"000" (00.0) for minimum off-scale sensor readings

4-2. Geomagnetic Special Code (MAGSP). Use this code with the HK-- MANOP header and five bells to denote a special observation associated with a geomagnetic "event". (Note: One nanotesla equals one gamma or 10^{-5} gauss.)

Line 1 MANOP heading DDGGgg (5 BELLS)
Line 2 MAGSP
Line 3 IIiii YMMDD 3GGgg 4s/01
Line 4 /Sdddd $X_1X_1X_1X_1X_1X_1$ $X_2X_2X_2X_2X_2X_2$ $Y_1Y_1Y_1Y_1Y_1Y_1$ $Y_2Y_2Y_2Y_2Y_2Y_2$ $Z_1Z_1Z_1Z_1Z_1Z_1$ $Z_2Z_2Z_2Z_2Z_2Z_2$ 99999

Line 1	MANOP heading (HK-- ----)		
	DDGGgg	Date/time group	
	5 BELLS	Bells will audibly alert receivers of the message that a special is being reported	
Line 2	MAGSP	Data Identifier, alphabetic character	
Line 3	IIiii	II	- World Meteorological Organization block number
		iii	- World Meteorological Organization station number
	YMMDD	Y	- Last digit of the year
		MM	- Number of the month
		DD	- Day of the month (corresponding to the GGgg time group)
	3GGgg	3	- Numerical filler (3rd group)
		GGgg	- Time of the special observation (hours and minutes, GMT)
	4s/01	4	- Numerical filler (4th group)
		s	- Status of report, or indicator for type of report, coded according to: 1-Data valid for period ending GGgg 2-Data valid for special observation taken at GGgg 3-Deletion of data for period ending GGgg 4-Correction of data for period ending GGgg
		/	- Filler
		01	- Number of data groups (always one)
Line 4	/Sdddd	/	- Filler
		S	- The sensor associated with dddd, where X denotes X-sensor, Y denotes Y-sensor, and Z denotes Z-sensor
		dddd	- The maximum geomagnetic field variation of the sensor at the time GGgg which caused the special to be issued (in nanoteslas)
	$X_1X_1X_1X_1X_1X_1$		- The maximum absolute geomagnetic field strength measured by the X-sensor (in nanoteslas) during interval
	$X_2X_2X_2X_2X_2X_2$		- The minimum absolute geomagnetic field strength measured by the X-sensor (in nanoteslas) during interval
	$Y_1Y_1Y_1Y_1Y_1Y_1$		- The maximum absolute geomagnetic field strength measured by the Y-sensor (in

nanoteslas) during interval

$Y_2Y_2Y_2Y_2Y_2$ - The minimum absolute geomagnetic field strength measured by the Y-sensor (in nanoteslas) during interval

$Z_1Z_1Z_1Z_1Z_1$ - The maximum absolute geomagnetic field strength measured by the Z-sensor (in nanoteslas) during interval

$Z_2Z_2Z_2Z_2Z_2$ - The minimum absolute geomagnetic field strength measured by the Z-sensor (in nanoteslas) during interval

99999 End of data indicator (include at end of last data line).

4-3. Geomagnetic Request Code (RQMAG). Use this code to request changes to transmitted data, to change data quality thresholds, or to request retransmission of data that may have been lost or garbled in transmission. Each magnetometer site will transmit a RQMAG message daily at 1030 GMT to report data time intervals and threshold settings.

Line 1 MANOP heading
Line 2 RQMAG
Line 3 IIiii YMMDD 3S/01
Line 4 11111 GGbb/ GGee/ RRTTPP XXXXXX YYYYYY ZZZZZZ BBBBB 99999

Line 1	MANOP heading		
Line 2	RQMAG		Data identifier, alphabetic character
Line 3	IIiii	II	- World Meteorological Organization block number
		iii	- World Meteorological Organization station number
	YMMDD	Y	- Last digit of the year
		MM	- Number of month
		DD	- Day of the month (corresponding to the GGee time group)
	3S/01	3	- Numerical filler (3rd group)
		S	- Indicator for change type according to: 1-Retransmit last message 2-Retransmit stored data messages within specified period 3-Change message parameters 4-Stop PIOSC messages 5-Start PIOSC messages 6-Daily report of threshold settings and data time intervals
		/	- Filler
		01	- Number of lines to follow (always one)
Line 4	11111		Data line indicator
	GGbb/	GG	- Hour beginning observation interval (GMT)
		bb	- Minute beginning observation interval (GMT)
		/	- Filler
	GGee/	GG	- Hour ending observation interval (GMT)
		ee	- Minute ending observation interval (GMT)
		/	- Filler
	RRTTPP	RR	- Time interval of maximum/minimum deviations with the observation period coded according to: // - No change from latest interval 01 - 5 minute intervals 02 - 10 minute intervals 03 - 15 minute intervals

04 - 30 minute intervals
05 - 60 minute intervals

TT - Time intervals of message transmission coded according to:
// - No change from latest interval
01 - 5 minute intervals
02 - 10 minute intervals
03 - 15 minute intervals
04 - 30 minute intervals
05 - 60 minute intervals

PP - Threshold for PI oscillations (in nanoteslas); normally defaulted to 30 nanoteslas. // indicates no change from latest threshold.

XXXXXX, YYYYYY, and ZZZZZZ - Amplitude thresholds (in nanoteslas) for X, Y, and Z components respectively. ///// indicates no change from latest threshold. Magnetic field values exceeding the threshold will not be reported in messages.

BBBBB - Magnetic field rate of change threshold (in nanoteslas per second) for all axes. ///// indicates no change from latest threshold. When the rate of change exceeds the threshold in any component (+ or -), associated magnetic field values will not be reported in MAGSP messages.

99999 End of data indicator (include at end of last data line).

CHAPTER 5

SPECIAL CODES

5-1. Event Code (EVENT). Use this code for rapid reporting of real-time solar and geophysical events. The activity being reported has a unique identifier depending on the type of data.

Line 1 MANOP heading 555555 (5 BELLS)
Line 2 EVENT
Line 3 IIiii 21/01
Line 4 11111 EEEEE ..... 99999 5 BELLS

Line 1	MANOP heading		
	555555	Dummy date/time group (GMT)	
	5 BELLS	Bells will audibly alert receivers of the message that an "event" is being reported. Senders will ensure the format used will activate bells on all receiving equipment (see Note 1)	
Line 2	EVENT	Data identifier, alphabetic character	
Line 3	IIiii	II	- World Meteorological Organization block number
		iii	- World Meteorological Organization station number
	21/01	2	- Numerical filler (2nd group)
		1	- Status of report (1=preliminary estimate)
		/	- Filler
		01	- Number of data lines that follow (always one)
Line 4	11111	Data line indicator	
	EEEEE	Event type indicator coded according to: (See Note 2)	
	RAD(II)	RAD	- Radio burst information at any fixed frequency (see Note 3)
		(II)	- Status of burst as follows:
			NO-No observation possible
			NS-No burst occurring, or activity does not meet event criteria (see Note 4)
			//-Burst equal to or greater than 1,500 solar flux units (sfu), but less than 5,000 sfu
			05-Burst equal to or greater than 5,000 sfu, but less than 10,000 sfu (reported regardless of whether RAD// has already been reported)
			11-Burst equal to or greater than 10,000 sfu (reported regardless of whether RAD// or RAD05 has already been reported)
			IP-Event-level burst is still in progress (see Note 5)
			00-Burst equals or exceeds 100 percent above background on 2695 MHz (tenflare)
			CU-Castelli "U" shaped burst spectral characteristics
			IF-Radio burst with integrated flux of 100,000 sfu-seconds or more (reported only if in automated mode)
	SWP(II)	SWP	- Radio burst information at sweep frequencies
		(II)	- Status of burst as follows:
			NO-No observation possible
			NA-Data not yet observable (see Note 6)
			NS-Activity does not meet event criteria
			22-Type II burst observed

44-Type IV burst observed
IP-Event-level sweep is still in progress (see Note 5)

FLA(II) FLA - Solar flare indicator (see Note 7)
(II) - Status of flare as follows:
NO-No observation possible
NE-No flare occurring
NS-Flare activity does not meet event criteria
//-Zero brilliance (0B) flare or greater observed
IP-Event-level flare is still in progress (see Note 5)

LOOP(I) LOOP - Solar loop prominence event observed (see Note 8)
(I) - Status of event as follows:
D-Loops seen primarily against solar disk
E-Loops seen primarily against east solar limb
W-Loops seen primarily against west solar limb

LIMB(I) LIMB - Solar energetic limb event (0.15 solar radius or greater from point of origin) observed (see Note 8)
(I) - Status of event as follows:
E-Located on east solar limb
W-Located on west solar limb

XR(FFI) XR - Solar X-ray event indicator (see Note 9)
(FFI) - Status of event as follows:
NO/-No observation in real-time
NS/-No event criteria enhancement
If an event was detected, then:
FF = Lower and upper limit of X-ray channel to the nearest Angstrom. (Example: FF = 18 refers to the GOES 1 to 8 Angstrom channel.)
I = X-ray flux trend according to:
I-Flux increasing and above event threshold
S-Flux steady at or near maximum
E-Flux ended, values below event threshold

FALSE False Alarm. Used only by the forecast center to indicate that an XR(FFI) event is a false alarm.

REQST Request. Used only by the forecast center if indications of a possible event in progress are received from outside sources, or to exercise the rapid response capability of the observatory network. Observing sites will respond with appropriate messages.

SITEC Sudden Increase in Total Electron Content in the ionosphere, when correlated with solar and/or X-ray activity (see Note 10)

99999 End of data indicator (include at end of last data line).
5 BELLS Bells will audibly alert receivers of the message.

NOTES:

1. Include bells with HE ( ) ( ) MANOP messages which report event data transmitted within 15 minutes after meeting event criteria or event maximum.

2. RAD(II), SWP(II), FLA(II), LOOP(I), LIMB(I), and SITEC may be encoded in any order within a single EVENT code message. These event type indicator groups may be repeated in a message to report multiple phenomena (e.g., RAD05 RADCU RADIF). No more than eight groups may be included in a single message.

3. Do not report a combination of RAD//, RAD05, or RAD11 in the same message. Report RAD00, RADCU, and RADIF regardless of whether RAD//, RAD05, or RAD11 have already been reported. Report RAD00, RADCU, and RADIF only once per burst.

4. Unlike the FLA(II) group, the RAD(II) group does not have a "NE (no burst occurring)" option. As a result, when responding to a RAD//, RAD05, or RAD11 report from another observatory and your site observed no corresponding burst at all (i.e., the other site's burst may be due to radio frequency interference): (1) respond with a RADNS, (2) append a plain language (PLAIN) message stating your site observed no activity at all, and (3) initiate an intersite data discrepancy review.

5. RADIP, SWPIP, and FLAIP: Use these groups when a previously reported event is still in progress and a new all-sensor EVENT code message must be transmitted for any reason. RADIP applies only to RAD//, RAD05, and RAD11, since RAD00, RADCU, and RADIF are reported only once per burst. Do not use SWPIP to follow up a SWPNA response; SWPNA must be reissued for all responses if the SFIR plot is not yet available for analysis. Use SWPIP when a Type II has been previously reported in the event code and a Type IV is subsequently observed (e.g., SWPIP SWP44). An event-level sweep is "IP" from the moment it starts to the moment it ends. An event-level burst is "IP" from the moment any frequency reaches 1,500 sfu until all eight frequencies are below 1,500 sfu and there is no indication any of them is likely to rise again above 1,500 sfu (e.g., a complex burst). An event-level flare is "IP" from the moment it reaches "brilliant" intensity, or an area importance of "1" or greater, until the flare clearly declines below both the intensity and area event thresholds.

6. SWP(II) data are not immediately available. Transmit reports as soon as an accurate determination of sweep type is made. Transmit SWPNA if total power data suggests a sweep may have occurred, but it is not yet visible on the SFIR plotter.

7. To initially report a flare event, an optical-only observatory in automatic mode (computer is able to analyze data and generate messages) will transmit a preliminary FLARE code message in place of the EVENT code "FLA//" message. Combined optical-radio observatories are not required to (but may) include a "FLA//" in an all-sensor EVENT code message under these circumstances. Since there is only one flare event threshold (i.e., exceeding 0N), do not transmit another "FLA//" message when a flare increases classification (for example, when it goes from a 1N to a 1B or a 2B). However, an extra FLARE code preliminary message, before the mandatory post maximum preliminary, would be appropriate.

8. Omit the LOOP(I) and/or LIMB(I) group(s) if they do not apply. Report LOOP(I) and LIMB(I) only once per event. There is no "in progress (IP)" option for these groups. So, if a loop prominence event or an energetic limb event is still in progress when a new all-sensor EVENT code message must be transmitted for any reason, the solar analyst may (depending on the exact circumstances) find it appropriate to append a PLAIN stating that loops or limb event activity is still in progress.

9. X-ray event messages do not require a response from the observatories.

10. Report the maximum deviation of the SITEC, extrapolated above the "normal" curve, in the next scheduled or unscheduled (HI, HR, or HO MANOP header) PLAIN message transmitted after the SITEC has ended. Report the maximum deviation data as it would be coded in the TELCO code. Example: A deviation of 1.34 x 10^{16} obtained from a manual TEC Conversion table would be reported as 01316 in the TELCO code. At Air Force Space Forecast Center (AFSFC) solar sites, a computer program named TELCO is available. This program's output is already in reportable TEC units (for the example above, the output would be 013).

5-2. Event Acknowledgement Code (AKNOW). This message is generated by the forecast center to acknowledge receipt of event, HE ( ) ( ) MANOP, messages and to provide a quality and system acceptance assessment of the messages.

Line 1 MANOP heading 555555 (5 BELLS)
Line 2 TTTTT
Line 3 11111 AKNOW XXXXX 99999 5 BELLS

Line 1	MANOP heading	- HEUS(X) KSFC, where (X) corresponds to the origin of the acknowledged message: 3-San Vito Solar Observatory 4-Sagamore Hill Solar Observatory 5-Ramey Solar Observatory 6-Holloman Solar Observatory 7-Palehua Solar Observatory 9-Learmonth Solar Observatory
	555555	- Dummy date/time group (GMT)
	5 BELLS	- Bells will audibly alert receivers of the message that the message has arrived
Line 2	TTTTT	- Message type being acknowledged: "FLARE", "DALAS", "BURST", "SWEEP", or "EVENT".
Line 3	11111	- Data line indicator
	AKNOW XXXXX	- Acknowledgement remark. If the message was received error-free and accepted by the forecast center computer system, the remark will read AKNOW GOOD. If the message was received, but rejected due to a data error and/or other cause, the remark will read AKNOW BAD LINE (YY) where (YY) is coded as: 00-Message appears good, but system problems at the forecast center prevented acceptance; retransmit message. 03 to 99-Approximate line number on which an error was detected; check message, correct, and retransmit.
	99999	- End of data indicator (include at end of last data line).
	5 BELLS	- Bells will audibly alert receivers of the message.

5-3. Plain Language Code (PLAIN). Use this code to report astrogeophysical data and/or operational information not reportable by another code, or to expand or explain data reported in another code. PLAIN messages may be transmitted separately or appended to other coded messages.

Line 1 MANOP heading
Line 2 PLAIN
Line 3 (Plain language text)
Line 3a (Plain language text)
Line 4 99999

```
Line 1  MANOP heading
Line 2  PLAIN   Data identifier, alphabetic character
Line 3  (text)  Non-decoded alphabetic character word descriptions; not more than 69 characters per line
Line 3a (text)  Continuation of line 3, repeat as often as necessary
Line 4  99999   End of data indicator (must be on a separate line).
```

5-4. Patrol Status Code (STATS). Use this code to report patrol start or stop times for an observatory's optical, radio, and/or geophysical observing equipment. Transmit messages as soon as feasible after both opening and closing the observatory, and as needed to report changing operating conditions throughout the day.

```
Line 1  MANOP heading
Line 2  STATS
Line 3  IIiii YMMDD STTnn
Line 4  11111 GGggM jEEOI jEEOI jEEOI jEEOI ..... .....
Line 4a 22222 jEEOI jEEOI ..... ..... ..... 99999
Line 5  33333 GGggM jFFOI jFFOI jFFOI jFFOI ..... .....
Line 5a 44444 jFFOI jFFOI ..... ..... ..... 99999
Line 6  55555 GGggM jHHOI jHHOI jHHOI jHHOI ..... .....
Line 6a 66666 jHHOI jHHOI ..... ..... ..... 99999
```

```
Line 1  MANOP heading (see Note 1)
Line 2  STATS   Data identifier, alphabetic character
Line 3  IIiii   II      - World Meteorological Organization block number
                iii     - World Meteorological Organization station number
        YYMMDD  Y       - Last digit of year
                MM      - Number of the month
                DD      - Day of the month (corresponding to the GGgg time group)
        STTnn   S       - Status of the report coded according to:
                          1-(Not Used)
                          2-Final report
                          3-Correction
                          4-Deletion
                TT      - Type of sensor system coded according to:  (See Note 1)
                          01-Optical (SOON-Solar Observing Optical Network)
                          02-Radio (RSTN-Radio Solar Telescope Network)
                          03-Geophysical (or other non-SOON or RSTN) instrument
                nn      - Number of data lines in this message

Line 4  11111   Optical (SOON) data line indicator (see Note 2)
        GGggM   GG      - Hour of valid time (GMT)
                gg      - Minutes of valid time (GMT)
                M       - Method of observation coded according to:  (See Note 3)
                          1-Automatic
                          2-Semiautomatic
        jEEOI   j       - Status of equipment coded according to:
                          0-On at sunrise
                          1-Inoperative at sunrise
                          2-On at interim time between sunrise and sunset
```

		3-Off at interim time between sunrise and sunset
		4-Off at sunset
	EE	- System/equipment indicator coded according to: (See Notes 4 and 5)
		01-Computer
		02-Automated Weather Network (AWN)
		03-AUTOVON (DSN)
		04-Commercial phones
		05-FMQ-7 (all SOON subsystems)
		06-Hydrogen-alpha system
		07-Spectrograph system
		08-Digital Image Processing System (DIPS)
		09-White light system
		//-All systems/equipment
	O	- Expected outage time coded according to:
		1-Less than 30 minutes
		2-30 minutes to less than 60 minutes
		3-One hour to less than 4 hours
		4-Four hours to less than 8 hours
		5-Eight hours or more
		9-Unknown
		/-Not applicable
	I	- Reason the system/equipment is inoperative coded according to:
		1-Weather
		2-Equipment problems
		3-Routine maintenance
		4-Power failure
		5-Calibrations
		6-Local obstructions
		9-Unknown
		/-Not applicable
99999	End of data indicator (put only at end of last data line)	
Line 4a 22222	Continuation line indicator for optical (SOON) data; the jEEOI groups in line 4a must pertain to the same GGggM given in line 4	
99999	End of data indicator (include at end of last data line).	
Line 5 33333	Radio (RSTN) data line indicator (see Note 6)	
GGggM	GG	- Hour of valid time (GMT)
	gg	- Minutes of valid time (GMT)
	M	- Method of observation coded according to:
		1-Automatic
		3-Manual
jFFOI	j	- Status of equipment coded according to:
		0-On at sunrise
		1-Inoperative at sunrise
		2-On at interim time between sunrise and sunset
		3-Off at interim time between sunrise and sunset
		4-Off at sunset
	FF	- Frequency/equipment indicator coded according to: (See Notes 4 and 5)
		01-Computer

02-Automated Weather Network (AWN)
03-AUTOVON (DSN)
04-Commercial phones
10-FRR-95 (all discrete frequency radiometers and SFIR)
11-Radiometer at 150 to 299 MHz
22-Radiometer at 300 to 499 MHz
33-Radiometer at 500 to 999 MHz
44-Radiometer at 1000 to 1999 MHz
55-Radiometer at 2000 to 3999 MHz
66-Radiometer at 4000 to 7999 MHz
77-Radiometer at 8000 to 11999 MHz
88-Radiometer at 12000 to 19999 MHz
19-Swept Frequency Interferometric Radiometer (SFIR)
//-All systems/equipment

O - Expected outage time coded according to:
1-Less than 30 minutes
2-30 minutes to less than 60 minutes
3-One hour to less than 4 hours
4-Four hours to less than 8 hours
5-Eight hours or more
9-Unknown
/-Not applicable

I - Reason the system/equipment is inoperative coded according to:
1-Weather
2-Equipment problems
3-Routine maintenance
4-Power failure
5-Calibrations
6-Local obstructions
7-Radio Frequency Interference (RFI)
9-Unknown
/-Not applicable

99999 End of data indicator (put only at end of last data line)

Line 5a 44444 Continuation line indicator for radio (RSTN) data; the jFFOI groups in line 5a must pertain to the same GGggM given in line 5

99999 End of data indicator (include at end of last data line).

Line 6 55555 Geophysical (or other non-SOON or RSTN) instrument data line indicator (see Note 7)

GGggM GG - Hour of valid time (GMT)
gg - Minutes of valid time (GMT)
M - Method of observation coded according to:
1-Automatic
3-Manual

jHHOI j - Status of equipment coded according to:
5-On at time of GGggM group
6-Off at time of GGggM group

HH - System/equipment indicator coded according to:
91-Ionosonde (DISS or manual ionosonde)
92-Magnetometer
93-Neutron Monitor
94-Riometer

95-Polarimeter or TISS

O - Expected outage time coded according to:
1-Less than 30 minutes
2-30 minutes to less than 60 minutes
3-One hour to less than 4 hours
4-Four hours to less than 8 hours
5-Eight hours or more
9-Unknown
/-Not applicable

I - Reason the system/equipment is inoperative coded according to:
1-Weather
2-Equipment problems
3-Routine maintenance
4-Power failure
5-Calibrations
6-Local obstructions
7-Radio Frequency Interference (RFI)
9-Unknown
/-Not applicable

99999 End of data indicator (put only at end of last data line)

Line 6a 66666 Continuation line indicator for geophysical (or other non-SOON or RSTN) instruments; the jHHOI groups in line 6a must pertain to the same GGggM given in line 6

99999 End of data indicator (include at end of last data line).

NOTES:

1. Do not combine optical, radio, and geophysical instruments in a single STATS message. Send each system status in separate messages, using the MANOP headers appropriate to the data type: HO for optical, HR for radio, and either HM or HI for geomagnetic and/or ionospheric. If old STATS messages are transmitted (e.g., to update the Air Force Space Forecast Center (AFSFC) data base), the current status must be retransmitted after sending the old messages is completed, since it is the last received message that updates the AFSFC status displays.

2. Repeat lines 4 and 4a as often as necessary, but do not include data for more than one GMT day in a single message. Data line 4 contains the 11111 and GGggM groups, and a maximum of seven jEEOI groups. Data line 4a contains the 22222 group and a maximum of eight jEEOI groups.

3. At a SOON site the method of observation ("M") may change (from semiautomatic to automatic, or vice versa) without any system/equipment item changing status. This may occur when light levels improve in the morning, making automatic operations possible, and again later in the evening when declining light levels may make automatic operations impossible. In such situations, the analyst must send a STATS message with a single jEEOI group of 206//. (The 206// group is required for decode purposes at the forecast center, not because the status of the Hydrogen-alpha system (EE = 06) has changed.) For example, a SOON site opened in semiautomatic mode; when light levels improve sufficiently to support automatic operations, the analyst would transmit the following message, even though no systems/equipment changed status:

```
STATS
IIiii 20226 20101
11111 17401 206// 99999
```

4. Report the status of all installed systems/equipment, in numerical order (i.e., // or 01, 02, 03, ...), in the first STATS message of the observing day. For SOON, analysts may report 05 (FMQ-7, all SOON subsystems) in place of 06 to 09 if these items have the same status, expected outage time, and reason for outage. For RSTN, analysts may report 10 (FRR-95, all discrete frequency radiometers and SFIR) in place of 11 to 88 and 19 if these items have the same status, expected outage time, and reason for outage. For example, a SOON site opens with the computer, commercial phones, and spectrograph inoperative; site has no AUTOVON (DSN) installed:

```
STATS
IIiii 20226 20102
11111 17252 10192 002// 10442
22222 006// 10752 008// 009// 99999
```

Outages can be reported "by exception"; to do so, first indicate all items are operational, then (in the same message) indicate the non-operational item(s) using the same time. The above example could be coded:

```
STATS
IIiii 20226 20101
11111 17252 0//// 10192 10442 10752 99999
```

5. After the first STATS message of the observing day, it is only necessary to report the systems/equipment which change status during the day. For example, continuing from above example, computer repaired, but no other changes:

```
STATS
IIiii 20226 20101
11111 18301 201// 99999
```

A STATS reportable AWN, DSN, or commercial phone outage is intended to reflect a site-wide outage in send, receive, or both. The fact that a single phone instrument/line or teletype printer is out of service is not reportable by STATS. For example, at a dual SOON/RSTN site, if SOON has no AWN capability, but RSTN does, the outage is not reportable by STATS. At a dual site, the SOON and RSTN analysts should not both report a site-wide AWN, DSN, or commercial phone outage. In fact, for a dual site, only a SOON STATS message (i.e., a 11111 or 22222 line entry) can be used to update these three items. The same isn't true for computers. It's possible for one side to have a computer outage and the other side to be in automatic mode, so the SOON and RSTN computers are treated separately. For this reason, a computer outage that affects both SOON and RSTN must be reported in both a SOON and a RSTN STATS message.

6. Repeat lines 5 and 5a as often as necessary, but do not include data for more than one GMT day in a single message. Data line 5 contains the 33333 and GGggM groups, and a maximum of seven jFFOI groups. Data line 5a contains the 44444 group and a maximum of eight jFFOI groups.

7. Repeat lines 6 and 6a as often as necessary, but do not include data for more than one GMT day in a single message. For example, status of an ionosonde and a polarimeter can be reported in the same STATS message using two lines 6. Data line 6 contains the 55555 and GGggM groups, and a maximum of seven jHHOI groups. Data line 6a contains the 66666 group and a maximum of eight jHHOI groups.

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SUMMARY OF CHANGES: Deleted the Optical Patrol (PTROL), Region Analysis Data (RGANL), Magnetic Data (MGMSG), and Radio Patrol (RADOP) codes, since they are no longer actively used. In the DALAS code (para 1-2), modified guidance for the Associated Remarks (AA) group and the 22222 data continuation line, and expanded NOTE 2. In the IONOS code (para 3-3), clarified NOTE 3. In the GEMAG code (para 4-1), deleted the status of report option S = 3-Data valid for three hour period ending GGgg. In the EVENT code (para 5-1), replaced or expanded NOTEs 2, 3, 4, and 8. In the AKNOW code (para 5-2), changed the explanation for the TTTTT group to reflect the fact that FLARE, DALAS, BURST, SWEEP, and EVENT code messages would be acknowledged. In the STATS code (para 5-4), expanded guidance in NOTEs 1 and 5.