High-Speed Data Throughput

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A study of inbound high-speed data (HSD) over a 25-week period shows an overall throughput of 99.46% from the DSSs. Of the faulty blocks, 19% contained bit errors and the remaining 81% were either not received or were not recognizable. Throughput performance is plotted on a weekly basis for each station.

As previously reported, the performance of the high-speed data circuits from the DSS to the JPL central communications terminal is continuously monitored by the GCF. The JPL Communications Processor (CP) records the monitor data and produces a weekly report detailing inbound HSD circuit performance for each tracking pass. These CP reports have been analyzed to determine HSD throughput. Throughput is defined as the percentage of transmitted blocks which are delivered error-free. The remaining blocks are either delivered with bit errors in them or are not delivered at all.

The period analyzed covers 25 weeks, February 18 through August 11, 1973. During this interval the DSN was principally engaged in the routine tracking of Pioneer 10 and the launch and tracking of Pioneer 11. All passes were tallied; hence the results presented herein represent normal GCF HSD performance.

The results of the analysis are shown in Table 1. The "Good" column is a count of error-free blocks delivered to the user. The "Error" column reflects blocks containing errors which were delivered. (The number of bit errors in each block is not known.) The "Out-of-lock" count occurred when a circuit failed between the DSS and JPL (the most prevalent cause) or when blocks could not be synchronized due to heavy errors. The performance of each station is shown, as well as the Ames-to-JPL circuits. The "All DSS" entry indicates the combined performance of all the DSSs shown.

Throughput for all of the DSSs was 99.465%. If DSS 51, the worst station from a transmission standpoint, is omitted the throughput increases to 99.607%.

The Goldstone stations, which are geographically close, have better than average throughputs, as one would expect. However, they are not much better. Goldstone's percentage of error blocks is much lower than the other stations. Combining these two characteristics leads to a recognized point—Goldstone has low block error rates. However, their circuit reliability is not markedly better. The Ames circuits, which are heavily used and fairly short, are generally comparable to the DSS circuits.

The tabulated data do not reflect the wide throughput variations which occur even on a weekly basis. Plots of throughputs for several stations are illustrated in Figs. 1 and 2. Significant drops in throughput are usually the result of a single extended outage during the week.

Table 1. HSD throughput, February–June 1973 (4800 bps, 1200 bit blocks, 203 data sets)

Location	Block count			Circuit hours	Throughput, %
	Good	Error	Out of lock		
DSS 11	7,979,318	1686	30,256	556	99.580
DSS 12	13,963,142	3553	31,227	972	99.752
DSS 14	13,466,668	2635	22,368	937	99.815
DSS 42	22,469,582	29,895	91,397	1569	99.463
DSS 43	9,830,033	13,882	26,184	685	99.594
DSS 44	5,568,608	10,280	24,166	398	99.385
DSS 51	19,222,892	35,339	203,600	1351	98.772
DSS 61	8,026,117	4212	14,859	559	99.762
DSS 62	12,283,789	13,719	52,342	857	99.465
DSS 71	1,347,357	942	1182	94	99.842
Ames	82,369,397	66,195	170,873	5737	99.713
All DSS	114,157,506	116,143	497,581	7978	99.465

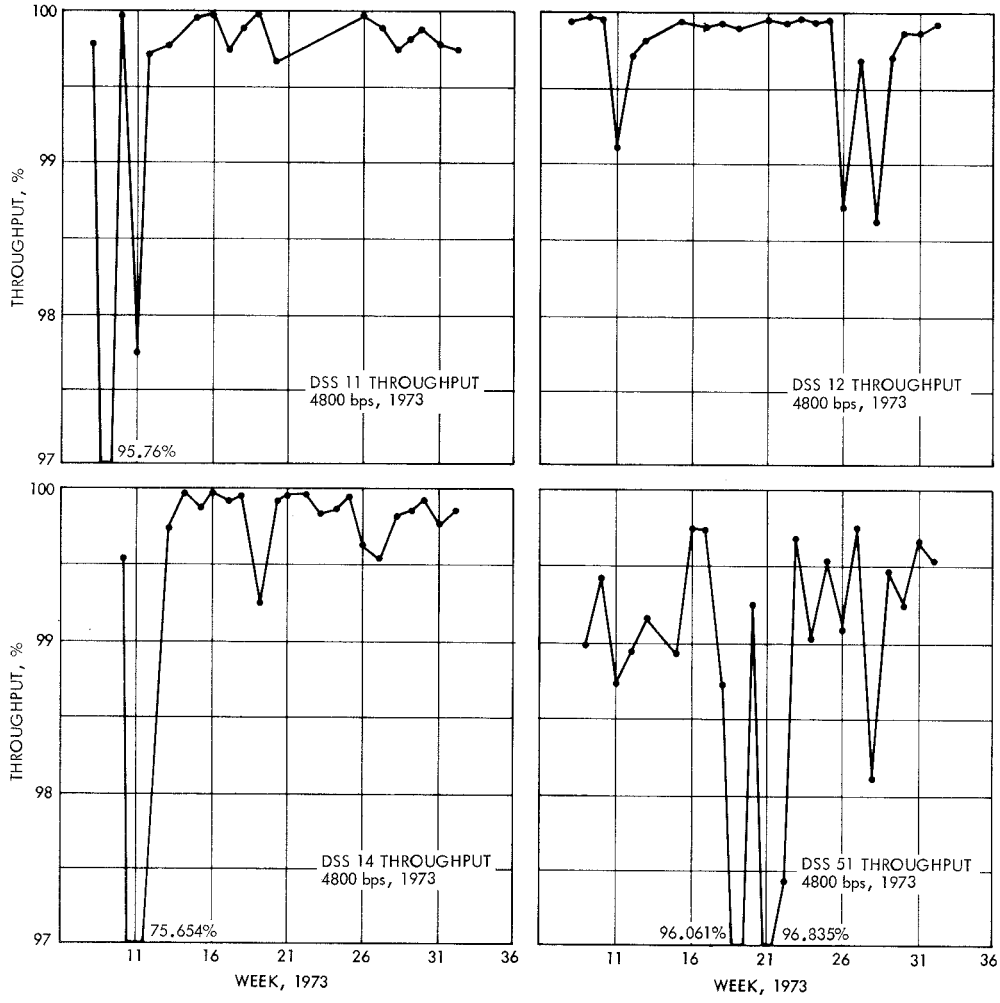

Fig. 1. High-speed data block throughput, at 4800 bps, 1200-bit blocks

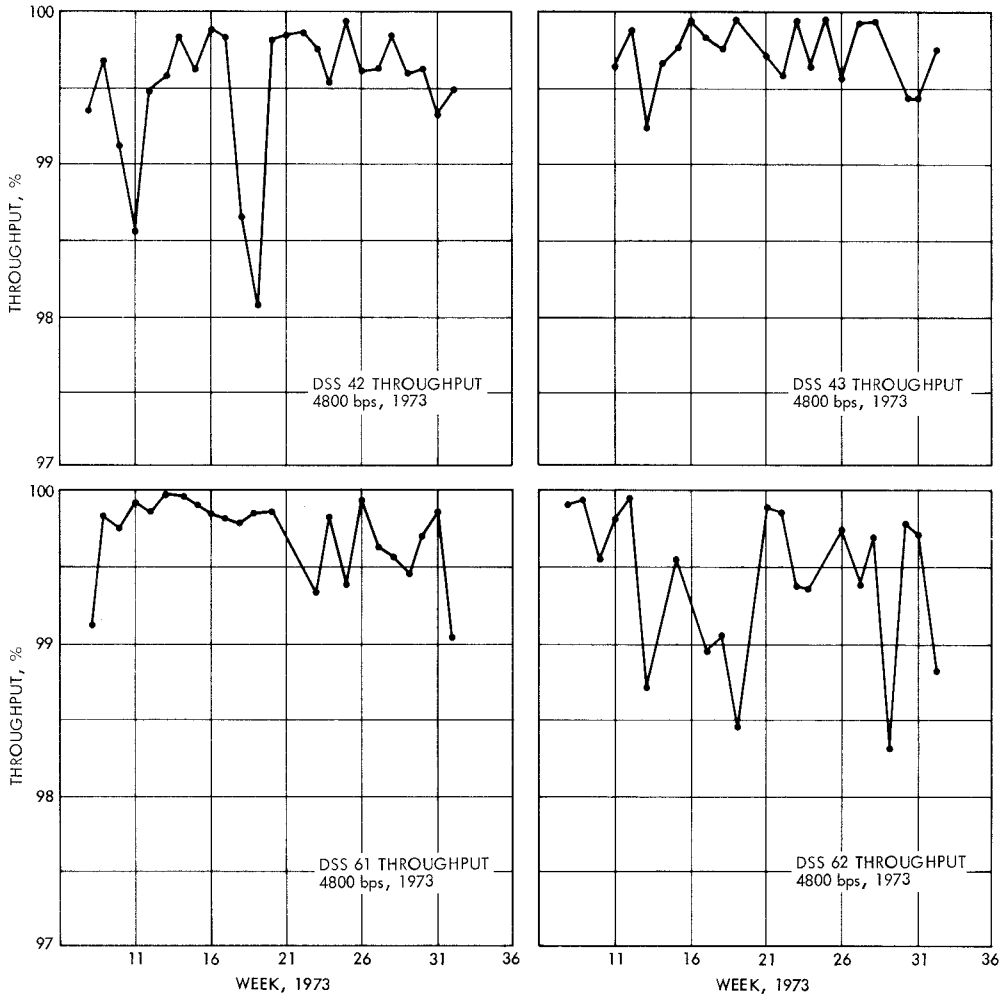
100
99
98
97
THROUGHPUT, %
DSS 42 THROUGHPUT
4800 bps, 1973
DSS 43 THROUGHPUT
4800 bps, 1973
DSS 61 THROUGHPUT
4800 bps, 1973
DSS 62 THROUGHPUT
4800 bps, 1973
11
16
21
26
31
36
WEEK, 1973

Fig. 1 (contd)