The requirements of low power, small space, low weight, and high data compression limit the capabilities of interplanetary plasma wave processing. The processing of plasma wave signals in spinning spacecraft in the range from D.C. to 500Hz are described. Another signal source from the intermediate frequency of a sounder transponder is processed by the same hardware, but with linear Fourier transform software.

Three antenna inputs are filtered to prevent aliasing above 500Hz. A 92db range of data is multiplexed to an analog-to-digital converter, and then to three RCA 1802 microcomputers. Groups of this data are collected under DMA control by each microcomputer. A logarithmically-spaced Fourier transform is computed. Each computer requires 2 kilowords of read-only-memory and a half kiloword of random access memory.

Data at lower frequencies is spin modulated by the spacecraft. For these signals, data is sampled 512 times in one spin and also processed by logarithmically-spaced Fourier transform techniques. A fourth microcomputer performs this task and coordinates all operations. This microcomputer requires 5 kilowords of read-only-memory and 3.5 kilowords of random address memory. The computer also performs data averaging, peak detection, data formatting, output compression, and ground commanded tasks.
1.33 ms

SOUNDER PULSE

VIDEO

15 ms

A

15 ms

B

15 ms

D

15 ms

C

CYCLES IN
SAMPLE TIME

10 11 12 13 14 15 16 17 18 19 20 21

5 7 7 8 6 9 1 1 1 1 1 1

4 0 6 3 9 6 0 1 2 2 3

0 4 8 2 6 0 2 8 5 1 8 4

4 8 2 6 0 4

TRANSLATED FREQUENCY
COMMANDS

MICRO NO. 4

S/C CMD DATA

16-BIT S.R.

MICRO NO. 4 DATA BUSS

S/C CMD GATE

CMD INTERRUPT

MICRO NO. 1 - 3

MICRO NO. 4 DATA BUSS

M1-3 CMD

IN I/O PORT

CK

DB MICRO NO. 1 ID1 ID2

INT

+ −

IN I/O PORT

CK

DB MICRO NO. 2 ID1 ID2

INT

+ −

IN I/O PORT

CK

DB MICRO NO. 3 ID1 ID2

INT

+ +
INPUT

STATE 0
- GAIN RANGE ALL INPUT GROUPS
- STROBE ALL SAMPLE AND HOLD AMPLIFIERS

STATE 1
- A/D CONVERT S/H NO. 1
- DMA GAIN RANGE AND A/D DATA FOR GROUP NO. 1 TO MICRO NO. 1

STATE 2
- A/D CONVERT S/H NO. 2
- DMA GAIN RANGE AND A/D DATA FOR GROUP NO. 2 TO MICRO NO. 2

STATE 3
- A/D CONVERT S/H NO. 3
- DMA GAIN RANGE AND A/D DATA FOR GROUP NO. 3 TO MICRO NO. 3
GAIN RANGING

GROUP SIGNALS IN

ANALOG MUX

SAMPLE AND HOLD

S/H

WINDOW COMPARATOR

V_H

V_L

TIMING LOGIC

RESET

CK

S/H

CE
INTERRUPT LOGIC

INTERRUPT SOURCES

RESET

INTERRUPT

INHIBIT PORT

INPUT PORT

MICRO NO. 4 INT DATA BUS

8

8

8

8

8

8