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POSTLAUNCH MEMORANDUM REPORT

FOR

MERCURY-ATLAS NO. 6 (MA-6)

PART II - DATA

NASA TM X 51175

[redacted]

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MANNED SPACECRAFT CENTER

Cape Canaveral, Florida

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1.0 INTRODUCTION

As indicated by the title this report is part II of the Postlaunch Memorandum Report of the Mercury-Atlas Mission No. 6 (MA-6 Spacecraft 13). It contains time histories of the data recorded onboard during the flight. A similar data compilation is available for the two previous Atlas missions (references 1 and 2).

No evaluation of the performance of the spacecraft systems will be made in this portion of the report since this is presented in Part I. Tabulations of data for most of the parameters presented are available at the Engineering Data and Measurements Office but space limitations prevent their inclusion in this report.

The astronaut's performance and physical reactions to prolonged weightless flight are of primary interest in this first manned orbital flight. Measurements of most of the physiological quantities are included. Measurements of the spacecraft systems parameters permit analysis of the systems pefformance.

2.0 DISCUSSION

All times are referenced to range zero which was 09:47:39 a.m., e.s.t., February 20, 1962. In addition to the data, a sequence of events table is also presented.

Figure 1 shows a block diagram of the instrumentation system used to measure and record the data. Figure 2 defines the reference axis system. The remainder of the figures present data obtained from the onboard tape.

The physiological measurements concerning the astronaut are presented in figures 95, 96, 97, 102, and 103.

An expanded time scale and expanded spacecraft angular rate scale have been used in the presentation of the data for the Automatic Stabilization and Control System. The rates produced by the low thrusters are small and the accuracy of the system is marginal in regard to the detection of the change in rate produced by these thrusters.

It may be noted that between times 00:00:44 and 00:01:24 nearly all the curves in the data presentation show an inordinate amount of scatter or, in the case of the continuously recorded parameters, a large deviation from the preceding and succeeding data. The scatter is most noticeable, of course, on plots of parameters with

expanded ordinate scales. The scatter and deviation are not true data and have been caused by wow and flutter or some similar malfunction in the onboard tape recorder. The degradation of performance of the recorder is attributed to the vibration environment encountered during the time of high dynamic pressure. In the Automatic Stabilization and Control System figures (no. 3 through no. 65), a disagreement in the time of control stick actuation may be seen between the commutated data and the continuously recorded data. Although the change in angular rates coincides with the continuously recorded stick positions, it has been determined that the commutated data shows the correct time. At random times during the flight the commutated data show dropouts. These dropouts should be ignored and are probably caused by a frame of commutated data which for some reason was outside the limits which the high-speed computer had been instructed to accept.

3.0 DATA PRESENTATION

The data are presented in the form of time-history plots grouped according to areas of interest. The following table lists the various groups of figures. Sequence of Events information is also included. A detailed listing is presented in the Table of Figures.

Major Headings	Figure
Sequence of Events	
Instrumentation System	1
Spacecraft Axis Diagram	2
Stabilization and Control Systems	3 thru 66
Electrical Functions	67 thru 72, 94, 95
Command Receivers	73 thru 75
Environmental System Temperatures	77, 78
Environmental System Pressures	76, 82 thru 88
Reaction Control System Temperatures	79
Structural and Equipment Temperatures	80, 81
Accelerations	89 thru 93, 98
Astronaut Physiological Data	96, 97, 98, 103, 104

4.0 SEQUENCE OF EVENTS

Lift-off 09:47:39.002 e.s.t. February 20, 1962

Range zero 09:47:39

	Time from Range Zero
Tower release	00:02:33.3
Tower escape rocket ignite	00:02:33.4
Spacecraft separation	00:05:03.6
Retroattitude command	04:32:38
Retrorocket fire	04:33:08
0.05g relay	04:43:31
Drogue parachute deploy	04:49:17.2
Antenna fairing release	04:50:11
Main parachute deploy	04:50:11
Impact bag deploy	04:52:56.3
Landing	04:55:23
Main parachute jettison	04:55:23
Periscope retract	-00:00:29.2
Periscope extend	00:05:06.2
Periscope retract (manually)	04:40:49
Periscope extend	04:49:38
First Orbit	
Darkness at spacecraft, into	00:40:13
Darkness at spacecraft, out of	01:14:46
Second Orbit	
Darkness at spacecraft, into	02:09:11
Darkness at spacecraft, out of	02:43:47
Third Orbit	
Darkness at spacecraft, into	03:38:10
Darkness at spacecraft, out of	04:12:46

LIST OF FIGURES

FIGURE	TITLE	TIME
1	Instrumentation Block Diagram	
2	Capsule Axis System	
3	Automatic Stabilization and Control System	00:00:20 to 00:04:20
4	Automatic Stabilization and Control System	00:04:20 to 00:09:00
5	Automatic Stabilization and Control System	00:09:00 to 00:13:40
6	Automatic Stabilization and Control System	00:13:40 to 00:18:20
7	Automatic Stabilization and Control System	00:18:20 to 00:23:00
8	Automatic Stabilization and Control System	00:23:00 to 00:27:40
9	Automatic Stabilization and Control System	00:27:40 to 00:32:20
10	Automatic Stabilization and Control System	00:32:20 to 00:37:00
11	Automatic Stabilization and Control System	00:37:00 to 00:41:40
12	Automatic Stabilization and Control System	00:41:40 to 00:46:20
13	Automatic Stabilization and Control System	00:46:20 to 00:51:00
14	Automatic Stabilization and Control System	00:51:00 to 00:55:40
15	Automatic Stabilization and Control System	00:55:40 to 01:00:20
16	Automatic Stabilization and Control System	01:00:20 to 01:05:00
17	Automatic Stabilization and Control System	01:05:00 to 01:09:40
18	Automatic Stabilization and Control System	01:09:40 to 01:14:20
19	Automatic Stabilization and Control System	01:14:20 to 01:19:00
20	Automatic Stabilization and Control System	01:19:00 to 01:23:40
21	Automatic Stabilization and Control System	01:23:40 to 01:28:20
22	Automatic Stabilization and Control System	01:28:20 to 01:33:00
23	Automatic Stabilization and Control System	01:33:00 to 01:37:40
24	Automatic Stabilization and Control System	01:37:40 to 01:42:20
25	Automatic Stabilization and Control System	01:42:20 to 01:47:00
26	Automatic Stabilization and Control System	01:47:00 to 01:51:40
27	Automatic Stabilization and Control System	01:51:40 to 01:56:20
28	Automatic Stabilization and Control System	01:56:20 to 02:01:00
29	Automatic Stabilization and Control System	02:01:00 to 02:05:40
30	Automatic Stabilization and Control System	02:05:40 to 02:10:20
31	Automatic Stabilization and Control System	02:10:20 to 02:15:00
32	Automatic Stabilization and Control System	02:15:00 to 02:19:40
33	Automatic Stabilization and Control System	02:19:40 to 02:24:20
34	Automatic Stabilization and Control System	02:24:20 to 02:29:00
35	Automatic Stabilization and Control System	02:29:00 to 02:33:40
36	Automatic Stabilization and Control System	02:33:40 to 02:38:20
37	Automatic Stabilization and Control System	02:38:20 to 02:43:00
38	Automatic Stabilization and Control System	02:43:00 to 02:47:40
39	Automatic Stabilization and Control System	02:47:40 to 02:52:20
40	Automatic Stabilization and Control System	02:52:20 to 02:57:00
41	Automatic Stabilization and Control System	02:57:00 to 03:01:40
42	Automatic Stabilization and Control System	03:01:40 to 03:06:20
43	Automatic Stabilization and Control System	03:06:20 to 03:11:00

LIST OF FIGURES

FIGURE	TITLE	TIME
44	Automatic Stabilization and Control System	03:11:00 to 03:15:40
45	Automatic Stabilization and Control System	03:15:40 to 03:20:20
46	Automatic Stabilization and Control System	03:20:20 to 03:25:00
47	Automatic Stabilization and Control System	03:25:00 to 03:29:40
48	Automatic Stabilization and Control System	03:29:40 to 03:34:20
49	Automatic Stabilization and Control System	03:34:20 to 03:39:00
50	Automatic Stabilization and Control System	03:39:00 to 03:43:40
51	Automatic Stabilization and Control System	03:43:40 to 03:48:20
52	Automatic Stabilization and Control System	03:48:20 to 03:53:00
53	Automatic Stabilization and Control System	03:53:00 to 03:57:40
54	Automatic Stabilization and Control System	03:57:40 to 04:02:20
55	Automatic Stabilization and Control System	04:02:20 to 04:07:00
56	Automatic Stabilization and Control System	04:07:00 to 04:11:40
57	Automatic Stabilization and Control System	04:11:40 to 04:16:20
58	Automatic Stabilization and Control System	04:16:20 to 04:21:00
59	Automatic Stabilization and Control System	04:21:00 to 04:25:40
60	Automatic Stabilization and Control System	04:25:40 to 04:30:20
61	Automatic Stabilization and Control System	04:30:20 to 04:35:00
62	Automatic Stabilization and Control System	04:35:00 to 04:39:40
63	Automatic Stabilization and Control System	04:39:40 to 04:44:20
64	Automatic Stabilization and Control System	04:44:20 to 04:49:00
65	Automatic Stabilization and Control System	04:49:00 to 04:53:40
66	Reaction Control System - Manual and Automatic Fuel (H_2O_2) Supply Pressure	00:00:00 to 05:00:00
67	Electrical System - Fans AC Bus Voltage; 7 VAC; d-c Amps; d-c Volts; ASCS Volts; Isolated Bus Volts; Standby Bus Volts	-00:00:20 to 00:09:00
68	Electrical System - Fans AC Bus Voltage; 7 VAC; d-c Amps; d-c Volts; ASCS Volts; Isolated Bus Volts; Standby Bus Volts	00:00:00 to 02:20:00
69	Electrical System - Fans AC Bus Voltage; 7 VAC; d-c Amps; d-c Volts; ASCS Volts; Isolated Bus Volts; Standby Bus Volts	02:20:00 to 04:40:00
70	Electrical System - Fans AC Bus Voltage; 7 VAC; d-c Amps; d-c Volts; ASCS Volts; Isolated Bus Volts; Standby Bus Volts	04:39:40 to 04:49:00
71	Electrical System - Fans AC Bus Voltage; 7 VAC; d-c Amps; d-c Volts; ASCS Volts; Isolated Bus Volts; Standby Bus Volts	04:49:00 to 04:58:20
72	Electrical System - Fans AC Bus Voltage; 7 VAC; d-c Amps; d-c Volts; ASCS Volts; Isolated Bus Volts; Standby Bus Volts	04:30:20 to 04:35:00

LIST OF FIGURES

FIGURE	TITLE	TIME
73	Command Receiver; Command Receiver Signal Strength.	00:00:00 to 00:11:40
74	Command Receiver; Command Receiver Signal Strength.	00:00:00 to 04:40:00
75	Command Receiver; Command Receiver Signal Strength,	04:40:00 to 04:55:50
76	O_2 Supply Pressure, Secondary and Primary: Coolant Quantity Pressure	00:00:00 to 05:00:00
77	Cabin Temperature; Suit Inlet Temperature; Body Temperature	00:00:00 to 00:11:40 04:40:00 to 05:03:20
78	Cabin Temperature; Suit Inlet Temperature; Body Temperature	00:00:00 to 04:40:00
79	RCS H_2O_2 Line Temperature: Roll CCW (Manual), Roll CW (Manual), Lo Roll CW (Automatic), Lo Roll CCW (Automatic)	00:00:00 to 05:00:00
80	Heat Shield Temperature; Retro Rocket Temperature	00:00:00 to 05:00:00
81	Temperatures: Low Frequency Transmitter, High Frequency Transmitter, 150 VA Main Inverter, 250 VA Main Inverter	00:00:00 to 05:00:00
82	Suit Pressure; Cabin Pressure; O_2 Partial Pressure; Static Pressure	00:00:00 to 00:11:40
83	Suit Pressure; Cabin Pressure; O_2 Partial Pressure; Static Pressure	00:00:00 to 01:10:00
84	Suit Pressure; Cabin Pressure; O_2 Partial Pressure; Static Pressure	01:10:00 to 02:20:00
85	Suit Pressure; Cabin Pressure; O_2 Partial Pressure; Static Pressure	02:20:00 to 03:30:00
86	Suit Pressure; Cabin Pressure; O_2 Partial Pressure; Static Pressure	03:30:00 to 04:40:00
87	Suit Pressure; Cabin Pressure; O_2 Partial Pressure; Static Pressure	04:40:00 to 04:51:40
88	Suit Pressure; Cabin Pressure; O_2 Partial Pressure; Static Pressure	04:51:40 to 05:03:20
89	Accelerations: A_x, A_y and A_z	00:00:00 to 00:11:40
90	Accelerations: A_x, A_y and A_z	03:30:00 to 04:40:00
91	Accelerations: A_x, A_y and A_z	04:40:00 to 04:51:40
92	Accelerations: A_x, A_y and A_z	04:51:40 to 05:03:20
93	Main DC Bus Current; Main DC Bus Voltage (Continuous)	-00:00:20 to 00:09:00 04:30:20 to 04:35:00
94	Main DC Bus Current; Main DC Bus Voltage (Continuous)	04:39:40 to 04:58:20
95	Pulse Rate; Body Temperature	00:00:00 to 01:52:00

LIST OF FIGURES

FIGURE	TITLE	TIME
96	Pulse Rate; Body Temperature	01:52:00 to 03:44:00
97	Pulse Rate; Body Temperature	03:44:00 to 05:08:00
98	Integrating Accelerometer	04:30:20 to 04:35:20
99	ASCS Yaw Gyro Output; ASCS Pitch Gyro Output; ASCS Pitch Scanner Output; ASCS Roll Gyro Output; ASCS Roll Scanner Output	00:00:00 to 01:30:00
100	ASCS Yaw Gyro Output; ASCS Pitch Gyro Output; ASCS Pitch Scanner Output; ASCS Roll Gyro Output; ASCS Roll Scanner Output	01:33:00 to 03:05:00
101	ASCS Yaw Gyro Output; ASCS Pitch Gyro Output; ASCS Pitch Scanner Output; ASCS Roll Gyro Output; ASCS Roll Scanner Output	03:05:00 to 04:40:00
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111	Isometric view of spacecraft showing various instrumentation pickups	

REFERENCES

1. Project Mercury Addendum Data Report for Mercury-Atlas Mission 4 (MA-4 Capsule 8A), NASA Project Mercury Working Paper No. 218, dated November 29, 1961.

2. Project Mercury Postlaunch Report, Part Two - Data for Mercury-Atlas Mission 5 (MA-5 Spacecraft 9), NASA Project Mercury Working Paper No. 221, to be published.

5.0 APPENDIX ON INSTRUMENTATION

The measured data were recorded onboard the spacecraft on a tape recorder carrying a 1/2-inch tape at a tape speed of 1-7/8 inches per second. A brief description of the data acquisition equipment onboard the spacecraft is given in the following paragraphs.

Telemetered Data

Spacecraft telemetry system - The spacecraft was equipped with two telemetry transmitters sending essentially the same information. Each transmitter carried six channels of information as indicated by the block diagram in figure 1. One of the six channels on each telemeter was commutated (90 segments) at the rate of 112-1/2 segments per second, and the other five channels were continuous.

Photographic Data

Pilot-observer camera - This camera was loaded with 16mm Ansco FPC-132 color film. This camera was to furnish a pictorial record of the astronaut during flight and excellent pictures were obtained. The camera was programed to operate at frame rates of 5 frames per minute and 360 frames per minute at preselected intervals during the mission.

Instrument-panel camera - The instrument-panel camera was loaded with Dupont Cronar 131 black and white film. The camera was to have operated at two different frame rates (30 frames per minute and 360 frames per minute) as shown in the table below. The camera was mounted to the left of the instrument panel and was not able to record the entire panel. The camera jammed after three exposures and no information was obtained.

Camera programing for pilot-observer and instrument-panel camera

	Frame Rate	
	Slow	Fast
Prior to umbilical eject	x	
Umbilical eject to cap sep + 60 seconds		x
Cap sep + 60 seconds to retrocommand*	x	
Retrocommand to retropack jettison		x
Retropack jettison to 0.05g	x	
0.05g to 10,000 feet		x
10,000 feet to power off	x	

*During orbit, the cameras were programed to go to a fast frame rate every 30 minutes for a period of 30 seconds.

5.0 APPENDIX ON INSTRUMENTATION

Recorded-only data

1-7/8 ips tape recorder - The following quantities were recorded only on the onboard tape recorder:

Continuous d-c current
Continuous d-c voltage
3.0 kc reference frequency
Continuous control stick position - roll
Continuous control stick position - pitch
Continuous control stick position - yaw

6.0 TELEMETERED AND RECORDED DATA

Events	Commutator segment (high and low TM link unless otherwise specified)	Instrument Range (0-100% Full Scale unless otherwise noted)
Tower release	46	On-Off
Tower escape rocket ignite	61	On-Off
Spacecraft separation	47	On-Off
Retroattitude command	48	On-Off
Retrorocket fire	50	On-Off
Retrorocket assembly jettison	53	On-Off
0.05g relay	87	On-Off
Drogue parachute deploy	54	On-Off
Antenna fairing release	55	On-Off
Main parachute deploy	56	On-Off
Periscope retract	72	On-Off
Mayday	60	On-Off
Impact bag deploy	51	On-Off
Main chute jettison	57	On-Off
Reserve chute deploy	58	On-Off
Pilot abort	59	On-Off
Stabilization and Control		
Control stick position (roll)	23 & continuous	± 12 deg
Control stick position (pitch)	24 & continuous	± 12 deg
Control stick position (yaw)	25 & continuous	± 14 deg
Gyro output (roll)	17	-130, +190 deg
Gyro output (pitch)	16	-120, +174 deg
Gyro output (yaw)	18	-70, +250 deg
Scanner output (roll)	86	-37.5, +33 deg
Scanner output (pitch)	88	-38.5, +33 deg
Scanner ignore (roll)	85	On-Off
Scanner ignore (pitch)	38	On-Off
ASCS slaving signal	63	On-Off
Roll solenoid, hi, +	69	On-Off
Roll solenoid, hi, -	70	On-Off
Pitch solenoid, hi, +	65	On-Off
Pitch solenoid, hi, -	66	On-Off
Yaw solenoid, hi, +	79	On-Off
Yaw solenoid, hi, -	78	On-Off

6.0 TELEMETERED AND RECORDED DATA

Stabilization and Control (cont'd)	Commutator segment (high and low TM link unless otherwise specified)	Instrument Range (0-100% Full Scale unless otherwise noted)
Roll solenoid, lo +	Low thrust solenoids superposed on continuous rate channels	On-Off
Roll solenoid, lo -		On-Off
Pitch solenoid, lo +		On-Off
Pitch solenoid, lo -		On-Off
Yaw solenoid, lo +		On-Off
Yaw solenoid, lo -		On-Off
Roll rate (low range, from liftoff to 0.05g)	Continuous	-9.9, +10 deg/sec
Roll rate (high range, from 0.05g to 10,000 alt.)	Continuous	-25.5, +31.5 deg/sec
Pitch rate	Continuous	-10.3, +10.5 deg/sec
Yaw rate	Continuous	±10.3, deg/sec
Electrical Functions		
3 volt reference	1	100% full scale
Zero ground reference	2	0% full scale
7 volt a-c bus voltage	3	0-8 volts a-c
D-c voltage	83	+12.9, +29.8 volts d-c
D-c voltage	Continuous	+12.9, +30 volts d-c
D-c current	42	0, +50 amps d-c
D-c current	Continuous	-0.6, +50.6 amps d-c
Fans a-c bus voltage	41	+95, +120 volts a-c (68.3, 89.3% F.S.)
ASCS a-c bus voltage	77	+90, +125 volts a-c (64.7, 94% F.S.)
Isolated d-c bus voltage	67H	+13.3, +23.4 volts d-c
Standby d-c bus voltage	67L	+13.2, +23 volts d-c
Standby inverter "ON"	62	On-Off

6.0 TELEMETERED AND RECORDED DATA

Astronaut	Commutator segment (high and low TM link unless otherwise specified)	Instrument Range (0-100% Full Scale unless otherwise noted)
Body temperature	4L	+92.5, +105.9 °F
Body temperature	4H	+92.6, +106 °F
ECG #1	Continuous	---
Respiration	Continuous	---
Blood pressure	Continuous	+56, +205 mm Hg (10, 85% F. S.)
Command Receivers		
Command receiver ON-OFF	5	On-Off
Command receiver signal strength "A"	Hi 7,27,49,71	0, 80 μv non-linear (30, 78% F. S.)
Command receiver signal strength "B"	Lo 7,27,49,71	0, 80 μv non-linear (20, 68% F. S.)
Environmental Functions		
Suit inlet temperature	11L	+39, +116 °F
Suit inlet temperature	11H	+38.5, +115 °F
Cabin temperature	10L	+35, +233 °F
Cabin temperature	10H	+34, +243 °F
Suit pressure	8 (dual range)	-0.2, +7.4, +15.3 psia (0, 98, 0% F. S.)
Cabin pressure	82 (dual range)	-0.2, +7.4, +15.2 psia (0, 101, 0% F. S.)
Static pressure	22	+15.2, -0.3 psia
Coolant quantity pressure	84	213, 489 psig
O_2 supply pressure, primary	9	-50, +7500 psig
O_2 supply pressure, secondary	12	-100, +7600 psig
O_2 partial pressure	L	-15, +980 mm Hg
	6H	-15, +985 mm Hg
O_2 emergency rate mode	68	On-Off

6.0 TELEMETERED AND RECORDED DATA

Accelerations	Commutator segment (high and low TM link unless otherwise specified)	Instrument Range (0-100% Full Scale unless otherwise noted)
Acceleration, Ax (low range, Cap. sep. +60 to retrocommand)	14, 44, 74	-0.415, +0.375 (15, 80% F. S.)g
Acceleration, Ax (high range, retrocommand to power OFF)	14,44,74	-3.2, +3.5 (15, 85% F. S.)g
Acceleration, Ay (low range, cap. sep. + 60 sec to retrocommand)	13, 43, 73	-0.415, +0.38 (19, 80% F. S.)g
Acceleration, Ay (high range, retrocommand to power OFF)	13, 43, 73	-4.0, +4.9g
Acceleration, Az	15,45,75	-31, +35g
Integrating accelerometer signal	52	0, 565 fps
Equipment Temperatures		
RCS automatic H_2O_2 line temperature lo roll, CW (R.E.)*	20H	-6, +242 °F
RCS automatic H_2O_2 line temperature lo roll, CCW (R.E.)	20L	-11, +239 °F
RCS manual H_2O_2 line temperature lo roll, CW (R.E.)	19H	-12, +260 °F
RCS manual H_2O_2 line temperature lo roll, CCW (R.E.)	19L	-29, +224 °F
Retrorocket temperature (R.E.)	80	-16, +140°F

* R.E. - Resistance element

6.0 TELEMETERED AND RECORDED DATA

Equipment Temperatures (cont'd)	Commutator segment (high and low TM link unless otherwise specified)	Instrument Range (0-100% Full Scale unless otherwise noted)
Heat shield temperature (T.C.)*	76	-140, +2470 °F
Inverter temperature, 150 v-amp (R.E.)	32	-10, +337 °F
Inverter temperature, 250 v-amp (R.E.)	21	-18, +322 °F
Transmitter temperature, HF (R.E.)	81H	+8, +320 °F
Transmitter temperature, LF, (R.E.)	81L	-16, +326 °F
Onboard Time		
Vernier clock	Continuous	0-12%
Time since launch 0-10 seconds	26	0-100%
Time since launch 0-1 minute	28	0-100%
Time since launch 0-10 minutes	29	0-100%
Time since launch 0-1 hour	30	0-100%
Time since launch 0-10 hours	31	0-100%
Time to retrograde 0-10 seconds	33	0-100%
Time to retrograde 0-1 minute	34	0-100%
Time to retrograde 0-10 minutes	35	0-100%
Time to retrograde 0-1 hour	36	0-100%
Time to retrograde 0-10 hours	37	0-100%
Calibrate signal	64	

* T.C. - Thermocouple

TABLE I

PREFLIGHT AND INFLIGHT CALIBRATIONS FROM ONBOARD TAPE
(VALUES ARE PERCENT OF FULL SCALE FOR NEXT TO LAST FRAME IN CALIBRATION TIME INTERVAL)

	-00:01:59 to -00:01:37	00:51:47.5 to 00:52:08.5	01:36:12 to 04:36:22	02:27:21 to 02:27:36	03:09:58 to 03:10:07	04:00:08 to 04:00:25	TIME OF Z CAL
	-00:01:35 to -00:01:20	00:52:14 to 00:52:46	01:36:24 to 01:36:38	02:27:55 to 02:28:31	03:10:09 to 03:10:20	04:00:32.5 to 04:00:55.5	TIME OF R CAL
SEGMENT 4	5.6	5.4	5.2	5.6	5.0	5.1	HI LINK Z CAL
	5.6	6.1	5.5	5.9	5.8	5.5	LO LINK Z CAL
	75.0	75.1	75.4	75.6	75.6	75.6	HI LINK R CAL
	77.0	78.9	78.0	77.7	77.5	78.3	LO LINK R CAL
SEGMENT 6	-0.1	-0.1	-0.7	-0.3	-0.5	-0.5	HI LINK Z CAL
	0.1	0.1	-0.1	0.0	0.1	0.1	LO LINK Z CAL
	77.4	77.5	77.4	77.4	77.4	78.2	HI LINK R CAL
	77.2	77.6	77.1	77.7	77.7	77.4	LO LINK R CAL
SEGMENT 10	9.1	9.0	8.5	8.8	8.7	8.7	HI LINK Z CAL
	15.0	15.2	14.5	15.1	15.4	14.9	LO LINK Z CAL
	54.3	54.4	54.4	54.7	54.0	55.1	HI LINK R CAL
	58.9	59.8	58.9	59.0	59.6	59.6	LO LINK R CAL
SEGMENT 11	14.1	14.3	14.0	14.1	14.1	14.5	HI LINK Z CAL
	16.9	17.4	16.6	17.6	17.6	17.1	LO LINK Z CAL
	81.7	83.3	83.1	82.9	82.5	83.6	HI LINK R CAL
	86.8	87.2	86.3	86.1	86.9	87.4	LO LINK R CAL
SEGMENT 19	31.6	32.2	31.8	31.9	32.0	31.5	HI LINK Z CAL
	39.0	40.2	39.6	39.7	40.4	40.4	LO LINK Z CAL
	90.5	90.4	90.0	90.3	90.0	89.9	HI LINK R CAL
	98.2	99.6	98.9	99.2	98.9	99.4	LO LINK R CAL

TABLE I

PREFLIGHT AND INFLIGHT CALIBRATIONS FROM ONBOARD TAPE

(VALUES ARE PERCENT OF FULL SCALE FOR NEXT TO LAST FRAME IN CALIBRATION TIME INTERVAL)

PRE	-00:01:59 to -00:01:37	00:51:47.5 to 00:52:08.5	01:36:12 to 01:36:22	02:27:21 to 02:27:36	03:09:58 to 03:10:07	04:00:08 to 04:00:25	TIME OF Z CAL
	-00:01:35 to -00:01:20	00:52:14 to 00:52:46	01:36:24 to 01:36:38	02:27:55 to 02:28:31	03:10:09 to 03:10:20	04:00:32.5 to 04:00:55.5	TIME OF R CAL
SEGMENT 20	29.4	29.5	28.7	29.5	28.9	28.9	HI LINK Z CAL
	30.3	31.2	30.5	30.6	31.3	30.8	LO LINK Z CAL
	89.6	89.3	89.1	89.4	89.5	89.1	HI LINK R CAL
	90.5	92.0	91.0	90.9	90.5	90.9	LO LINK R CAL
SEGMENT 21	16.7	17.0	16.3	16.6	16.7	16.3	HI LINK Z CAL
	16.4	17.0	16.5	16.7	17.2	16.9	LO LINK Z CAL
	86.5	86.8	86.5	87.0	86.6	86.9	HI LINK R CAL
	86.6	87.8	87.2	87.3	87.7	87.6	LO LINK R CAL
SEGMENT 32	17.5	17.9	17.4	17.7	17.6	17.6	HI LINK Z CAL
	17.6	18.1	17.7	18.0	18.1	18.0	LO LINK Z CAL
	87.0	87.7	87.2	86.7	86.8	88.2	HI LINK R CAL
	87.9	88.0	88.1	88.0	88.0	88.3	LO LINK R CAL
SEGMENT 42	-0.3	0.0	-0.1	-0.1	-0.5	-0.5	HI LINK Z CAL
	-0.5	0.0	-0.3	0.1	0.1	0.3	LO LINK Z CAL
	83.8	85.0	84.3	84.7	83.7	84.4	HI LINK R CAL
	85.4	86.0	85.0	85.1	85.7	86.0	LO LINK R CAL
SEGMENT 76	4.8	4.5	4.1	4.7	4.5	4.3	HI LINK Z CAL
	4.5	5.3	4.4	5.2	5.2	4.8	LO LINK Z CAL
	65.2	66.1	65.5	65.8	65.7	66.4	HI LINK R CAL
	66.4	67.6	66.3	66.4	67.6	67.6	LO LINK R CAL

TABLE I

PREFLIGHT AND INFLIGHT CALIBRATIONS FROM ONBOARD TAPE

(VALUES ARE PERCENT OF FULL SCALE FOR NEXT TO LAST FRAME IN CALIBRATION TIME INTERVAL)

	-00:01:59 to -00:01:37	00:51:47.5 to 00:52:08.5	01:36:12 to 01:36:22	02:27:21 to 02:27:36	03:09:58 to 03:10:07	04:00:08 to 04:00:25	TIME OF Z CAL
	-00:01:35 to -00:01:20	00:52:14 to 00:52:46	01:36:24 to 01:36:38	02:27:55 to 02:28:31	03:10:09 to 03:10:20	04:00:32.5 to 04:00:55.5	TIME OF R CAL
SEGMENT 80	8.9	9.4	8.9	9.6	9.2	9.4	HI LINK Z CAL
	8.3	9.5	9.3	9.9	9.6	9.7	LO LINK Z CAL
	84.2	85.7	84.3	84.7	84.5	85.8	HI LINK R CAL
	84.5	86.5	85.6	86.1	85.5	86.5	LO LINK R CAL
SEGMENT 81	15.0	15.0	15.3	15.4	15.0	15.3	HI LINK Z CAL
	16.6	17.4	16.8	17.5	17.4	16.9	LO LINK Z CAL
	84.2	85.1	84.7	83.8	84.5	85.5	HI LINK R CAL
	85.4	87.1	86.1	86.6	86.2	87.0	LO LINK R CAL

TABLE II

TIME OF VARIOUS CONTROL SYSTEM MODES*

TIME SPAN Hours:Min:Sec	CONTROL MODE
00:05:00 - 00:07:58	ASCS
00:07:58 - 00:10:46	Control Systems Checks
00:10:46 - 00:25:00	ASCS
00:25:00 - 00:28:28	FBW
00:28:28 - 01:30:00	ASCS
01:30:00 - 01:31:00	ASCS & MPCS
01:31:00 - 01:31:17	ASCS
01:31:17 - 01:32:00	FBW or MPCS
01:32:00 - 01:33:58	ASCS
01:33:58 - 02:00:20	FBW
02:00:20 - 02:01:34	ASCS
02:01:34 - 02:01:42	FBW & MPCS
02:02:08 - 02:02:23	MPCS
02:02:23 - 02:08:29	ASCS
02:08:29 - 02:13:28	ASCS & MPCS
02:13:28 - 03:31:00	MPCS
03:31:00 - 03:37:38	ASCS
03:37:38 - 03:41:05	ASCS & MPCS
03:41:05 - 03:52:09	ASCS & MPCS
03:52:09 - 04:25:02	FBW
04:25:02 - 04:26:05	ASCS (Orientation Mode)
04:26:05 - 04:28:05	ASCS (Orbit Mode)
04:28:05 - 04:36:35	ASCS & MPCS
04:36:35 - 04:37:20	ASCS & MPCS
04:37:20 - 04:41:58	MPCS
04:41:58 - 04:47:44	FBW & MPCS
04:47:44 - 04:49:17	ASCS Rate Damping
04:49:17	Drogue Deploy

*Determined from onboard voice tape. Checked against system operation.

FBW	Fly By Wire
ASCS	Automatic Stabilization Control System
MPCS	Manual Proportional Control System

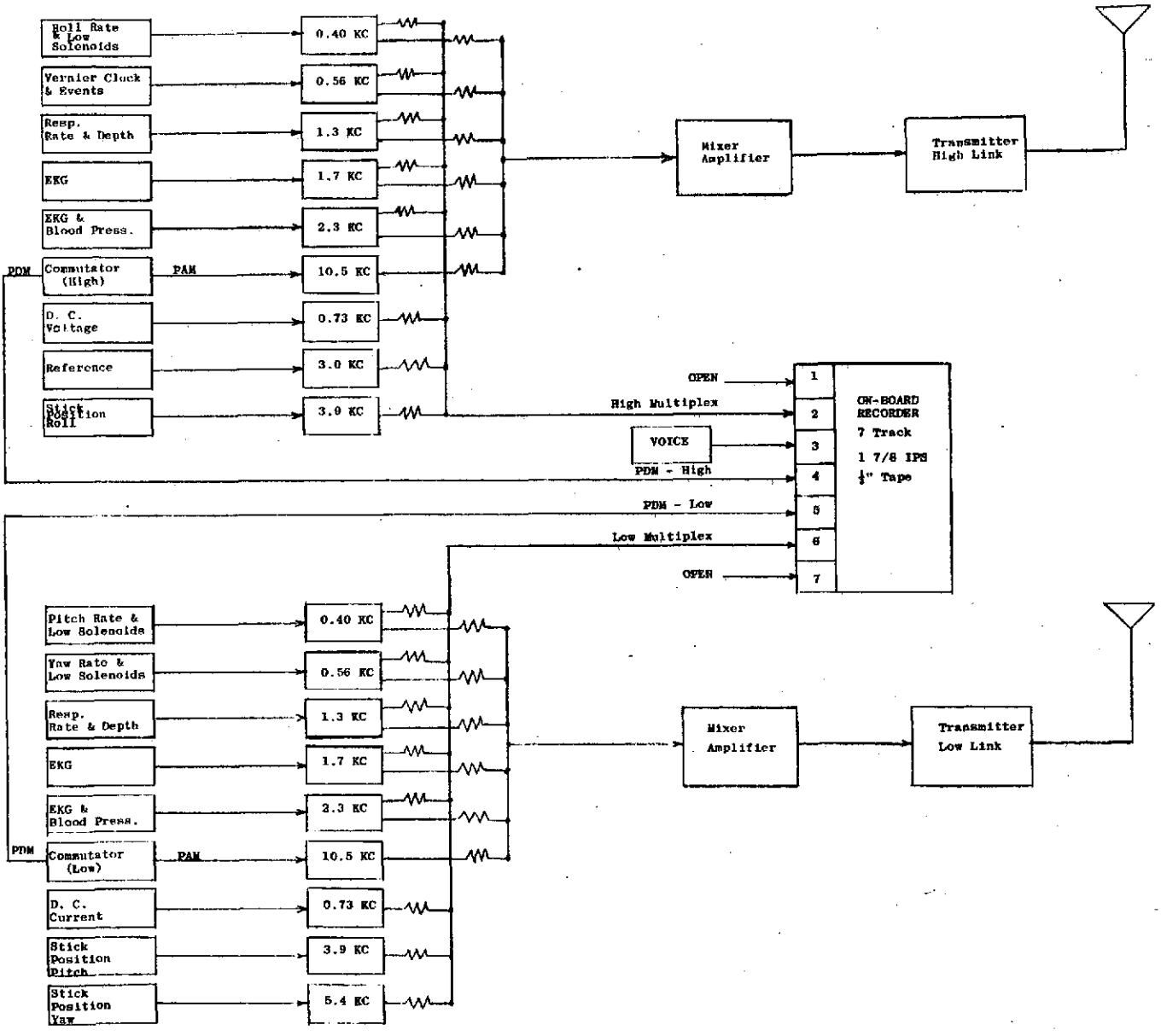
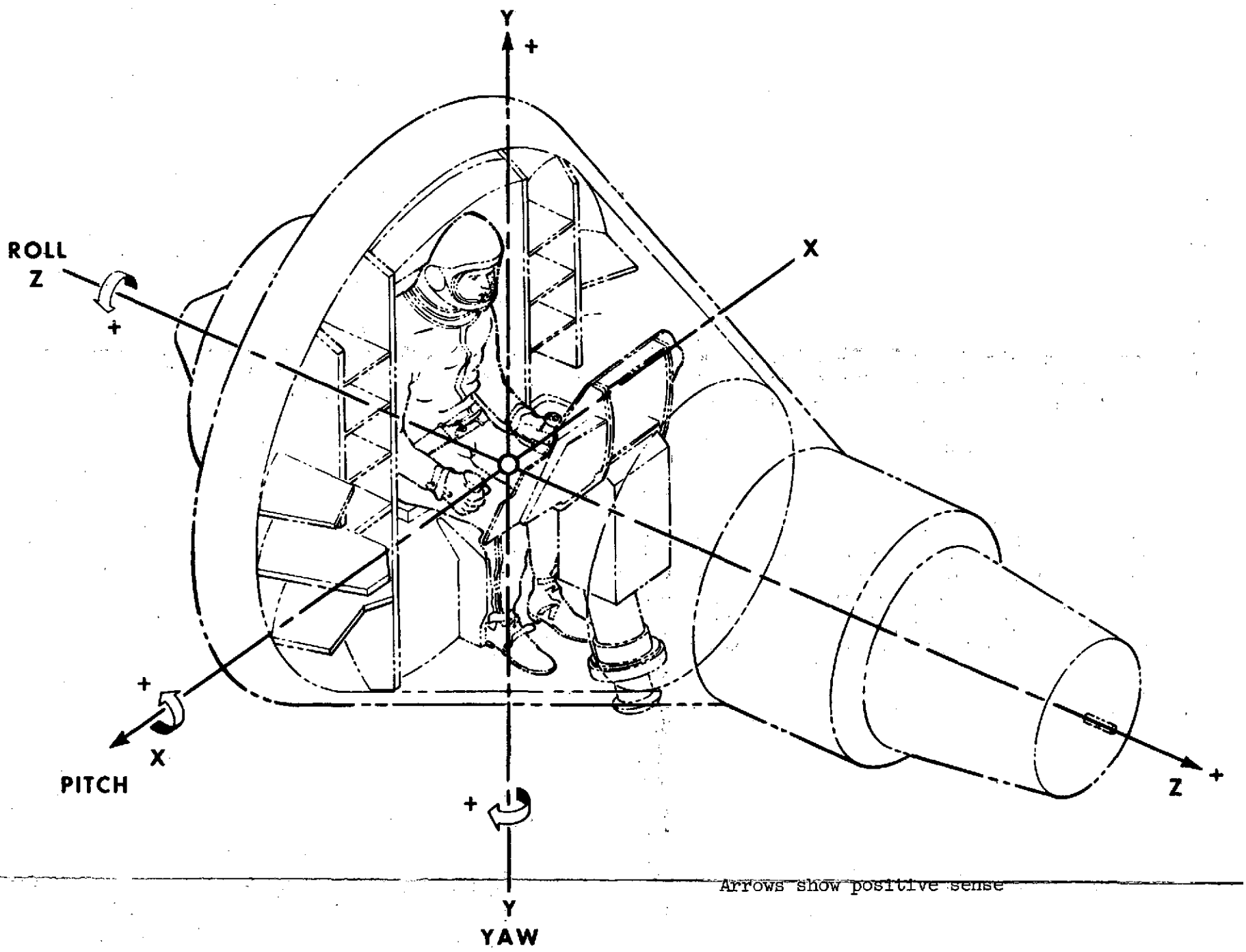


Figure 1.- Capsule instrumentation system block diagram.



PITCH

Pitch is defined as the rotation of the spacecraft about its X-axis. The pitch angle is zero degrees (0°) when the Z-axis lies in a horizontal plane. Using the astronaut's right side as a reference, positive pitch is achieved by counterclockwise rotation from the zero degree (0°) plane. The rate of this rotation is the spacecraft pitch rate and is positive in the direction shown.

YAW

Yaw is defined as the rotation of the spacecraft about its Y-axis. Clockwise rotation of the spacecraft when viewed from above the astronaut, is called right yaw and is defined as positive.

Yaw angle is considered zero degrees (0°) when the spacecraft is in normal orbital position (blunt end of spacecraft facing line of flight). When the positive Z-axis of the spacecraft is directed along the orbital flight path (recovery end of spacecraft facing line of flight), the yaw angle is 180°.

ROLL

Roll is defined as the rotation of the spacecraft about its Z-axis. Clockwise rotation of the spacecraft, as viewed from behind the astronaut, is called right roll and is defined as positive (+). When the X-axis of the spacecraft lies in a horizontal plane, the roll angle is zero degrees (0°)

ACCELEROMETER POLARITY WITH RESPECT TO GRAVITY

With the spacecraft in the launch position, the Z-axis will be perpendicular to the earth's surface and the Z-axis accelerometer will read +1 "G".

Figure 2 - MA-6 Spacecraft axis diagram

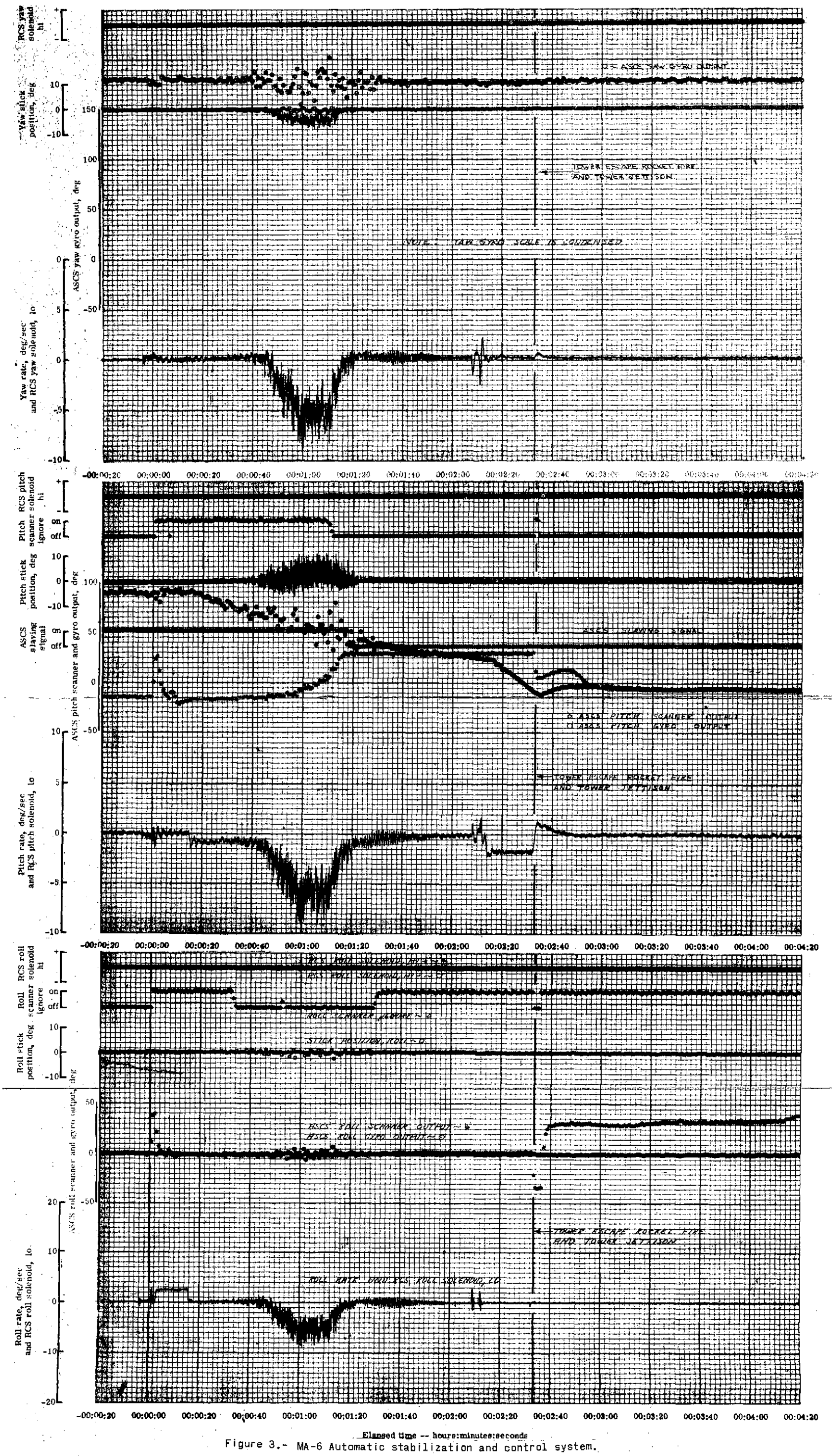


Figure 3.- MA-6 Automatic stabilization and control system.

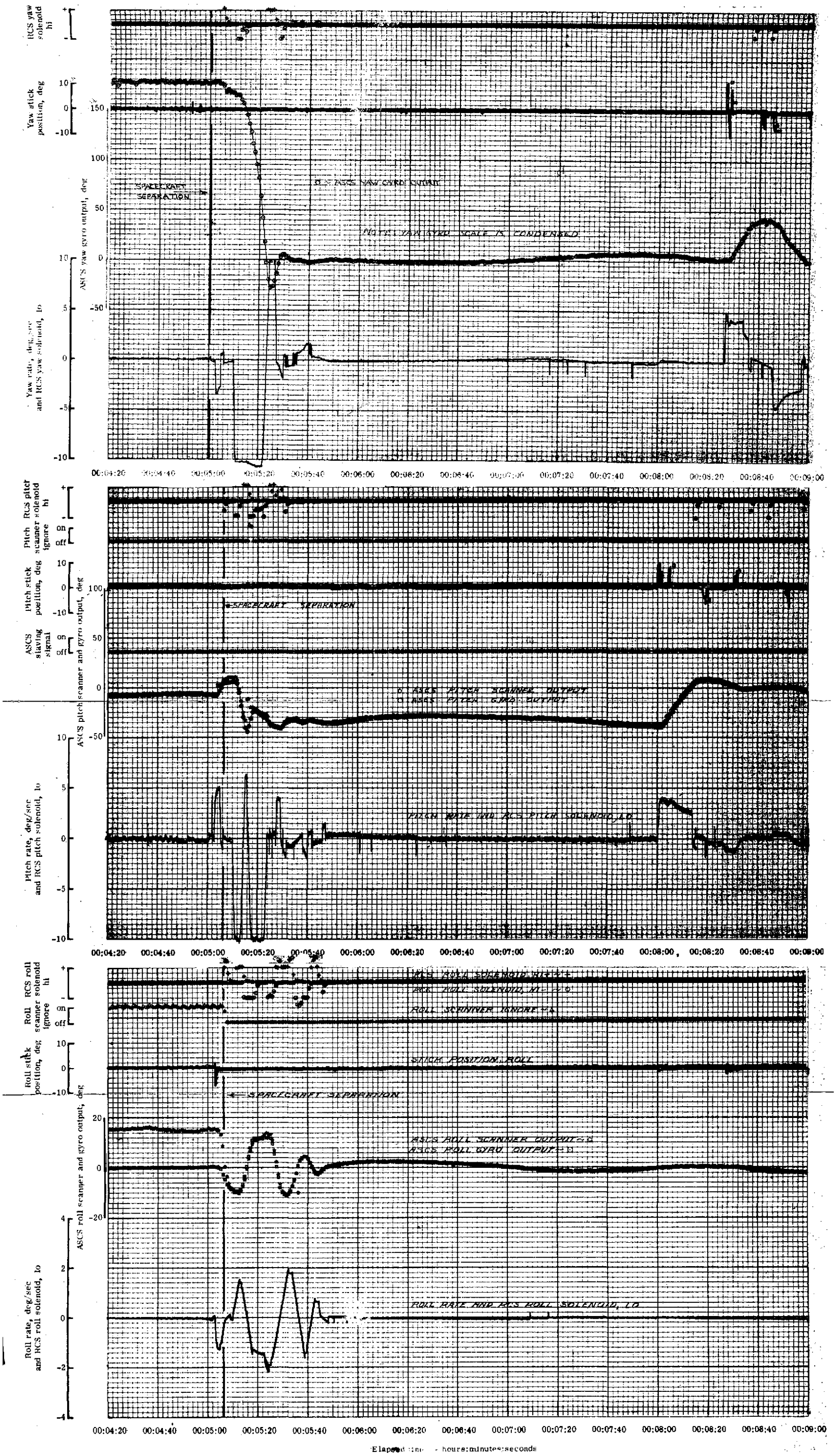


Figure 4.- MA-6 Automatic stabilization and control system.

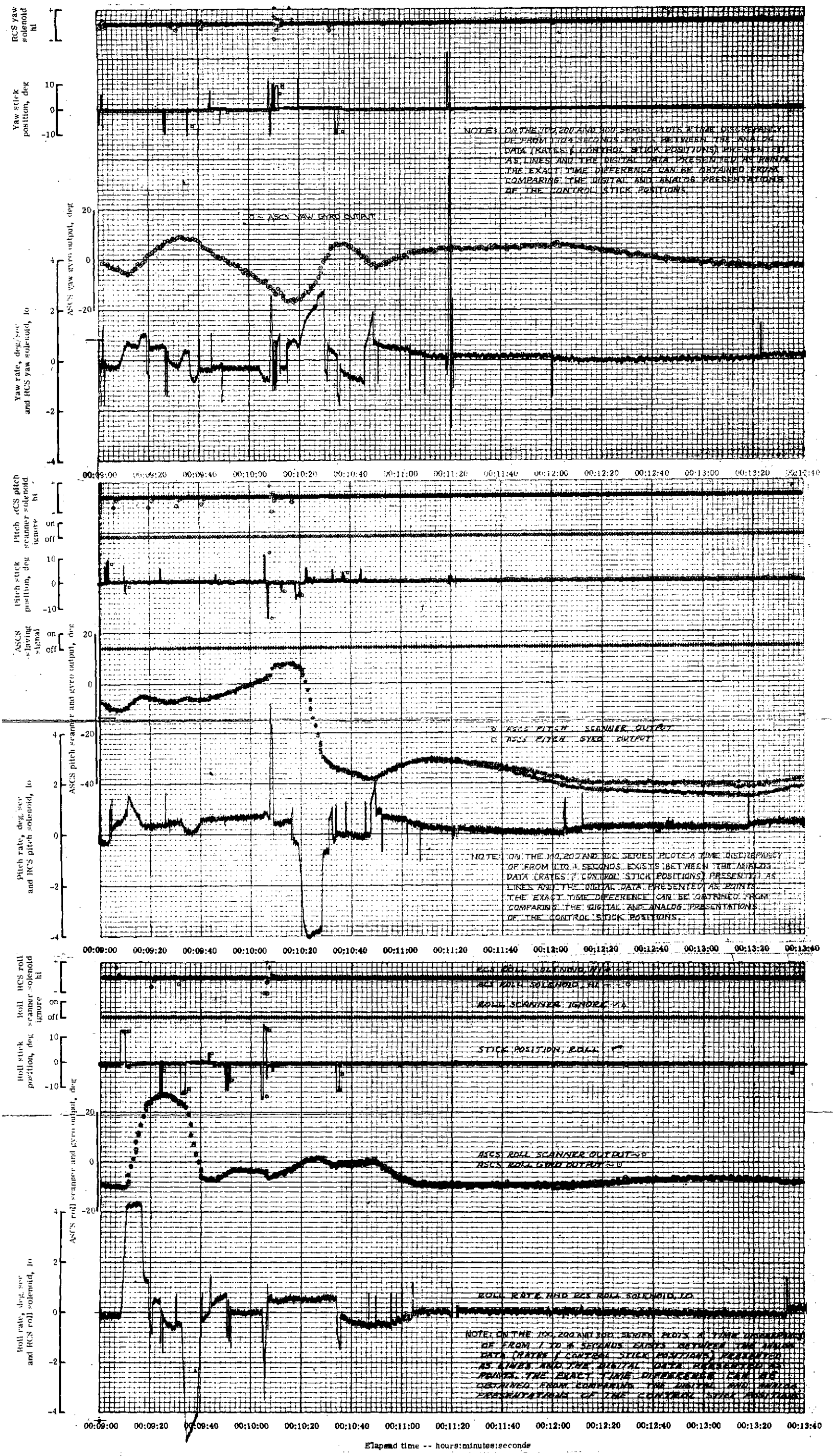


Figure 5.- MA-6 Automatic stabilization and control system.

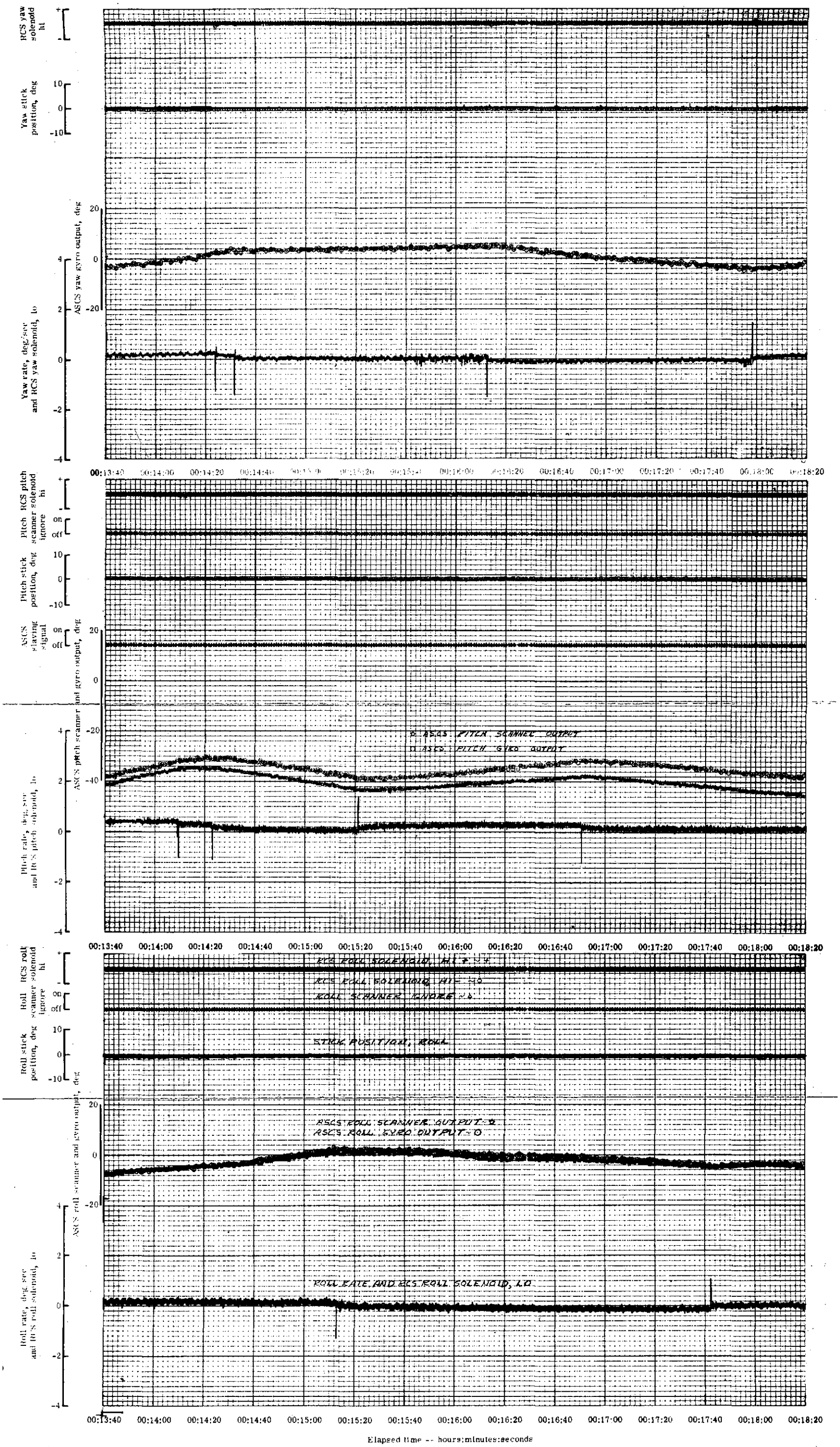


Figure 6.- MA-6 Automatic stabilization and control system.

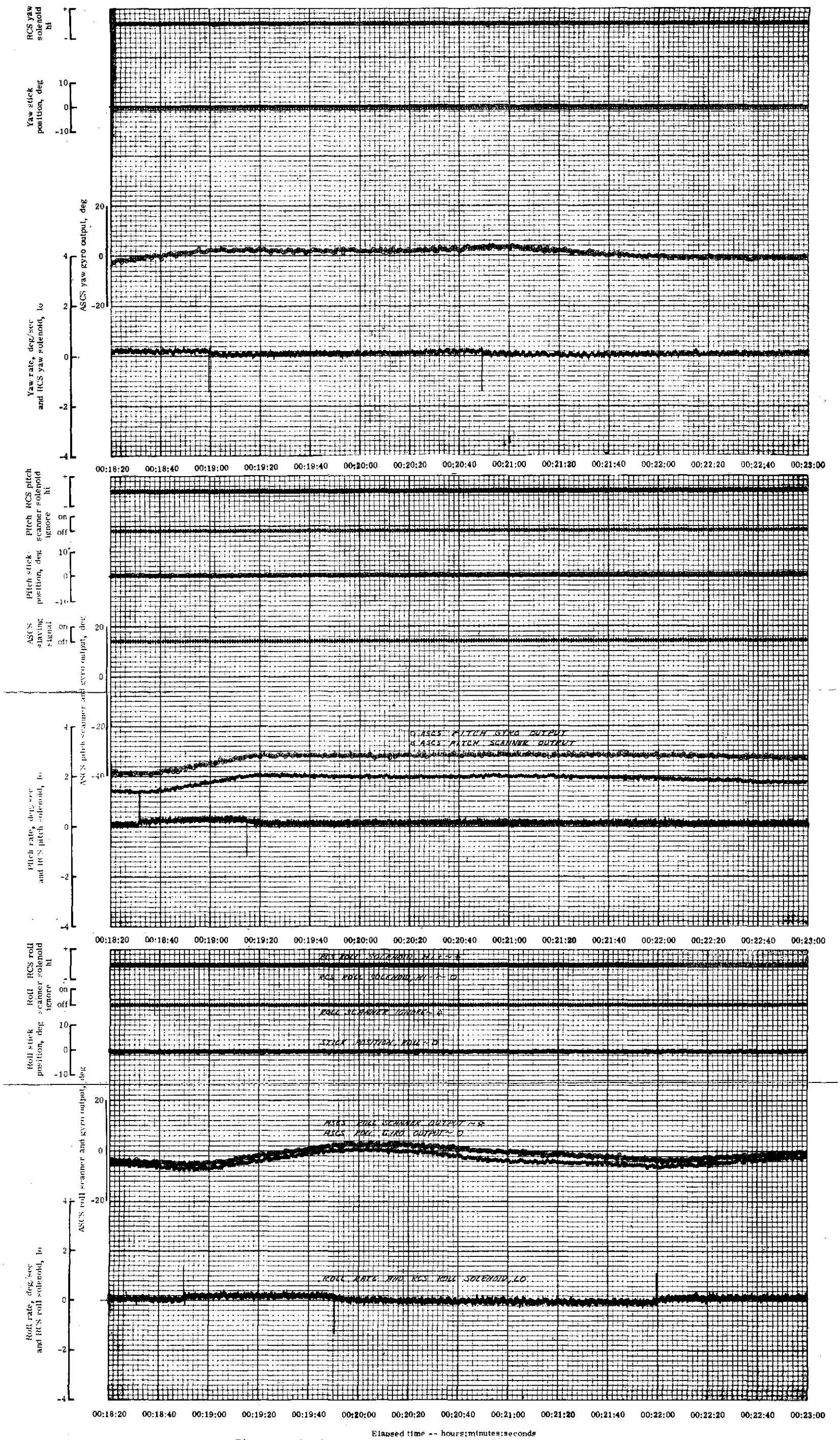


Figure 7.-MA-6 Automatic stabilization and control system.

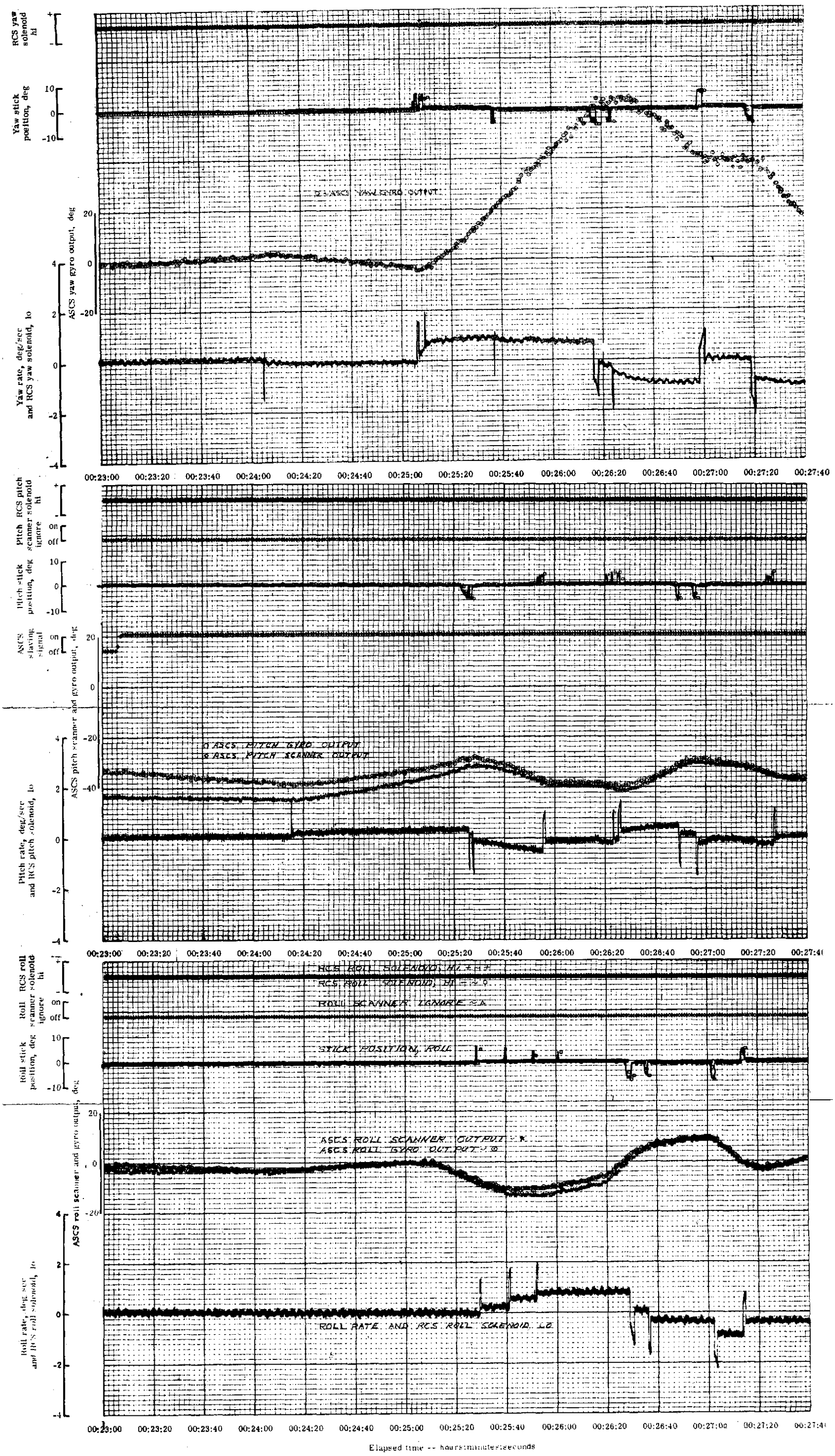


Figure 8.- MA-6 Automatic stabilization and control system.

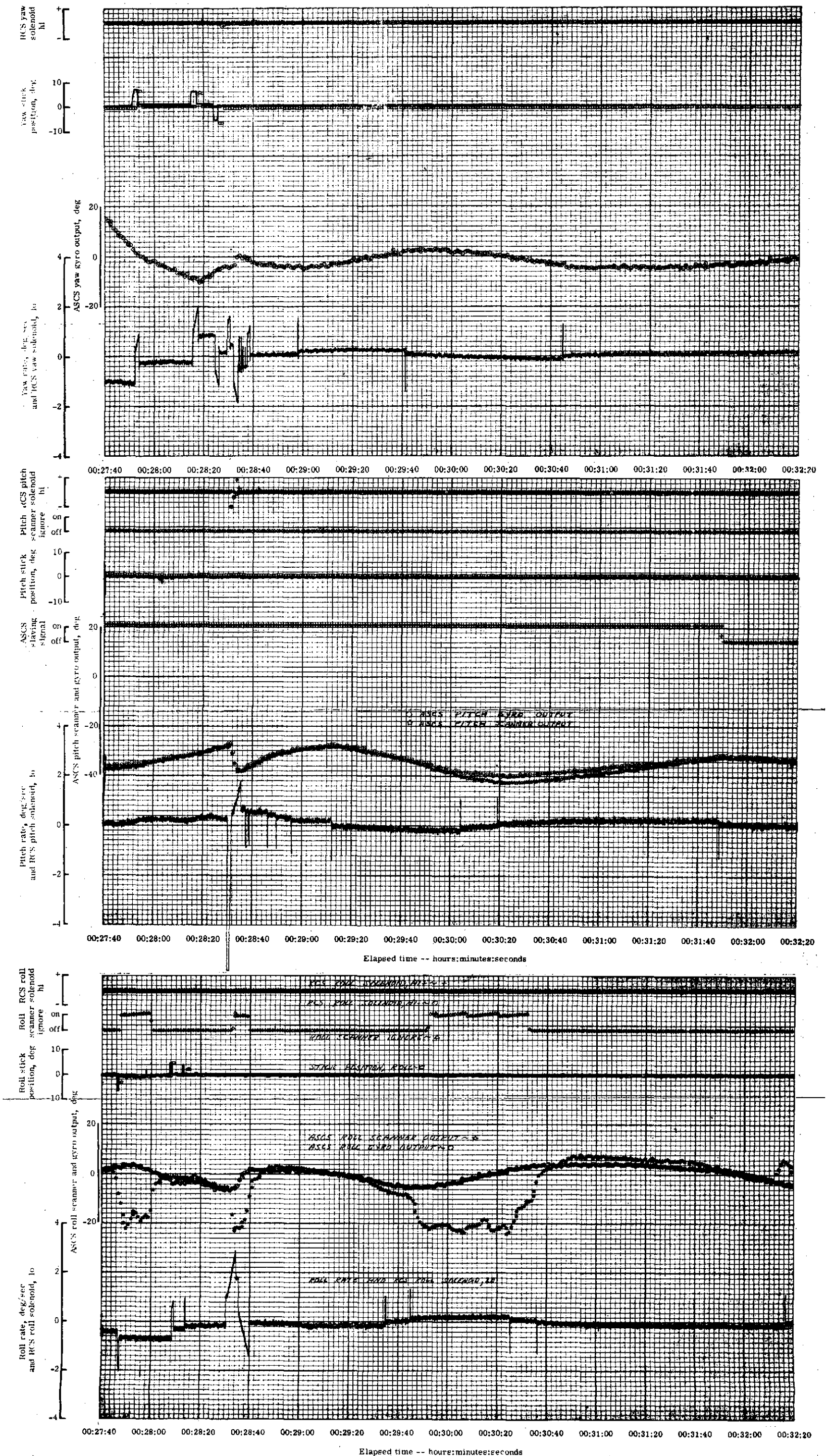


Figure 9.- MA-6 Automatic stabilization and control system.

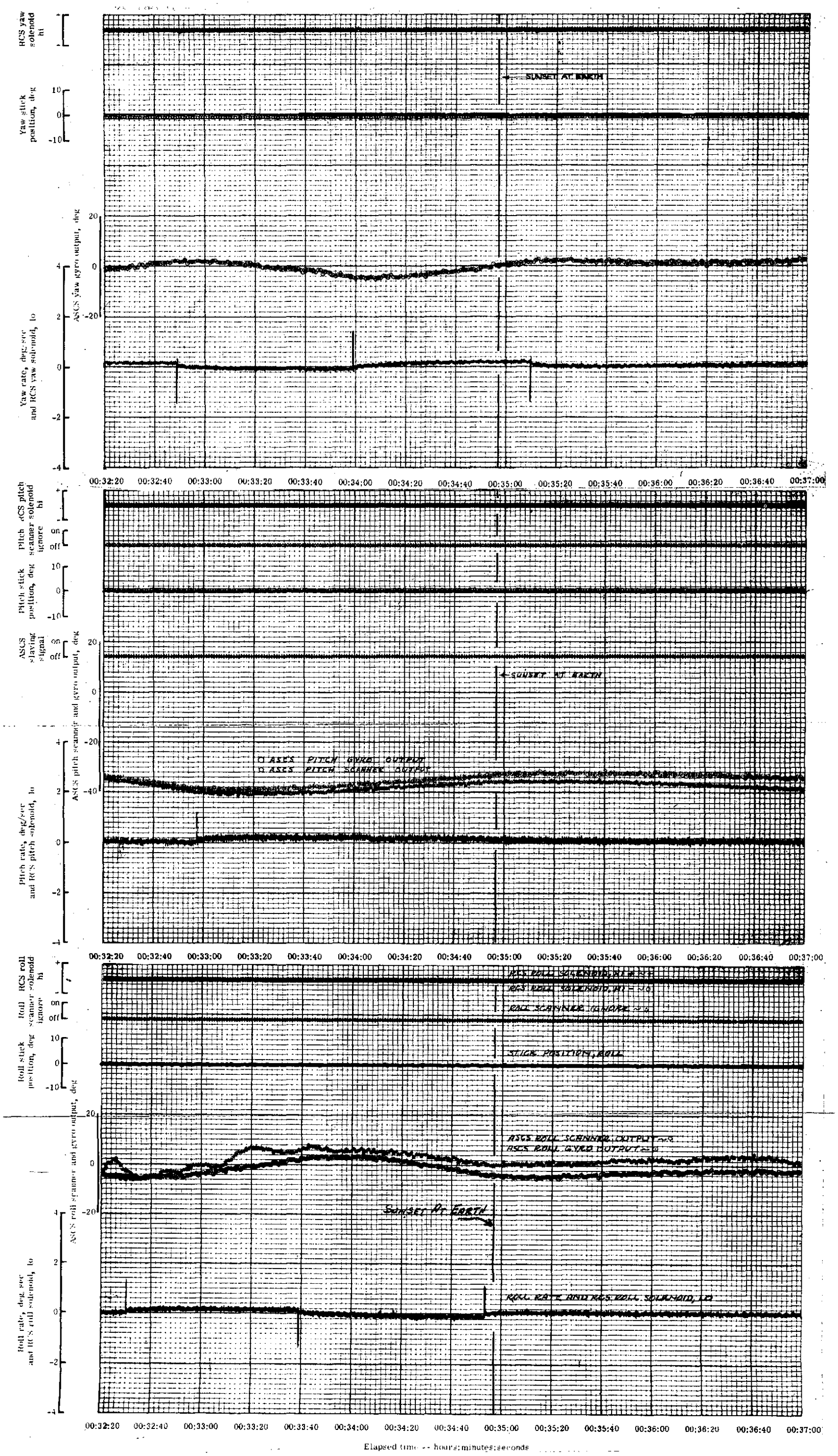


Figure 10.- MA-6 Automatic stabilization and control system.

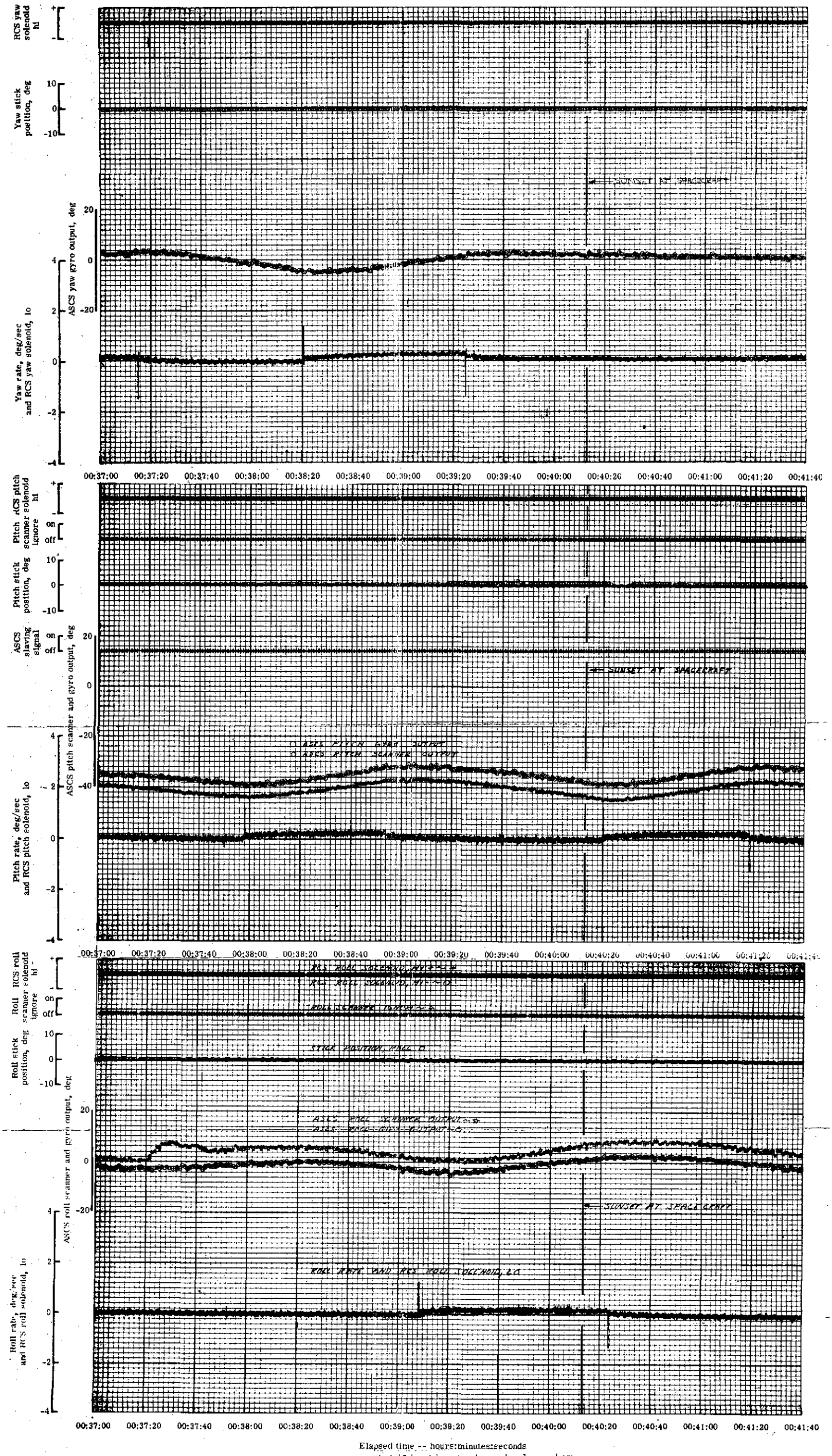


Figure 11.- MA-6 Automatic stabilization and control system.

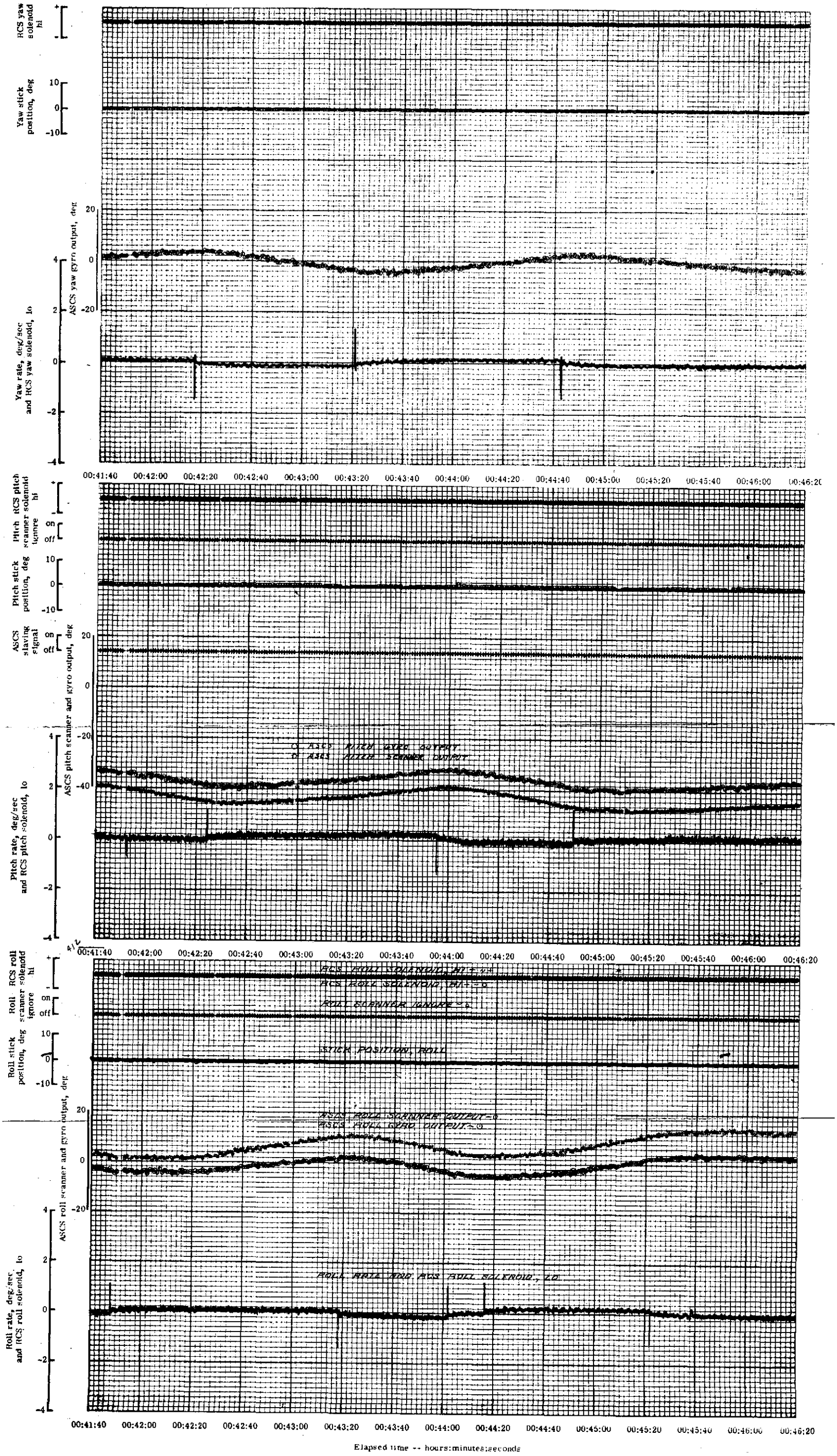


Figure 12.- MA-6 Automatic stabilization and control system.

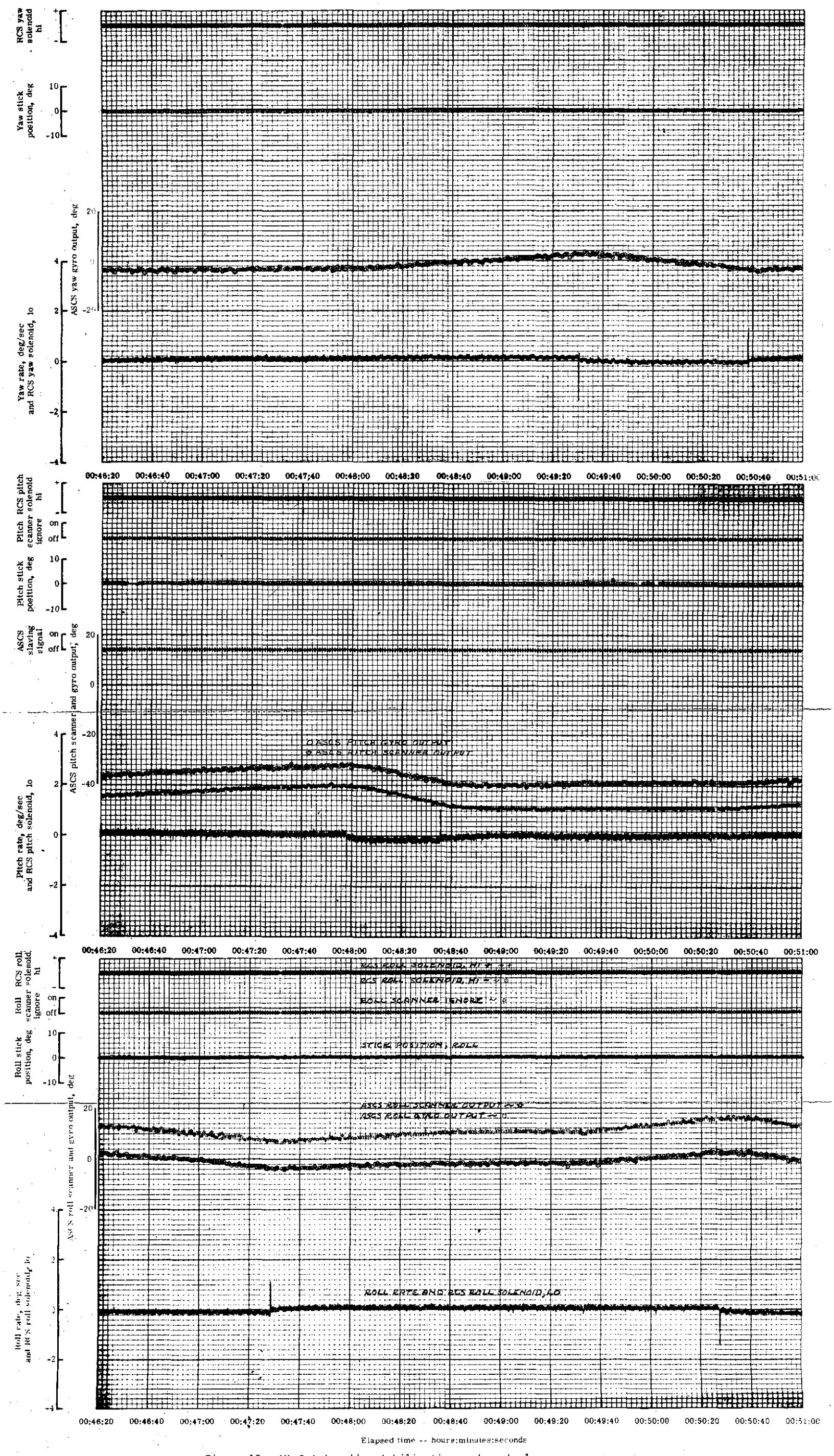


Figure 13.- MA-6 Automatic stabilization and control system.

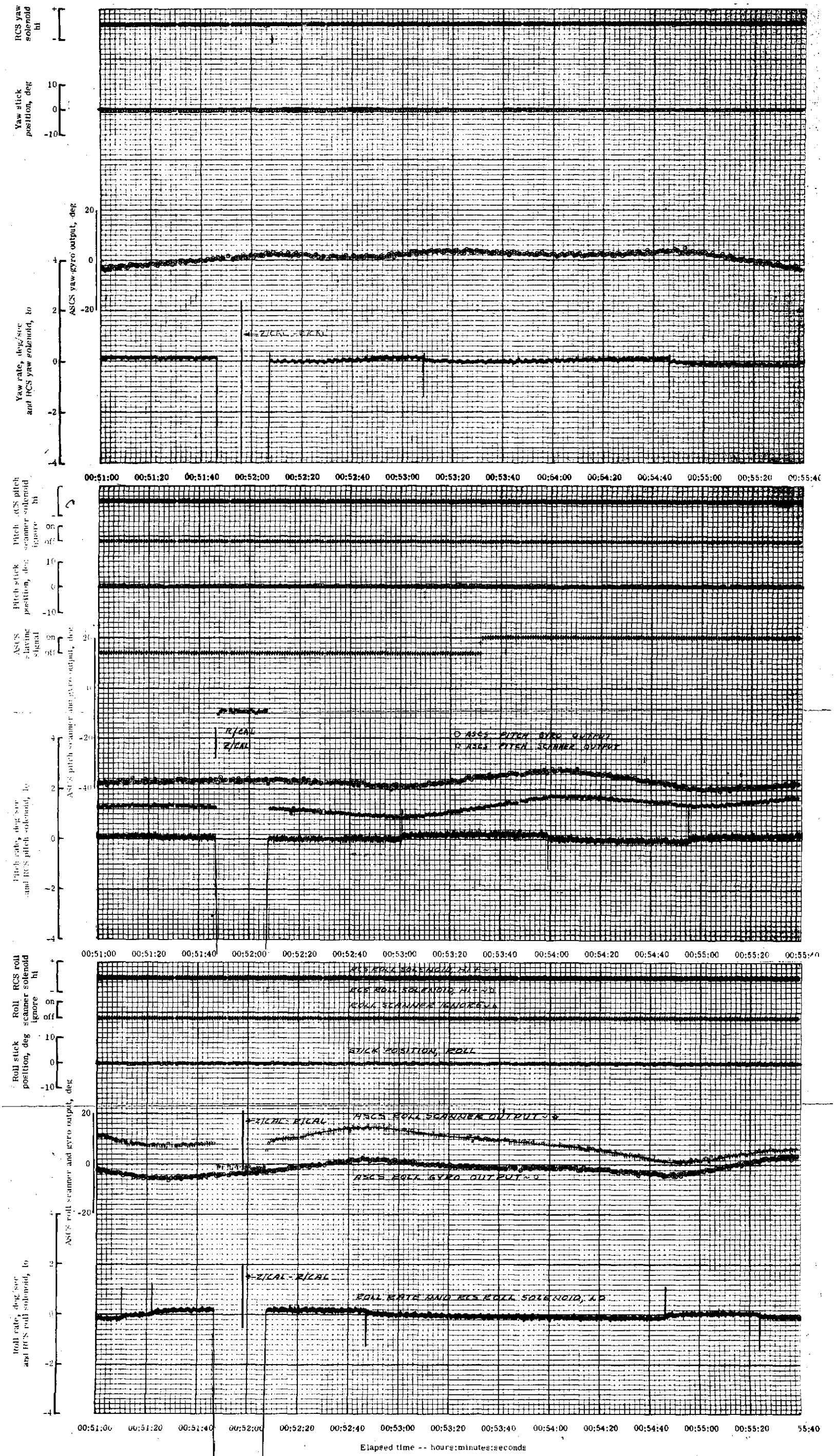


Figure 14.- MA-6 Automatic stabilization and control system.

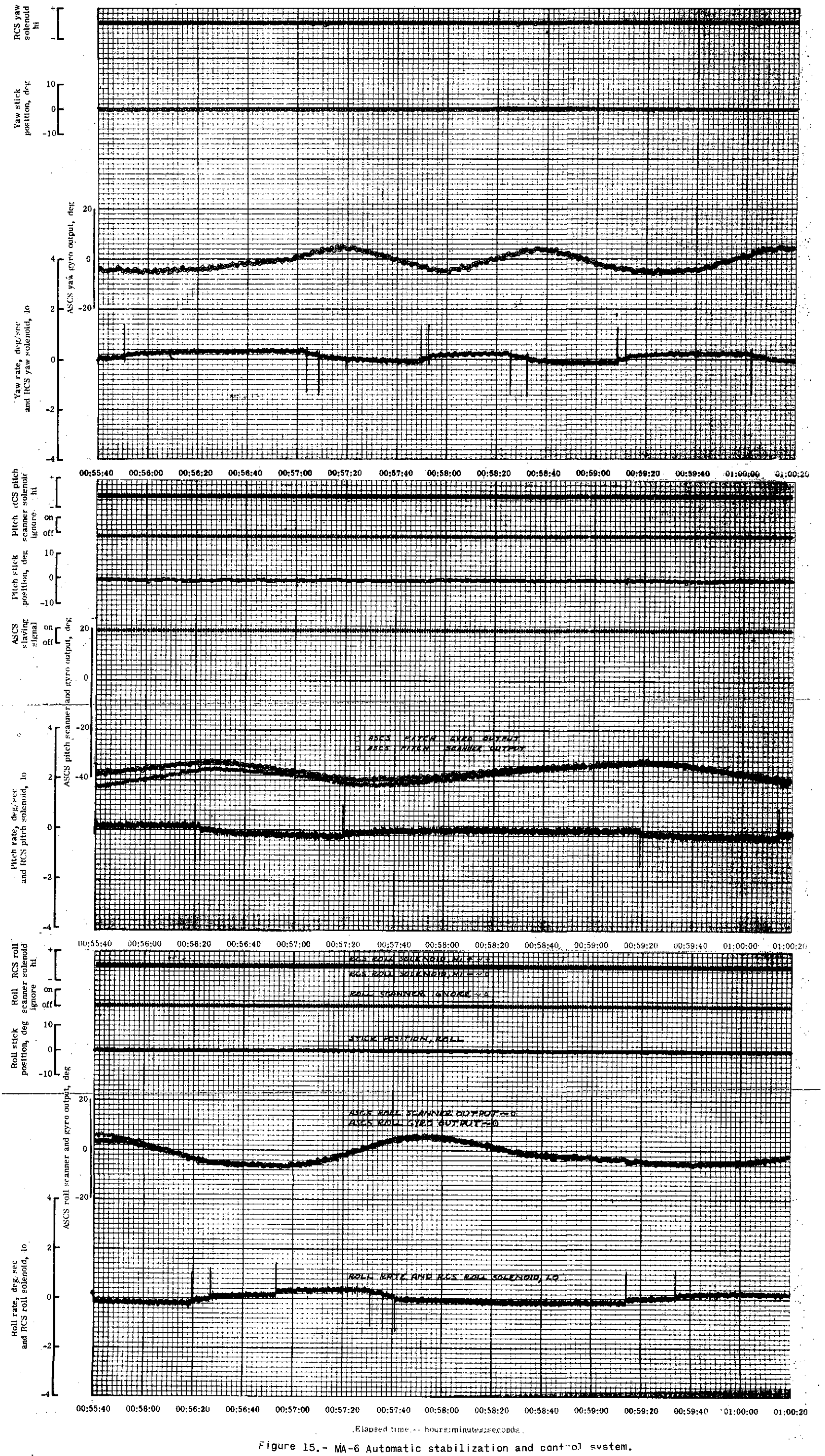


Figure 15.- MA-6 Automatic stabilization and control system.

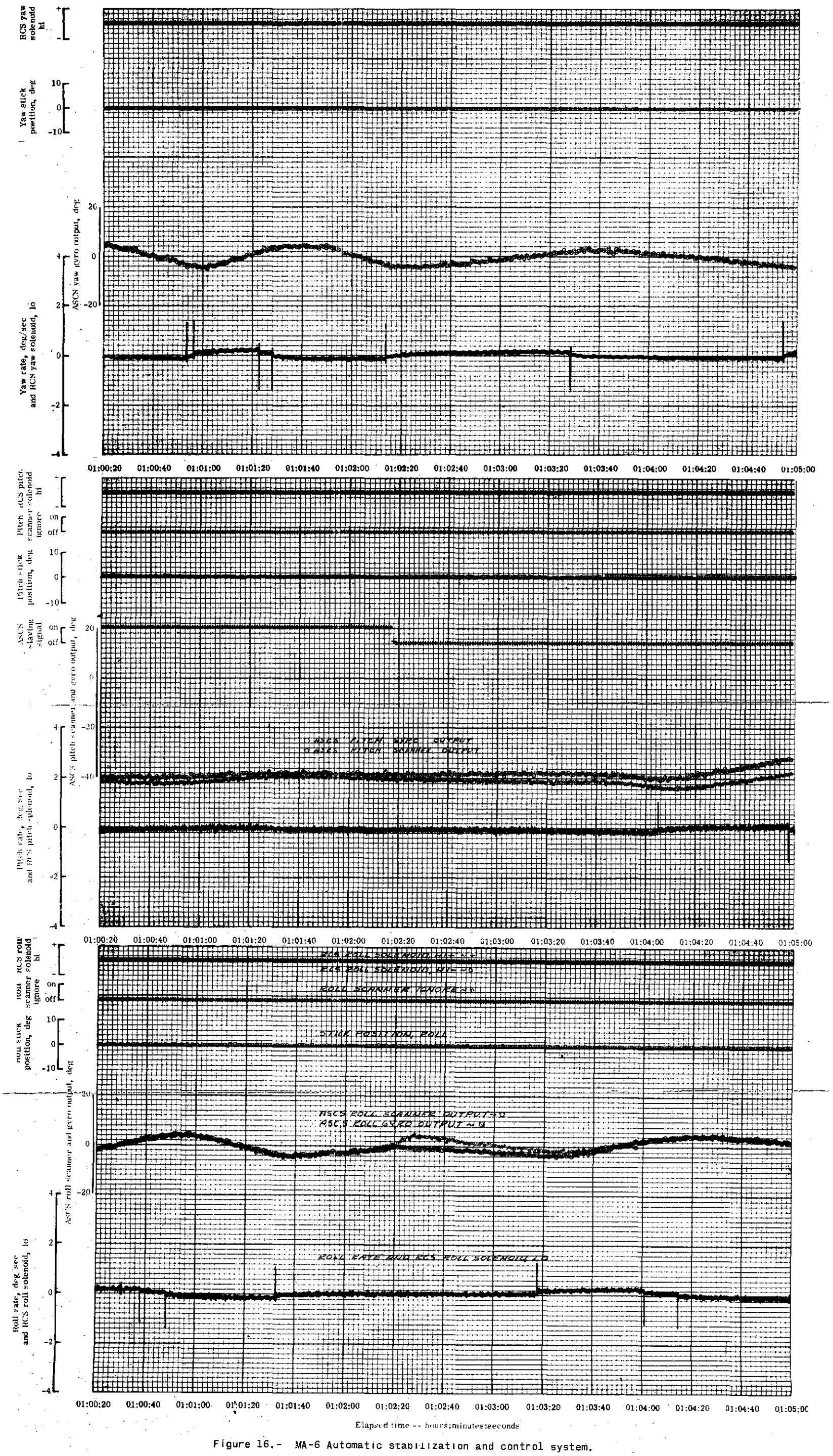


Figure 16.- MA-6 Automatic stabilization and control system.

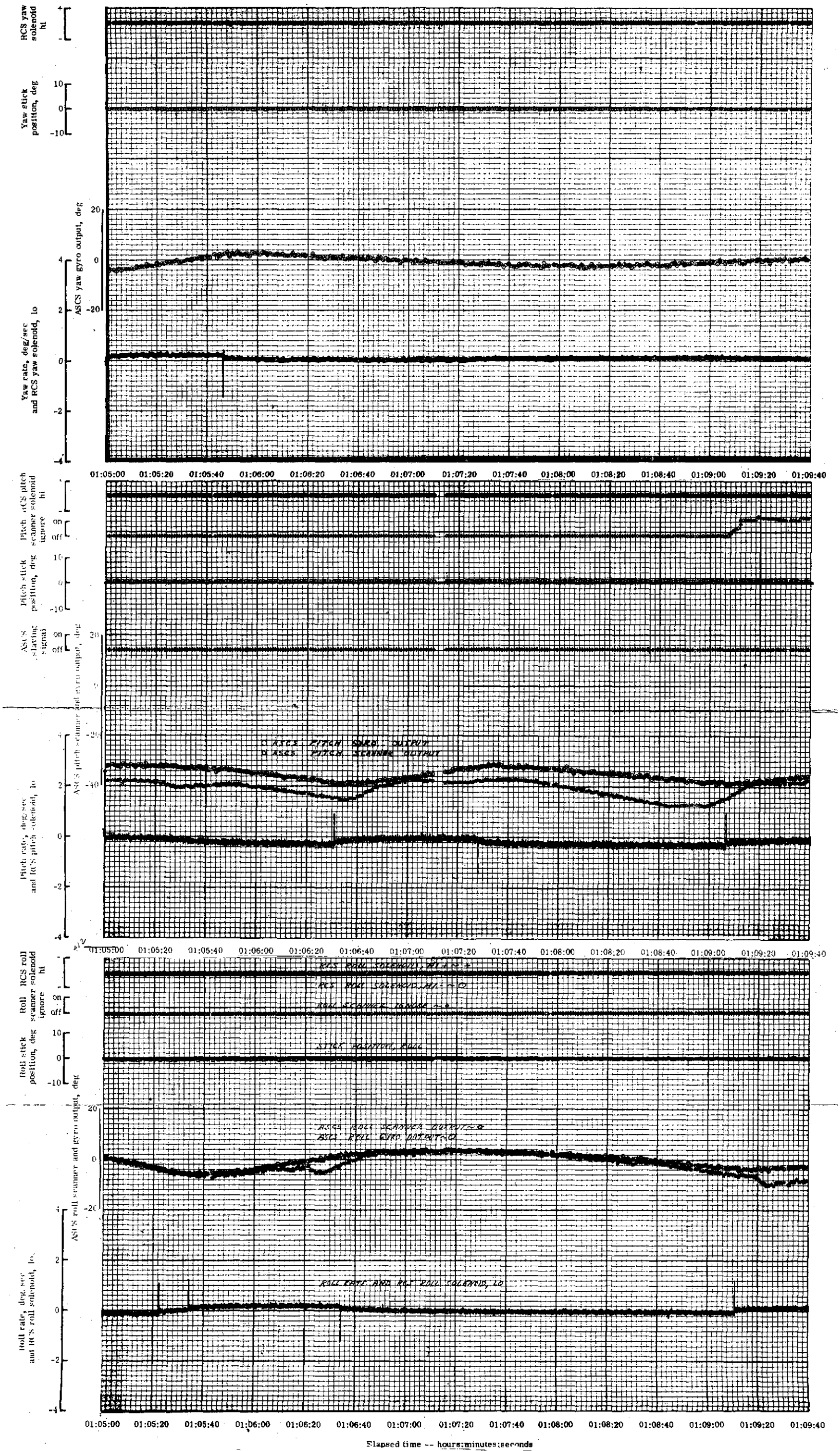


Figure 17.- MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

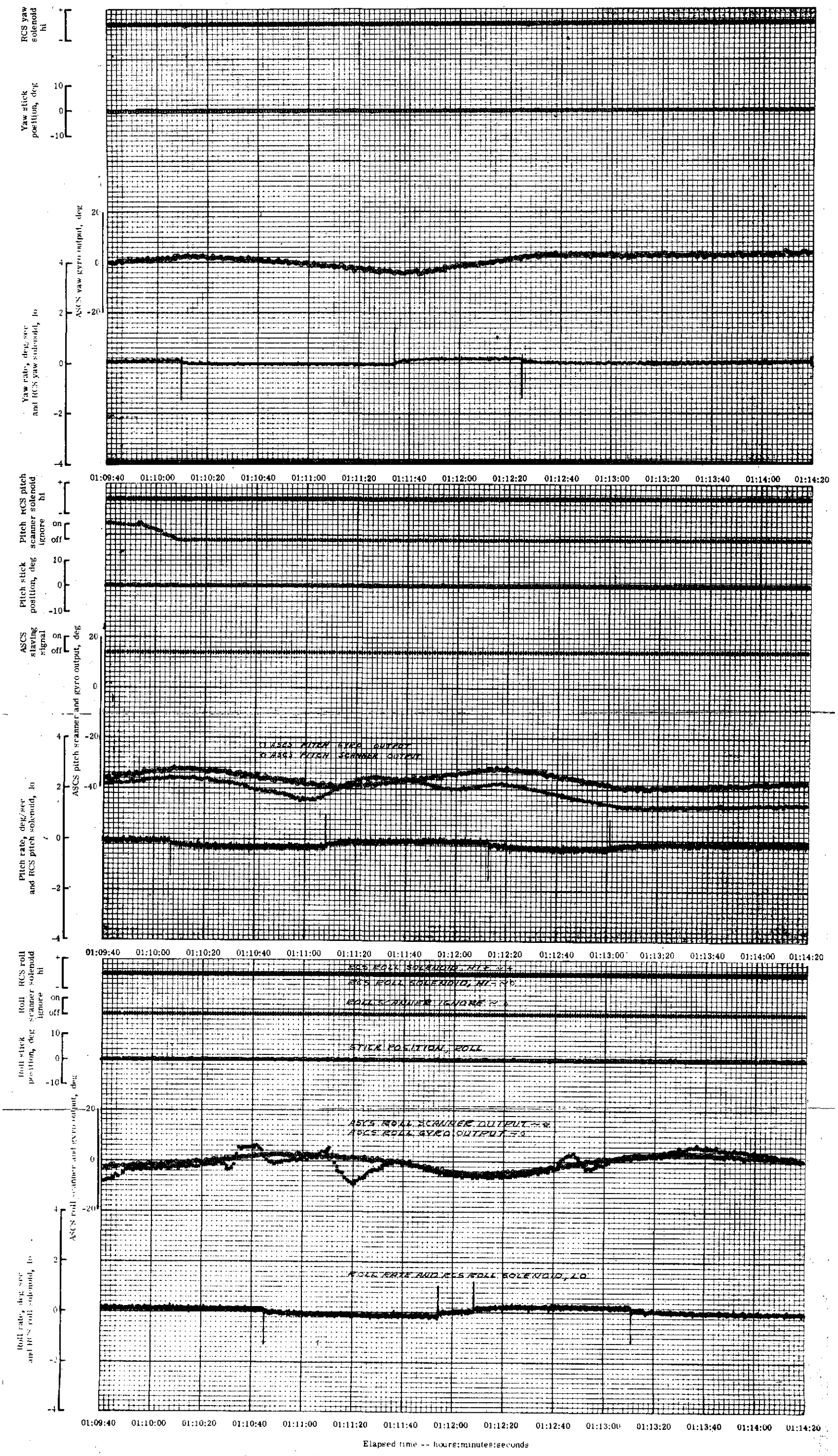


Figure 18.- MA-6 Automatic stabilization and control system.

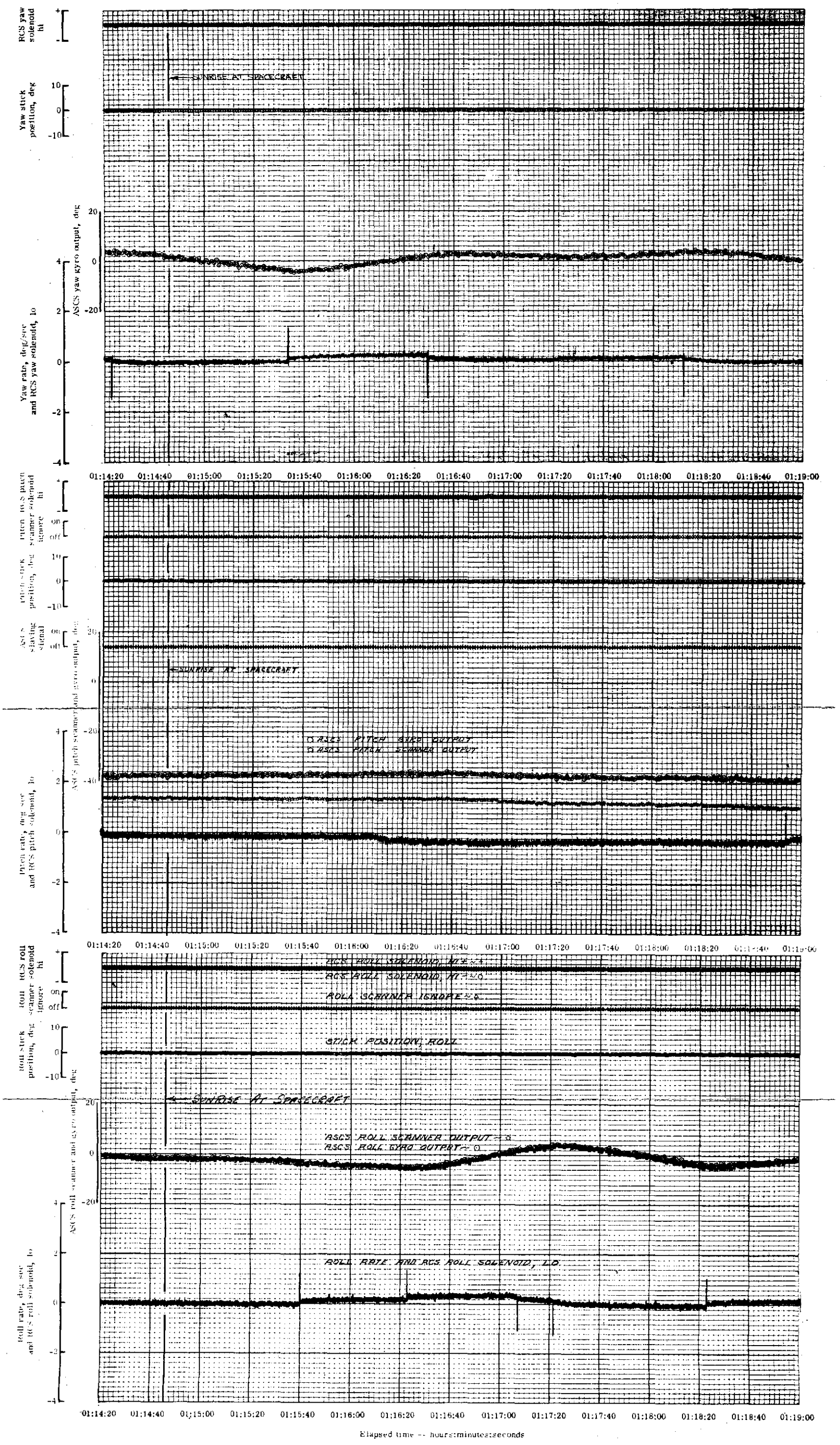


Figure 19.- MA-6 Automatic stabilization and control system.

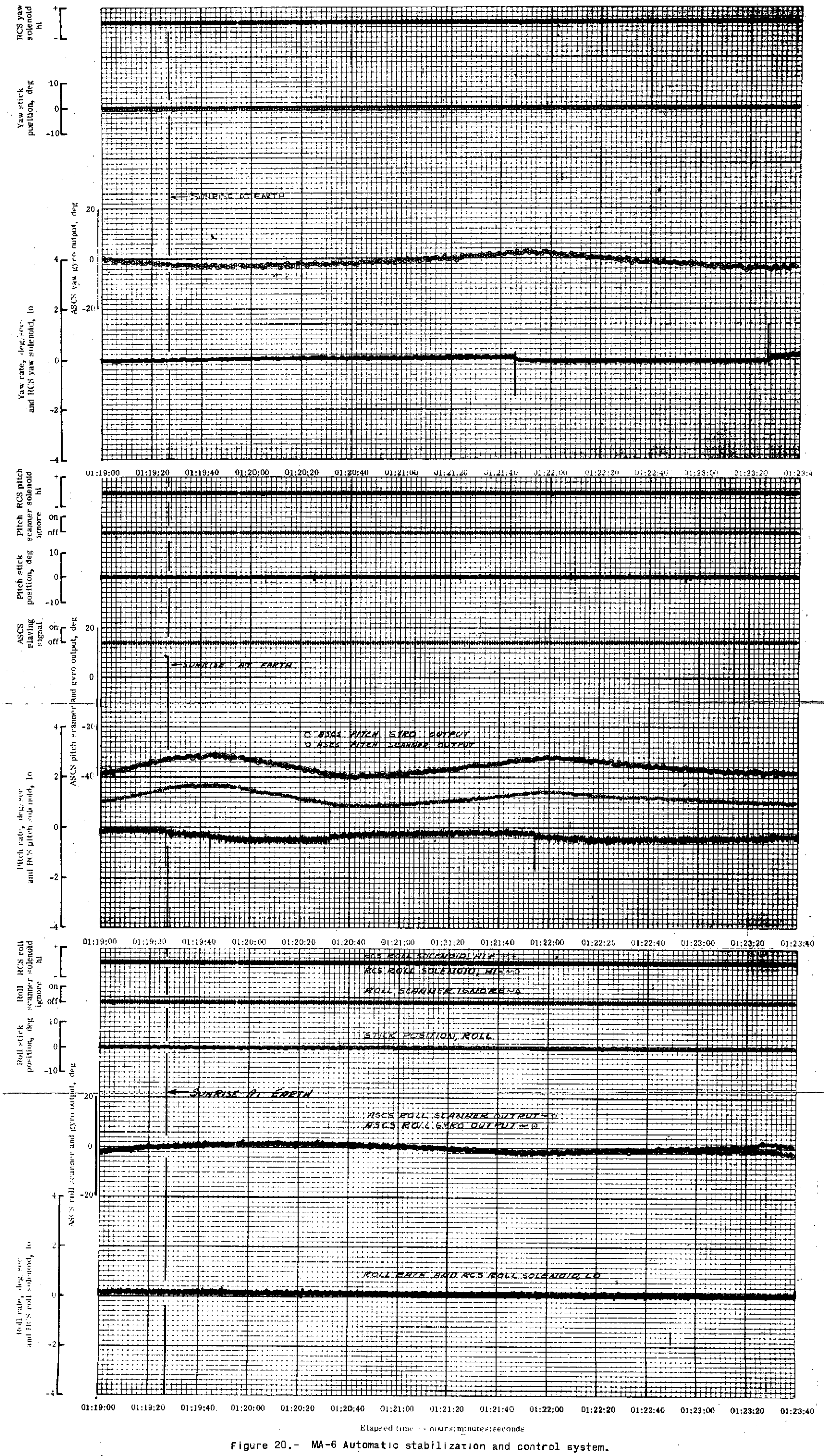


Figure 20.- MA-6 Automatic stabilization and control system.

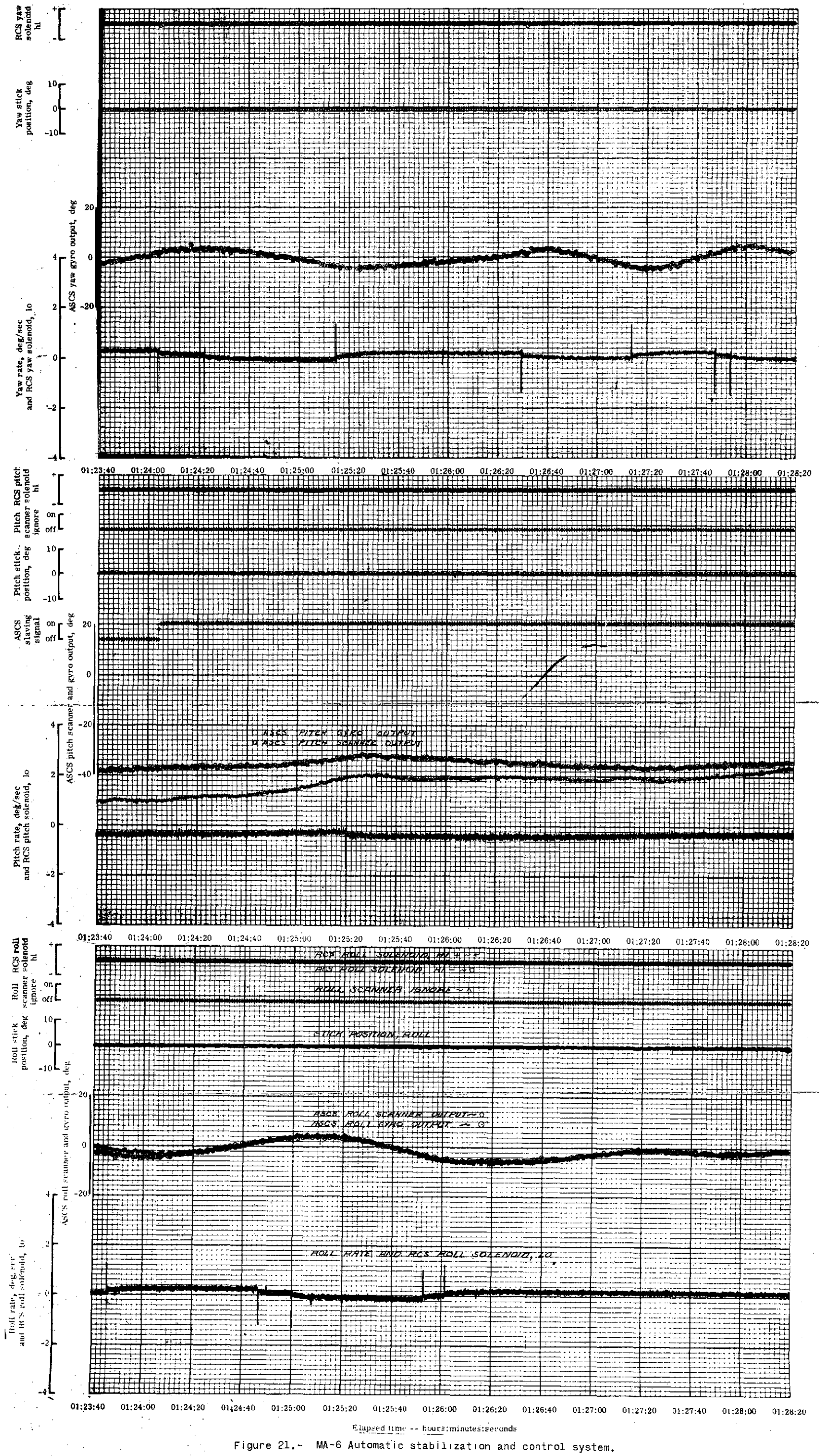


Figure 21.- MA-6 Automatic stabilization and control system.

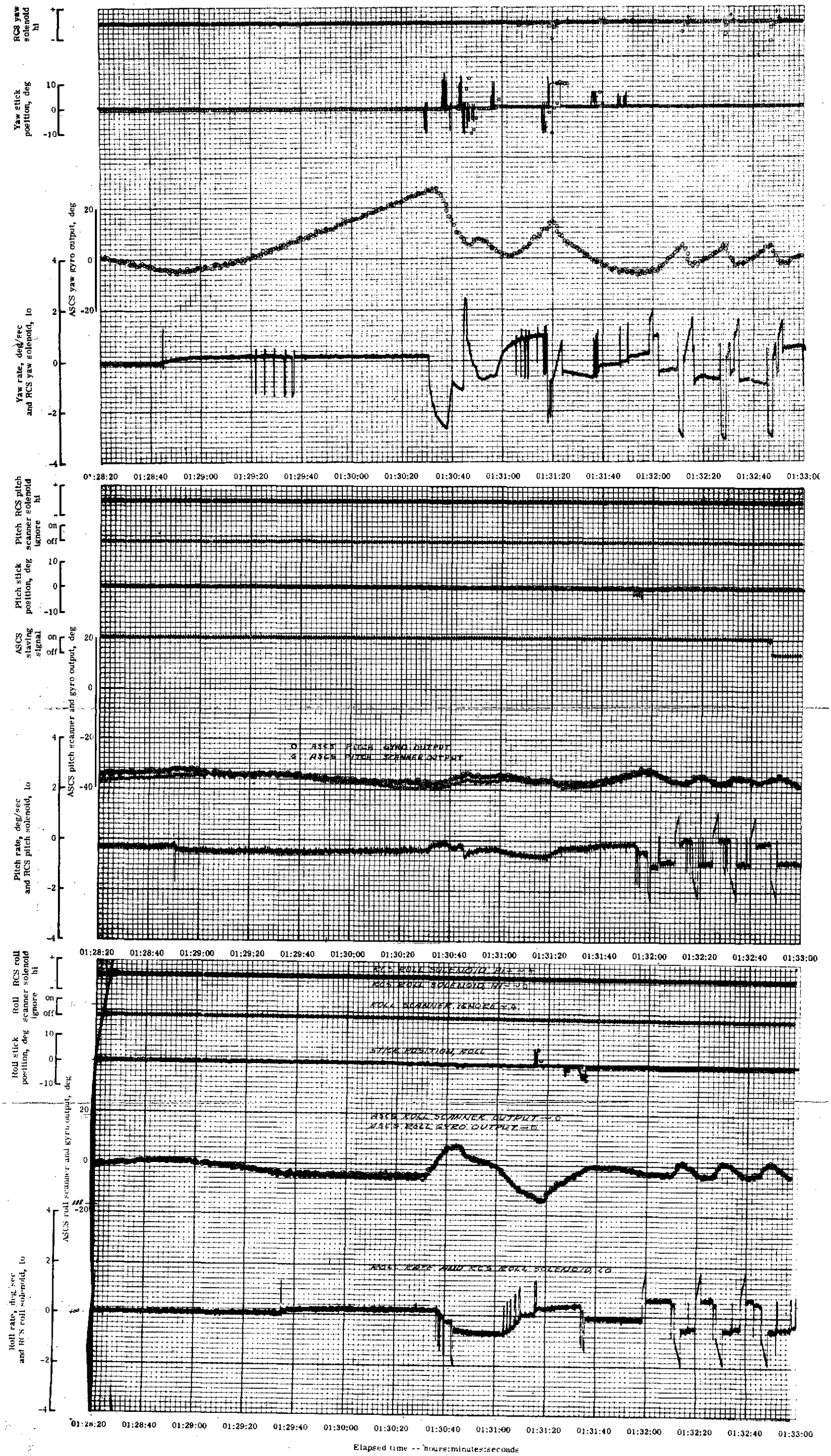


Figure 22.- MA-6 Automatic stabilization and control system.

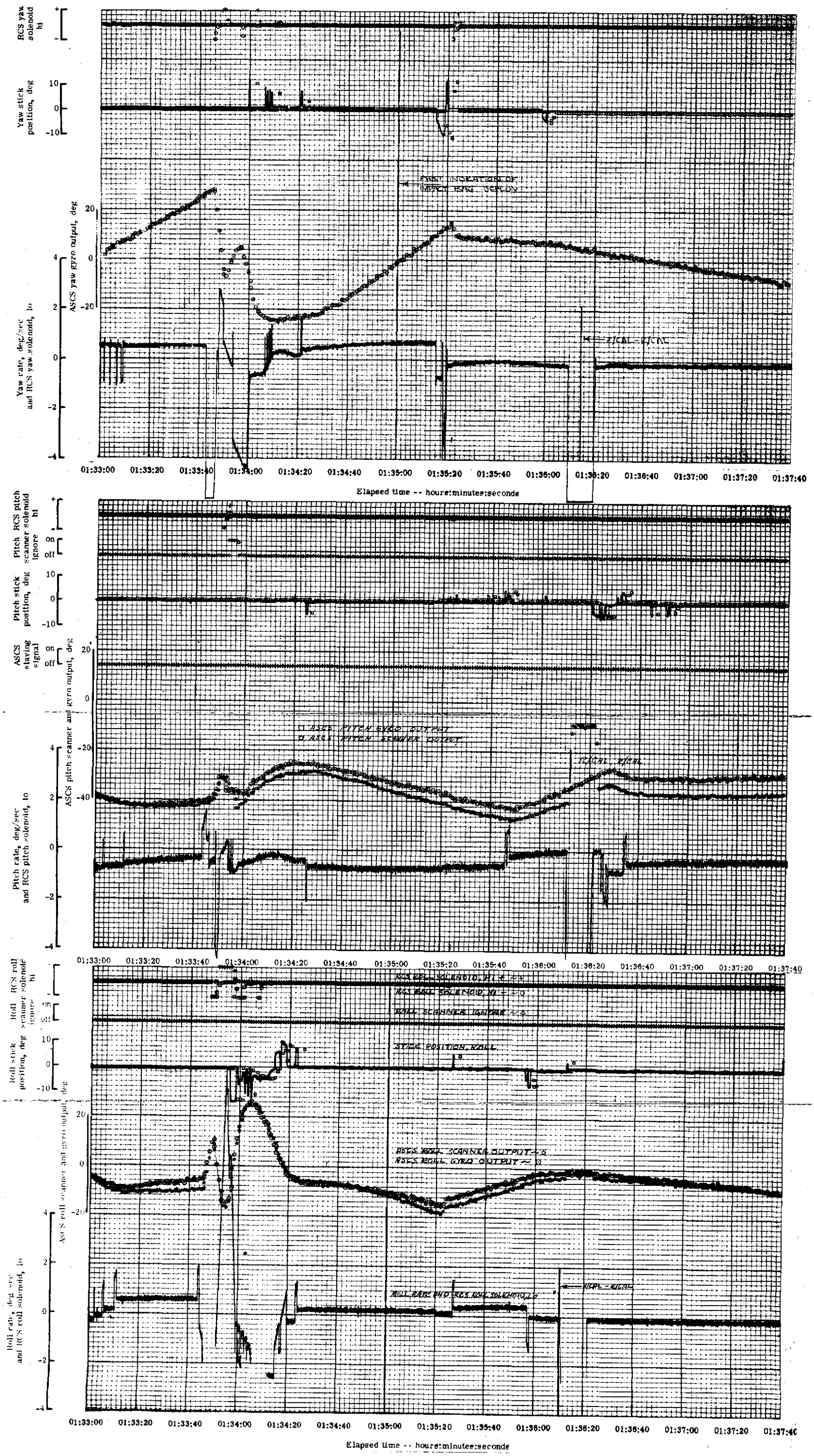


Figure 23.- MA-6 Automatic stabilization and control system.

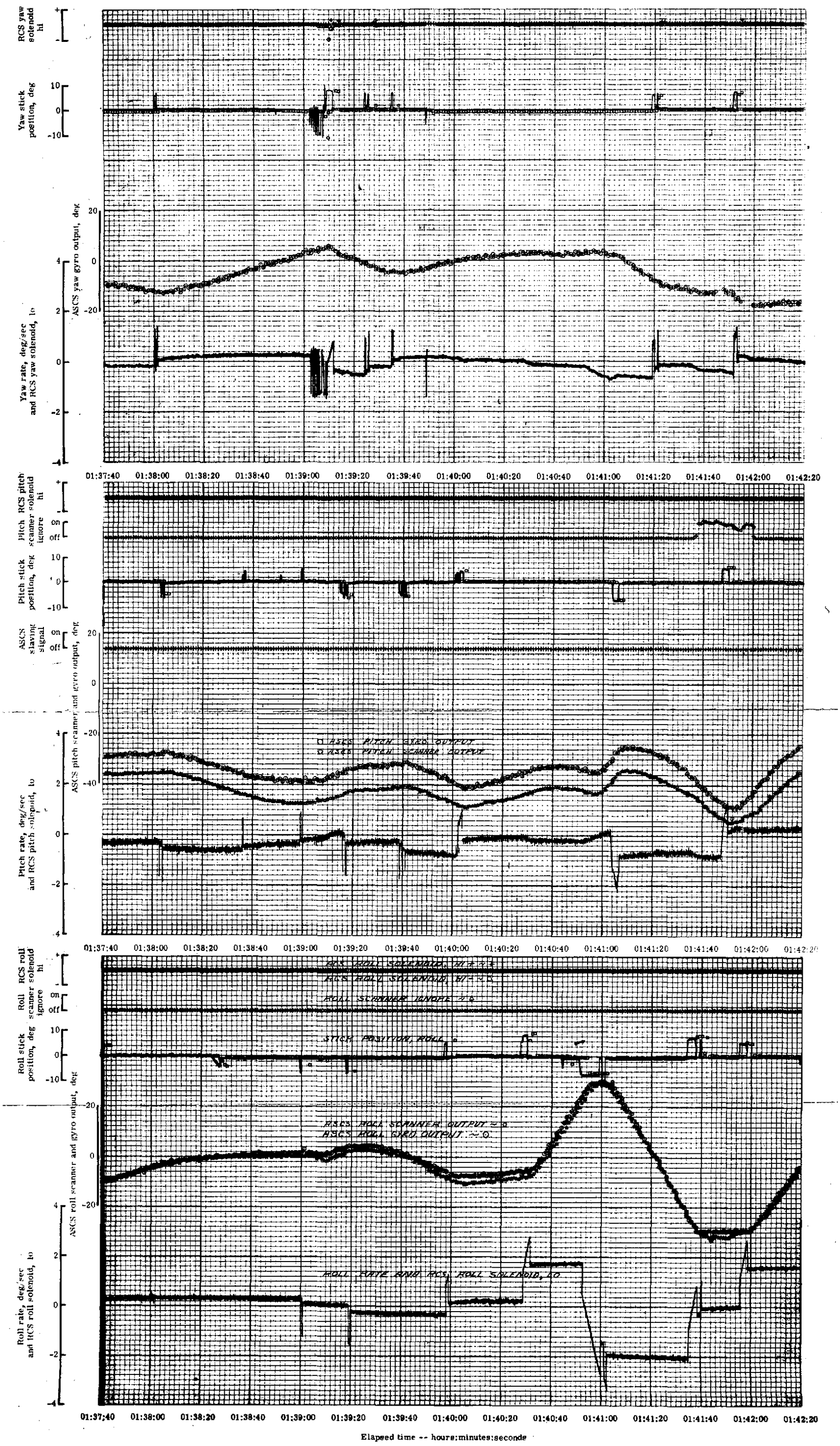


Figure 24.- MA-6 Automatic stabilization and control system.

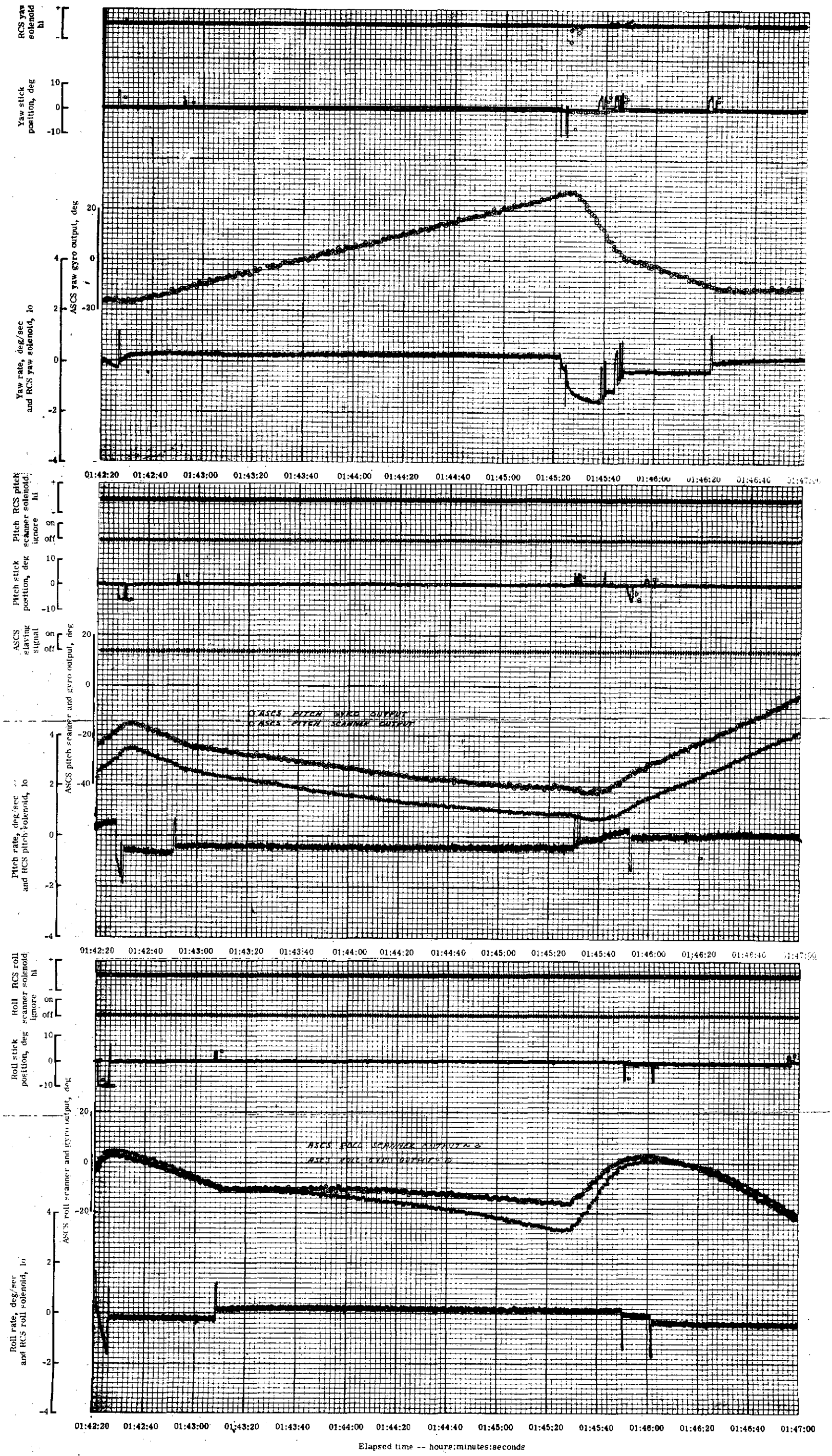


Figure 25.- MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

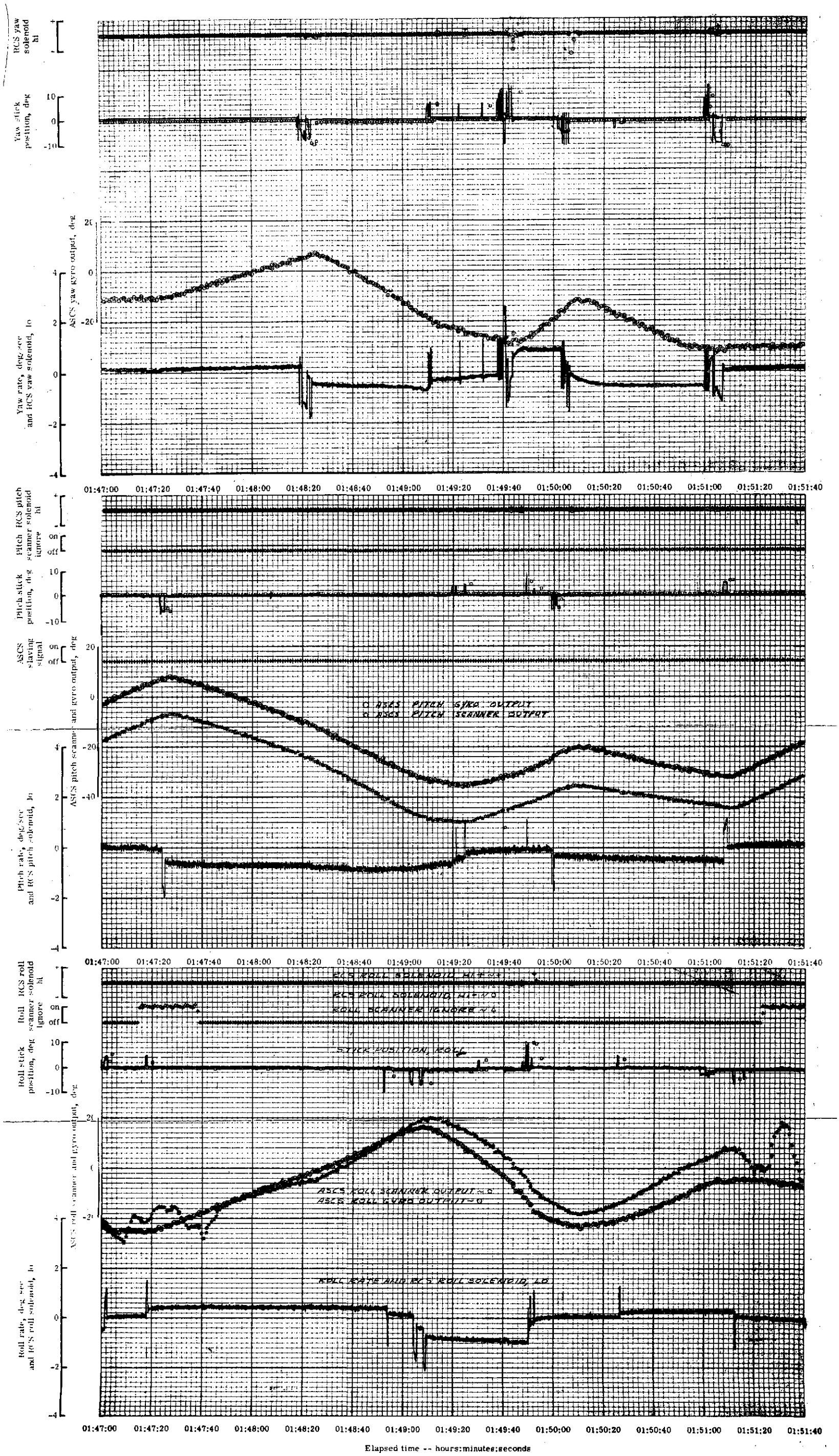


Figure 26.- MA-6 Automatic stabilization and control system.

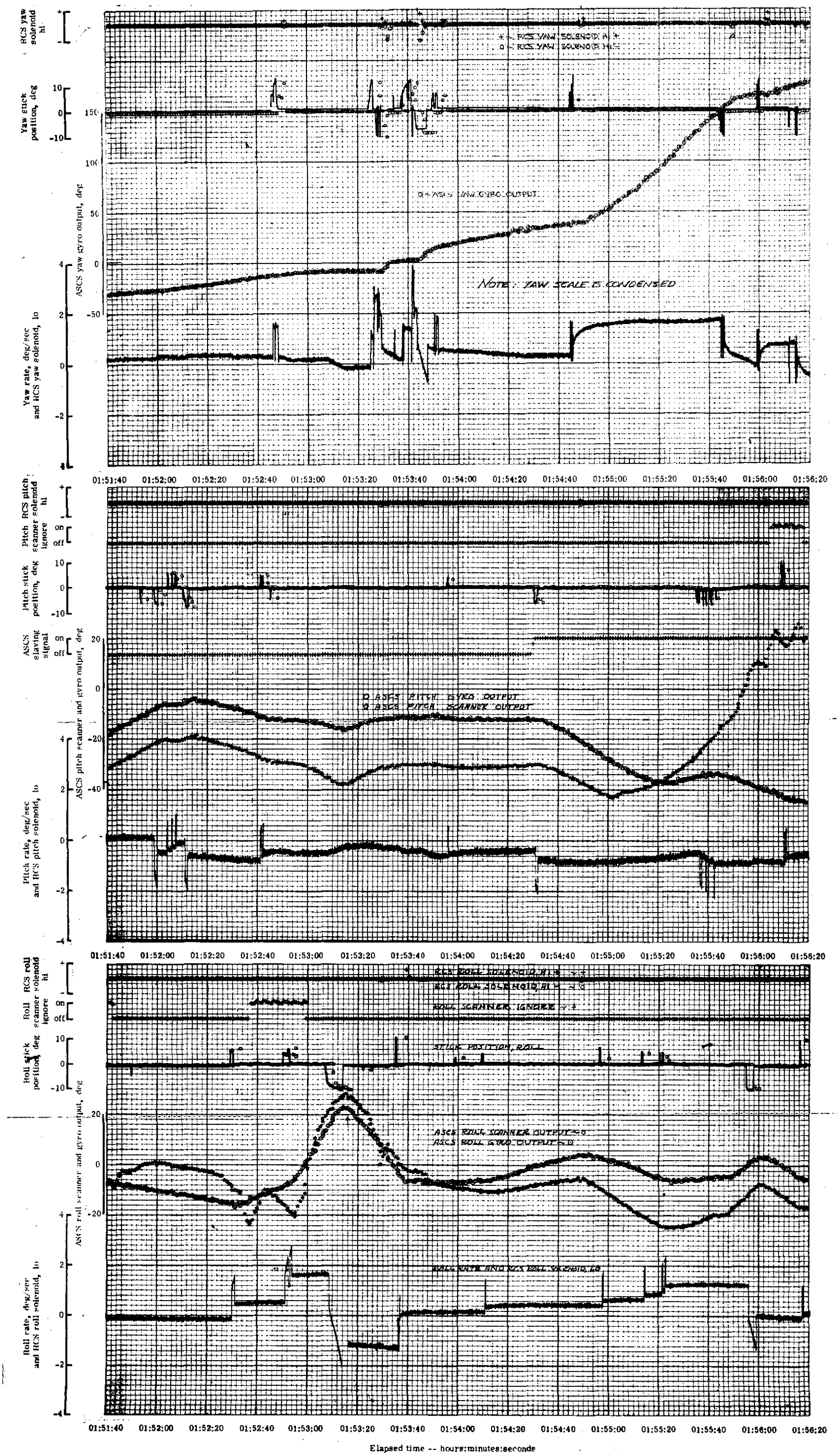


Figure 27.- MA-6 Automatic stabilization and control system.

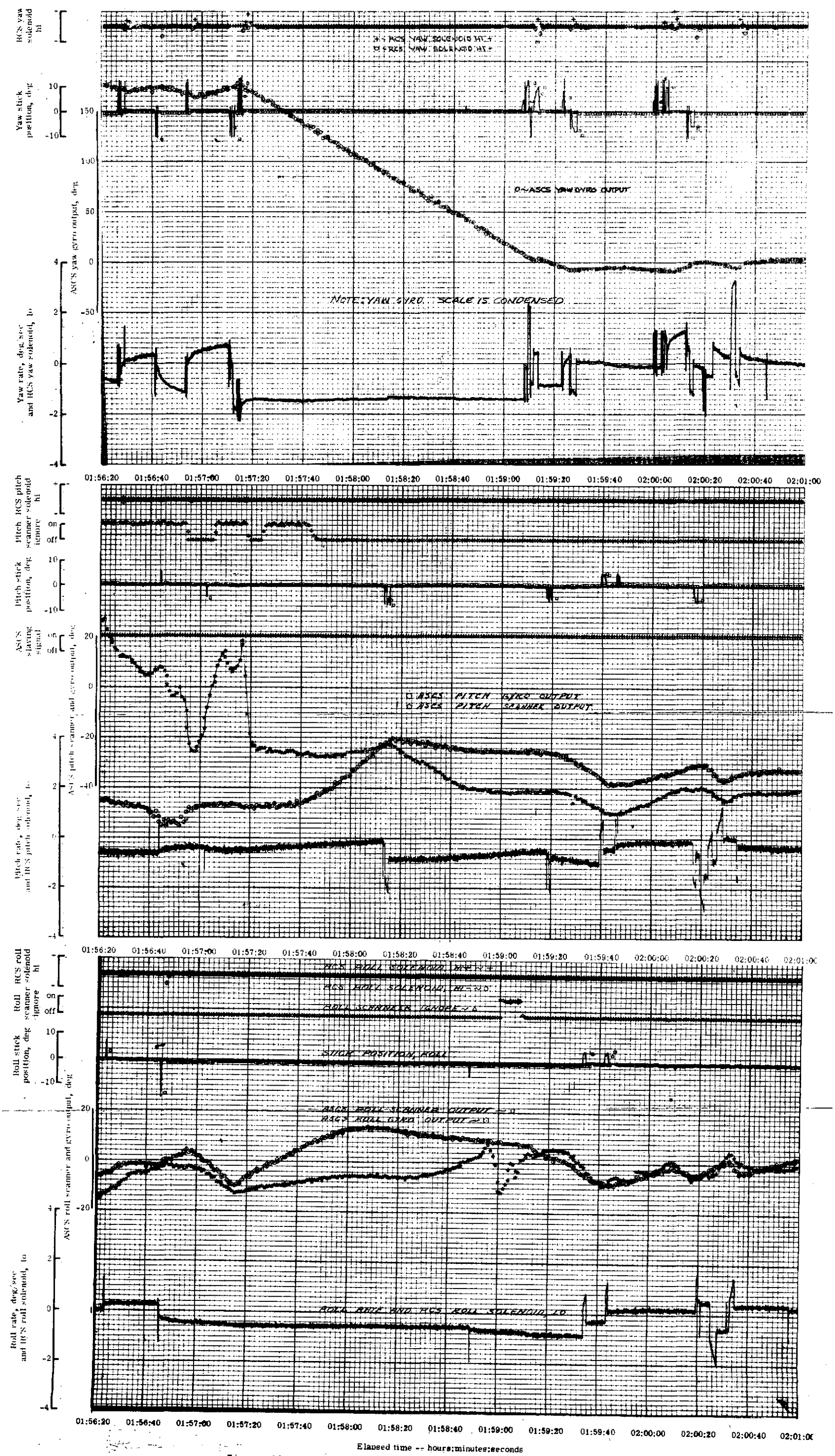


Figure 28.- MA-6 Automatic stabilization and control system.

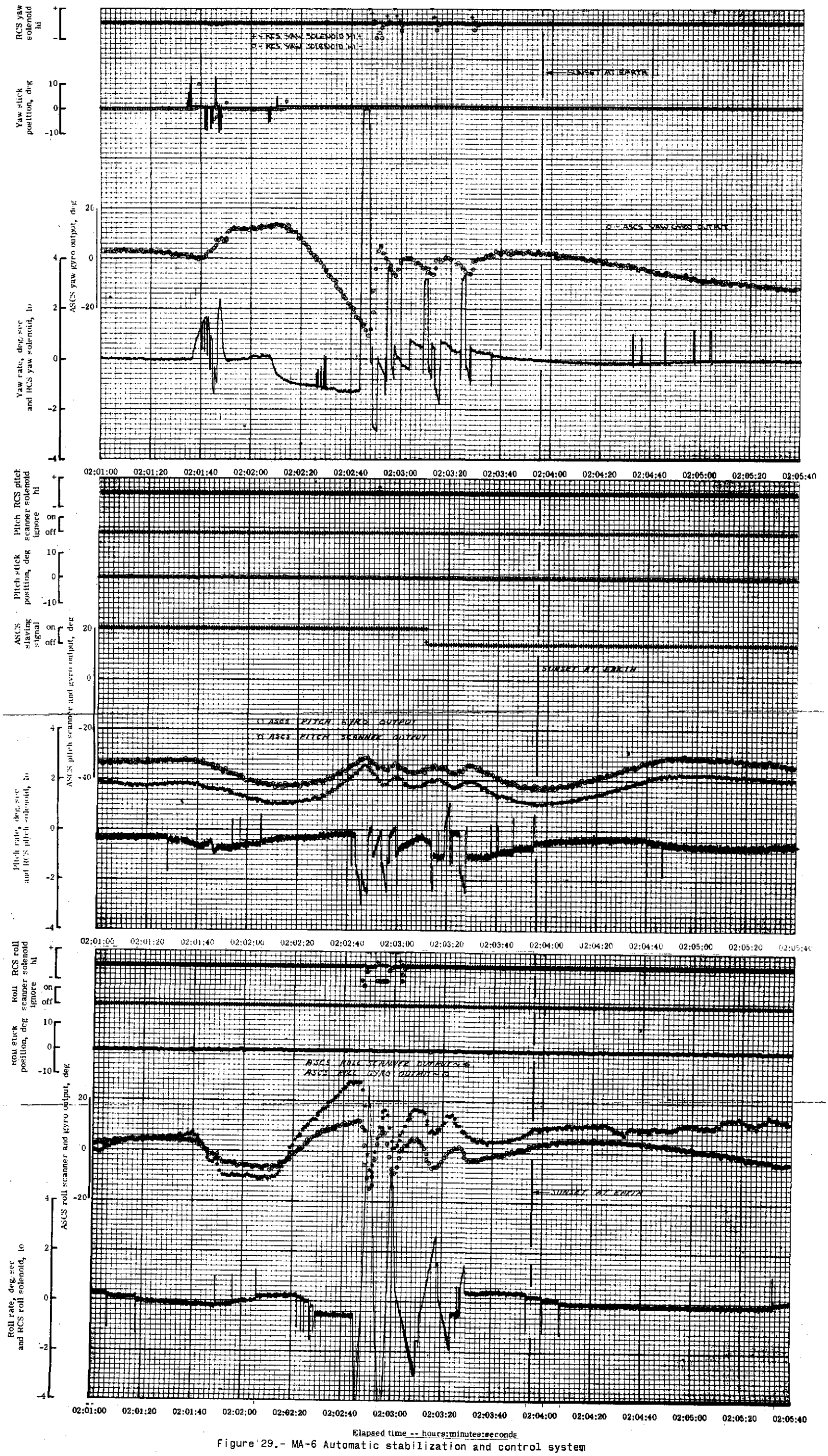


Figure 29.- MA-6 Automatic stabilization and control system

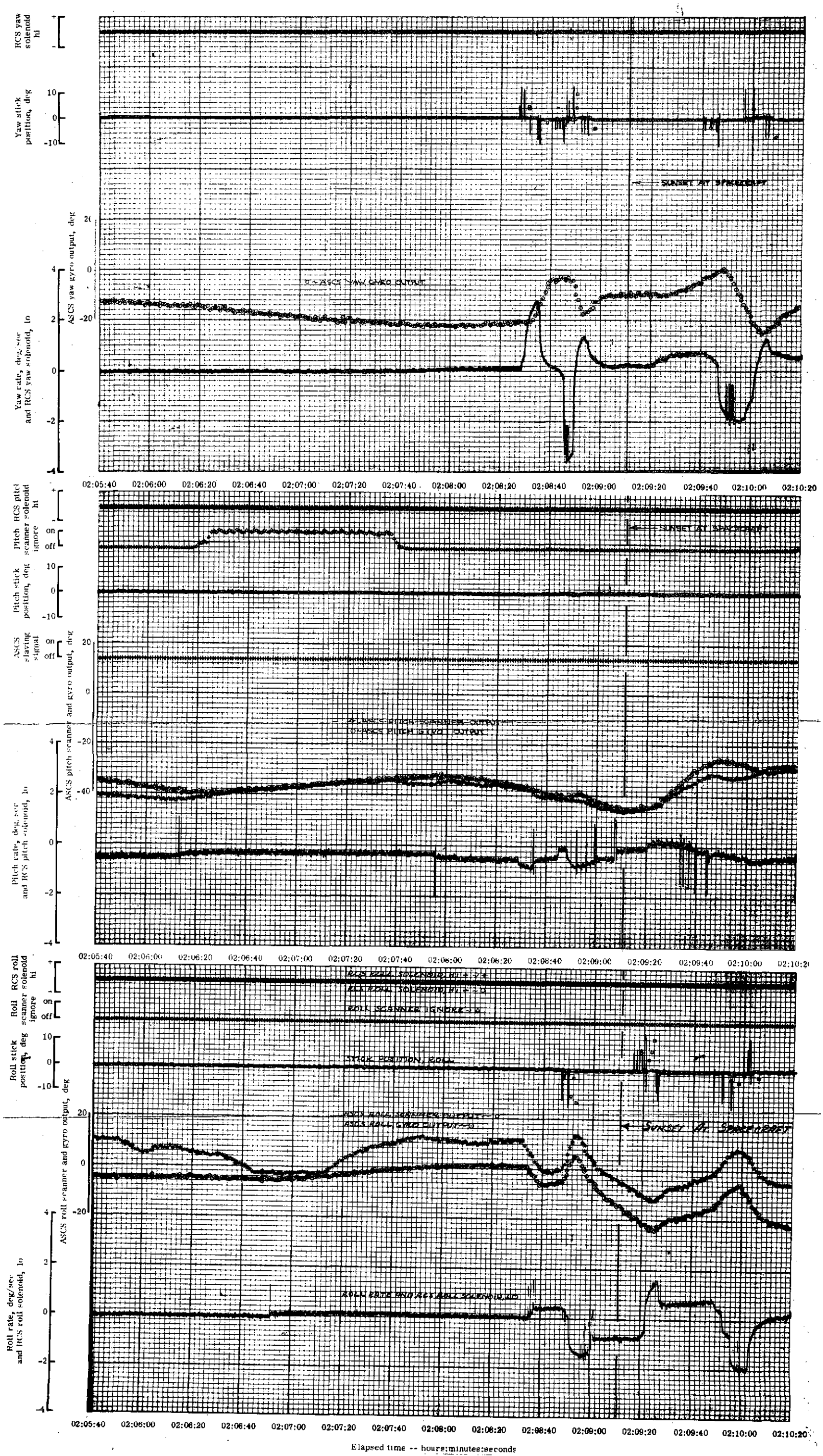


Figure 30.- MA-6 Automatic stabilization and control system.

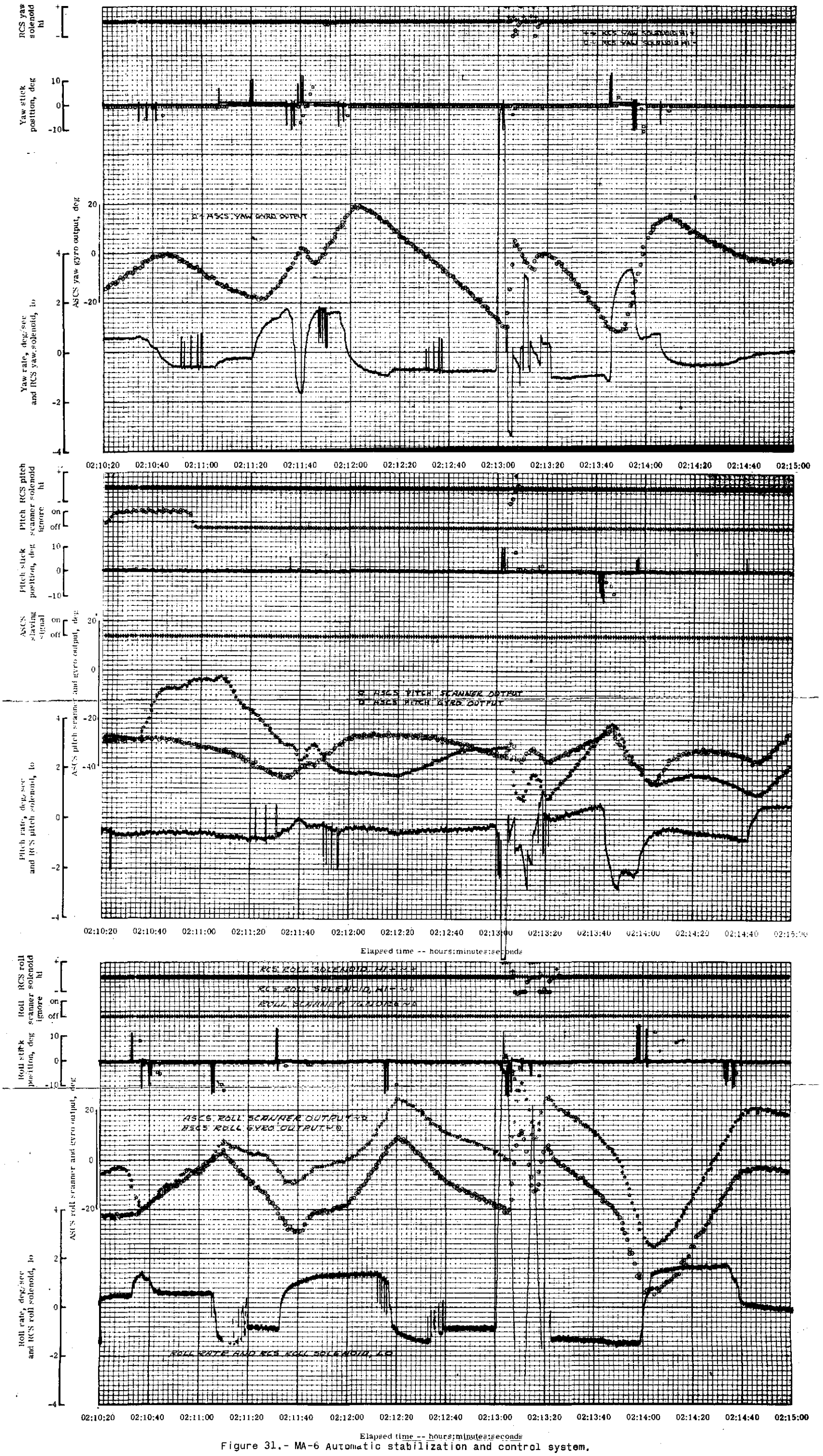


Figure 31.- MA-6 Automatic stabilization and control system.

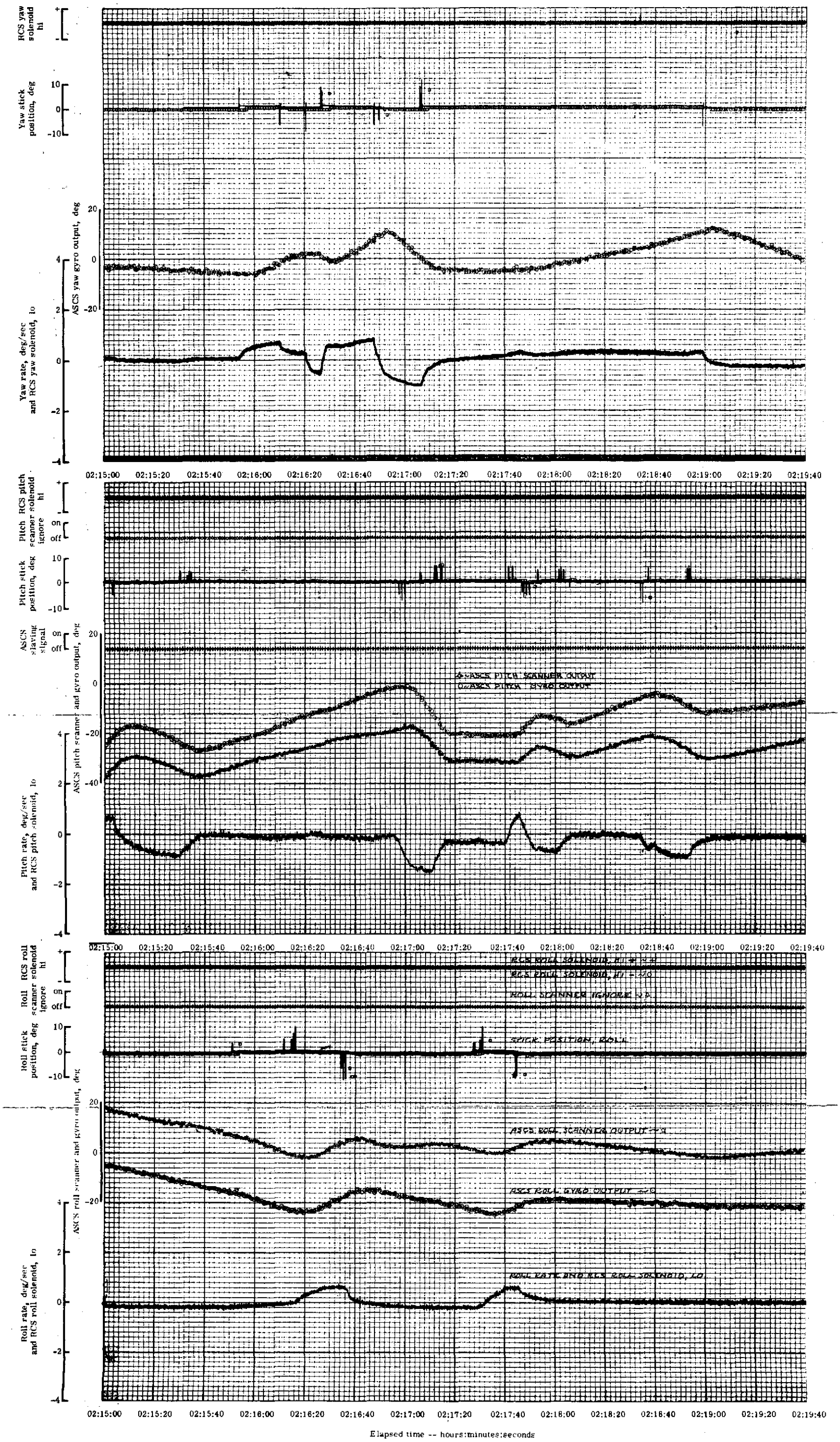


Figure 32.- MA-6 Automatic stabilization and control system.

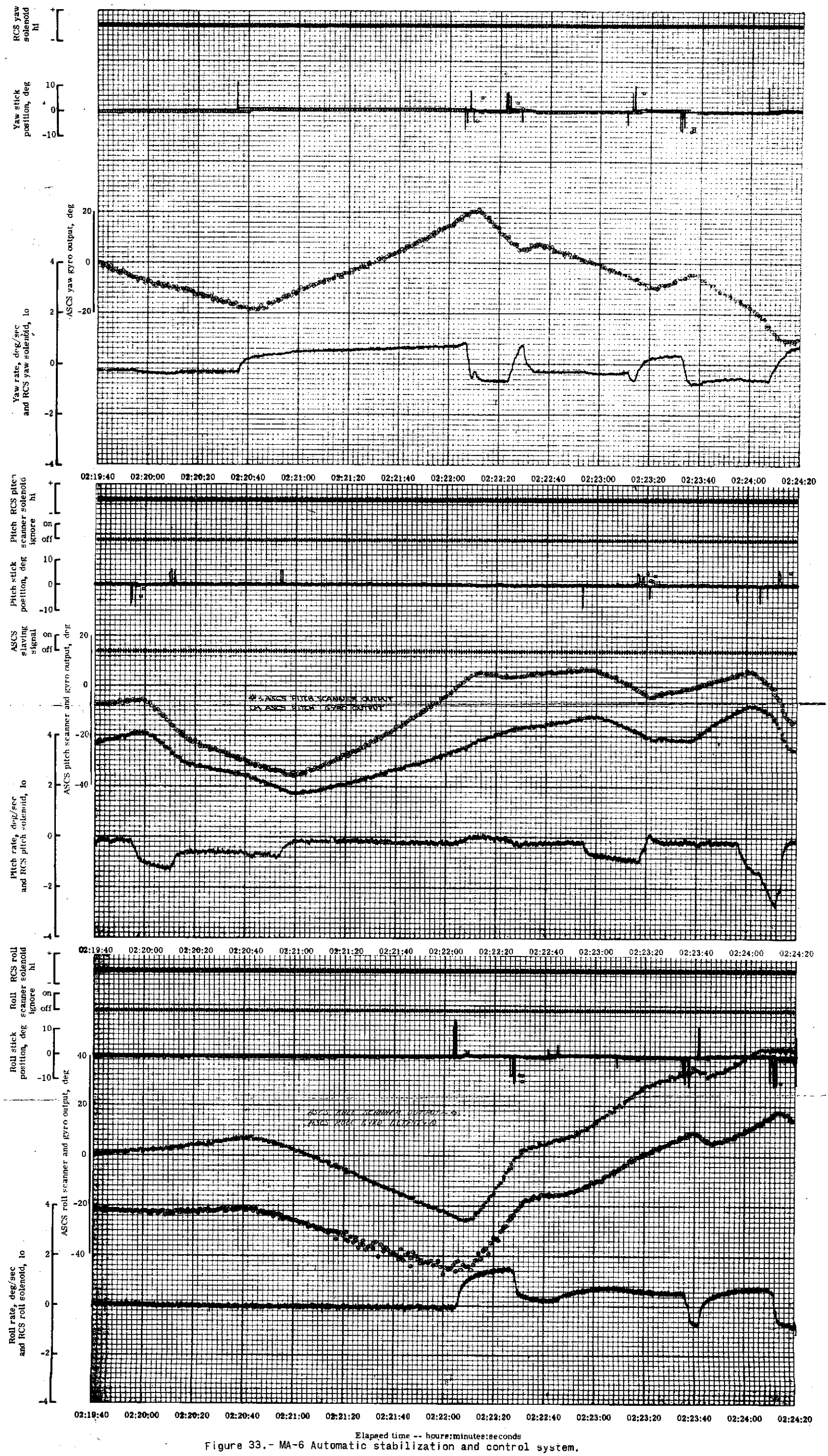


Figure 33.- MA-6 Automatic stabilization and control system.

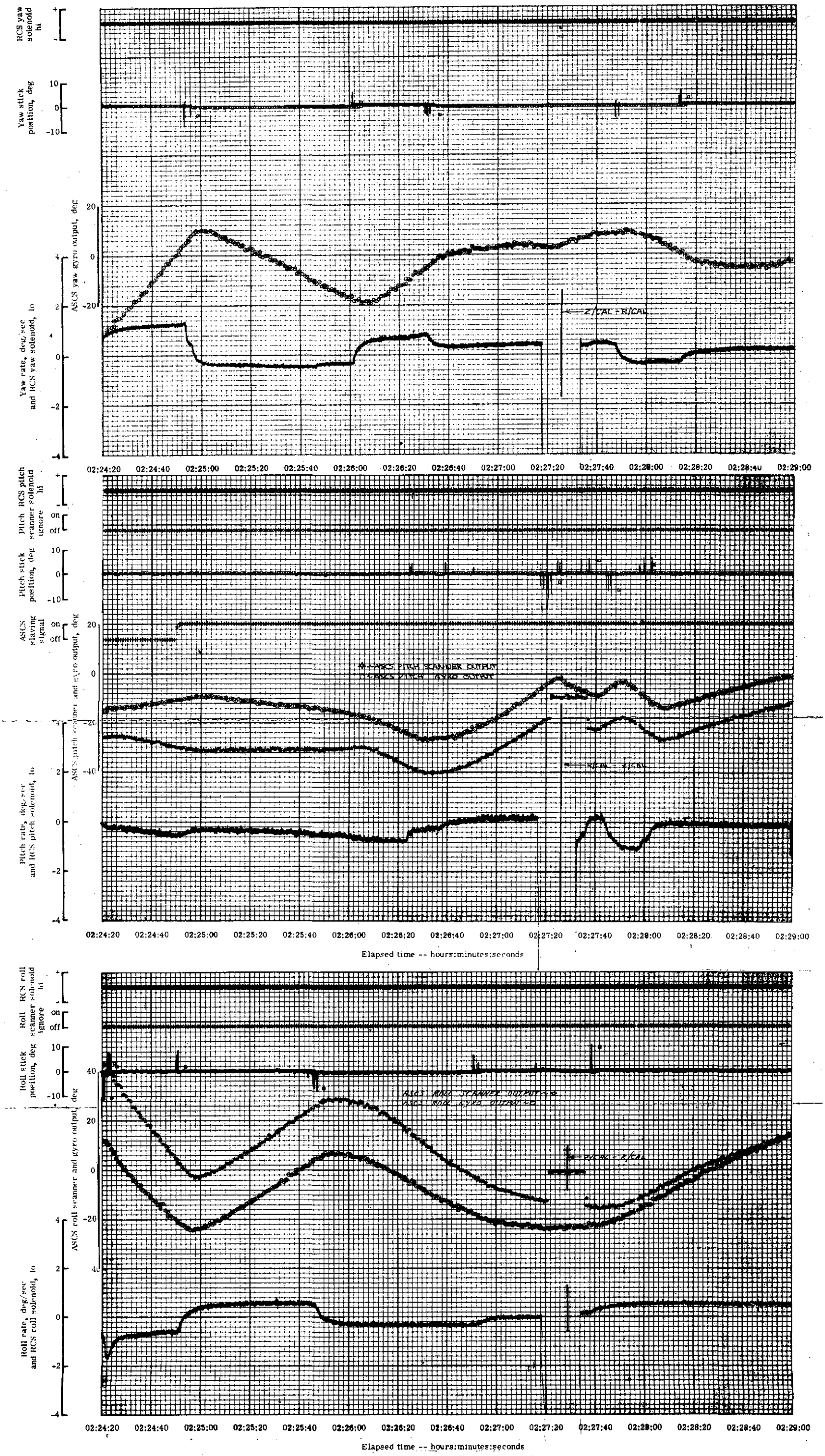


Figure 34.- MA-6 Automatic stabilization and control system.

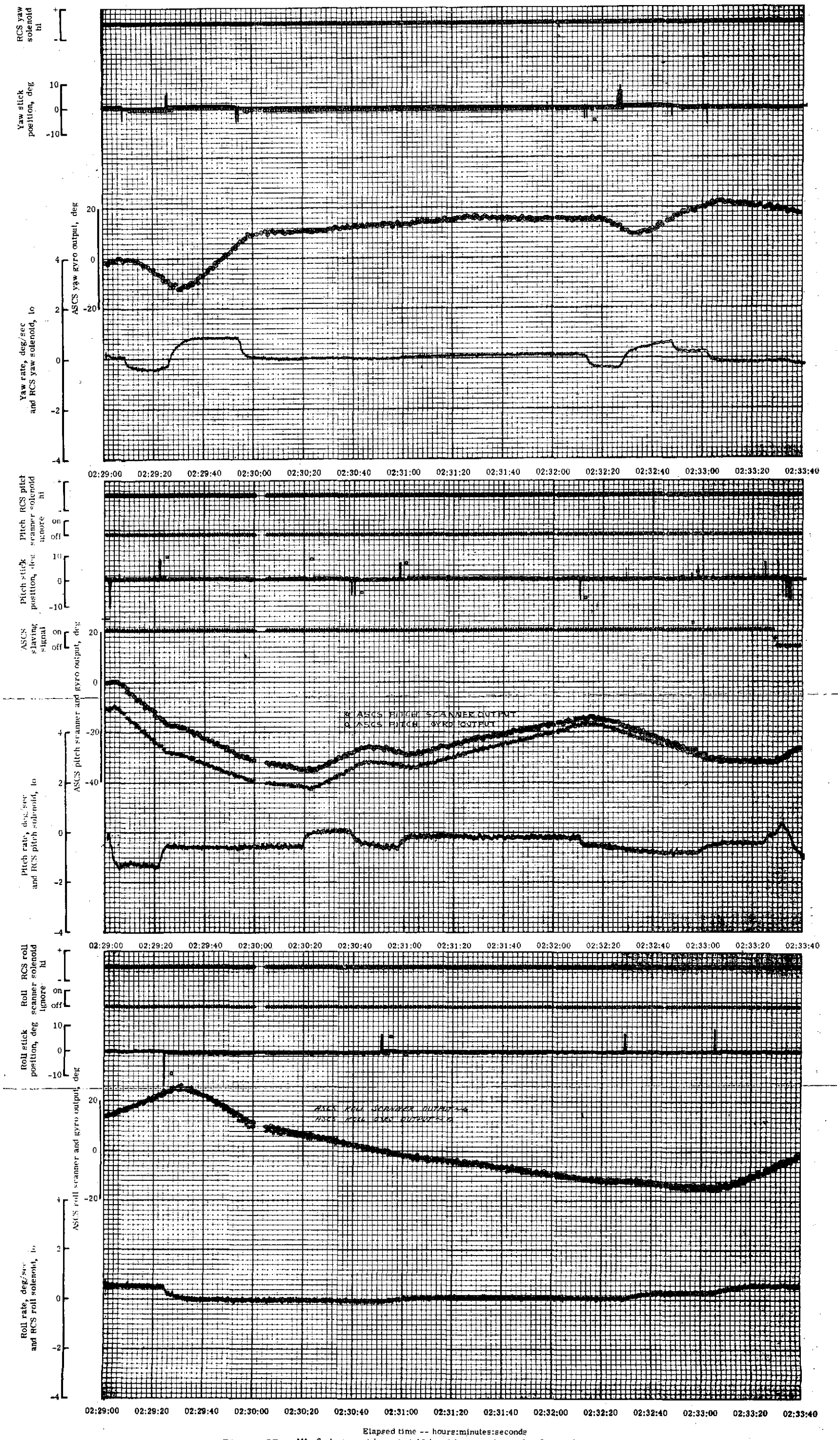


Figure 35.- MA-6 Automatic stabilization and control system.

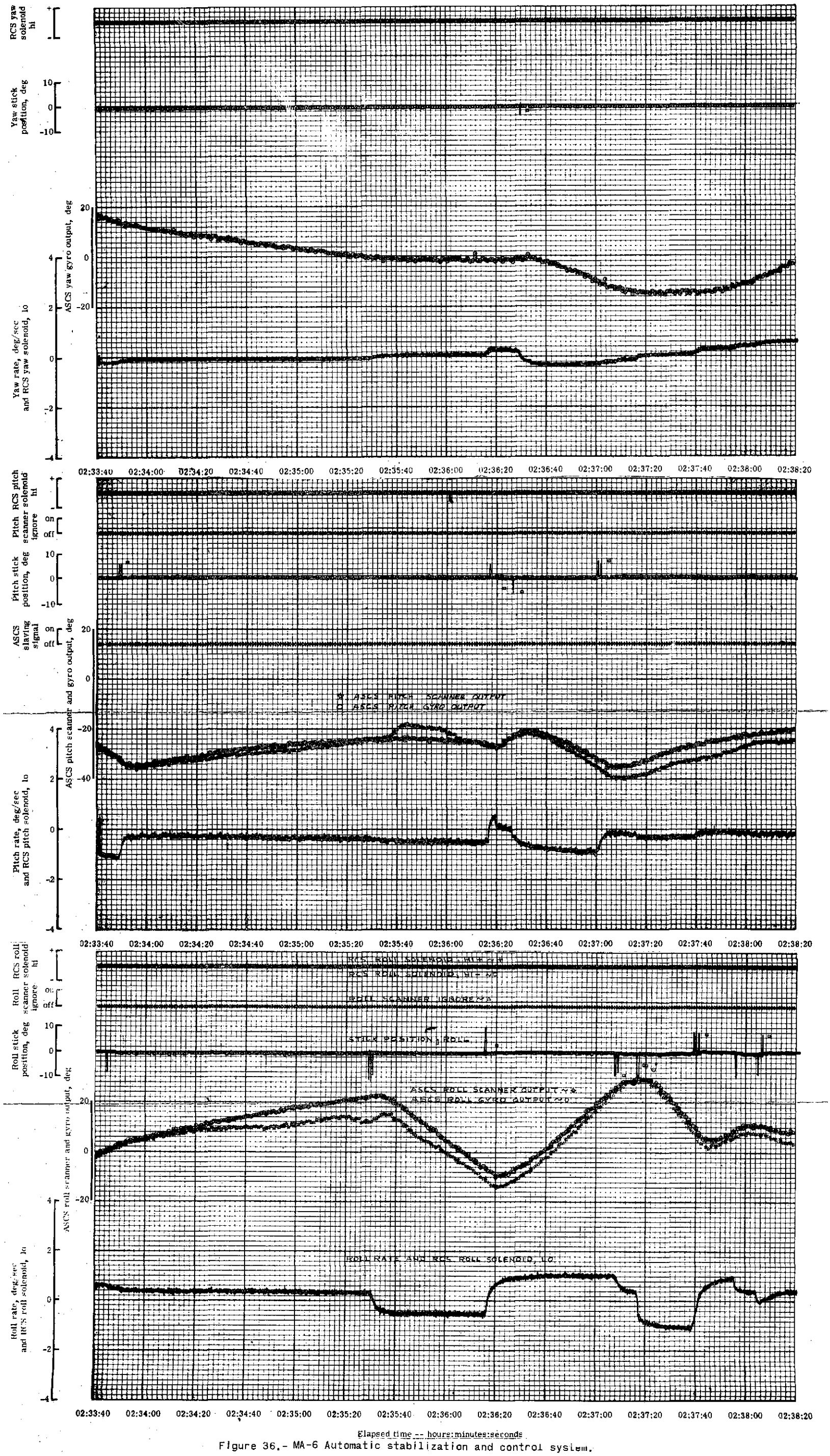


Figure 36.- MA-6 Automatic stabilization and control system.

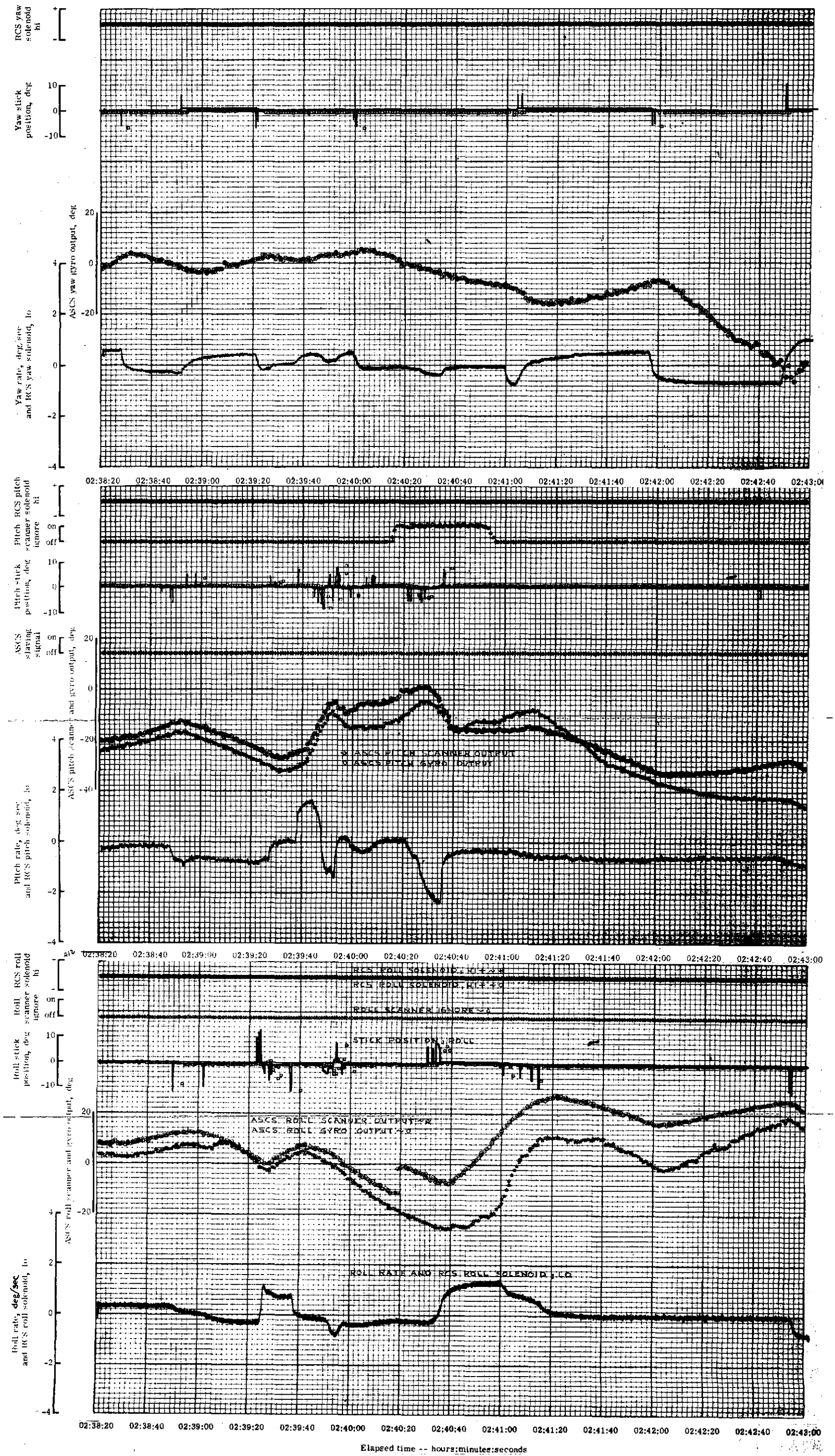


Figure 37.- MA-6 Automatic stabilization and control system.

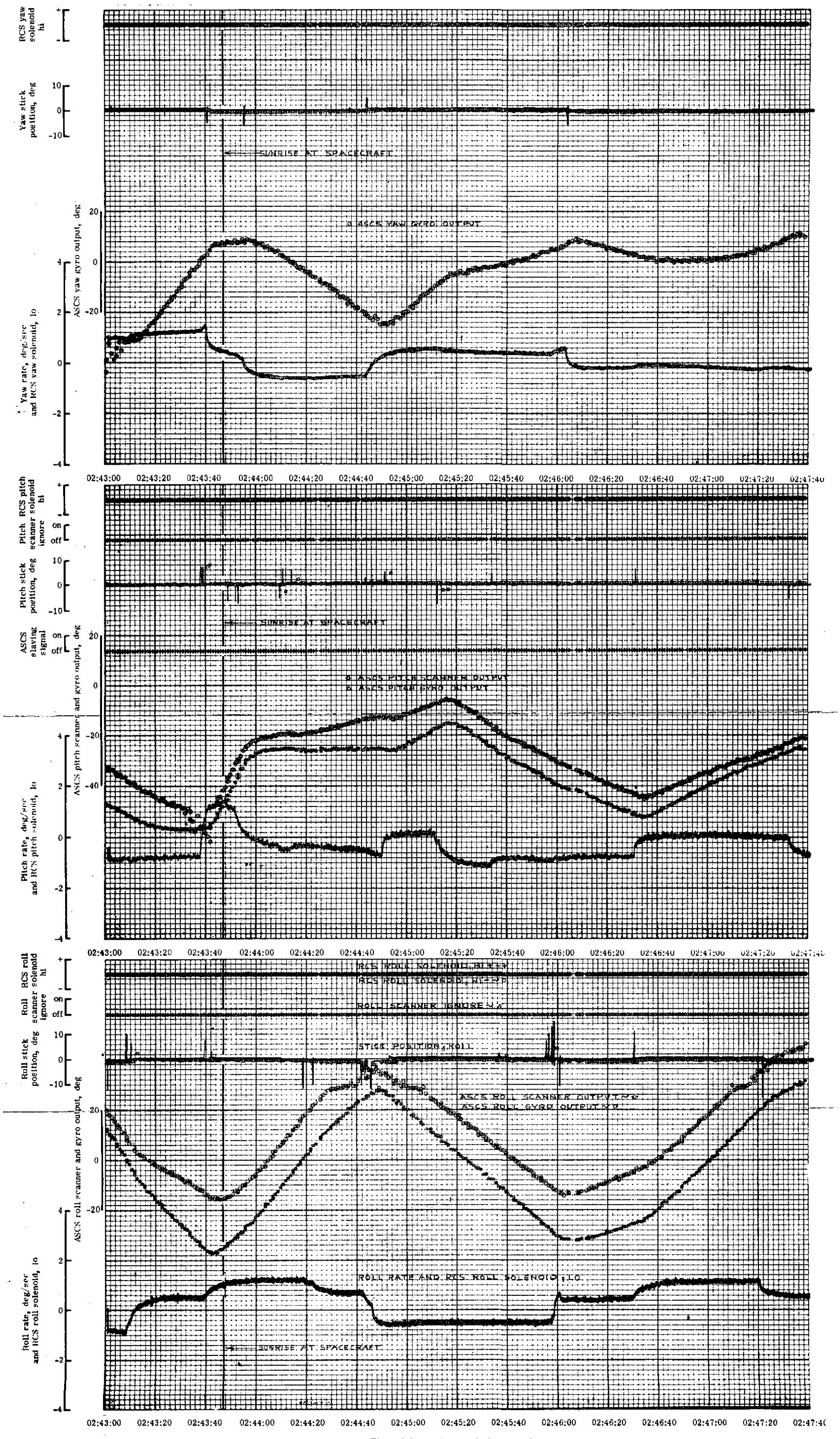
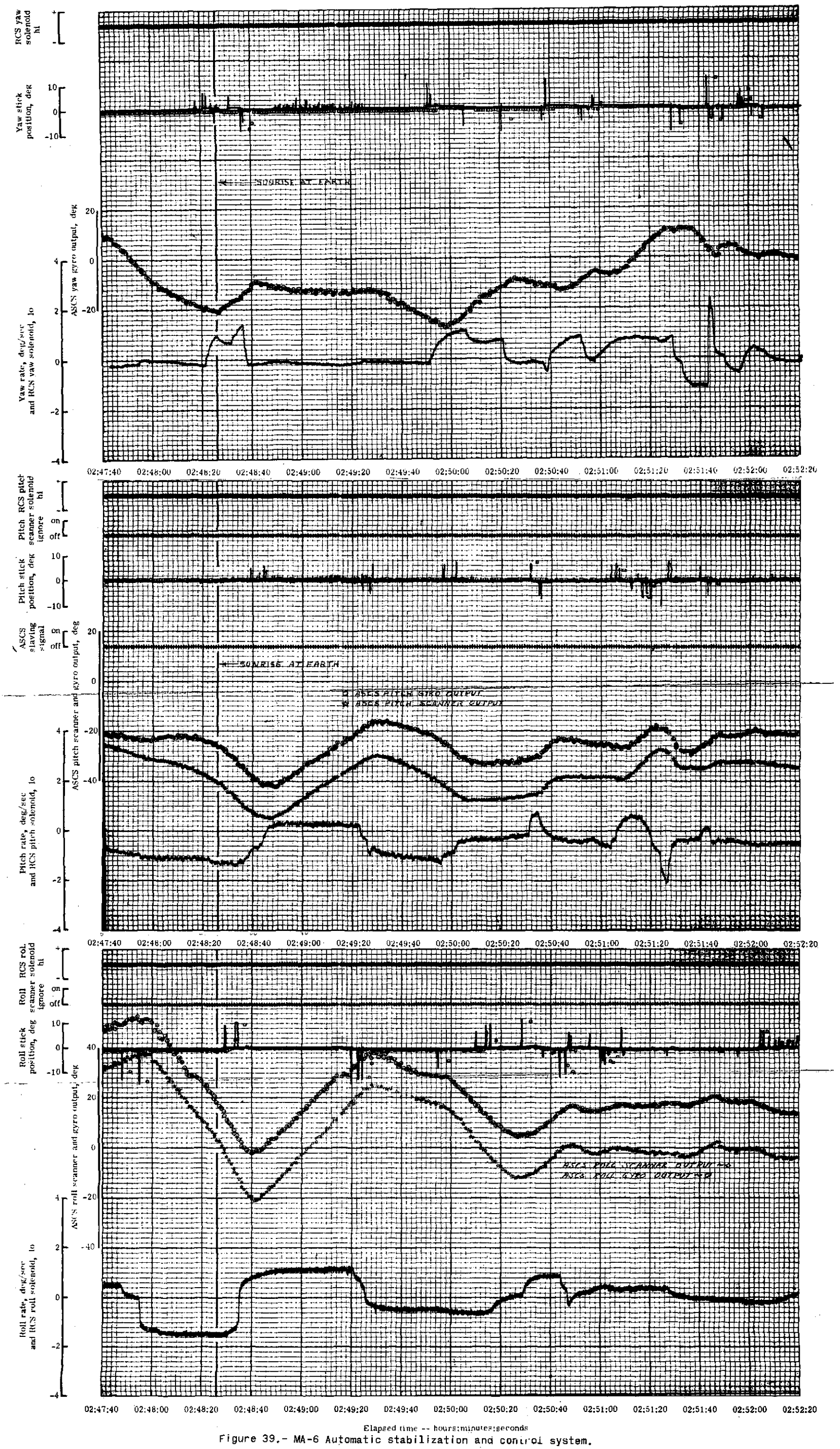


Figure 38.- MA-6 Automatic stabilization and control system.



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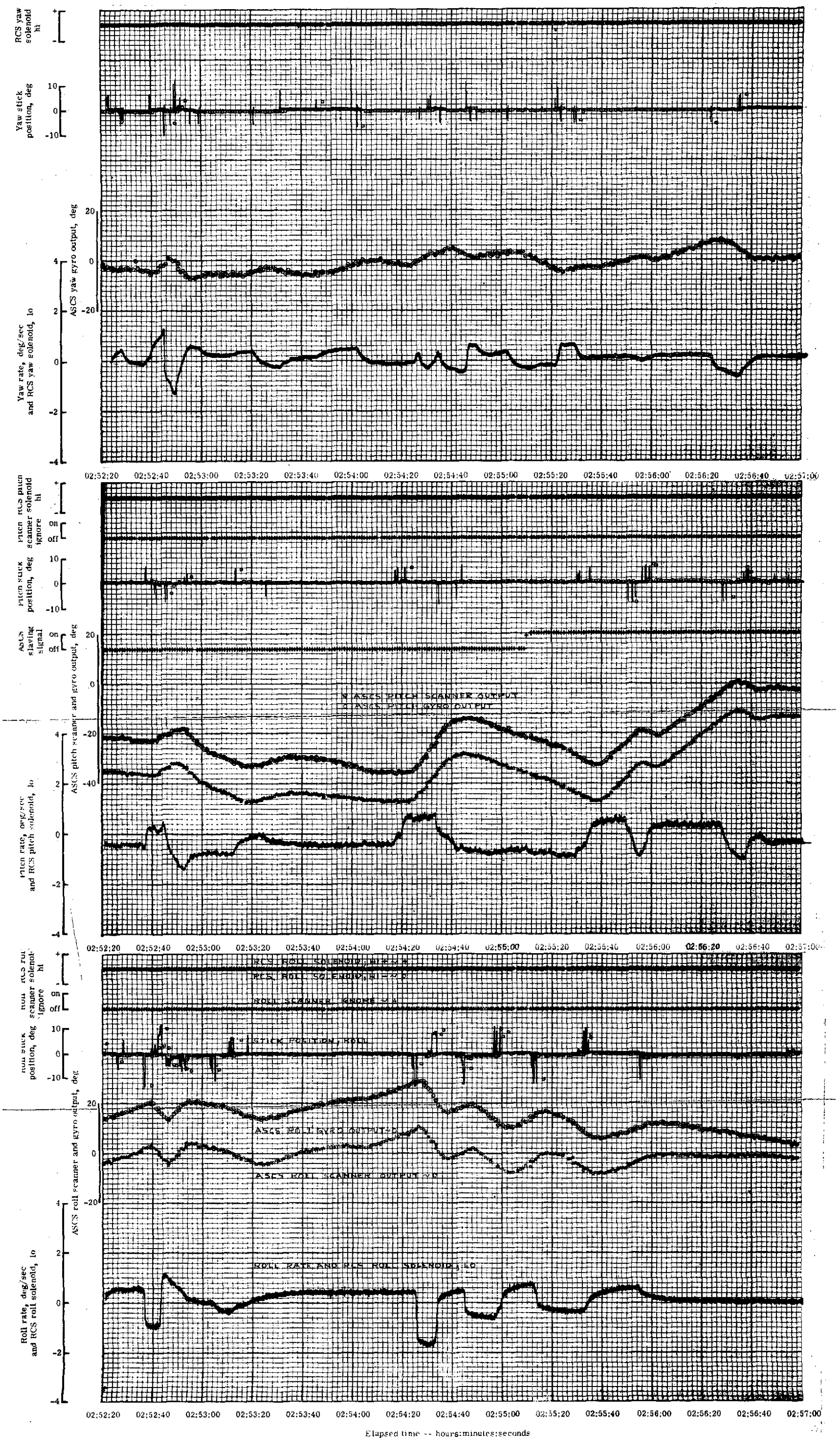

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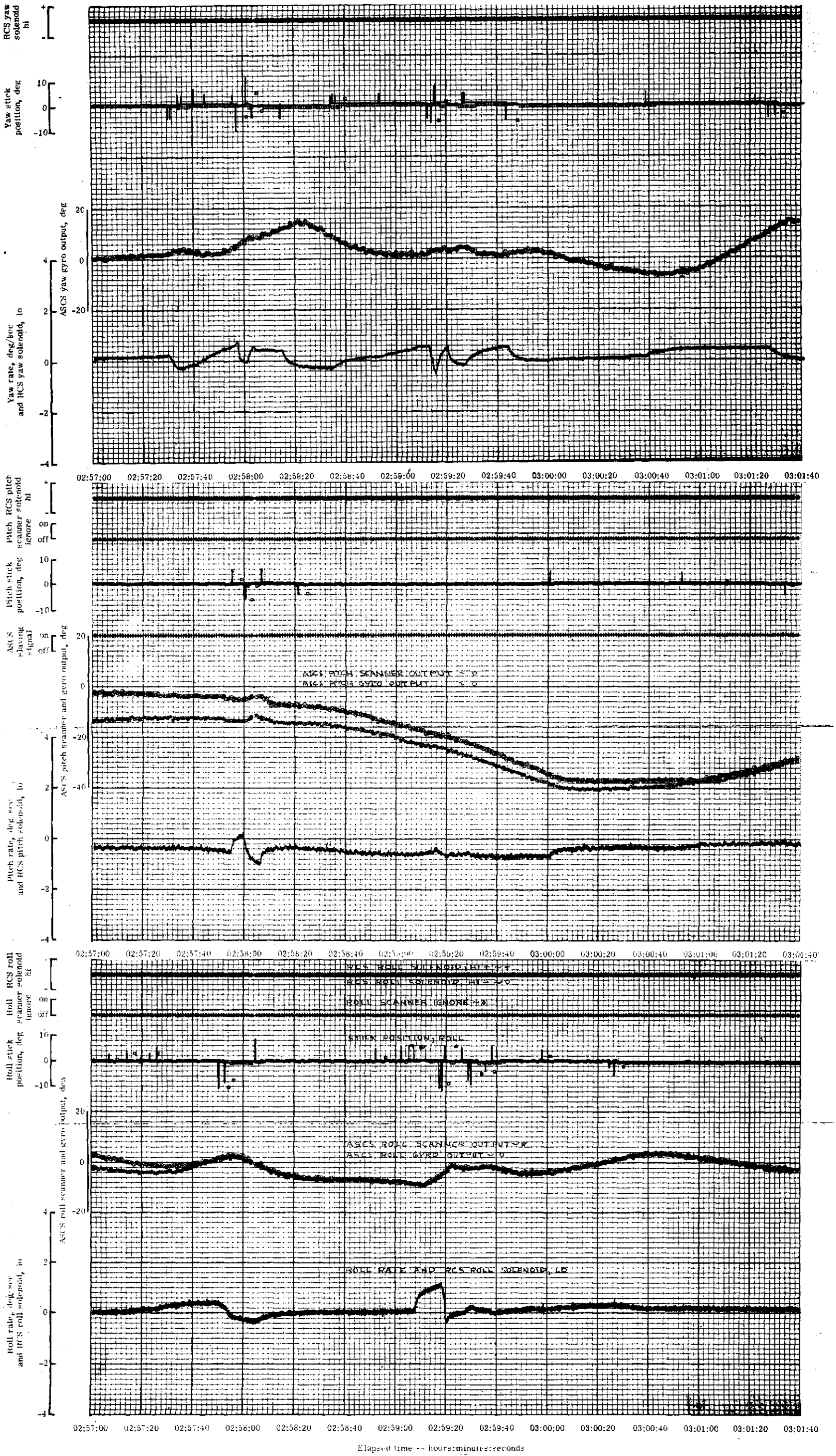
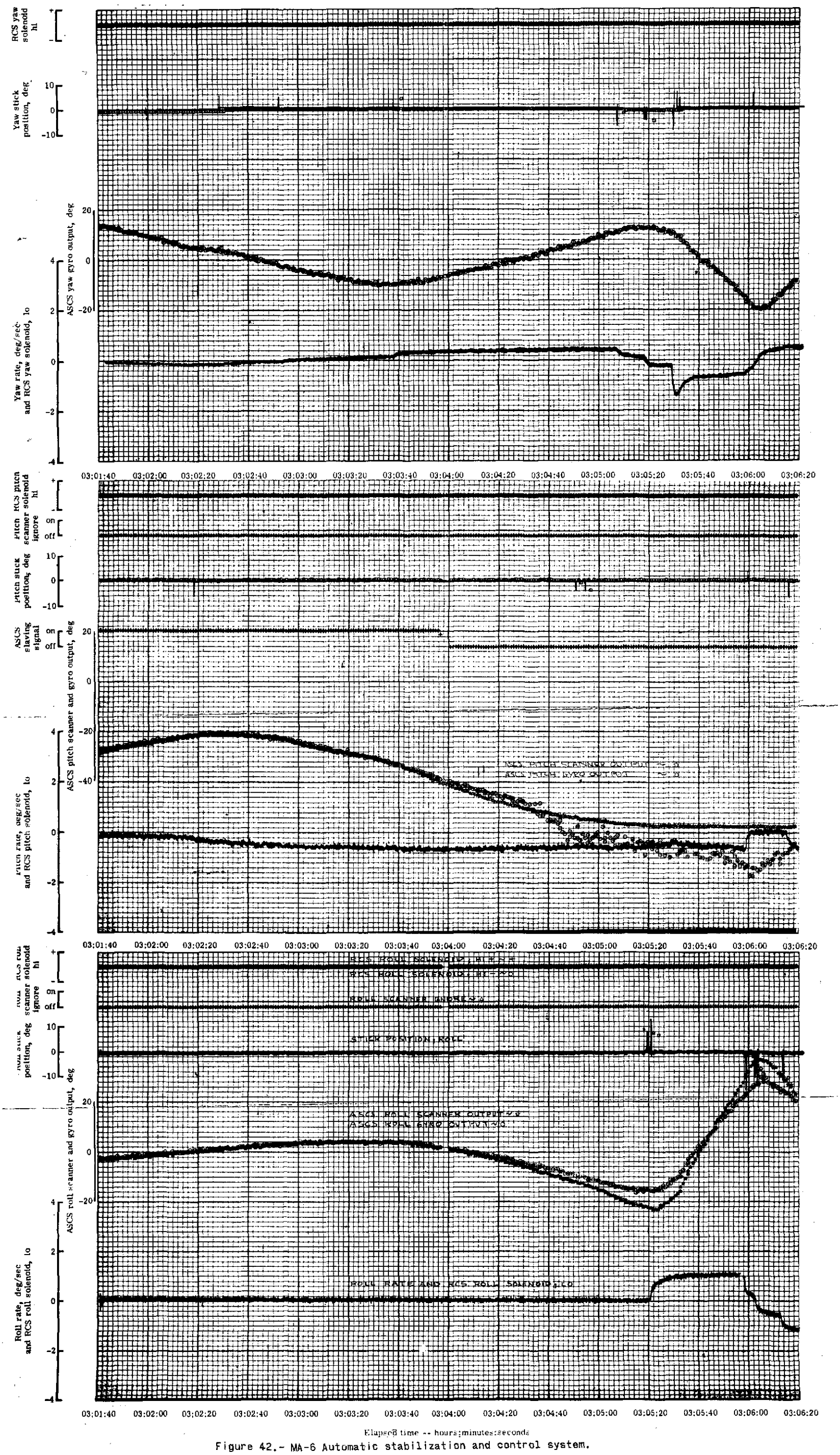


Figure 41.- MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM



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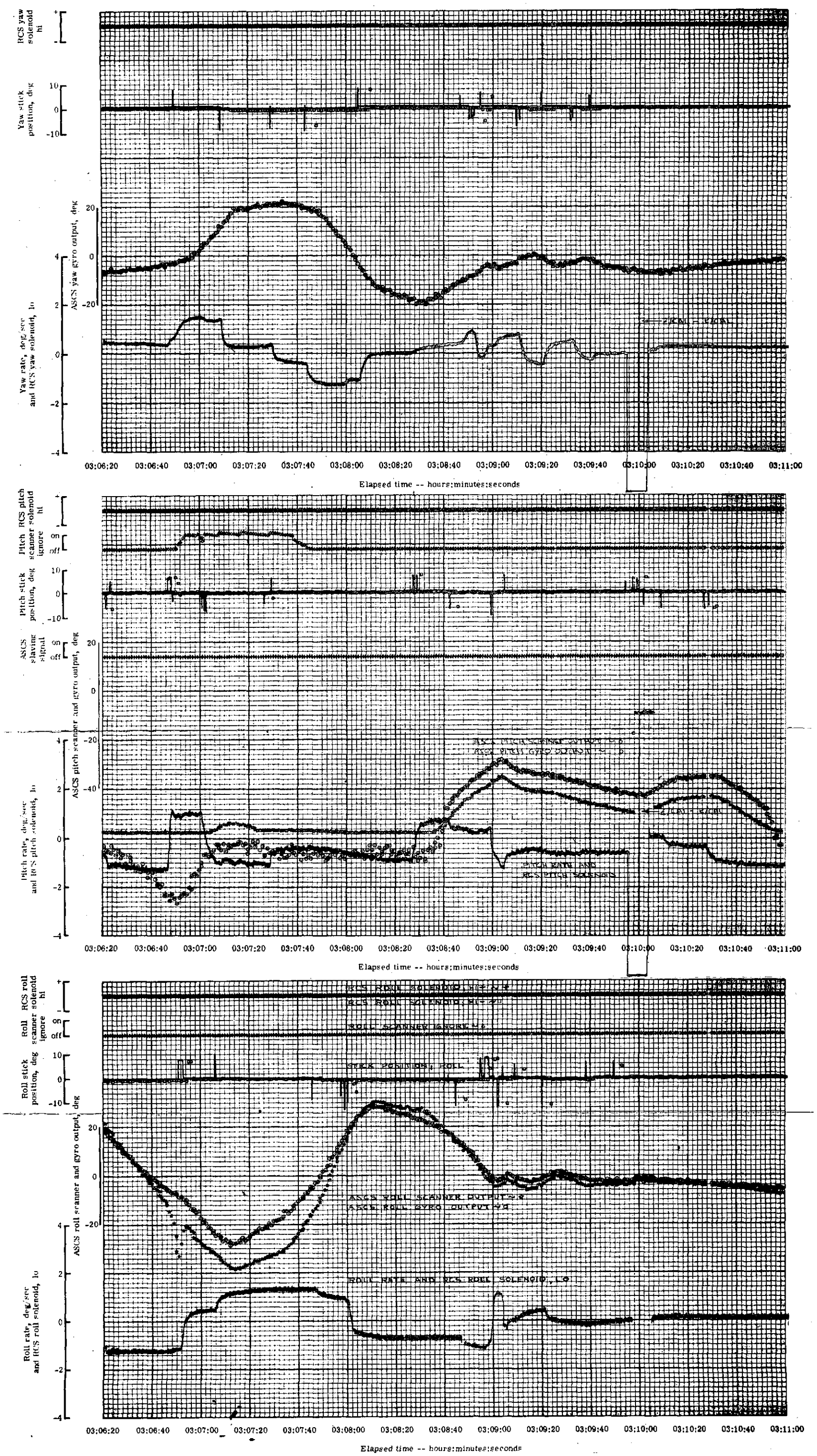


Figure 43.- MA-6 Automatic stabilization and control system.

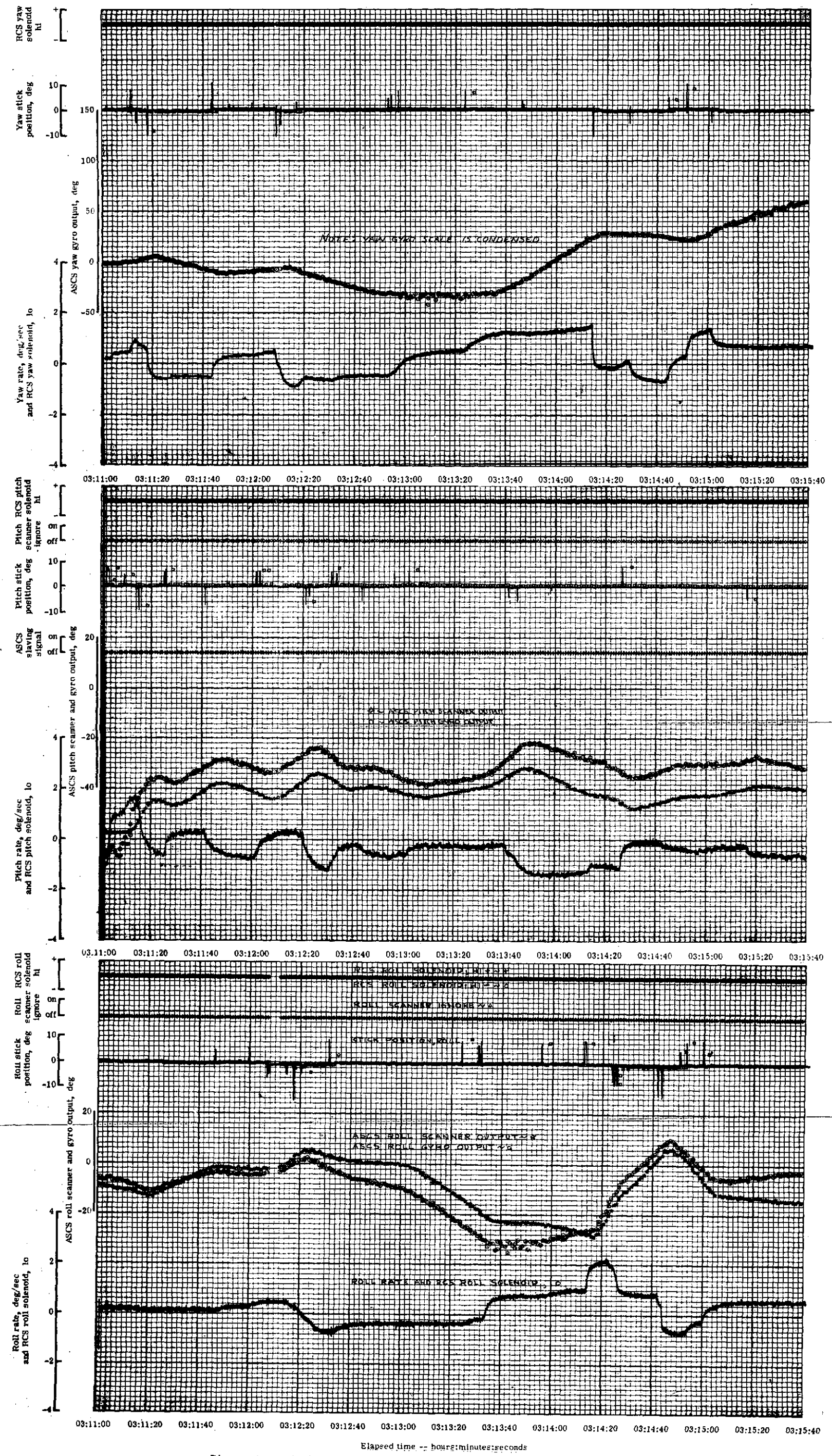
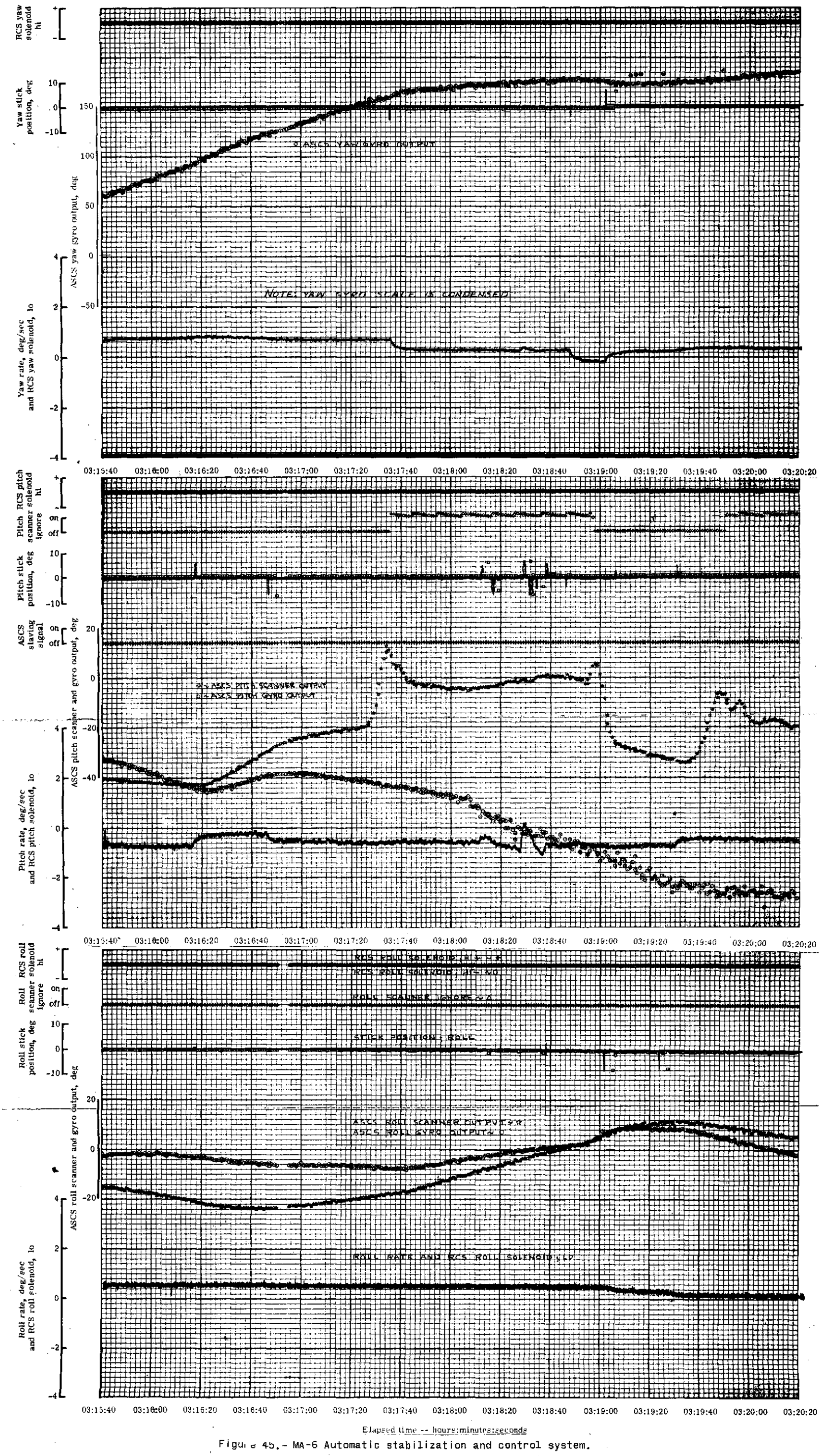


Figure 44.- MA-6 Automatic stabilization and control system.



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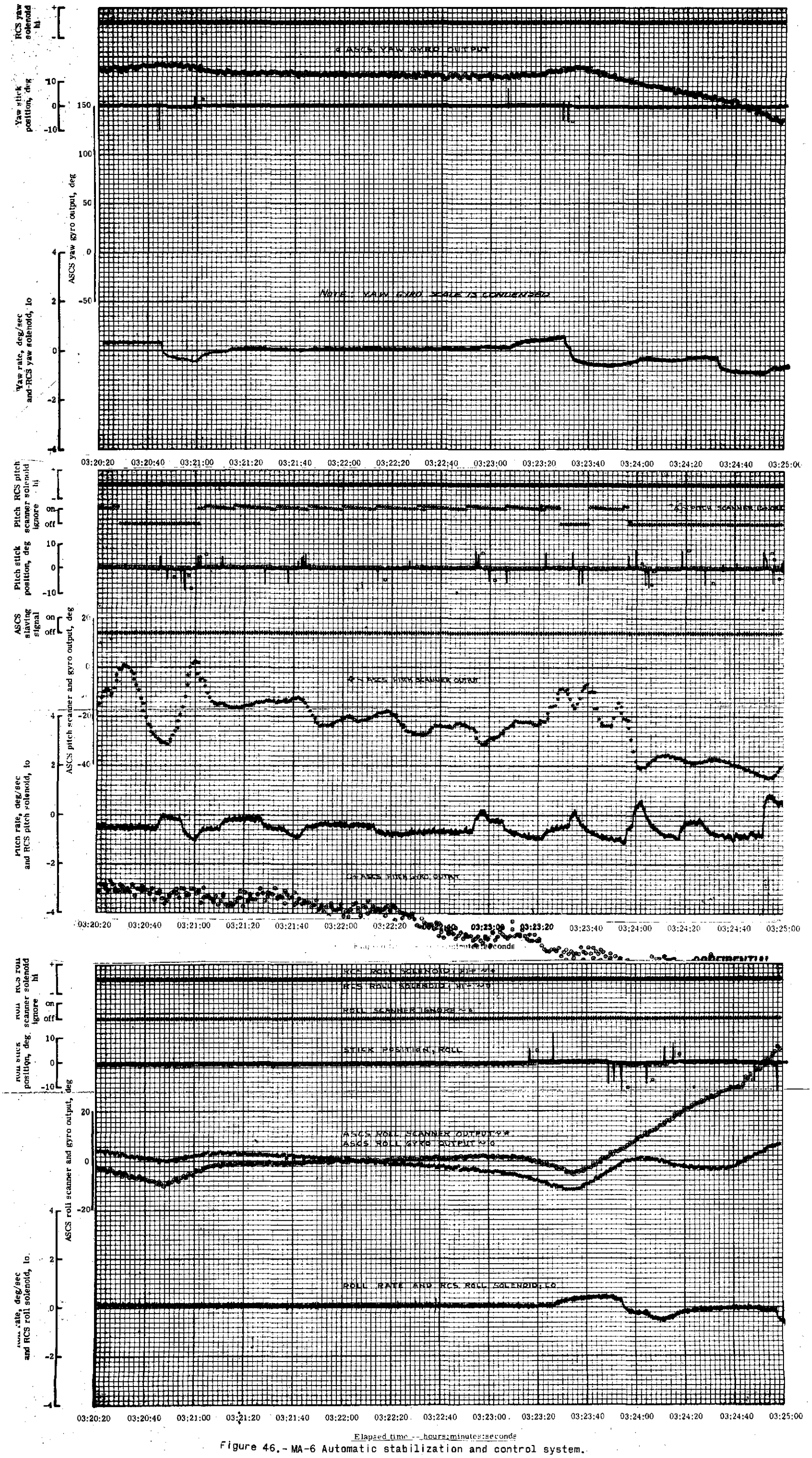

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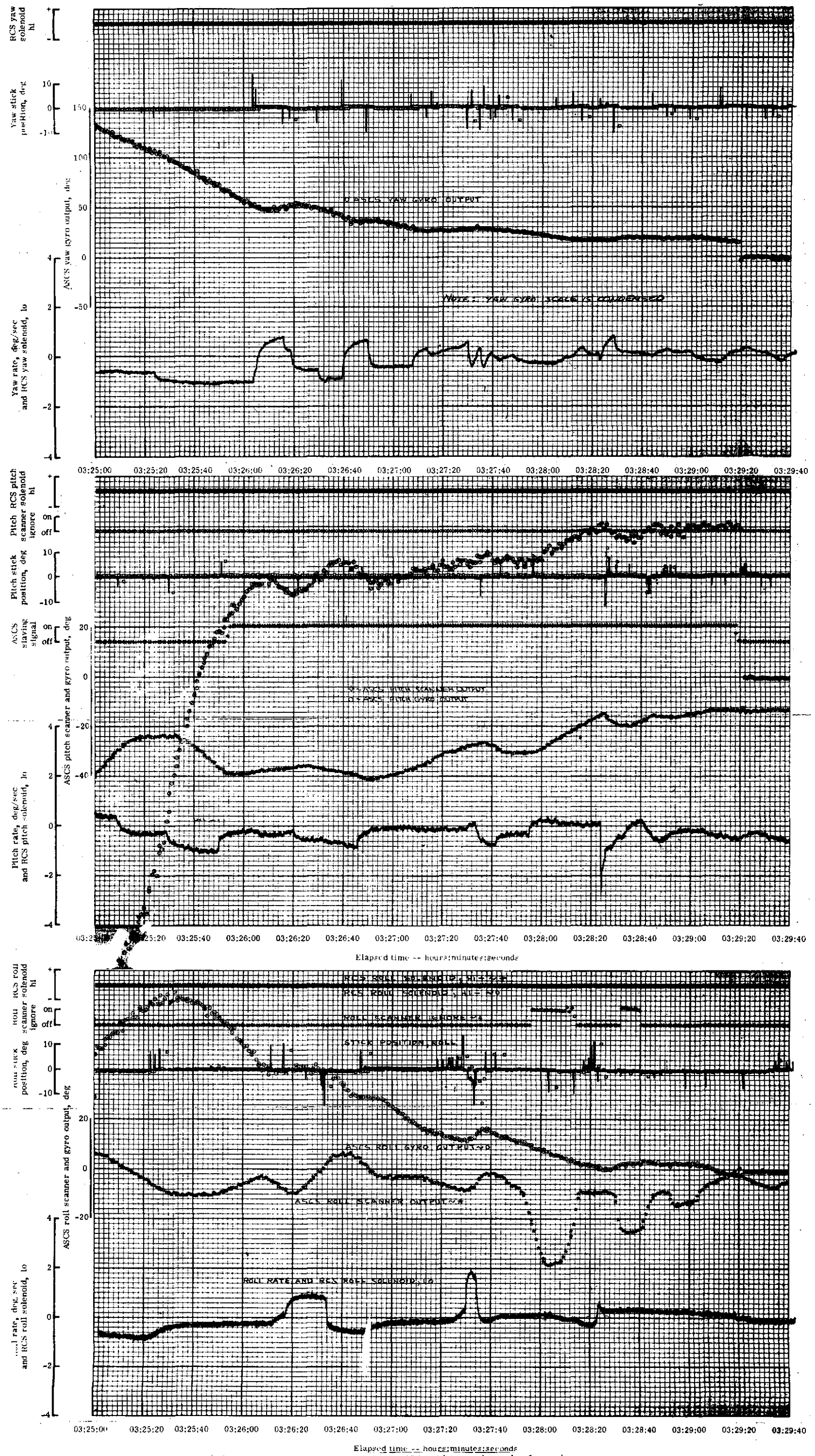


Figure 47.- MA-6 Automatic stabilization and control system.

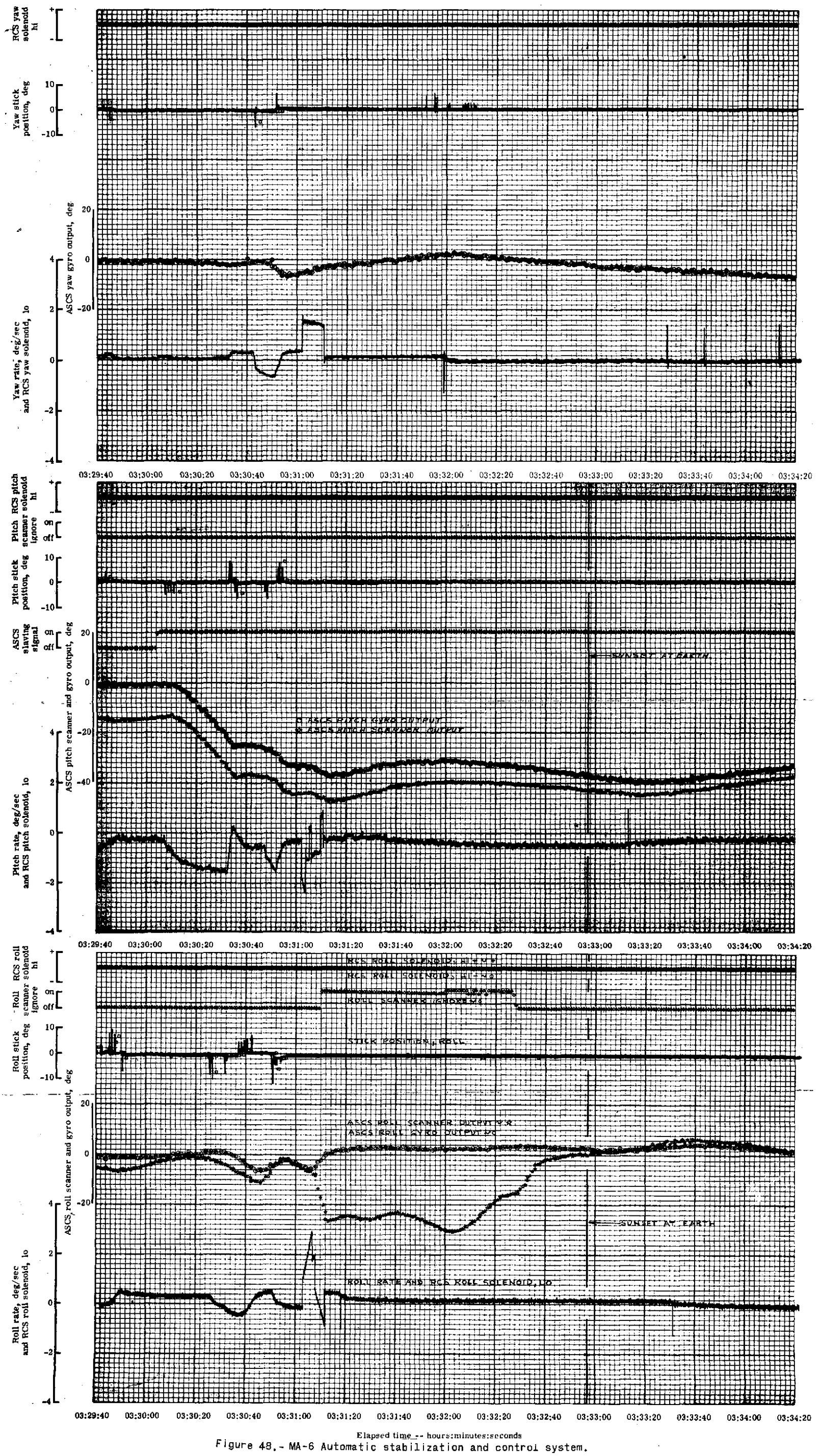


Figure 48.- MA-6 Automatic stabilization and control system.

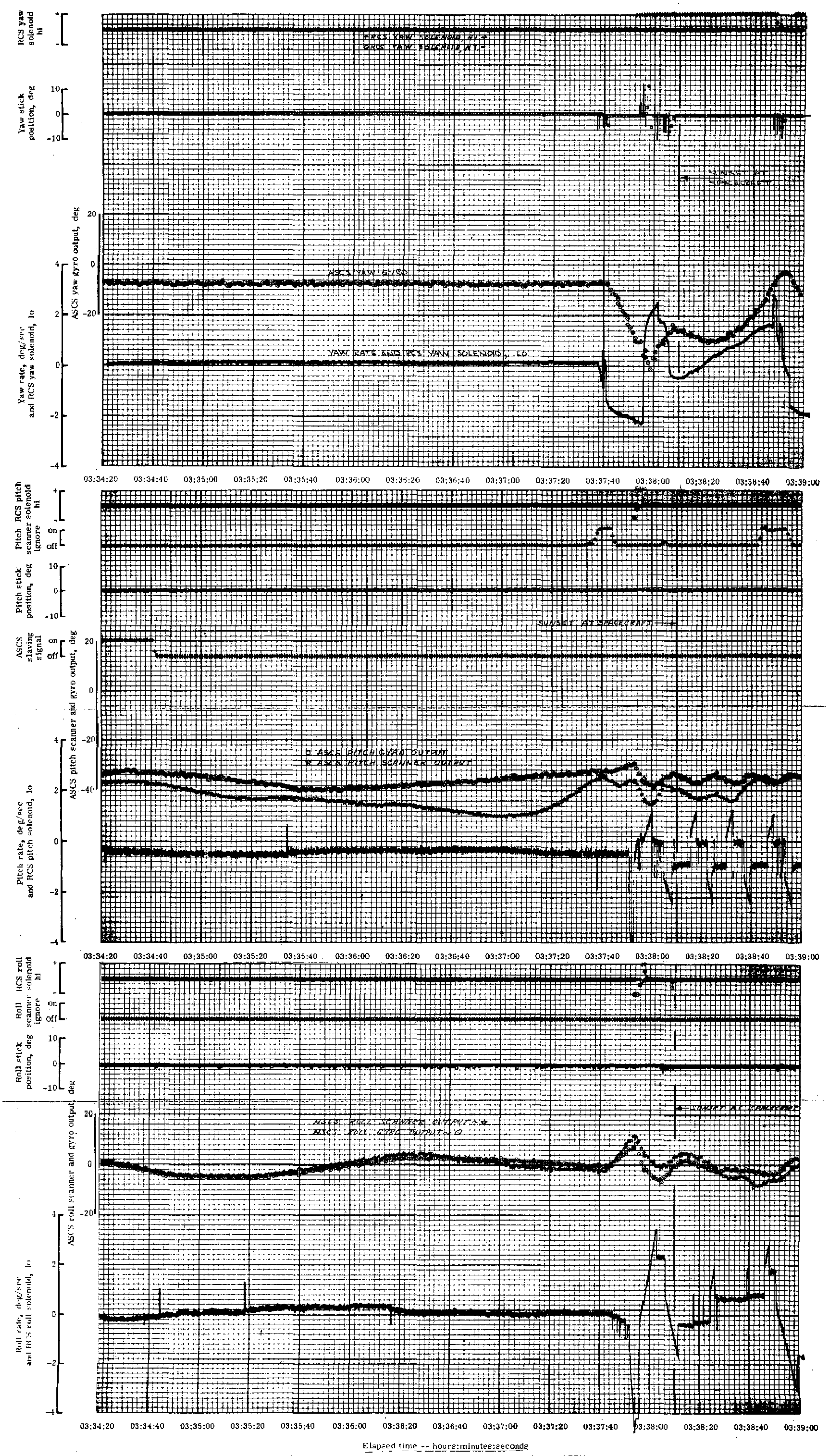


Figure 49.-MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

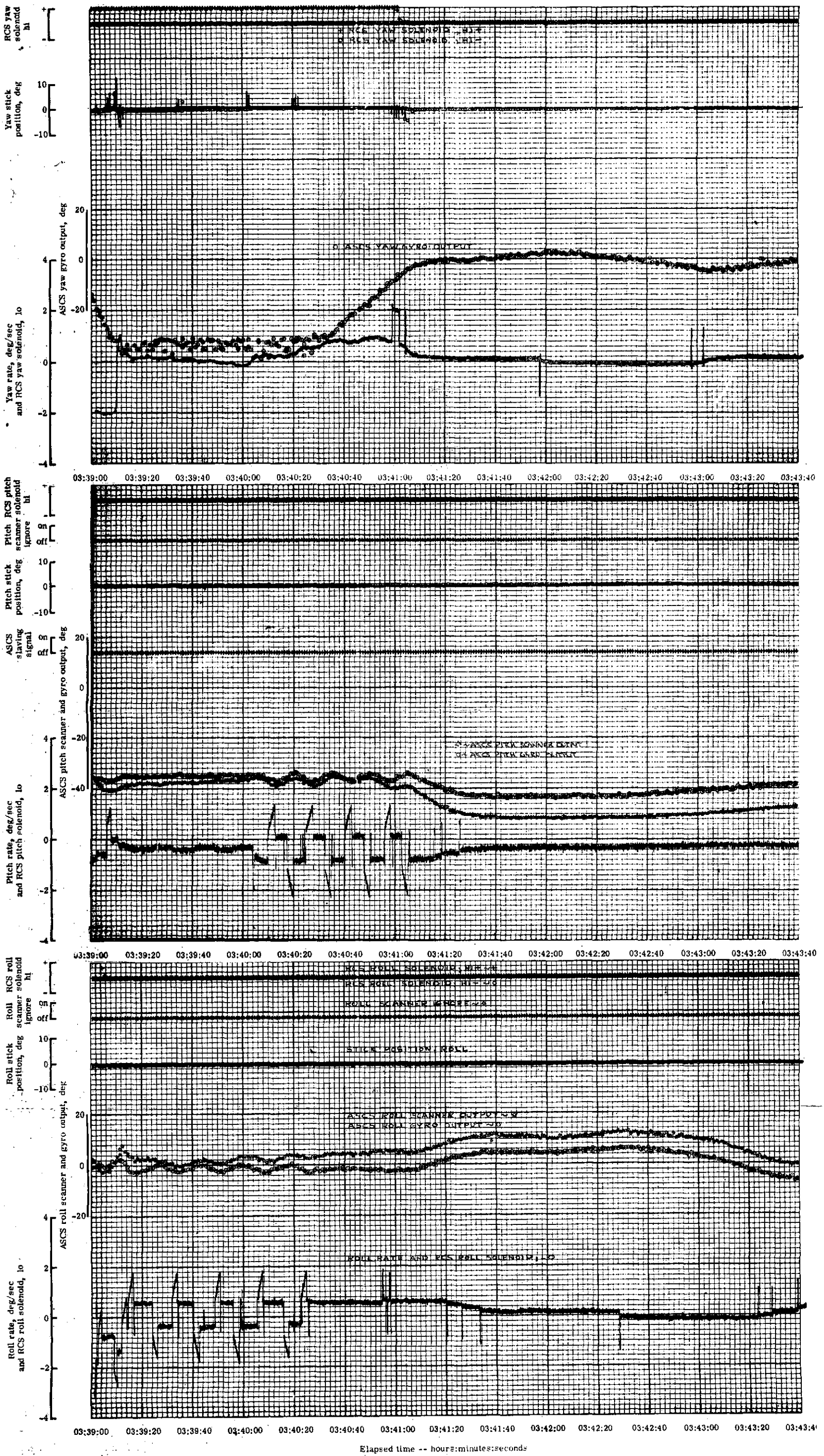


Figure 50.- MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

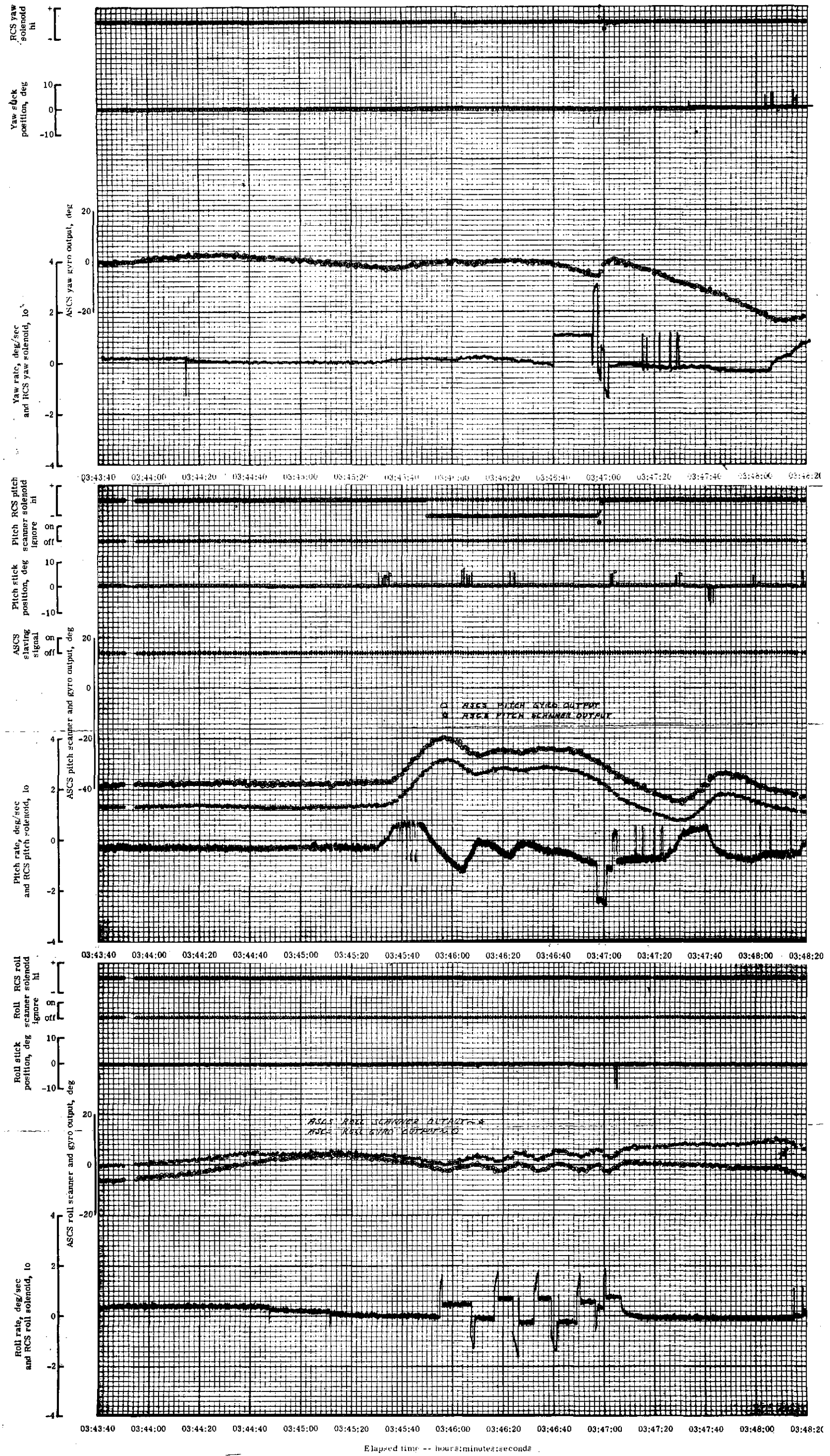


Figure 51.- MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

CONFIDENTIAL

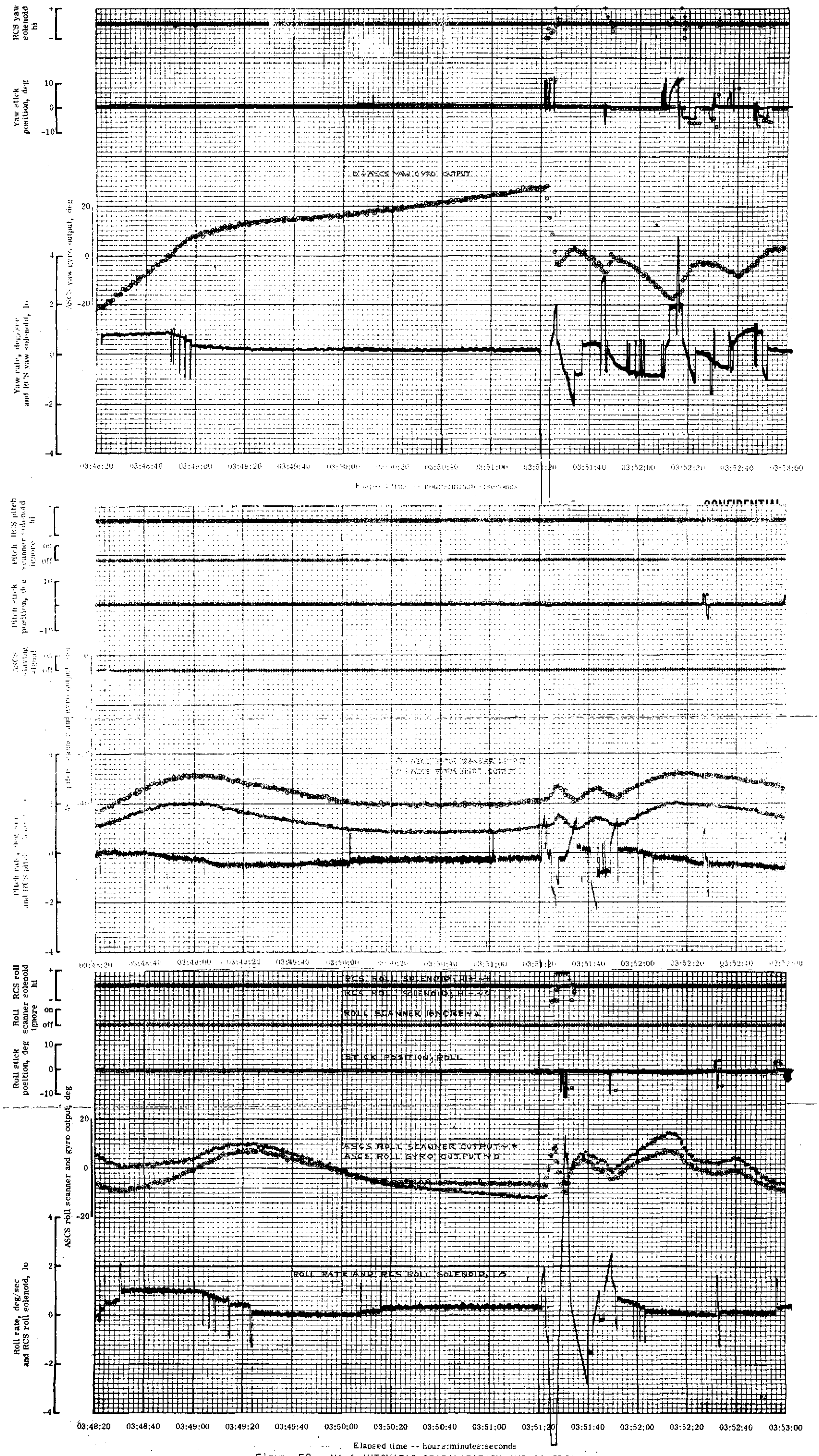


Figure 52.– MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

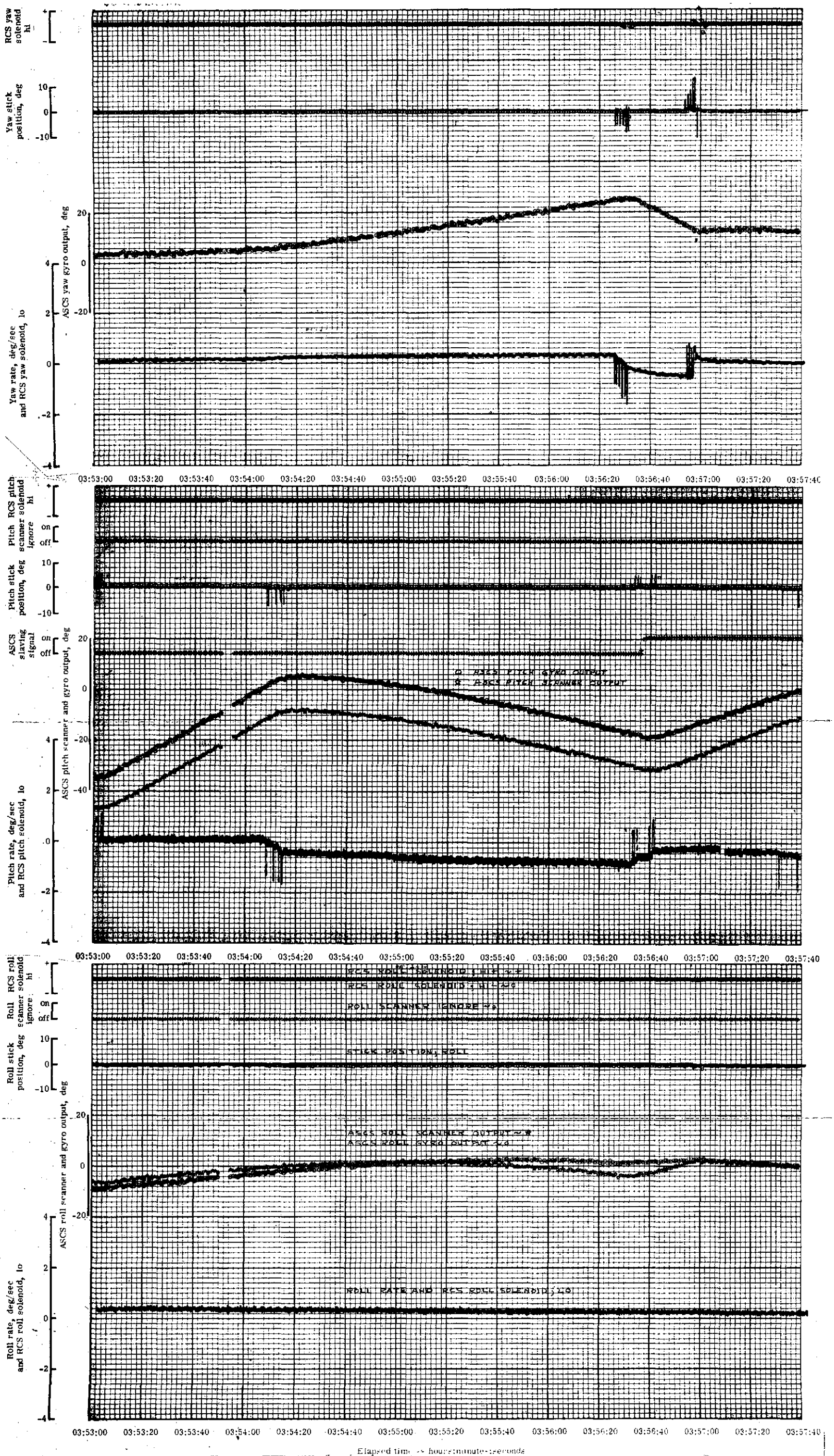


Figure 53.- MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

CONFIDENTIAL

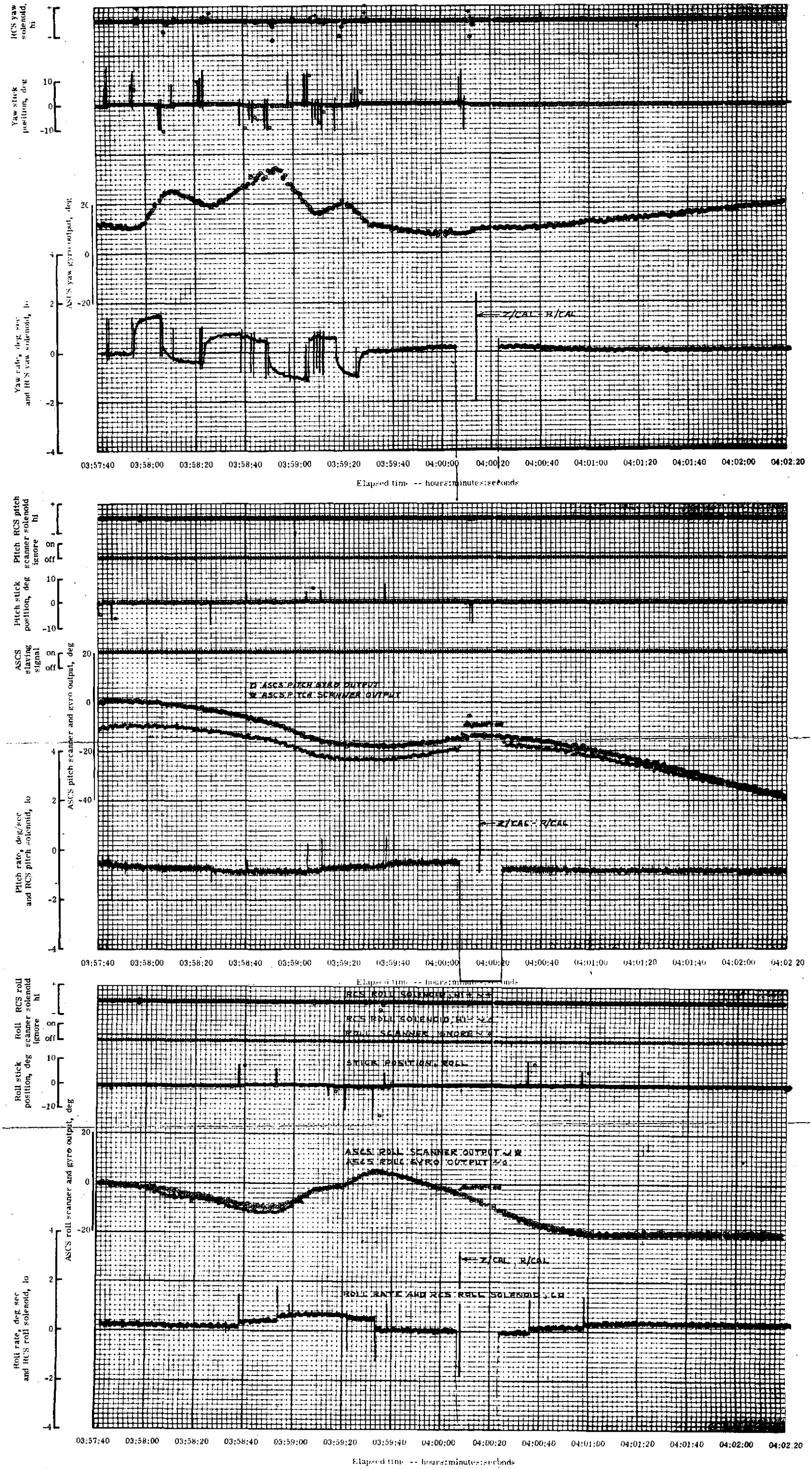


Figure 54.- MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

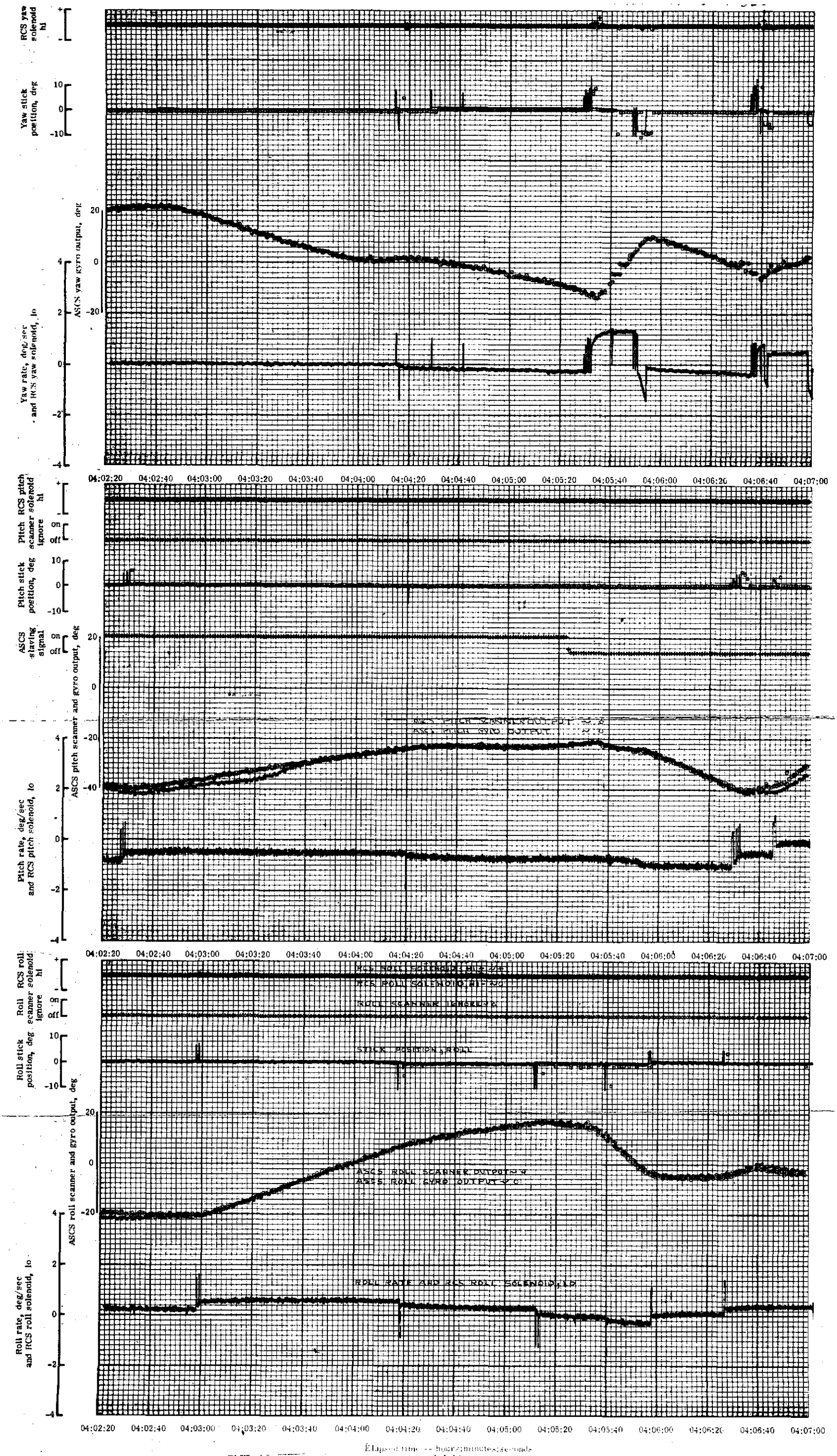


Figure 55.- MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

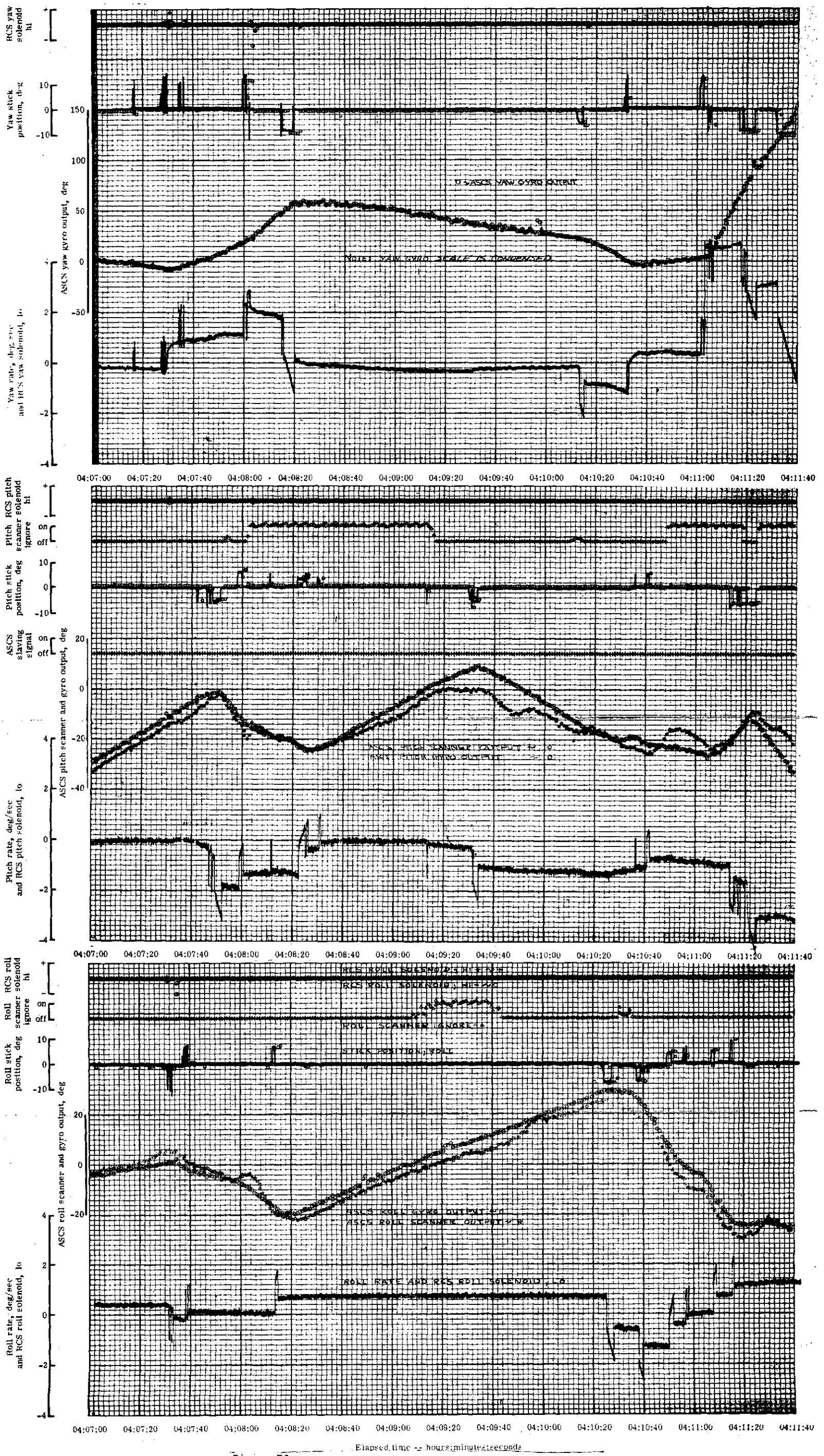


Figure 56.- MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

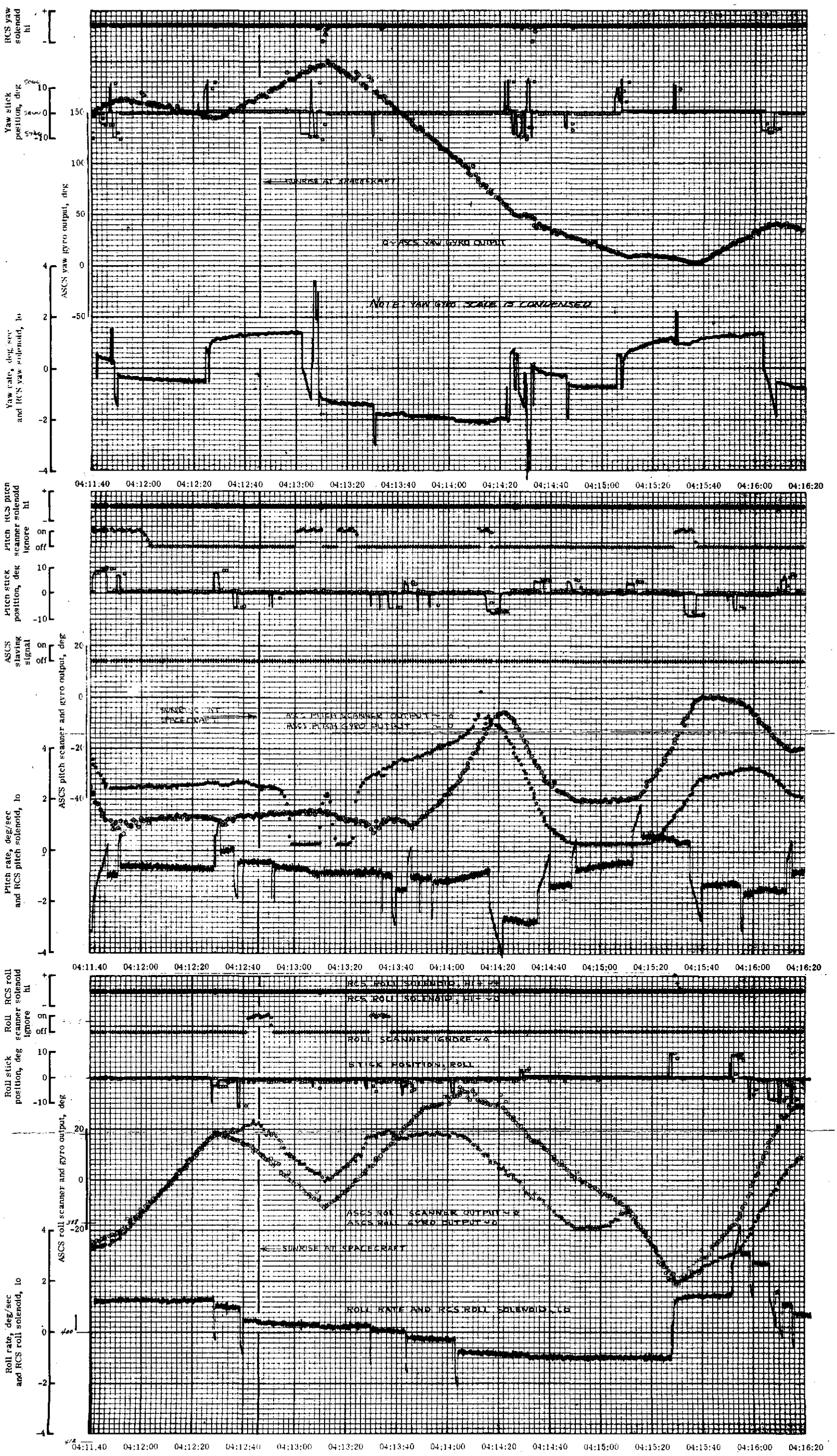


Figure 57.- MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

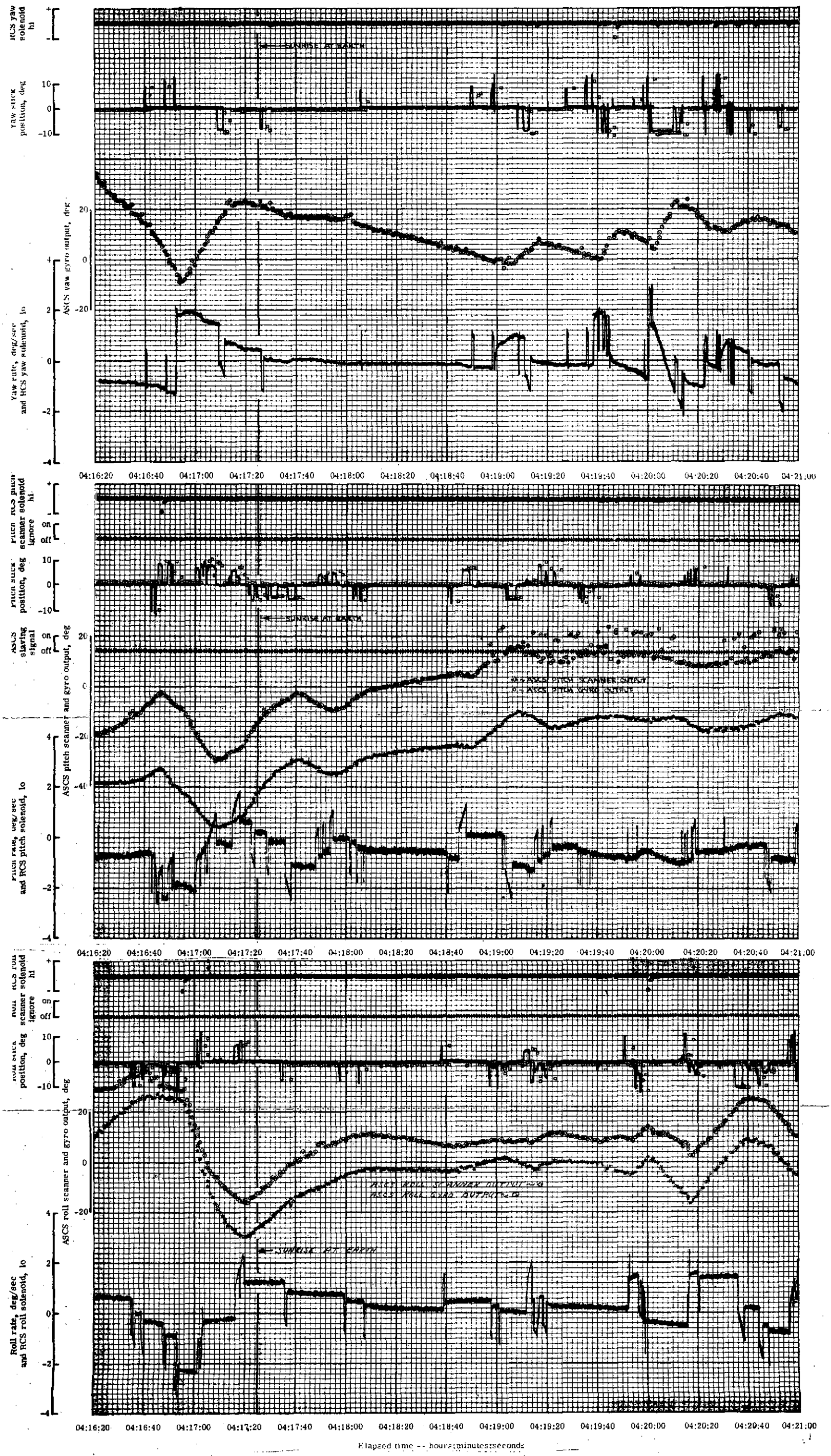


Figure 58.- MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

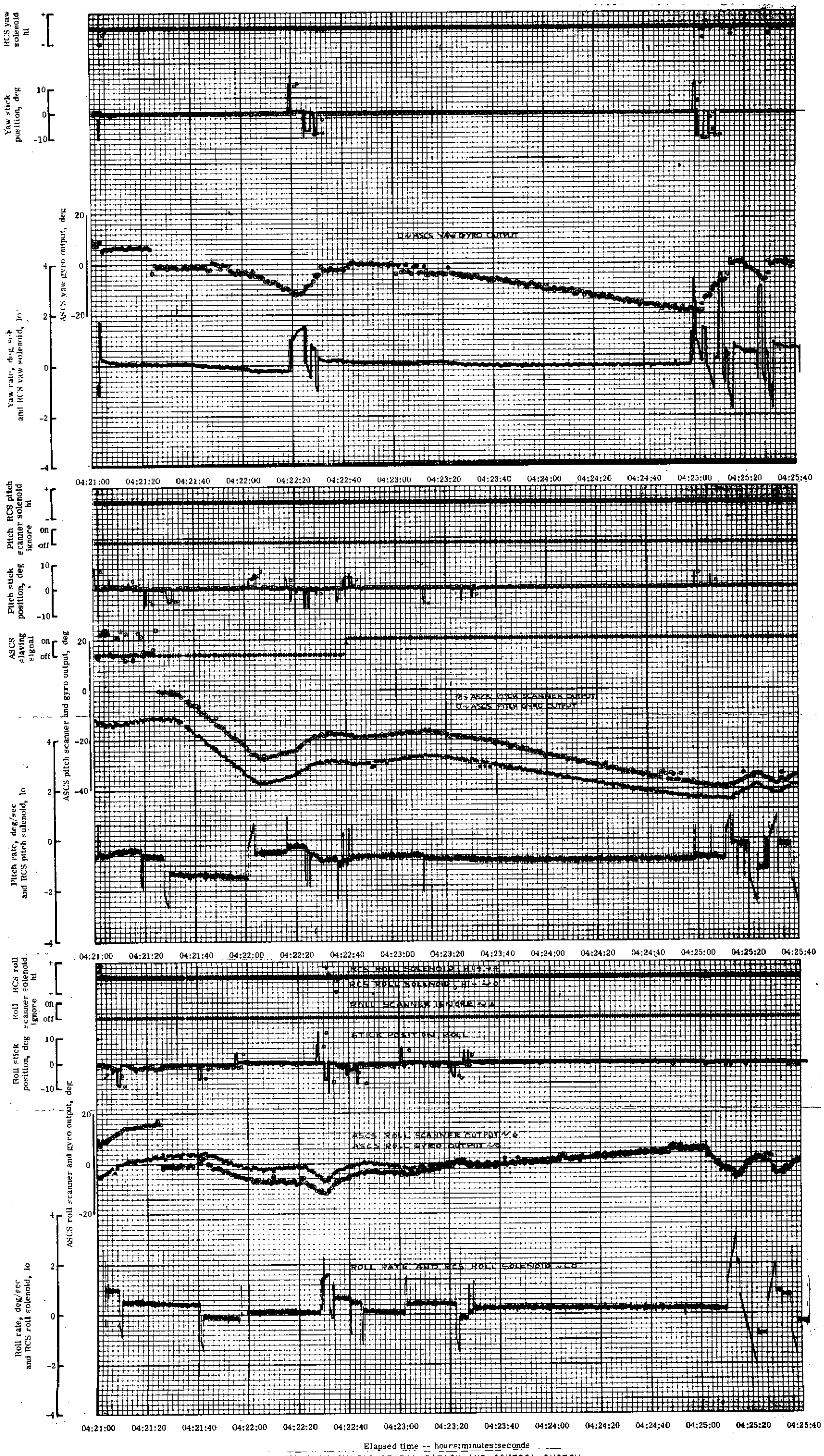


Figure 59.- MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

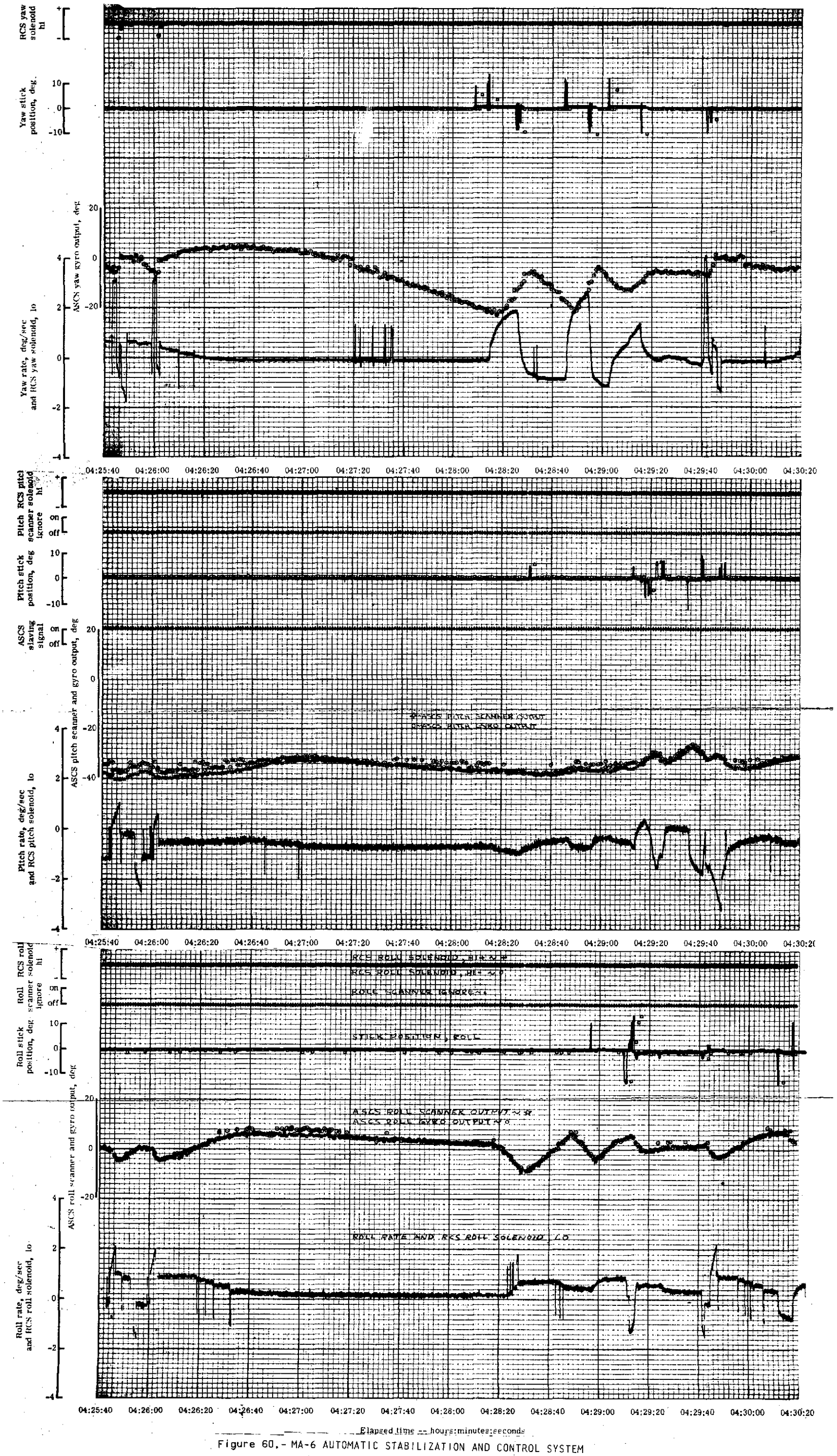


Figure 60.- MA-6 AUTOMATIC STABILIZATION AND CONTROL SYSTEM

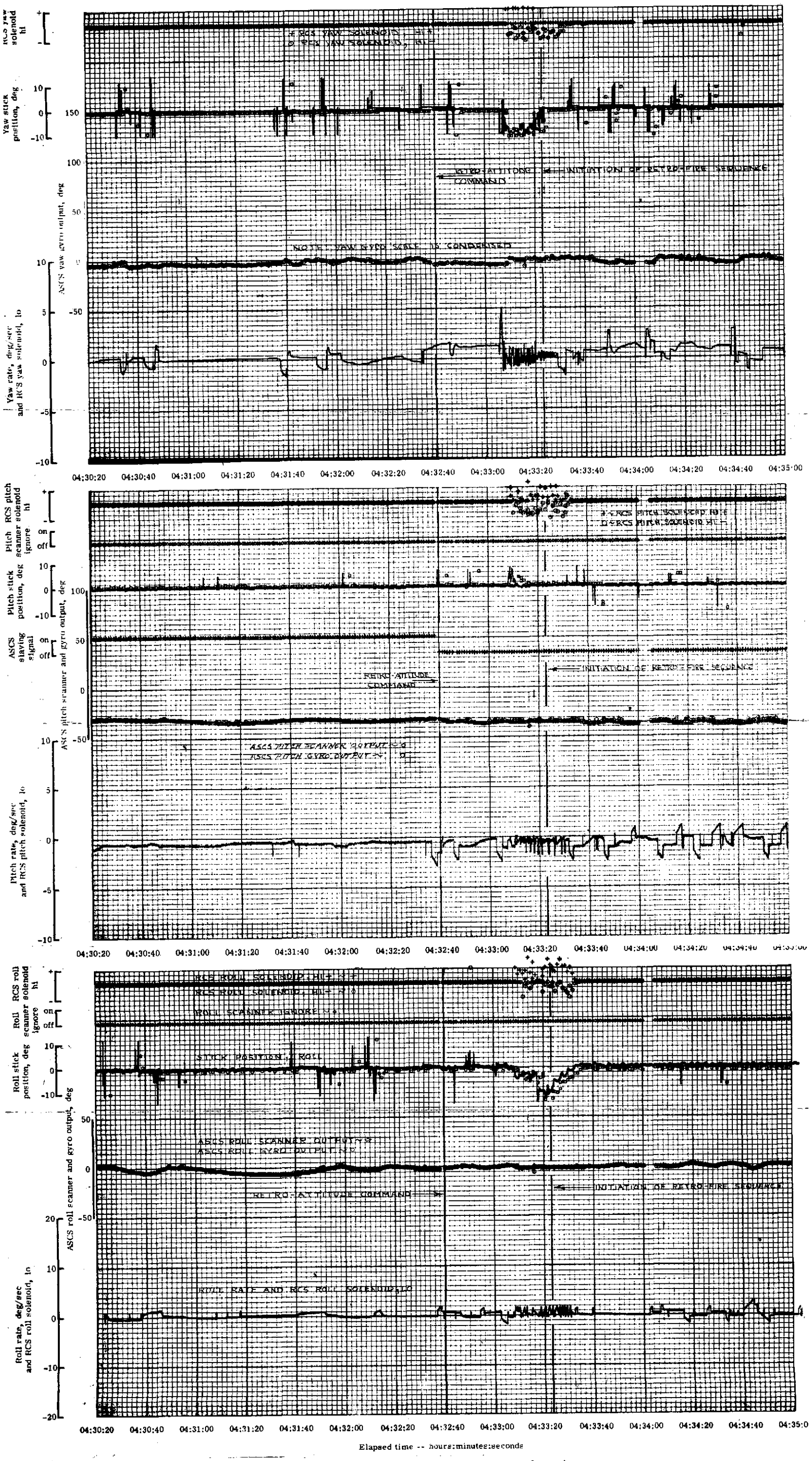


Figure 61.- MA-6 Automatic stabilization and control system.

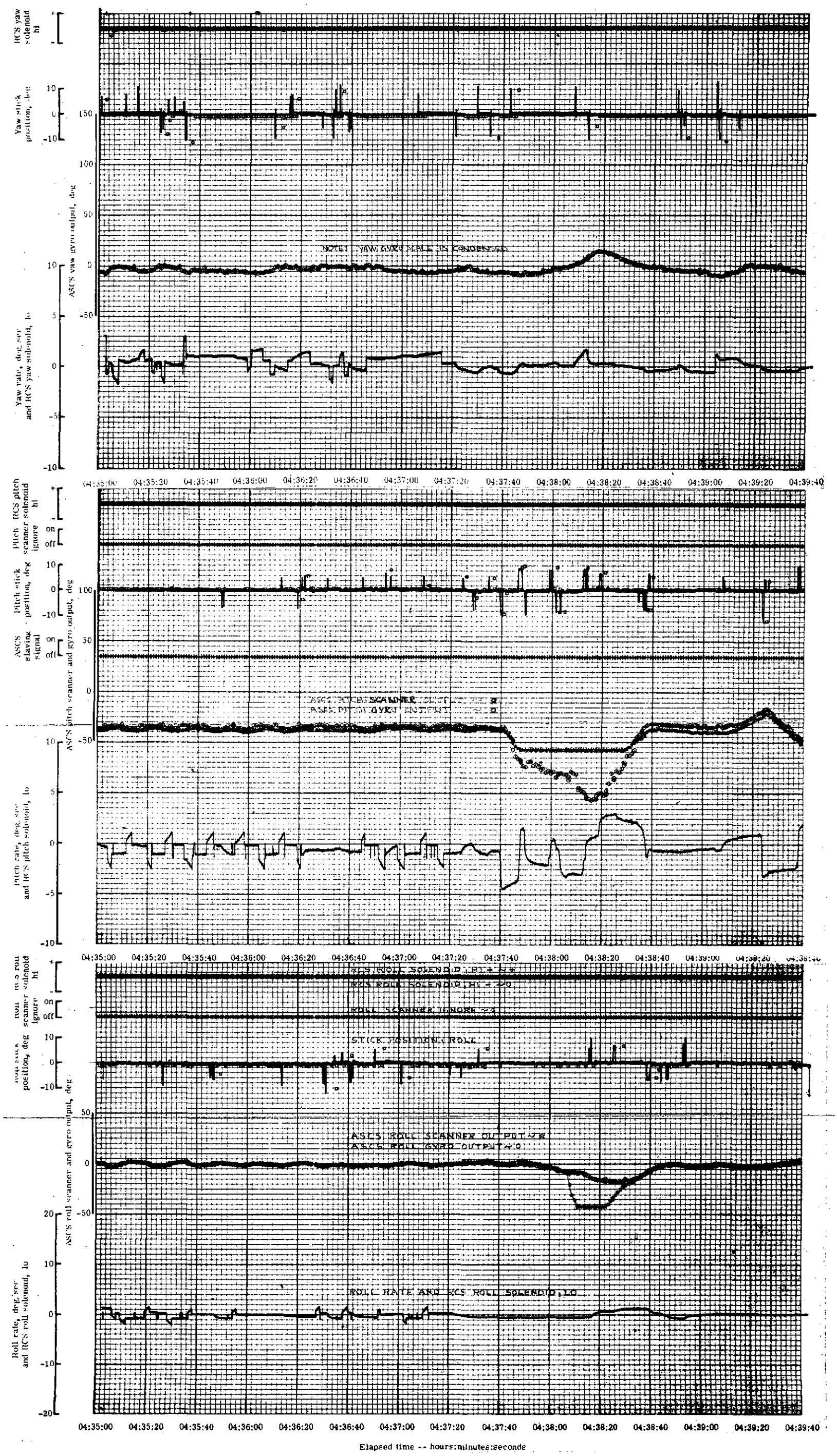


Figure 62.- MA-6 Automatic stabilization and control system.

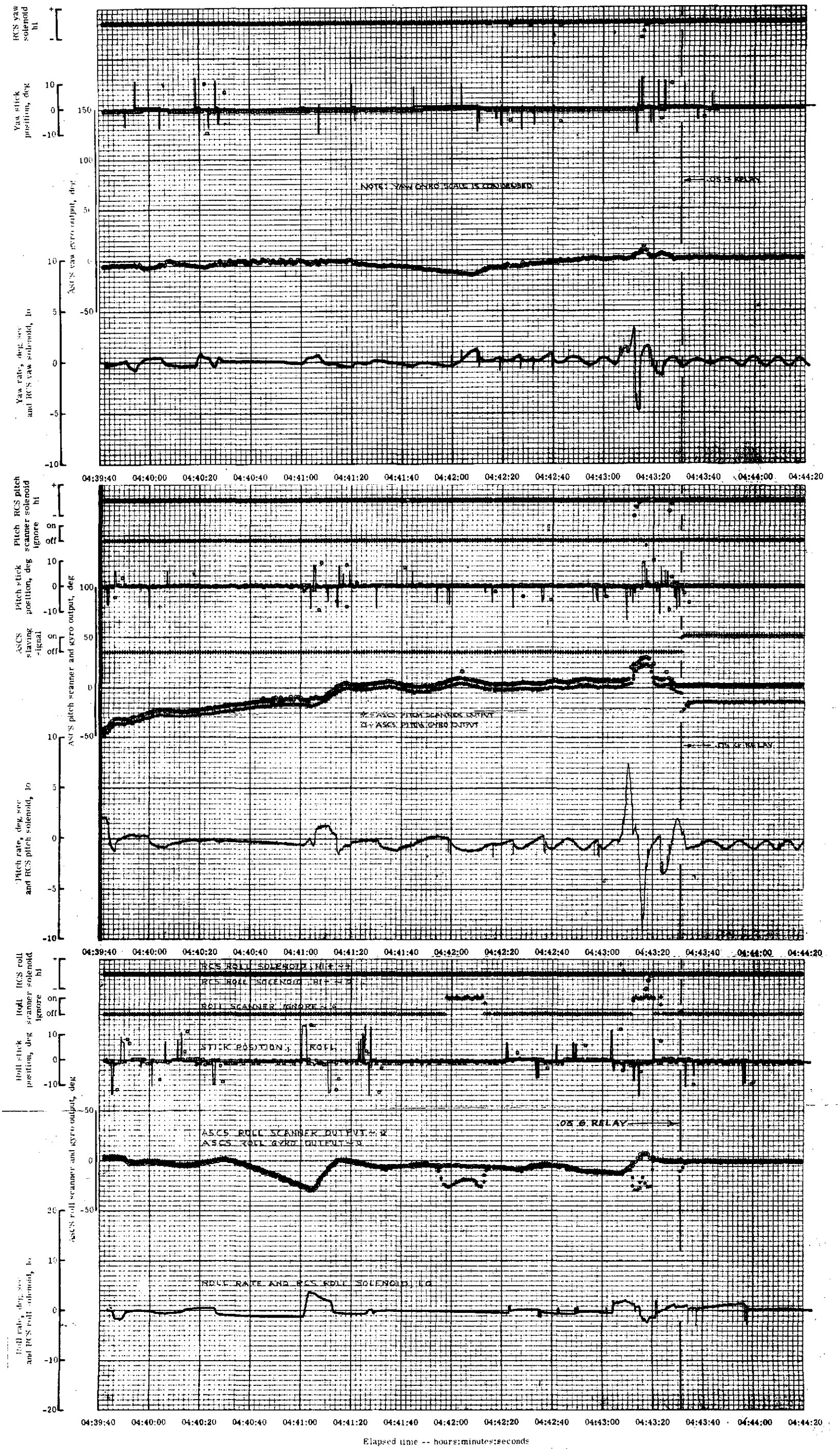


Figure 63.- MA-6 Automatic stabilization and control system.

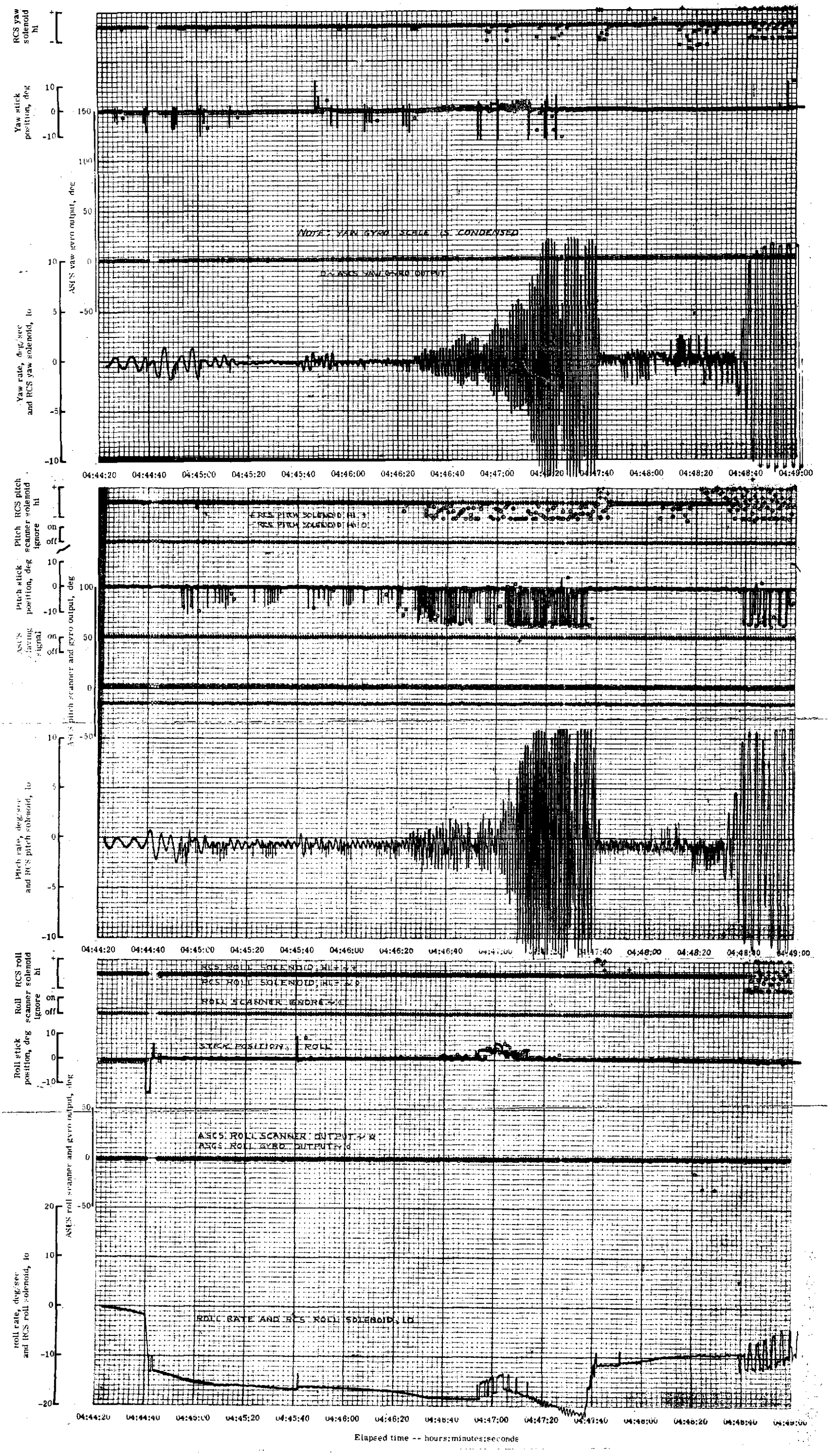


Figure 64.- MA-6 Automatic stabilization and control system.

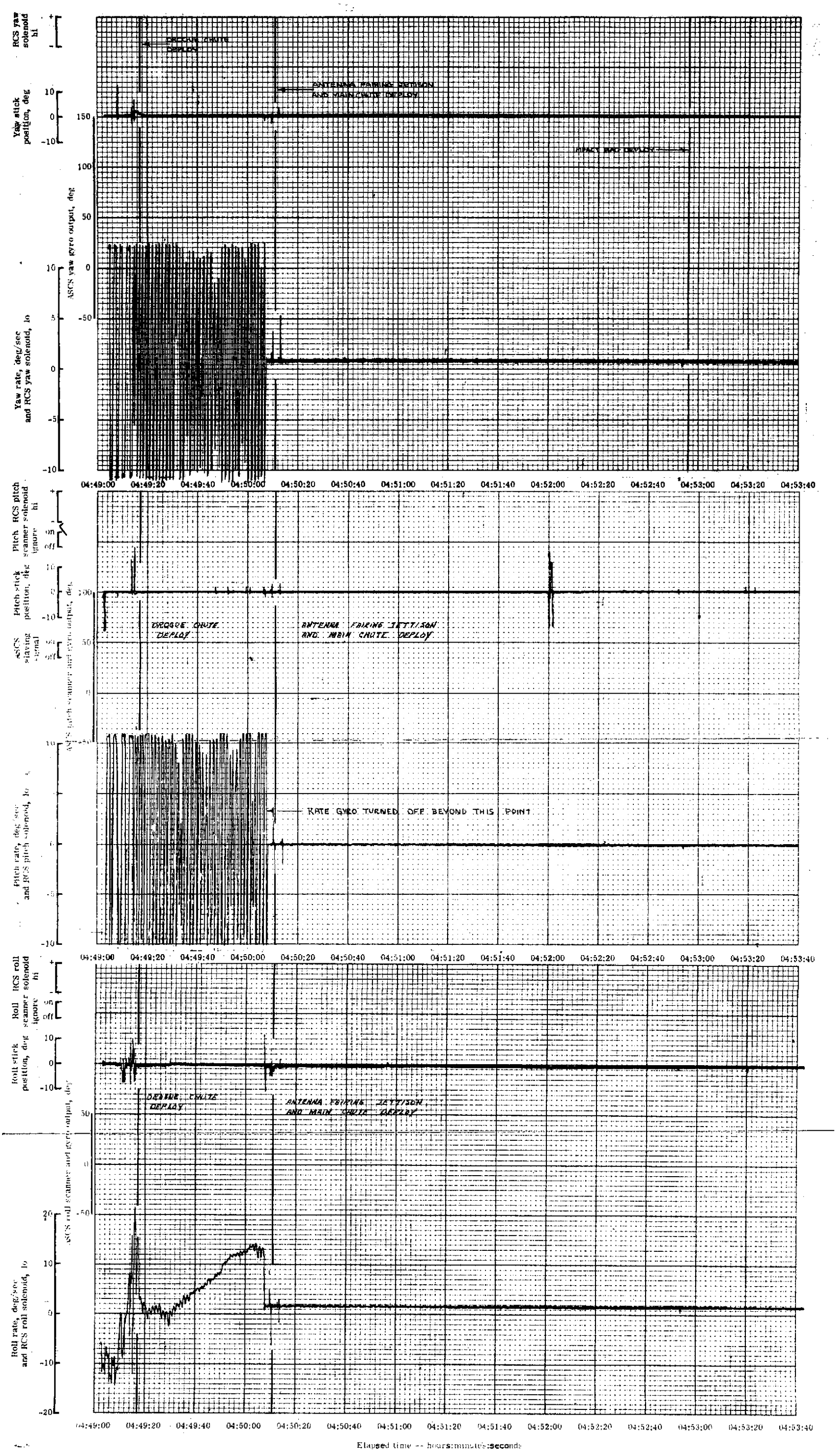


Figure 65.- MA-6 Automatic stabilization and control system.

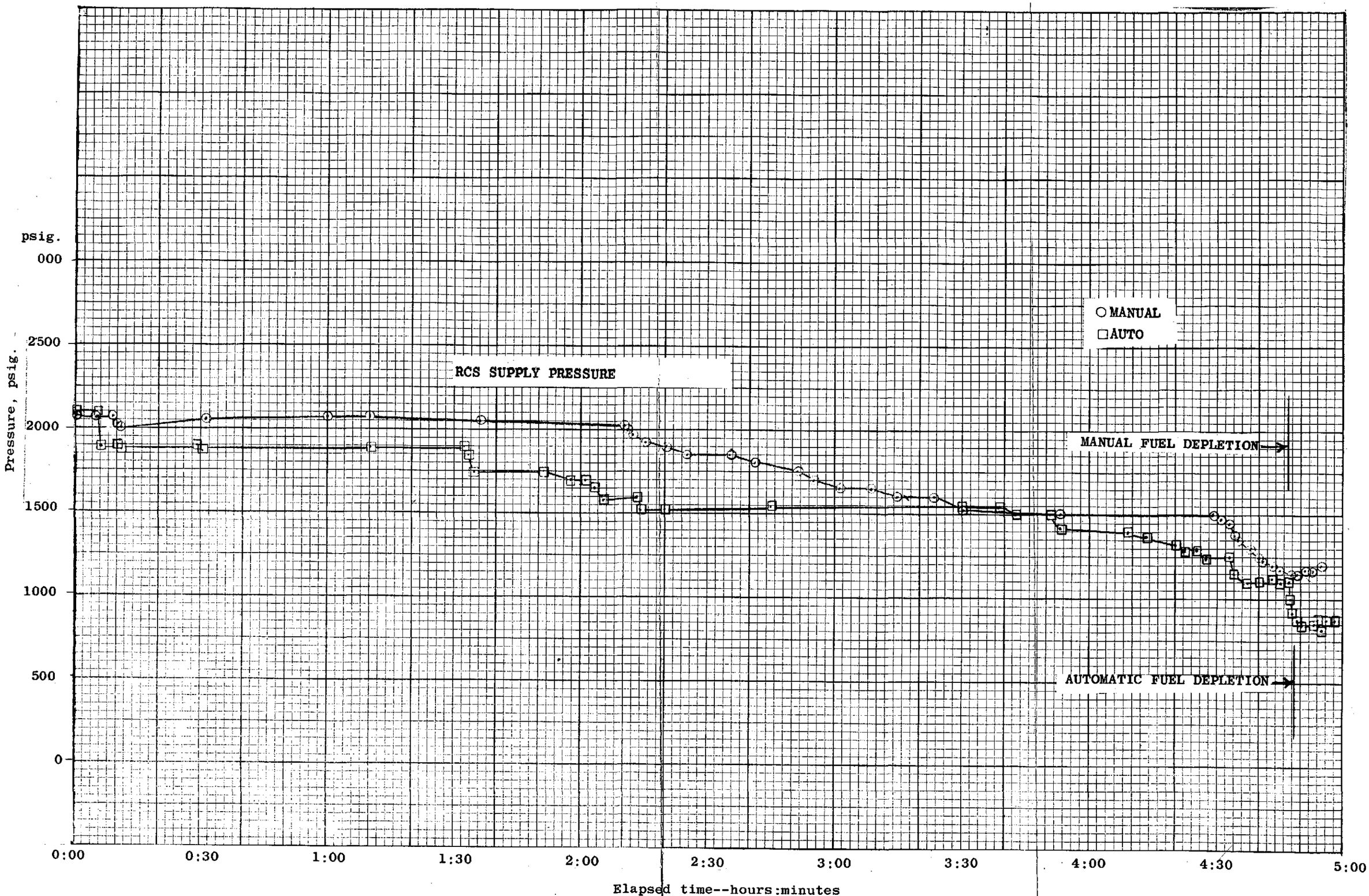


Fig. 66 REACTION CONTROL SYSTEM - MANUAL AND AUTOMATIC FUEL (H_2O_2) SUPPLY PRESSURE

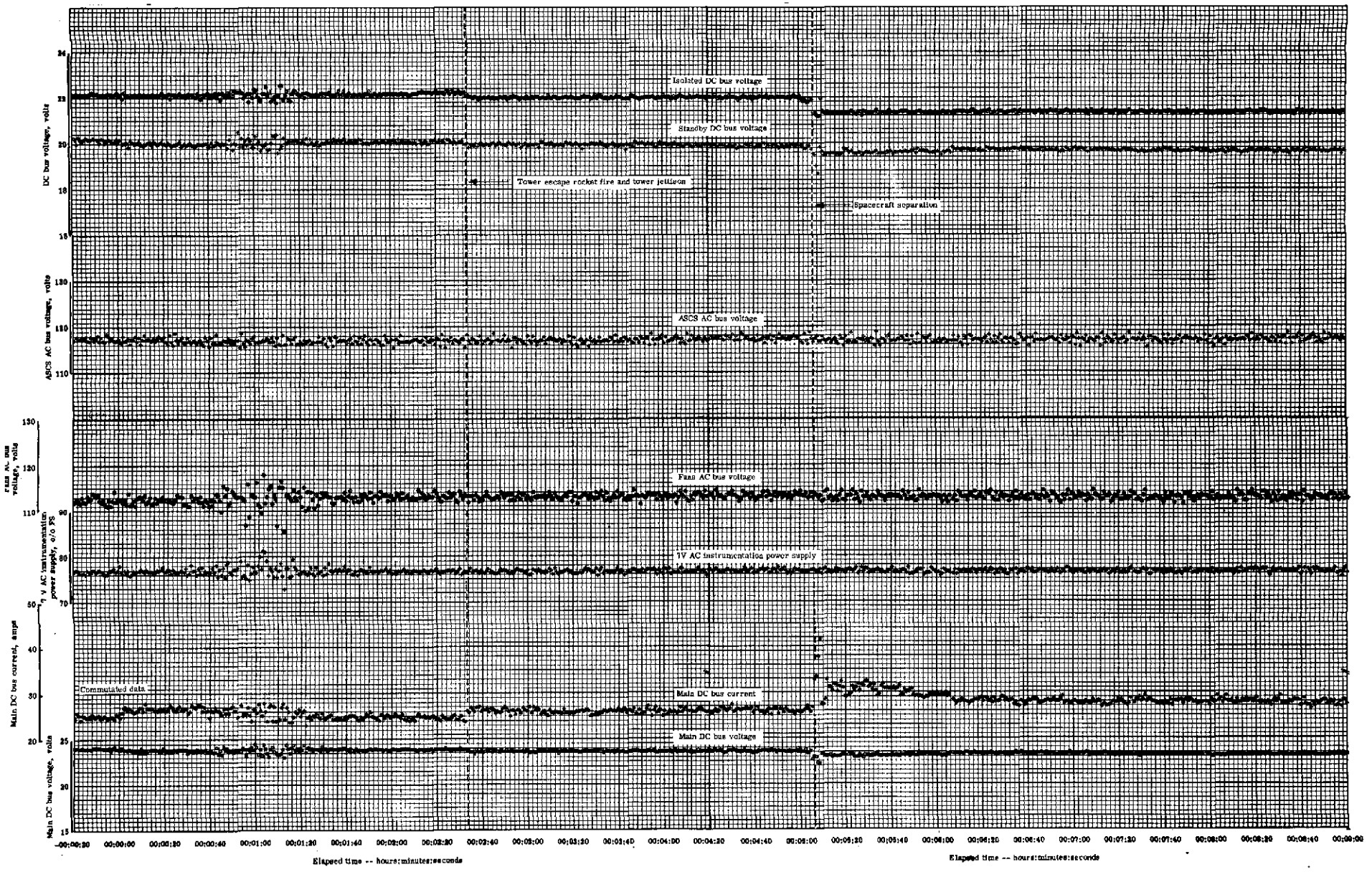


Fig. 67 - Electrical System-Fans AC Bus Voltage; 7VAC; d-c Amps; d-c Volts; Standby Bus Volts; ASCS Volts; Isolated Bus Volts

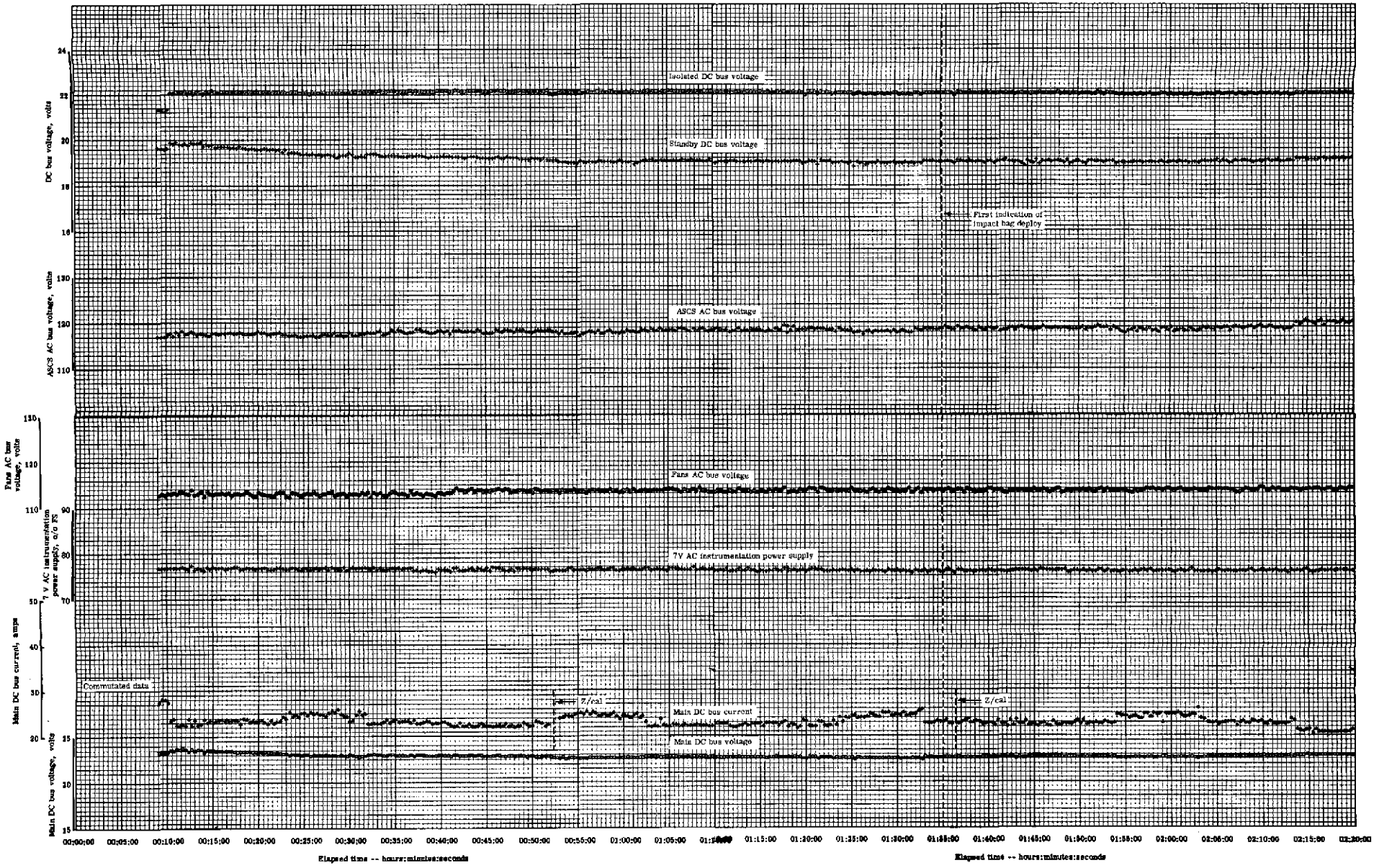


Fig. 68 - Electrical System-Fans AC Bus Voltage; 7VAC; d-c Amps; d-c Volts; Isolated Bus Volts; Standby Bus Volts; ASCS Volts

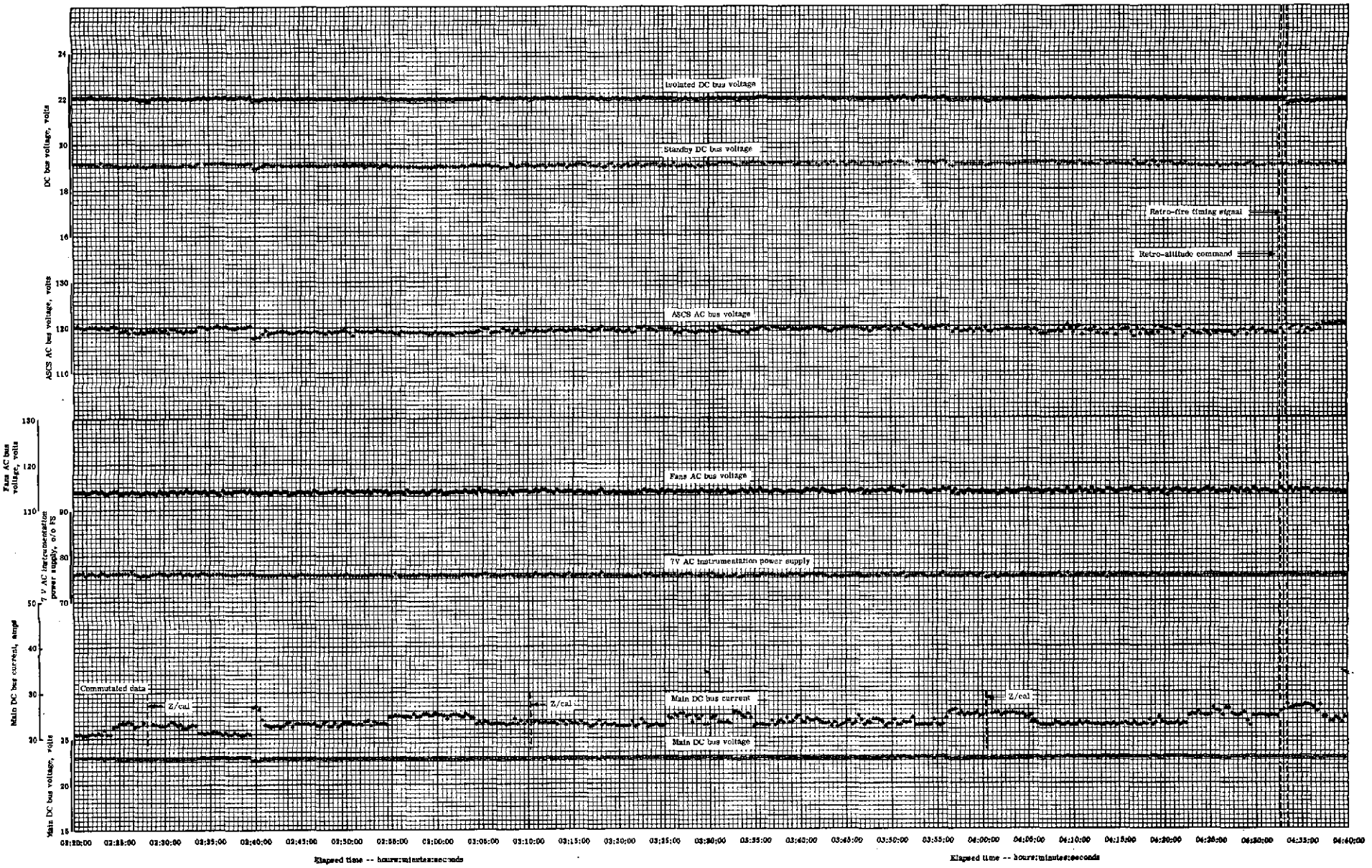


Fig. 69 - Electrical System-Fans AC Bus Voltage; 7VAC; d-c Amps; d-c Volts; Isolated Bus Volts; Standby Bus Volts; ASCS Volts

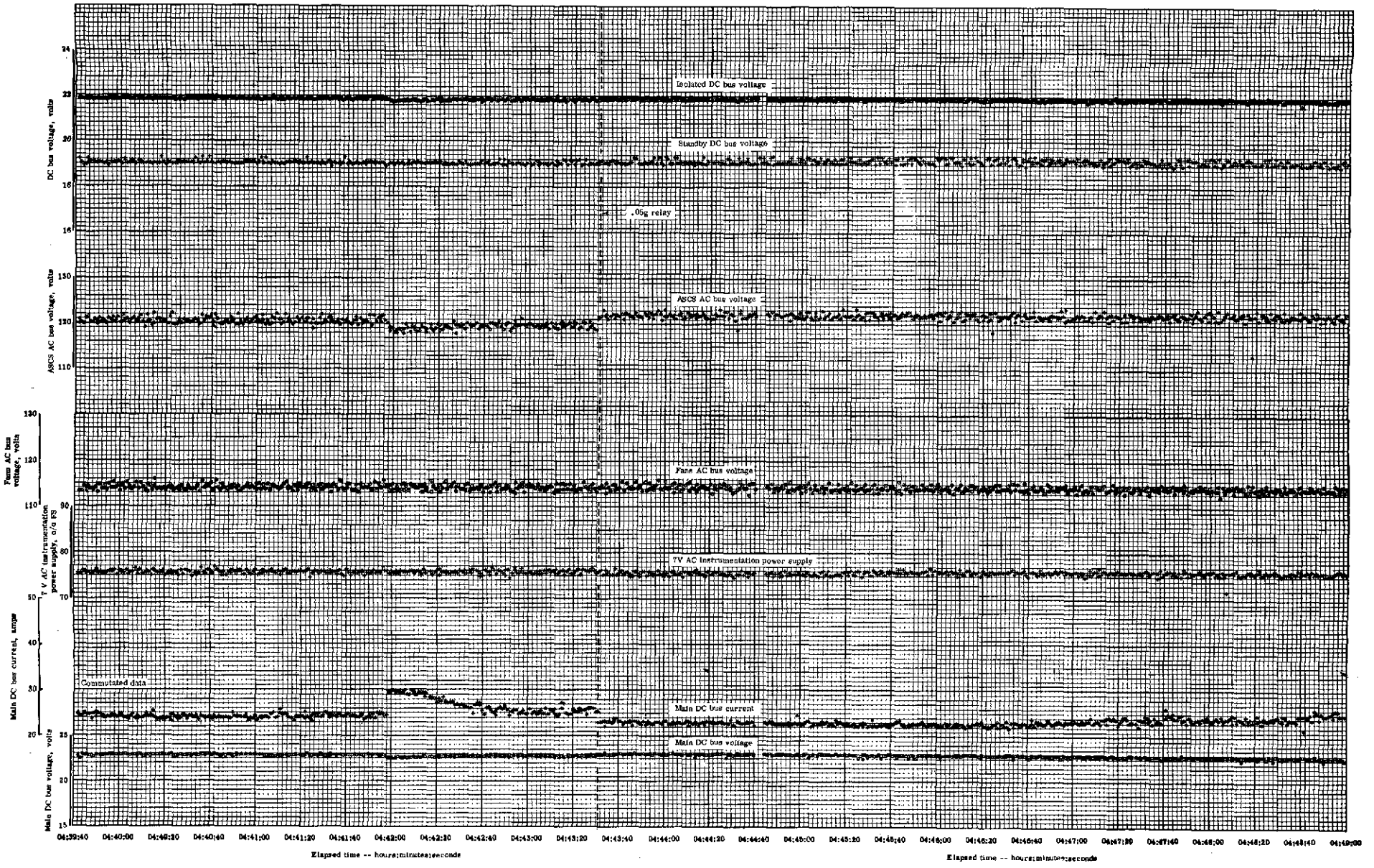


Fig. 70 - Electrical System-Fans AC Bus Voltage; 7VAC; d-c Amps; d-c Volts; ASCS Volts; Isolated Bus Volts; Standby Bus Volts

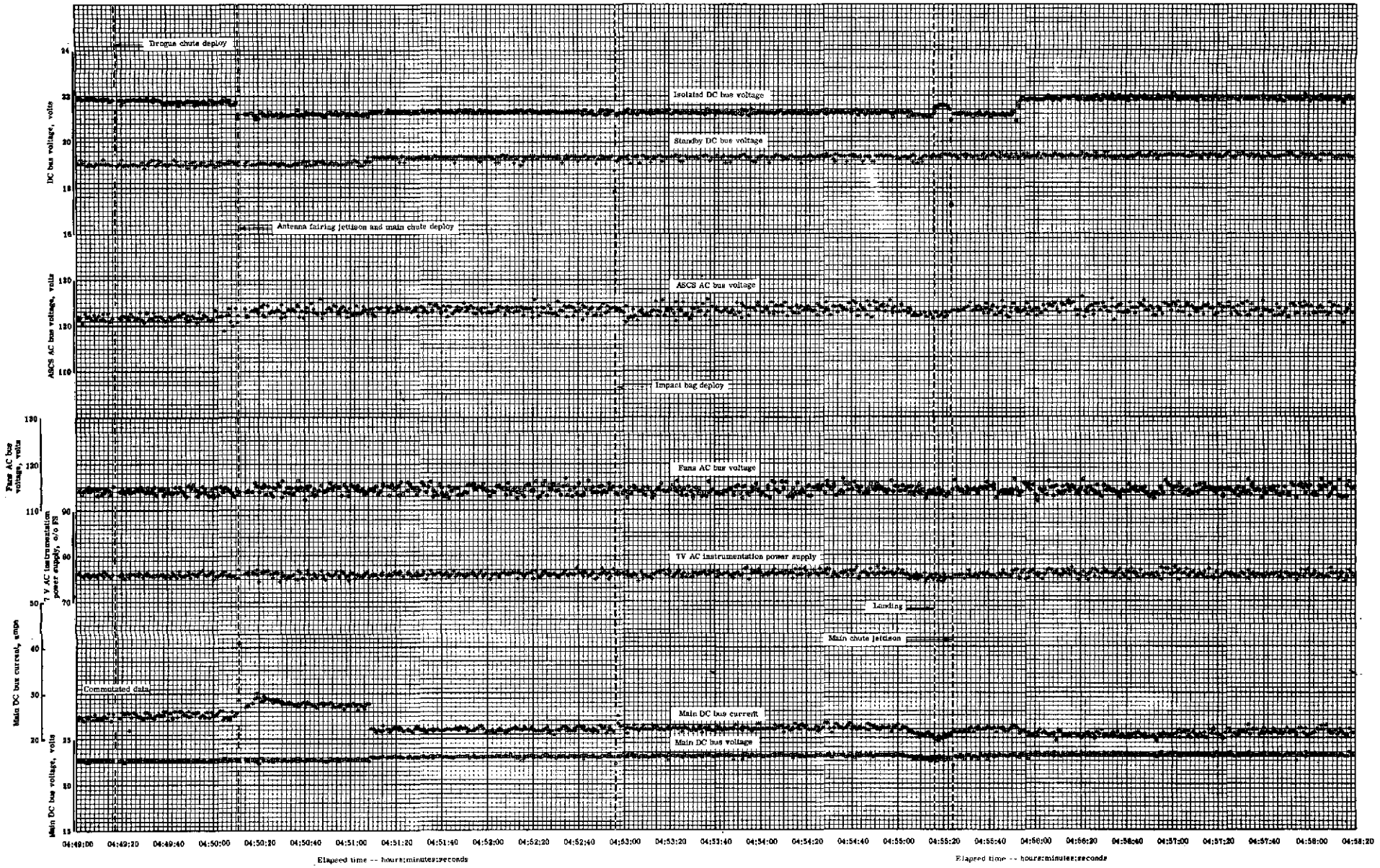


Fig. 71 - Electrical System-Fans AC ~~Bus Voltage; 7 VAC;~~ d-c Amps; d-c Volts; ASCS Volts; Isolated Bus Volts; Standby Bus Volts

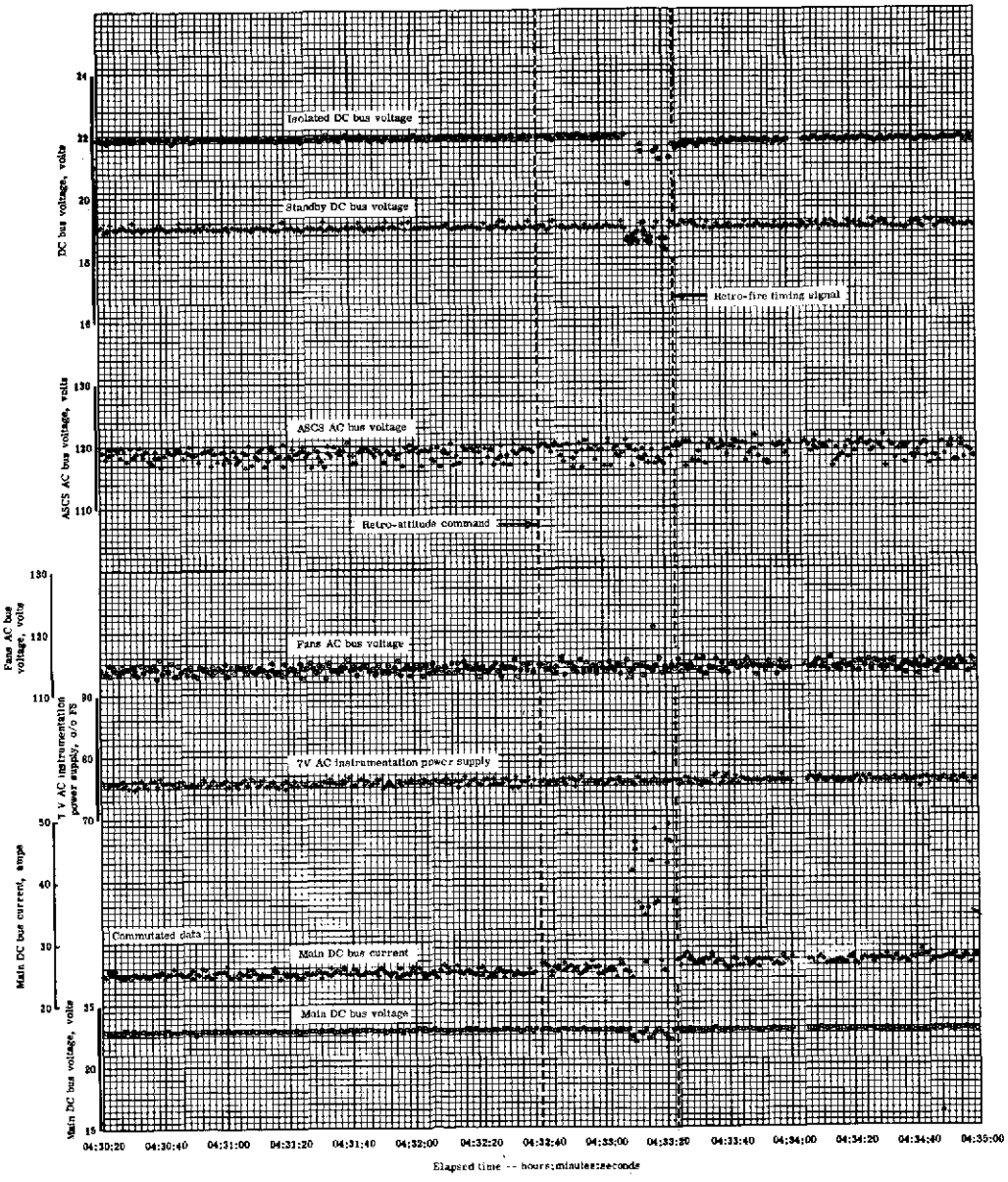


Fig. 72 - Electrical System-Fans AC Bus Voltage; 7VAC; d-c Amps; d-c Volts; ASCS Volts; Isolated Bus Volts; Standby Bus Volts

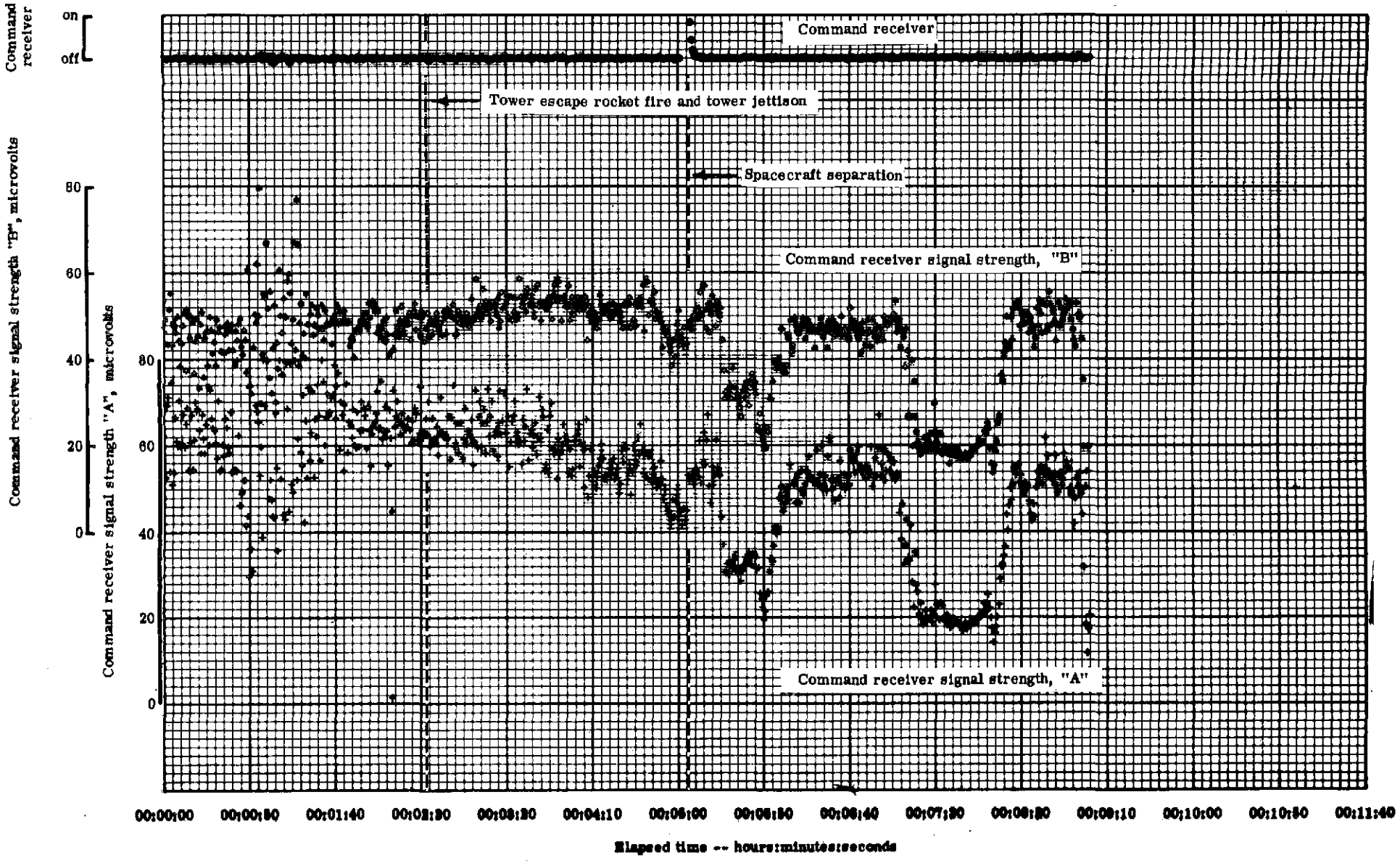


Fig. 73 - Command Receiver; Command Receiver Signals Strength, A & B

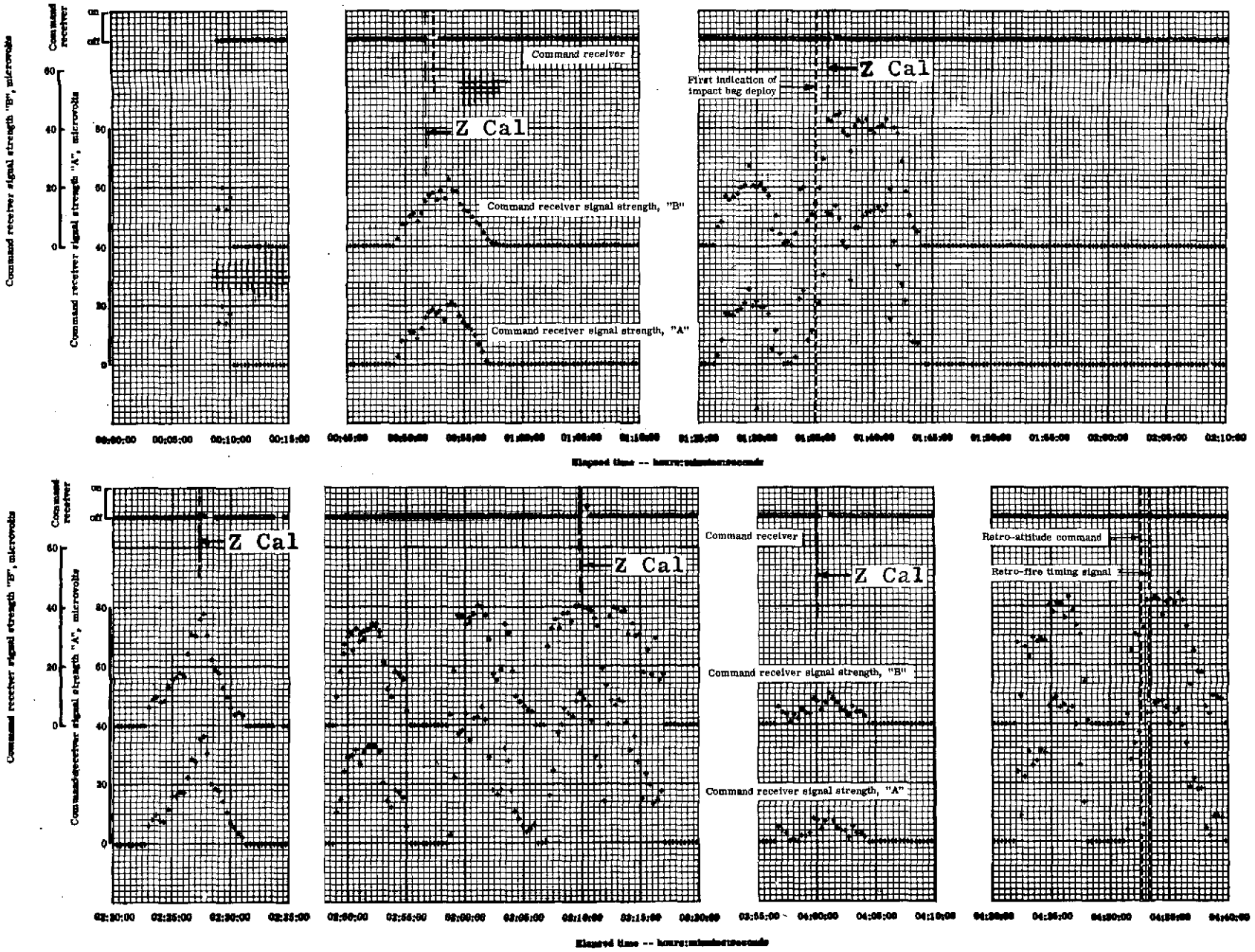


Fig. 74 - Command Receiver, Command Reciever Signal Strength, A & B

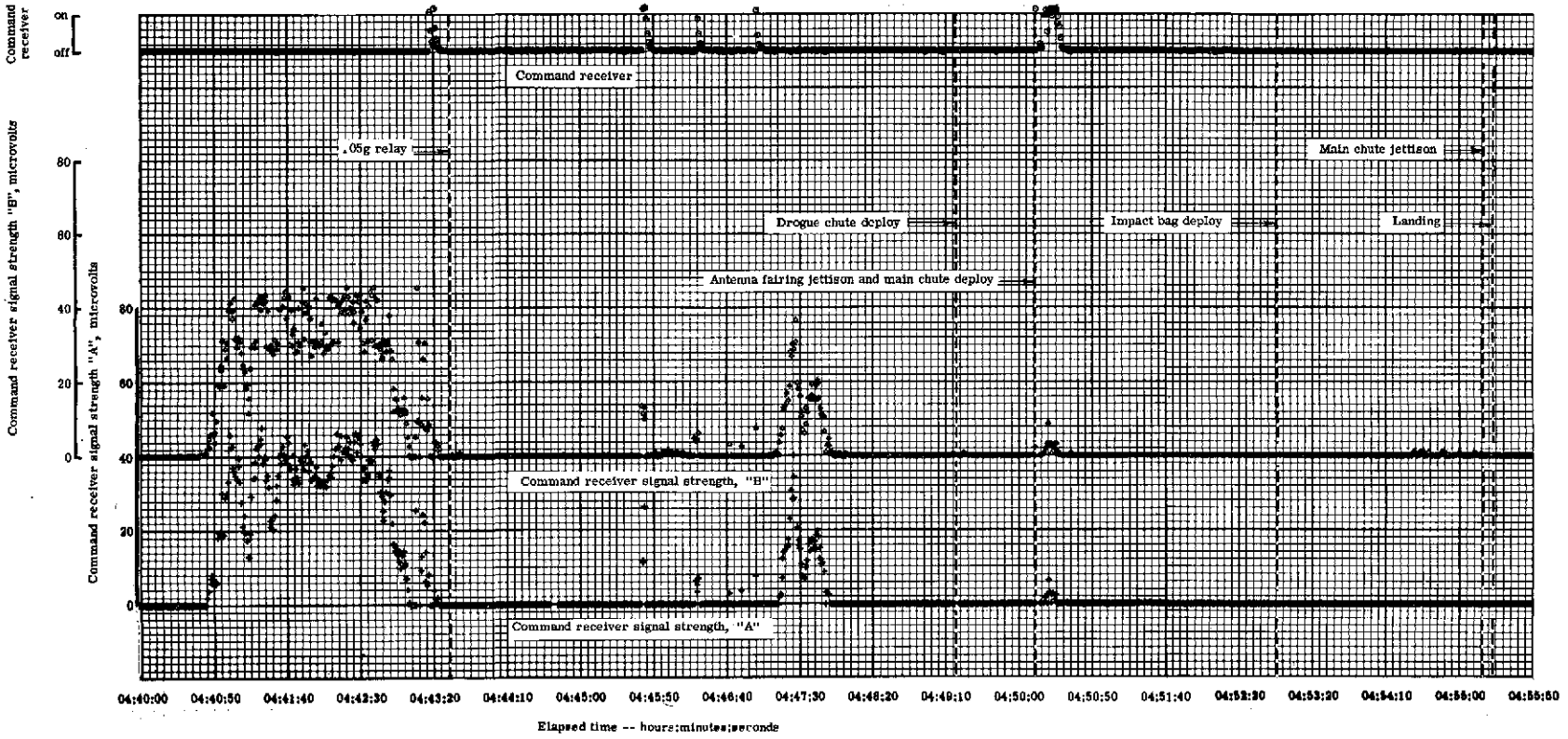


Fig. 75 - Command Receiver; Command Receiver Signals Strength, A & B

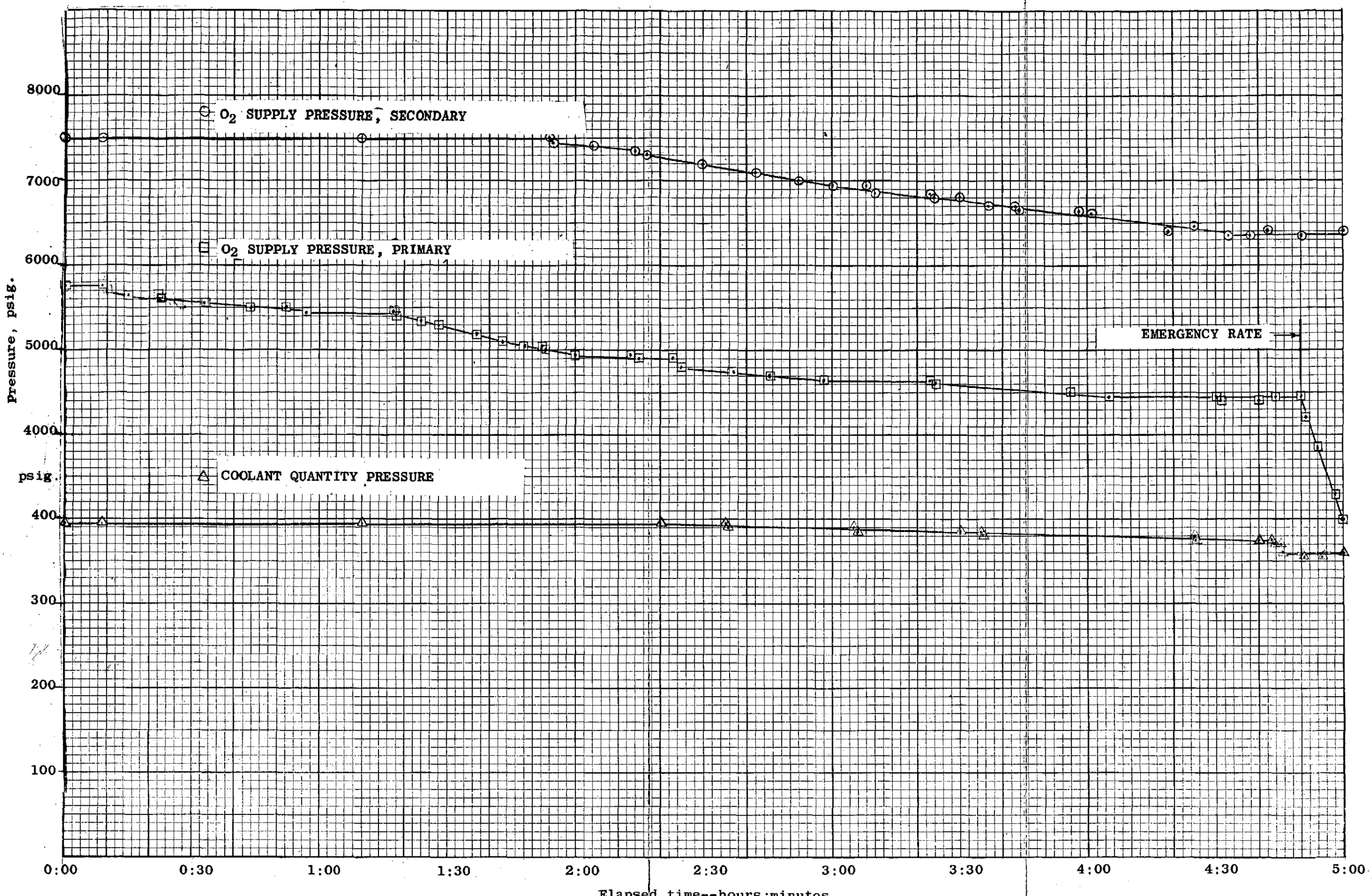


Fig. 76 OXYGEN SUPPLY AND COOLANT QUANTITY PRESSURES

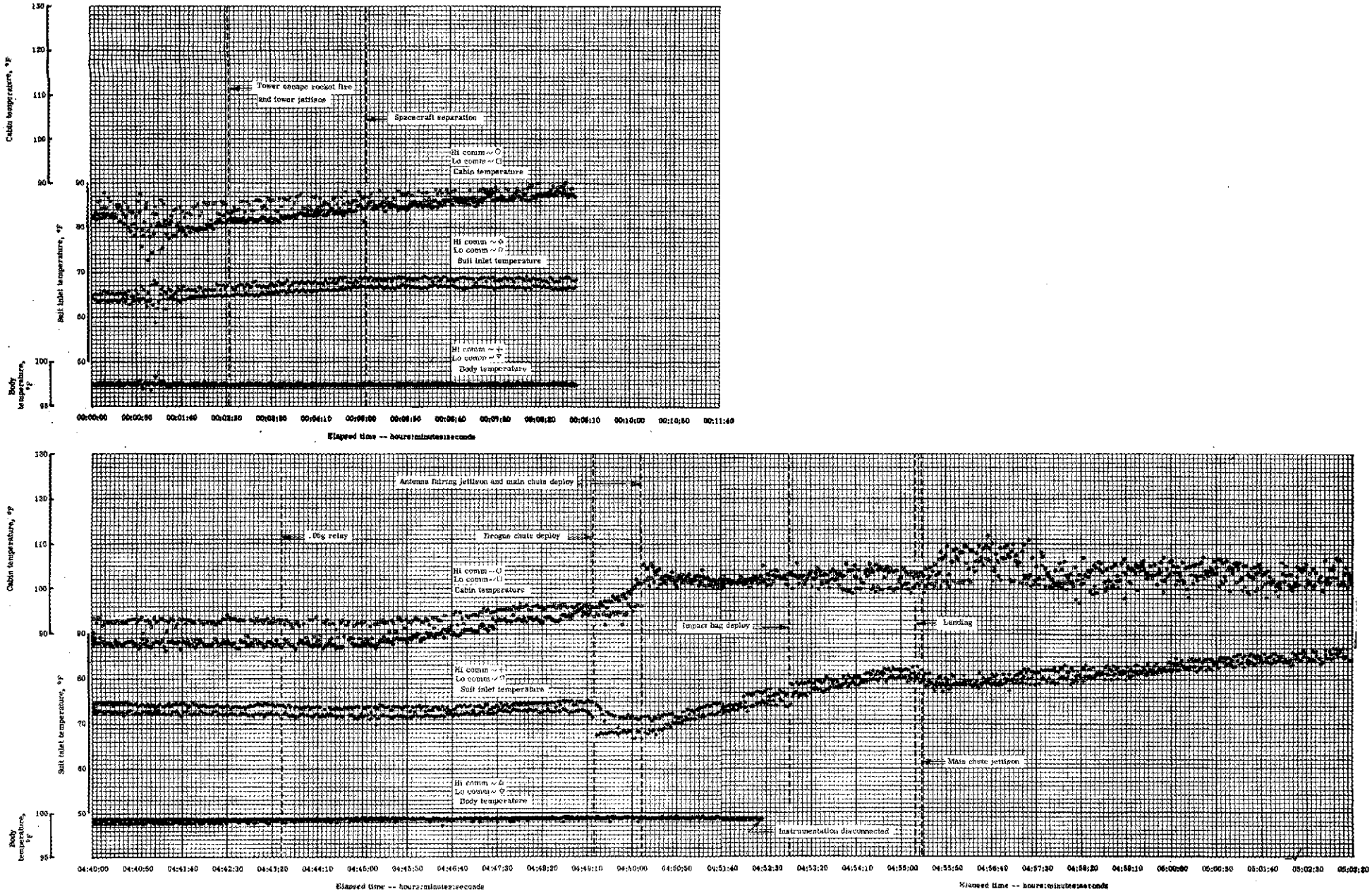


Fig. 77 - Cabin Temperature; Suit Inlet Temperature; Body Temperature

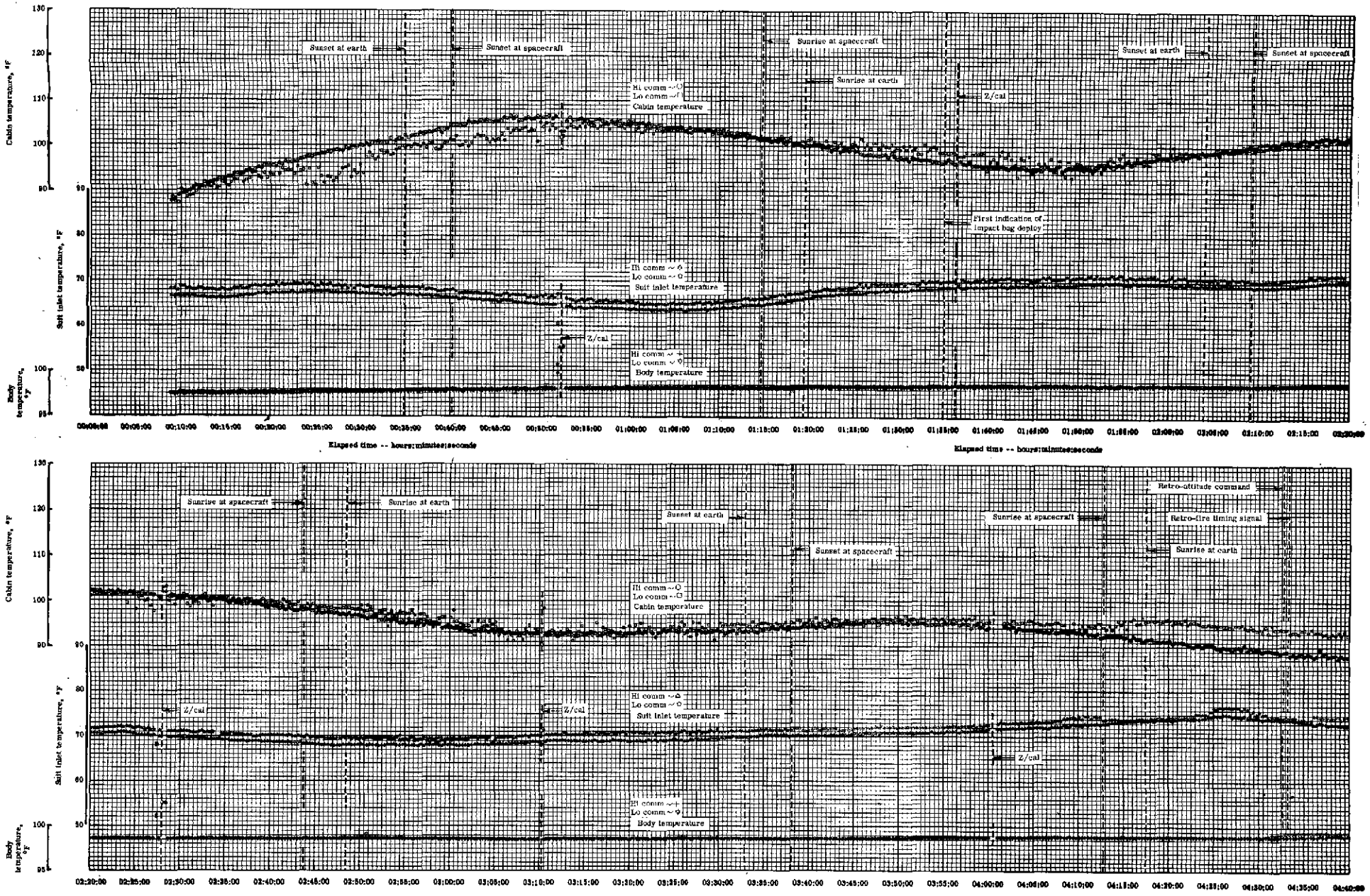


Fig. 78 - Cabin Temperature; Suit Inlet Temperature; Body Temperature

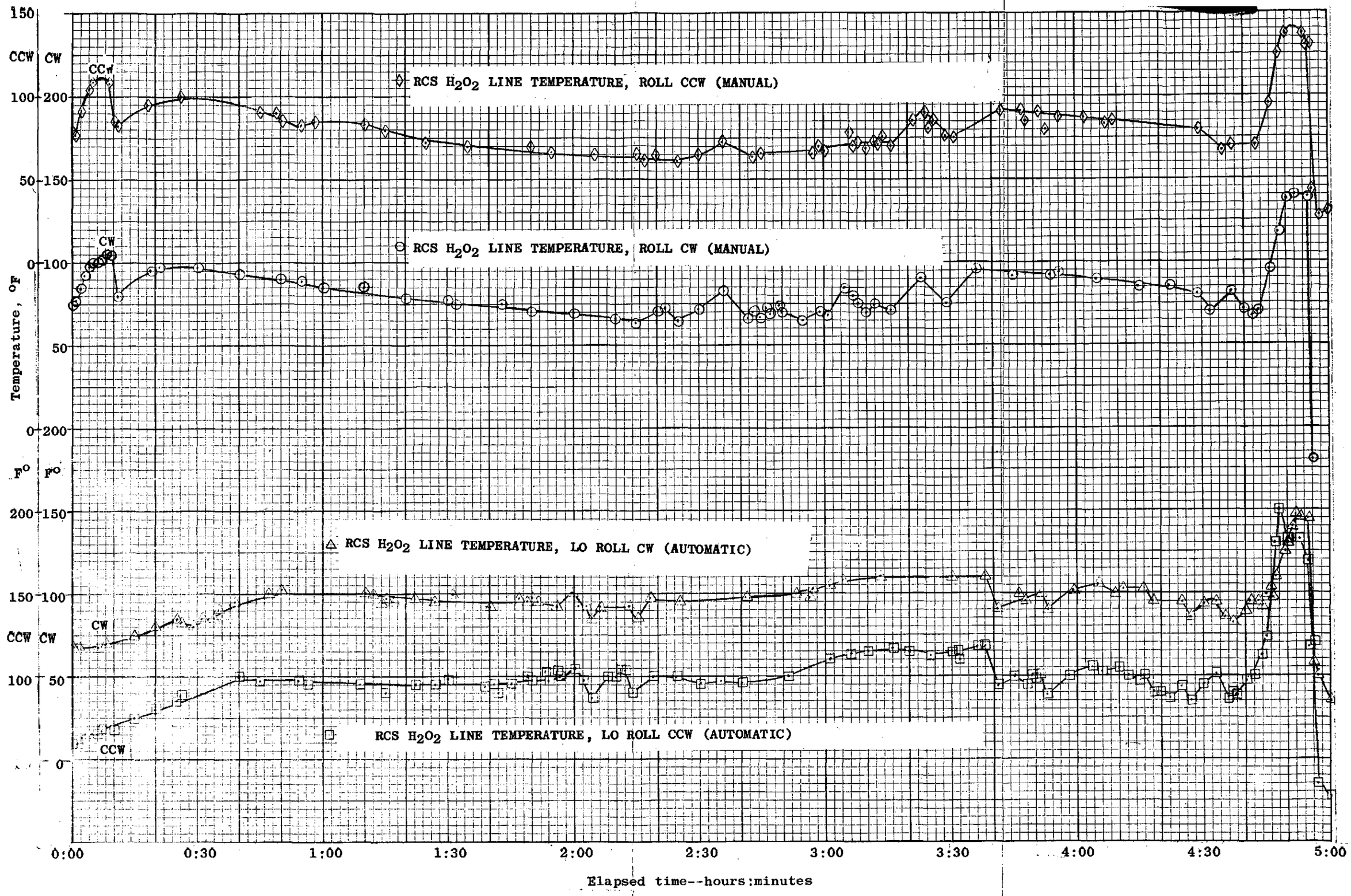


Fig. 79 RCS H_2O_2 LINE TEMPERATURES

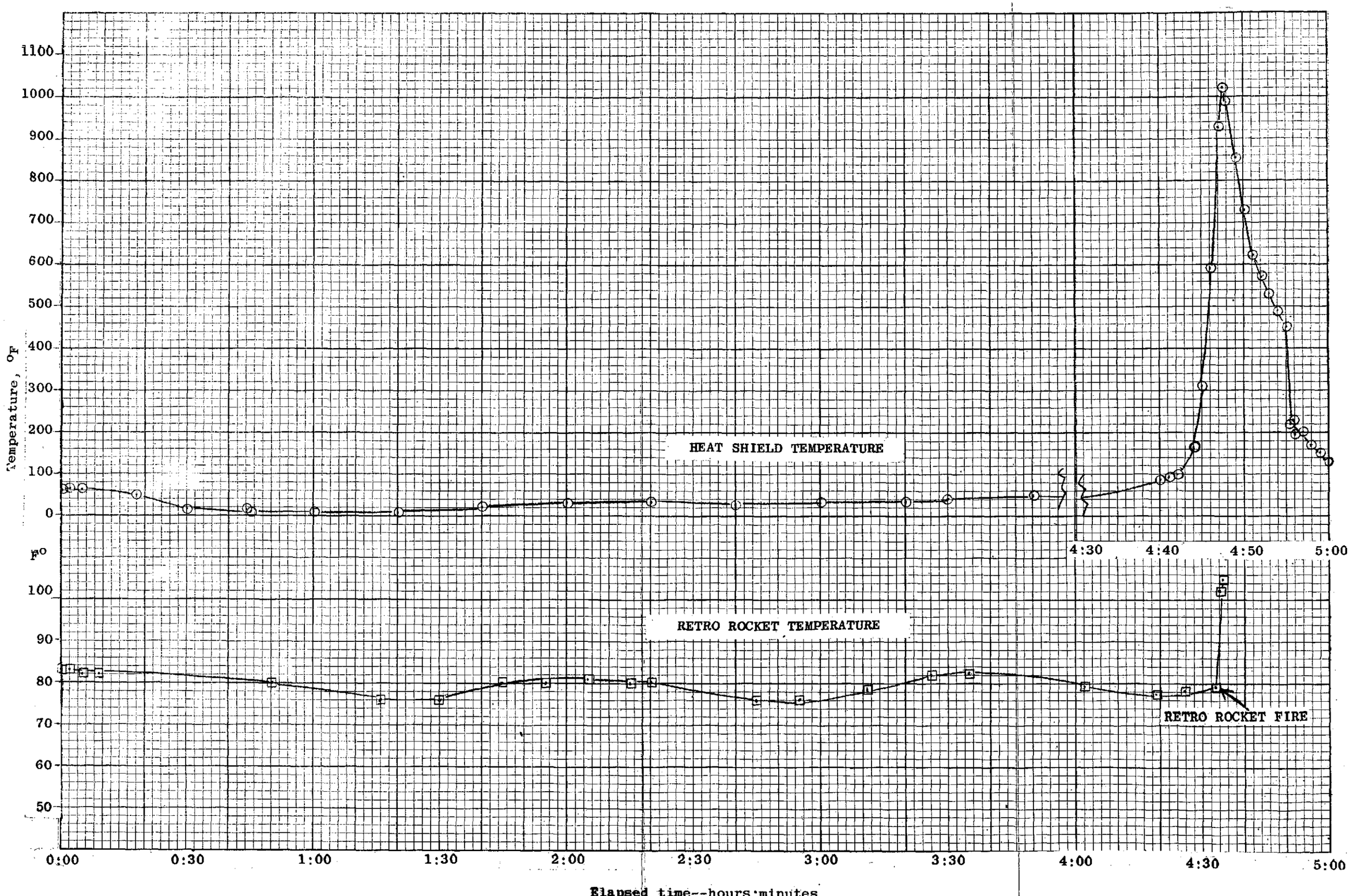


Fig. 80 HEAT SHIELD AND RETRO ROCKET TEMPERATURES

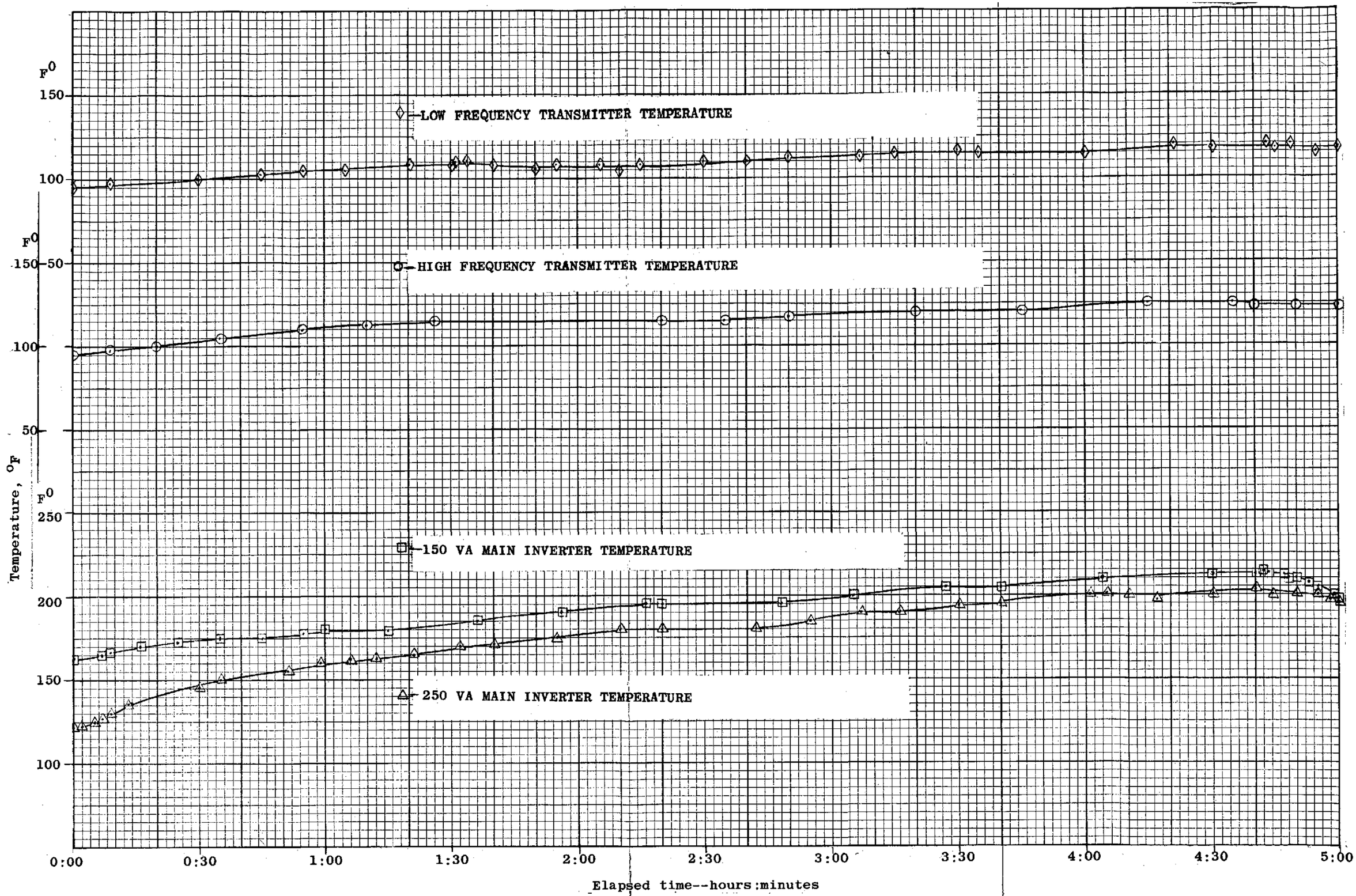


Fig. 81-LOW FREQUENCY TRANSMITTER, HIGH FREQUENCY TRANSMITTER TEMPERATURES; 150 VA MAIN INVERTER AND 250 VA MAIN INVERTER TEMPERATURES

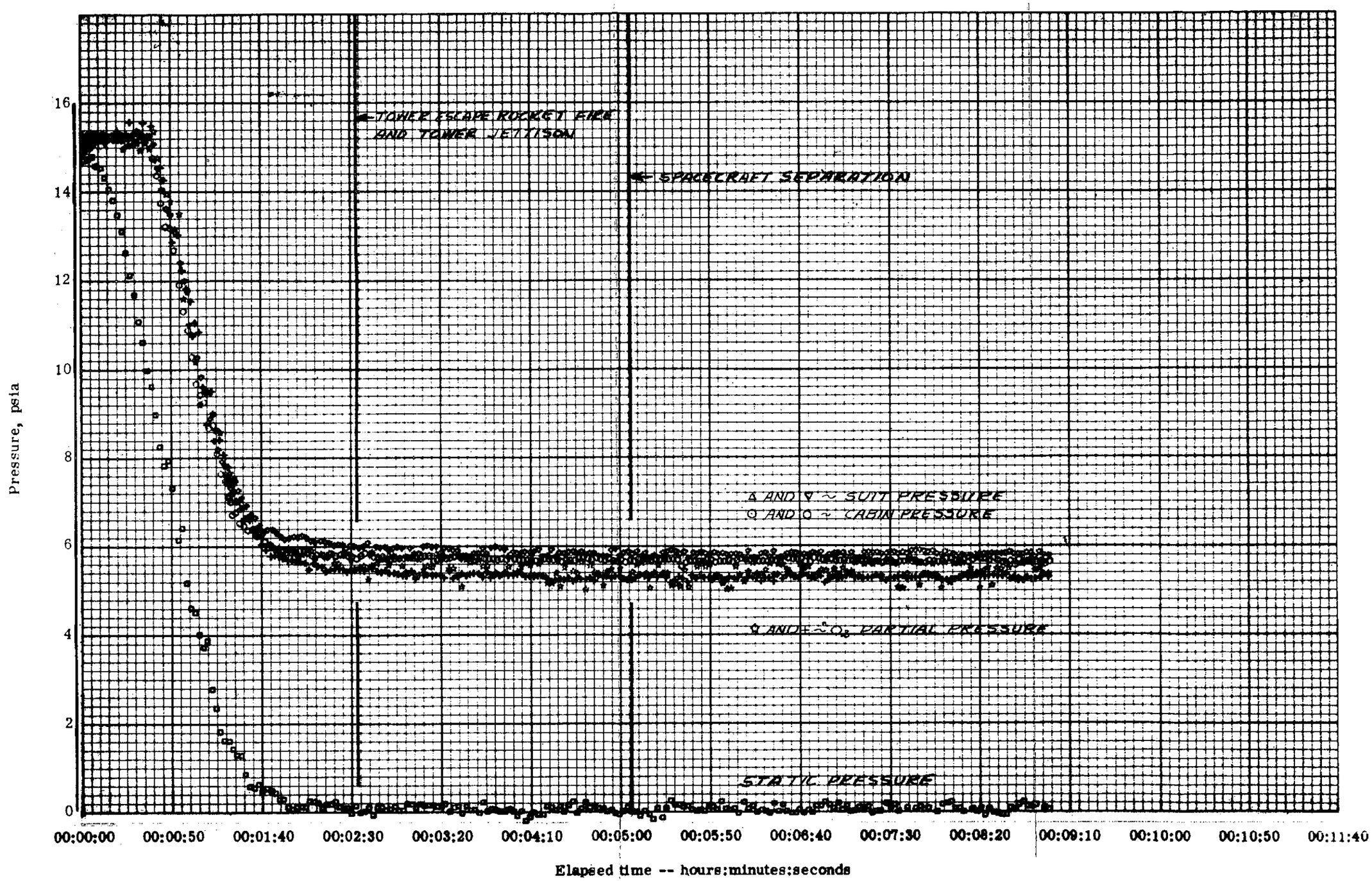


Fig. 82 MA-6 SUIT PRESSURE; CABIN PRESSURE; O_2 PARTIAL PRESSURE; STATIC PRESSURE

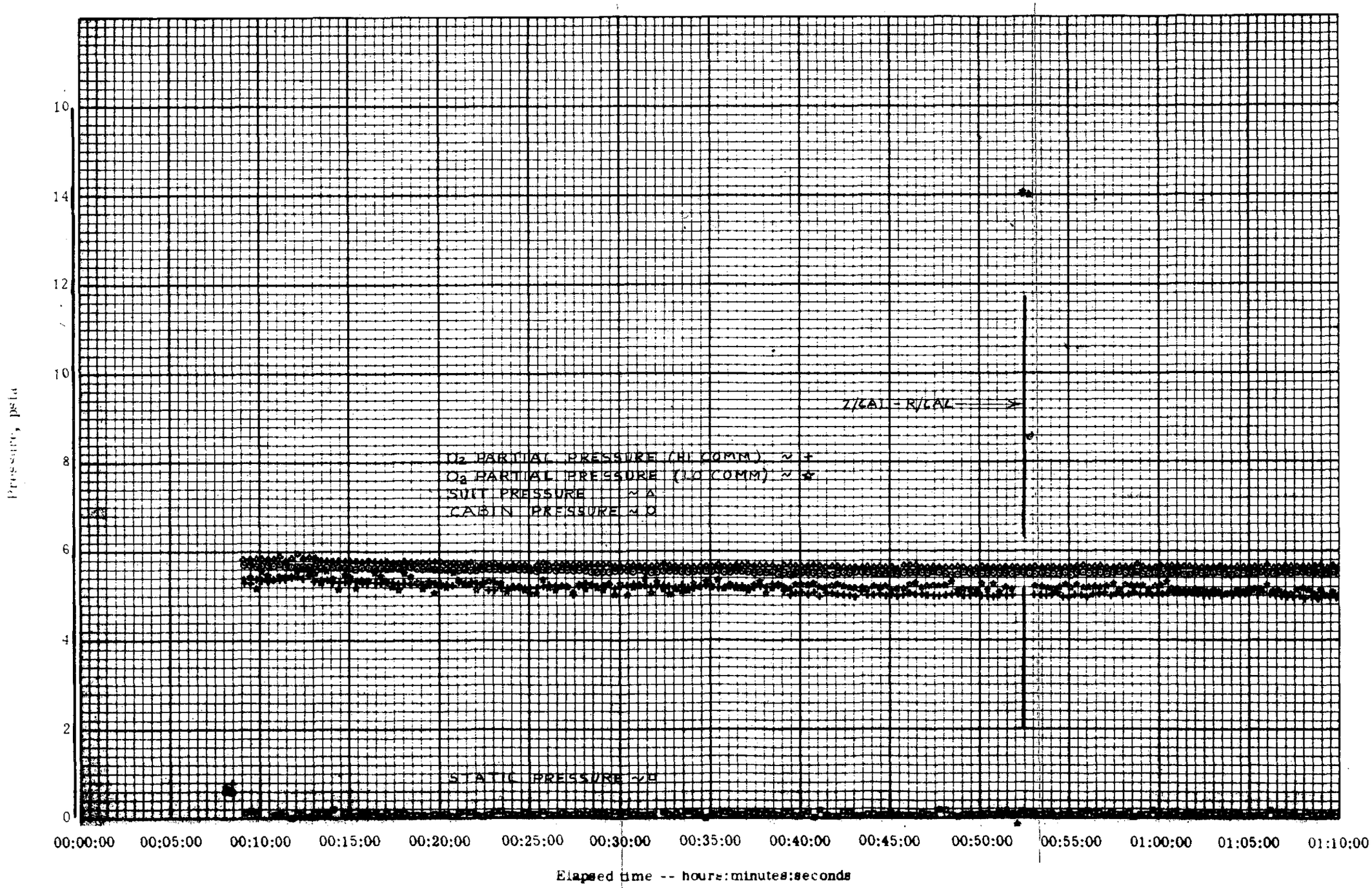


Fig. 83 MA-6 SUIT PRESSURE; CABIN PRESSURE; O_2 PARTIAL PRESSURE; STATIC PRESSURE

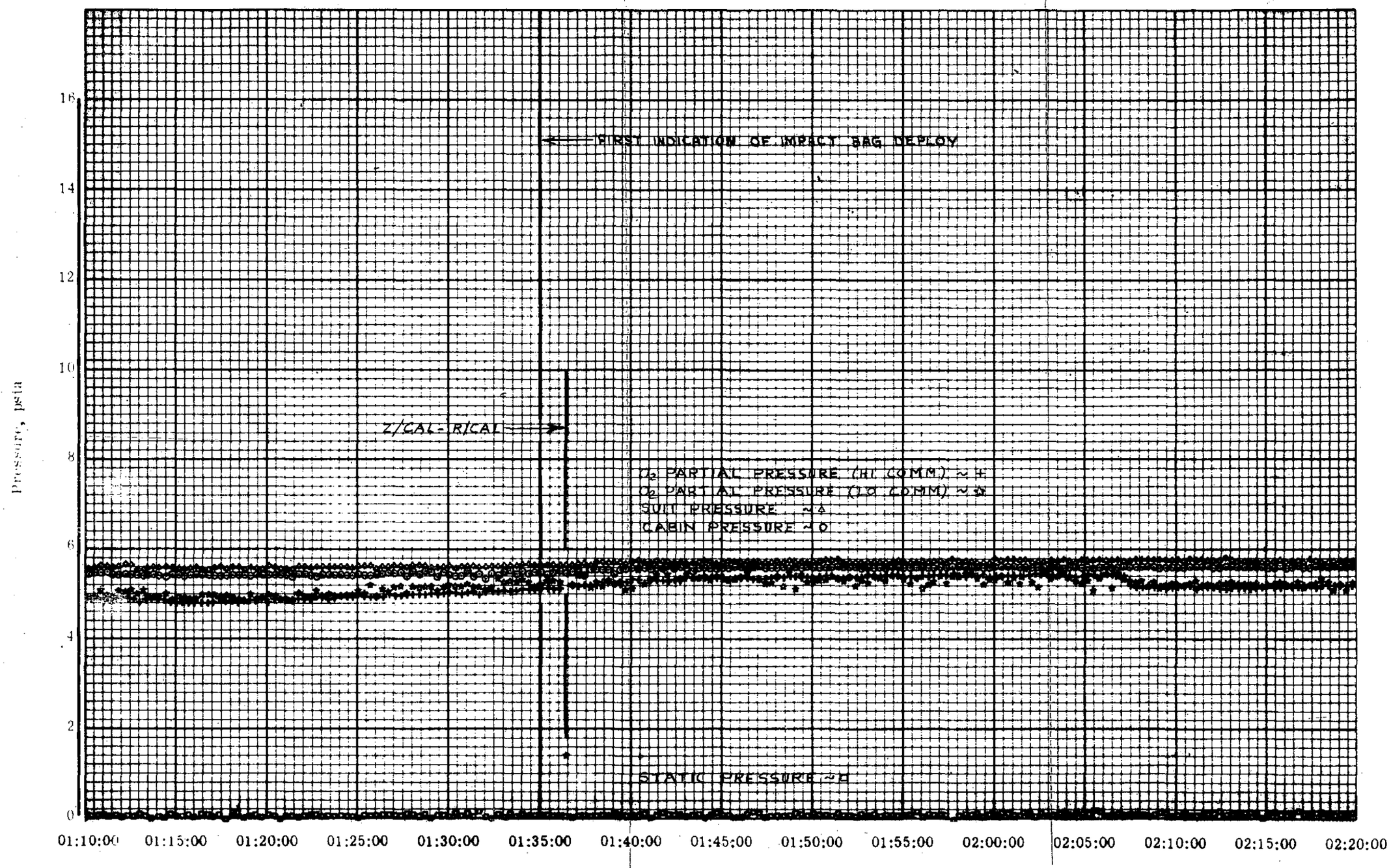


Fig. 84 MA-6 SUIT PRESSURE; CABIN PRESSURE; O_2 PARTIAL PRESSURE; STATIC PRESSURE

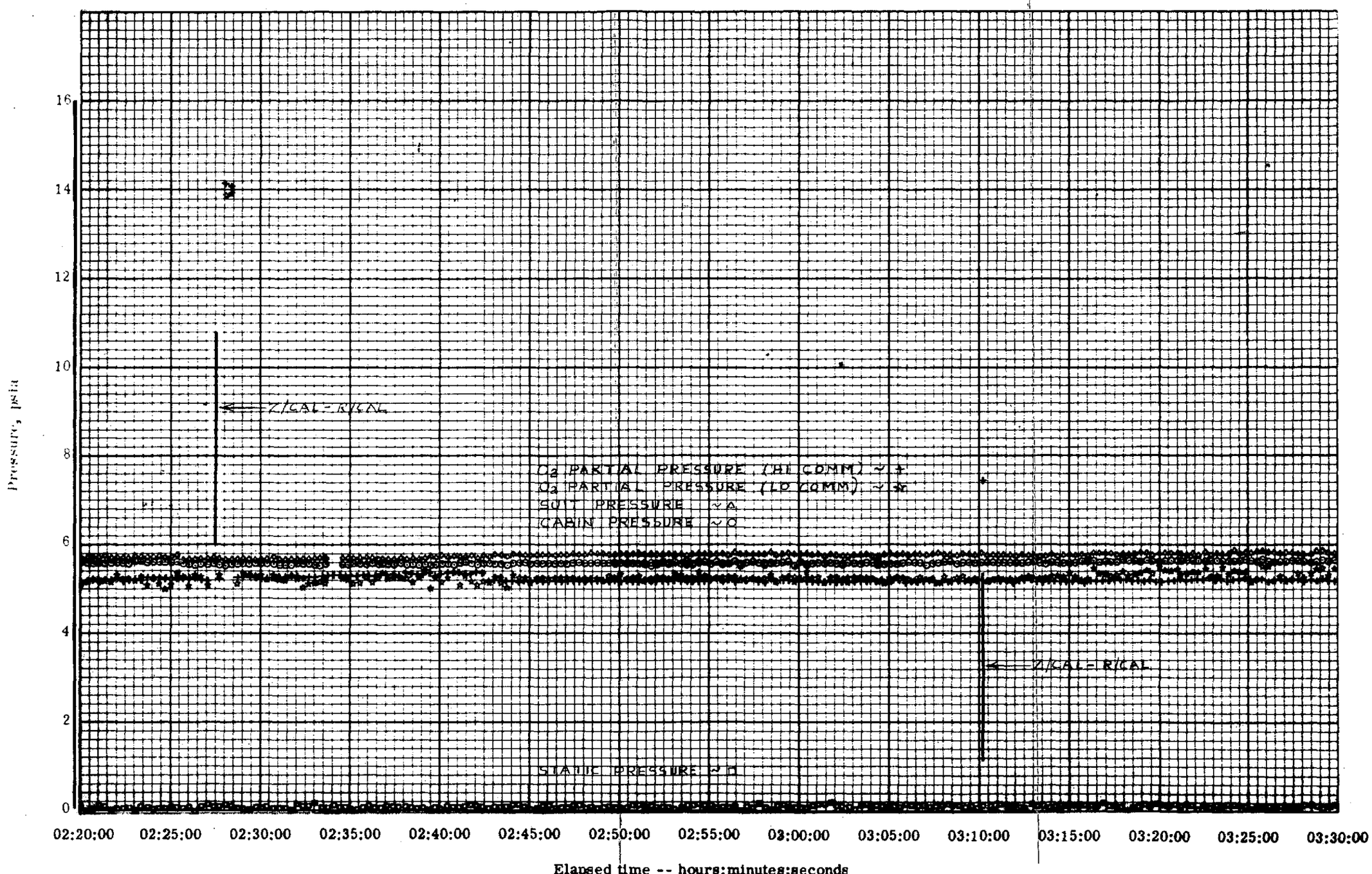


Fig. 85 MA-6 SUIT PRESSURE; CABIN PRESSURE; O_2 PARTIAL PRESSURE; STATIC PRESSURE

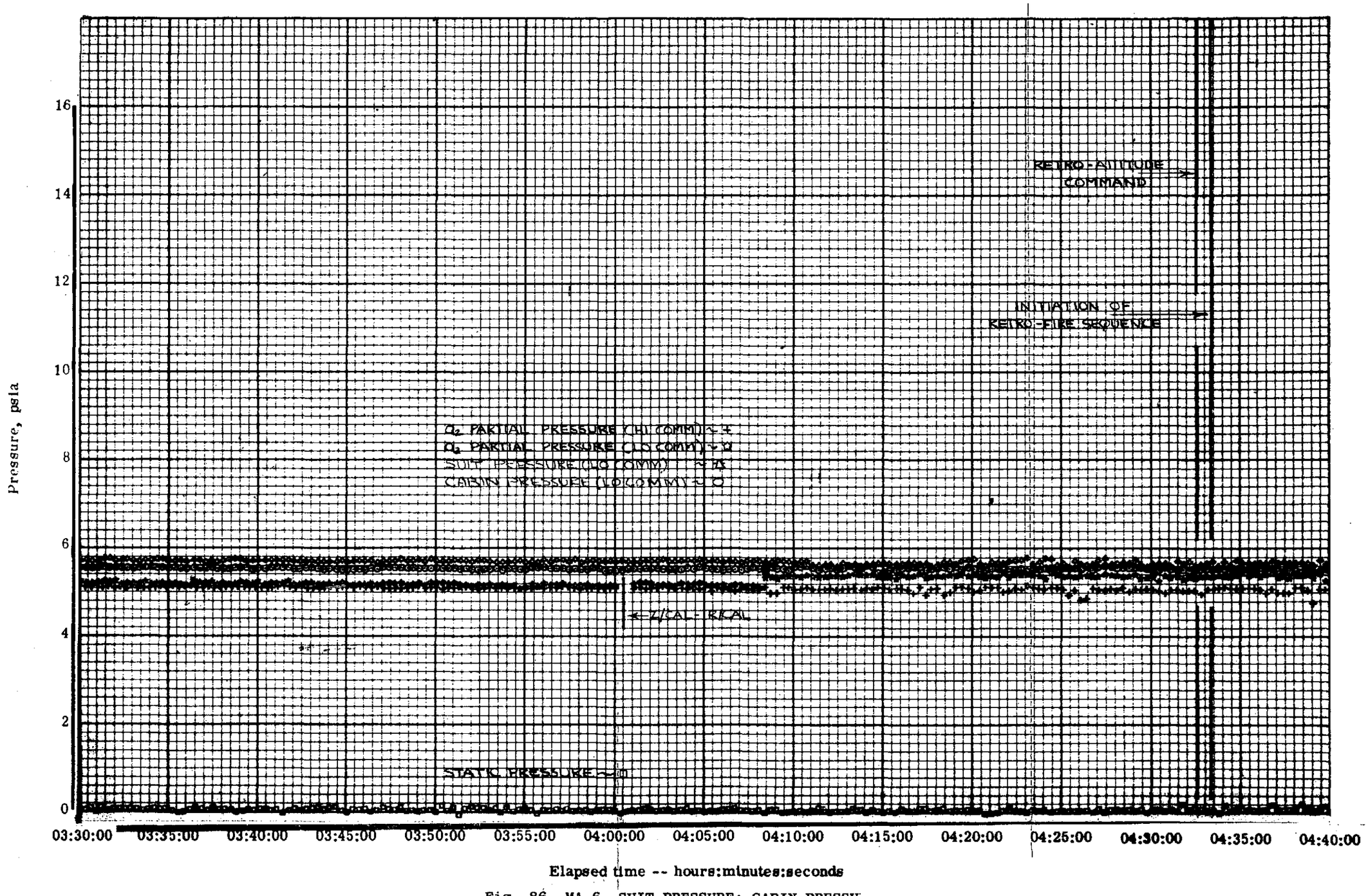


Fig. 86 MA-6 SUIT PRESSURE; CABIN PRESSURE
O_2 PARTIAL PRESSURE; STATIC PRESSURE

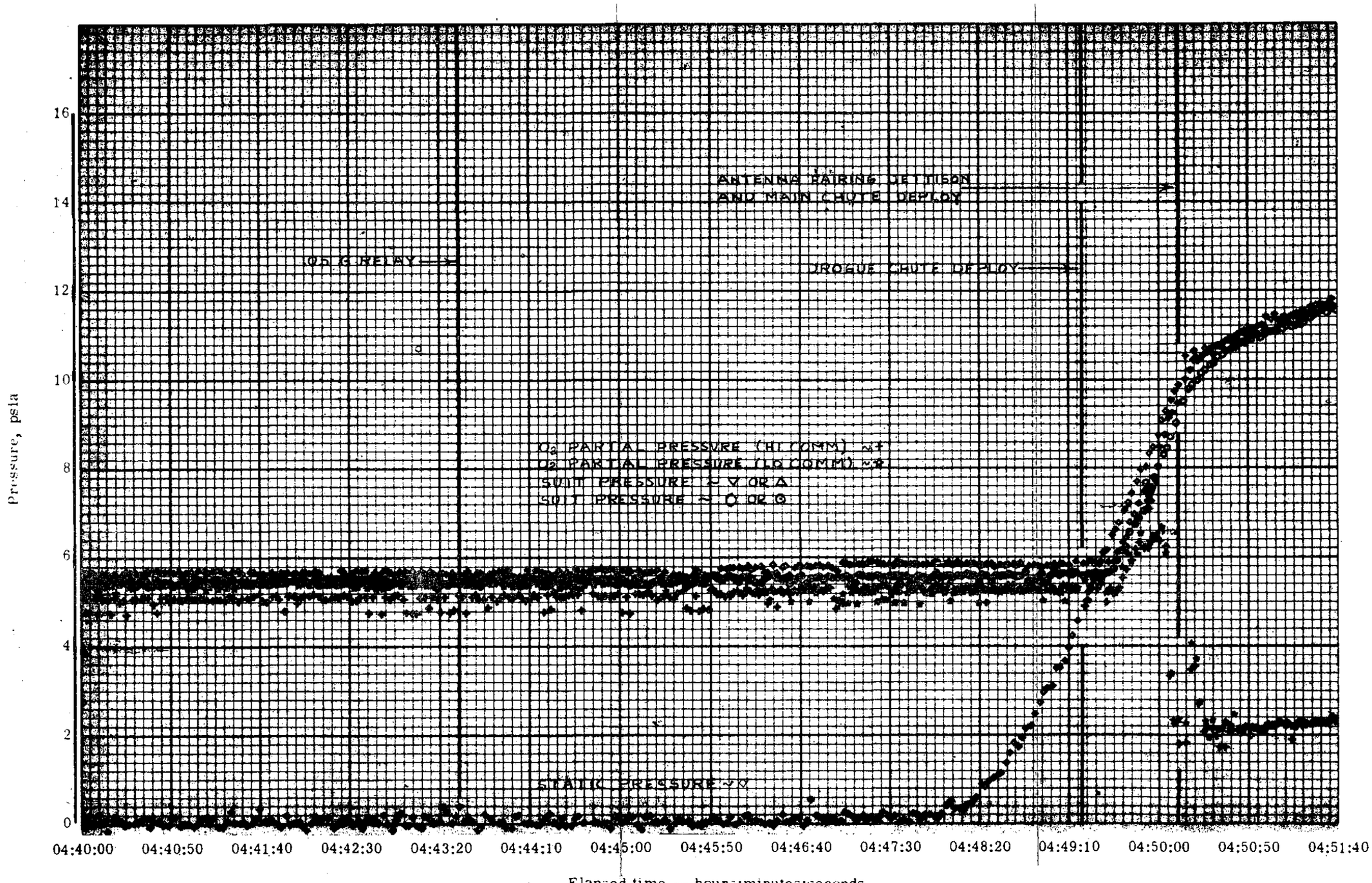


Fig. 87 MA-6 SUIT PRESSURE; CABIN PRESSURE; O_2 PARTIAL PRESSURE; STATIC PRESSURE

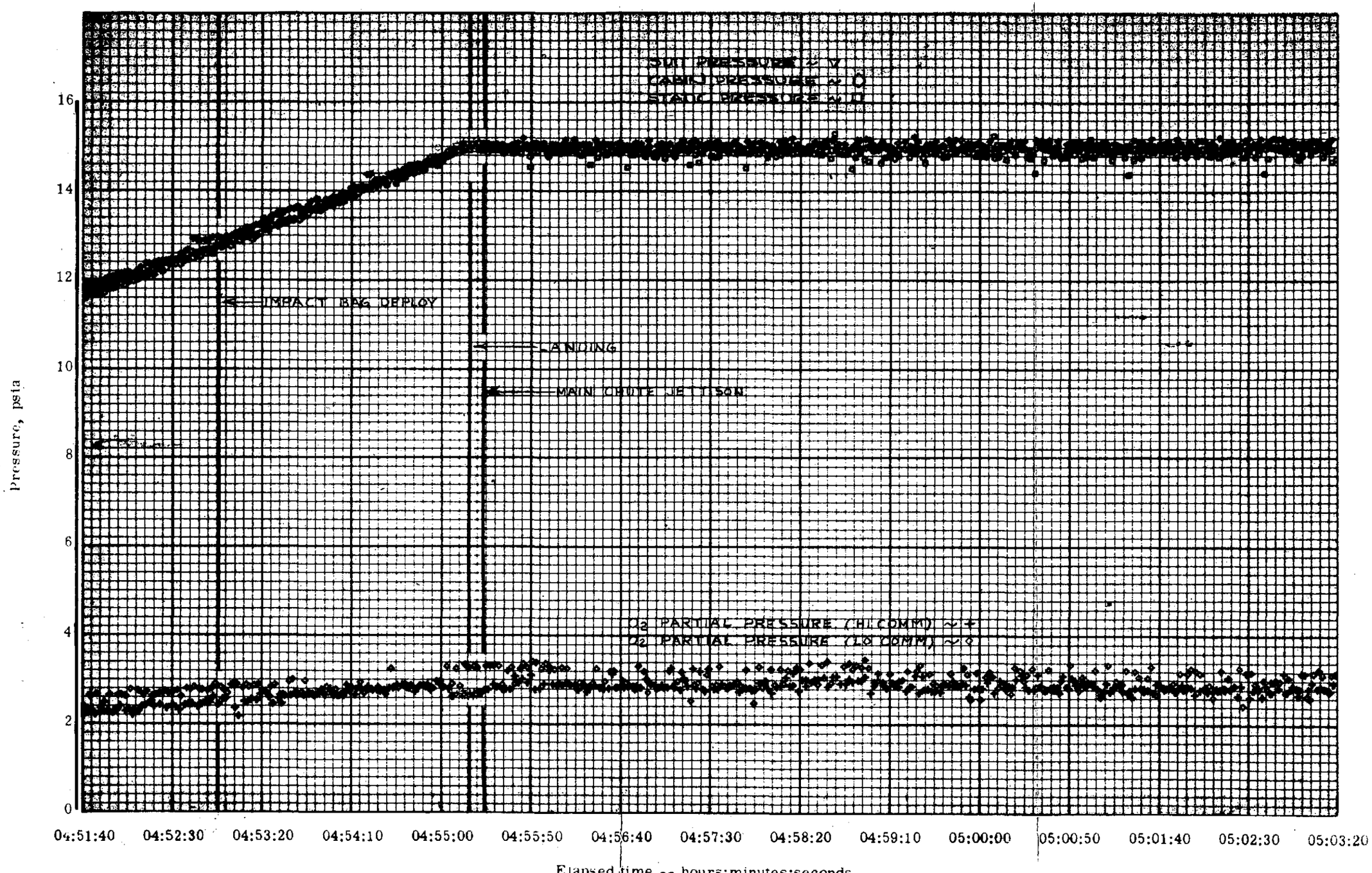


Fig. 88 MA-6 SUIT PRESSURE; CABIN PRESSURE; O_2 PARTIAL PRESSURE; STATIC PRESSURE

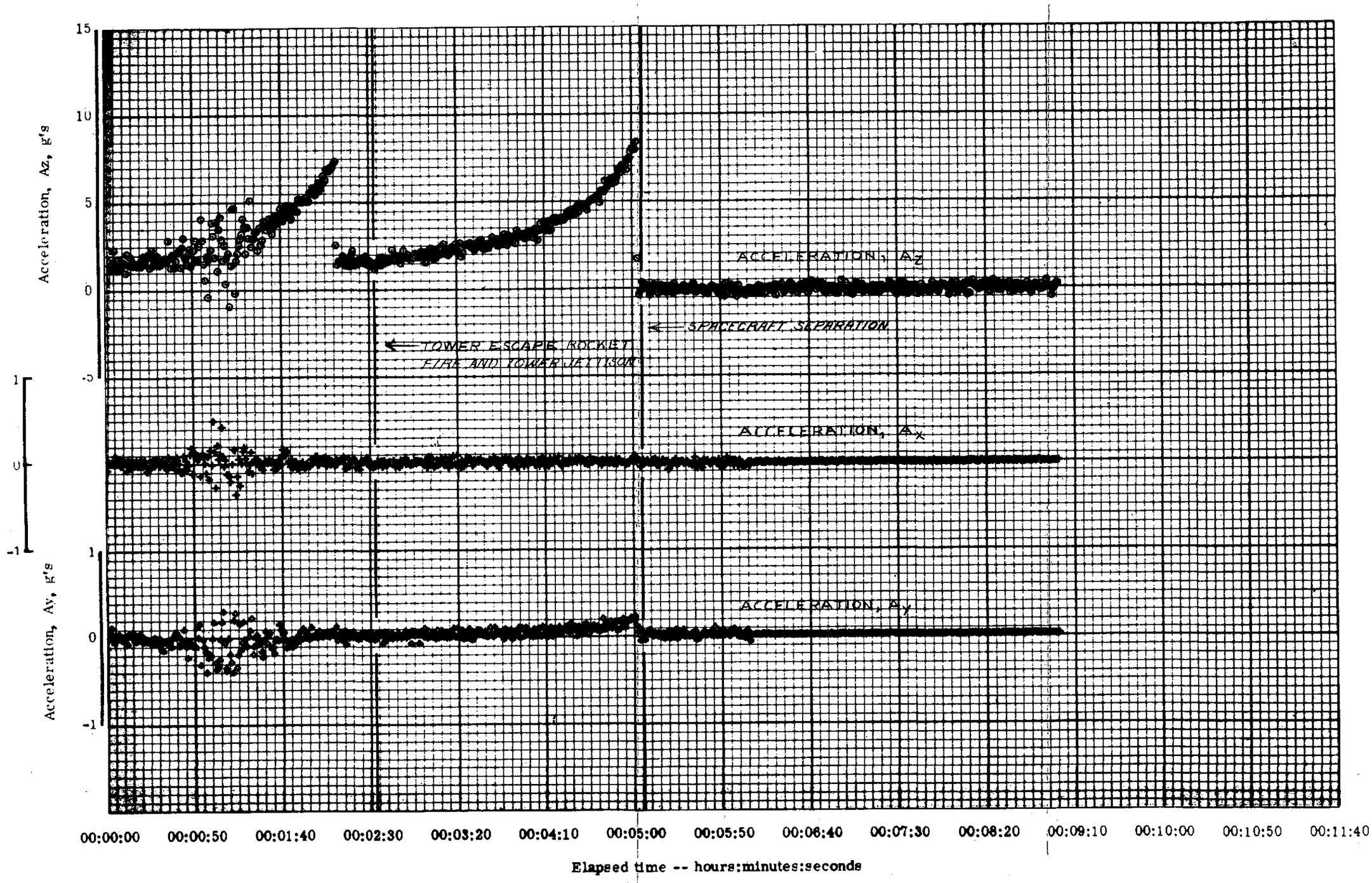


Fig. 89 MA-6 ACCELERATIONS: A_x, A_y, and A_z

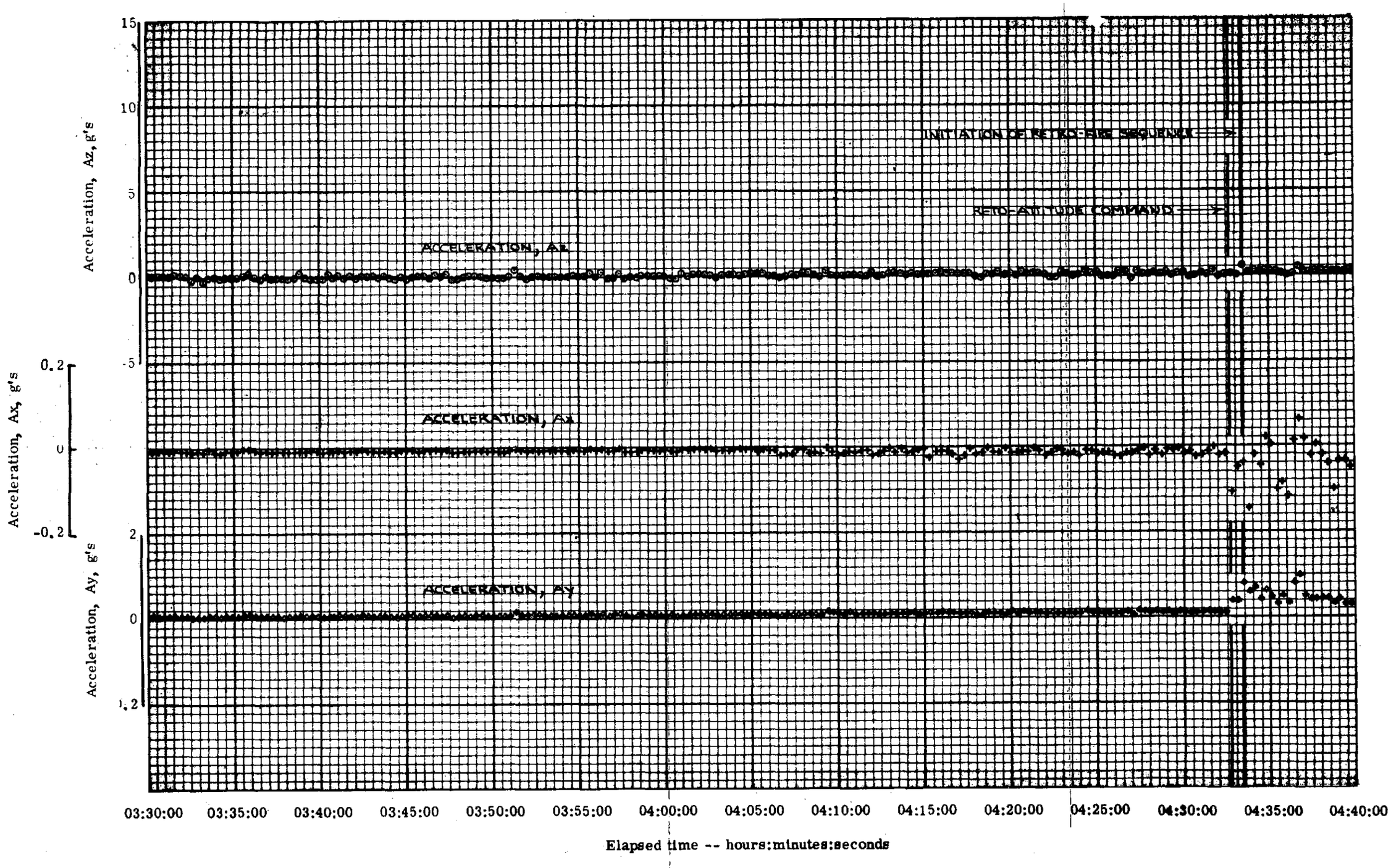


Fig. 90 MA-6 ACCELERATIONS: A_x, A_y, and A_z

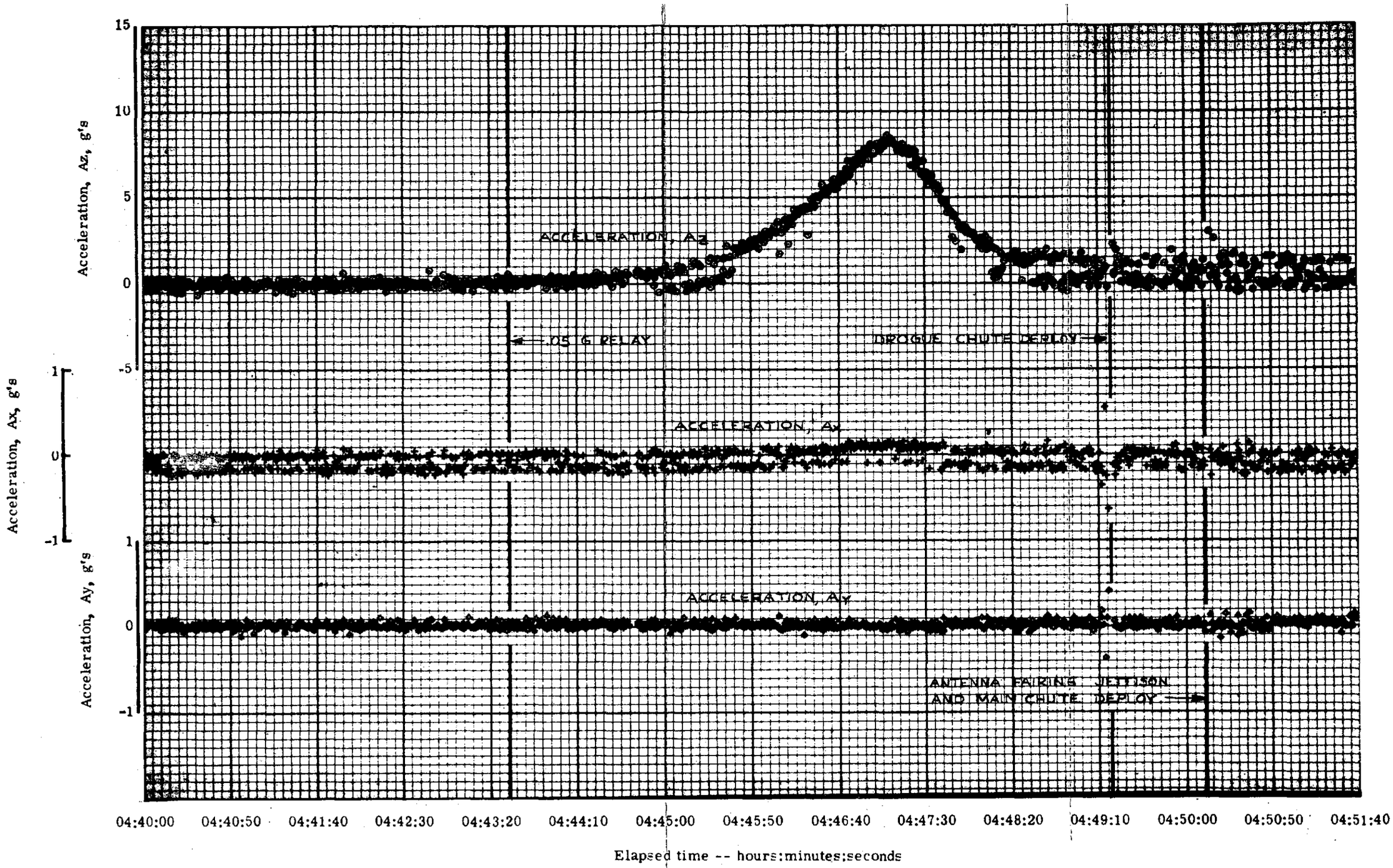


Fig. 91 MA-6 ACCELERATIONS: A_x, A_y, and A_z

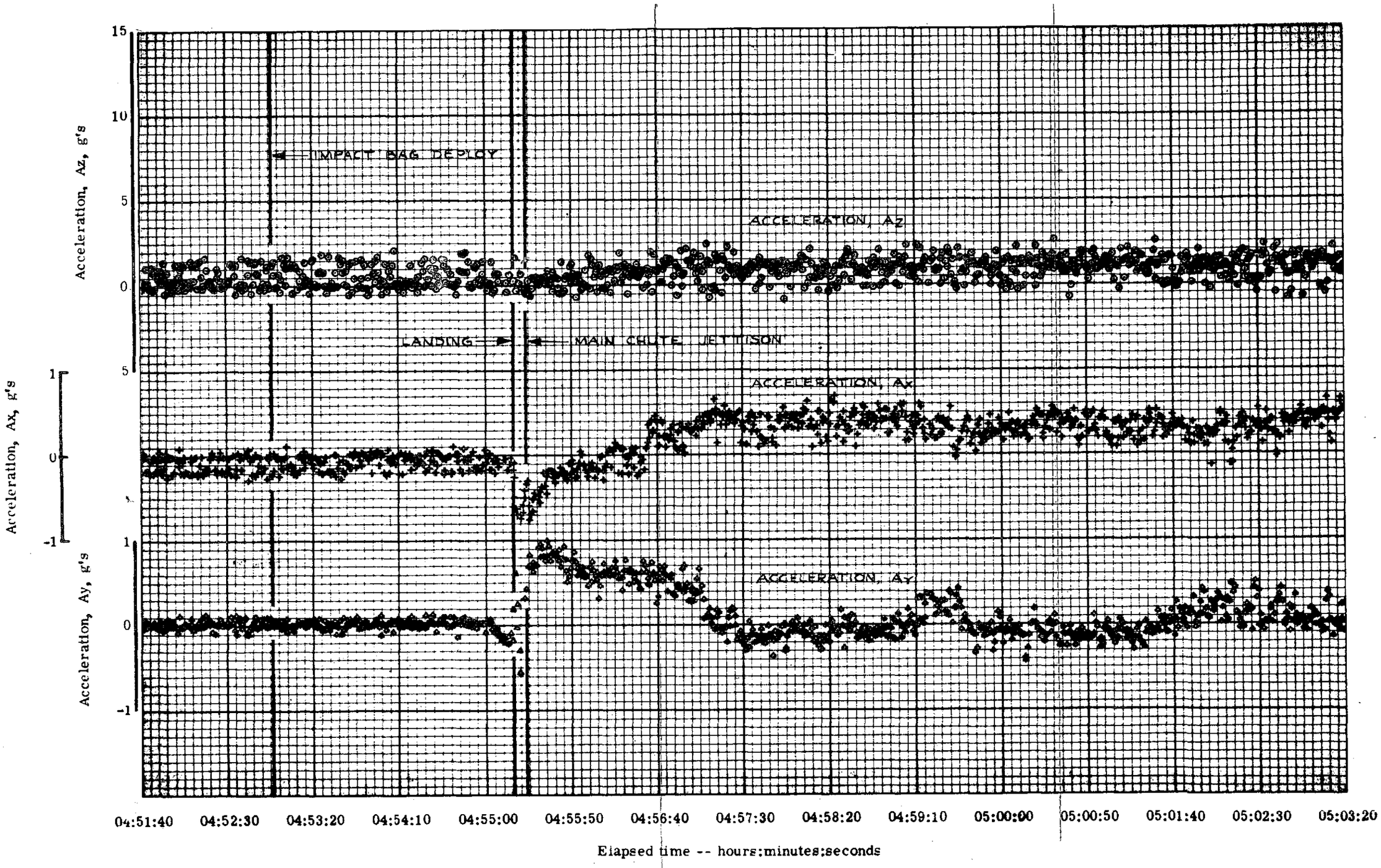
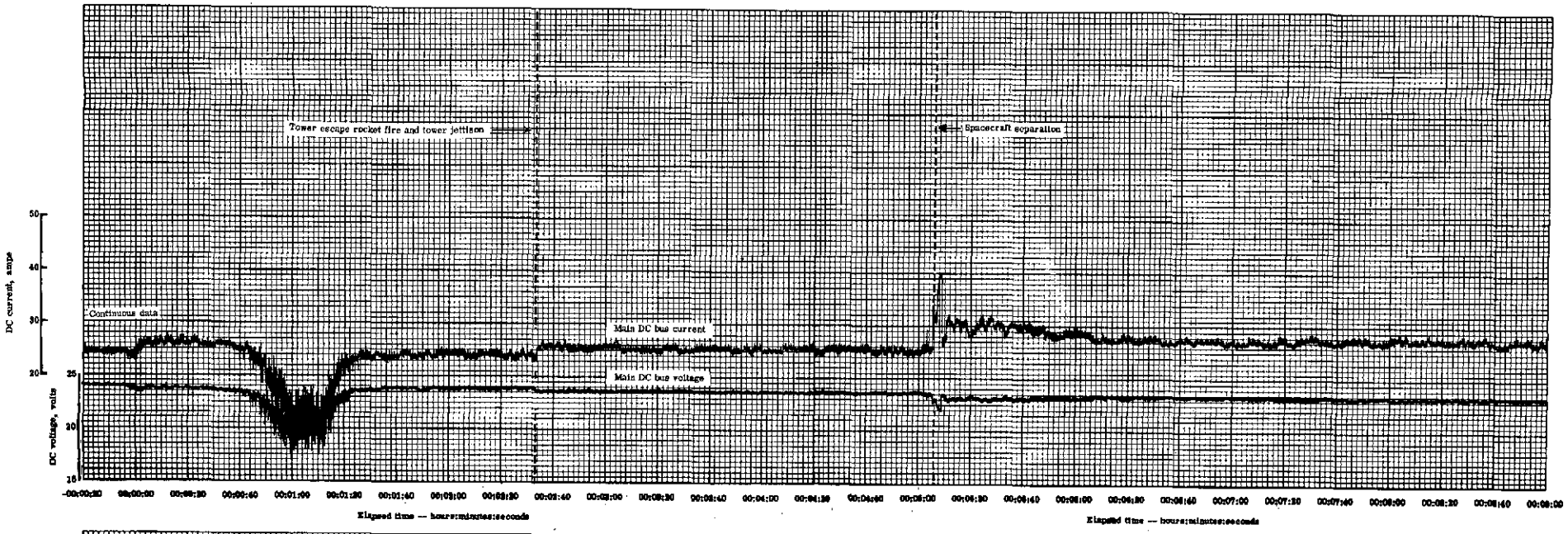


Fig. 92 MA-6 ACCELERATIONS: A_x, A_y, and A_z



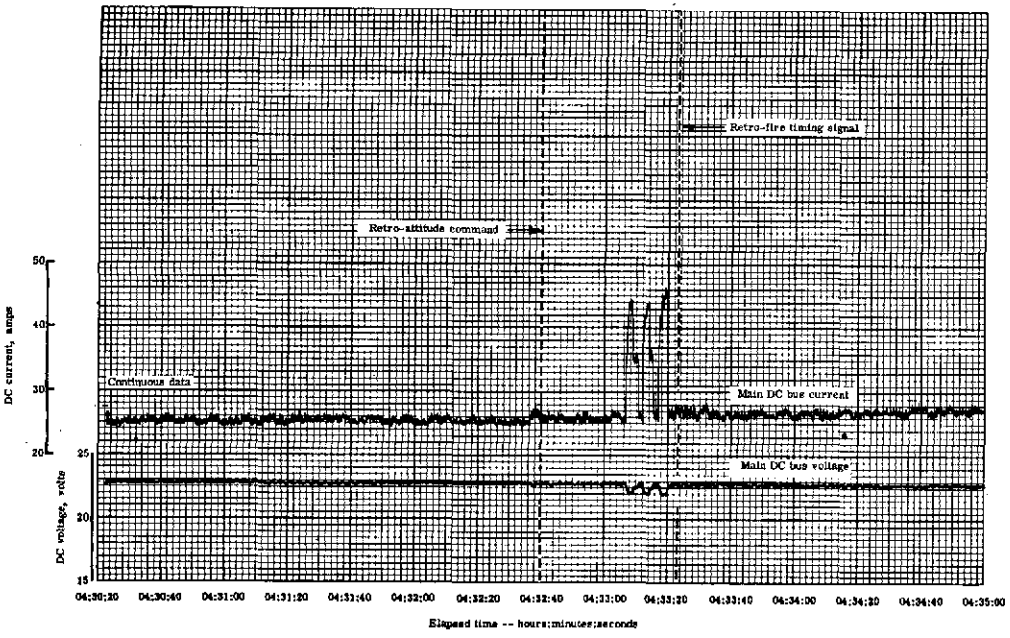
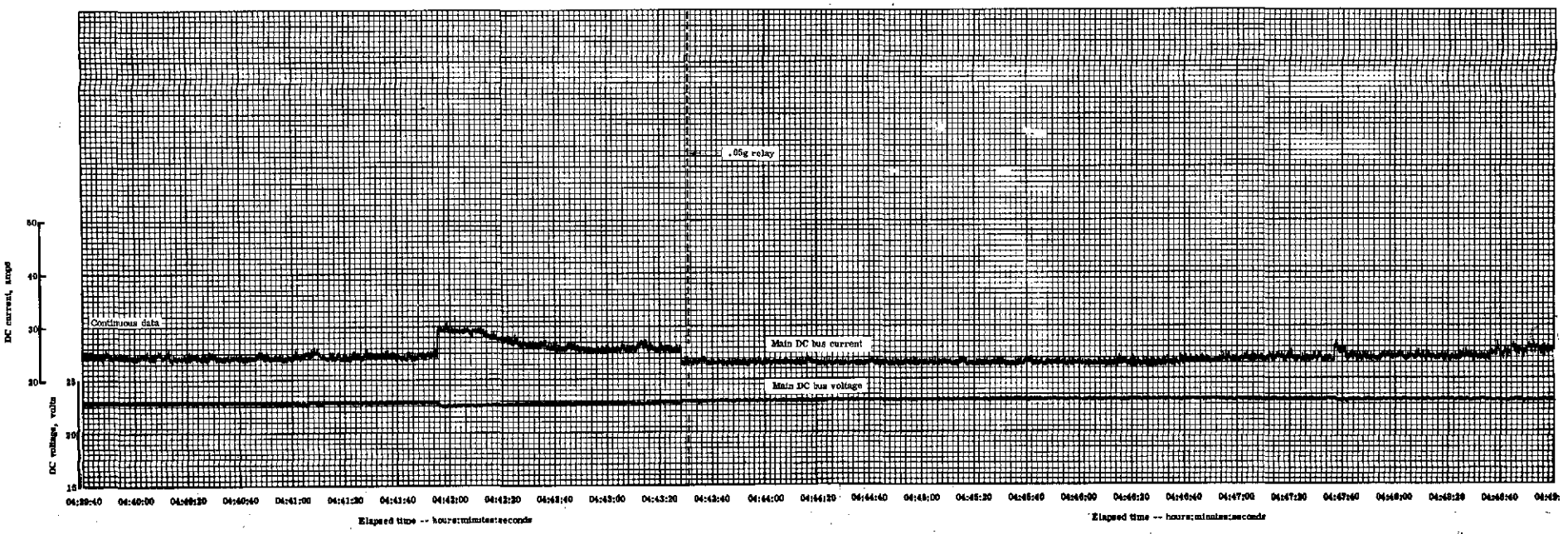


Fig. 93 - Main DC Bus Current and Voltage(continuous)



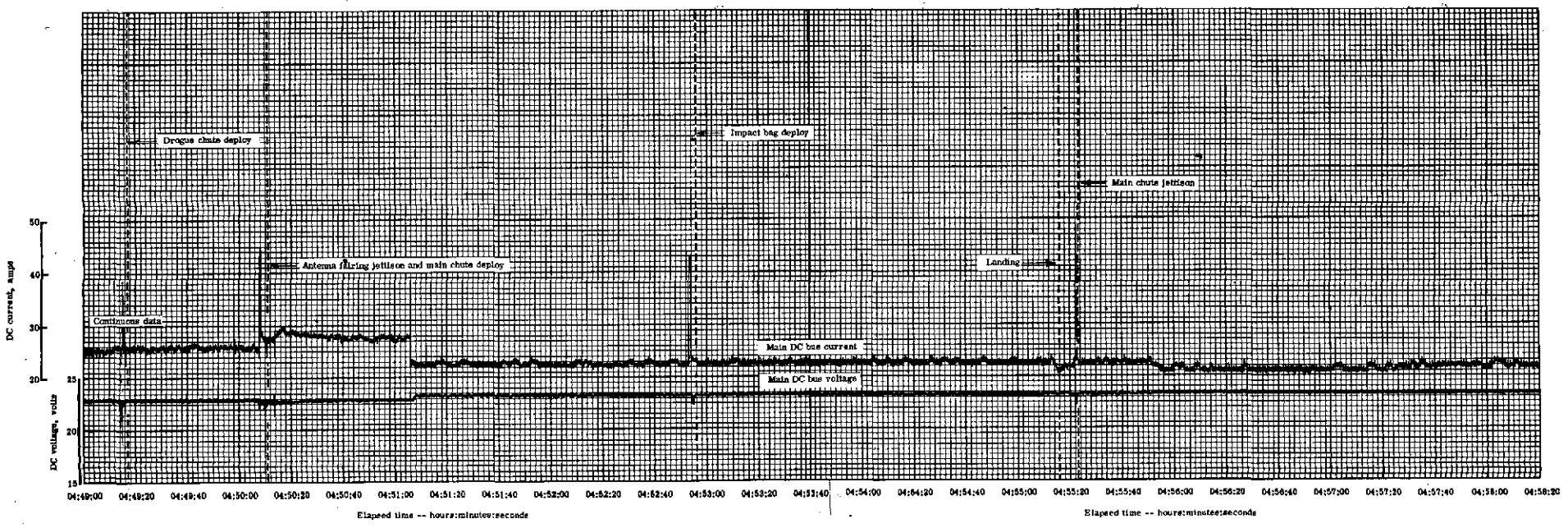


Fig. 94 - Main DC Bus Current and Voltage(continuous)

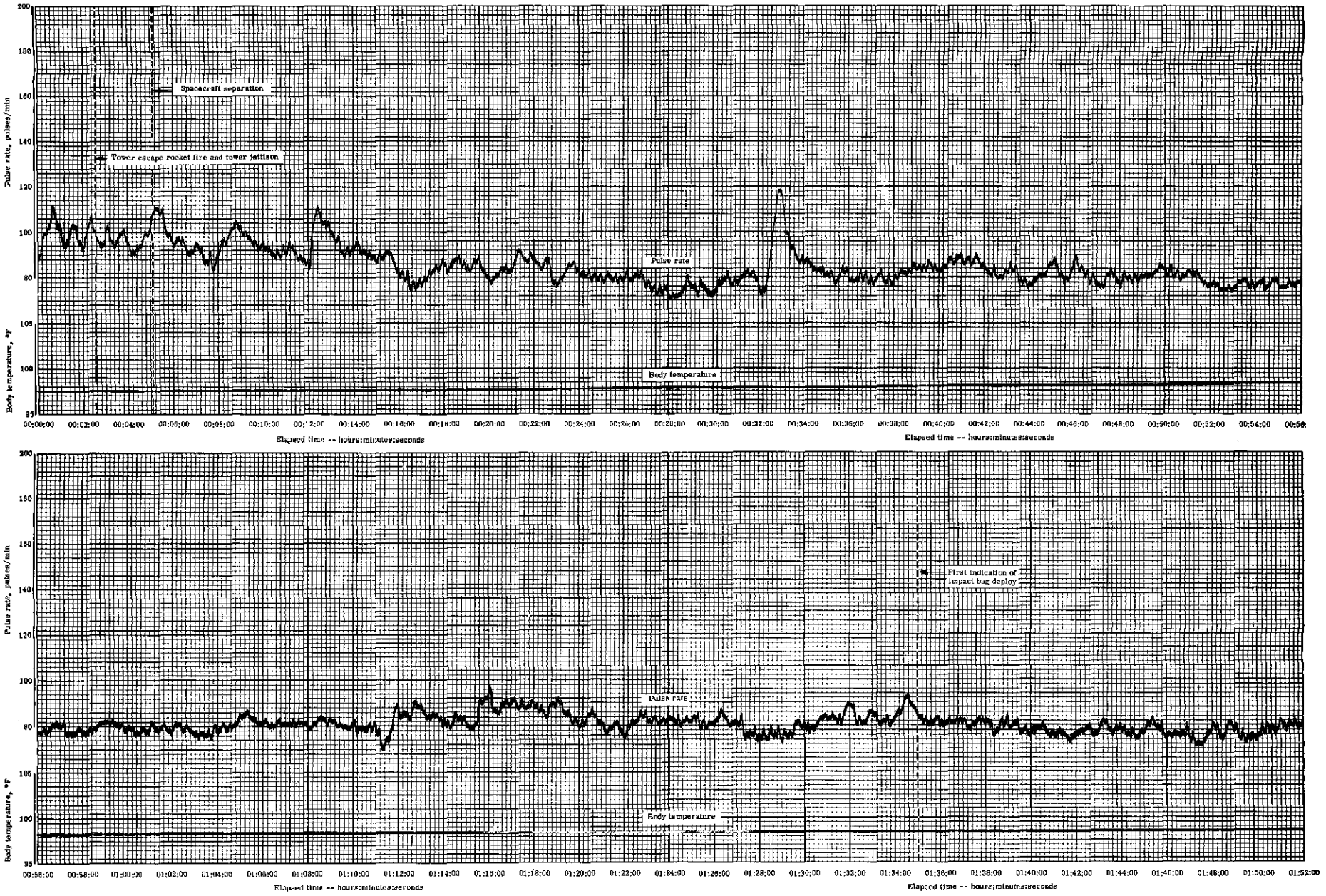


Fig. 95 - Pulse Rate and Body Temperature

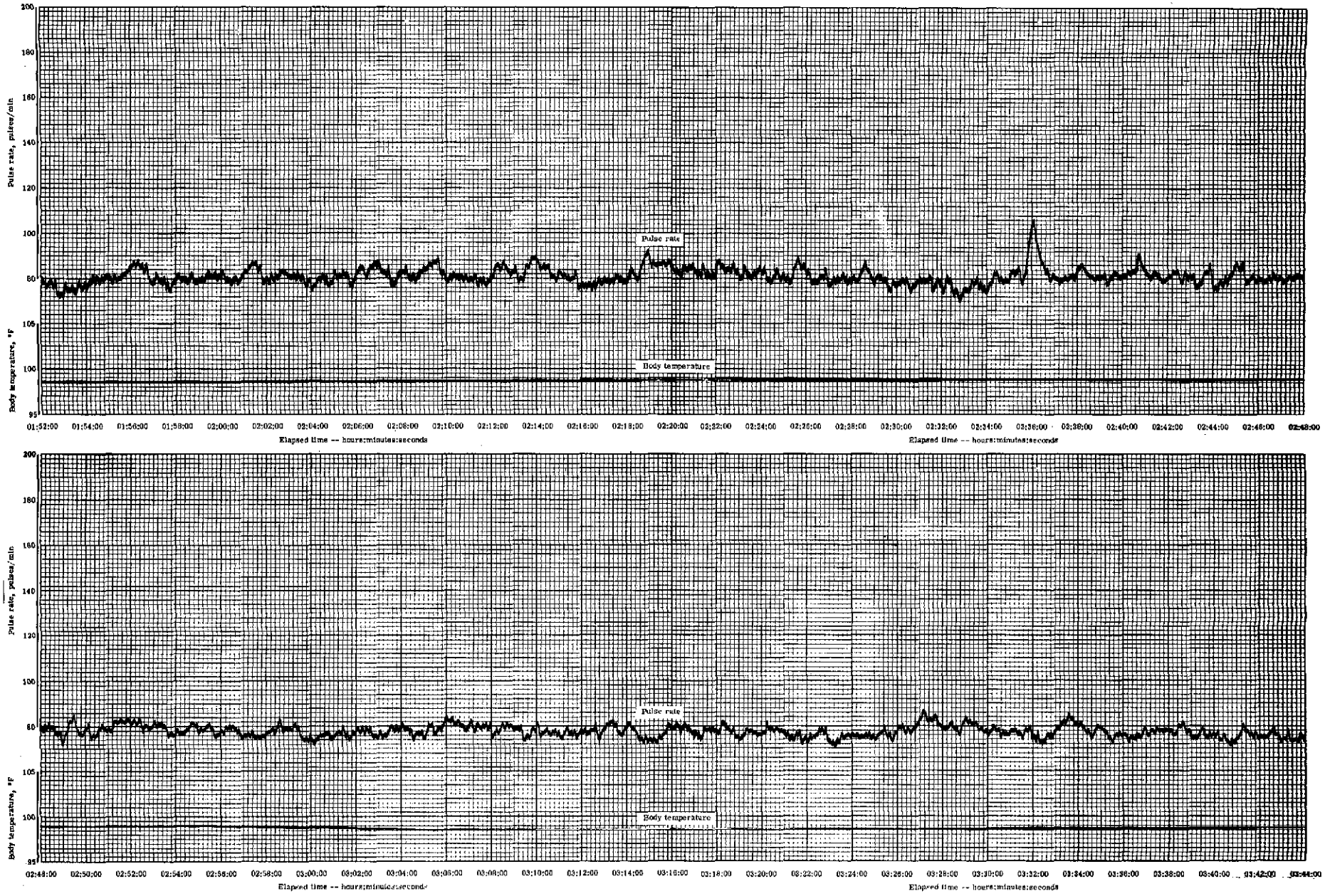
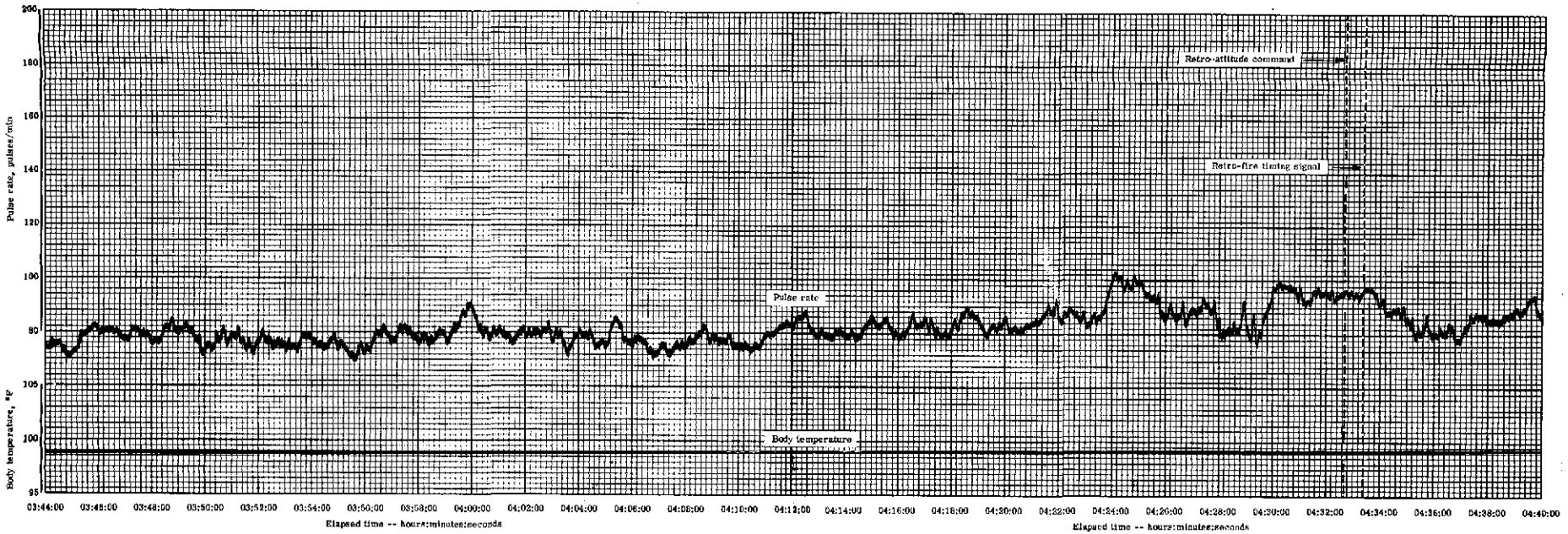


Fig. 96 - Pulse Rate and Body Temperature



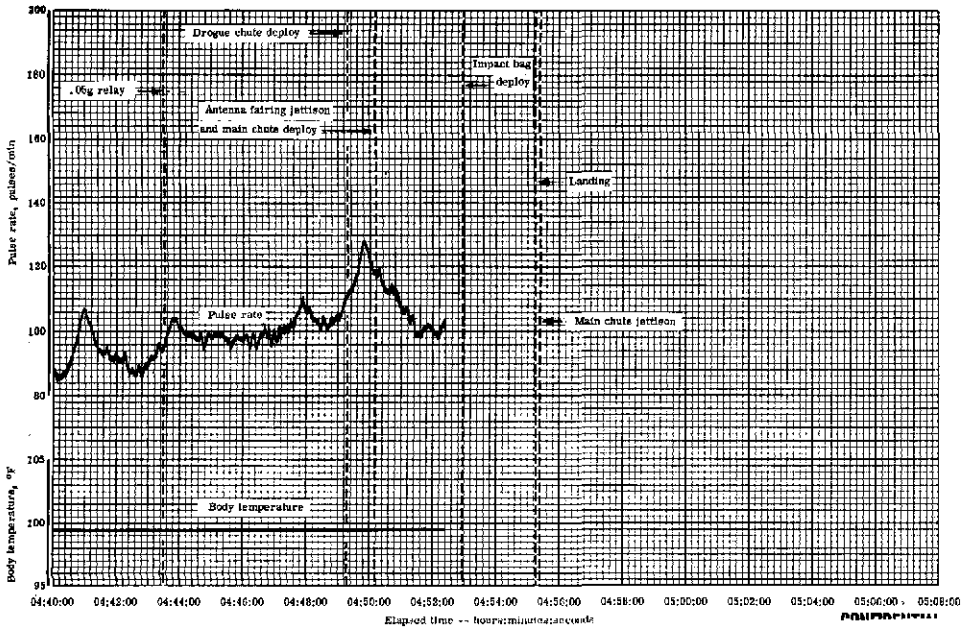


Fig 97 - Pulse Rate and Body Temperature

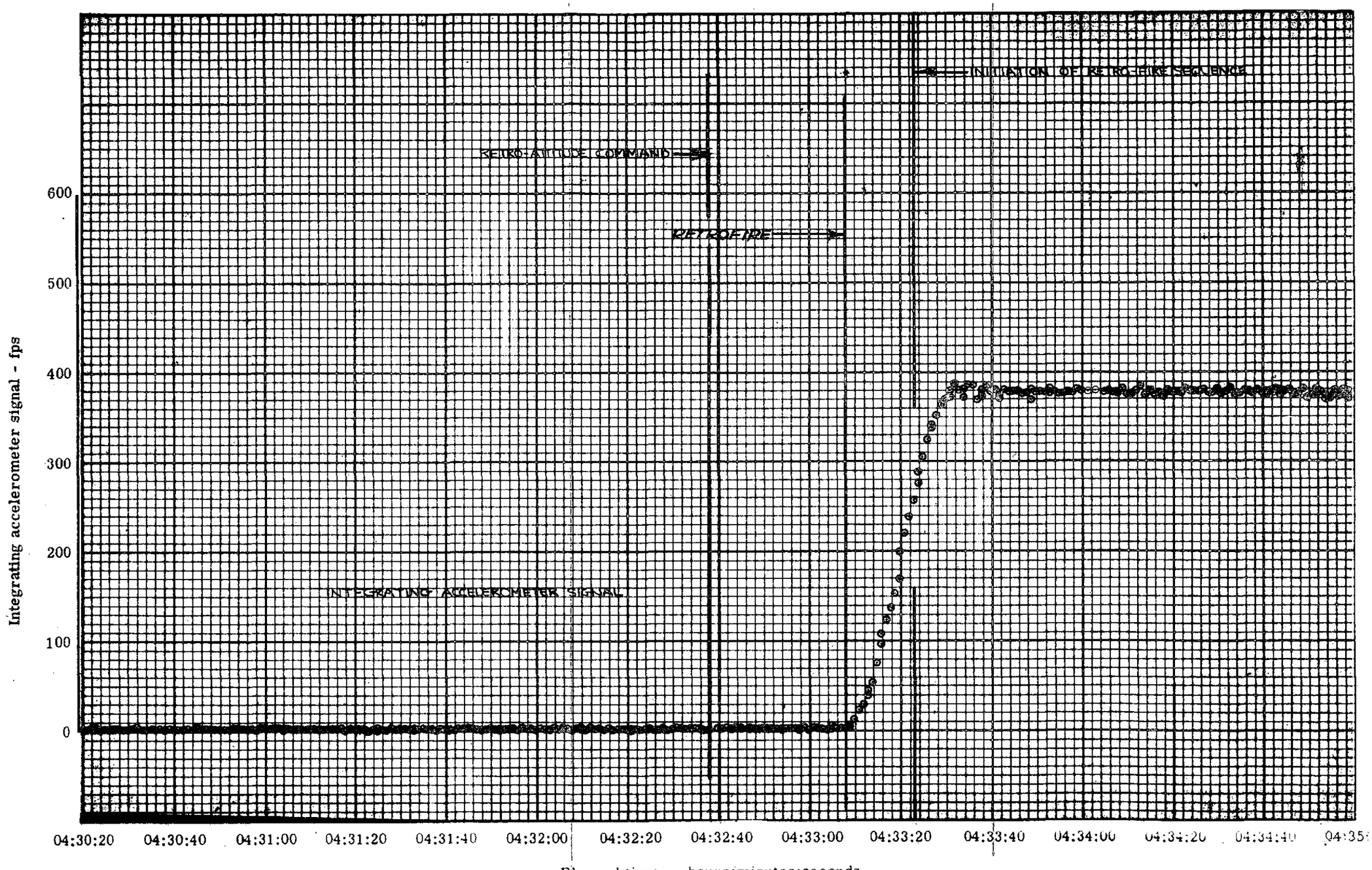


Fig. 98 MA-6 INTERGRATING ACCELEROMETER

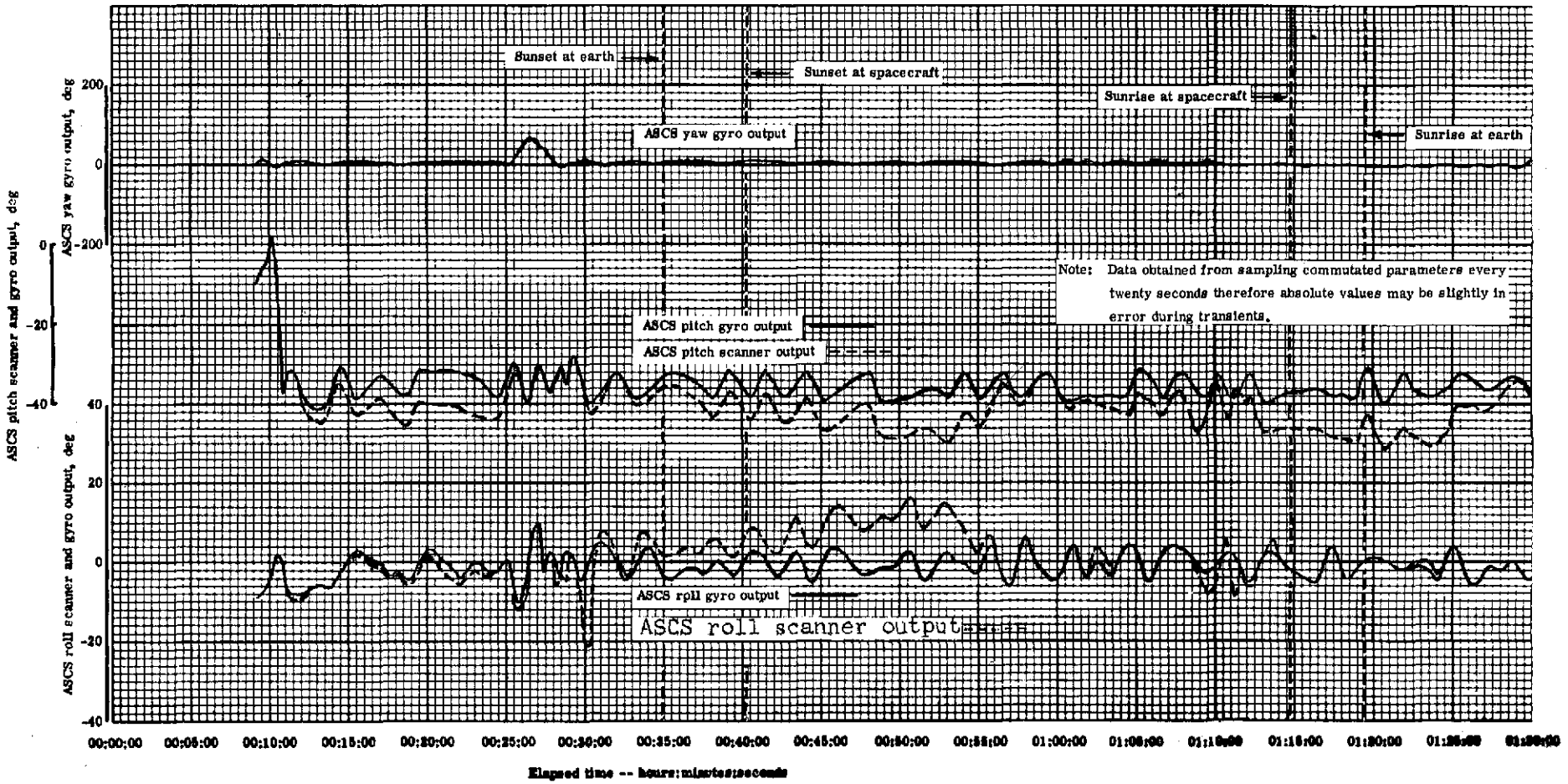


Fig. 99 - ASCS Yaw Gyro Output; ASCS Pitch Gyro Output; ASCS Pitch Scanner Output; ASCS Roll Gyro Output; ASCS Roll Scanner Output

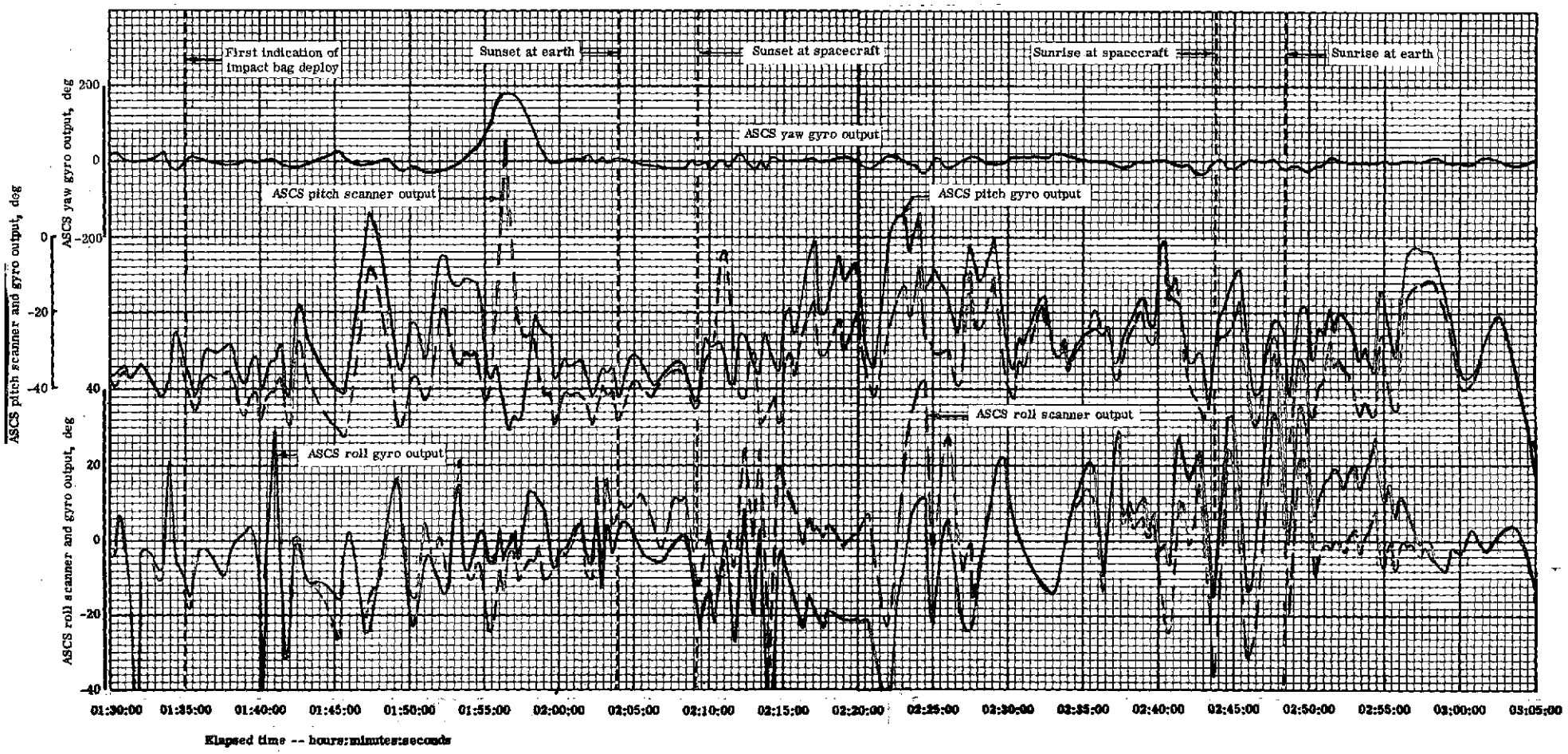


Fig 100 - ASCS Yaw Gyro Output; ASCS Pitch Gyro Output; ASCS Pitch Scanner Output; ASCS Roll Scanner Output; ASCS Roll Gyro Output

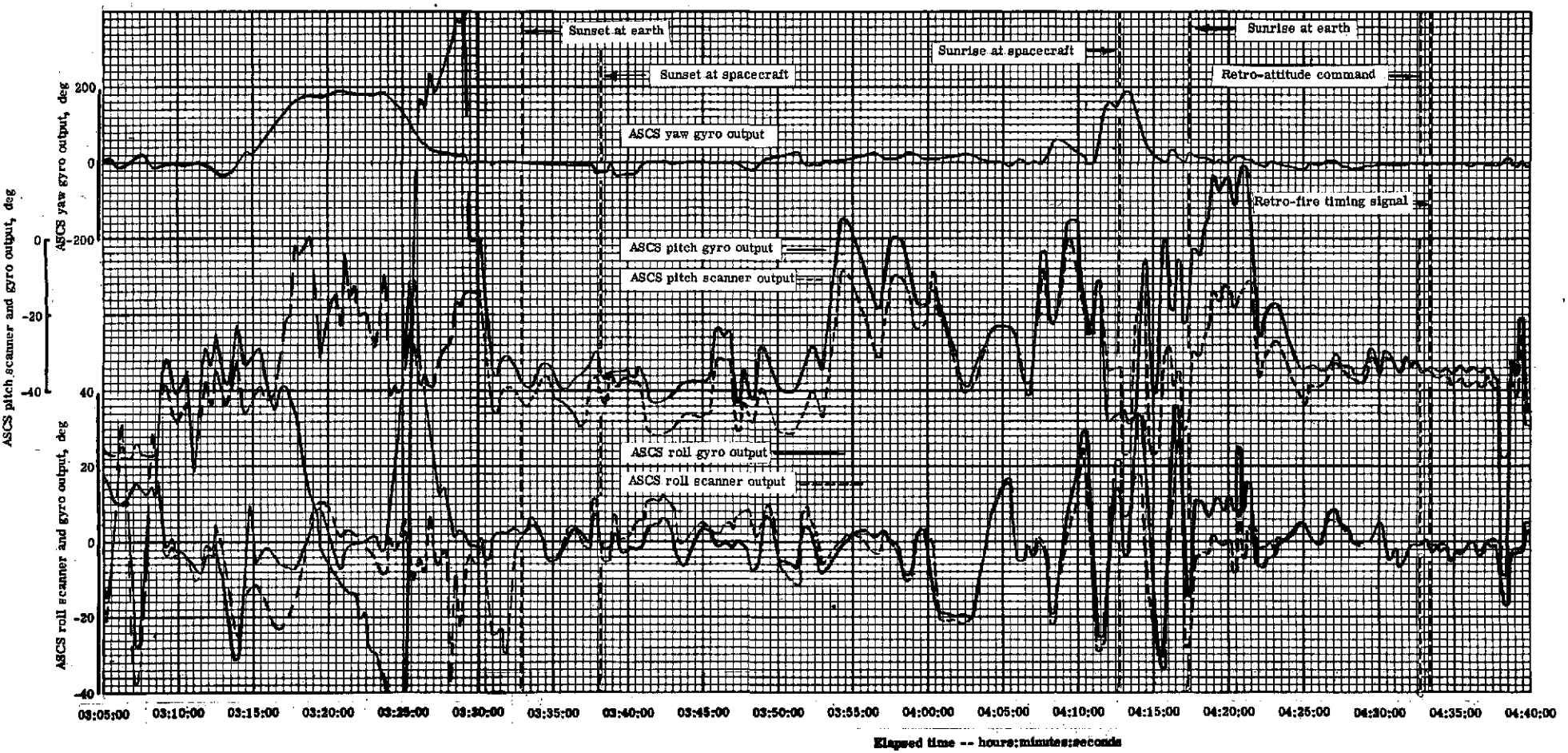


Fig. 101 - ASCS Yaw Gyro Output; ASCS Pitch Gyro Output; ASCS Pitch Scanner Output; ASCS Roll Gyro Output; ASCS Roll Scanner Output

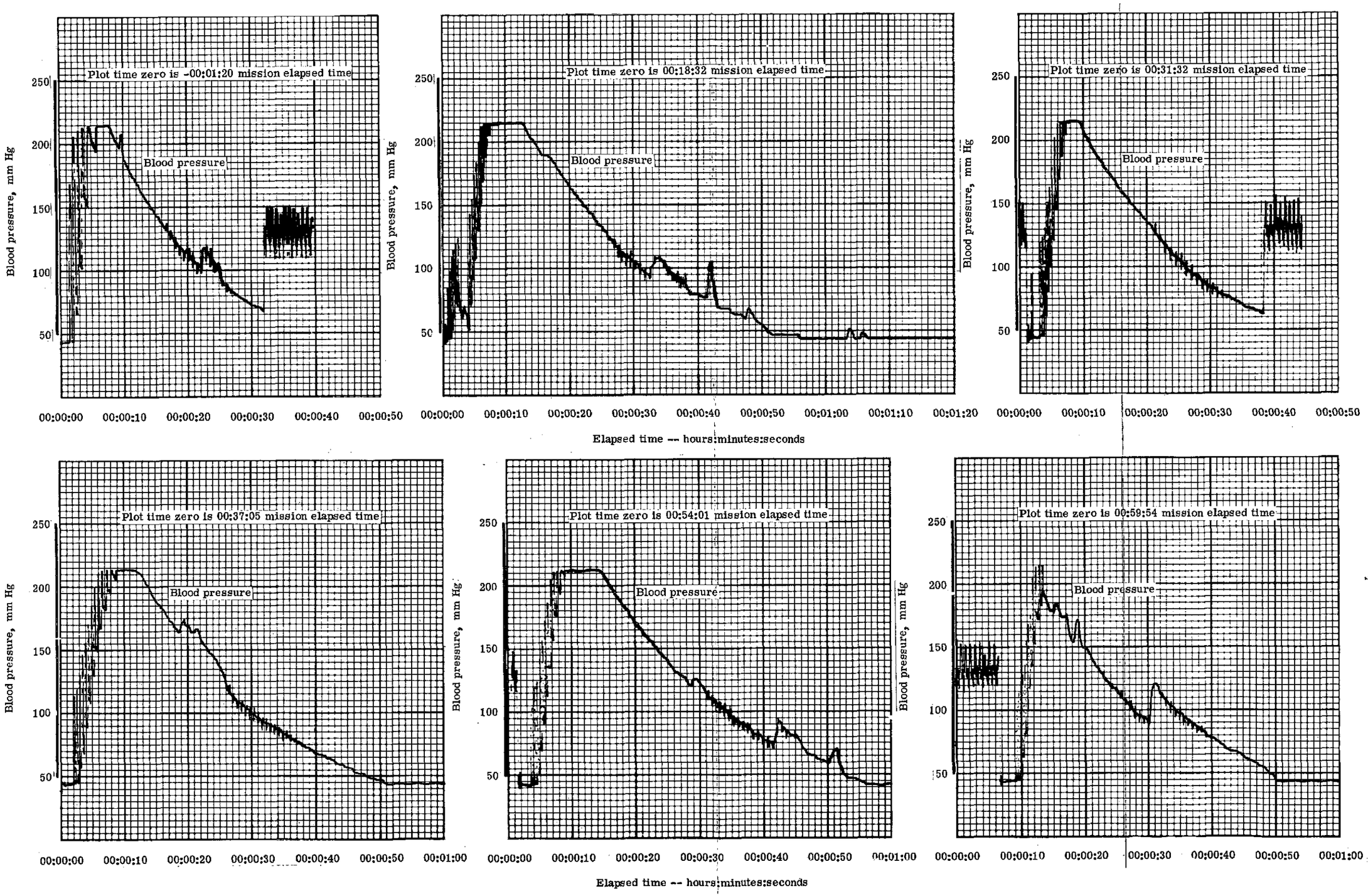


Fig 102 - Blood Pressure

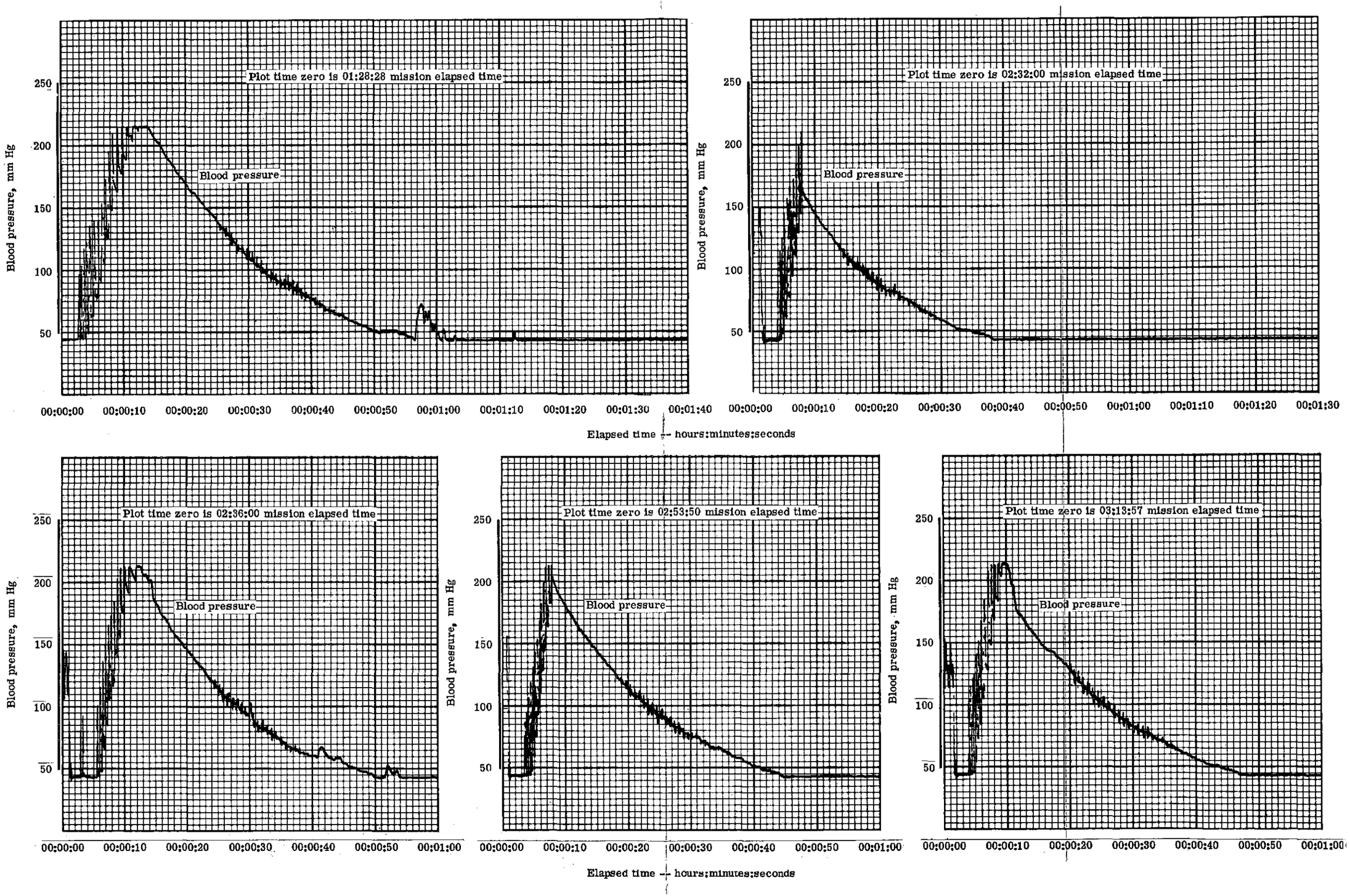


Fig. 103 - Blood Pressure

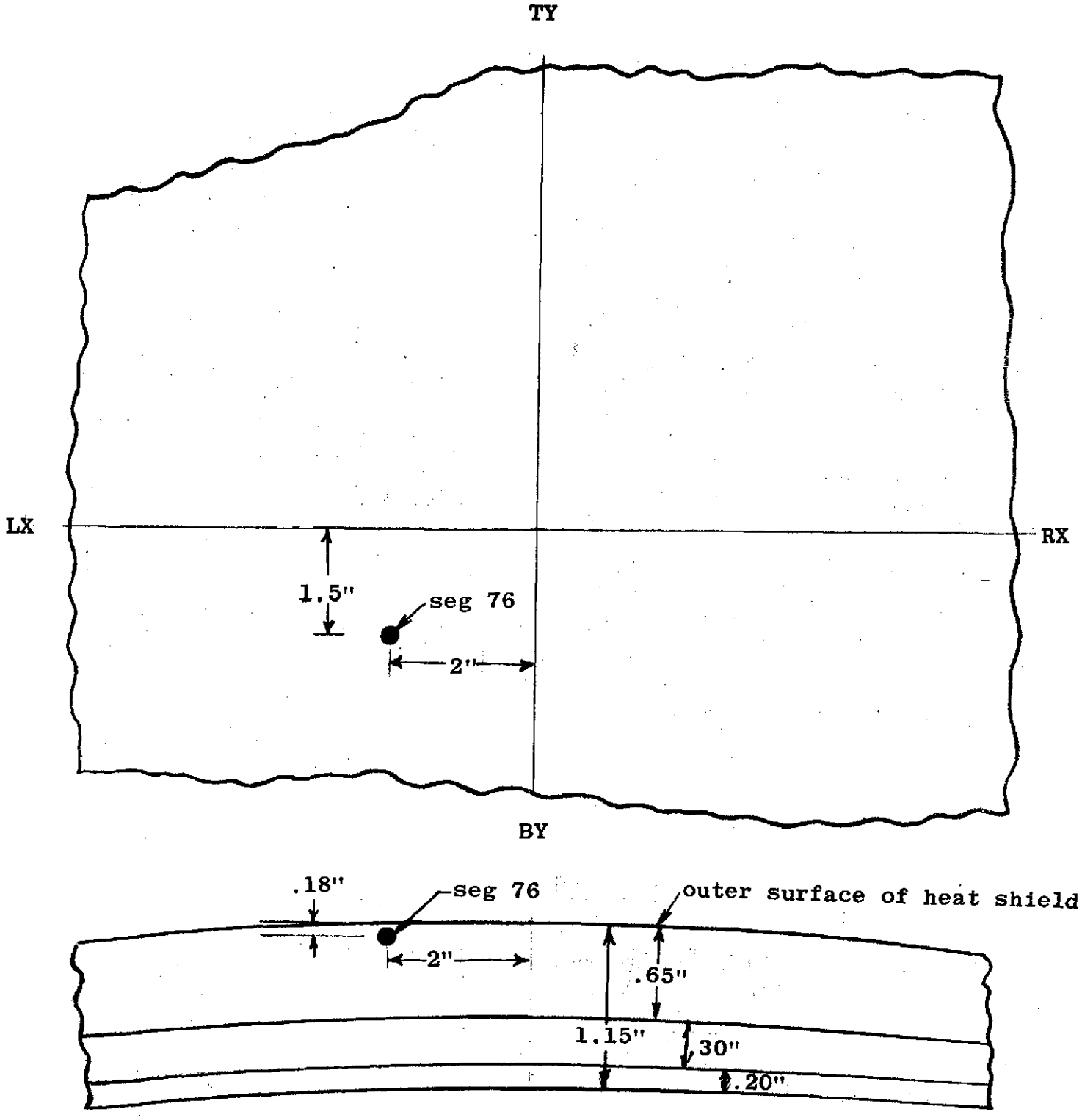
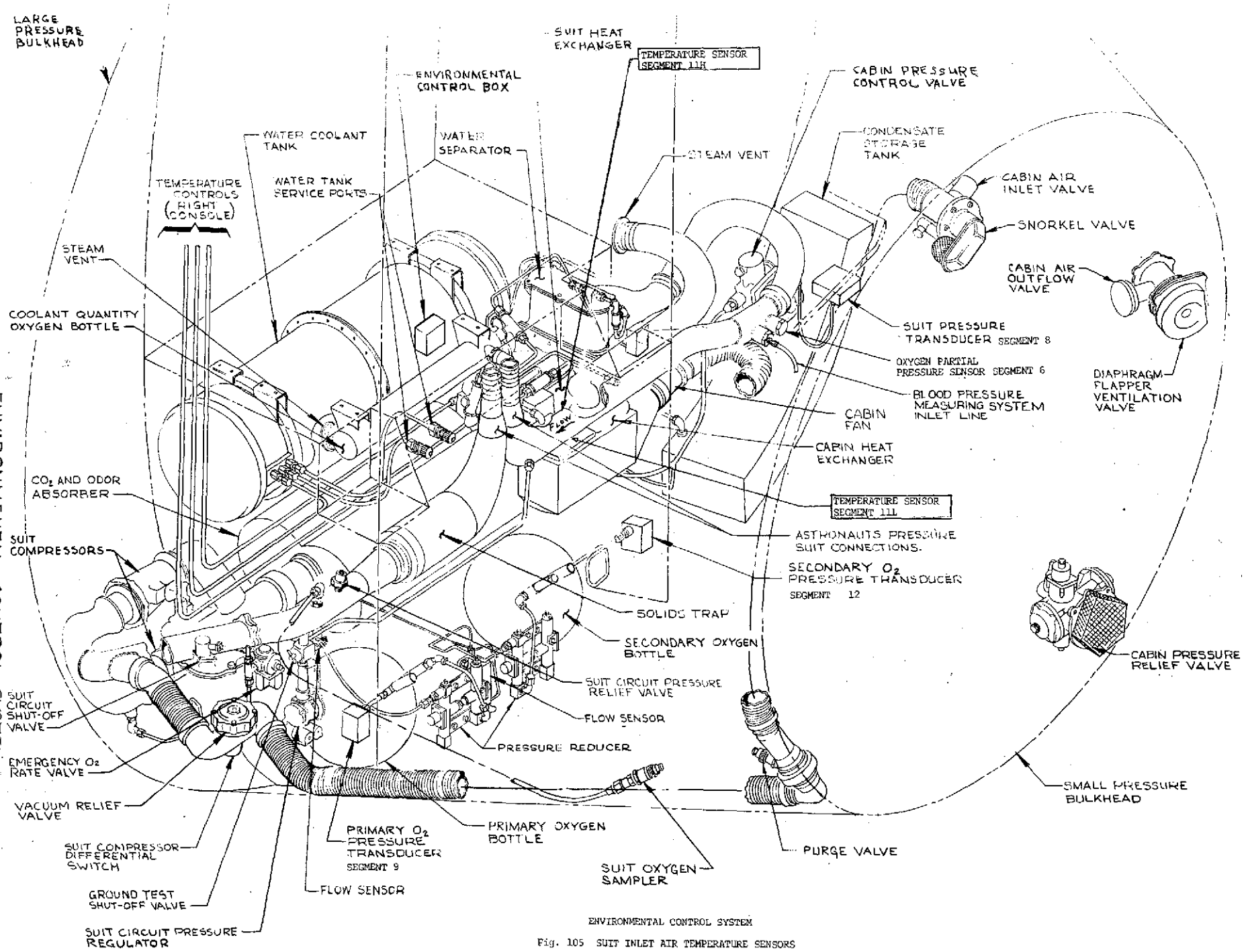


Figure 104.- Location of heat shield thermocouple (segment 76)



ENVIRONMENTAL CONTROL SYSTEM

Fig. 105 SUIT INLET AIR TEMPERATURE SENSORS

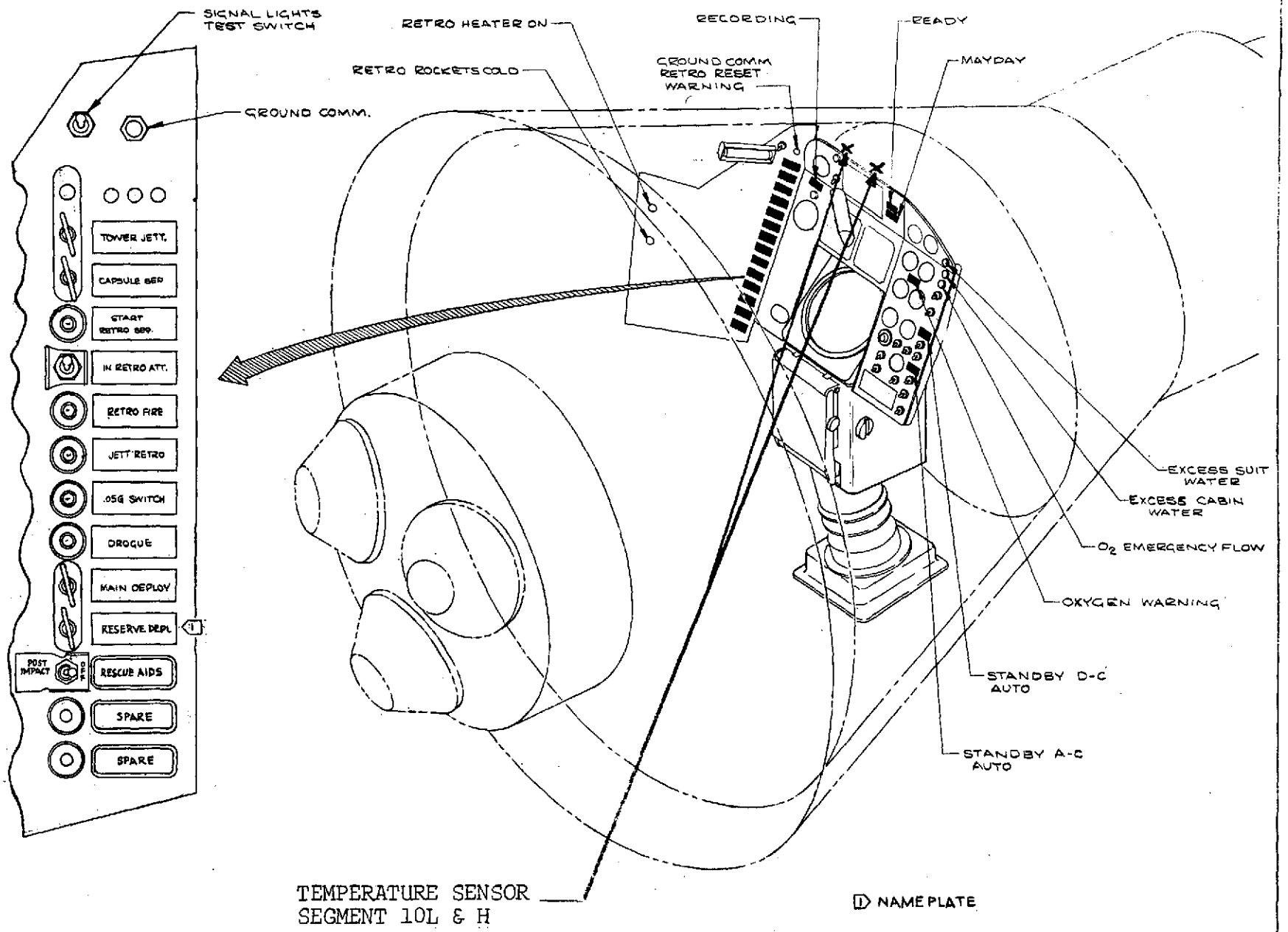


Fig. 106 CABIN AIR TEMPERATURE SENSORS

AUTOMATIC RCS INSTALLATION

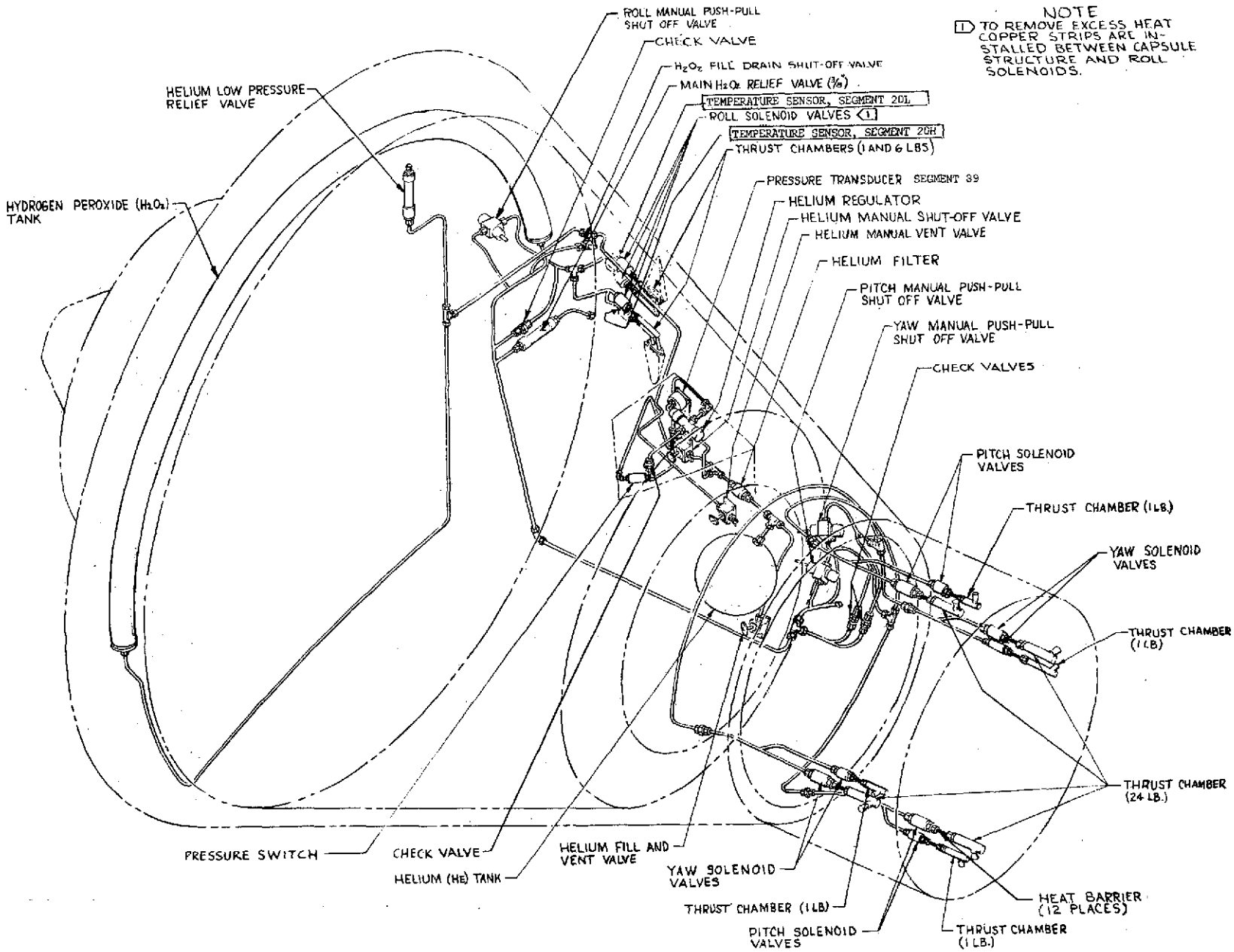


Fig. 107 TEMPERATURE SENSORS: RCS AUTO H_2O_2 LINE, LO ROLL, CLOCKWISE AND COUNTERCLOCKWISE

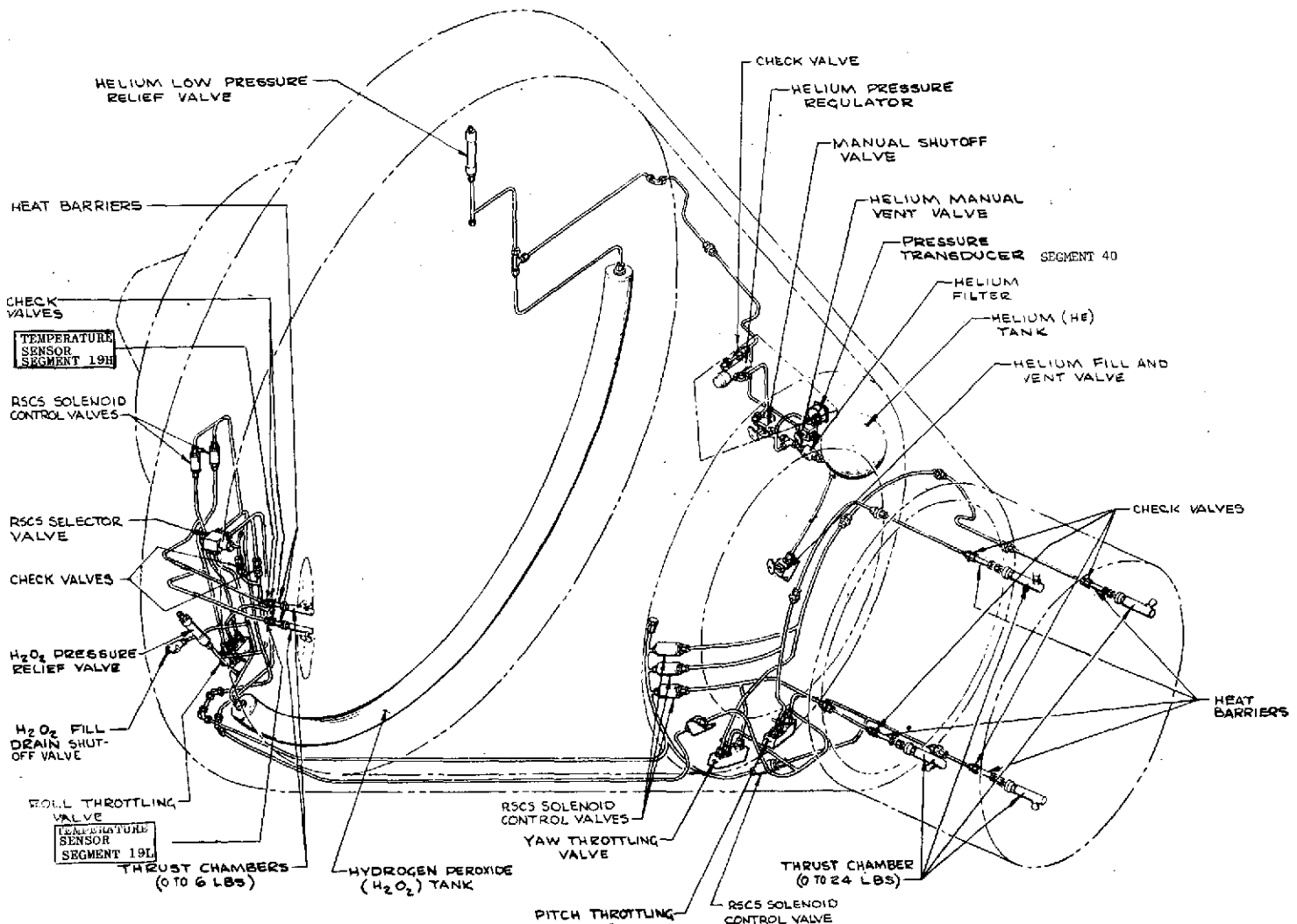


Fig. 108 TEMPERATURE SENSORS: RCS MANUAL H_2O_2 LINE, LO ROLL, CLOCKWISE AND COUNTERCLOCKWISE

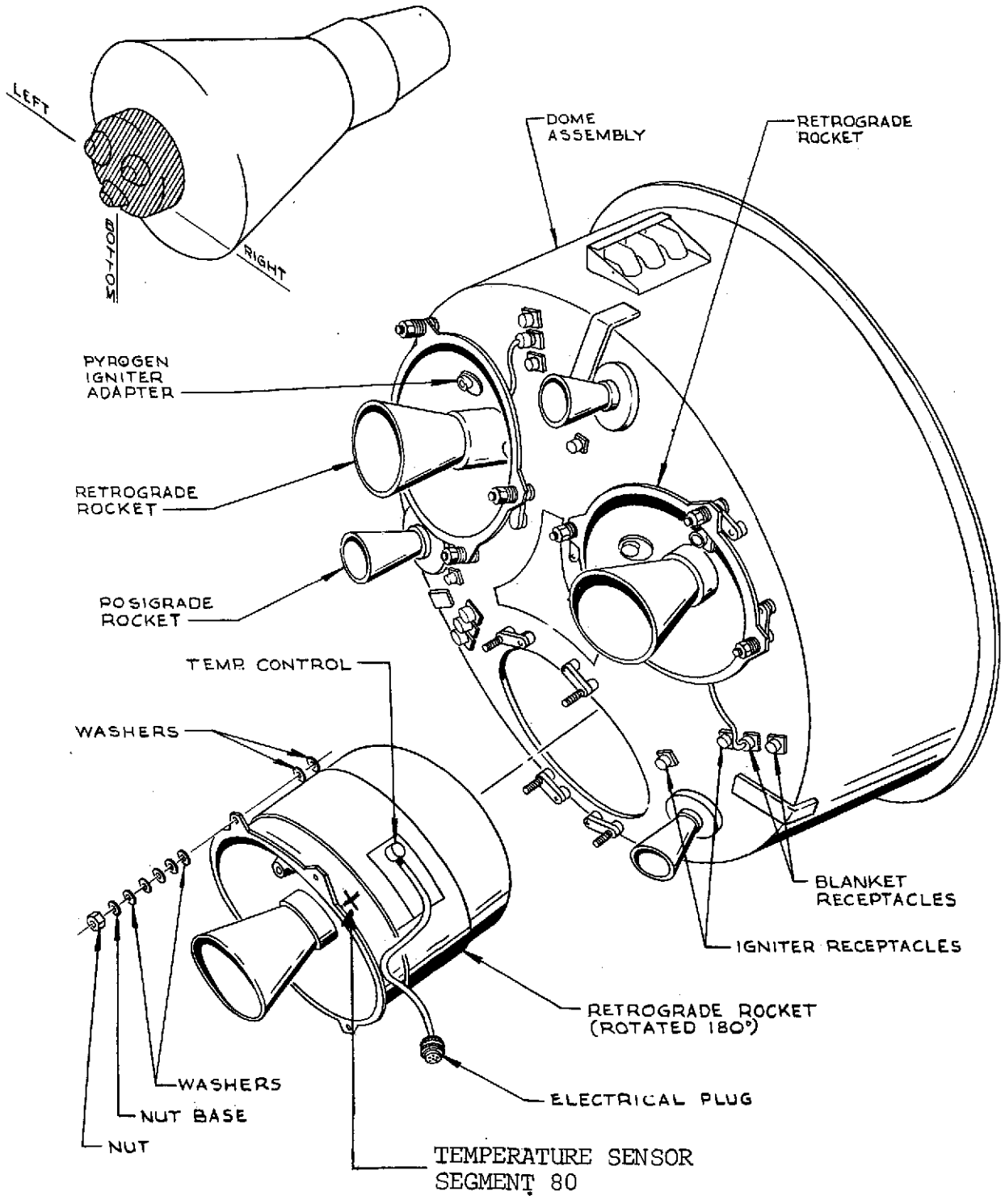


Fig. 109 RETRO ROCKET TEMPERATURE SENSOR SHOWN ON RETROGRADE ROCKET SYSTEM

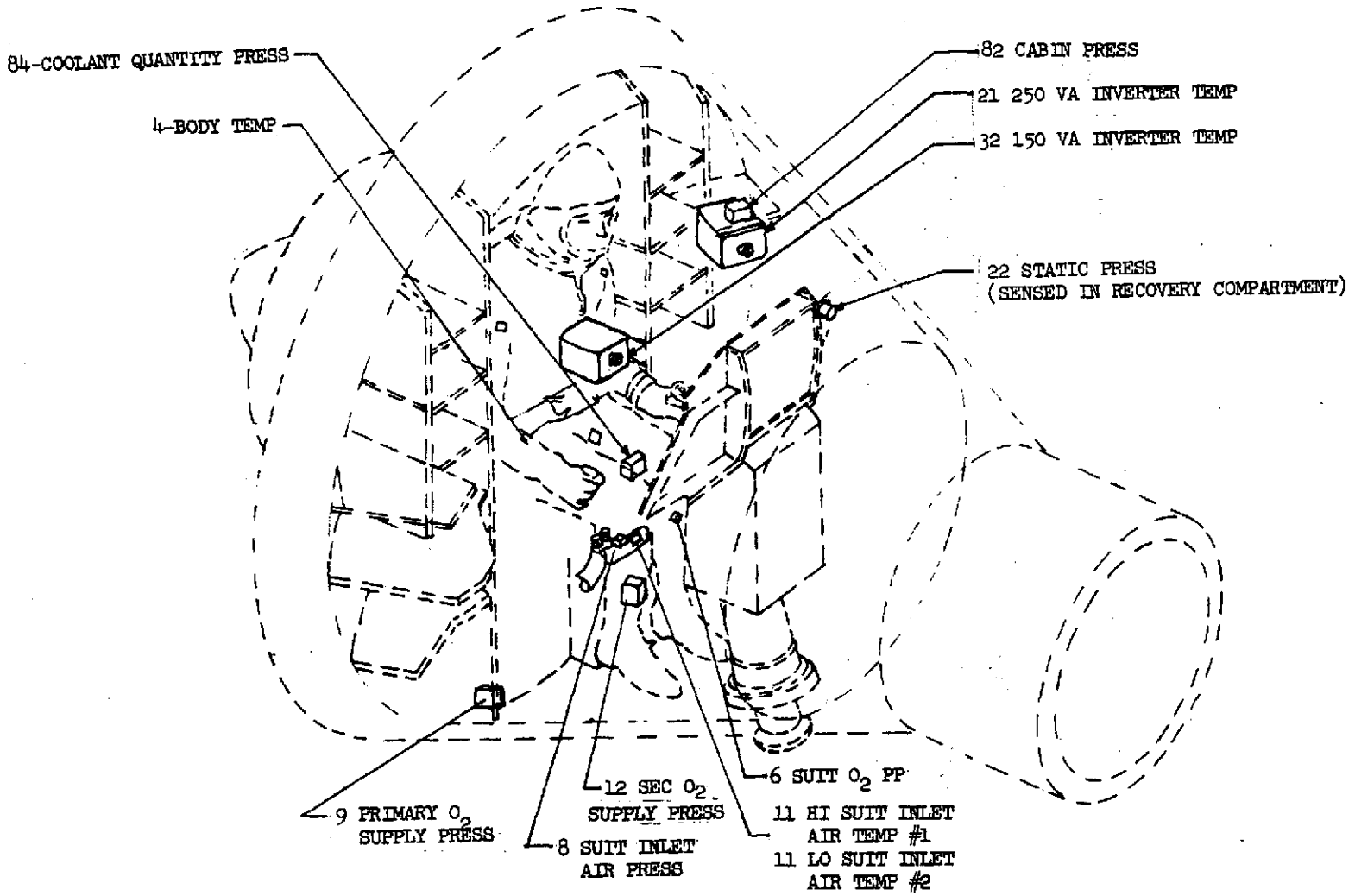
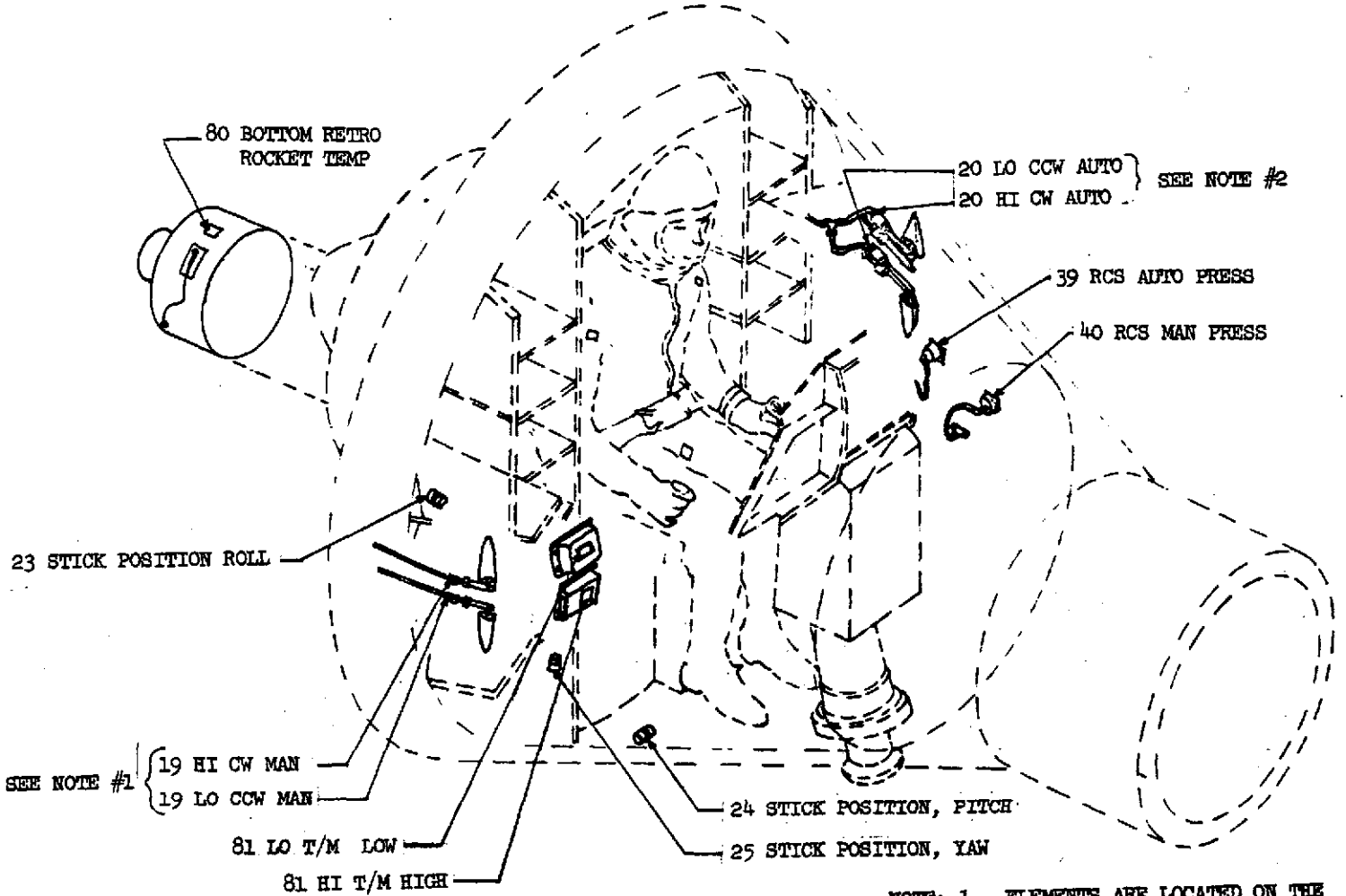


Fig. 110 ISOMETRIC VIEW OF SPACECRAFT SHOWING VARIOUS INSTRUMENTATION PICKUPS



NOTE: 1. ELEMENTS ARE LOCATED ON THE "B" NUTS ON THE INLET SIDE OF THE MANUAL THRUSTER CHECK VALVES.

2. ELEMENTS ARE LOCATED ON THE "B" NUTS ON THE INLET SIDE OF THE #1 ROLL THRUSTER SOLENOID VALVES.

Fig. 111 ISOMETRIC VIEW OF SPACECRAFT SHOWING VARIOUS INSTRUMENTATION PICKUPS

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PART II-DATA *

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Manned Spacecraft Center

Cape Canaveral, Florida

March 3, 1962