

RENSELAER OBSERVATORY PUBLICATIONS

Number 15

18-Megacycle Cosmic-Noise Intensities

1959 December 1 to 1960 January 31

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Published with assistance from the  
Benjamin Apthorp Gould Fund

Observatory of  
Rensselaer Polytechnic Institute  
Troy, New York

1960 February

## INTRODUCTION

### The Data

Apparatus for measuring the changes in intensity of 18-megacycle cosmic noise received from the sky has been set up at the Sampson Station of the Observatory of Rensselaer Polytechnic Institute. The position of the equipment is latitude  $42^{\circ} 47'$  North, longitude  $73^{\circ} 27'$  West. The purpose of the program is to detect the occurrence of solar flares indirectly by the associated effect on the transmission properties of the ionosphere. The effect is to decrease suddenly the transmissivity of the ionosphere to produce a sudden cosmic-noise absorption (SCNA), examples of which may be seen on the succeeding pages of this paper. The apparatus responds in a somewhat similar fashion to several other effects, particularly auroral activity. At times of solar disturbance there are in addition a number of increases of incoming radiation which we believe to be solar in origin. In what follows these are referred to as bursts.

This is a continuation of the records of 18-megacycle cosmic-noise intensity published in ROP 1. The same receiver is in use. The antenna, however, was rebuilt on June 19, 1958 to the same characteristics as the former one. The new antenna consists of tubular twin-lead instead of the former open lines, and its performance is presumably more independent of moisture conditions.

On the pages which follow we show reproductions of the recorder tapes, one week on a page. The original tapes move at four inches per hour. The reduction for the photographs here is very closely 1 to 12. Times are given in Universal Time.

It should be noted that the receiver response is rapid when the signal decreases, but slow when an increase occurs. Thus the record of a burst gives only an approximation to the rate of rise and maximum value attained, but generally not the true values. The times of beginning and the duration, however, are significant.

The vertical markers every ten minutes are produced by a separate receiver tuned to station WWV at 5 megacycles. The amplitude of these markers during a solar disturbance is very rough indication of the field strength of the 5-megacycle signal as received at the Sampson Station.

activity, on the other hand, shows a slower decrease of intensity, and usually a more rapid rise, resulting in a more symmetrical curve. Such events are often repeated a number of times during a single night, with varying values of maximum absorption. There are occasionally isolated daytime events in which the decrease in intensity is slow; we refer to these as "slow SCNA's."

The bursts generally show a fast onset, limited by the time constant of the receiver for increasing signals, and a short duration. Because of the time constant, the maximum intensity recorded may be considerably less than the true maximum intensity. The time of beginning and the duration are, however, significant. Often the bursts occur in groups. Noise storms on the sun may show on the records as a series of superimposed bursts, giving a highly variable trace.

#### Calibration

On most days two two-point calibrations are recorded, usually at about 0100 and 1100 U.T., for the purpose of checking receiver stability. The lower, "cold," step is produced by substituting a cold resistor for the antenna and indicates the receiver noise level. The upper, "hot," step is an arbitrary level approximately equal to the maximum level of incoming cosmic noise. In addition, a daily step calibration shows 3-decibel steps ( $V_n^2/V_{n+1}^2 = 0.5$ ) from the same "hot" level, called 0 db. The steps are produced by feeding known voltages from a signal generator into the receiver. The lowest step is the "cold" calibration rather than a known input signal. The changes from day to day are small, but sufficient to make the scale at the left of the charts only approximate. Note the non-linearity of the scale.

#### The Comments

On the pages facing the reproductions are lists of events and comments about the records. In the comments, certain numerical indications of importance and intensity are given. For SCNA's the "class" is a measure of importance on a rising scale of 1- to 3+, determined by amplitude and duration. The percentage of absorption is the intensity ratio of the least cosmic noise received during the event to the noise which would have been received if the event had not occurred.

In some cases, a rise or fall of the recorder pen can be identified with a disturbance caused by operation or testing of other equipment in or near the building in which the 18-megacycle receiver is located. Such a rise or fall is identified as "interference." In some cases it is suspected rather than established. "b" means before.

Beginning January 1, 1960 the comments will include the Geophysical Alerts and Special World Intervals which are issued by the World Warning Agency of the International World Day Service.

#### Acknowledgements

During the interval covered in this report, the equipment was under the care of the following observers:

Justin A. Curtis

Ralph Haskell

Masakazu Oshima

We are indebted to William Adair and Raymond Falconer for the photography of the strip charts, and to Mrs. Cassie Young for the typing of the tables and text.

The work represented by this publication has received support from a number of sources. We would like to acknowledge in particular the support of the following:

National Science Foundation

Trustees of Rensselaer Polytechnic Institute

Benjamin Apthorp Gould Fund

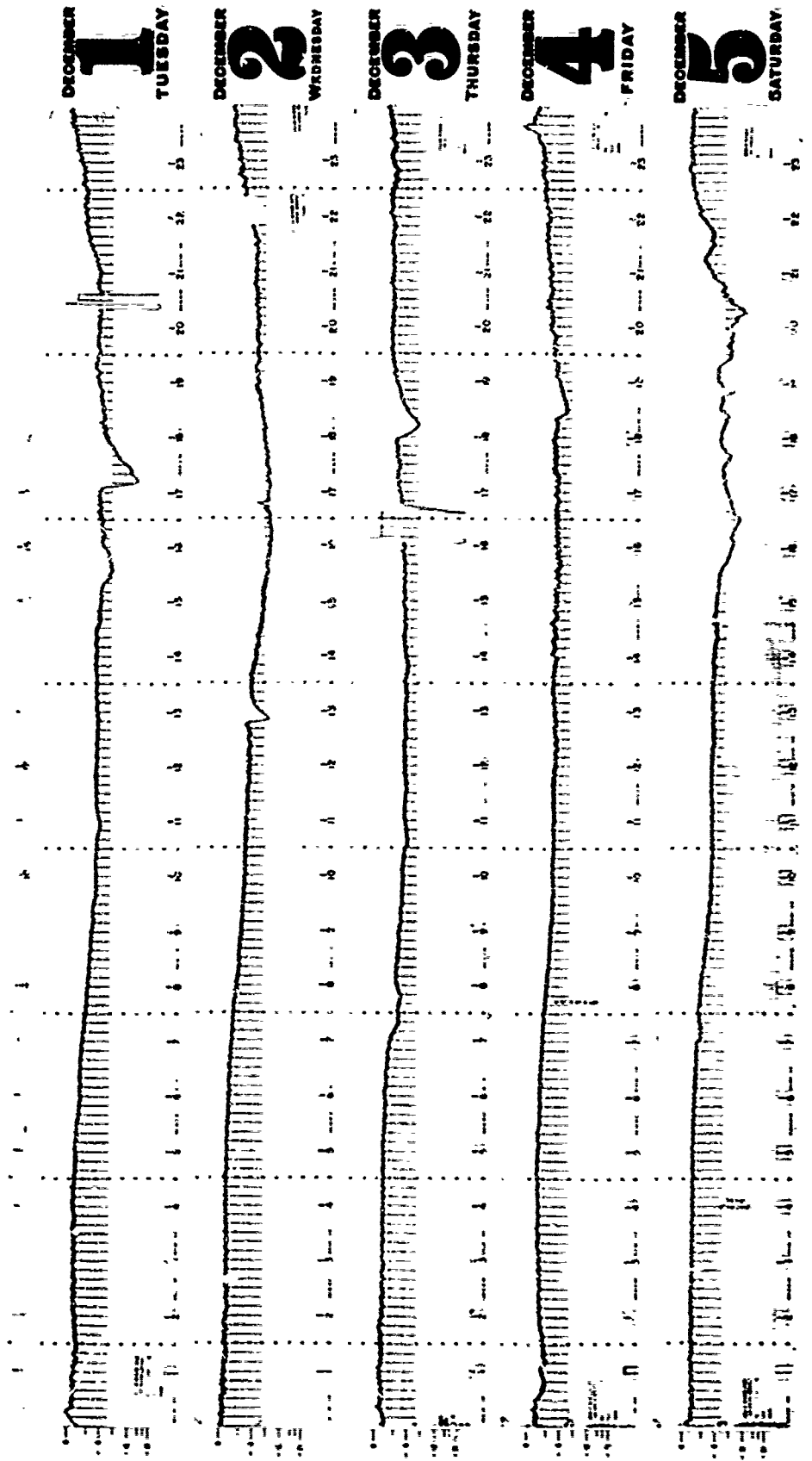
Office of Naval Research

#### Erratum

ROP 14, page 8, November 21, 1959  
Insert time, 1620-1720, in front of comment.

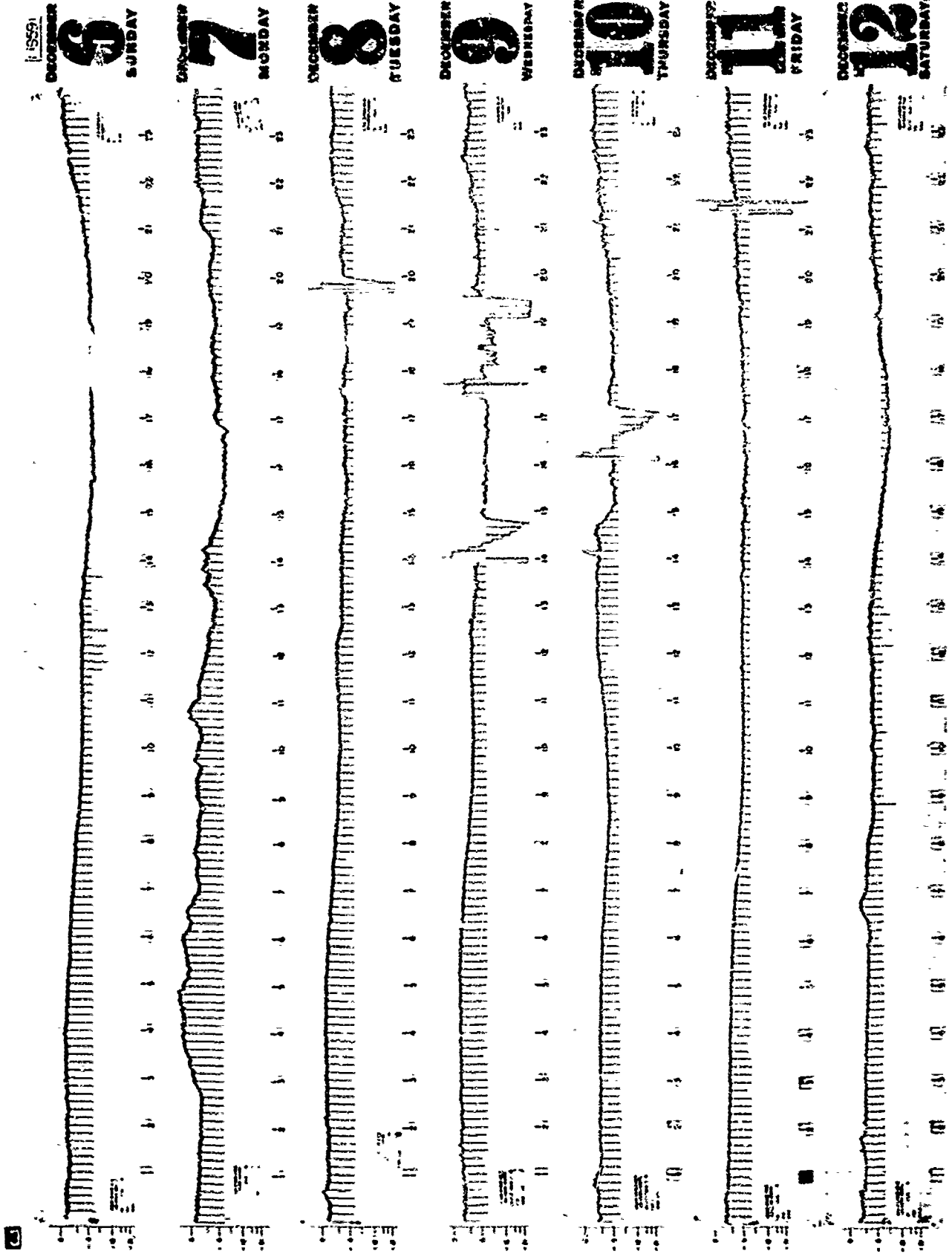
1959			
December 1	1705 - 1820	SCNA, class 3, 69% absorption.	
December 2	1248 - 1318 1644 - 1649	SCNA, class 2, 49% absorption. Burst.	
December 3	1756 - 1910	SCNA, class 2, 49% absorption.	
December 4	1820 - 1906	SCNA, class 1, 30% absorption.	
December 5	1530 - 2206	Absorption, possibly caused by daytime aurora, during IGY alert. 54% maximum absorption.	

Vertical text along the right edge of the page, likely a scanning artifact or bleed-through from the reverse side.



18 MC COSMIC NOISE INTENSITY VS. UNIVERSAL TIME IN HOURS

1959			
December 6	No comments.		
December 7	0242 - 2115		Variability correlates with precipitation and electric activity.
December 8	No comments.		
December 9	1722 - 1932		Equipment adjustments.
	2120 - 2400		Rise in level due to failure of heating equipment.
December 10	0000 - 1444		Unusually high level due to failure of heating equipment.
	1404 - 1410		Burst.
	1444 - 1510		Fall in level due to gradual warming up of equipment.
	2104 - 2110		Burst.
December 11	2135		Recorder zero point adjustment.
December 12	0613 - 0710		Variation in level correlates with atmospheric electricity.



18 MG COSMIC NOISE INTENSITY VS UNIVERSAL TIME IN HOURS

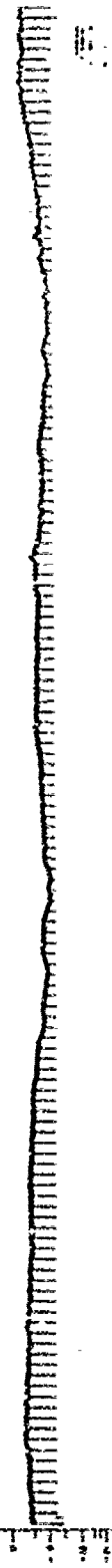
1959

December 13	0250 - 0258 1728 - 1733	Peak, cause unknown. Burst.
December 14	No comments.	
December 15	1753 2100 2110	Recorder zero adjustment preceded and followed by hot-cold calibration. Burst. Burst.
December 16	1651 - 1659	Burst.
December 17	2215 - 2245	Bursts.
December 18	1450 - 1510 1650 - 1710 1750 - 1757	Bursts. Bursts. Burst.
December 19	1710 - 1717	Burst.

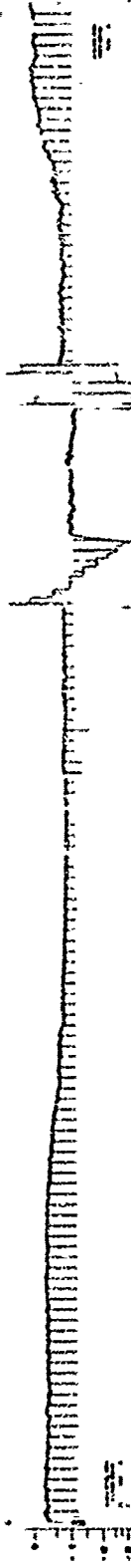
DECEMBER  
**13**  
SUNDAY



DECEMBER  
**14**  
MONDAY



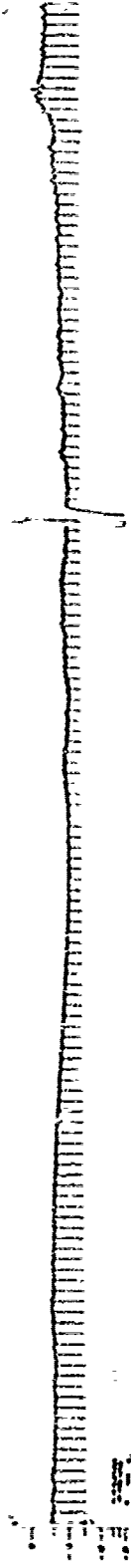
DECEMBER  
**15**  
TUESDAY



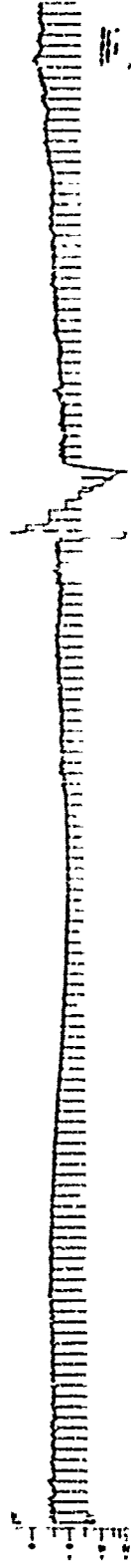
DECEMBER  
**16**  
WEDNESDAY



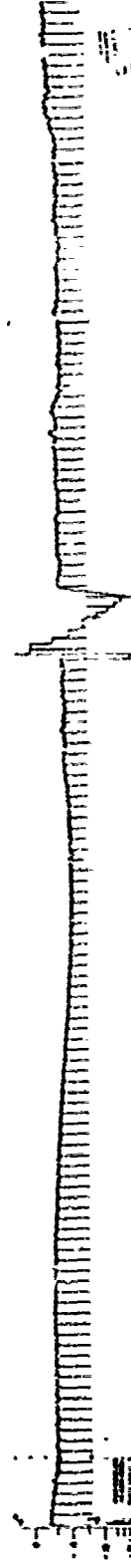
DECEMBER  
**17**  
THURSDAY



DECEMBER  
**18**  
FRIDAY



DECEMBER  
**19**  
SATURDAY



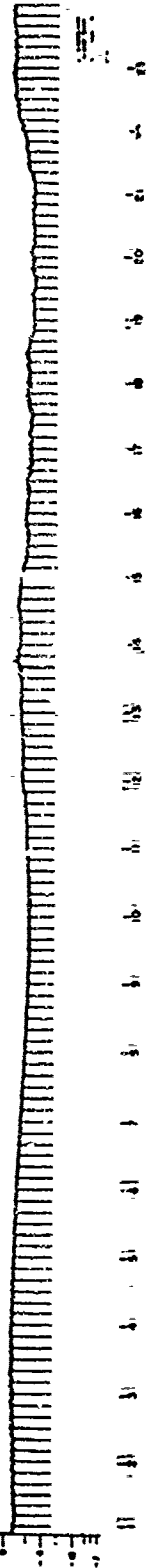
COSMIC NOISE INTENSITY VS UNIVERSAL TIME IN HOURS

1959

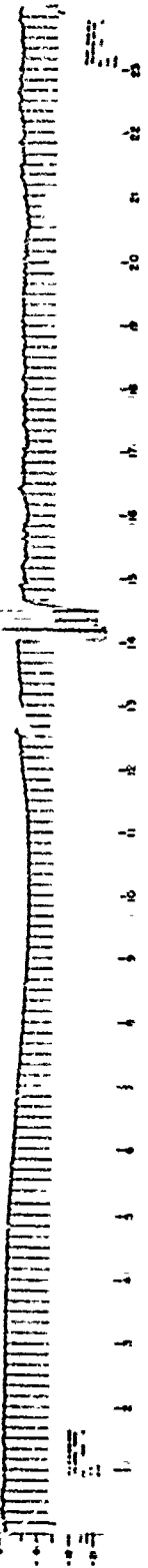
December 20 Note that the trace for this day begins at 0100 UT, not 0000 UT as usual. Some ten-minute marks are farther apart than normal.

1344 - 1350	Bursts.
December 21	
1230 - 1238	Burst.
1450 - 1730	Variable.
December 22	
1358 - 1852	Variable.
December 23	
1759 - 1810	Bursts.
1905 - 1920	Bursts.
December 24	
2007 - 2400	Variable.
December 25	No comment.
December 26	No comment.

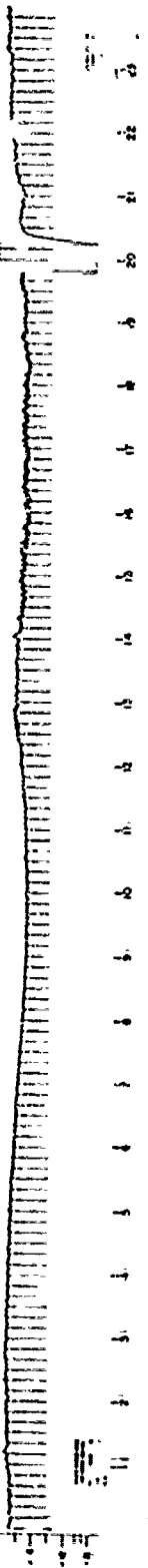
1960  
DECEMBER  
**20**  
SUNDAY



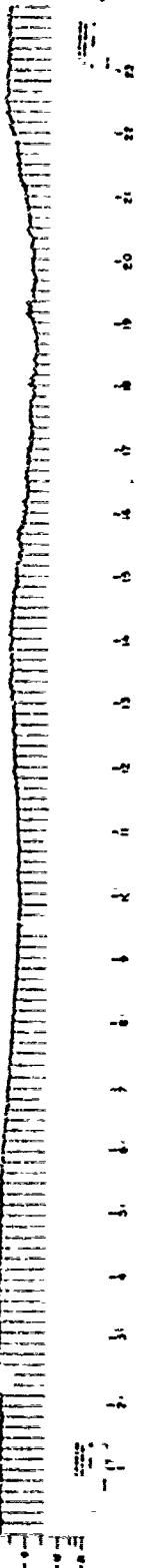
DECEMBER  
**21**  
MONDAY



DECEMBER  
**22**  
TUESDAY



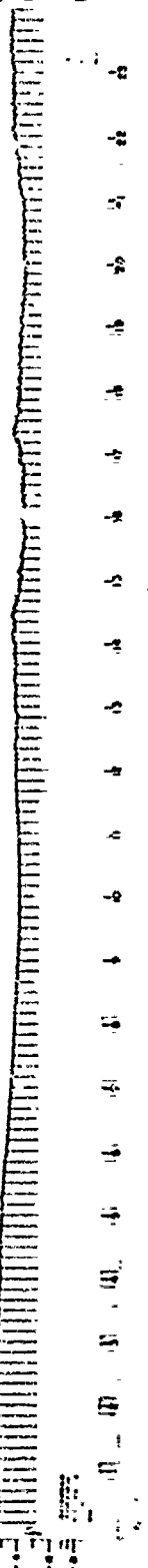
DECEMBER  
**23**  
WEDNESDAY



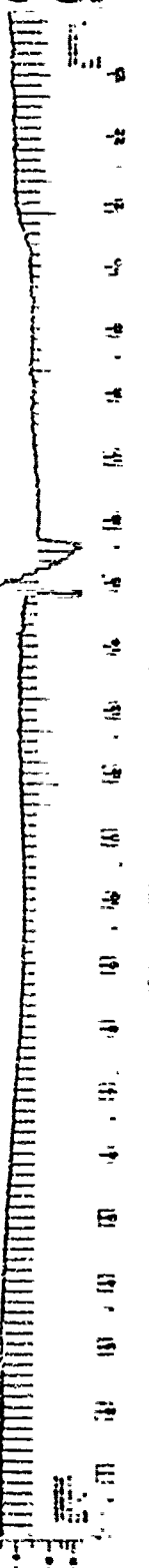
DECEMBER  
**24**  
THURSDAY



DECEMBER  
**25**  
FRIDAY



DECEMBER  
**26**  
SATURDAY



18 MC COSMIC NOISE INTENSITY VS UNIVERSAL TIME IN HOURS

1959

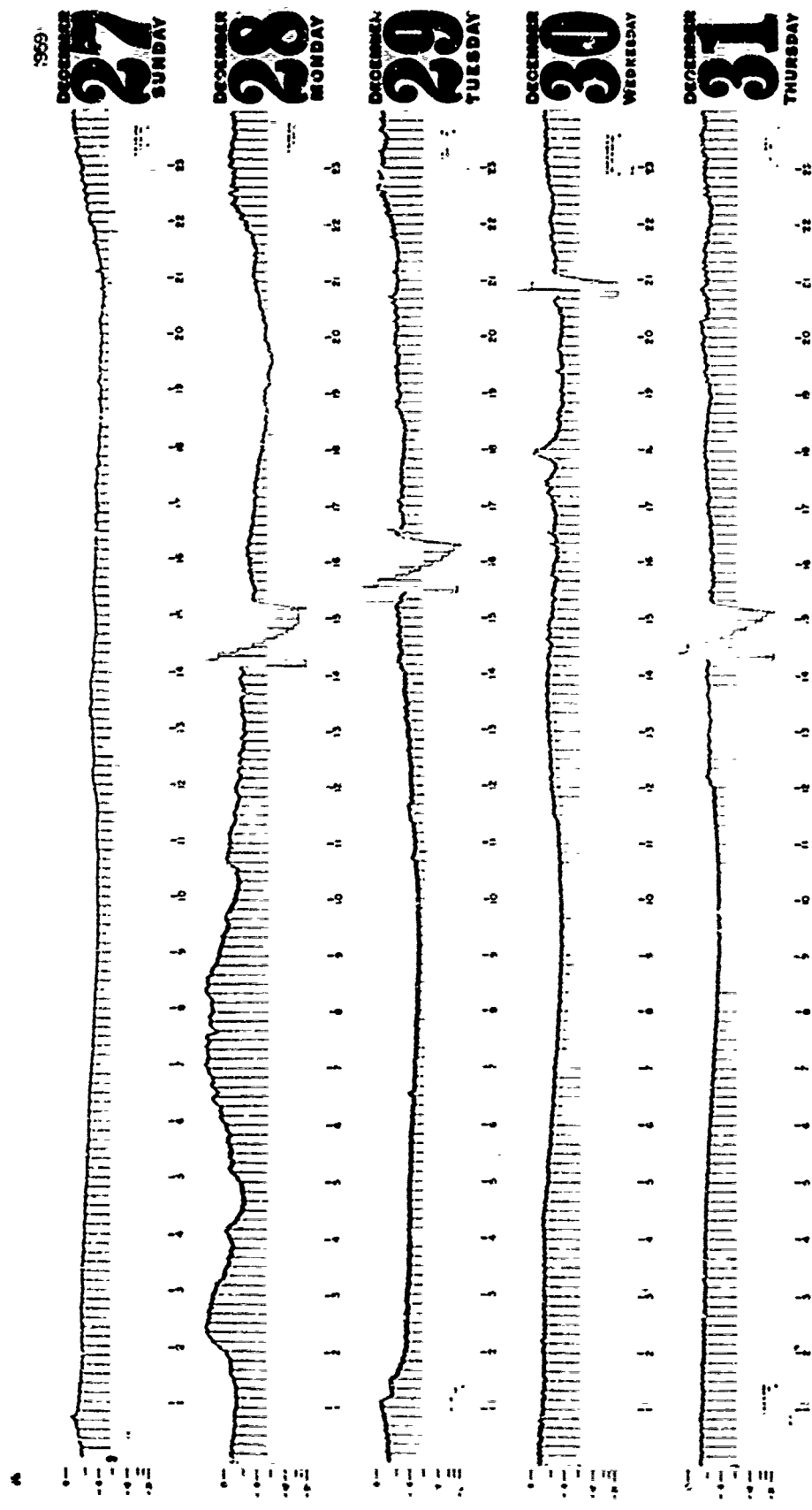
December 27 2047 - 2140 Bursts.

December 28 Large magnitude of trace variation possibly due to area storm. Freezing rain or rain all day.

December 29 Icing on all equipment might prevent indications of small phenomena.  
 0100 - 0200 Unusually rapid drop may be continuation of variability of December 28.  
 0629 - 0635 Peak, cause unknown; correlates with change in trace on most other equipment.  
 1517 Equipment adjustment.  
 1631 - 1635 Burst.

December 30 1433 - 1650 Variable.  
 1655 - 1820 Sudden change in level, possibly caused by heavy winds.

December 31 2016 - 2050 Possible SCNA, class 1-, absorption 20%, recovery unusually slow.



18 MC COSMIC NOISE INTENSITY VS UNIVERSAL TIME IN HOURS

1960

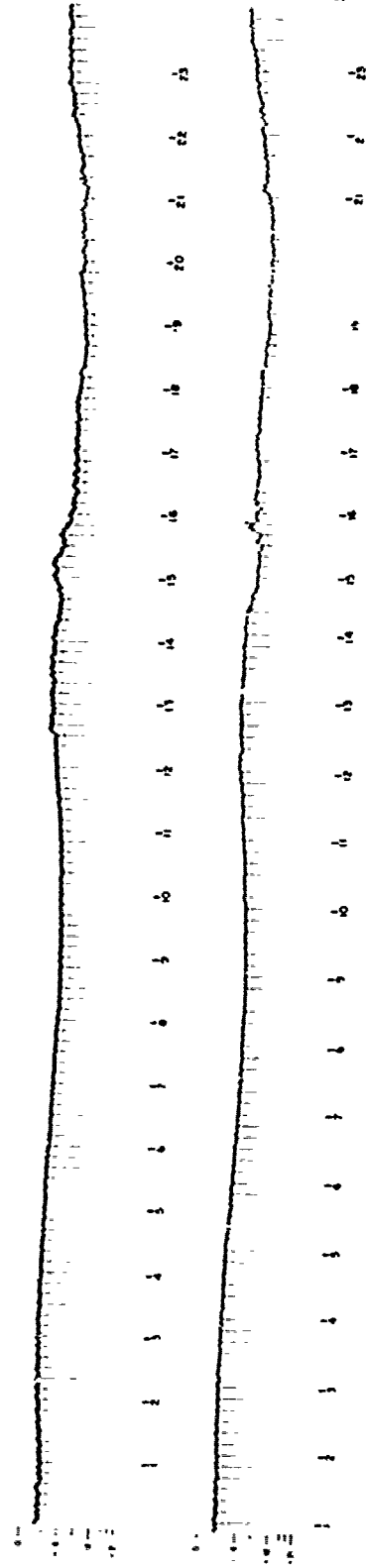
January 1 1230 - 2200 Variability, cause unknown.

January 2 Note that trace for this day begins at 0100 UT. Some ten-minute marks are farther apart than usual.

1422 - 1429 Equipment adjustment.

1525 - 1612 Several bursts.

JANUARY 1 FRIDAY  
JANUARY 2 SATURDAY



18 MC COSMIC NOISE INTENSITY VS UNIVERSAL TIME IN HOURS

1960

January 3

Note that trace for this day begins at 0100 UT, not at 0000 UT as usual. Some ten-minute marks are farther apart than usual.

1217 - 1810

Variable, correlates with strong oscillation of atmospheric pressure and atmospheric electrical potential gradient.

1303 - 1317

Burst.

1325 - 1329

Burst.

1350 - 1358

Burst.

January 4

Large double burst during period of variability.

1545 - 1601

Burst.

1758 - 1803

Burst.

2057 - 2108

Double peak, correlates with precipitation.

January 6

1915 - 1945

Several large bursts.

2223 - 2400

Low trace probably due to malfunction of recorder.

January 7

0000 - 0220

Low trace due to malfunction of recorder.

2045 - 2101

Peaks, possibly due to interference.

2224 - 2233

Peak, possibly due to interference.

January 8

0115 - 1400

Trace level low and variable, probably due to malfunction of recorder.

1400 - 1711

Equipment adjustments.

1911 - 1920

Peak correlates with precipitation.

2000 - 2007

Peak correlates with precipitation.

2038 - 2045

Peak correlates with precipitation.

2150

Recorder not functioning properly.

January 9

0000 - 1410

Recorder not functioning properly.

1410 - 1655

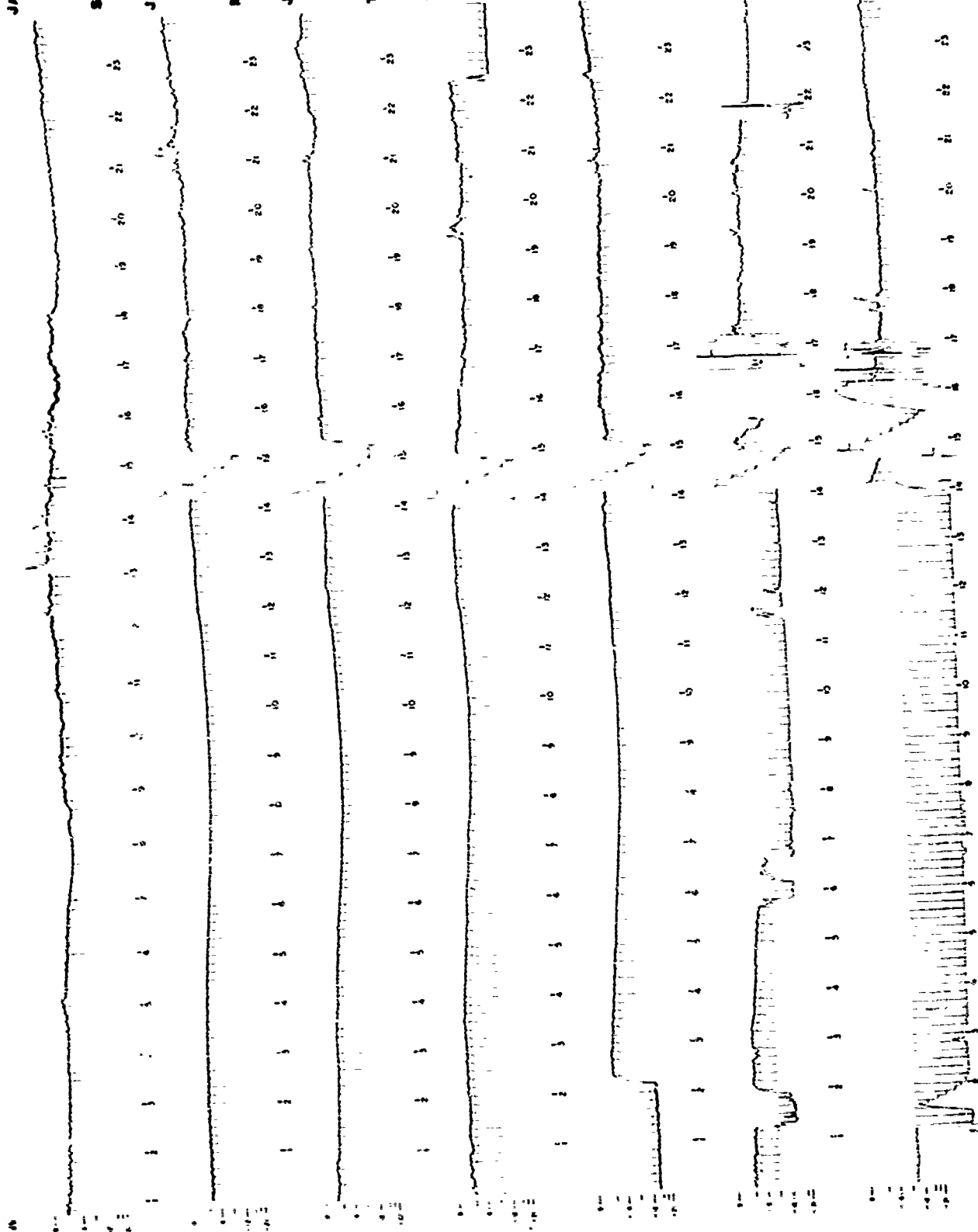
Equipment adjustments.

1732 - 1752

Peaks, probably due to interference or malfunction of recorder.

Beginning January 6 at 2220, the trace is probably invalid and the data are of low weight.

1960 JANUARY 3 SUNDAY  
JANUARY 4 MONDAY  
JANUARY 5 TUESDAY  
JANUARY 6 WEDNESDAY  
JANUARY 7 THURSDAY  
JANUARY 8 FRIDAY  
JANUARY 9 SATURDAY



18 MC COSMIC NOISE INTENSITY VS UNIVERSAL TIME IN HOURS

1960

January 10  
 1620 - 1800 Possible slow SCNA, class 3, 69% absorption.  
 2020 - 2250 Possible slow SCNA, class 2, 58% absorpctic ..  
 2205 - 2210 Burst.

January 11  
 Geophysical Alert Number 44: Magnetic storm started January 10 at 0719.  
 1641 - 1655 Possible burst.  
 1701 - 1715 Gain and zero-point adjustment.  
 1655 - 1722 Gain and zero-point adjustment.

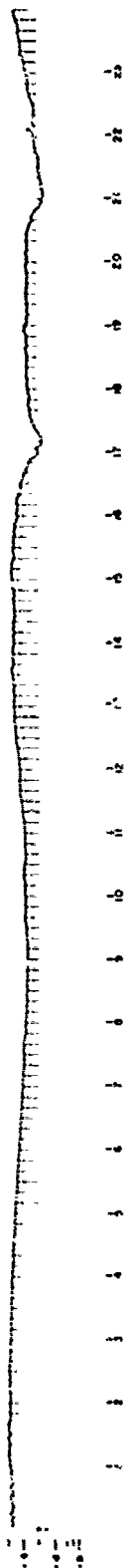
January 12  
 1800 - 1807 Possible burst.  
 1915 - 2000 Variable.

January 13  
 Geophysical Alert Number 45: Magnetic storm started January 13 at 1900.  
 1825 - 2400 Variable.

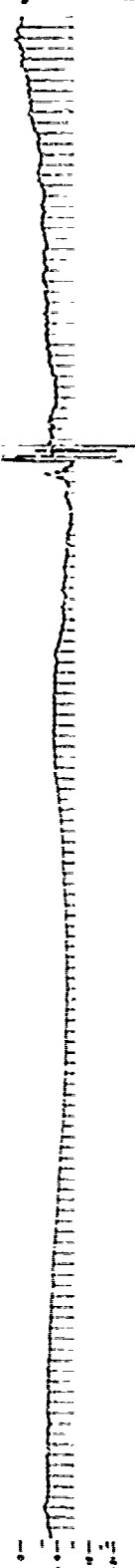
January 14  
 0000 - 0850 Variable.  
 1220 - 1330 Rise in level probably due to precipitation.  
 1600 - 2215 Variable, correlates with pressure and atmospheric electric potential.  
 gradient fluctuations. Also, precipitation was reported from  
 1800 - 2000.

January 15  
 0122 - 0345 Variable, cause unknown.  
 1712 - 1731 Peaks, cause unknown.  
 1757 - 1805 Peaks, cause unknown.

1960  
JANUARY  
**10**  
SUNDAY



JANUARY  
**11**  
MONDAY



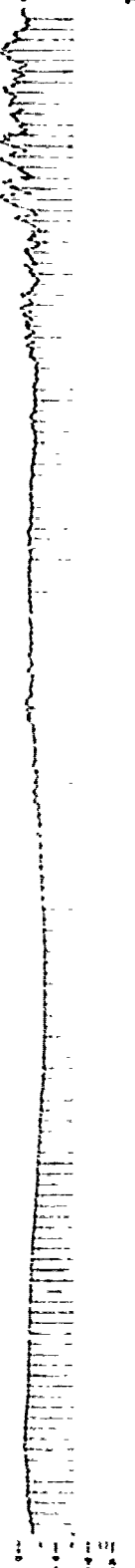
JANUARY  
**12**  
TUESDAY



JANUARY  
**13**  
WEDNESDAY



JANUARY  
**14**  
THURSDAY



JANUARY  
**15**  
FRIDAY



JANUARY  
**16**  
SATURDAY



18 MC COSMIC NOISE INTENSITY VS UNIVERSAL TIME IN HOURS

1960

January 17            0210 - 0225            Peak, cause unknown.

January 18            Geophysical Alert Number 46: Magnetic storm started January 17 at 1200.  
1805 - 1835            Peak, caused by interference.

January 19

0223 - 0242            Peak.

0320 - 0329            Peak.

0332 - 0340            Peak.

0406 - 0416            Peak.

0630 - 0640            Peak.

the peaks from 0223 to 0640 occur during an interval of strong variations of atmospheric electric potential gradient and atmospheric pressure, accompanied by precipitation.

1203 - 1211            Peak, cause unknown.

January 20            0710 - 2120            Variable.

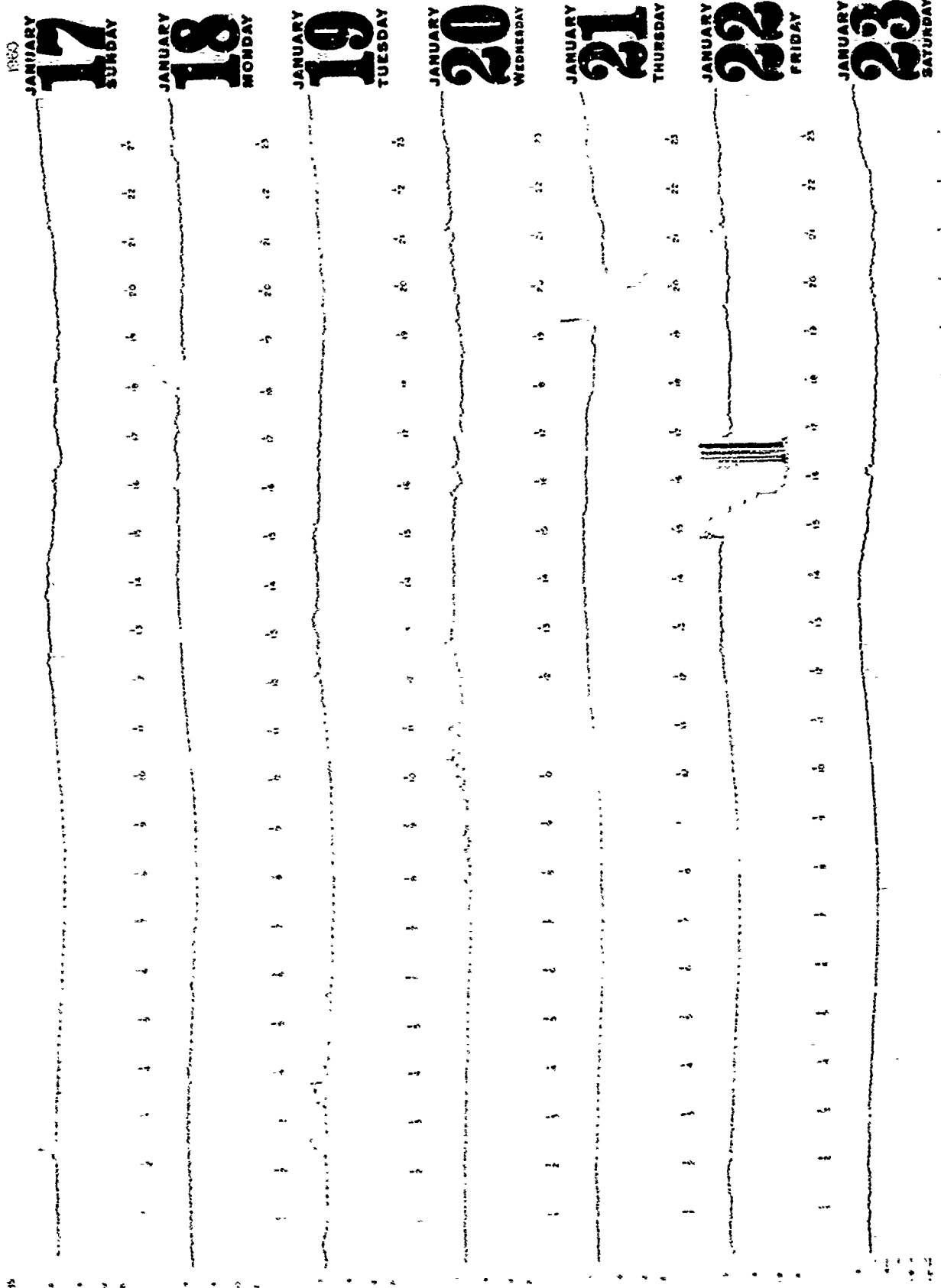
January 21            Geophysical Alert Number 47: Magnetic storm started January 21 at 00xx.  
2130 - 2140            Burst.

January 22

1510 - 1620            Equipment adjustments.

2049 - 2115            Burst, correlates with dip in intensity of 27-kilocycle atmospheric.

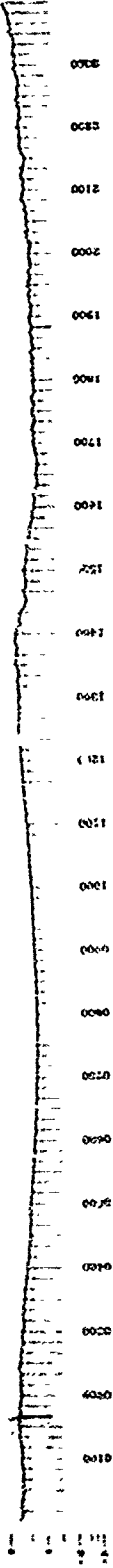
January 23            1557 - 1612            Peak, cause unknown.



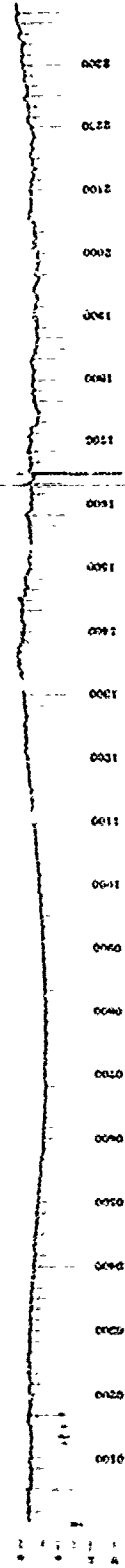
18 MC COSMIC NOISE INTENSITY VS UNIVERSAL TIME IN HOURS

1960			
January 24	No comment.		
January 25	1620 - 1631	Equipment adjustment.	
January 26	1405 - 1532	Variable.	
January 27	2110 - 2125	Peak, cause unknown.	
January 28	0710 - 1720	Variable, accompanied by precipitation.	
January 29	No comment.		
January 30	0417 - 0420	Rise in level, cause unknown.	
	1608 - 1614	Peak, cause unknown.	
	2051 - 2108	Burst.	

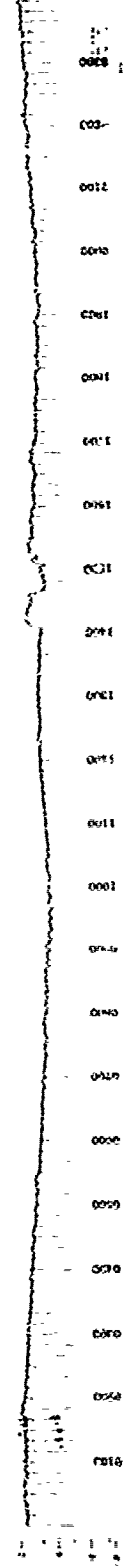
1960  
JANUARY  
**24**  
SUNDAY



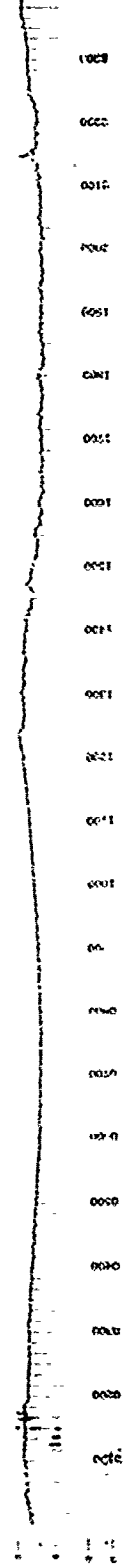
JANUARY  
**25**  
MONDAY



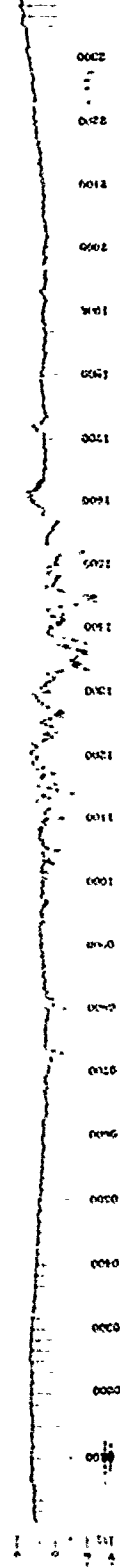
JANUARY  
**26**  
TUESDAY



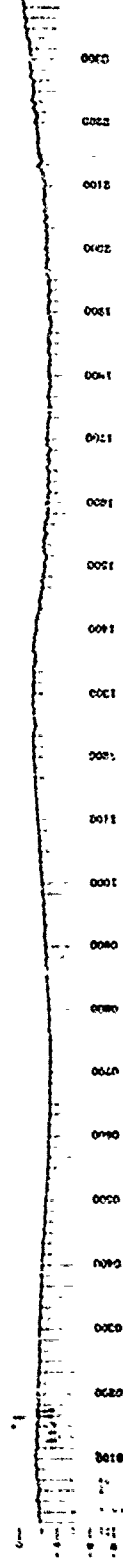
JANUARY  
**27**  
WEDNESDAY



JANUARY  
**28**  
THURSDAY



JANUARY  
**29**  
FRIDAY



JANUARY  
**30**  
SATURDAY



18 MC COSMIC NOISE INTENSITY VS UNIVERSAL TIME IN HOURS

1960

January 31

0810 - 1604

Chart drive not functioning properly.

ROP 15, 1960

1960  
JANUARY  
**31**  
SUNDAY

