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U.S./U.S.S.R. COOPERATIVE PROGRAM IN OPEN-CYCLE MHD ELECTRICAL POWER GENERATION

Joint Test Report No. 4

Tests in the U-25B Facility: MHD Generator Tests No. 6 and 7

ARGONNE NATIONAL LABORATORY

ARGONNE NATIONAL LABORATORY, ARGONNE, ILLINOIS

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U.S./U.S.S.R. COOPERATIVE PROGRAM IN OPEN-CYCLE MHD ELECTRICAL POWER GENERATION:

Joint Test Report No. 4

Tests in the U-25B Facility: MHD Generator Tests No. 6 and 7

Editors

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January 1981

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PREFACE

This report is one in a series that describes the results of experiments open-cycle magnetohydrodynamic power generation carried out jointly by specialists from the United States and the Soviet Union under the understanding on Open-Cycle MHD Cooperation, reached on October 6, 1972, by representatives of the U.S./U.S.S.R. Joint Working Group for Energy, meeting in Moscow, and endorsed as a cooperative program by the U.S./U.S.S.R. Joint Committee for Scientific and Technical Cooperation, in Washington, D. C., March 21, 1973.

These experiments are planned, conducted, and analyzed together by teams of specialists from both countries. Both countries also supply test components and equipment for the joint experiments. By combining resources in this cooperative program, the United States and the Soviet Union accelerate the development of open-cycle MHD systems in both countries. To provide rapid dissemination of information and data to other groups and countries interested in the development of MHD power systems, reports are issued a short time after completion of tests and experiments.

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FOREWORD

This report has been prepared in accordance with the U.S./U.S.S.R. Cooperative Program in the area of MHD energy conversion. The sixth test in the series scheduled for the U-25B facility was completed in July 1979 and the seventh test in December 1979.

Dr. B. F. Picologlou
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October 6, 1980

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NOMENCLATURE

NOMENCLATURE

A	channel cross-sectional area
A_i	attenuation in laser interferometer
A_n	normalized interframe voltage variation
B	magnetic field induction
C_A	% mass concentration of alkaline seed
C_f	skin friction
C_o	coefficient of contrast of submillimeter interferometer
D_i	ion diffusion coefficient
d	hydraulic diameter
E_n	interframe voltage
$\bar{E}_n$	average interframe voltage
E_x	axial electric field
$\langle E \rangle$	mean interframe voltage
e	electron charge
f	frequency
G	mass flow rate
G_{gas}	natural gas fuel flow rate
G_{oxid}	oxidizer flow rate
G_{purge}	purging air flow rate
G_{seed}	seed solution flow rate
h_{tc}	stagnation enthalpy at channel centerline
h_{tw}	stagnation enthalpy at channel wall
I_L	load current
i_p	Langmuir probe current
J_y	transverse current density

NOMENCLATURE

K_σ coefficient of conductivity reduction

k_s equivalent hydraulic roughness

ℓ_r ion recombination length

n_A alkaline metal atom number density

n_e electron number density

p static pressure

p_c combustor pressure

p_o stagnation pressure

q_w wall heat flux

R_{leak} interframe leakage resistance

R_{e_d} Reynolds number based on hydraulic diameter

r_p Langmuir probe electrode radius

SR stoichiometric ratio

T_{ph} preheat temperature

T_o stagnation temperature

T_{pl} plasma temperature

T_w wall temperature

U plasma velocity

V_x Hall voltage

W_{rad} radiant heat flux

α nonuniformity parameter

α_r ion recombination coefficient

β Hall parameter

δ boundary layer thickness

δ_{el} electrical layer

μ_e electron mobility

ρ density

σ plasma electrical conductivity

$\hat{\sigma}_w$ channel relative electrical conductivity

ϕ phase shift in laser interferometer

ψ_{O_2} oxygen enrichment

ABSTRACT

A description of the main results obtained during Tests No. 6 and 7 at the U-25B Facility using the new channel No. 2 is presented. The purpose of these tests was to operate the MHD generator at its design parameters.

Described here are new plasma diagnostic devices: a traversing dual electrical probe for determining distribution of electron concentrations, and a traversing probe that includes a pitot tube for measuring total and static pressure, and a light detector for measuring plasma luminescence. Data are presented on heat flux distribution along the channel, the first data of this type obtained for an MHD facility of such size.

Results are given of experimental studies of plasma characteristics, gasdynamic, thermal, and electrical MHD channel performance, and temporal and spatial nonuniformities.

Typical modes of operation are analyzed by means of "local" electrical analyses. Computer models are used to obtain predictions for both localized and overall generator characteristics. These theoretical predictions agree closely with the results of the "local" analyses, as well as with measurements of the overall gasdynamic and electrical characteristics of the generator.

SUMMARY

Review and analysis of the results of Tests No. 6 and No. 7 leads to the following conclusions.

1. The design parameters of the facility and generator have been achieved. The mass flow rate of combustion products was increased to 5 kg/s, the magnetic field was 5 T, and oxidizer oxygen enrichment was 50 vol %. Electrical power output was ~1.3 MW with potassium seed and ~1.5 MW with cesium seed.

2. The diagonal generator operated stably for more than one hour at these high power levels, with Hall fields as high as 2.2 kV/m and interframe voltages higher than 60 V in several locations.

3. As a result of combustor modifications, mass flow rates of natural gas fuel were increased, and it was possible to operate at fuel-rich conditions with low levels of pressure fluctuation and combustor and channel vibration, over the entire range of plasma mass flow rates.

4. The instrumentation and plasma diagnostics of the facility were further improved by the introduction and testing of a new traversing dual electrical probe for determining the distributions of electron concentration, a traversing probe combining a pitot tube and light intensity probe for measurement of spatial and temporal variations of pressure, velocity, and plasma temperature, and a new system for measuring axial distribution of heat flux.

5. Study of temporal and spatial interframe voltage distributions confirmed that the diagonal generator operated stably, without any evidence of interelectrode breakdowns, under high electrical stresses. Data obtained supported existing models of the origin of nonuniformities.

6. The close agreement between analytical predictions of generator performance and experimental results supports the validity of the analytical models.

7. The combustor, superconducting magnet system, and all other components of the facility operated as expected, and no problems associated with vibrations, stresses, or high voltages were experienced.

8. Post-test partial disassembly and inspection of the channel confirmed that its condition is satisfactory. The only deterioration is associated with thermal erosion of the packed ceramic of the electrodes. This deterioration will be easily reversed by repacking the electrode grooves with new ceramic. The appearance of smoke, which terminated Test No. 7, is attributed to local overheating as a result of failure of the insulator between two modular channel sections. This deficiency can, and will be corrected in future tests.

1.0 INTRODUCTION

The sixth and seventh joint tests with a Soviet MHD channel and a U.S. superconducting magnet system were conducted in July and December, 1979, in the U-25B facility. Previous tests at that facility, results of which are given in Joint Reports [1,2,3], were aimed at gradually increasing the operating parameters of the facility toward attainment of its design conditions. Corollary objectives were improvements in facility components, generator instrumentation, and plasma diagnostics.

The goals of the earlier tests having being accomplished, the objective of Tests No. 6 and 7 was to attain the generator design conditions and demonstrate that the diagonal generator operates stably under those conditions.

An additional objective was further improvement of the instrumentation and plasma diagnostics, by testing for the first time: a) a traversing double electrical probe for the determination of cross-sectional electron density distributions; b) a traversing probe, incorporating a pitot tube for the measurement of total and static pressure distributions and velocity profiles, and a light intensity detector for the determination of spatial and temporal plasma temperature fluctuations, and c) a measurement system for obtaining heat flux distribution along the channel.

This report contains:

1. Detailed presentation of the results of gasdynamic, thermal, and electrical generator experiments.

2. Results of studies of temporal and spatial generator nonuniformities.

3. Detailed analysis of selected operating modes, using "local" electrical analyses.

4. Results of analytical studies, using computer models and comparison of those results with data obtained in the experiments.

2.0 COMPONENTS OF THE U-25B FACILITY

The U-25B flow train described in Refs. 1-4, was assembled in the same manner as in previous tests [1-4]. Consequently, only those changes made in preparation for Tests No. 6 and 7 are addressed in this section.

2.1 MHD Channel

Tests No. 6 and 7 were performed with Channel No. 2, which had been built at IVTAN. It is of frame construction, and its main feature is that groups of 12 frames each are preassembled into 13 sections, unlike Channel No. 1. These individually-assembled sections are subsequently combined in a modular fashion in the pressure vessel. This approach simplifies channel assembly. It also facilitates minor repairs, because it is possible to remove individual sections without disassembling the entire channel. The geometry of the channel and the frame construction are identical to those of Channel 1. The primary goal of Tests No. 6 and 7 with Channel 2 was to test it near its design parameters under conditions of low channel wall roughness, good thermal insulation, and high level of interframe electrical isolation.

2.2 Combustor

The combustor used in Tests No. 6 and 7 was assembled in the usual configuration, i.e., in the following section sequence: transition, burner, seed injection, support, and nozzle sections.

Prior to Test No. 6, the flow resistance of the burner was reduced by increasing the total cross section of the twelve gas input orifices. This permitted operation of the combustor at mass flow rates of 2 to 5 kg/s and oxygen enrichment of up to 55 vol %. In Test No. 7, a new "cold" wall nozzle was used and, also, measures were taken to lower the level of pressure fluctuations and vibrations in the combustor. To this end, special deflectors, which were designed to insure better mixing and increase the length of the combustion zone, were installed in 30 % of the burner orifices.

2.3 Superconducting Magnet System

In preparation for Test No. 6, preventive maintenance was performed on the refrigerator and liquefier systems. In both, the temperature was raised, the system was purged, and, after careful valve adjustment, put back in operation. In order to maintain the required vacuum in the cryostat, an additional vacuum pump, which can be turned on quickly in an emergency, was installed.

In preparation for Test No. 7, a number of additional improvements were made in the system. These included installation of pressure gauges in the refrigerator and liquefier return lines, replacement of the level sensor, LO-7, and system checkout testing in an automatic operating mode, the latter in order to check system performance and, more specifically, the operation of the valve that supplies liquid helium to the cryostat from Dewar No.1.

3.0 INSTRUMENTATION AND DATA ACQUISITION SYSTEM

The instrumentation system was further improved and expanded during Tests No. 6 and 7. More specifically, a traversing dual electrical probe, designed and fabricated at IVTAN, for determining distributions of electron concentration over the cross section of the fourth diffuser section was used during Test No. 6. During Test No. 7, a traversing pitot and light intensity probe, designed and fabricated at MIT, for the measurement of temporal and spatial distribution of static and absolute pressure and of plasma luminescence, was tested at the combustor nozzle. In addition, during Test No. 7, a number of frames along the channel were instrumented for calorimetric determination of axial heat flux distribution.

The great majority of the measurements were recorded by both the U.S. and the Soviet data acquisition and processing systems.

3.1 Diagnostic Measurements

3.1.1 Measurement System

Figure 3.1 shows the locations of the diagnostic instrumentation during Tests No. 6 and 7. Plasma temperature, $T_{p\ell}$, was measured at the channel inlet, alkaline metal atom concentration, n_A, was determined in the nozzle and the combustor; plasma electrical conductivity, σ, was measured, during Test No. 6 only, in the nozzle. The radiant heat flux was measured in the combustor during Test No. 6, and in the nozzle during Test No. 7. Plasma parameter measurements using the submillimeter laser interferometer were performed in the diffuser. The traversing electrical probe was also used, at the same location in the diffuser, during Test No. 6. The pitot probe was installed in the combustor nozzle.

3.1.2 Measurement of Alkaline Metal Atom Concentration

Alkaline metal atom concentration, n_A, was measured in the same manner as in previous tests, using the shift in the maximum of the self-reversed line, $\Delta\lambda_{max}$, with respect to the line center. Potassium atom concentration was determined on the violet wing with wave length of 7655 Å, and cesium atom

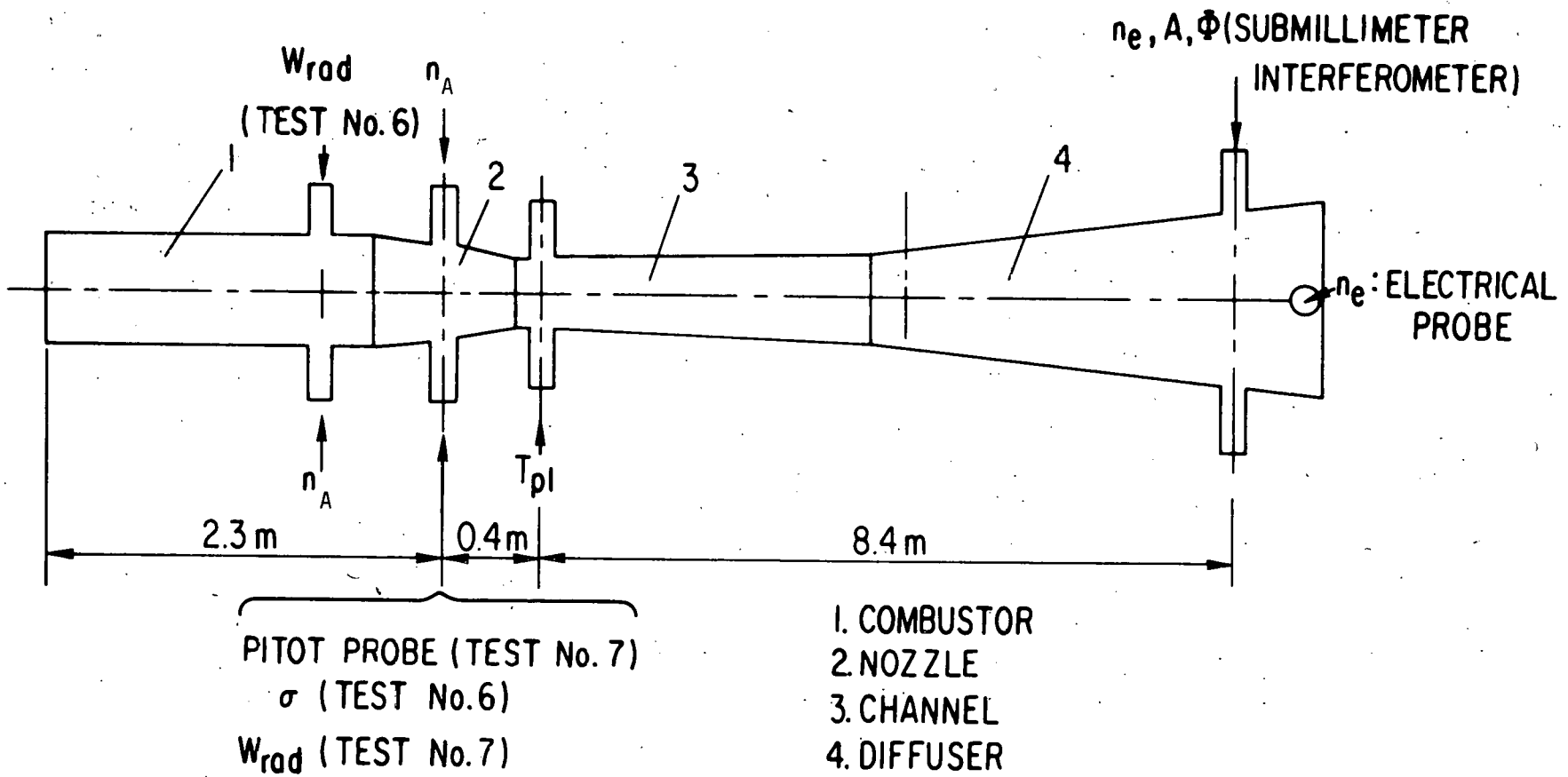

Fig. 3.1 Sites of diagnostic measurements during Tests No. 6 and 7

concentration on the red wing with wave length 8521 Å. During analysis of the resonant potassium line, the behavior of the absorption coefficient at different locations within the wing was taken into account in the manner described previously [5]. Data on the cesium resonant line were obtained at IVTAN by an experiment of special design. During Test No. 7, spectral line contour data were both recorded by the strip chart recorder in the plasma diagnostic laboratory and, also, supplied to the data acquisition system (DAS). Figure 3.2 shows one of the resulting contours. In some cases, contour data were processed by the computer. During Tests No. 6 and 7, difficulties were encountered in determining potassium atom concentration, because high seed mass flow rates caused quite large shifts in the maximum of the self-reversed lines. During Test No. 7, the shifts were as much as 200 Å. For shifts of such extent, variation in the spectral sensitivity of the photomultiplier tube, FEY-9, which decreases in the region of the potassium line with increase in the wave length, should be taken into account. Changes

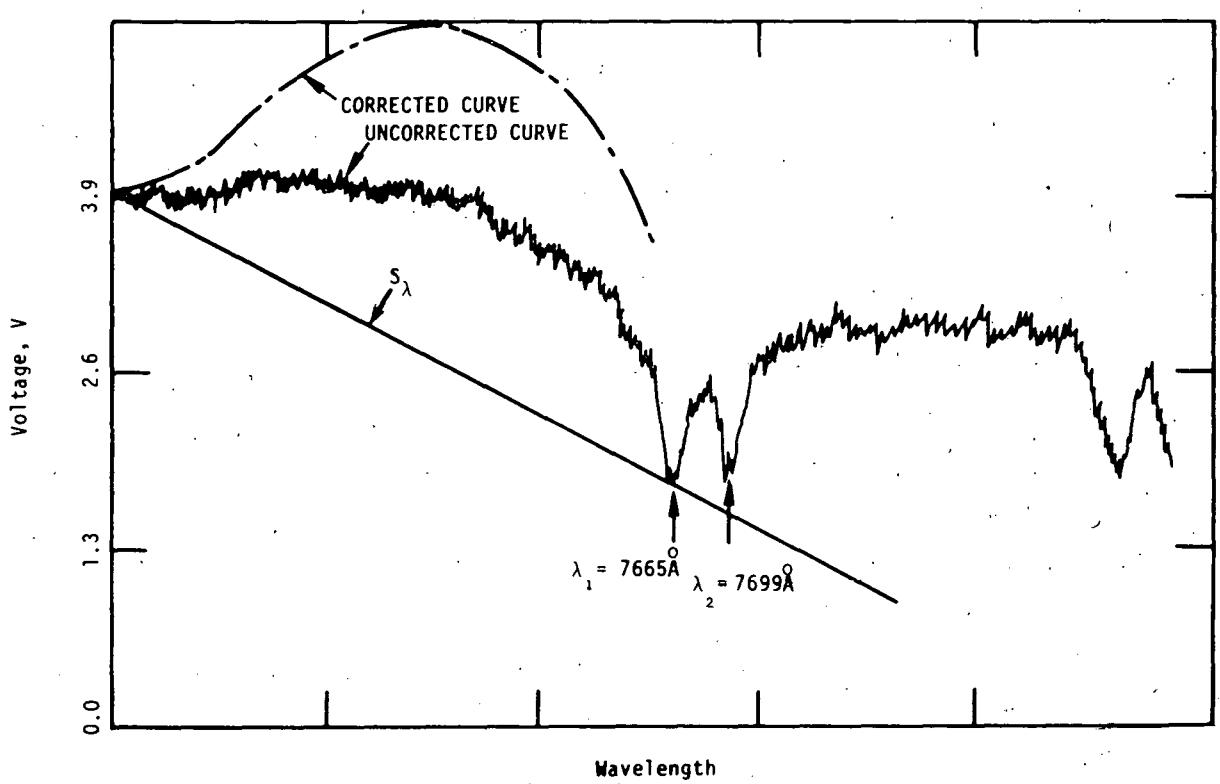

Fig. 3.2 Spectral line contour: from raw data and as corrected by using the variation of photomultiplier sensitivity, S_λ, with wavelength

in the photomultiplier sensitivity as a function of the wave length and the resulting effects on the shape and the location of the spectral line maximum are shown in Fig. 3.2.

The determination of potassium atom concentration was made on the basis of corrected self-reversed contours. Cesium atom concentration was determined in the combustor; in this case, the shifts were not large and it was not necessary to enter correction factors to account for changes in the photomultiplier sensitivity.

3.1.3 Plasma Temperature Measurement

As in previous tests, plasma temperature was determined by the generalized inversion method based on sodium resonance lines. In both tests, the temperature measurement system operated reliably during all operating modes. The measurement reliability was insured by continued supply of sodium to the channel and control of the purging flow of air through the measuring tubes. However, it should be noted that in Test No. 7 it appeared that the system lost its calibration at the moment of the grounding incident involving the electronic power supply of the U. S. pitot tube; thereafter, the temperature measurements were apparently low by approximately 100-150 °C.

3.1.4 Electrical Conductivity Measurement

During Test No. 6, electrical conductivity measurements were obtained with the same instruments used in previous tests. During Test No. 7 no direct measurements of electrical conductivity were performed; hence, electrical conductivity was determined analytically on the basis of measured temperature and atom concentration at the channel entrance.

To this end, electron concentration, n_e, was determined by using Saha's equation, and electrical conductivity was then computed from the basic relationship,

$$\sigma = e n_e \mu_e \,, \tag{3.1}$$

where μ_e is the electron mobility computed on the basis of the following

equation, which takes into account the interaction of electrons with the various components of combustion products and seed atoms [6]:

$$\mu_e = (0.2277 \frac{T(K)}{1000} - 0.0914) \times [1 + (0.034 + 0.03 \frac{T(K)}{1000} (1 - C_A)] \times$$

$$[1 + 0.0245 (\frac{1}{g} - 2) (18 - 4 \frac{T(K)}{1000} - C_A)] \times$$

$$p [0.026 (\frac{T(K)}{1000} - 2)^2 - 0.0025 (\frac{T(K)}{1000} - 2.2) p - 1] . \qquad (3.2)$$

Here, C_A = mass % concentration of alkaline seed, g = mass concentration of oxygen in the oxidizer, and p = pressure.

3.1.5 Radiant Heat Flux Measurement

As in previous tests, radiant heat flux was measured over the spectral interval between 0.2 and 4.5 micrometers, using a radiation detector with a thermocouple sensor. To decrease the effect of vibrations, the detector was mounted on special shock-absorbing mounts.

In measuring the radiant flux emitted by the plasma during Test No. 7, there was practically no contribution from the opposite wall of the nozzle because there was a window there that was larger than the radiation detector's field of view. During measurements performed in Test No. 6, radiation from the opposite wall of the combustor could contribute as much as 30 % of the signal. It is difficult to estimate this contribution more accurately because the temperature of the hot wall of the combustor was not measured.

The sensitivity of the radiation detector during Test No. 6 was 64 mV/W, whereas, it was 57 mV/W in Test No. 7.

3.1.6 Electrical Double Probe Measurements

During Test No. 6, plasma parameters were determined by use of a Langmuir probe. The probe was located in the fourth diffuser section. A double cylindrical probe was used, which was introduced into the plasma by means of a

pneumatic drive. The gas pressure in the pneumatic cylinder of the probe drive system can be continuously controlled. The probe penetrates a maximum of 230 mm into the plasma, and its full dwell time is 0.4 s. The probe is fabricated of stainless steel, the electrodes being 2 mm in diameter and 10 mm in length. The Teflon insulator was protected by an aerodynamic metal shield. An isolation transformer was used to achieve isolation of the instrument from the plasma potential. The design of the probe proved quite satsifactory; 24 measurements were taken during the test, without detrimental effects on the probe.

Probe current was measured during the tests at constant voltage between the probe electrodes. The voltage was varied between 0 and 12 V, in steps, at different depths of penetration; this makes it possible to determine the ionic contribution to the V-I probe characteristic. Probe current was recorded with time constant of 10^{-4} s, on an oscillograph strip chart. Current and probe position were recorded simultaneously. Measurement range was changed by varying the measuring resistance between 4 and 90 Ω.

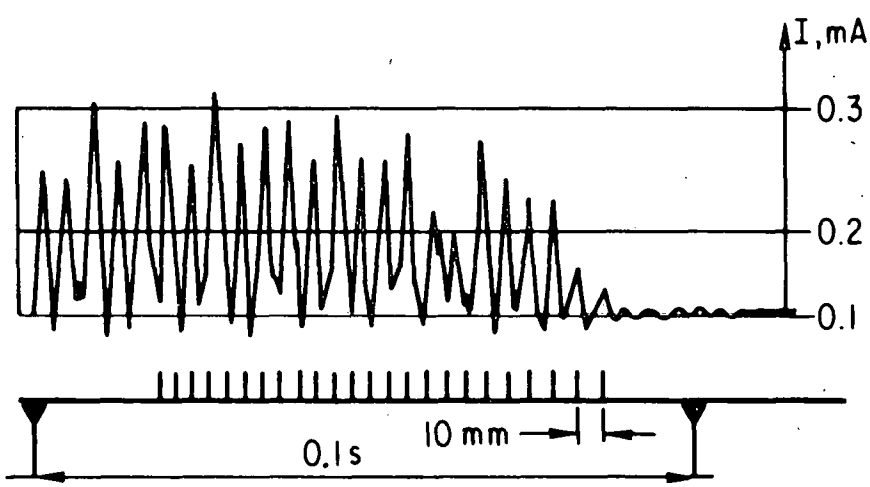

Fig. 3.3 Typical probe current oscillogram of the double electrical probe

A typical probe current oscillogram is shown in Fig. 3.3. The figure includes indicators for probe position and timing markers. The position

indicator second from the right corresponds to the probe entry into plasma. Position indicators make it possible to observe the increase in current as the probe penetrates to the flow. This increase occurs at a distance of 10-13 cm from the diffuser wall. Spatial resolution is determined by the probe length and is 1 cm. Timing markers provide for a rough estimate of the frequency of the probe current fluctuations. The primary fluctuation frequencies of the probe current are 50 and 300 Hz. However, both higher and lower frequencies are also present. The amplitude of the current fluctuations is approximately 50 % of the average value.

Estimates of the thickness of the hydrodynamic layer ($\delta = 5 \times 10^{-3}$ cm), and electrical layer ($\delta_{el} = 5 \times 10^{-4}$ cm), near the probe show that, under the conditions of this experiment, the hydrodynamic layer was thicker than the electrical layer. On the basis of these estimates, it can be assumed that the processes primarily involved in the deposit of charged particles on the probe surface are diffusion and convection. In this case, the expression for the probe current is of the form

$$i_p \simeq 4\, e\, n_e r_p^{1/2}\, U^{1/2}\, D_i^{1/2}, \tag{3.3}$$

where r_p = 2 mm, radius of the cylindrical electrode of the probe,
U = flow velocity, and
D_i = coefficient of ion diffusion.

It follows, from Eq 3.3, that the probe current is proportional to the electron concentration. Therefore, the distribution of probe current in the boundary layer reflects, primarily, distribution of electron concentration; current fluctuations are most likely representative of fluctuations in electron concentration. The time-averaged electron concentration, determined by Eq 3.3, and the probe measurements, taken at maximum probe penetrations, were only a fraction of those obtained with the laser interferometer. This is probably the result of the fact that, in Eq 3.3, the effect on probe current of charged particles recombinations near the probe are not taken into account. The volume recombination can be neglected if the characteristic recombination length, ℓ_r, considerably exceeds the boundary layers near the probe. The recombination length is $\ell_r = (D_i/\alpha_r\, n_e)^{1/2} = 10^{-2}$ cm, where D_i,

the potassium ion diffusion coefficient, is 2.8 cm^2/s [8], and α_r, the recombination coefficient, is 18 x 10^{-19} cm^3/s [9].

Under the experimental conditions, the recombination length is comparable to the boundary layer thickness near the probe; therefore, the use of Eq 3.3 in determining n_e is not entirely justified.

3.1.7 Submillimeter Laser Interferometer

A submillimeter interferometer with a radiation source of 337 μm wavelength was used, as previously, to determine the electron concentration, n_e, and mobility, μ_e, in the fourth section of the diffuser. The interferometer system was essentially the same as that used in Tests No. 4 and 5. However, the coefficient of contrast, C_0, which is the ratio of signal intensity at maximum and minimum interference, was increased from ~ 5 to ~ 10 (in the absence of plasma) by obtaining better correspondence between the wave fronts of the reference and the measuring channels at the sensor [3].

The phase shift, ϕ, with plasma present in the measuring channel of the interferometer, was previously determined directly on the basis of the interference pattern registered on the recorder [3]. Measurement error was approximately $\pm$ 0.5 fringe. By means of a device developed during these latest tests, error in phase shift measurement was reduced considerably.

Figure 3.4 is a block diagram of the system. The interferometer was calibrated by moving one of the mirrors (item No. 1) located in the reference channel by a distance corresponding to one interference fringe. The mirror is mounted on a table (2), equipped with a screw vernier (3). Calibrated movement of the table is obtained by means of an electric motor (4), with a reducer (5), that rotates the vernier through a coupling (6). Remote control was exercised by an operator represented by 7 in the figure.

Total error in measuring phase shift, ϕ, and attenuation, A_i, of the submillimeter signal during Tests No. 6 and 7 did not exceed the following values: $\Delta\phi \leq 0.2$ fringe; $\Delta A_i \leq 0.65$ db. This corresponds to $\Delta n_e \sim 2 \times 10^{12}$ cm^{-3} measurement error in electron concentration, and error in electron mobility of $\Delta\mu_e = (0.2 \cdot \Delta\phi + \Delta A_i)/A_i \simeq 0.06/A_i$ $(m^2/V \cdot s)$.

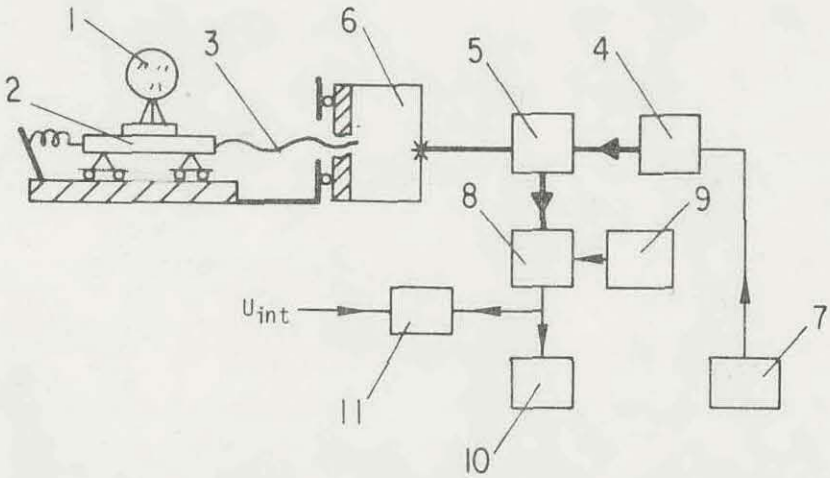

Fig. 3.4 Submillimeter laser interferometer system
1, Phase rotation mirror; 2, table; 3, vernier micrometer; 4, electrical motor; 5, gear reducer; 6, coupling; 7, control panel; 8, potentiometer; 9, constant voltage source; 10, digital voltmeter; 11, strip chart recorder; U_{int}: interference signal

3.1.8 Pitot Traversing Probe

During Test No. 7, the probe designed and built by the Energy Laboratory of the Massachusetts Insititute of Technology was tested for the first time. The probe was mounted immediately upstream of the throat of the nozzle (entry to the constant-area section), where the ratio of the cross-sectional area to that of the throat is 1.059, and the local diameter of the nozzle is 177 mm. This location was fixed by geometric constraints of the facility. Figure 3.5 is a schematic diagram of the probe system.

The cylindrical probe, 12.7 mm in diameter, was designed to measure the total pressure of the plasma, while performing a traverse to the centerline. The local static pressure was also measured, allowing the Mach number profile to be determined. The nominal frequency response of the pressure measurement system was 200 Hz (-3 dB) and the adjustable traverse time on the order of 5 s. The pressure measurement orifices were air-purged at high pressure for ~100 ms once a second, in order to keep them free of seed deposits.

The probe also contained a quartz optical-fiber bundle, which had a narrow, 4-degree field of view through a 0.7-mm orifice on the axis of the

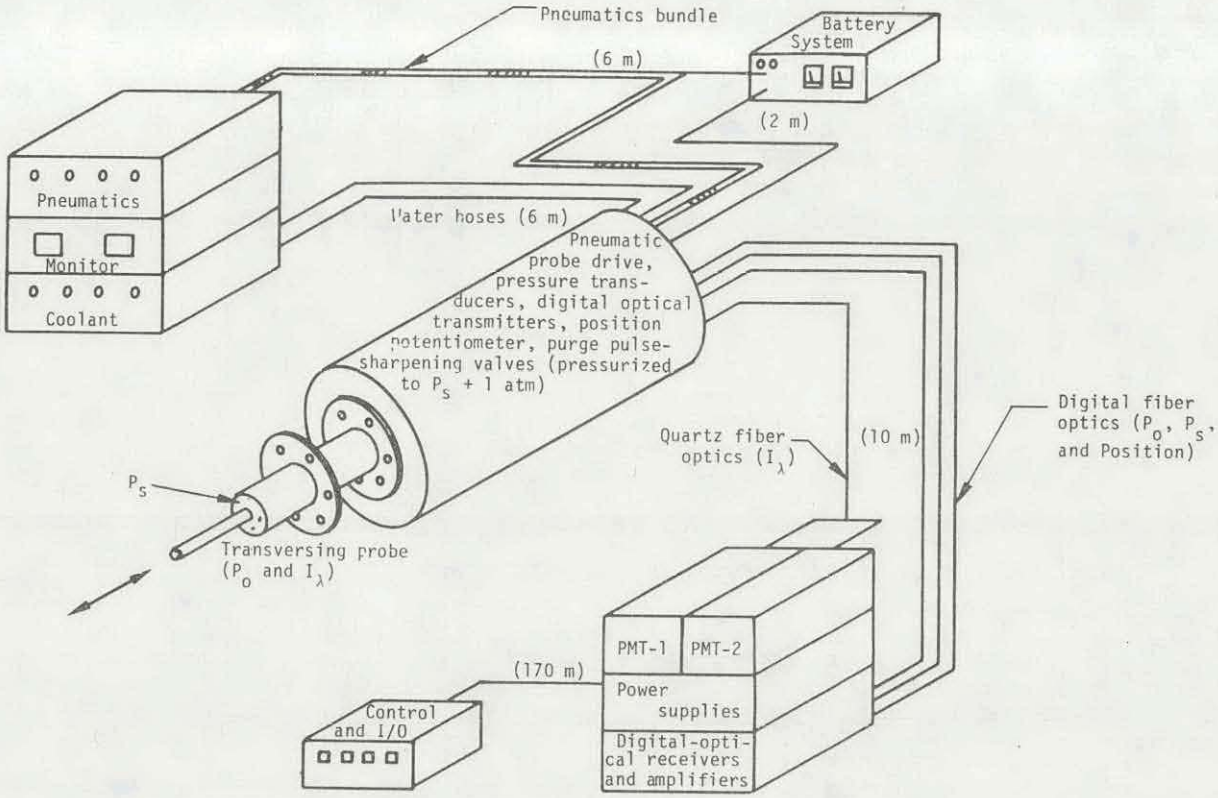

Fig. 3.5 Component and interconnection schematic of traversing pitot probe system

probe, orthogonal to the plasma flow. The probe and its housing were water cooled, and a constant stream of air flowed around the tip of the optical fiber bundle and out through the orifice, providing additional cooling as well as purging action necessary to keep it free of seed deposits.

The fiber bundle, 10 m in length, was bifurcated at the end opposite the probe, and lens-coupled to two matched photomultiplier detectors through narrow-band (0.5 nm, nominal) optical filters at center wavelengths spaced 1.0 nm apart, i.e., at wavelengths of 765.5 nm and 764.5 nm, in the wing of the principal resonance emission line of potassium. The purpose was to examine the fluctuations in plasma temperature as a function of radial position, integrating over two different effective optical depths, as well as to estimate the plasma temperature level. The latter measurement, which requires an absolute irradiance calibration of the system, was not attempted during this shakedown test.

The total and static pressure transducer signals and the probe position transducer signal were digitally encoded at the probe and tramsitted 10 m through optical fibers to receivers, for reconversion to high-level analog signals. These, together with the amplified photomultiplier output signals, were carried over a long signal cable (approximately 170 m) to the U.S. computer-based data acquisition system. The transducers were mounted in the probe housing and powered by a battery system that floated electrically at the entrance-end voltage of the MHD channel (up to 5 kV). The traversing mechanism was remotely operated, was purely pneumatic, and had automatic return. Thus, by using the four optical links and nonconducting pneumatic and water hoses as the only paths into the high-voltage region, complete electrical isolation was achieved.

3.2 Electrical Instrumentation

The electrical instrumentation of the MHD generator and inverter system for Test No. 6 is shown in block diagram form in Fig. 3.6, and for Test No. 7 in Fig. 3.7. The diagrams indicate all the voltages and currents measured, as well as the locations at which measurements were taken. The instrumentation for current and of voltage measurements is of the same type as in all previous tests.

In Test 6, power take-off currents were measured in frames 12-23 (I12-I23) and 132-143 (I132-I143). In addition, the current in frames 57 (I57), 93 (I93), and inverters 17, 19, and 21 were monitored with the same instrumentation as in Test No. 5.

In Test No. 7, the following currents were recorded.

1. I9-I24, with the option of switching I9-I12 and I21-I24 in or out to change the size and the location of the inlet power takeoff region.

2. I132-I147, with the option of switching I132-I135 and I144-I147 in or out to change the size and the location of the outlet power takeoff region.

3. Interframe currents between frames 4-5, 37-38, 73-74, 109-110, and 150-151 only during the application of the external source.

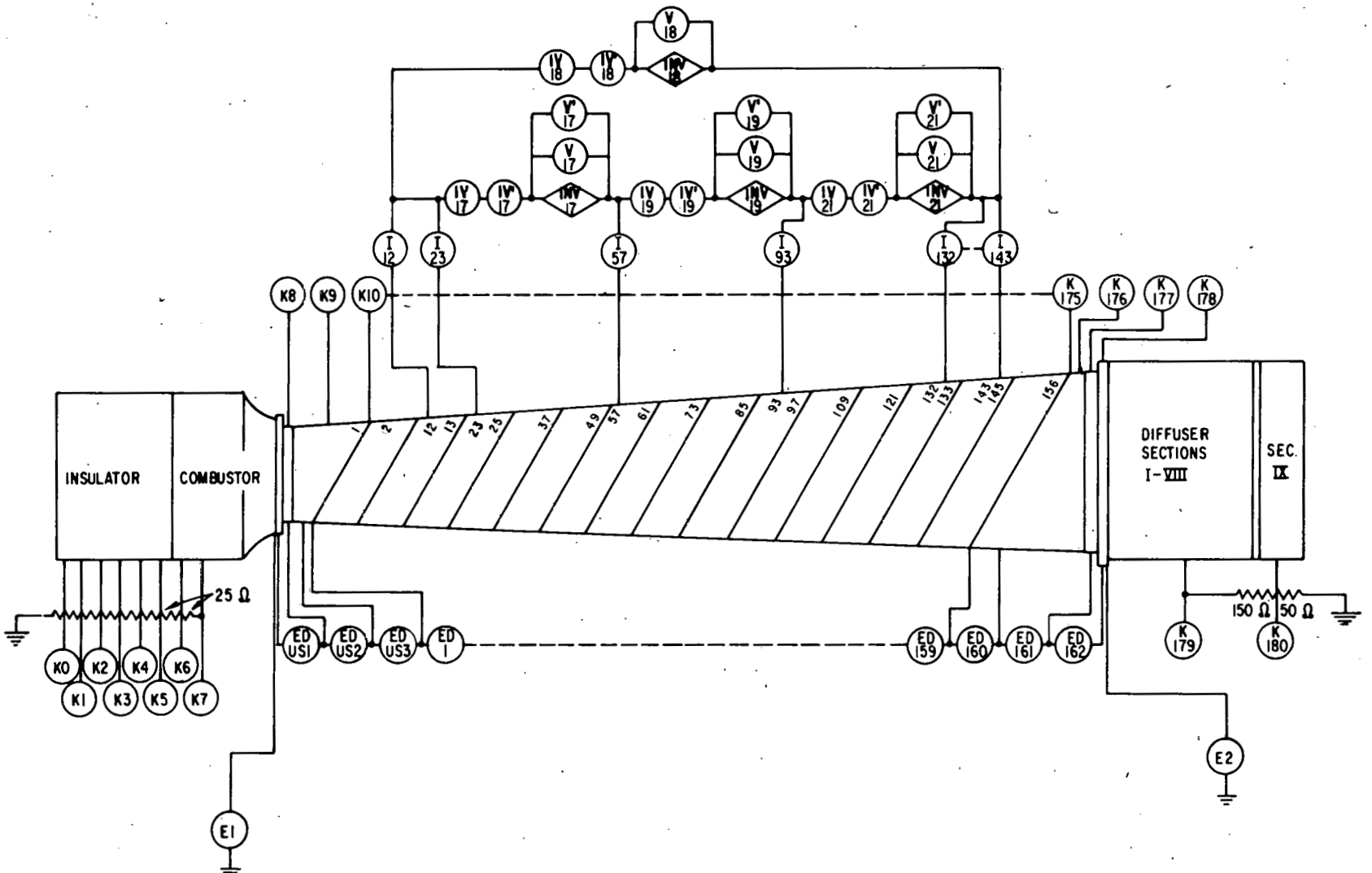

Fig. 3.6 Electrical instrumentation diagram, Test No. 6

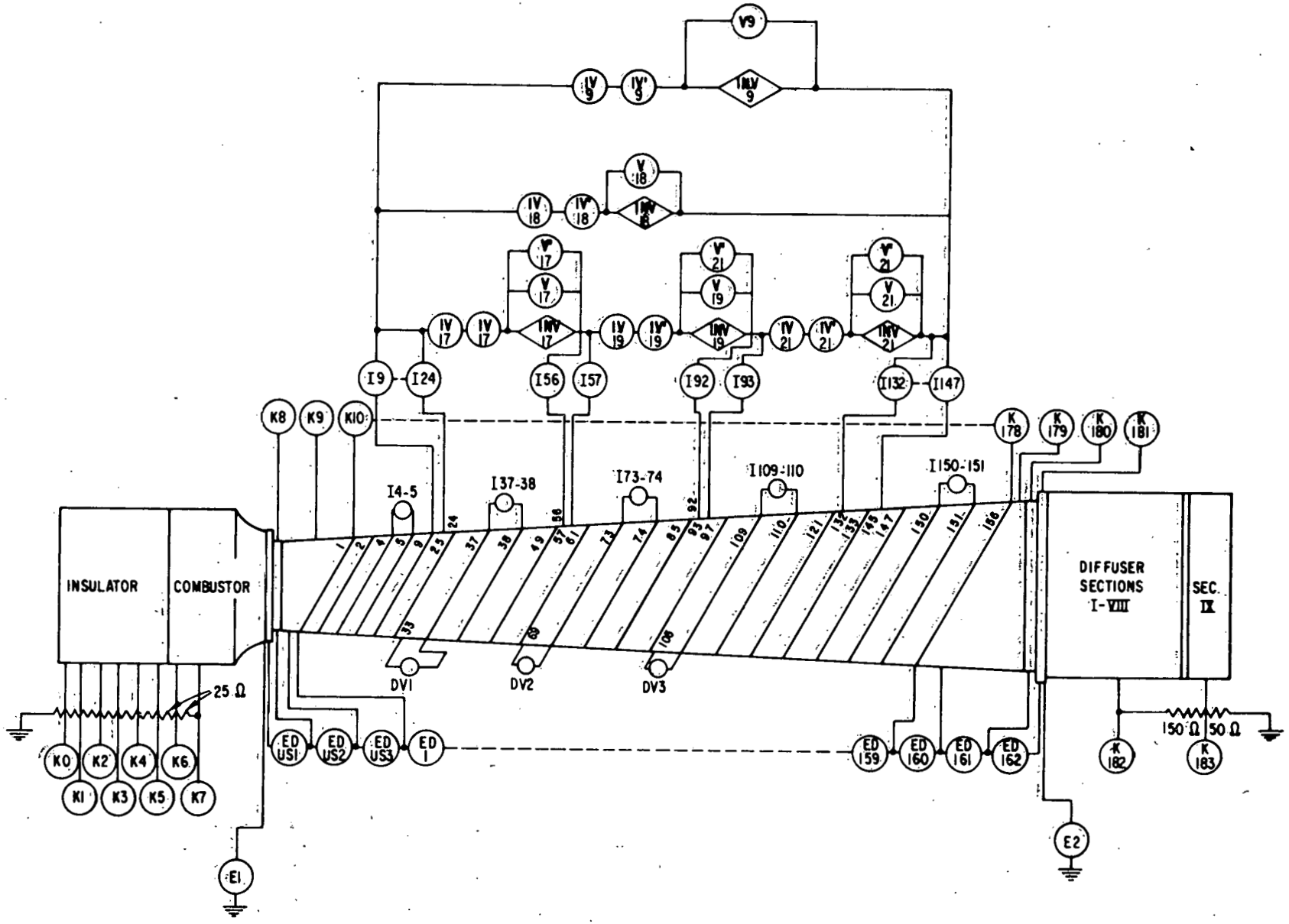

Fig. 3.7 Electrical instrumentation diagram, Test No. 7

4. Frame currents I56, I57, and I92, I93 with the option of switching I56 and I92 in or out.

In addition to all the interframe voltages measured between adjacent frames, measurements were taken of three sets of 4 frames as a group. These are indicated as DV1, DV2, and DV3 in Fig. 3.7.

During Test No. 6, the plasma conductivity and the channel resistance were measured, using inverter 18 in the rectifying mode as the driving source; during Test No. 7, the plasma conductivity was measured, using inverter 18, and the channel insulation characteristics were measured, using inverter 9. These measurements were taken with the same instruments used in Test No. 5. Potential-to-ground was also measured at the combustor, channel inlet, channel outlet, and diffuser at locations shown in the diagrams.

3.3 Data Bank

Modern computing methods and equipment are required for efficient processing of such large amounts of experimental data as obtained from tests performed at the U-25B facility. Both the data processing steps and the computational interconnections must be automated as fully as possible.

A computer-based (HP 2100) DAS acquires the experimental results; subsequently, raw input data are converted into engineering units and stored on magnetic tapes and printouts, which served, until recently, as the information base for users at large. It became clear that it was necessary to create a computer-based data bank that would permit storing data in an orderly manner and would provide effective information retrieval.

Work was begun in March 1979 on creation of a data bank (DB) involving an HP-3000 computer that would use the DAS as its source. The following tasks have been completed:

1. Evaluation of the nature and volume of information entering the DB, taking into account the software features of the computer system.

2. Evaluation of possible DB user requirements in terms of bank content and information access.

3. Selection of optimum DB structure on the basis of the foregoing two determinations.

4. Development of DB structuring on the basis of preliminary information about specific aspects of future tests.

5. Evaluation of data transfer from the DAS to the DB. The main difficulty has been in the different representation of real numbers in the two computers. This made it necessary to develop a special program for number conversion.

6. Development of other than standard software for accessing and processing information stored in the DB.

Consider the DB containing information obtained during Test Nos. 6 and 7. The DB includes seven data files. Two files contain symbol information. In the INFORM file, auxiliary information is stored; the NAMES file contains the capability of decoding parameter designations and parameter dimensions. One file, MEAS, is necessary for expedient information search and retrieval. Among the remaining for files, two correspond to Test No. 6 data, the other two to Test No. 7. In each case, one file for a specific test contains information common for all measurements (its capacity is equal to the number of measurements in the test); the other file relates to additional data, i.e., measurements other than standard flow train measurements.

In utilizing the DB, standard and special software are required. Standard software permits conducting various search operations and displaying information in tabular form (here, numerical operations and multi-indexing can be performed). The main function of nonstandard software is to provide graphic information processing.

The development and the use of a data bank containing experimental data obtained at the U-25B facility effectively addresses the problem of information storage and processing, and allows more effective analysis and forecasting of facility performance.

4.0 TEST OPERATIONS

4.1 Major Test Parameters

During Test No. 6, the performance of the MHD generator was mapped for several operating conditions, with mass flow rates of up to 4.6 kg/s, oxygen enrichment of up to 57 vol %, and magnetic field intensity of up to 5 T. During Test No. 7, the mass flow rate reached its design value of 5 kg/s at oxygen enrichment of 50 vol %. Throughout most of the generator testing, seed was added by injection of an aqueous solution of potassium carbonate, the potassium concentration in the combustion products being approx 1 mass %. In order to increase the electrical conductivity further, cesium seeding was used during the later stages of Test No. 7, with Cs concentration of up to ~2 mass%.

During Test No. 6, at combustion products mass flow rate of 4.5 kg/s, oxygen enrichment of 50 %, and magnetic field of 5 T, the maximum electrical power output of the generator slightly exceeded 1 MW. During Test No. 7, at the design mass flow rate of 5 kg/s, 50 % oxygen enrichment, and magnetic field of 5 T, electrical power output was 1.3 MW with potassium seeding and 1.5 MW with cesium seeding. At these operating conditions, the enthalpy extraction was ~5 %, the power per unit mass flow rate reached ~0.3 MJ/kg, and the power per unit volume was ~10 MW/m^3. The maximum Hall voltage was 5.2 kV, and the maximum Hall field strength was ~2.2 kV/m. The total operating time of the combustor for the two tests was ~30 h; power was extracted from the generator for ~12 h, total, during the tests. In operation with cesium, during Test No. 7, the generator produced power outputs of 1.3-1.4 MW for approximately one hour in an essentially continuous fashion.

4.2 Test Program

TEST NUMBER 6

July 22, 1979

13:50 Cooling system to channel No. 2 and combustor turned on and adjusted.

July 28, 1979

10:05 Oxidizer compressor and exhaust fan started.

14:40 Oxidizer temperature increased at the rate of 50 °C/h (G = 4.0 kg/s).

21:50 Gasdynamic characteristics obtained for oxidizer temperature of 500 °C (G = 2.0, 3.0, and 4.0 kg/s).

July 29, 1979

8:20 Gasdynamic characteristics obtained for oxidizer temperature of 900 °C (G = 2.0, 3.0, and 4.0 kg/s).

July 30, 1979

13:45 Oxidizer mass flow rate reduced to 1.7 kg/s (T_{ph} = 900 °C).

14:05 Combustor ignited.

15:25 Oxyen enrichment established at 40 vol %.

15:35 External leak in one cooling water hose discovered. Combustor shut down and hose repaired.

22:20 Flow train heating continued at oxidizer mass flow rate of 4 kg/s (T_{ph} = 900 °C).

July 31, 1979

8:30 Combustor ignited.

10:36 Channel V-I characteristics obtained with external source (Inverter No. 18).

12:35 Magnet switched on.

17:10 Combustor mass flow rate of 2.5 kg/s, oxygen enrichment of 50 vol %, established.

18:18 Channel V-I characteristics obtained for combustor mass flow values of 2.5, 3.0, 3.5, 4.0, and 4.5 kg/s while the magnetic field strength varies from 3 to 5 T.

19:30 Maximum channel power output of 1068 kW obtained at combustor mass flow rate of 4.6 kg/s, oxygen enrichment of 50 vol %.

20:00 Combustor mass flow rate of 3.5 kg/s and oxygen enrichment of 57 vol % established. Channel V-I characteristics obtained. Maximum channel power output, 943 kW.

20:20 Combustor mass flow rate reduced to 2.5 kg/s.

20:40 Seed injection stopped and magnet switched off.

20:55 Combustor shut down.

TEST NUMBER 7

December 1, 1979

12:15 Cooling system to channel No. 2 and combustor turned on and adjusted.

December 3, 1979

9:07 Oxidizer compressor and exhaust fan started.

10:45 Gasdynamic characteristics of the flow train are measured during cold flow (G = 2.0, 3.0, 4.0, 5.0, and 6.0 kg/s).

December 4, 1979

1:45 Oxidizer temperature increased at the rate of 50 °C/h (G = 4.0 kg/s).

December 5, 1979

11:00 Gasdynamic characteristics obtained for oxidizer temperature of ~850 °C (G = 2.0, 3.0, and 4.0 kg/s).

December 6, 1979

8:09 Oxidizer mass flow rate reduced to 1.8 kg/s (T_{ph} = 900 °C).

8:16 Combustor ignited.

10:18 Oxygen enrichment of 50 vol % established.

10:40 Combustor mass flow rate increased to 2.6 kg/s.

11:52 Channel V-I chracteristics obtained with external source (Inverter No. 9).

12:59 Magnet switched on.

15:22 As the magnetic field strength approaches 4 T, power supply of the pitot probe electrically shorts the combustor to ground.

15:58 Magnet switched off, seed injection stopped, because channel and combustor are grounded.

17:00 Pitot probe power supply removed.

17:20 Test program resumed.

20:45 Magnetic field strength stable at 5 T.

21:45 Increase combustor mass flow rate to 4.5, 5.0 kg/s.

23:05 Maximum channel output power of 1.30 MW measured at mass flow

rate of ~5 kg/s; using potassium seed and oxygen enrichment of 51 vol %.

23:10 Cesium seed injected at mass flow rate of 200 L/h.

23:45 Cesium seed mass flow rate increased to 500 L/h.

December 7, 1979

0:05 Cesium seed mass flow rate decreased to 300 L/h.

0:15 Maximum channel output power of approximately 1.5 MW measured at mass flow rate of ~5 kg/s, using cesium seed and 50 % oxygen enrichment.

0:38 Fire protection system senses presence of smoke in warm bore of the magnet. Facility is shut down.

End of Test No. 7.

4.3 Oxidizer Supply System

During the Test No. 6 warm blow, at oxidizer mass flow rate of 4.0 kg/s, maximum temperature of 960 °C was reached. When the mass flow rate was reduced to 1.7 kg/s before firing the combustor, temperature in the flow train dropped to 920 °C. To increase oxygen enrichment from 40 vol % to 50-57 vol %, additional oxygen was supplied from a tank at the oxygen plant. Oxidizer temperature was then reduced to 870 °C.

During Test No. 7 warm blow, at oxidizer mass flow rate of 4.0 kg/s, maximum oxidizer temperature reached before firing the combustor was 970 °C. Oxygen enrichment was increased to 50 vol %, from 40 vol %, by supplying additional oxygen from a tank at the oxygen plant. Oxidizer temperature was then maintained at 890-910 °C.

4.4 Combustor

Total combustor operating time during Test No. 6 was 13 h, 20 min.

For Test No. 7, a new nozzle was fabricated; the mixing process in the burner was changed by modifying the burner; the igniter was also pretested to insure reliable operation.

During Test No. 7, the combustor operated for 16 h, 21 min. Under maximum power operating conditions, the mass flow rate of combustion products was ~5 kg/s, oxygen enrichment ~50 %, and combustor pressure was in excess of 4.0 ata (0.4 MPa). Maximum electrical power output (~1.5 MW) was obtained under stoichiometric ratio, SR, of ~0.87.

Combustor thermal losses and acoustic characteristics were studied during Tests No. 6 and 7.

Thermal losses relative to total thermal combustor power were as follows: Test No. 6, 7.8-8.4 %; Test No. 7, 6.5%.

During Tests 4 and 5, it had been found impossible to supply enough gas fuel to the combustor to ensure design stoichiometric ratio. To solve this problem, the diameter of gas burner orifices was increased; this modification resulted in a substantial deterioration in the acoustic stability of the combustor. Oscillation amplitudes of up to 12 % of the average combustor pressure, at a frequency of ~380 Hz, were observed. Such pressure fluctuations resulted in noticeable vibrations (up to 8 g). It is interesting to note that, whereas channel loading stabilized the combustion process in previous tests, generation of power during Test No. 6 had no such effect.

The acoustic characteristics of the combustion that were recorded during Test No. 6 were judged unsatisfactory; consequently, the combustor burner was modified before Test No. 7. Specifically, deflector plates were installed in approximately 30 % of the gas orifices, resulting in parallel stream mixing. Increasing burner dwell time is recognized as one of the most effective ways to ensure combustion stability. Installation of deflectors in some of the orifices resulted in creating two combustion zones; this decreased the energy release density that sustains oscillations and stabilized the combustion process. An additional stabilizing effect was the resulting change of the phase relationship between heat release and pressure peak (Rayleigh criterion) [11]. The deflectors shifted the combustion heat release zone 150-200 mm away from pressure wave peaks.

As evidenced by the results obtained, maximum pressure fluctuations in the combustor during Test No. 7 did not exceed 2 % of the average pressure, and vibrations did not exceed 2 g. Furthermore, the vibrations that occurred were across a range of frequencies; there was no dominant frequency, regardless of the operating mode. Hence, it can be concluded that the installation of the deflectors in the combustor resulted in stable operation.

Because a new channel was used during Tests No. 6 and 7, and the warm blow was performed at mass flow rates of 2 to 4 kg/s, i.e., under obviously supersonic flow conditions in the channel, special studies have been made of the vibrations present. These studies were performed during warm blow of test No. 6. Mass flow rate was varied between 2.5 and 4.5 kg/s. Changes noted in the vibration levels of the combustor, nozzle, and channel pressure vessel are listed in Table 4.1.

Table 4.1

Vibration Levels in the Components of the U-25B Flow Train During Warm Blow of Test No. 6

G, kg/s	T, °C	p_c, atm	BVK-2z, g	BVK-4x, g	BVK-4z, g	BVK-1k, g	BVK-2k, g	f, Hz
2.5	91	1.12	0.3	0.3	0.3	0.3	0.3	6300
3.3	916	1.38	0.6	0.7	0.5	0.5	0.5	6300
3.7	972	1.54	0.9	1.0	0.8	0.8	0.7	6300
3.9	972	1.71	1.2	1.2	1.0	1.0	0.9	6300

G = oxidizer mass flow rate
T_{ph} = oxidizer temperature
p_c = Combustor pressure
f - Dominant vibration frequency

BVK-2z - Vibrations in the transition section
BVK-4x, BVK-4z - Nozzle vibrations
BVK-1k, BVK-2k - Channel vibrations

The table shows that, as the oxidizer mass flow rate increases (as does the Mach number), vibration amplitude also increases in all flow train

elements. However, at mass flow rate of 3.9 kg/s, maximum vibrations do not exceed 1.2 g at 6300 Hz. An estimate done by standard procedures [12] showed that, for these vibrations, displacements do not exceed 5-10 x 10^{-6} mm. Stresses accompanying such displacements are insignificant; flow train elements can be cycled indefinitely under such stress levels.

Therefore, the possibility that dangerous vibrations can take place under supersonic flow conditions at the U-25B facility appears to be remote, and warm blow at 4 kg/s can be recommended for future tests there.

During Tests No. 6 and 7, studies centered on experimental determination of interactions between gasdynamic and electrical fluctuations were initiated. Limitations in tape recording equipment restricted the data obtained on magnetic tape to only two parameters: pressure fluctuations in the nozzle, and fluctuations of interframe voltage between frames 61 and 62.

The recorded signals were analyzed, using a spectrum analyzer and a correlator. The analysis of the data shows that, with acoustical fluctuations present in the combustor (Test No. 6, G, ~2.5 kg/s; oxygen enrichment, ~47 %; seed flow rate, ~280 L/h; B field, 3.0 T; inverter current, 0 A), the spectra of both signals indicate peaks in the frequency intervals of 350-400 Hz and 700-750 Hz (Fig. 4.1). The spectra are narrow-band in nature, and substantial correlation between the fluctuations is evident. The mutual correlation function shown in Fig. 4.2 is sinusoidal in shape, suggesting sinusoidal distributions of pressure and voltage fluctuations. As indicated in Fig. 4.2, the phase shift between the fluctuations is ~0.8 ms. The correlation coefficient is ~0.9.

Phase shifts approaching 0.8 ms are also obtained with the following equation [12] for standing waves in a moving medium:

$$\Delta\tau = \frac{kMT\Delta\ell}{\ell}, \tag{4.1}$$

where k is wave number; M, Mach number; T, fluctuation period; $\Delta\ell$, measurement basis, and ℓ, characteristic dimension.

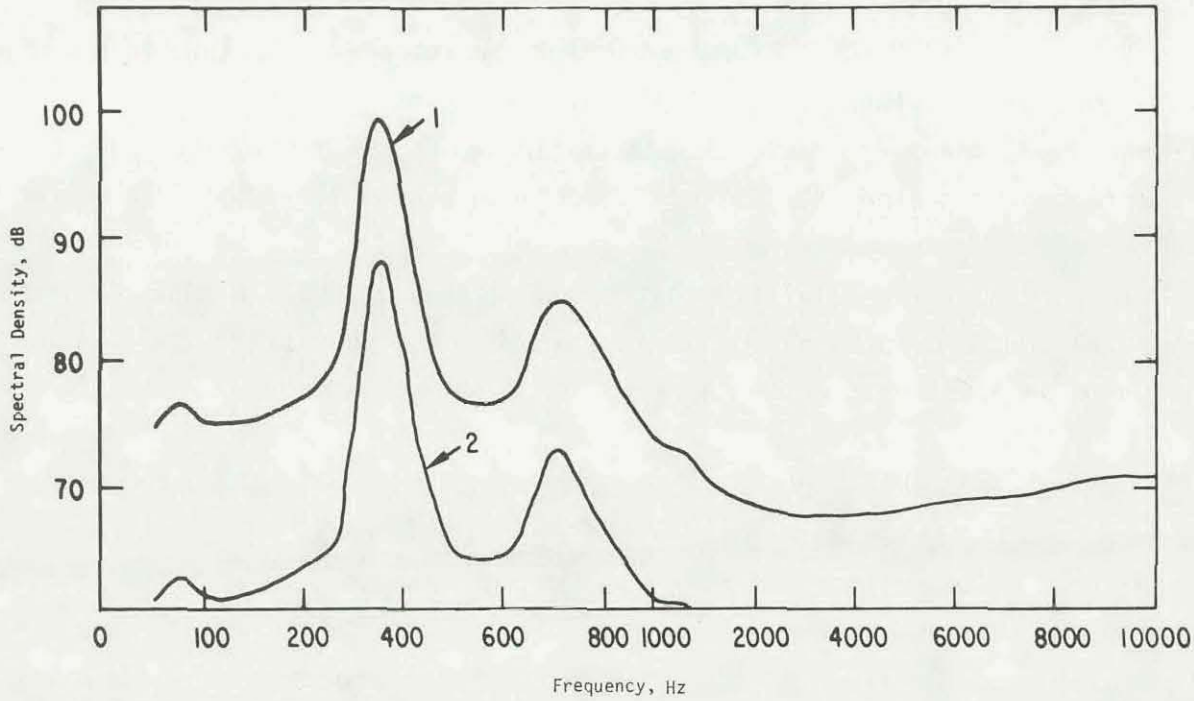

Fig. 4.1 Spectra of pressure fluctuations of combustion products in the nozzle (1) and interframe voltage fluctuations (2) in active portion of channel (frames 61-62); Test No. 6; G = 2.5 kg/s, oxygen enrichment = 47 vol %, seed flow rate = 280 L/h, B = 3 T, inverter current = 0 A

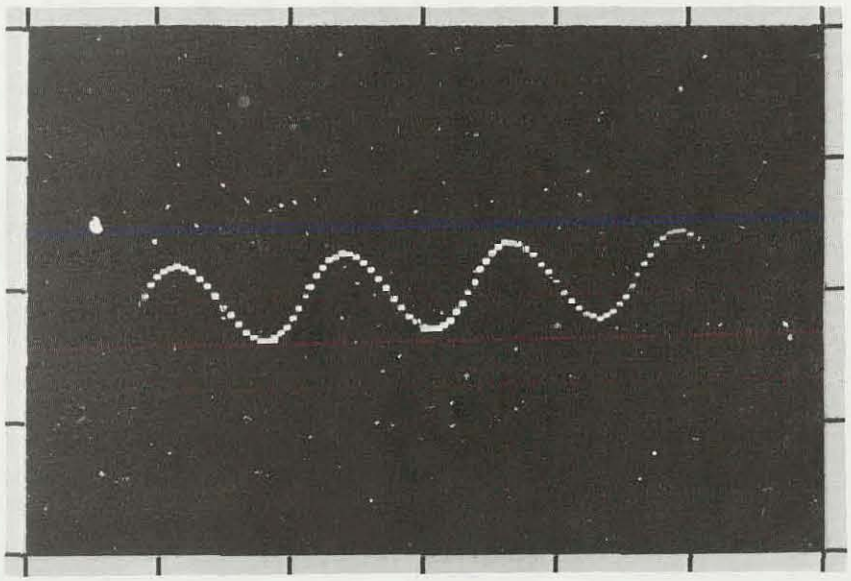

Fig. 4.2 Correlation function between pressure fluctuations in the nozzle and interframe voltage fluctuations (frames 61-62); Test No. 6; G ~2.5 kg/s, oxygen enrichment = 47 vol %, seed flow rate = 280 L/h, B = 3 T, inverter current = 0 A; time scale: horizontal = 2 ms/div, vertical = 2 V/div

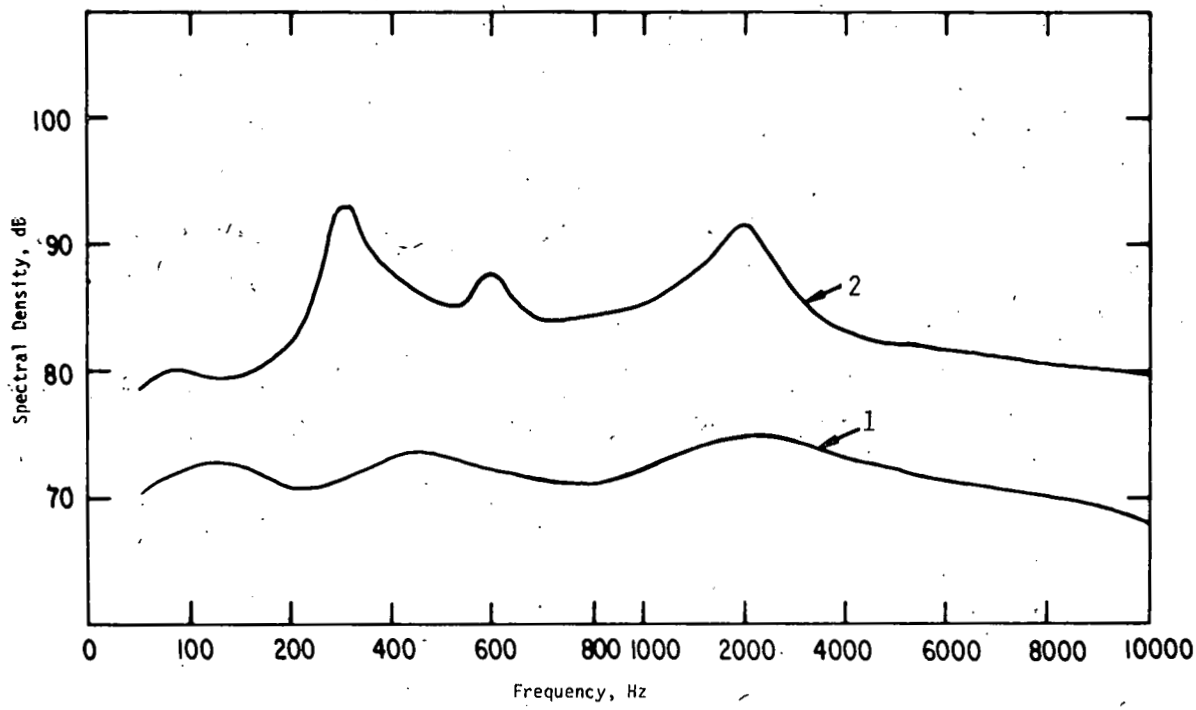

Fig. 4.3 Spectra of (1) pressure fluctuations of combustion products in the nozzle and (2) interframe voltage fluctuations (frames 61-62); Test No. 7; G = 5.0 kg/s, oxygen enrichment = ~51 vol %, B = 5 T, and output power = 1.3-1.4 MW

Analysis of nozzle pressure fluctuations and interframe voltage fluctuations between Frames 61 and 62 during Test No. 7 in a maximum power generating mode shows a substantial difference between spectra (Fig. 4.3). The spectrum of the interframe fluctuation shows well defined components at 300 and at 2000 - 3000 Hz. In the pressure fluctuation spectrum, there are no sharply defined peaks. No correlation between signals was observed.

4.5 Seed Injection System for Tests No. 6 and 7

During Test No. 6, the following aqueous solution of seed was used:

K_2CO_3 = 47.9 mass %

KOH = 0.5 mass %

NaOH = 0.5 mass %

(Equivalent K_2CO_3 concentration in the solution would have been 48.56 mass %.)

Solution density: $\gamma = 1.52\ g/cm^3$

During Test No. 7, the following aqueous solutions of seed were used:

a. Potassium Carbonate:

K_2CO_3 = 46 mass %

NaOH = 0.5 mass %

Solution density: γ = 1.5 g/cm^3

b. Alkaline metal salts of Cs, Rb, K, Na, with cesium as a dominant component:

The density of the cesium seed solution was 1.8 g/cm^3; concentration of the compound in the aqueous solution was 71 mass %; the composition of the dissolved salts was as follows:

CH_3COOCs - 926 g/L
CH_3COORb - 169 g/L
CH_3COOK - 97 g/L
CH_3COONa - 74.5 g/L

The same seed injection method was used for both tests. The seed was injected through six seed nozzles. No atomizing air was used in any of the operating modes.

During Test No. 6, seed was injected for 3 h, 46 min. Flow rate of seed solution varied between 220 L/h and 410 L/h, to maintain potassium molar concentration of 0.65-0.7 mol % in combustion products of varying mass flow rates. During the test, 1000 liters of the seed solution, containing 760 kg of dry potassium carbonate, were used.

During Test No. 7, potassium seed was injected for 7 h, 37 min, using 2395 liters of seed solution (1650 kg of dry potassium carbonate). Flow rate of the seed solution varied between 240 L/h and 500 L/h. Maximum output power for potassium seed (1.3 MW) was obtained at seed flow rate of 450 L/h and molar concentration of ~0.7 % in combustion products. Cesium seed was injected for 1 h, 27 min, representing total use of 505 liters. During optimization of the flow rate of the cesium seed on the basis of output power, flow rate of 300 L/h was established as optimum. At this value, maximum power, 1.5 MW, was obtained. During this operating mode, concentration of alkaline metal in combustion products was ~0.35 mol %.

4.6 SCMS Operation

The superconducting magnet system operated satisfactorily during Test No. 6, with the exception of a protective magnet discharge, which took place at a field of ~5 T.

An increase in magnet cryostat pressure was observed, particularly at magnetic fields between 4 and 5 T.

Preliminary analysis indicates that the magnet discharge occurred because of misoperation of the valve controlling the liquid helium flow to the cryostat. A review of the history of the cryostat liquid helium level indicates instable operation of this valve. To correct the situation at the time of the test, the upper helium level limit was set to 50 %, and the lower limit to 45 % of indicated cryostat liquid level.

Throughout the test, a fraction of the helium boil-off was transferred into the impure helium gas storage. A variation of the indicated magnet insulating vacuum was noted; the vacuum was 3.5×10^{-4} mm Hg when magnet charging began, and had deteriorated to 5×10^{-4} mm Hg when charging was completed.

During the preparation for Test No. 7, a chart record was kept of the liquid helium level and pressure in the cryostat, and of opening and closing the valve controlling flow of liquid helium into the cryostat. During these preliminary tests, there were cases of cryostat overfilling. Other instances of overfilling also occurred during Test No. 7. The probable cause of overfilling is abnormal operation of the liquid helium level controller.

During the tests, cryostat pressure varied between 2 psi in the boil-off mode and 3.5 psi maximum in the filling mode. The magnet remained in the charged state for 13 hours.

4.7 Electrical Loading

Figure 4.4 depicts the loading of the MHD channel during Tests No. 6 and 7.

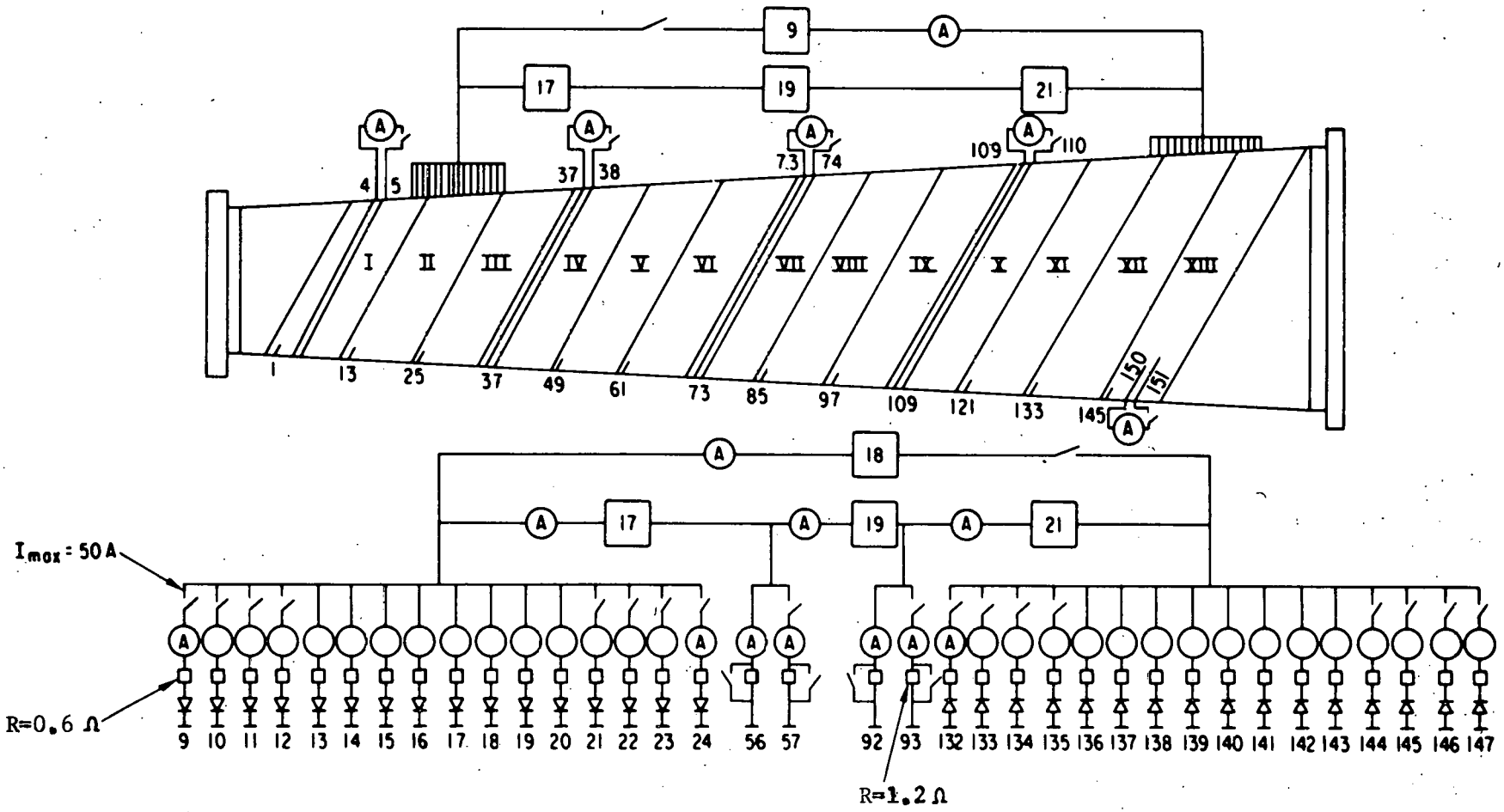

Fig. 4.4 Schematic of electrical loading of the channel

Because of its high Hall voltage, the channel is loaded by means of three inverters, connected in series with two intermediate connecting points (at frames No. 56-57 and 92-93). The intermediate connecting points allow optimization of the power output by ensuring proper current distribution along the channel. Input and output current takeoff regions are located in those zones where the electrical field gradient is near zero. Depending upon electrical and gasdynamic operating modes, the optimum current takeoff zone may shift upstream or downstream. Consequently, in taking into account the U-25B channel configuration, input and output current takeoff regions were made as wide as possible (frames No. 9 through 24 at the inlet, No. 132 through 147 at the outlet). At both the inlet and outlet, contactors were used, allowing choice of optimum current takeoff connection according to the operating mode. To block current circulation, each takeoff lead included a diode and, in addition, had a fixed ohmic resistance equal to 0.60 Ω. Resistors in the current takeoff leads not only control the current distribution, they also prevent possible damage to the frames from the appearance of excessive current in one of the frames.

Because the level of electrical insulation between components of the channel and the remainder of the flow train may have a substantial effect upon channel performance, the loading scheme (Fig. 4.4) includes additional measuring circuits for determination of leakage currents over the channel walls and to ground through the input and output elements of the channel and the flow train. To this end, an external source is used (Inverter No. 9 or No. 18 operating as rectifier). Inverter 18 is also used in experiments for determining the electrical conductivity of the plasma along the length of the channel.

5.0 TEST RESULTS

5.1 Test Program

As in the previous tests of the U-25B facility, the subject program included periods of "cold" flow and "warm" flow before ignition of the combustor. Static pressure measurements in the combustor, channel, and diffuser were recorded for "cold" air flow rates of 2 kg/s to 6 kg/s during both Test Nos. 6 and No. 7. Warm preheated air was then flowed through the test train, its temperature being raised at the rate of 50 °C/h. Measurements of static pressure distribution were obtained for mass flow rates of 2-4 kg/s at temperatures of approximately 350 °C and 900 °C during Test No. 6, and of approximately 675 °C and 900 °C during Test No. 7.

5.1.1 Program for Test No. 6

On July 30, 1979, the combustor was ignited and combustor data obtained at a mass flow rate of 2 kg/s without oxygen enrichment and with oxygen enrichment of 40 vol %. The primary program for Test No. 6, accomplished on July 31, 1979, is shown schematically in Fig. 5.1. At point I-1, an external field was applied to the channel with Inverter 18 operating in the rectifying mode and without potassium seeding, and an equivalent wall resistance of 600 Ω was measured. Potassium seeding was begun at the rate of at 230 L/h, and an external field was applied with Inverter 18. After the seed flow was interrupted, an equivalent wall resistance of 250 Ω was measured.

The magnet was then energized and, at 3 T, measurements were taken at a combustor flow rate of ~ 2.5 kg/s for oxygen enrichments of 40 vol % (I-2) and of 50 vol % (I-3). The magnet field strength was increased as the mass flow rate of the combustor was increased, and data were taken at ~3 kg/s and 4 T (I-4), and at ~3.5 kg/s and 4.5 T (I-5). Magnetic field strength of 5 T was attained, and data were taken at ~ 4 kg/s (I-6), ~ 4.5 kg/s (I-7), ~3.5 kg/s (I-8), and 2.5 kg/s (I-10). While combustor flow rate was at 3.5 kg/s (I-9), oxygen enrichment was increased to 57 vol %. A maximum power of 1.07 MW was attained at conditions I-7, i.e., 5 T, 4.5 kg/s. After data had been taken at ~ 2.5 kg/s and 5 T, the mass flow rate of the combustor was decreased to ~ 2 kg/s, the seed flow terminated, and the magnet shut down.

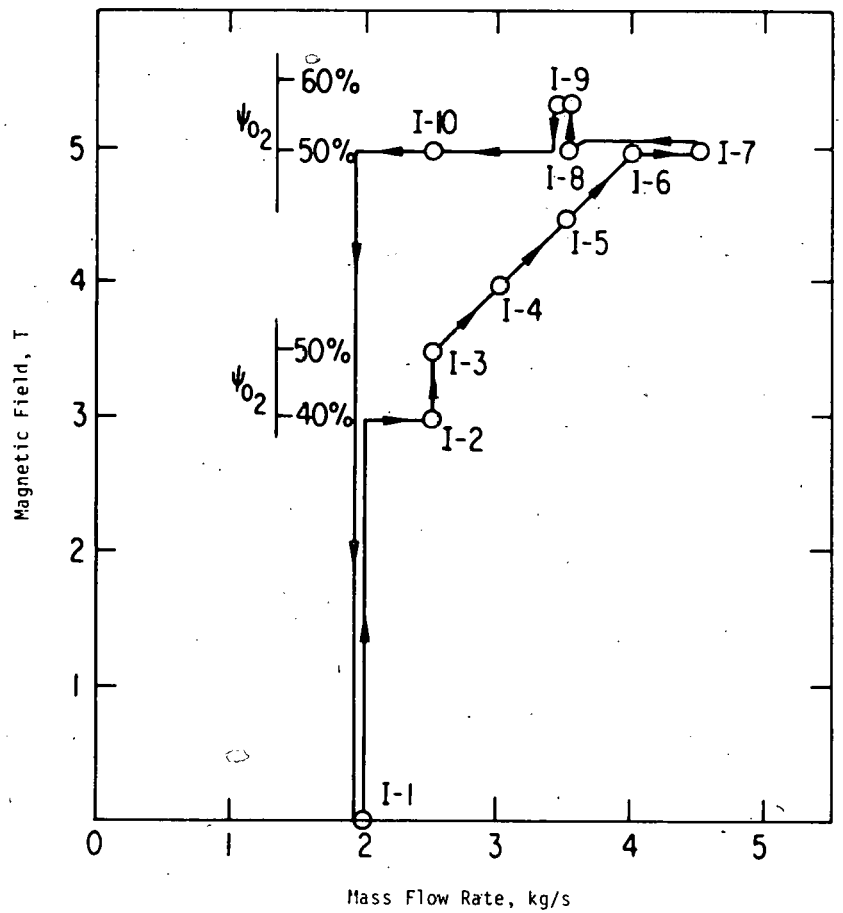

Fig. 5.1 Summary of test points, Test No. 6, July 31, 1979

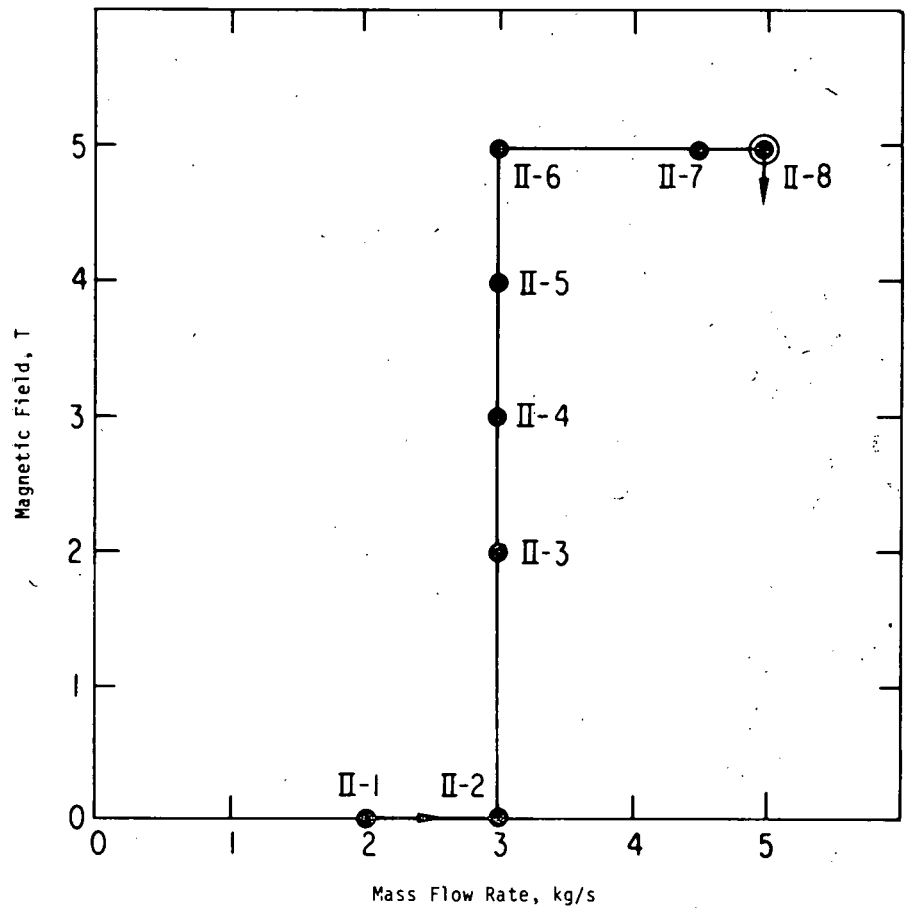

Fig. 5.2 Summary of test points, Test No. 7, December 6-7, 1979

Data on the magnet, channel, and other elements of the flow train were recorded throughout the test, using the instrumentation and data acquisition equipment described in Section 3.0. In addition, the V-I characteristics of the MHD channel were obtained at almost all the points indicated by symbols in Fig. 5.1. Diagnostic measurements of the plasma properties were obtained at many of the operational points shown in that figure.

5.1.2 Program for Test No. 7

The program for Test No. 7 is shown schematically in Fig. 5.2 for December 6-7, 1979. At ignition, the flow rate to the combustor was ~2 kg/s. Oxygen enrichment was then increased to 50 vol % (II-1). During the increasing of oxygen enrichment, calorimetry data were taken on the channel at various degrees of enrichment: approximately 30, 37, 45, and 50 vol %. The mass flow rate of the combustor was increased to 3 kg/s, while oxygen enrichment of 50 vol % (II-2) was maintained. An external field was applied with Inverter No. 9, operating in the rectifying mode, to determine the equivalent wall resistance without seed flow. Flow of potassium seed was established, and the V-I characteristic of the channel was obtained with Inverter No. 18. The magnet was energized and data were taken at 2, 3, 4, and 5 T (II-3 to II-6). The mass flow rate was increased to ~4.5 kg/s (II-7), then to ~5 kg/s (II-8). Maximum power with potassium seed, 1.3 MW, was attained at 5 kg/s. The seed was switched from potassium to cesium, and the flow rate of the cesium seed was varied from 200 to 500 L/h, to find the optimum flow rate. The optimum value appeared to be 300 L/h, and the maximum power obtained at that condition was 1.5 MW.

At this maximum condition, II-8, with cesium seed, the alarm system indicated smoke in the bore of the magnet. After the existence of smoke was visually confirmed, emergency shutdown procedures were started. Subsequent visual inspection indicated no obvious areas of arcing or burning.

Measurements similar to those made during Test No. 6 were taken during Test No. 7, at the operational points indicated in Fig. 5.2.

5.2 Results of Diagnostic Measurements During Tests 6 and 7

Figure 5.3 presents the results of measurements of major plasma parameters during Test 6, as well of MHD generator power; stoichiometric ratio, SR; oxidizer oxygen enrichment, ψ, etc. Data points correspond to common measurement times.

It can be seen that there is an overall correlation in behavior among the measured parameters: maximum power is achieved at maximum mass flow rates of seed, gas, and oxidizer. Under these conditions, plasma temperature, radiant flux, electrical conductivity, potassium atom concentration, and electron concentration are also at their maximum.

It should be noted that simultaneous determination of potassium atom concentration at two cross sections (between 11 and 12 h) resulted in potassium spectral lines of approximately the same shape. Potassium atom concentrations at the two locations differ because of different pressures in the combustor and nozzle. The nozzle pressure was not measured; it was calculated from the combustor and the channel inlet pressures.

Special attention should be paid to the variation in the radiant flux at the instant when the seed injection is started and stopped (in the figure, these points are denoted by ↑ seed and ↓ seed). It is clear that potassium contributes significantly to the total radiation.

In comparing different parameters, it should be remembered that T_{pl}, n_A, W_{rad}, and σ were measured at the channel entrance, whereas n_e was measured in the diffuser.

Figure 5.4 presents the results of measurements taken during Test 7. In general, variations in the measured parameters correspond to operating mode changes. It should be noted that the maximum readings of power and radiant heat flux were obtained in the later stages of the test, i.e., when cesium seed was used. However, values of n_e and σ, computed on the basis of spectroscopic measurements, are lower than expected. This can be explained by the fact that the measured temperatures were lower than the actual ones as a

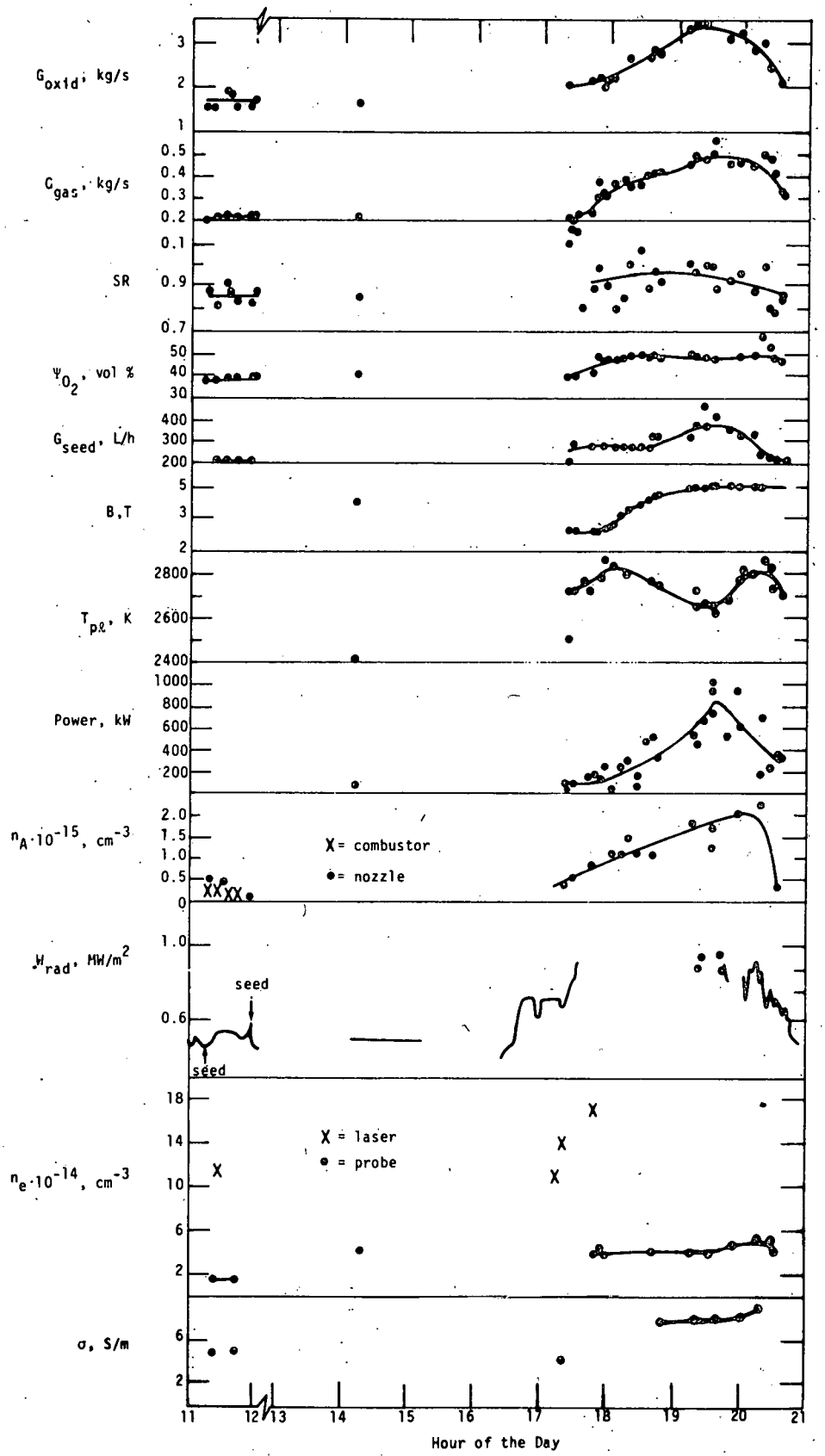

Fig. 5.3 Histories of plasma and facility parameters during Test No. 6

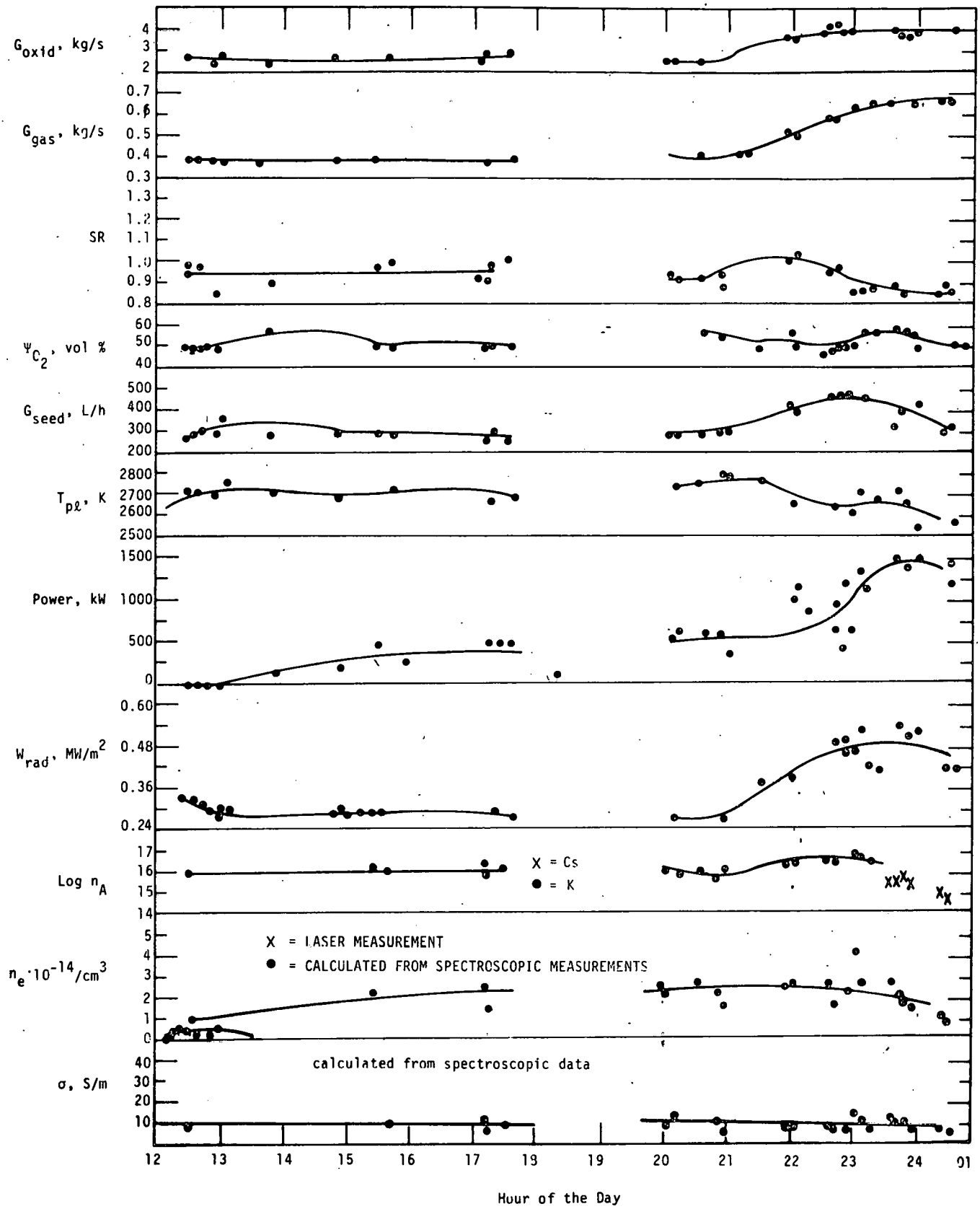

Fig. 5.4 Histories of plasma and facility parameters during Test No. 7

result of change in calibration of the instruments, resulting from accidental grounding of the combustor.

Discrepancies between calculated and measured values of n_e can be explained by the fact that calculations are made for the temperature measured at the channel inlet, whereas the n_e measurements were taken at the diffuser, where temperatures are lower by 200-250 K.

Figures 5.5 through 5.7 show representative Mach number profiles from measurements taken with the traversing pitot probe, during the warm and hot blow periods, at the times indicated on each plot. These profiles were generated on the basis of the static pressure at the wall, measured just prior to each traverse, and the total pressure measured during the traverse. Because of the noise level, digital smoothing has been applied to the raw data, and purge pressure pulses have been eliminated.

The Mach number profiles were obtained, using calculated effective average values of the ratio of specific heats of the gas or plasma. For the warm blow, $\gamma = 1.40$ was used; for the hot blow, $\gamma = 1.14$. The mass flow rate and the stoichiometric ratio recorded by either the U.S. or U.S.S.R. computer system for the time closest to beginning of the traverse are also listed with each plot.

It is evident that, the boundary layer is on the order of 1 cm thick at this point in the flow train during the hot blow, and increases in thickness with temperature level, as expected. During the cold and warm blows, the thickness is less than 5 mm. During the warm blow and at the lowest hot blow temperatures, there are two shallow peaks in the profile: one in the core, the other outside the boundary layer, but near the wall. At the higher temperatures and mass flows, the profiles are effectively flat, apart from the boundary layers.

It should be noted that the probe was unavoidably located at a station where the Mach number level was high enough for the flow around a cylinder to be just supercritical, and, at full extension, the probe would just choke the

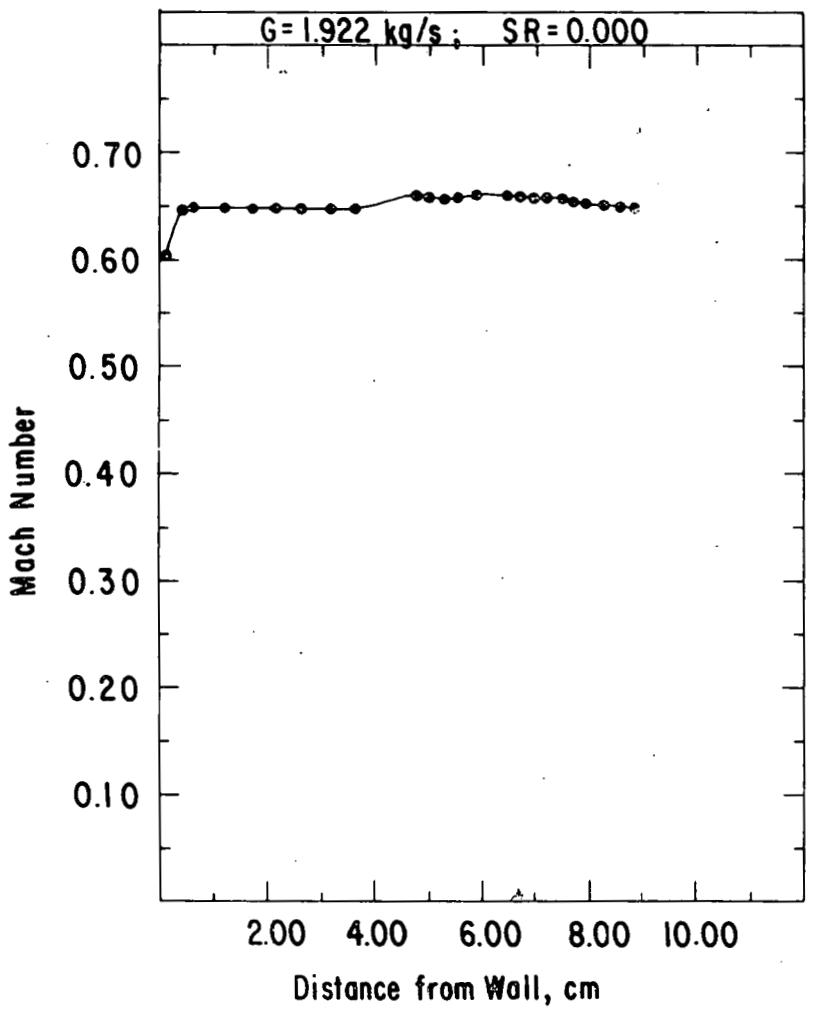

Fig. 5.5 Mach number profile at nozzle toward end of warm blow (08:13, 12/06/79)

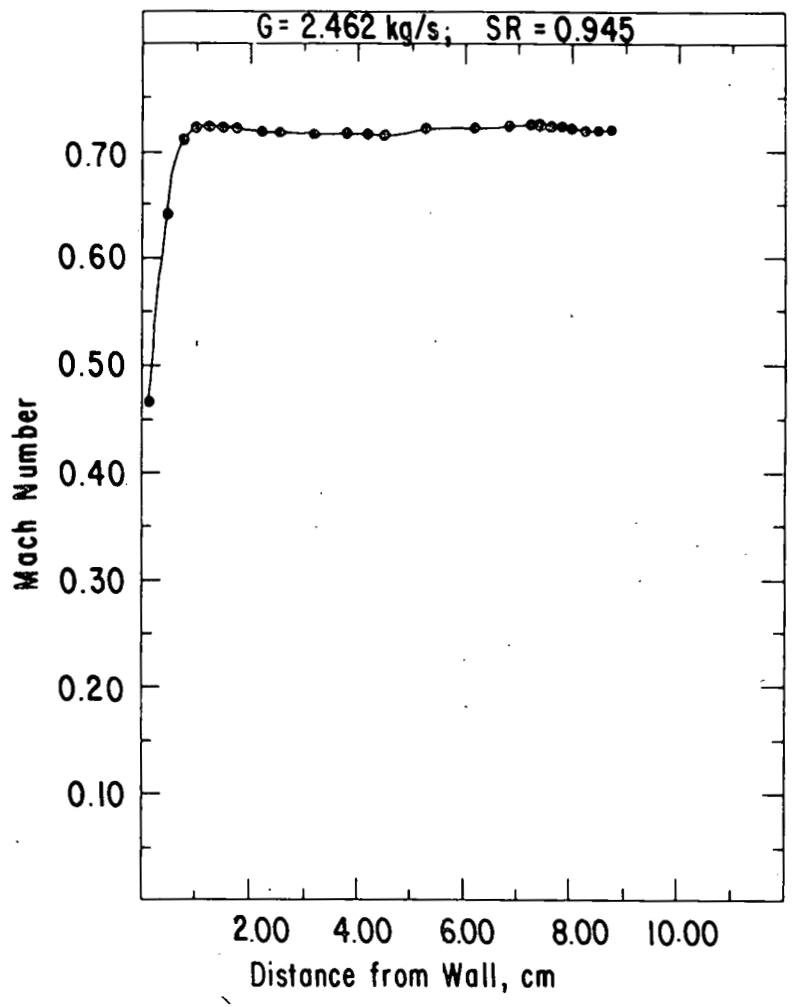

Fig. 5.6 Mach number profile at nozzle during hot blow (09:07, 12/06/79)

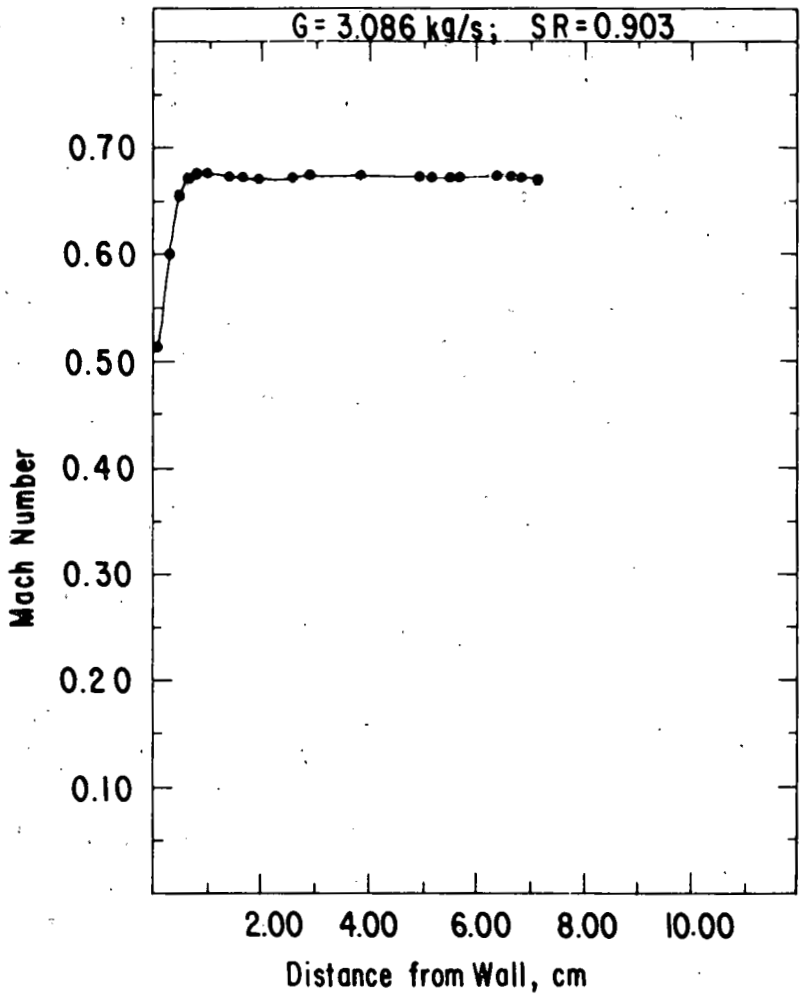

Fig. 5.7 Mach number profile at nozzle during hot blow period, 13:23, 12/6/79 (partial transverse only)

flow, using purely geometrical area-ratio considerations. No attempt has been made to correct for the effects of any weak shock waves possibly present.

Spectral analysis of pressure and light intensity signals obtained with the probe was also conducted. The results indicate significant noise levels at 50 and 60 Hz, overshadowing the desired signals. The cause of this noise, discovered and corrected after the test, was an accidental short to ground.

5.3 Gasdynamic Characteristics of the MHD Channel

5.3.1 Wall Skin Friction

Determining the channel skin friction is important, because of its influence on heat transfer and on the electrical performance of the channel. As in all previous tests of Channel 1, static pressure distributions for

Channel 2 were measured at 10 axial locations and over a range of temperature and mass flow conditions during the cold and warm blows. In general, the characteristics of the warm blow flow through Channel 2 were similar to those of previous tests, except that the channel friction and, hence, wall roughness appear to be less than was the case with Channel 1.

Figure 5.8 compares typical pressure distributions during Tests 6 and 7 during the warm blow at 900 °C and mass flow rate of approximately 2.5 kg/s with those for Channel 1 during Test 5. The different pressure levels for each of these tests is the result of different test train exit pressures in each test. However, the steeper curves of Tests 6 and 7 tend to indicate the smoother nature of the walls of the new channel.

The gasdynamic skin friction coefficient, C_f, for Tests 6 and 7 was calculated in the same manner as for previous tests [2]. Calculated values of C_f are shown in summary form in Fig. 5.9. Although large scatter of these computed values is evident, because of the sensitive nature of the measurement, it appears that the friction coefficient of Channel 2 is approximately 0.01. Somewhat higher values were indicated during Test 7 than during Test 6, as expected. Figure 5.9 also sumarizes the range of calculated friction coefficients for Tests 2, 3, 4, and 5 [1,2,3], and presents all of this information as a function of the accumulated power-generation run time of the channel. For convenience, the time selected to characterize each test is the midpoint of the time required for the test. It is observed that, within the scatter of the friction coefficient values, they tend to increase steadily with run time. This trend is also consistent with the measured increase of the channel heat transfer from test to test, as will be discussed in Section 5.4.

Figure 5.10 shows C_f, determined from the measured gasdynamic parameter distribution along the channel, as a function of Reynolds number. This figure also shows the C_f values calculated on the basis of "rough" pipe flow of relative roughness, k_s/d, between 0.005 and 0.1. This figure confirms the trend already discussed, the increase of skin friction coefficient values with run time as a result of the erosion of ceramic material from the channel surface.

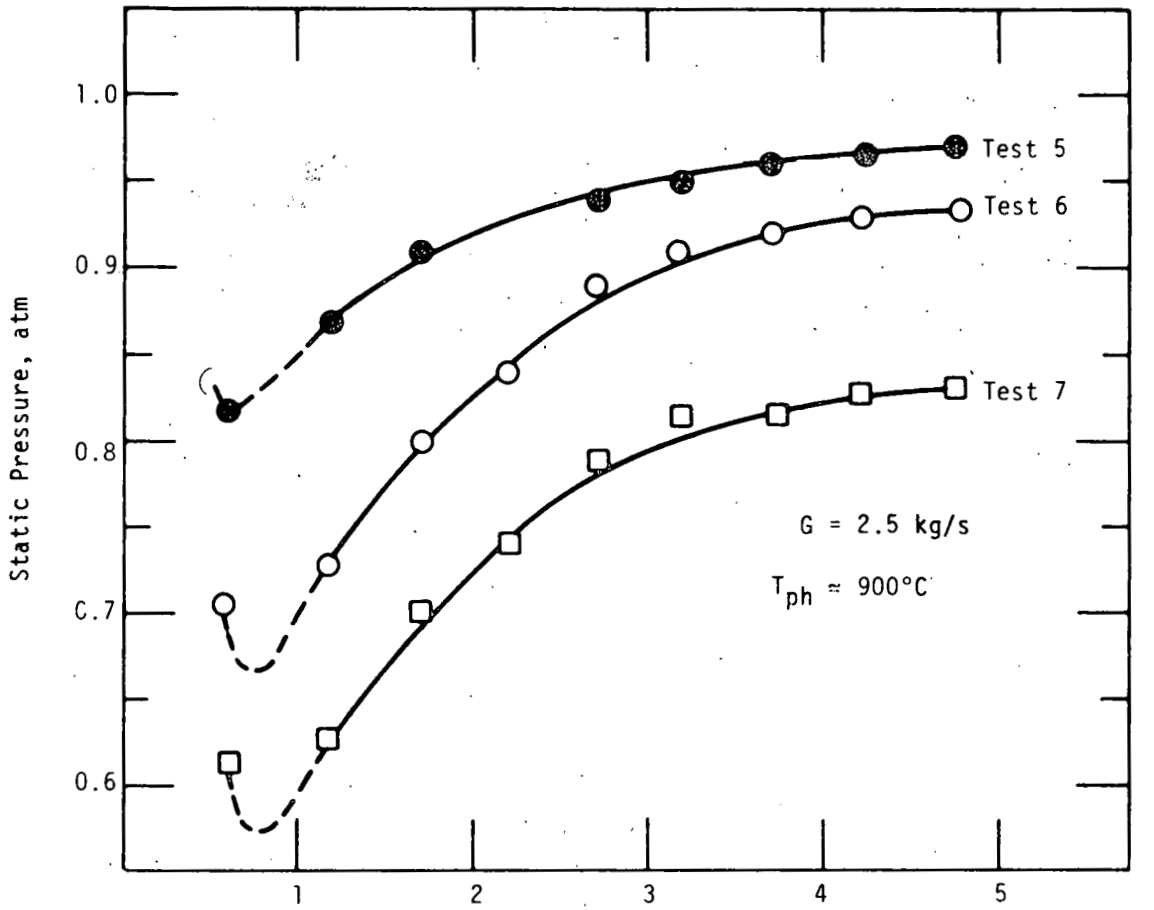

Fig. 5.8 Axial pressure distributions during warm blow

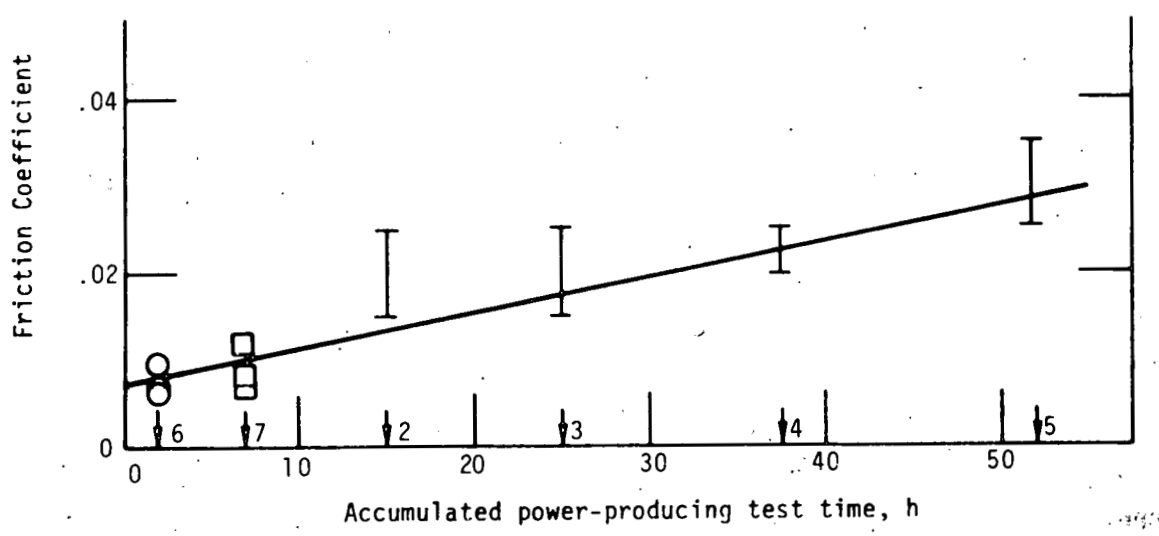

Fig. 5.9 Channel friction coefficients for different tests at the U-25B facility (numbers adjacent to arrows denote test numbers)

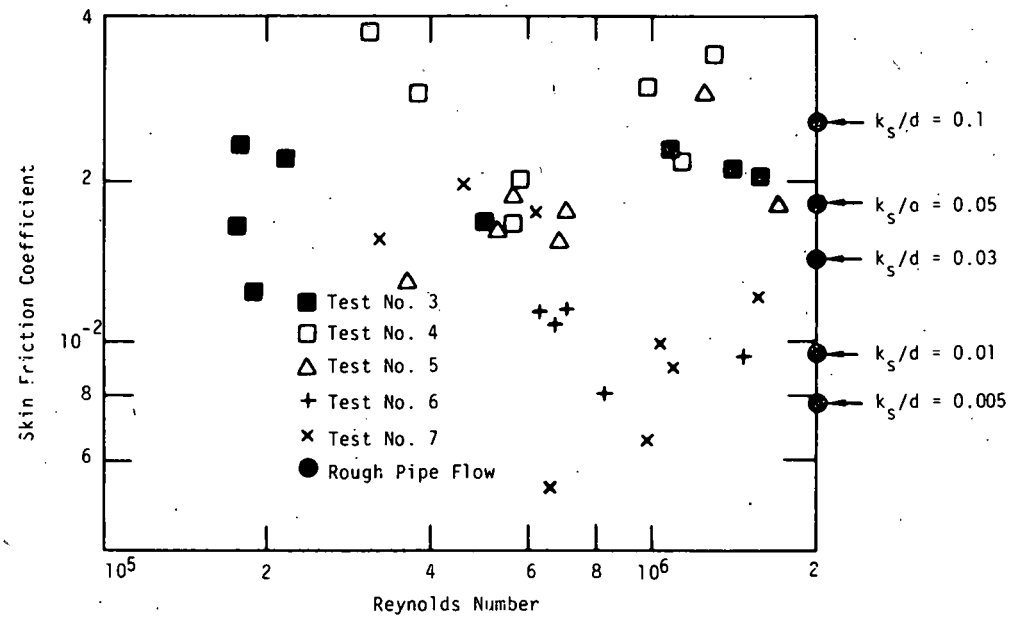

Fig. 5.10 Friction coefficient in constant-area section of channel as a function of Reynolds number

5.3.2 Computed and Measured Cold and Warm Blow Static Pressure Distributions

Figures 5.11 and 5.12 show, in the same order, the static pressure distribution measured along the channel during Test No. 6 at mass flow rates of 4.1 and 3.6 kg/s. The corresponding stagnation temperatures were 380 K and 710 K. Figure 5.13 depicts the static pressure distribution along the channel during Test No. 7 for mass flow rate of 3.9 kg/s at a stagnation temperature of 367 K. The ANL quasi-three-dimensional MHD generator code [13] was used to predict the pressure distribution for these cases. Very good agreement was obtained between the analytical predictions and the measurement data for assumed effective wall roughness, k_s, of 0.001 m for Test No. 6 and 0.003 m for Test No. 7. These findings are in agreement with the results presented in the previous section, which indicated that the channel wall became rougher in Test No. 7 than it had been in Test No. 6, because of erosion of the ceramic lining of the channel surface.

5.4 Heat Transfer Characteristics of the MHD Channel

During the first tests at the U-25B facility, total heat loss in the channel was determined, in addition to gasdynamic and electrical channel performance, through calorimetric measurements of the cooling water. Experimental data have been obtained for both Channels 1 and 2. Some of these re-

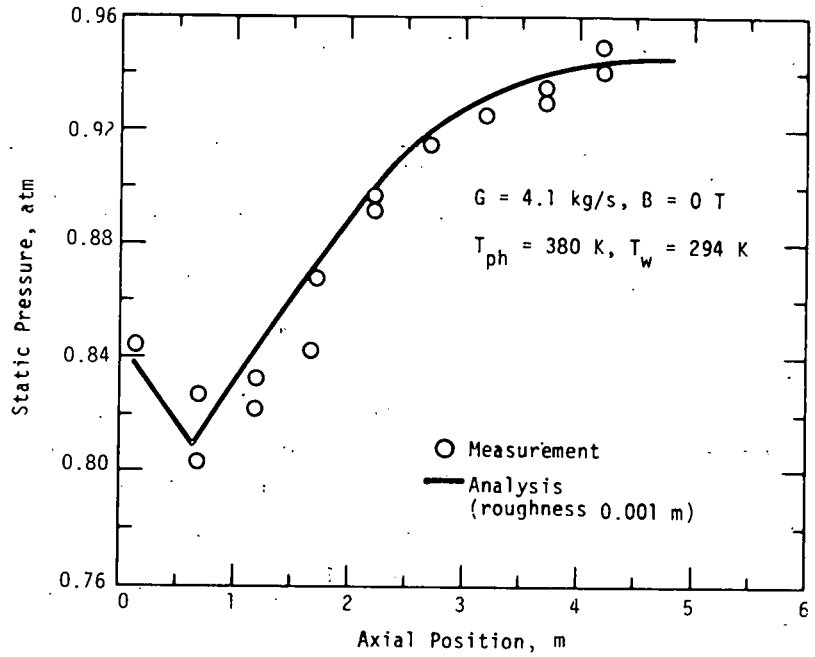

Fig. 5.11 Axial pressure distribution during cold blow in Test No. 6
IVTAN Meas No. 120, 13:57:52, 7/28/79

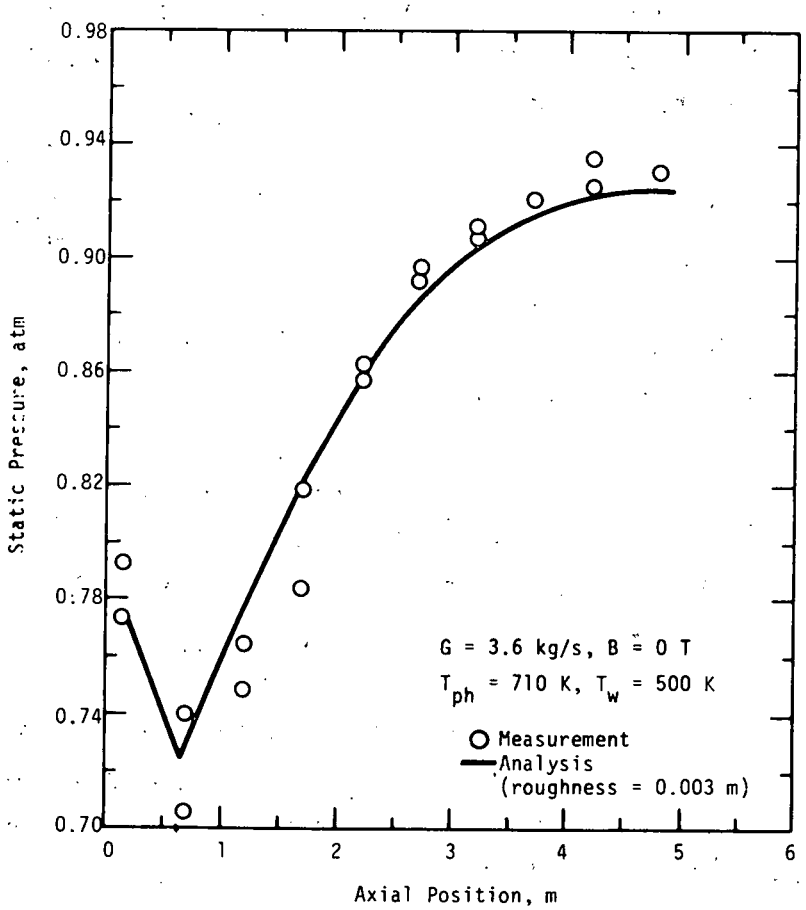

Fig. 5.12 Axial pressure distribution during warm blow in Test No. 6
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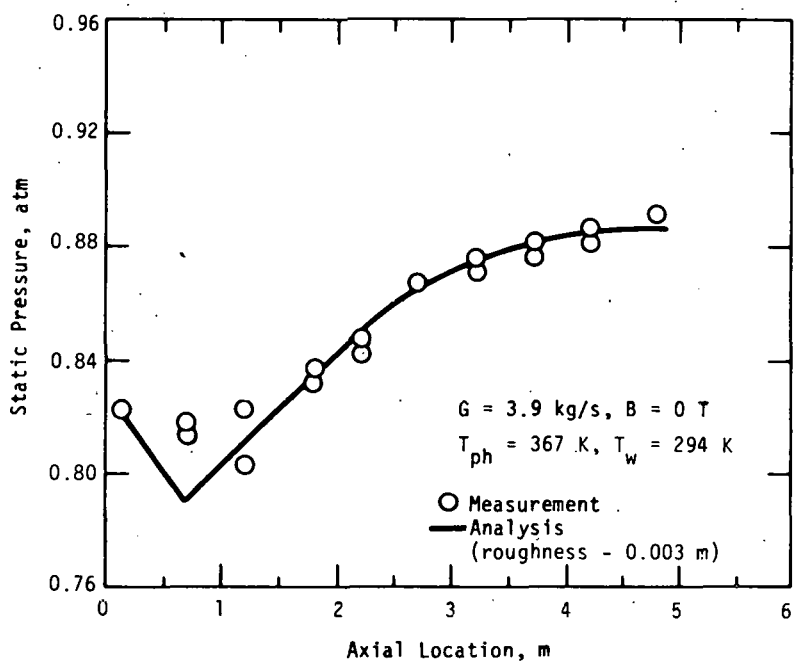


Fig. 5.13 Axial pressure distribution during cold blow in Test No. 7

IVTAN Meas No. 60,

14:00:07, 12/03/79

sults are summarized in Fig. 5.14, where heat losses are presented as a function of the operating time for Channel 1 (Tests No. 3, 4, 5) and Channel 2 (Test No. 6) for different operating parameters. Increased heat loss with increase in mass flow rate of plasma and in oxidizer oxygen enrichment is apparent.

Heat loss data for Channel 2 are in satisfactory agreement with those for Channel 1, and support the conclusion, previously reported [3], that heat loss increases as a function of power generating time.

Increase of thermal losses with the increase in channel life can be attributed to: a) gradual increase in wall roughness (and the resulting increase in the friction coefficient), and b) decrease in channel wall temperature as a result of partial loss of ceramic packed in the frame grooves.

During Test 7, systematic studies of heat transfer in the channel were begun. For the first time, measurements of fluxes along the channel were taken. This was accomplished by calorimetric measurements of the cooling water for four groups of frames: Group 1, frames 18 and 20; Group 2, frames 85, 87, and 89; Group 3, frames 121, 123, and 125, and Group 4, frames 138 and

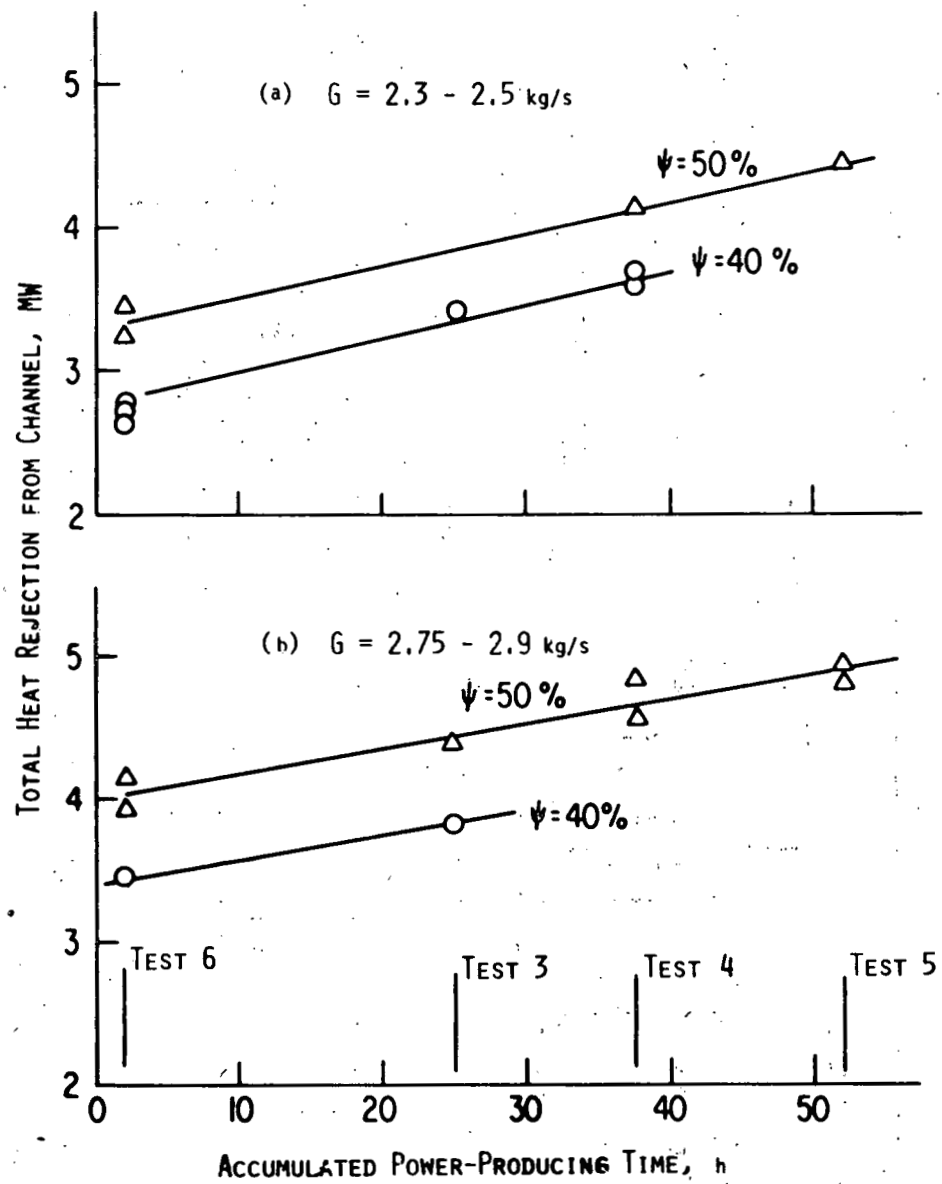


Fig. 5.14 Representative channel heat rejection rates from several tests

140. For each group, mass flow rate of water and increase in temperature were measured. The measurement system is diagrammed in Fig. 5.15. Water temperature measurements were taken with thermocouples located at the discharge of frames 18, 85, 121, and 138, outside the "warm" bore of the magnet and electrically insulated from the channel. This approach permitted measurements during the entire test, with and without magnetic field and under power generating condtions. No noticeable effects of either the magnetic field or leakage currents through the cooling water upon thermocouple readings were observed. At magnetic fields of up to 4 T, additional measurements of

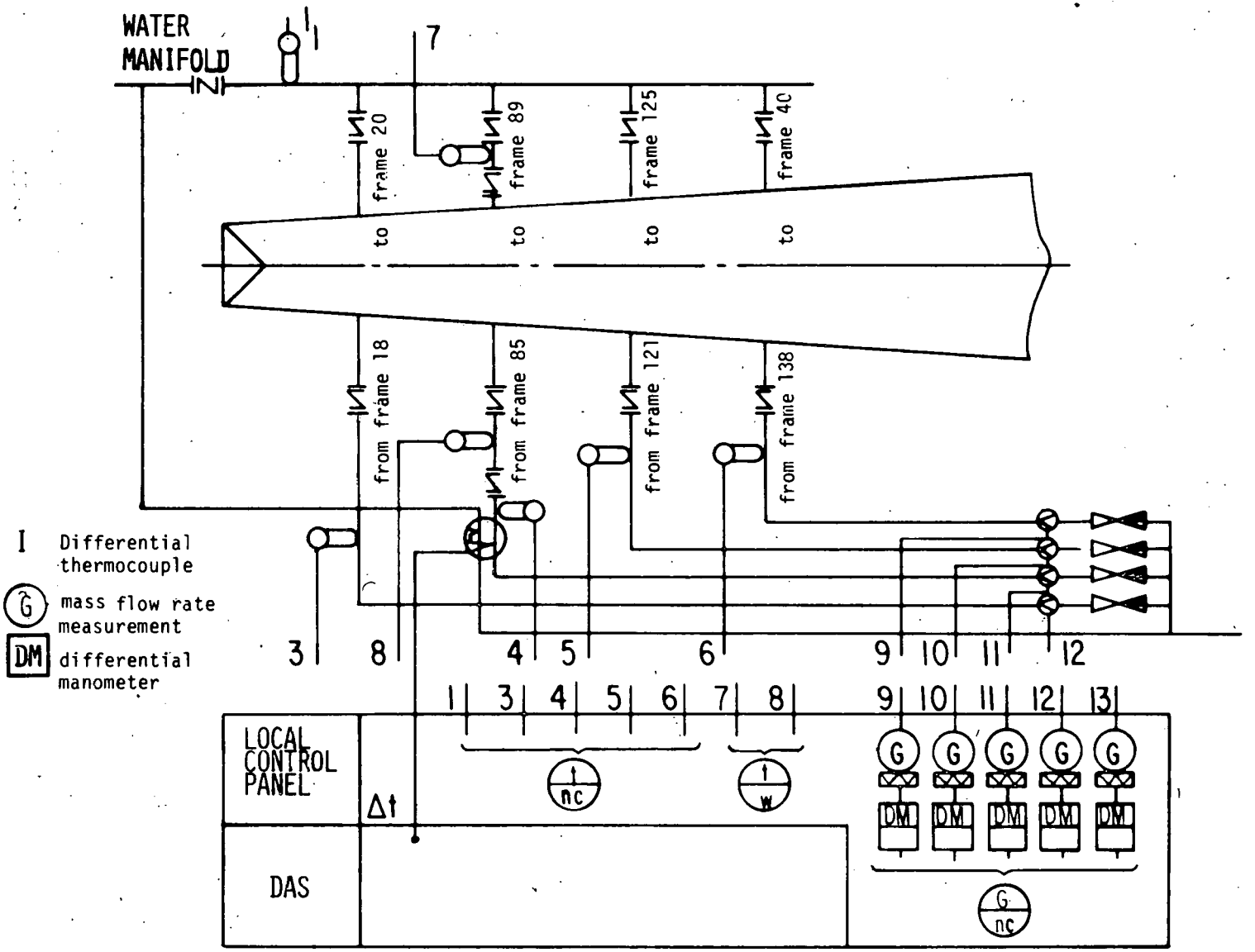


Fig. 5.15 Schematic of system for measuring heat fluxes during Test No. 7

increase in cooling water temperature were performed for frames 85-89, by means of a differential thermocouple with sensitivity of 0.7 mV/°C. The analysis showed that heat loss to the water somewhat exceeds that computed on the basis of individual thermocouples installed at the inlet and outlet of this group of frames.

To ascertain further the effect of heat loss along the flow train upon the accuracy of calorimetric measurements, water temperature rise was determined by individual temperature measurements at the inlet and outlet of frame No. 89, within the magnet warm bore, during operation without the magnetic field. Comparison of these data with those obtained outside the magnet warm bore indicated good agreement (within a few percentage points).

Mass flow rate of cooling water was determined at each measuring location by means of calibrated orifices. Valves were installed in each line, to permit smooth control of the water flow.

Data obtained from the thermocouples and water flow-measuring orifices were fed to a special control panel, where control valves were also installed. Data from the differential thermocouple were recorded by the DAS.

During the test, the mass flow rates of water in each experimental branch were so set as to ensure sufficiently high and, at the same time, safe water heating, Δt. During maximum power output, Δt values were as high as 37 °C.

Table 5.1 lists the distributions of thermal fluxes along the channel for a number of typical operating modes during Test 7. The table shows that the heat flux to the channel wall reached ~3.3 MW/m^2* at the upstream section.

As a rule, heat flux values at the channel entrance did not exceed those for the channel exit (Group 3) by more than a factor of three. Typical

* In Ref. 14, a value of 3.5 MW/m^2 is quoted. This discrepancy results from the fact that, in Ref. 14, the copper surface of the frames was used in the data reduction, whereas, here the gas side surface of the interelectrode insulator is also included.

Table 5.1
Heat Flux Distribution Along the Channel
Test No. 7, U-25B

	Heat Flux, MW/m^2			
IVTAN Meas No.	x = 0.837 m	x = 2.731 m	x = 3.731 m	x = 4.197 m
909	0.868	0.507	0.353	0.548
915	1.168	0.651	0.452	0.714
928	1.496	0.770	0.622	0.939
947	1.901	0.838	0.614	0.980
955	2.004	0.872	0.597	0.972
1025	1.994	0.838	0.639	0.989
1057	1.866	0.804	0.605	0.972
1092	1.909	0.846	0.732	1.080
1096	1.686	0.758	0.698	1.002
1098	1.815	0.770	0.605	0.997
1101	1.823	0.821	0.689	1.147
1102	1.935	0.914	0.765	1.155
1105	1.952	0.922	0.765	1.088
1113	2.004	0.998	0.757	1.122
1122	2.013	0.922	0.774	1.155
1143	2.107	1.058	0.799	1.188
1157	2.064	0.880	0.715	1.205
1230	2.030	1.091	0.774	1.130
1287	2.090	1.252	0.782	1.163
1303	2.124	1.193	0.765	1.088
1314	2.064	1.168	0.732	1.047
1365	2.486	1.235	0.782	1.130
1387	2.701	1.379	0.849	1.196
1480	2.787	1.396	0.866	1.238
1443	2.787	1.430	0.841	1.238
1468	2.787	1.447	0.849	1.246
1530	2.753	1.439	0.891	1.329
1540	2.830	1.430	0.883	1.321
1549	2.770	1.413	0.866	1.263
1565	2.770	1.413	0.841	1.238
1583	2.89	1.506	0.900	1.329
1714	3.011	1.549	0.950	1.371
1722	3.054	1.625	0.976	1.379
1729	3.105	1.633	0.959	1.379
1818	3.312	1.701	0.992	1.446
1844	3.277	1.693	1.009	1.454
1849	3.14	1.4471	0.9	1.088
1851	3.217	1.659	1.018	1.479
1864	3.217	1.693	1.108	1.504
1873	3.208	1.684	1.026	1.471
1875	3.157	1.667	1.009	1.487
1877	3.157	1.667	1.009	1.487
1886	3.174	1.752	1.009	1.396

thermal flux distributions along the channel for a number of operating modes are shown in Fig. 5.16. It can be seen that the heat flux distributions were sufficiently smooth, except at the fourth group of frames, $x \approx 4.2$ m, where consistently high values of heat flux were observed. However, heat flux changes in this region correspond fully to changes in operating mode parameter and in heat flux values in the other sections.

The reason for heat flux higher values in the region of frame group No. 4 are not clear at this time. It may be related to an increase in wall roughness near the end of the channel, to the complex flow patterns caused by the existence of a shock, to gas radiation from the diffuser, or to a combination of those factors.

Figure 5.17 presents thermal fluxes as a function of time during Test 7 for the four cross sections under investigation. Analysis of these data shows that changes in thermal fluxes correspond closely to changes in major test parameters, such as mass flow rate of plasma, plasma composition, mass flow rate of seed, and magnetic field.

At the beginning of the test (at ~ 11:30; see a in the figure), a substantial increase in heat flux is observed, the result of increasing oxygen enrichment, from 21 vol % to approx 49 vol %, and mass flow rate of plasma, from ~ 2 kg/s to ~ 3.3 kg/s.

A summary of data on the effect of oxygen enrichment upon heat flux in the absence of magnetic field and ionizing seed is depicted in Fig. 5.18, in terms of the ratio, $q/q_{20.5}$, where $q_{20.5}$ is heat flux at 20.5 vol % O_2 enrichment. From that figure, one can see that, for constant combustion mass flow rate, raising oxygen enrichment from 20.5 vol % to 47 vol %, leads to an increase of 50-70% in heat flux along the channel. This result is confirmed by calculations of combustion products enthalpy, which indicate a 60% increase in enthalpy under these conditions.

It can be seen from Fig. 5.17 that, after seed injection (~ 12:15 h; see b), the heat flux in the first measuring section decreased by 12% in 15 minutes. This may be related to the processes occurring in the combustor

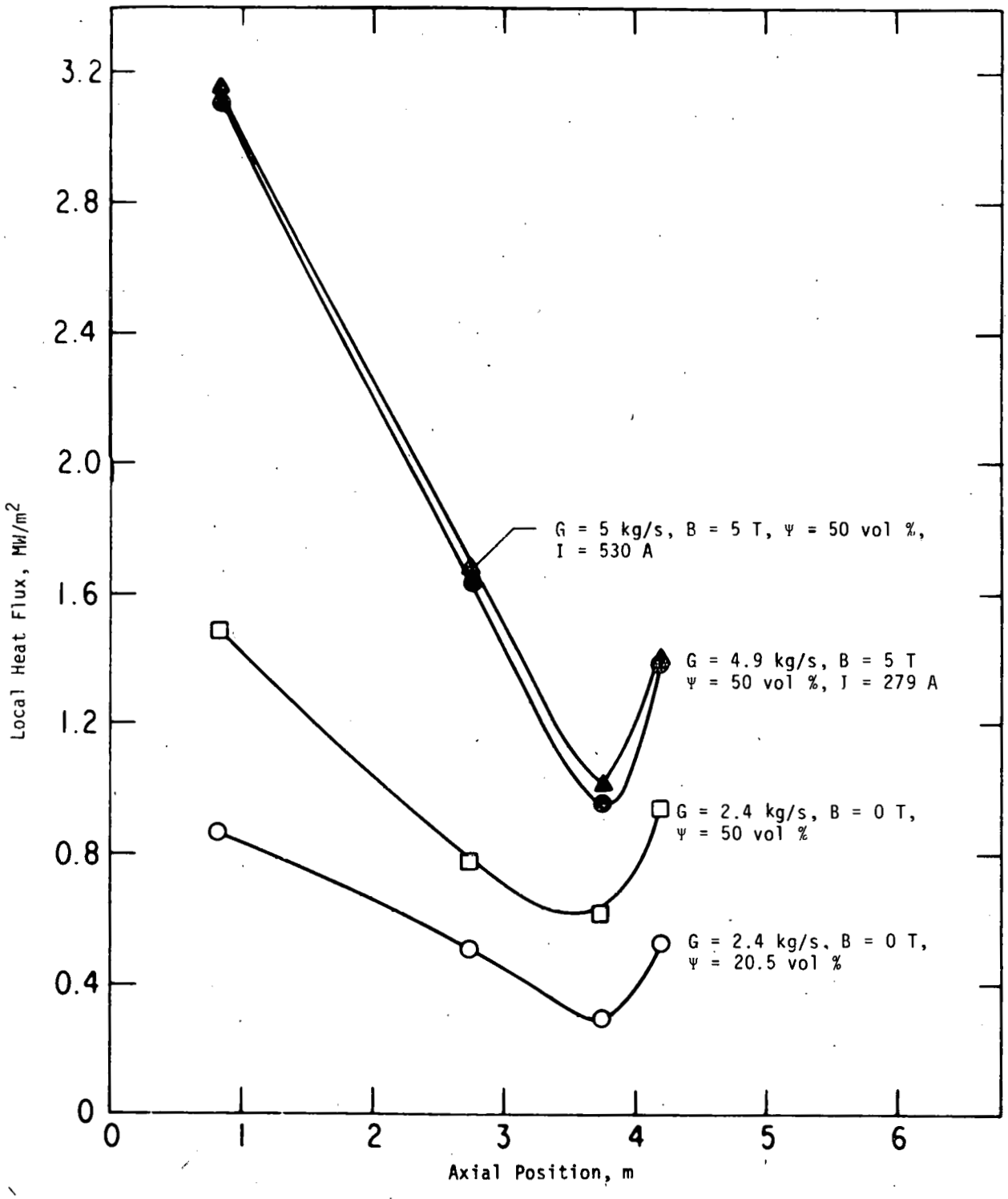


Fig. 5.16 Axial distribution of local heat flux at various test conditions

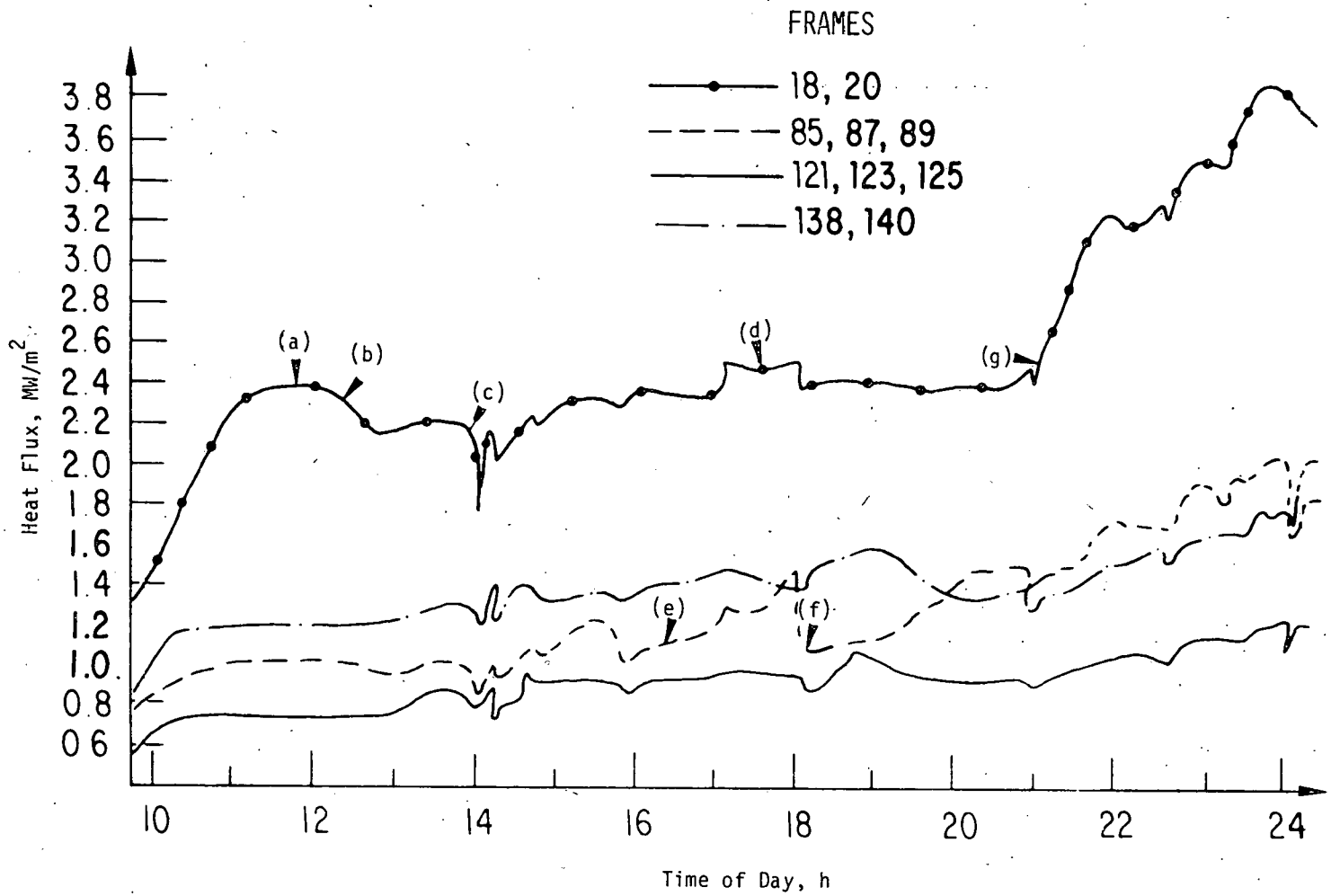


Fig. 5.17 Histories of heat flux measurements

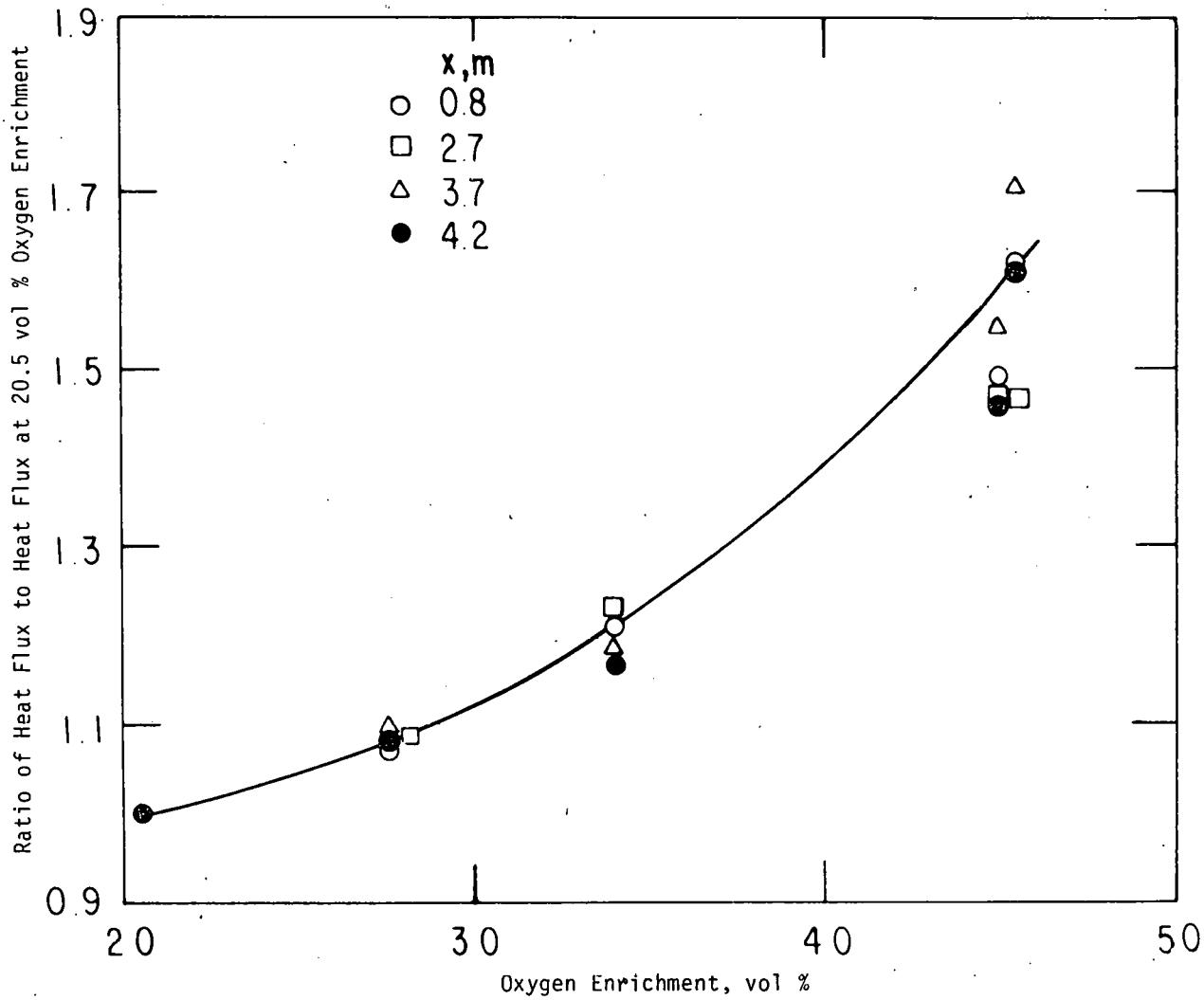


Fig. 5.18 Effect of oxygen enrichment on local heat flux (G=2.2 kg/s, B=0 T)

during adjustment of seed injection, as well as to possible seed deposition on channel walls. In the second measurement section, the decrease in the heat flux was less, and no decrease was observed in sections 3 and 4.

Between 14:00 and 14:30 h (see c), seed injection was interrupted and the combustor was adjusted for operation near SR of 1.0. During this adjustment, the stoichiometric ratio was as low as 0.7 and the mass flow rate of the total combustion products was reduced by 10-30%. The observed decrease in the overall heat flux levels and their fluctuating values during this time, are attributed to transient processes within the combustor.

The nature of heat flux variations between 14:30 and 21:00 h (see d), when the mass flow rate of combustion products was maintained constant at ~ 3.3 kg/s, oxygen enrichment was at approx 50%, and magnetic field varied between 3 and 5 T, is of interest. When the channel was subjected to a strong magnetic field under these conditions, the behavior of thermal fluxes along the channel changed. Earlier, most significant changes in heat flux with changes in operating mode parameter were occurring at the channel entrance, where heat flux is maximum. At B = 4 T or higher, heat flux began to display significant changes in the second measuring location, where the magnetic field is maximum. It is of particular interest to observe the behavior of heat flux at the second measuring location when seed flow was interrupted (16:00-17:00 h see e), then re-established. At the moment seed injection was interrupted, a decrease of up to 40% in heat flux was observed; heat flux values after the first and second interruption were nearly the same. At other measuring locations, changes in heat flux were considerably smaller. As estimates show, when seed injection is interrupted, heat flux to the wall may decrease (by tens of percentage points) because of a decrease in radiant heat flux. In addition, the results obtained may be related to changes in channel flow that are caused by electromagnetic interaction. Studies show that shock system location in the U-25B channel depends substantially on the degree of electromagnetic interaction. With relatively high interaction (B = 5 T), shocks are located between 2.7 to 3.2 m, i.e., in the region of the second measurement location, whereas, in the absence of interaction (no seed injection), the shock system shifts downstream. It is known, that, in the presence of a shock system, the nature of the flow changes substantially, and the heat flux to the wall may increase considerably. Most likely, the flow structure changed when seed was interrupted, and heat flux at the second measurement location decreased because the shock system had shifted downstream. At the same time, the heat flux increased somewhat at the third and fourth groups of frames, located near the channel exit. It is also possible that the effect observed is related to certain complex mechanisms produced by electromagnetic interaction.

During the final test stage (after 21:00 h; see g), significant increase in heat flux was observed at all measuring sections, caused primarily by increase of the mass flow rate of combustion products to 5 kg/s. The shock

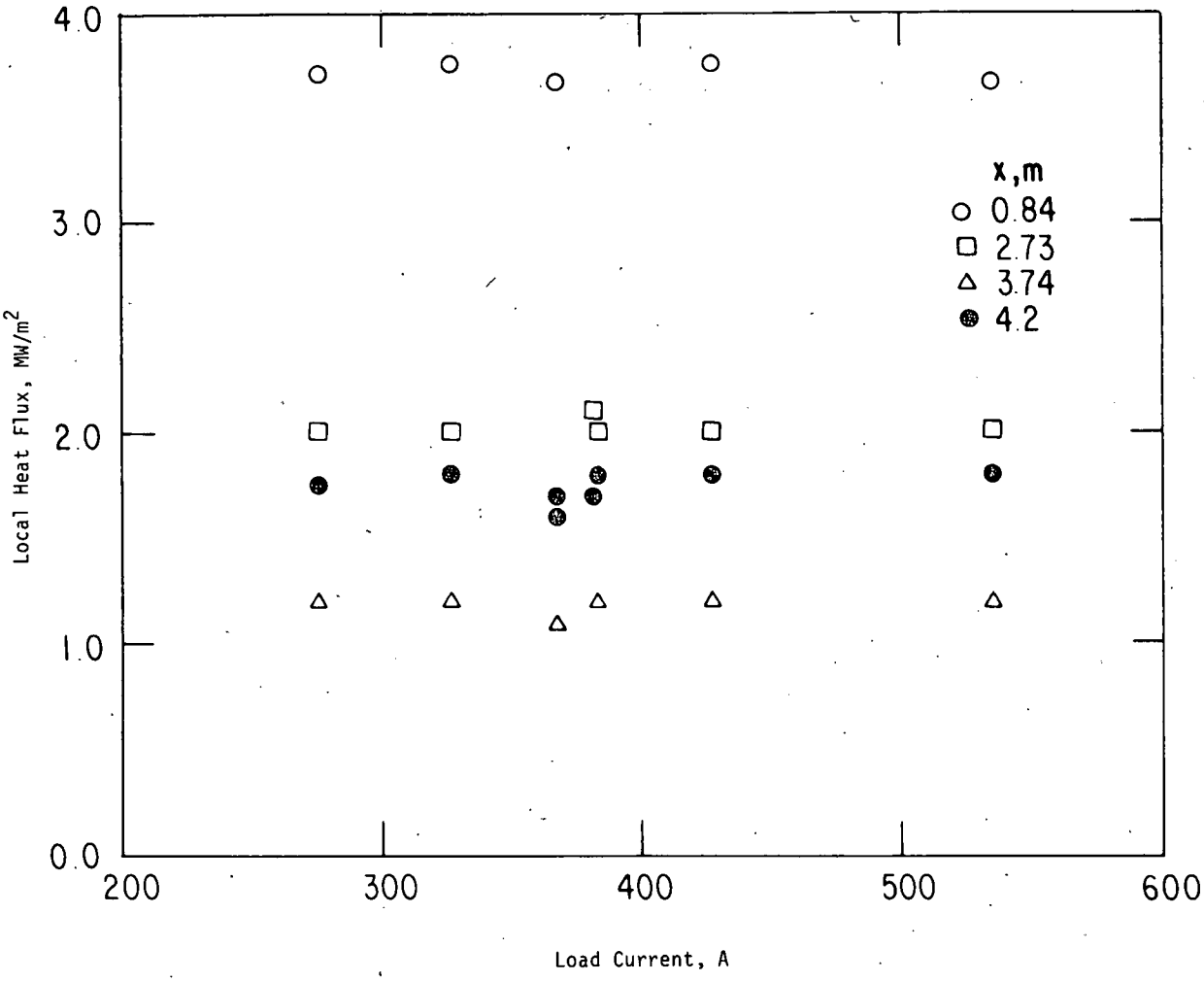


Fig. 5.19 Effect of load current on local heat flux

system shifted downstream during this time, but shock intensity decreased, because electromagnetic interaction increased simultaneously.

During the same period, maximum power output was obtained. Figure 5.19 shows measured heat flux, q_w, as a function of channel load current. The experimental values of q_w correspond to points on the V-I characteristic of the generator taken under the following operating conditions: mass flow rate of 5 kg/s, oxygen enrichment of 50 vol %, magnetic field of 5 T, and cesium acetate seed. Maximum power achieved during this period was 1.5 MW. During this operating mode, load current, I_L, varied within 270 A $\leq I_L \leq$ 540 A. Figure 5.19 shows that q_w is practically independent of I_L. This conclusion holds at all four measurement locations. Scatter of experimental data points did not exceed a few percentage points.

It should be noted that, during the operation of the facility, zirconia packed in the electrode grooves was ablated. This leads to an increase in heat losses, an effect that, apparently, was most pronounced during the final stages of the test, under the conditions of maximum generated power. To investigate this effect, the data obtained need more careful analysis; hence, in the future, the scope of heat flux measurements should be increased.

For a detailed analysis of the results of Test 7, information is needed as to the distribution of wall surface temperature along the channel. In a given measuring cross section, average wall temperature, $\bar{T}_w$ may be evaluated by using the following relationship:

$$\bar{T}_w = (T_1 + T_2)/2 + q_w \left(R_{th} + \frac{1}{h_w}\right), \tag{5.1}$$

where,

T_1 = Cooling water temperature at frame inlet,

T_2 = Cooling water temperature at frame exit,

q_w = Heat flux determined as the ratio of measured heat loss to frame area,

R_{th} = Effective thermal wall resistance, and

h_w = Cooling water film heat tranfer coefficient.

Film heat transfer coefficient, h_w, was determined from the following equation relating the Nusselt number, Nu, to the Reynolds number, Re, and the Prandlt number, Pr.

$$Nu = 0.021\ Re^{0.8}\ Pr^{0.43}. \tag{5.2}$$

Effective thermal resistance was evaluated, using the relationship:

$$R_{th} = \frac{1}{h_g}\left[\frac{\theta_w}{1-\theta_w} - \frac{h_g}{h_w}\right], \tag{5.3}$$

where h_g = gas film heat transfer coefficient, θ_w = relative average wall temperature, determined as follows:

$$\theta_w = \frac{\bar{T}_w - T_{cw}}{T_{p\ell} - T_{cw}}. \tag{5.4}$$

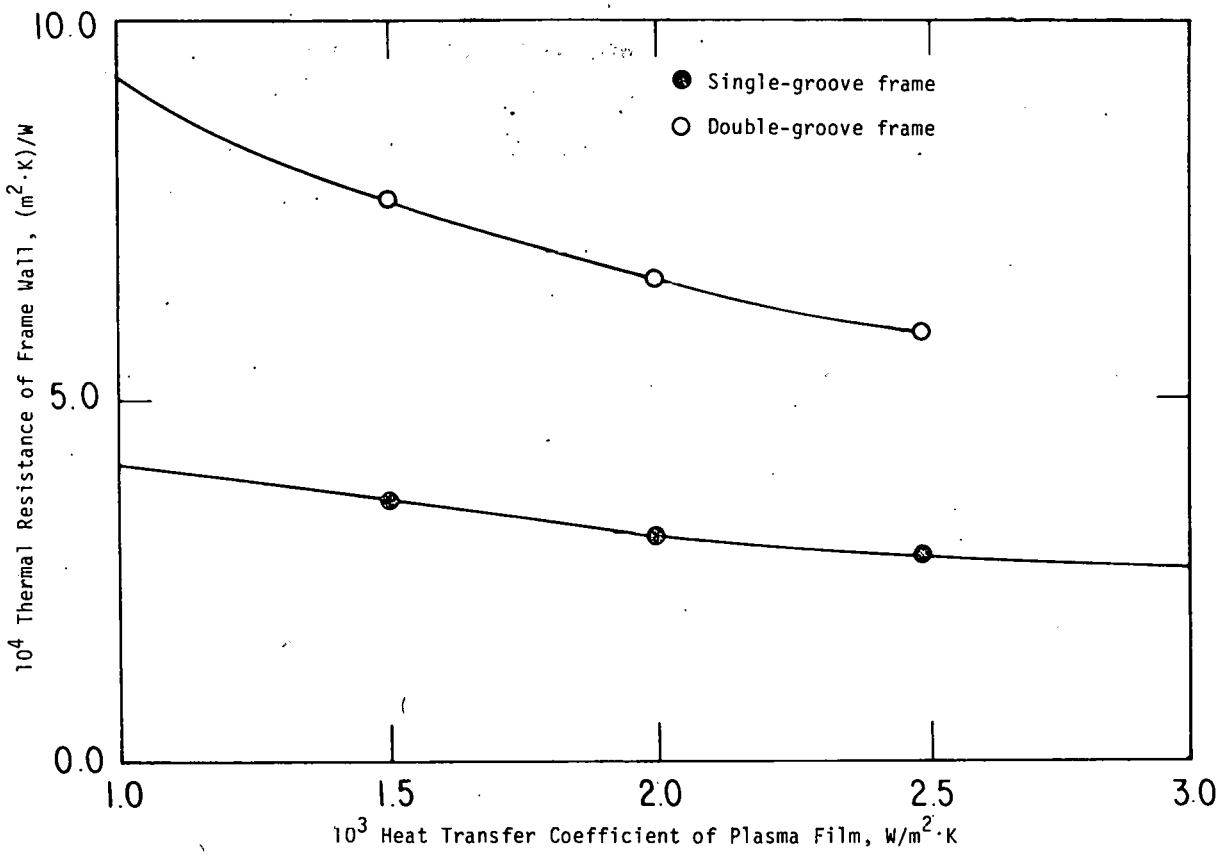


Fig. 5.20 Thermal resistance of frame wall as a function of the heat transfer coefficient of the plasma

In the above equation, $\bar{T}_w$, is the average theoretical wall temperature, $T_{p\ell}$ the combustion products temperature, and T_{cw} the cooling water temperature.

In the final analysis, the problem in determining R_{th} is reduced to solving for the temperature field in a frame, taking into account its actual geometry. Temperature fields were calculated for frame elements with one and two grooves, taking into account their location relative to flow direction (i.e., straight and skewed frame elements). Thermal frame resistance, R_{th}, was assumed to be an arithmetic average of thermal resistance of "straight" and "skewed" frame elements. Calculations were performed for different $T_{p\ell}$ and h_g. The function $R_{th}(h_g)$ was determined on the basis of the results of those calculations. Calculated values of thermal resistance, R_{th}, as a function of h_g for frames with one or two grooves are shown in Fig. 5.20. It can be seen that values of R_{th} for frames with one groove are considerably

higher and depend upon the heat transfer coefficient to a larger degree than is the case with frames having two grooves.

Using known values of q_w and $T_{p\ell}$ (obtained by means of gasdynamic analysis) and the function $R_{th}(h_g)$, and using Eq 5.1, T_w can be determined for every measurement location by iteration.

The results of analysis for T_w along the channel, for the first three measurement locations and for a number of characteristic operating modes during Test No. 7, are presented in Table 5.2. The table indicates that wall temperature along the channel does not change monotonically. This is the result of the fact that, at the first measurement location, there are two-groove frames that have a ratio of metal-to-ceramic areas of 1.29, which is more than twice that for single-groove frames.

5.5 Determination of Channel Insulation Resistance

The resistance of channel insulation during Test No. 6 was determined by the method described previously [15]. Before seed injection, a 400- to 700-V dc potential was applied with an external source, and currents of no more than 0.2-0.3 A were measured. On the basis of this measurement, the equivalent resistance, R_x^{eq}, was determined to be 1-2 kΩ. After seed was injected and then interrupted, R_x^{eq} decreased to approximately 0.35 kΩ. For this specific value of R_x^{eq}, the relative electrical conductivity of the channel, $\hat{\sigma}_w$ which is defined as the ratio of plasma resistance to wall resistance, is given by $\hat{\sigma}_w = 1/(115\ \sigma\ A)$. Here, σ is the plasma conductivity and A is the channel cross-sectional area.

During Test No. 7, this approach was supplemented by direct measurement of channel leakage currents. The resistance of channel insulation was determined before seed injection. Total current leakage was 1.83 A at an externally applied voltage of 1014 V dc; therefore, R_x^{eq} = 560 Ω. With this externally applied source, leakage currents at channel locations that correspond to frames 4, 37, 109, and 150, were approximately 0.33 A, 0.14 A, 0.01 A, and 0.34 A, in the same order. Current leakage values for frames 4 and 150 coincide with current leakage to ground at the channel inlet and

Table 5.2

Distribution of Thermal and Gasdynamic Parameters
Along the Channel During Test No. 7 at the U-25B Facility

IVTAN Meas No.	Power, kW / V_x, V / B, T	G, kg/s / Ψ, vol % / G_{seed}, L/h	x, m	enthalpy, kcal/kg	p, ata	$\langle T_{p\ell} \rangle$, K	q_w, MW/m^2	T_w, K	$\langle U \rangle$, m/s
909		2.381	0.837	719.9	0.776	2297	0.868	774	960
		20.5	2.731	733.7	0.858	2315	0.507	999	579
			3.741	721.3	0.861	2299	0.353	821	386
1025		3.53	0.837	1275.9	1.390	2746	1.944	1170	1017
	1319	49.5	2.731	1176.2	0.580	2611	0.838	1327	1237
		288*	3.741	1024.4	0.320	2469	0.639	1170	1582
1303	637.3	3.37	0.837	1316.08	1.330	2758	2.124	1219	1071
	3029	51.5	2.731	1259.7	0.688	2670	1.193	1538	1028
	4.98	299*	3.741	1281.2	0.766	2693	0.765	1295	691
1387	687.4	4.52	0.837	1284.05	1.829	2776	2.701	1321	1530
	1892	49.7	2.731	1153.3	0.695	2604	1.379	1574	1233
	4.98	482*	3.741	1168.9	0.623	2609	0.849	1346	1102
1443	981.3	4.53	0.837	1265.6	1.616	2745	2.787	1331	1123
	306	550.6	2.731	1146.9	0.705	2595	1.430	1584	1293
	4.98	418*	3.741	1154.06	0.629	2594	0.841	2338	1087
1549	765.6	5.0	0.837	1256.06	1.772	2755	2.770	1329	1135
	2912	48.9	2.731	1132.2	0.744	2596	1.413	1589	1352
	4.98	454*	3.741	1159.9	0.651	2608	0.866	1359	1174
1729	1425	4.91	0.837	1339.5	2.144	2824	3.105	1397	959
	5069	50.8	2.731	1180.01	0.803	2629	1.633	1655	1252
	4.98	244**	3.741	1165.48	0.679	2606	0.959	1416	1098
1818	1404	5.03	0.837	1331.8	2.502	2826	3.312	1442	843
	3569	51.7	2.731	1218.9	1.069	2676	1.701	1688	993
	4.98	463**	3.741	1161.1	0.764	2606	0.992	1434	1113
1873	1393	4.95	0.837	1331.7	2.320	2825	3.208	1425	834
	4988	50.7	2.731	1230.0	1.063	2689	1.688	1688	982
	4.97	305**	3.741	1171.7	0.764	2619	1.026	1456	989
1886	1385	5.04	0.837	1328.3	2.305	2823	3.174	1421	913
	3638	50.5	2.731	1220.3	1.021	2680	1.752	1695	1035
	4.97	305**	3.741	1168.47	0.752	2617	1.009	1445	1021

* = K seed, ** = C_s seed

outlet. Total resistance of this leakage circuit is approximately 3 Ω. Based on these measurements, interframe resistance in the region of frame 37 was approximately 70 Ω. Distribution of potential along the channel, corresponding to these measurements, is shown in Fig. 5.21.

In Test No. 7, R_x^{eq} was not determined after seed interruption; hence, the foregoing value of σ_w was used in the local analysis of channel electrical characteristics. The use of this expression, derived from measurements taken during Test No. 6, was justified on the basis that, for similar operating conditions, the electrical channel performance was quite similar for the two tests (see Fig. 5.22, which shows a comparison of integral V-I characteristics obtained for Tests 6 and 7 during similar gasdynamic operating conditions).

Consequently, it can be concluded that the channel and other flow train elements were sufficiently insulated during Tests No. 6 and 7.

Plasma conductivity during the two tests was determined from measurements obtained during application of an external electrical voltage. Figure 5.23 depicts V-I characteristic of the plasma contained between the power takeoff

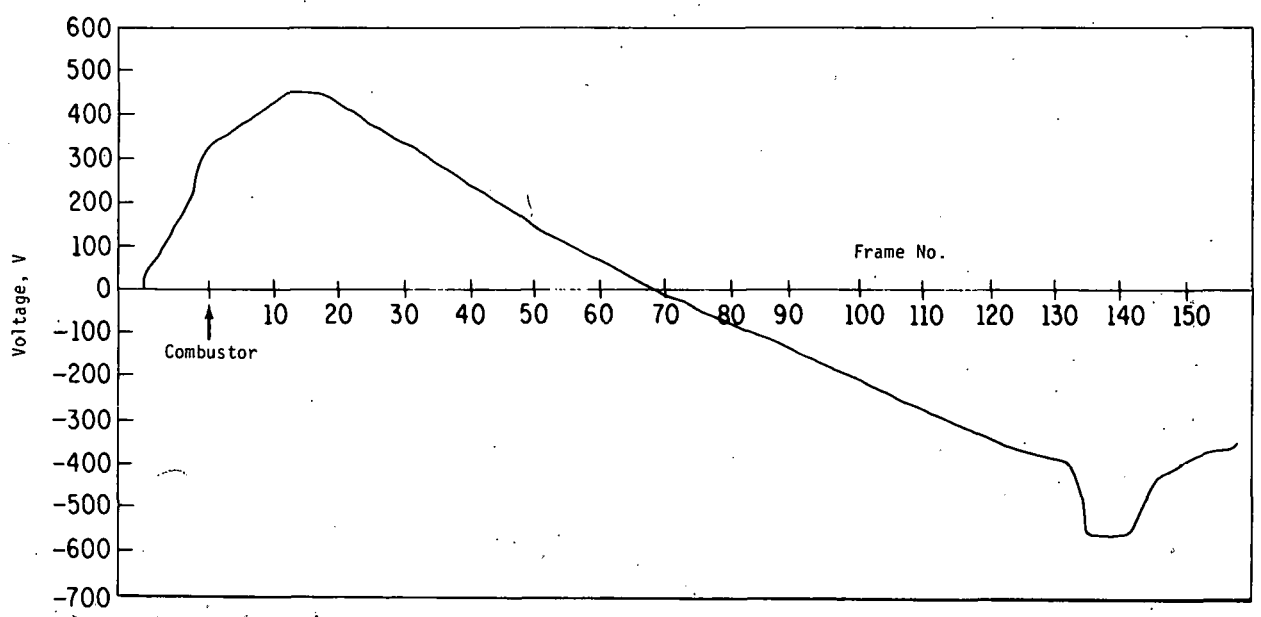


Fig. 5.21 Voltage distribution with an applied external source without seed, Test No. 7, IVTAN Meas No. 998

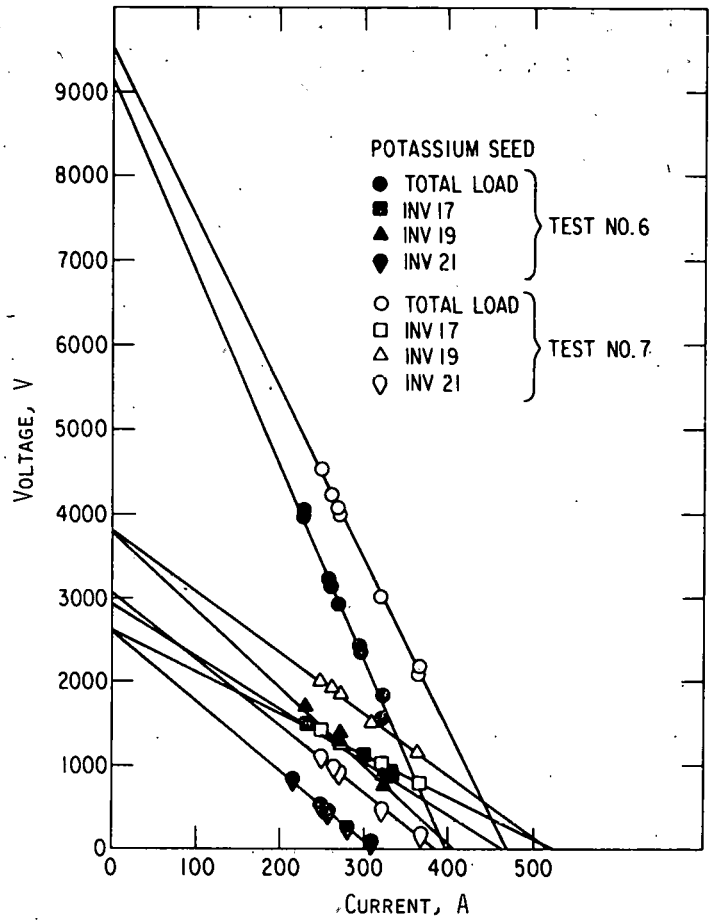


Fig. 5.22 Voltage-current load line characteristics, Tests No. 6 and 7; G = 4.5 kg/s, O_2 = 50 vol %

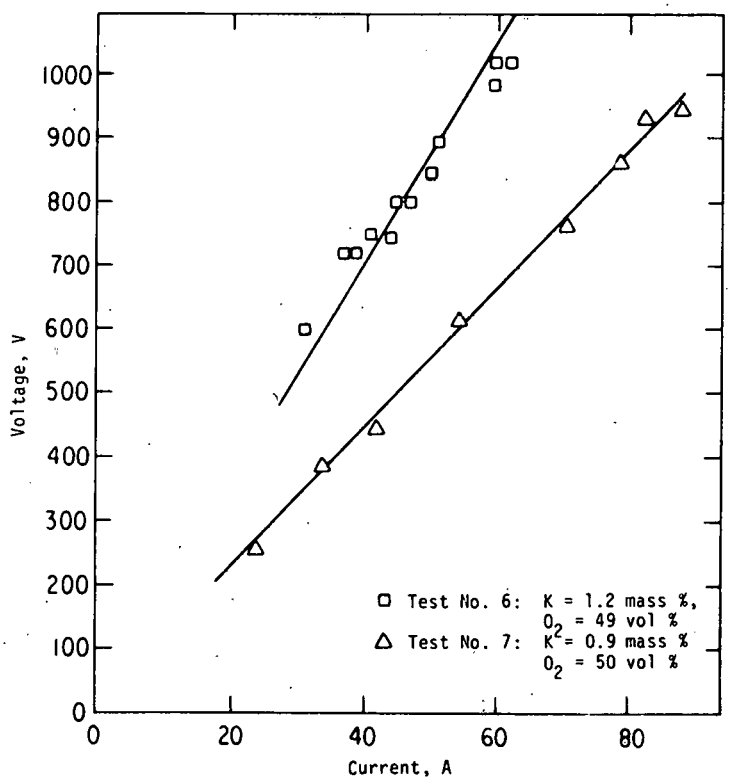


Fig. 5.23 V-I characteristics of the channel with an applied external source

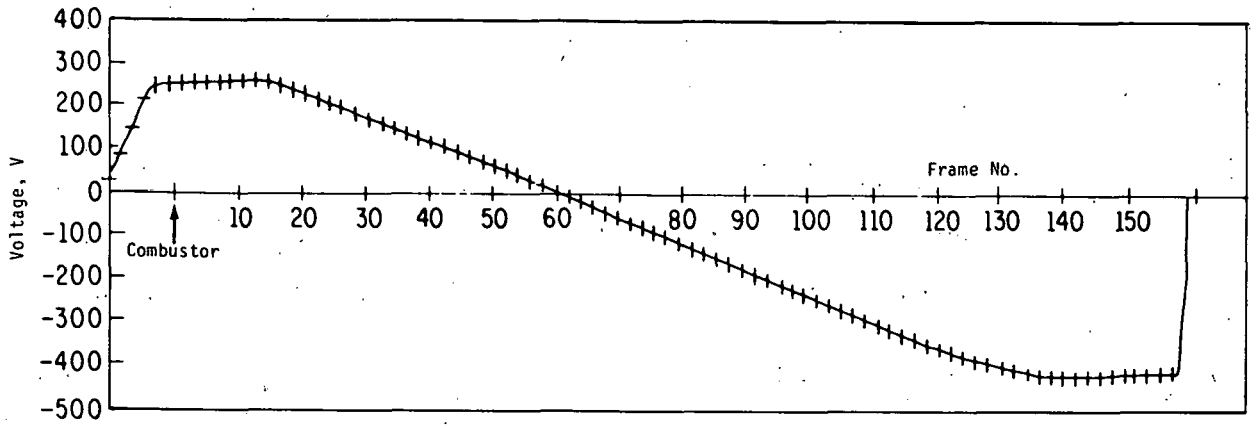


Fig. 5.24 Distribution of voltage during determination of plasma impedance, using an external source; Test No. 7, IVTAN Meas No. 1025

regions of the channel. Experimental points fall on a straight line. The slope of the V-I characteristic obtained during Test No. 7 is less steep than that obtained during Test No. 6, because higher average plasma conductivity was achieved in Test No. 7. Typical potential distribution along the channel is shown in Fig. 5.24. Conductivity was estimated from these measurements, using equations given in Ref. 15.

In addition to calculating conductivity on the basis of experimental V-I data, channel flow calculations were performed, using thermal and gasdynamic measurements, and theoretical equilibrium conductivity was determined.

Table 5.3 presents experimental and calculated theoretical equilibrium conductivity values along the channel.

As that table shows, the distribution of experimental plasma conductivity, σ_{exp}, during Test No. 6 has a maximum in the channel, which results from the presence of mixed flow in the channel, with a shock occurring in the vicinity of x = 2.2 m. During Test No. 7, the distribution of σ_{exp} decreases monotonically along the channel, because the shock occurs between 3.7 and 4.2 meters. The computation of σ_{exp} accounts for conductivity non-uniformities in the boundary layer and nonideal wall insulation. Values for channel leakage resistances were selected on the basis of data with the applied external field mentioned at the beginning of this section.

Table 5.3

Experimental and Theoretical Equilibrium Conductivity Distributions

	Test No. 6, IVTAN Meas No. 601 G = 2.12 kg/s, ψ_{O_2} = 40 vol % seed - 1.2 mass % potassium				Test No. 7, IVTAN Meas No. 1025 G = 3.42 kg/s, ψ_{O_2} = 50 vol% seed - 0.92 mass % potassium			
x, m	p, kg/cm^2	$\langle T_{p\ell} \rangle$, K	σ_{calc}, S/m	σ_{exp}, S/m	p, kg/cm^2	$\langle T_{p\ell} \rangle$, K	σ_{calc}, S/m	σ_{exp}, S/m
1.2	0.527	2881	5.17	2.75	1.010	2669	12.14	7.54
1.7	0.569	2414	5.87	2.36	0.760	2608	10.02	4.95
2.2	0.703	2452	6.50	2.84	0.585	2563	8.91	4.43
2.7	0.818	2460	6.31	3.50	0.425	2497	7.42	3.86
3.2	0.874	2448	5.75	3.27	0.350	2467	6.97	2.89
3.7	0.898	2427	5.06	4.70	0.320	2465	7.15	2.85

5.6 Channel Electrical Performance

5.6.1 Current Distributions in Takeoff Regions

Before Test No. 6, the takeoff current distribution had been highly nonuniform, with the last electrode of the inlet and exit takeoff regions carrying a large current. The results of the earlier tests have been useful in formulating an analytical model [16] for prediction of current distributions and in suggesting ways to obtain more uniform current distribution in the takeoff regions. On the basis of predictive calculations with this analytical model, the inlet takeoff region was moved in the downstream direction (frames 12 through 23 for Test No. 6, frames 11 through 22 for Test No. 7). These changes in the location of the power takeoff region resulted, as predicted, in more uniform current distributions. Figure 5.25 presents measured inlet takeoff, and Fig. 5.26 presents corresponding exit takeoff current distributions. Measurement Nos. 1125 and 1136 were taken during Test No. 6 at mass flow rate, G, of 4.5 kg/s; oxygen enrichment, ψ, of 46 %; magnetic field intensity, B, of 5 T; near short-circuit current (~330 A), and near maximum power (~1 MW). Measurement Nos. 1875 and 1865 were taken

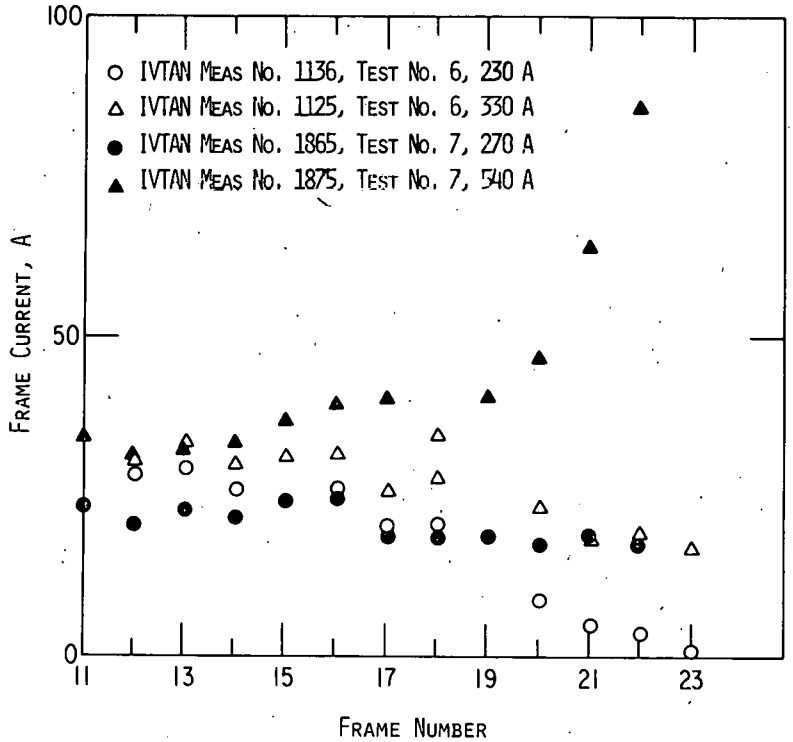


Fig. 5.25 Distribution of current at inlet power takeoff region of U-25B channel

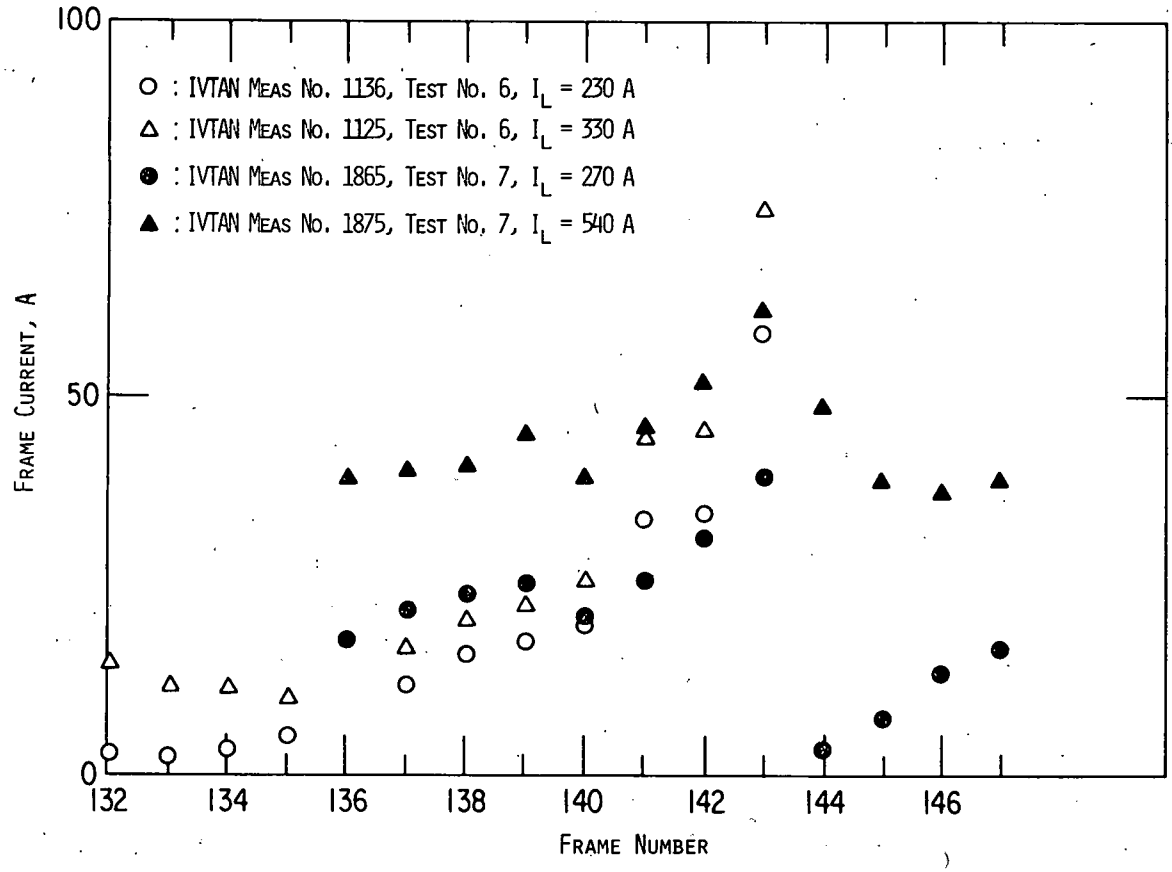


Fig. 5.26 Distribution of current at exit power takeoff region

during Test No. 7 at G = 5 kg/s, ψ = 50 %, B = 5 T, near short-circuit current (~540 A), and near maximum power (~1.35 MW) under Cs seeding conditions. It is noted that, during Test No. 6, the maximum current condition (Meas No. 1125) has a more uniform inlet distribution than the maximum power condition (Meas No. 1136). The opposite was true during Test No. 7. This change in behavior was the result of displacing the inlet power takeoff region by a single frame. Although predictive calculations were not carried out for the exit current takeoff region, the results of the inlet takeoff region suggested moving the exit current takeoff region, during Test No. 7, from frames 132 through 143 to frames 136 through 147. This displacement resulted in a more even distribution. The shape of the distribution, however, displays an unexpected behavior, with either a maximum or a sharp discontinuity at frame 143. No explanation of this anomaly has yet been developed.

5.6.2 Load Line Characteristics

During Tests No. 6 and 7, as in all previous tests, load lines were obtained for each of the inverters, as well as for the entire channel, under a variety of operating conditions. As a rule, the inverters were adjusted for balanced operation (the same load current in each inverter). Because it was evident that the stoichiometric ratio, SR, influences the channel performance strongly, care was taken to construct the load lines shown in Figs. 5.27, 5.22, and 5.28 on test points corresponding to the same stoichiometric ratios. Linear regression analysis was used in drawing load lines from the selected points.

In operating conditions with total mass flow rates below 4 kg/s, the slope of the current-voltage characteristic for inverter 21 was less steep than those for inverters 17 and 19, the slopes of which were essentially the same (for example, see Fig. 5.27). The difference indicates different plasma impedance, most likely associated with a shock structure located at midlength in the channel.

Figure 5.22 shows the load lines characteristics close to the operating conditions that yielded maximum power in Test No. 6, and those corresponding to similar conditions during Test No. 7. The load lines of the individual inverters are shown as having approximately the same slope, unlike the case of

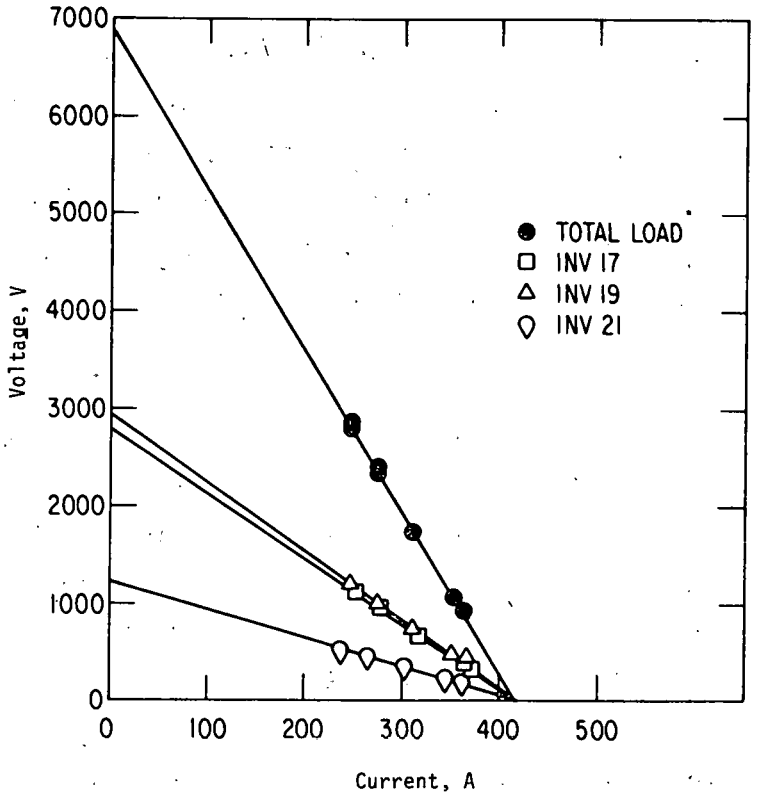


Fig. 5.27 Voltage-current load line characteristics, Test No. 6; G = 3.6 kg/s, O_2 = 50 vol %, potassium seed

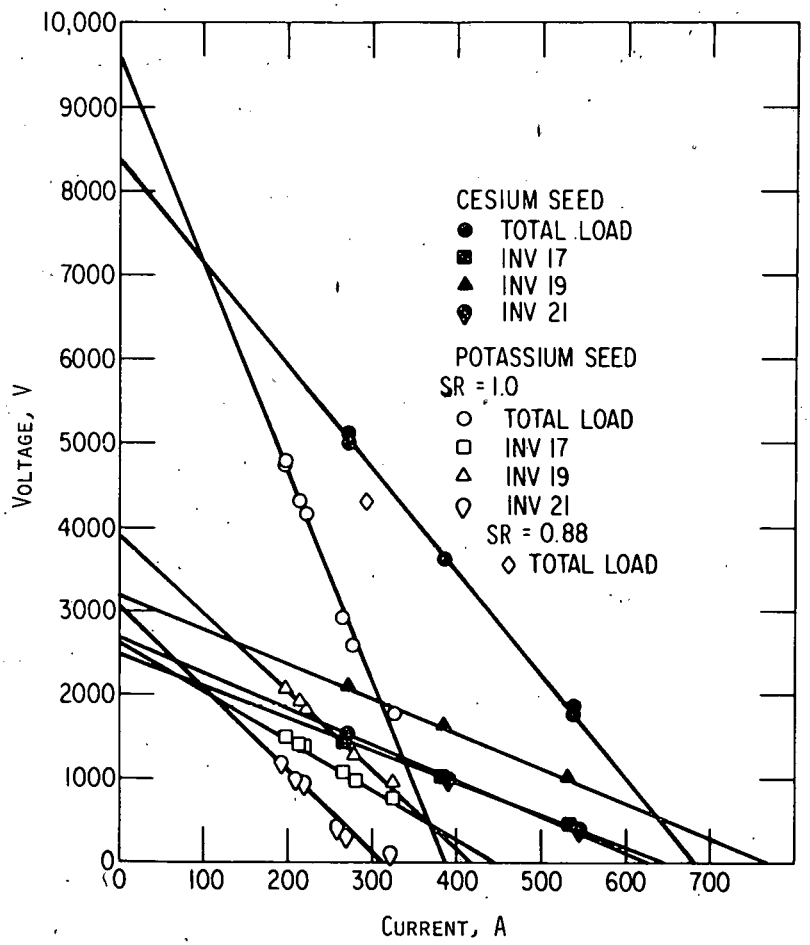


Fig. 5.28 Voltage-current load line characteristics, Test No. 7; G = 5.0 kg/s, O_2 = 50 vol %

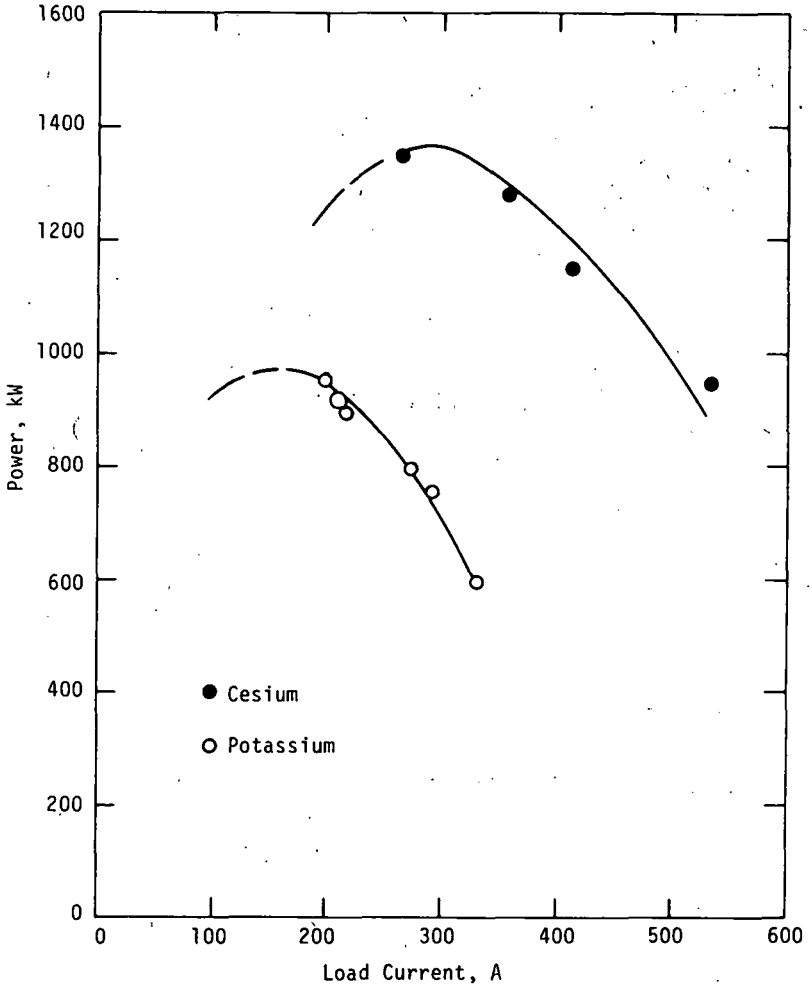
low mass flow rate discussed above. This indicates a more uniform plasma impedance along the channel, although the slightly different slope of the load line for inverter 17 suggests that the front of the channel operated at lower plasma impedance. During Test No. 7, steps were taken to reduce the amount of cold purge air injected into the channel and to optimize the combustor stoichiometric ratio. As a result, the conductivity in Test No. 7 was increased, as was the power output.

Figure 5.28 shows the load lines for potassium and cesium seeding at the design mass flow rate of 5 kg/s during Test No. 7. The same observations made for Fig. 5.22 can be made here. The slopes of the load lines for the three inverters are even closer together for cesium operation, suggesting even more uniform plasma impedance along the channel. It should be noted that the load lines corresponding to potassium seeding were not obtained under optimum stoichiometric ratio; in fact, they were obtained at a stoichiometric ratio (SR) of ~0.96, and are fairly close to those shown in Fig. 5.22 for Test No. 6 at a mass flow rate of 4.5 kg/s and SR ~0.98. The maximum power achieved in Test No. 7 under conditions corresponding to the potassium load lines of Fig. 5.28 was ~900 kW. When the combustor was optimized to SR ~0.88, power increased by approximately 40 % and reached approx 1.3 MW. Although a load line was not taken at this condition, the operating point that yielded ~1.3 MW is shown in the figure for comparison.

5.6.3 Total Power Output

Previous tests with Channel No. 1 were not directed toward achieving the design maximum power of the generator. They provided opportunity to improve facility performance and to build confidence in the operational safety of the channel and magnet over a wide range of operating conditions. Test 7 was planned, in part, to reach the maximum design conditions. Power levels achieved in Test 7, corresponding to potassium and cesium seed, are shown in Fig. 5.29. Higher power levels than those shown in this figure were obtained by optimizing the facility conditions and, in particular, the stoichiometric ratio and the mass flow rate of seed.

Power-per-unit mass flow achieved for each test, except the shakedown Test No. 1, are summarized in Fig. 5.30. This comparison illustrates the



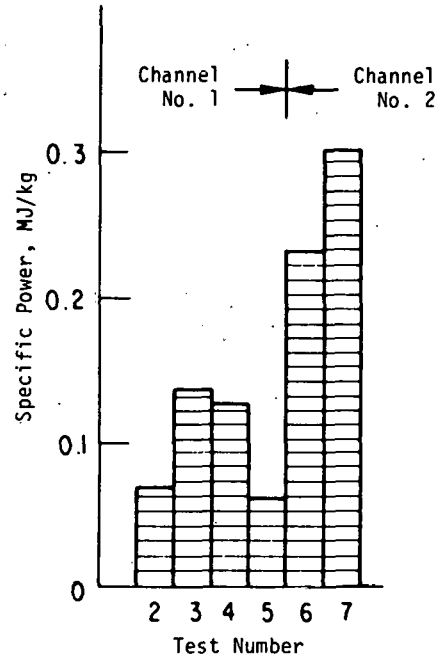


Fig. 5.29 (left) Experimental power levels achieved near design conditions in Test No. 7; G=5 kg/s, $O_2' = 50$ vol%, B = 5 T

Fig. 5.30 (above) History of specific power output of U-25B (B=5 T)

maturing of the U-25B test program. The specific power achieved in Test 7, approximately 0.3 MJ/kg, exceeds that obtained in other MHD facilities, with the exception of the much larger U-25 MHD pilot plant.

5.7 Interframe Voltage Nonuniformities

5.7.1 Axial Distribution of Interframe Voltage

Typical axial distributions of interframe voltage are shown in Figs. 5.31 and 5.32 for overall Hall voltages approaching 5 kV. These distributions are characterized by large, short-period nonuniformities, with several interframe insulators sustaining more than 80 volts. Approximately thirty minutes after switching to cesium seed, the distributions became noticeably smoother, as illustrated by Fig. 5.32. These spatial fluctuations of interframe voltage

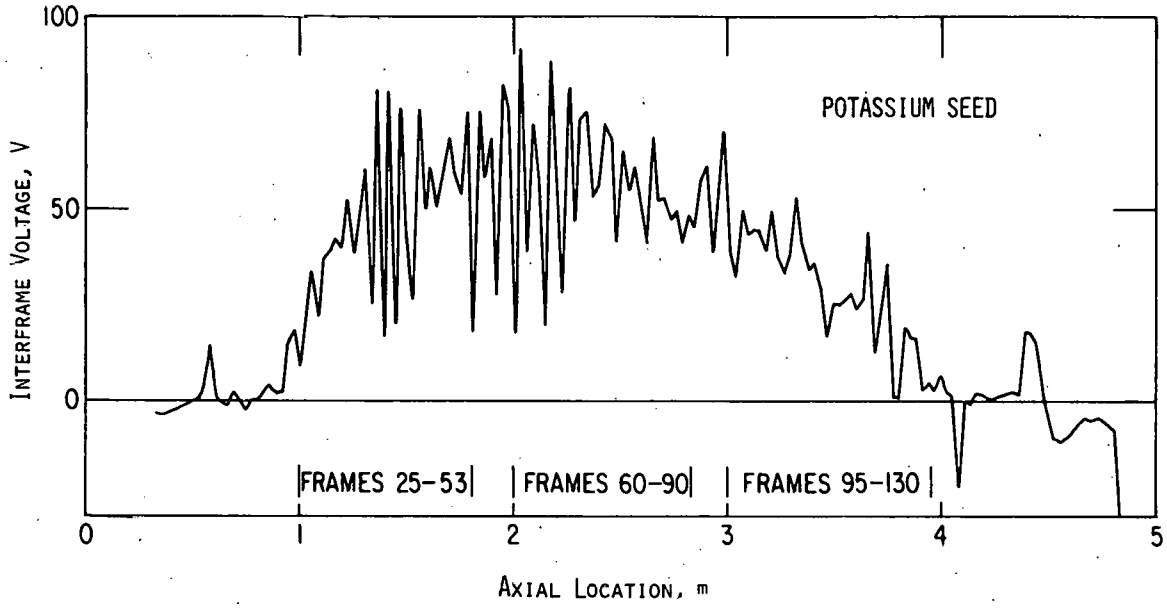
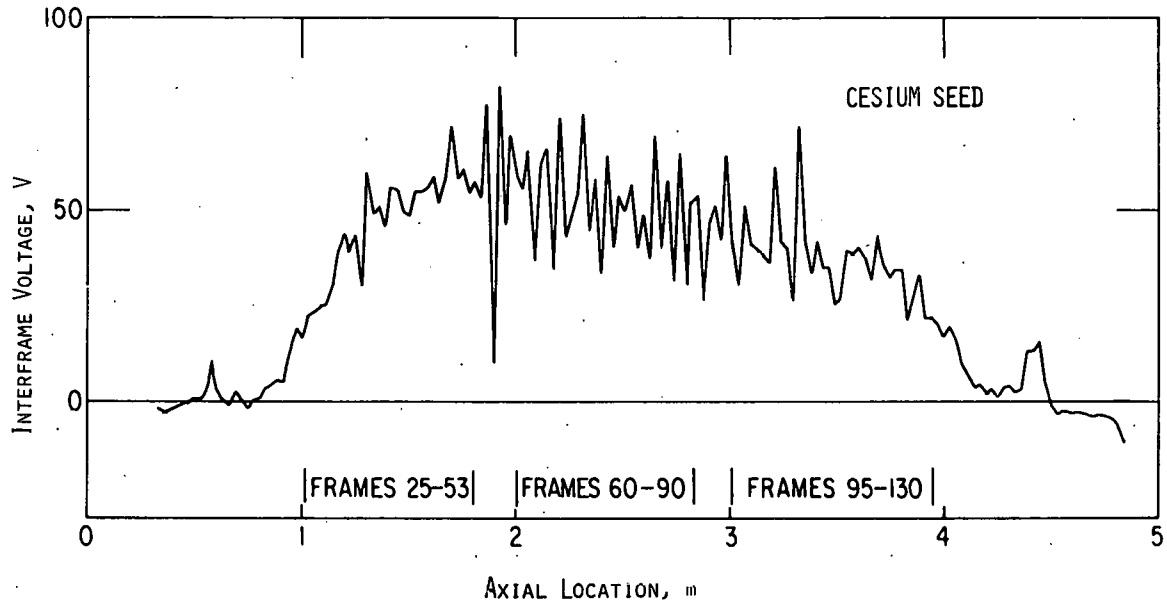


Fig. 5.31 (above) Distribution of interframe voltage; Test No. 7, ANL Meas No. 5686, Hall voltage = 4720 V

Fig. 5.32 (below) Distribution of interframe voltage; Test No. 7, ANL Meas No. 5806, Hall voltage = 4965 V



were quasi-steady, with some distributions of high and low-interframe voltages maintained for long periods of time (hours) during load changes. Post-test inspection revealed only two weak interelectrode gaps (31-32 and 57-58), where interframe resistances was less than 10 Ω.

The nature of these voltage distributions was determined by statistical analysis of three groups of frames (25-53, 60-90, and 95-130), corresponding to regions connected to the three inverters. The interframe voltage, E_n, is defined as the voltage difference between frames n + 1 and n. The average interframe voltage, $\bar{E}_n$, was determined by the least squares fit of a quadratic function to the measured voltage distribution of each of the three groups of frames. The mean interframe voltage, <E>, was determined for each group by the equation:

$$\langle E \rangle \equiv \frac{1}{N} \sum_{n=k}^{n=k+N} E_n \ . \tag{5.5}$$

The normalized interframe voltage deviation, A_n, is defined by:

$$A_n \equiv \frac{E_n}{\bar{E}_n} - 1 \ . \tag{5.6}$$

The root mean square value of the normalized interframe voltage deviation is defined in the usual fashion:

$$A_{RMS} \equiv \sqrt{\frac{1}{N} \sum_{n=k}^{n=k+N} A_n^2} \tag{5.7}$$

The root mean square value of the interframe voltage deviation, E'_n, defined as $E_n - \bar{E}_n$, can be computed in the same manner. Note that, for $\bar{E}_n \simeq \langle E \rangle$, $E'_{RMS} \simeq \langle E \rangle A_{RMS}$. Twenty-eight selected instances (twenty-five with a magnetic field of 5 T) from Test No. 7 were analyzed. The root mean square values of the normalized deviations are shown in Fig. 5.33 as a function of mean interframe voltage for each of the three groups of frames. Note that A_{RMS} decreases for the larger mean interframe voltage levels, and that the values for cesium seed fall below those for potassium. The data of Fig. 5.33 are fairly well described by the inverse relation, $A_{RMS} = C/\langle E \rangle$, if the mean interframe voltage, <E>, is greater than 10-15 volts. For potassium, the con-stant C is 15 volts; for cesium, it is 7.8 volts.

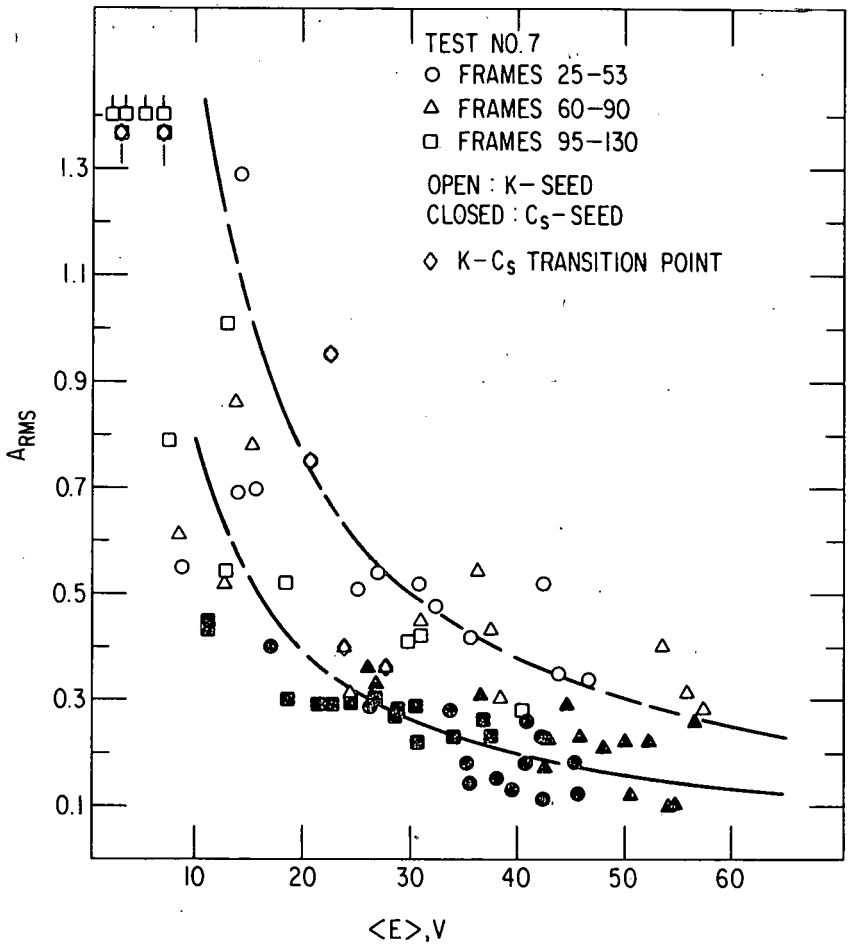


Fig. 5.33 Root mean square of normalized voltage deviation vs mean interframe voltage (open symbols indicate K seed; closed symbols, Cs seed)

For $\bar{E}_n = \langle E \rangle$, namely, for constant Hall field, C is approximately equal to E_{RMS} and, hence, the RMS magnitude of the voltage deviations is nearly independent of the average Hall voltage. The presence of cesium seed reduced the constant C and, consequently, the RMS level of voltage variations by a factor of nearly two compared with potassium seed.

Typical probability distribution functions for A_n are given by Fig. 5.34 for the upstream group of frames, and Fig. 5.35 for the middle group. These probability functions are nearly symmetrical. The band width of the probability function is roughly proportional to A_{RMS}; however, the difference in A_{RMS} values in Fig. 5.35 is the result of the spreading of the base of the probability function for Cs while the bandwidths remain approximately the same. Note that the cesium cases have a narrower probability function than the potassium cases; hence, the presence of cesium reduces considerably the probability of a large nonuniformity.

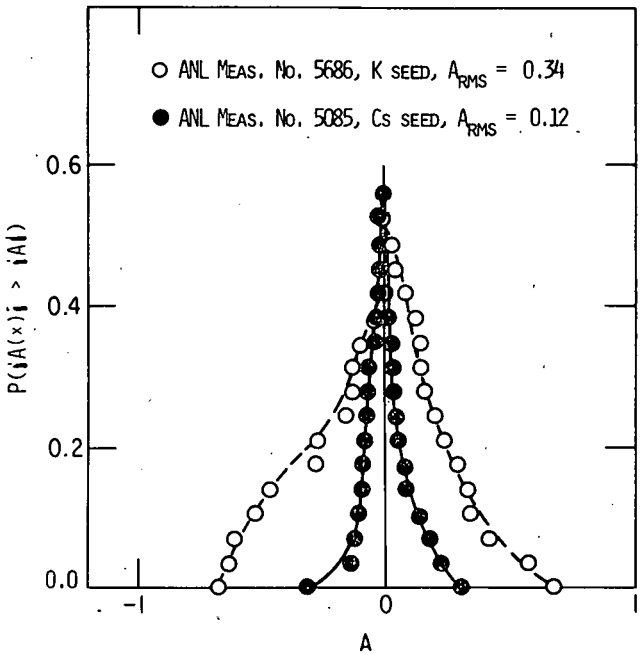


Fig. 5.34 Probability distribution function of the normalized interframe voltage deviation; frames 25--53, Test No. 7

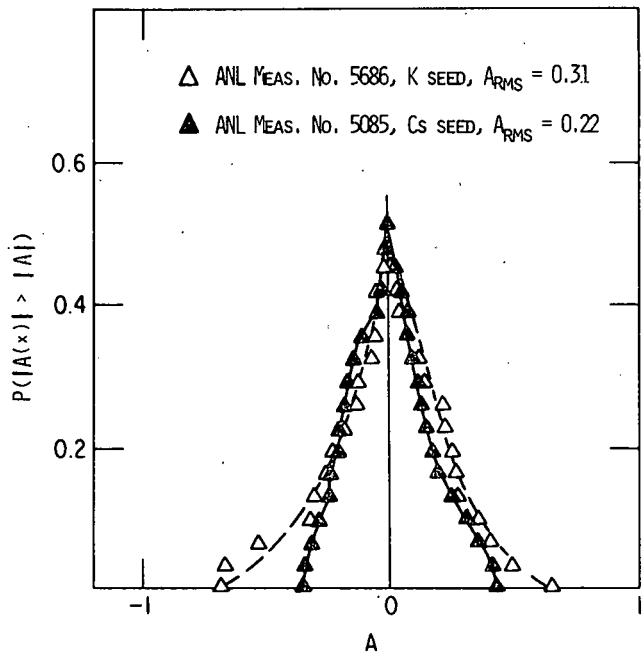


Fig. 5.35 Probability distribution function of the normalized interframe voltage deviation; frames 69--90, Test No. 7

The periodicity of these spatial voltage flutuations was determined by spatial correlation of the normalized voltage deviations. The correlation coefficient is calculated as a function of frame displacement, m, by:

$$R_a(m) = \left(\frac{1}{N}\sum_{n=k}^{n=k+N} A_n A_{n+m}\right)/A_{RMS}^2 \ . \tag{5.8}$$

Typical correlation functions are displayed in Fig. 5.36 for potassium and in Fig. 5.37 for cesium. Many of the cases calculated are strongly periodic in nature, with a wavelength of two frames (the cases of frames 25-53 in Fig. 5.36 and of frames 60-90 in Fig. 5.37 are good examples). This type of correlation implies that the voltage deviations of neighboring gaps from the average, have a strong tendency to alternate between positive and negative values. For weak nonuniformities, the highly correlated and periodic nature of the spatial fluctuations disappears, as illustrated in Fig. 5.37 for the case of frames 25-53 with Cs seed.

The strength of the autocorrelation improves as the parameter, $\langle E\rangle A_{RMS}$, increases. The correlation coefficient for one-frame separation is plotted

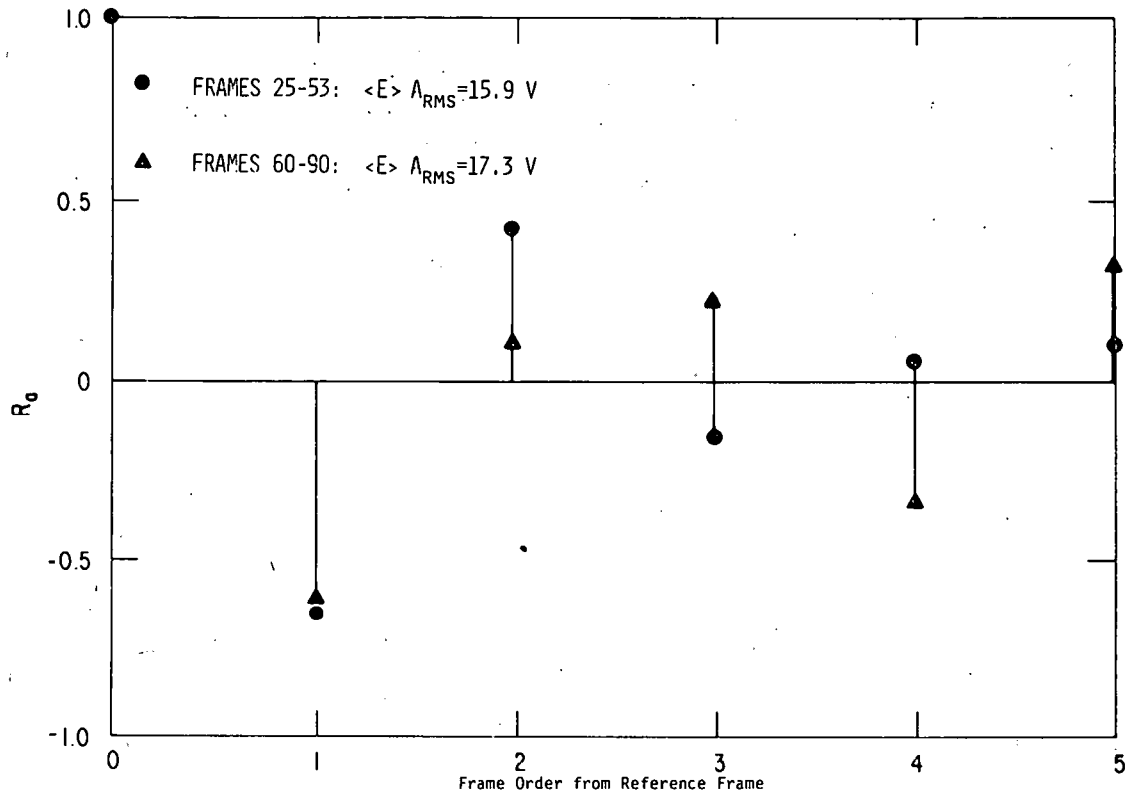


Fig. 5.36 Spatial correlation coefficient of normalized interframe voltage deviation; Test No. 7, ANL Meas No. 5686, K seed

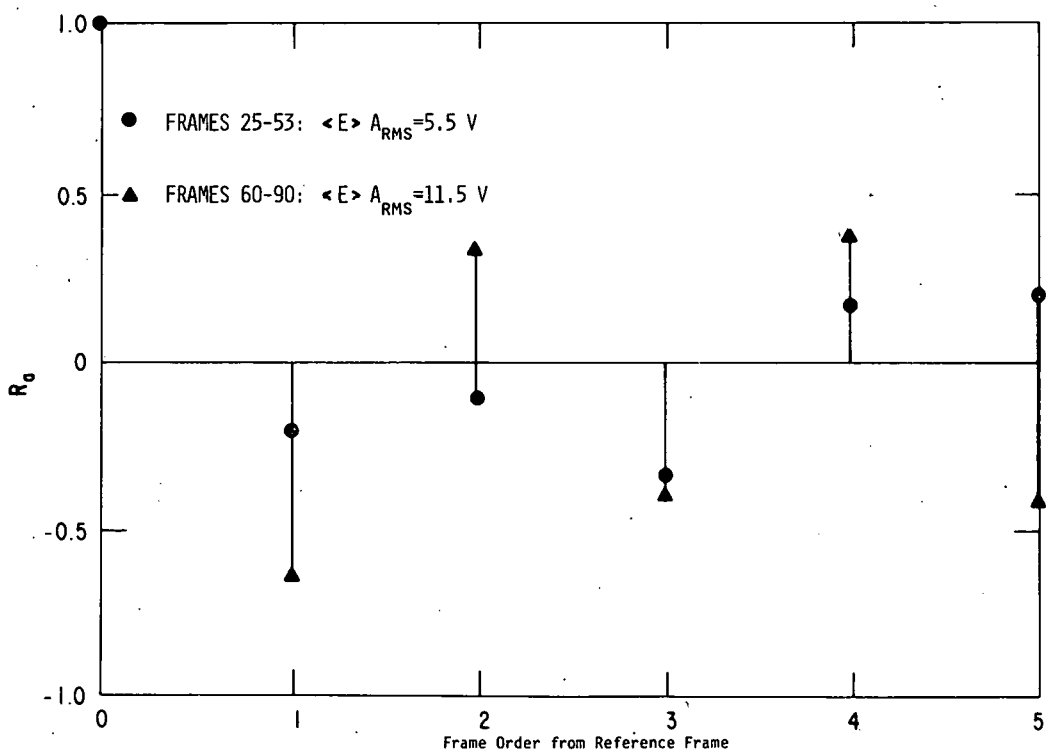


Fig. 5.37 Spatial correlation coefficient of normalized interframe voltage deviation; Test No. 7, ANL Meas No. 5805, Cs seed

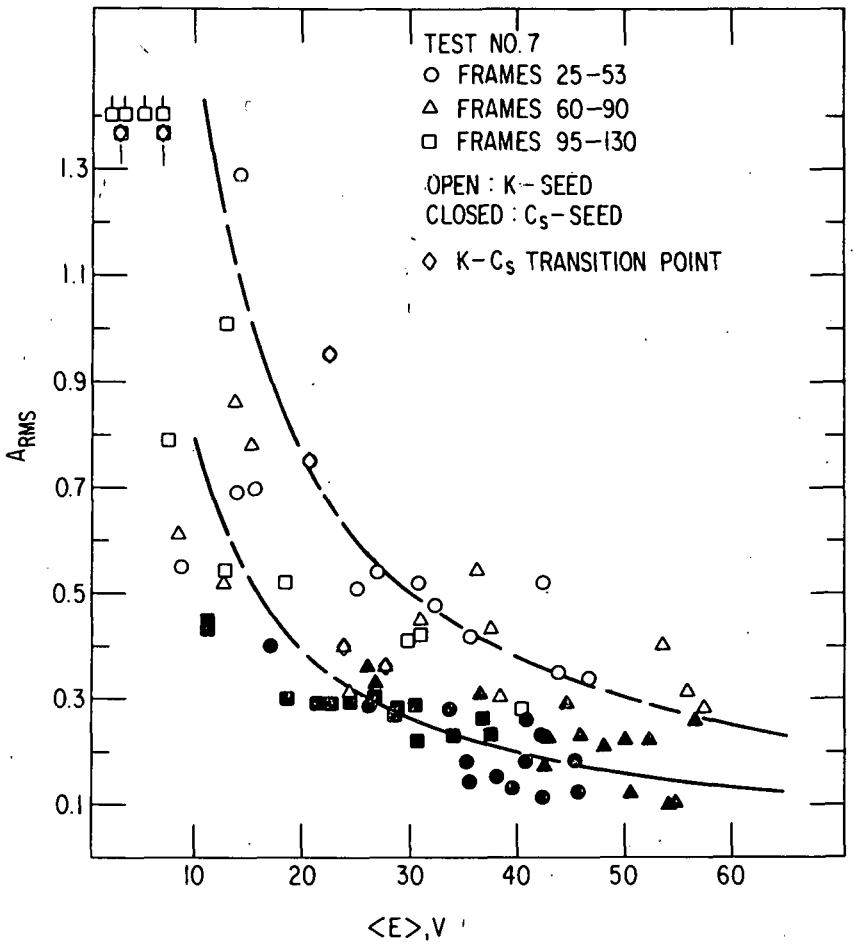


Fig. 5.38 Correlation coefficient for single-frame displacement vs $\langle E\rangle A_{RMS}$

versus $\langle E\rangle A_{RMS}$ in Fig. 5.38 for a variety of frame groups and generator conditions. For $\langle E\rangle A_{RMS}$ greater than approximately 10 volts, a strong negative correlation of the voltage deviation across neighboring gaps results. Recall that the parameter, $\langle E\rangle A_{RMS}$, is approximately equal to E'_{RMS}.

The probability distribution functions presented here are qualitatively similar to those that have been presented for the U-25 channels [17]. The negatively-skewed distributions reported in Ref. 17 were observed in approximately 40% of the cases of the present results, whereas only 10% were skewed to positive values.

The present results compare well with the nonuniformity theory of Solbes and Lowenstein [18]. For a diagonal channel of height-to-electrode pitch ratio of 10, the most unstable nonuniformity mode occurs at a wavelength-to-

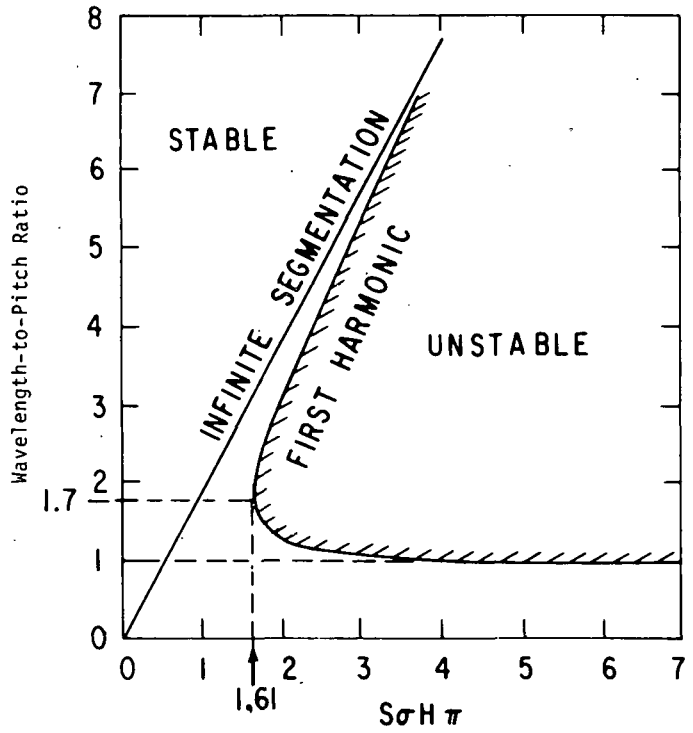


Fig. 5.39 Generator stability boundary--no wall leakage--height-to-pitch ratio = 10

(S = sum of slopes of voltage-current characteristics for the anode and cathode walls and external circuit, σ = core plasma conductivity, H = eletrode length along the magnetic field)

[From Solbes and Lowenstein: "Electrical Nonuniformities and their Control in Linear MHD Channels," 15th Symposium on Engrg. Aspects of MHD]

pitch ratio of 1.7 (see Fig. 5.39). This value is in good agreement with the correlation results that have been presented here. The basic destabilizing mechanism in the Solbes-Lowenstein model is the negative V-I characteristic of the electrode arc conduction mode. Inspection of the channel after Test No. 7 revealed that the rammed zirconia lining was heavily eroded, leaving cold copper as the primary electrode material. Hence, the U-25B electrodes were most probably operating in the arc mode, which satisfies the destabilizing condition for the Solbes-Lowenstein nonuniformity model.

One can speculate that the dramatic reduction in nonuniformities during operation with cesium seed is caused by an electrode surface effect. The properties of potassium carbonate and cesium carbonate deposits are considerably different, and the lower melting and decomposition temperatures of the cesium carbonate deposits could act to reduce the arc voltage drop; also, the interelectrode leakage resistance could change. Normally, the use of cesium seed would tend to intensify the Solbes-Lowenstein instability, by increasing plasma conductivity and, thus, decreasing plasma ballasting. However, cesium seed deposits on the channel walls may reduce the arc negative resistance and/or the intrelectrode leakage resistance; both effects would tend to stabilize the nonuniformities.

5.7.2 Temporal Fluctuations of Electrical Parameters

Studies of electrical and gasdynamic fluctuations were continued in Tests No. 6 and No. 7. In these studies, the prime interest was the recording and analysis of interelectrode voltage fluctuations, to develop a basis for diagnosis of Hall voltage breakdown in MHD channels [19]. Fluctuation spectra obtained in studies of interframe voltage fluctuations of the U-25B channel did not, generally speaking, reveal the intensive high frequency noise characteristic of interelectrode Hall breakdown, as observed previously in tests with the Faraday channel 1-D [19]. However, under conditions of maximum electrical stresses, certain interelectrode voltages contained fluctations that could correspond to conditions of unstable Hall breakdown.

During Tests No. 6 and 7, the fluctuations of the interframe Hall potentials were recorded at 10 points along the length of the channel. (These points were at the active section of the channel, at the locations of interemediate current takeoff and near the end takeoff zones.) The fluctuations were, in general, quite similar for the two series of tests.

During the measurement of V-I characteristics with an external source, using inverter No. 18, without a magnetic field (as well as during operating modes with magnetic field up to 3 teslas and output power at low levels), the main component of interframe voltage fluctuations was at a frequency of 300 Hz distorted with a weak high-frequency component of approximately 1 kHz.

When the inverter current and voltage were varied between their minimum and maximum values, the interframe voltage fluctuations did not change by more than 5-10 volts, with the average interframe voltage being between 15 and 20 volts.

The shape of the interframe voltage fluctuations did not change substantially when the magnetic field was increased to 4 and 5 teslas. However, the fluctuation amplitude did increase, particularly at the point of intermediate current takeoff during Test No. 7 and near the end takeoff zone during Test No. 6.

Thus, during Test No. 6, IVTAN Meas No. 1002 (B = 4.6 T; Hall potential, 2.9 kV; load current, ~220 A), the variations of interframe voltage fluctuations at the active region of the channel were within 5 to 10 volts at the points of intermediate current takeoff (frames 57 and 93) and within 20 to 30 volts near the end takeoff zones. However, between frames 24 and 25, the variation in the amplitude of fluctuations was approximately 60 to 80 volts, as shown in Fig. 5.40. Considerable irregularity in the potential distribution, as recorded by the data acquisition system, was observed in the neighborhood of frames 24 and 25.

In Test No. 7, IVTAN Meas No. 1540 (B = 5 T; Hall potential, 1.8 kV), the variations in the interframe voltage fluctuations at the active channel region, frames 62-63, 63-64, and near the end takeoff zones, frames 23-24, 131-132, were within 10 to 15 volts, whereas, at the intermediate current takeoff point, between frames 56 and 57, the variations were up to 30 volts, with the average value of the interframe voltage being 30 to 40 volts, as shown in Fig. 5.41.

During Test No. 7 at magnetic field of 4 T, abnormally high levels of fluctuation occurred at the point of the intermediate current takeoff, between frames 91-92. The variations in this region were up to 80 to 100 volts. At the adjoining frames, 92-93, however, the amplitude of fluctuation was quite low, and did not exceed 20 volts. It is interesting to note that, in general, the interframe voltage fluctuations of adjoining frames of the active channel region are different in nature. This may be because of the different conditions of the current flow at adjoining frames in the channel.

Under the conditions of maximum power generation in Test No. 6, unstable high-frequency fluctuations of large amplitude, typical of conditions immediately preceding a breakdown, occurred between frames 128 and 129, as shown in Fig. 5.42. However, these fluctuations disappeared when the operating mode was changed. Study of the autocorrelation function of the interframe voltage fluctuations for Test No. 7 with output power between 1.2 and 1.5 MW showed only two significant components present in the spectrum (at frequencies of 300 Hz and between 2 and 3 kHz).

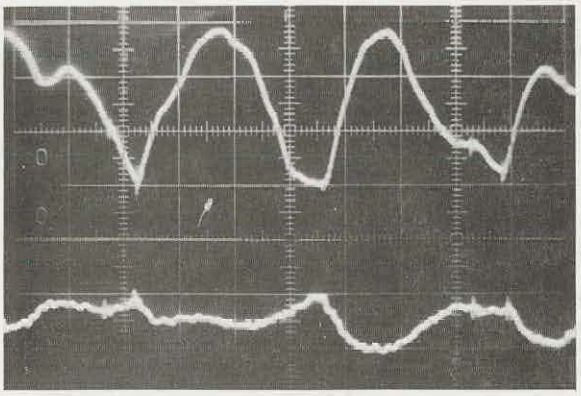


Fig. 5.40 Oscillograms of voltage fluctuations between frames 57-58 (lower) trace); 24-25 (upper) at B=4.6 T; Test No. 6, IVTAN Meas No. 1002; output power, 732 kW; time scale, 1 ms/div; vertical scale, 20 V/div; steady-state ΔV between frames, 50 V.

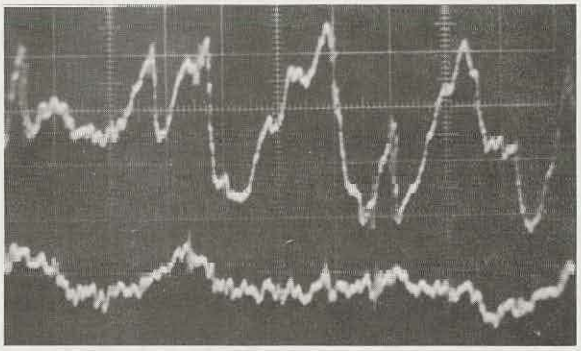


Fig. 5.41 Oscillograms of voltage fluctuations between frames 62-63 (lower trace); 56-57 (upper) at B=5 T; Test No. 7, IVTAN Meas No. 1540; time scale, 1 ms/div; vertical scale, 10 V/div.

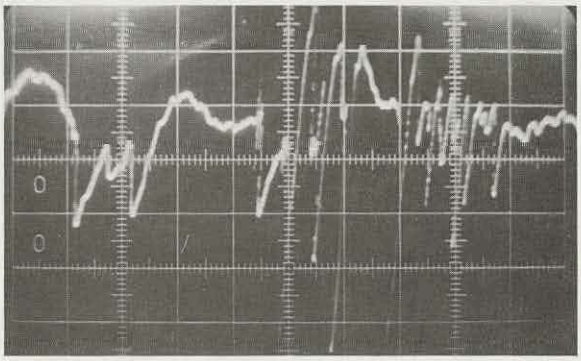


Fig. 5.42 Oscillograms of voltage fluctuations between frames 128-129 at B=5 T; Test No. 6, IVTAN Meas No. 1150; output power, 966 kW; time scale, 1 ms/div; vertical scale, 20 V/div.

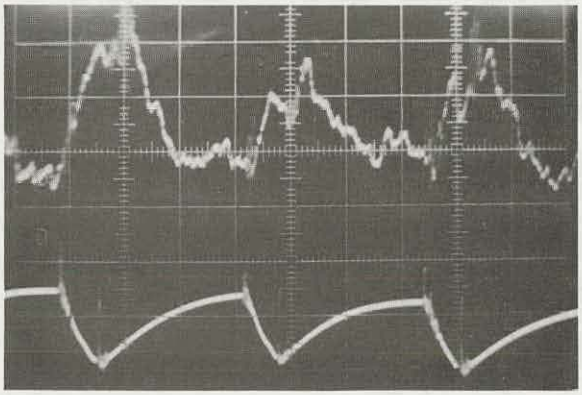


Fig. 5.43 Oscillograms of voltage fluctuations between frames 57-58 (upper trace) and current fluctuations in frame 57 (lower); Test No. 7, IVTAN Meas No. 1750; time scale, 1 ms/div; vertical scale: upper trace, 5 V/div, lower trace, 13 A/div.

Also during Test No. 7, measurements of current fluctuations in the take-off circuits of frames 23 and 57 were made by the use of current sensors. The characteristic fluctuation signals obtained from the current sensors remained constant during the entire test, and were of the form shown by the lower curve in Fig. 5.43. As the output current increased, the fluctuation level increased somewhat, but the recorded frequency remained constant at approximately 300 Hz. However, because of the low sensitivity of the current sensors to high frequency components and because of the high level of the input signal at 300 Hz, introduced by the load inverters, the use of these sensors to record current fluctuations caused by current transfer from plasma to electrodes is not very promising.

During Tests 6 and 7, additional electrical fluctuation data were recorded directly on an FM magnetic tape recorder, making it possible to analyze a few parameters for frequencies of up to approximately 4,000 Hz. These data have been analyzed by use of an electronic frequency analyzer and correlator, as well as by digitizing the signals and analyzing them numerically in a manner similar to that employed to study fast scan data from previous tests [2,3]. Both methods of analysis produced essentially the same results.

The magnetic tape data also demonstrated that the predominant frequency was 300 Hz. Other, lower frequencies exist, as do harmonics of 300 Hz.

The typical wave form of the signal is shown in Fig. 5.44 for two test conditions. In general, the fluctuation component is triangular in shape. Figure 5.44 also illustrates another interesting point: at low magnetic interaction conditions (B = 3 T, G = 2.5 kg/s), the wave form of all three signals is quite regular, suggesting that the inverter system is imposing this wave form upon the channel. At conditions of higher magnetic interaction (5 T, G = 3.5 kg/s), the wave form becomes more irregular, suggesting that the effect of plasma fluctuations begins to appear in the inverter output.

Some characteristics of the fluctuations of INV17, ED28, and ED51, obtained from the magnetic tape data for Test 6, are shown in Table 5.4.

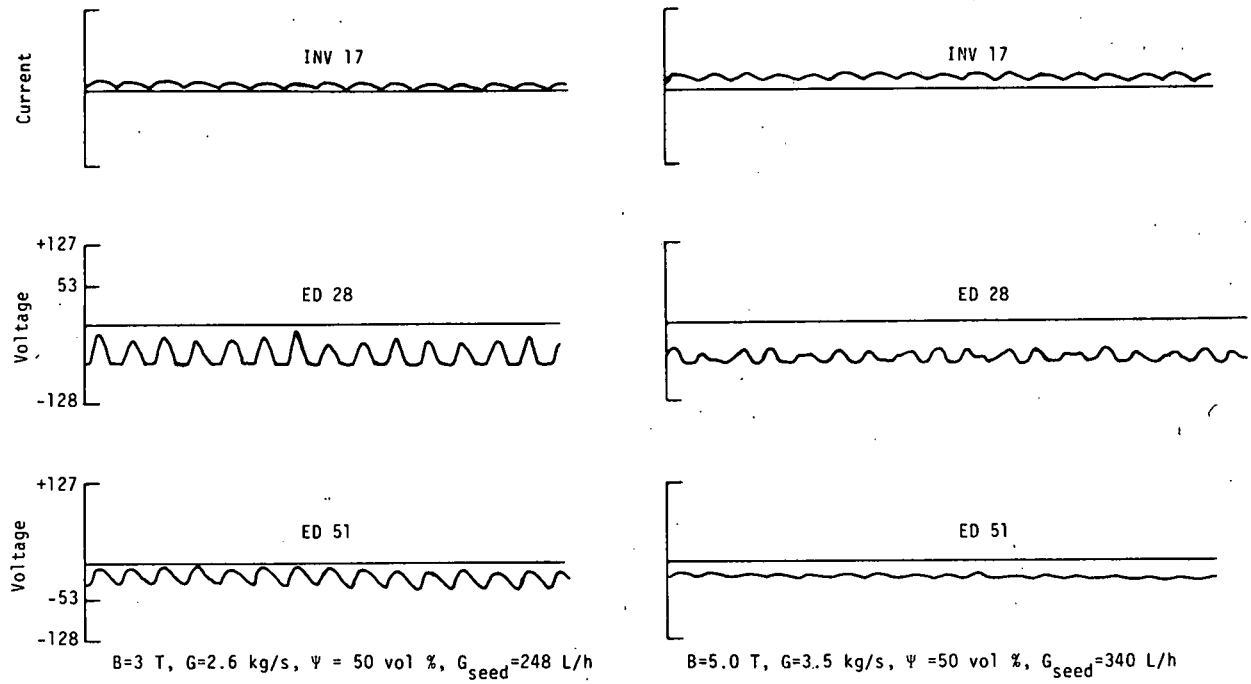


Fig. 5.44 Waveforms of selected parameters (INV17 = current of inverter 17; ED 28 and ED 51 = interframe voltages between frames 28 and 29, 51 and 52

Root-mean-square values of the fluctuations, $\Delta V'$, about the dc level for the ED28 AND ED51 interframe voltages varied, in general, between about 10% and 50% of the dc level, $\overline{\Delta V}$; however, there were some exceptions. The RMS

Table 5.4

Fluctuation Characteristics of Selected Signals during Test No. 6

(I', $\Delta V'$: fluctuating components; $\bar{I}$, $\overline{\Delta V}$: dc components)

			INV 17		ED 28		ED 51	
B, T	G, kg/s	Ψ_{O_2}, vol %	I'_{RMS}, A	$\frac{I'_{RMS}}{\bar{I}}$	$\Delta V'_{RMS}$, V	$\frac{\Delta V'_{RMS}}{\overline{\Delta V}}$	$\Delta V'_{RMS}$, V	$\frac{\Delta V'_{RMS}}{\overline{\Delta V}}$
3.9	3.0	50	3.69	0.218	7.19	0.506	6.74	0.352
5.0	3.5	50	4.55	0.157	3.30	0.129	4.55	0.115
5.0	4.0	50	4.30	0.124	3.20	0.692	3.08	0.241
5.0	4.5	50	4.04	0.151	3.29	0.330	4.55	0.169

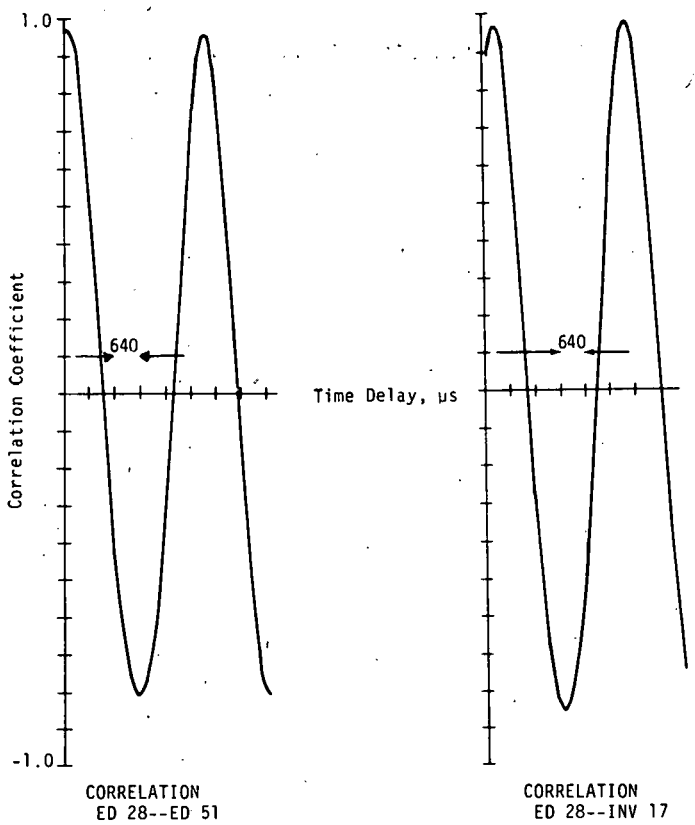


Fig. 5.45 Cross-correlations of selected signals

(B = 5 T, G = 3.5 kg/s, O_2 = 50 vol %)

values of the current fluctuations, I', about the dc level of the INV17 current were lower, between 10 and 20% of the dc value, $\bar{I}$.

Cross-correlations of signals taken on magnetic tape have also been run. Correlations of ED28 and ED51 signals, as well as of ED28 and INV17 signals, are shown for a typical test condition in Fig. 5.45. It is observed that the interframe voltages were essentially in phase; at this test point, however, the current in Inverter 17 slightly lagged the interframe voltage between frames 28 and 29. This trend is also evident in many other test points that were analyzed, but not in all of them. Analysis of this behavior has not yet been completed.

6.0 TEST RESULTS ANALYSIS

6.1 Investigative Data Analysis

The method termed, "local analysis," which has been used to analyze previous results from the U-25B (2,3,14,15,20) was refined and used for analysis of the data from Tests No. 6 and 7. The technique makes extensive use of the experimental data to determine the primary gasdynamic and electrical characteristics (core velocity, temperature, transverse current density, etc.) This approach avoids the need for accurate computation of critical quantities, such as voltage drop and boundary layer profiles, for which adequate data (e.g., wall temperature, wall roughness) may not be available. The calculated values of the primary quantities, which are relatively insensitive to the model assumptions, can then be used to determine secondary and more detailed generator characteristics (such as wall leakage and boundary layer parameters) without the necessity of recomputing the core flow behavior. Calculation of the secondary quantities requires additional assumptions, and the results may be sensitive to the precise choices; this sensitivity may be used, however, to help define which assumptions are most appropriate. It should be stressed that the technique cannot be used to predict channel performance; it is, rather, a convenient and efficient way to reduce and study the data and to evaluate some procedures used in design calculations.

The discussion that follows consists of three parts. First, a description of the method and the sensitivity of the primary quantities to various inputs are discussed. Next, the computed values of primary quantities for Test No. 6 and No. 7 are presented and discussed. In the final section, the results for the secondary quantities, in particular for wall leakage and boundary layer parameters, are presented.

6.1.1 Description of the Method of Analysis

The calculations are made for the centerline of the flow, assuming that the boundary layers do not meet. The model uses the measured axial distributions of static pressure and axial electric field at several levels of inverter current. The axial electric field data are used to determine the local

load lines (E_x vs I_L/A) and, by extrapolation, to determine the value of current density that corresponds to local short circuit ($E_x = 0$) condition. The equations used to determine the core flow are:

$$\rho_c U_c \frac{dU_c}{dx} = [- (\frac{d\hat{p}_c}{dx}) + J_{y_c} \cdot \hat{B}] , \tag{6.1}$$

$$\rho_c U_c \frac{dh_{t_c}}{d_x} = [(\sigma_c \hat{E}_{x_c} - \beta_c J_{y_c}) \hat{E}_{x_c} + J_{y_c} (J_{y_c} \frac{1 + \beta_c^2}{\sigma_c} + U_c B - \sigma_c \beta_c \hat{E}_{x_c})] , \tag{6.2}$$

$$h_c = h_{t_c} - U_c^2/2 = f(\hat{p}_c, \rho_c), \tag{6.3}$$

where ^ denotes a known (i.e., measured) quantity and the subscript, c, denotes core values. When the initial conditions of an electrical model are specified, the equations can be used to integrate along the channel and determine axial variations of the core quantities.

Two electrical models have been used: an extended version of the layer model and a quasi-three-dimensional model [21]. For both, the load line equation is linear:

$$E_{x_c} = \frac{\frac{I_L}{A} - W}{S + R_{leak} A} , \tag{6.4}$$

where W and S are quantities that depend on the model chosen, and R_{leak} is the unknown interframe leakage resistance. The transverse current density for both models is linear in the axial field, i.e.,

$$J_{y_c} = - E_{x_c} B_1 - W_1 , \tag{6.5}$$

where, again, the quantities B_1 and W_1 depend upon the model used. Use of the data to determine I_L/A for short circuit (i.e., to determine W) in effect removes the need to specify a voltage-drop model. Further, it makes the determination of J_{y_c} independent of the absolute level of electrical conductivity, although the shapes of the boundary layer profiles are still of some importance.

The quasi three-dimensional model [21] includes the effects of finite segmentation and conducting sidewalls, and has been used in a limited number of the calculations. The majority of the calculations have been made with the use of a simpler model, with the following assumptions:

1. negligible axial variations of the quantities (implies infinite segmentation),

2. $J_z = 0$ (that is, the effect of conducting sidewalls is neglected),

3. constant Hall parameter, β, equal in magnitude to $\langle\beta\rangle$ where $\langle\ \rangle$ denotes averaging over the cross-sectional area [the variation of β is included when the quantity $\sigma/(1+\beta^2)$ is computed], and

4. constant U, equal in magnitude to $\langle U\rangle$.

With the above assumptions, the appropriate equations are:

$$E_x = \frac{\frac{I_L}{A} - (\cot\gamma + \langle\beta\rangle)\ \langle U\rangle\ \hat{B}/R}{\langle\sigma\rangle - (\langle\beta\rangle^2 - \cot\gamma^2)/R + \text{pitch}/A\cdot R_{leak}}, \tag{6.6}$$

where

$$R \equiv \left\langle \frac{1}{\left\langle \frac{\sigma}{1+\beta^2} \right\rangle_z} \right\rangle_y = \frac{(\cot\gamma + \langle\beta\rangle)\ \langle U\rangle\ \hat{B}}{(\hat{I}_L/A)_{\ell sc}}, \tag{6.7}$$

and

$$J_{y_c} = \frac{\frac{\sigma_c}{1+\beta_c^2}}{\left\langle \frac{\sigma}{1+\beta^2} \right\rangle_z} \cdot \frac{(\langle\beta\rangle - \cot\gamma)\ \hat{E}_{x_c} - \langle U\rangle\ B}{R}, \tag{6.8}$$

where $\langle\ \rangle_y$ and $\langle\ \rangle_z$ denote averaging in the y and z directions, $(I_L/A)_{\ell sc}$ denotes a local short circuit value determined from the local load lines, and R is the resistance parameter. The independence of J_{y_c} of the absolute level of conductivity is shown clearly. To determine the quantities, $\langle\beta\rangle$ and $\langle U\rangle$,

power law profiles for velocity and stagnation enthalpy have been assumed. The thickness of the boundary layer is determined by varying the thickness until the mass conservation equation is satisified. A 1/5th power law velocity profile was assumed; the stagnation enthalpy profile shape is considered a "free" parameter in the determination of the primary quantities.

6.1.2 Calculation of Reliability of Primary Quantities

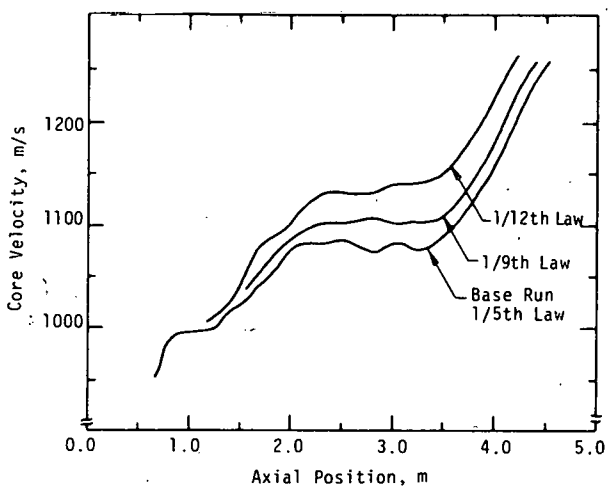
The sensitivity of the primary results (U_c, T_c, σ_c, β_c) to various assumptions was checked; specifically, sensitivity to the following parameters was investigated:

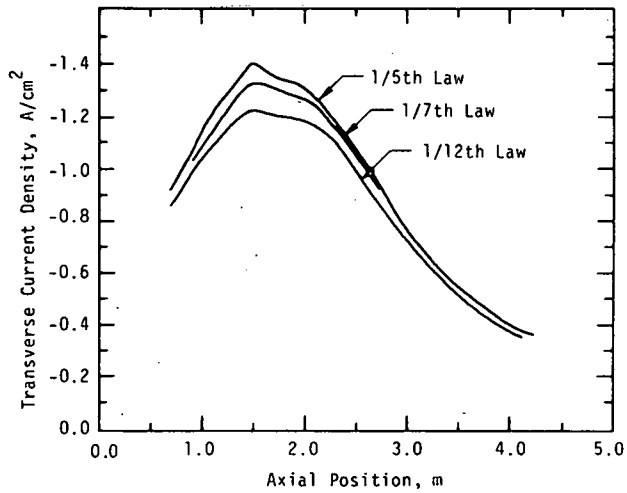
1. stagnation enthalpy power low coefficient, n,

where $$\frac{h_t - h_{t_w}}{h_{t_c} - h_{t_w}} = \left(\frac{y}{\delta}\right)^{1/n} , \qquad (6.9)$$

2. wall temperature, T_w,
3. local perturbation in static pressure,
4. absolute conductivity level,
5. combustor pressure,
6. initial conditions, and
7. assumed electrical model.

The sensitivity of core velocity and transverse current density to the power law coefficient is depicted in Figs. 6.1a and 6.1b, and, as shown, is low. With the exception of the local static pressure perturbation, which affects only the region of the perturbation (see Fig. 6.2), the sensitivity to all the above listed parameters is low. Hence, the primary results obtained are reliable, despite the fact that some of the input parameters are only known approximately. Additional sensitivity study results supporting this conclusion are reported elsewhere [22]. The three-dimensional model predicts higher values of transverse current density than does the extended layer model, but without major changes in the results.





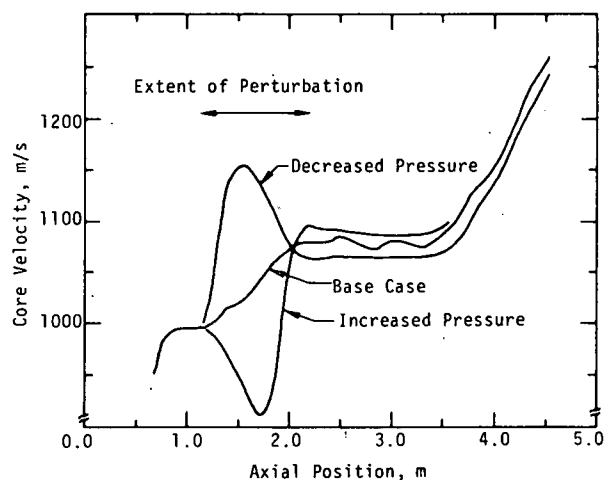


Fig. 6.1a (top left) Effect of assumed enthalpy profile on calculated distribution of core velocity

Fig. 6.1b (top right) Transverse core current density as a function of axial position (for three values of "n" in Eq 6.9)

Fig. 6.2 (lower left) Effect of local perturbation of pressure on calculated distribution of core velocity (using a localized perturbation of ± 5% from the measured distribution of pressure

6.1.3 Calculations of Boundary Layer and Wall Resistance Characteristics

With the core properties well established, the boundary layer and wall leakage parameters can be determined from the model. As has been discussed, the boundary layer thickness is determined from the measured core velocity, local area, and assumed profile shapes. The enthalpy profile shape (i.e., the quantity, "n") is determined such that the calculated value of the plasma resistance parameter agrees with the value inferred from the data. Typically, the results of Tests 6 and 7 indicate total enthalpy power law coefficients of ~4; care must be taken in interpreting this number, because it represents the combined effect of thickness and profile shape (i.e., the enthalpy defect). This is the proper parameter by which to compare models.

The final quantity of interest is the interframe leakage resistance. If the entire discrepancy between the experimentally measured axial field and the value determined from the local analysis is attributed to leakage, Eq 6.6 can be used to determine the value of the interframe resistance.

6.1.4 Results for Tests No. 6 and 7

Calculations were done for six conditions of Tests 6 and 7. The record numbers and values of the main parameters are given for each of these cases in Table 6.1. All channel flow calculations are started at an axial location of 0.7 m. The inlet conditions were established by a heat balance and nozzle flow calculation, using the measured stagnation pressure and the measured static pressure at that location, PC2 or PC12, depending on which was more reliable. In the case of the cesium run, the combustor pressure was not measured directly and was determined to be consistent with an estimated displacement thickness at the inlet region. The conditions at station PC2, PC12 are shown for the six cases in Table 6.2. The plasma conductivities shown in the table are for 100 % seed ionization.

The results for the primary quantities are summarized in Figs. 6.3a--6.3f as axial distributions of velocity, temperature, transverse current density,

Table 6.2
Channel Inlet Conditions for Cases Chosen for Analysis

Case	Pressure Tap	Pressure, atm	Core Velocity, m/s	Core Temp, K	Stagnation Temp, K	Core Conductivity, S/m
1	PC2	2.30	962	2828	2951	13.7
2	PC12	1.93	1046	2762	2908	9.3
3	PC12	1.82	1035	2773	2848	10.4
4	PC12	1.28	1075	2723	2823	10.4
5	PC2	1.65	1061	2690	2913	8.1
6	PC12	1.19	1133	2647	2873	7.6

Table 6.1

Main Parameters of Operating Modes Chosen for Analysis

Case	Seed	Test No.	Mass Flow Rate, kg/s	ψ_{O_2}, vol %	Combustor Pressure, atm	Combustor Heat Loss, MW	Preheat Temp, K	Max Power Conditions ANL Meas No.	Max Power Conditions Time	Max Current Conditions ANL Meas No.	Max Current Conditions Time
1	Cs	7	5.00	50.3	3.69	2.12	1184	5880	00:30:22	5886	00:31:22
2	K	7	5.01	49.2	3.47	1.98	1184	5656	22:38:58	5686	22:43:58
3	K	7	4.49	50.8	3.17	1.75	1175	5621	22:00:43	5586	21:54:52
4	K	7	3.36	51.2	2.39	1.38	1161	5495	20:56:26	5542	21:04:16
5	K	6	4.55	46.3	3.06	2.14	1189	5475	19:21:41	5483	19:39:35
6	K	6	3.58	48.6	2.43	1.85	1158	5372	18:49:13	5385	18:51:28

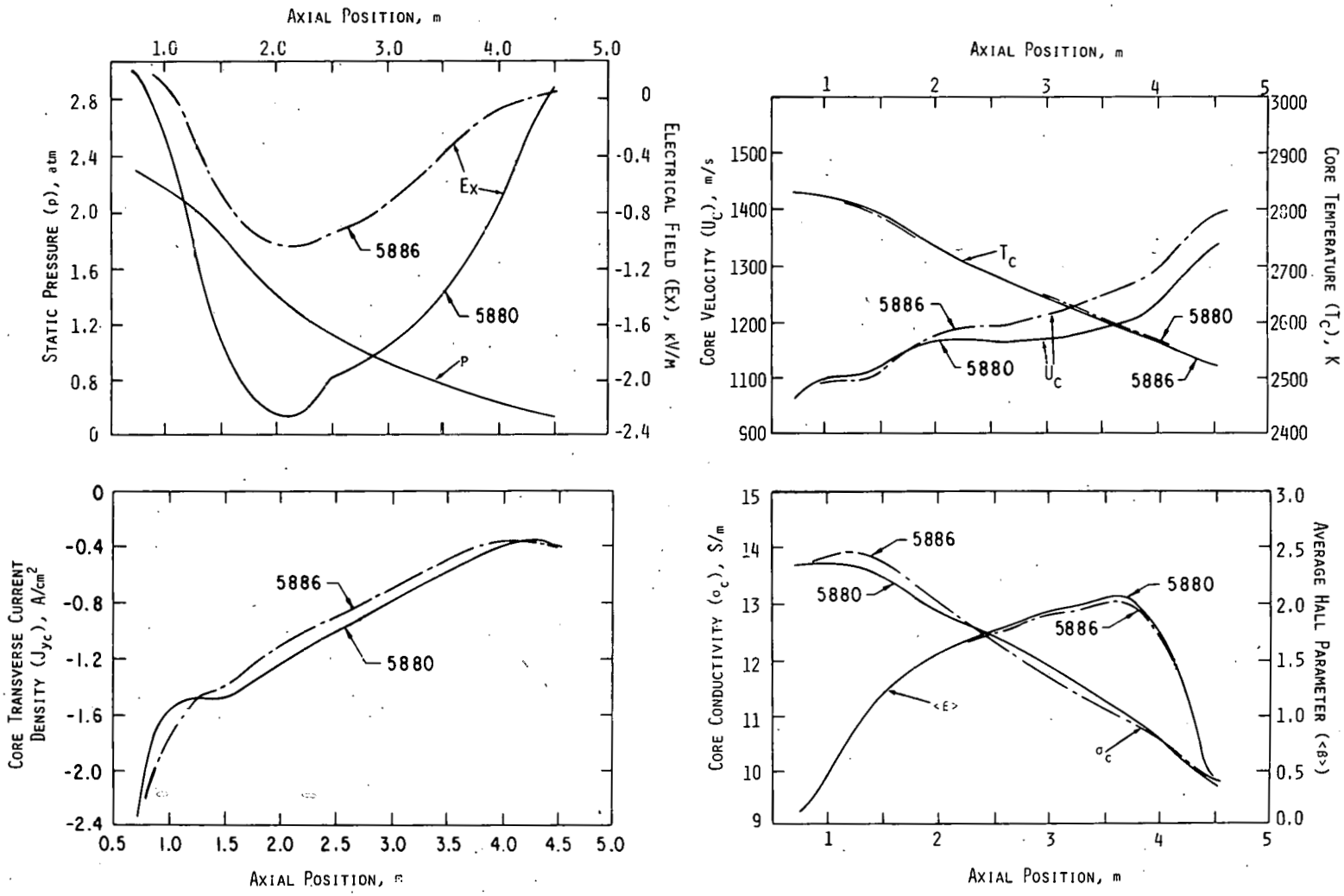


Fig. 6.3a Primary results of local analysis, Test No. 7; curves identified by ANL Meas No.; cesium seed G = 5 kg/s, Ψ_{O_2} = 50 vol %, B = 5 T

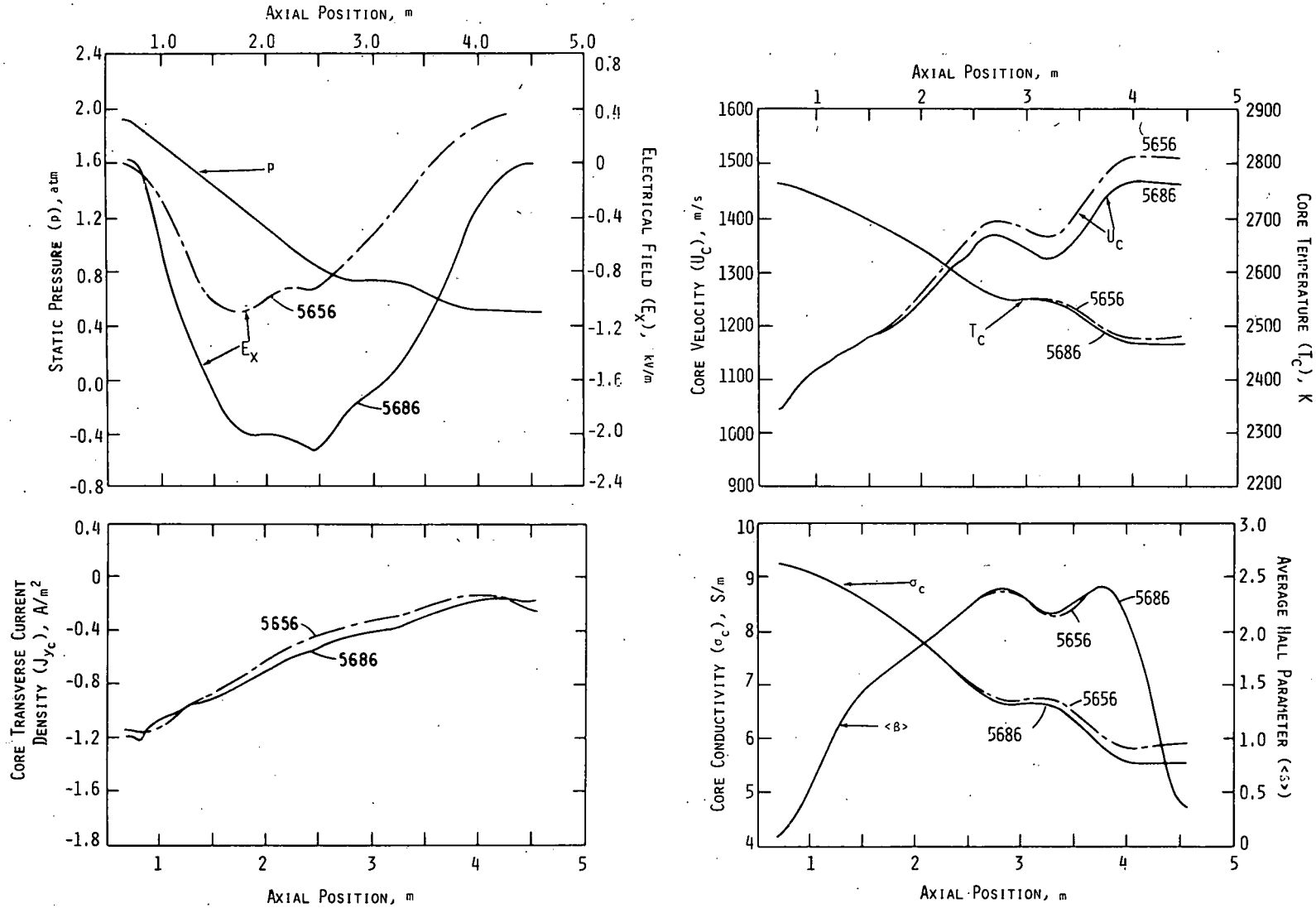


Fig. 6.3b Primary results of local analysis, Test No. 7; curves identified by ANL Meas No.; potassium seed G = 5 kg/s, Ψ_{O_2} = 49 vol %, B = 5 T

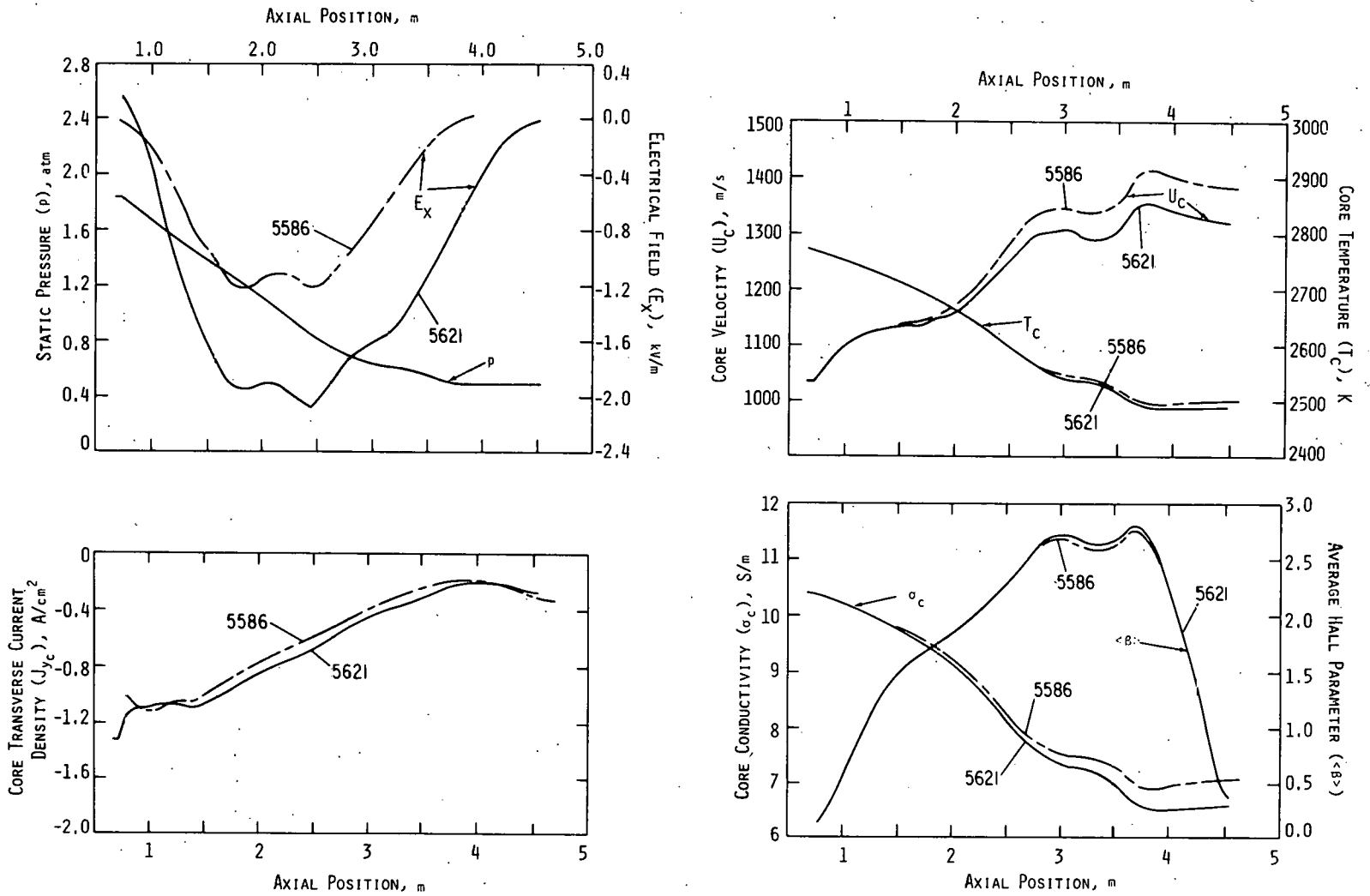


Fig. 6.3c Primary results of local analysis, Test No. 7; curves identified by ANL Meas No.; potassium seed G = 4.5 kg/s, Ψ_{O_2} = 51 vol %, B = 5 T

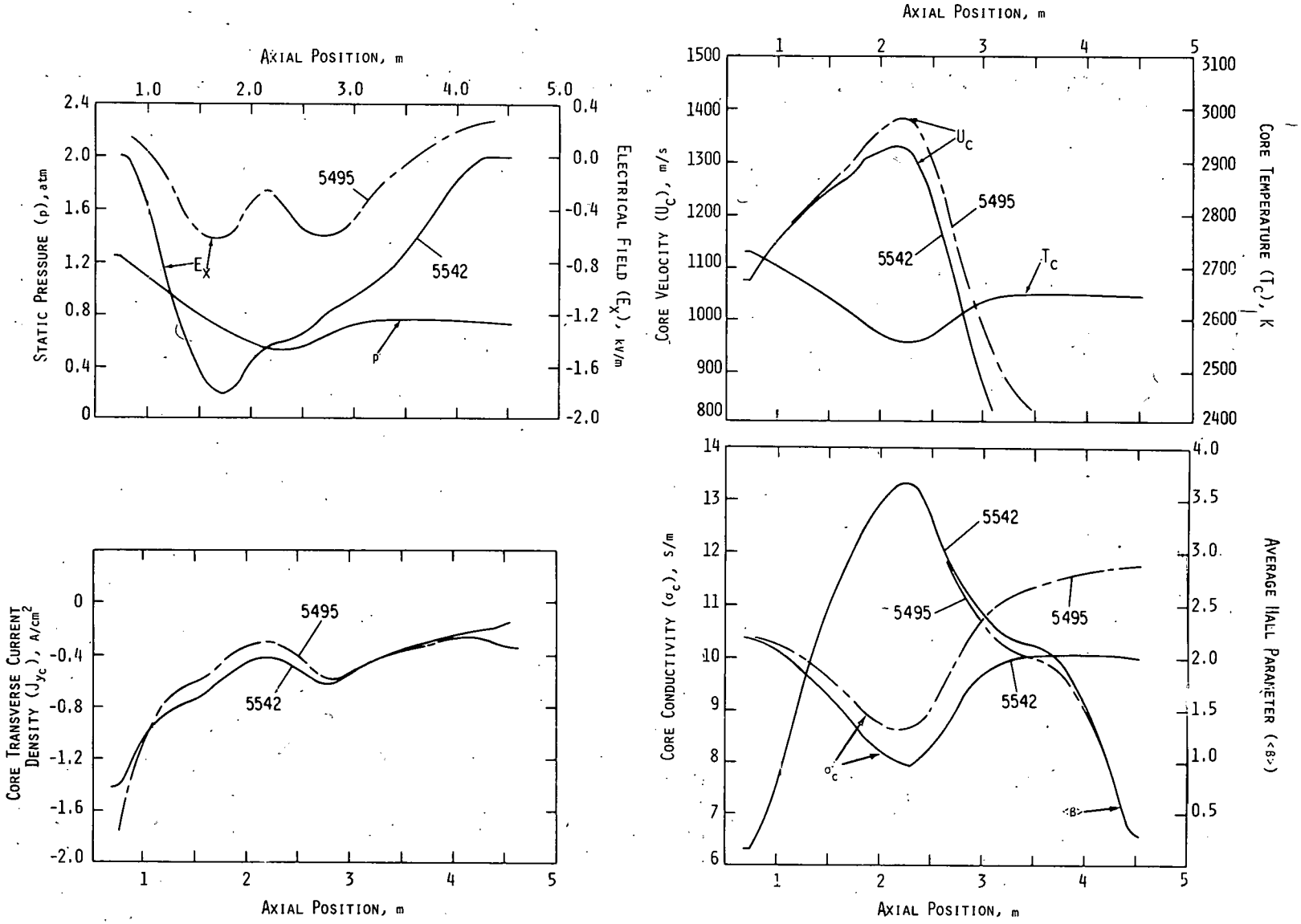


Fig. 6.3d Primary results of local analysis, Test No. 7; curves identified by ANL Meas No.; potassium seed G = 3.4 kg/s, Ψ_{O_2} = 51 vol %, B = 5 T

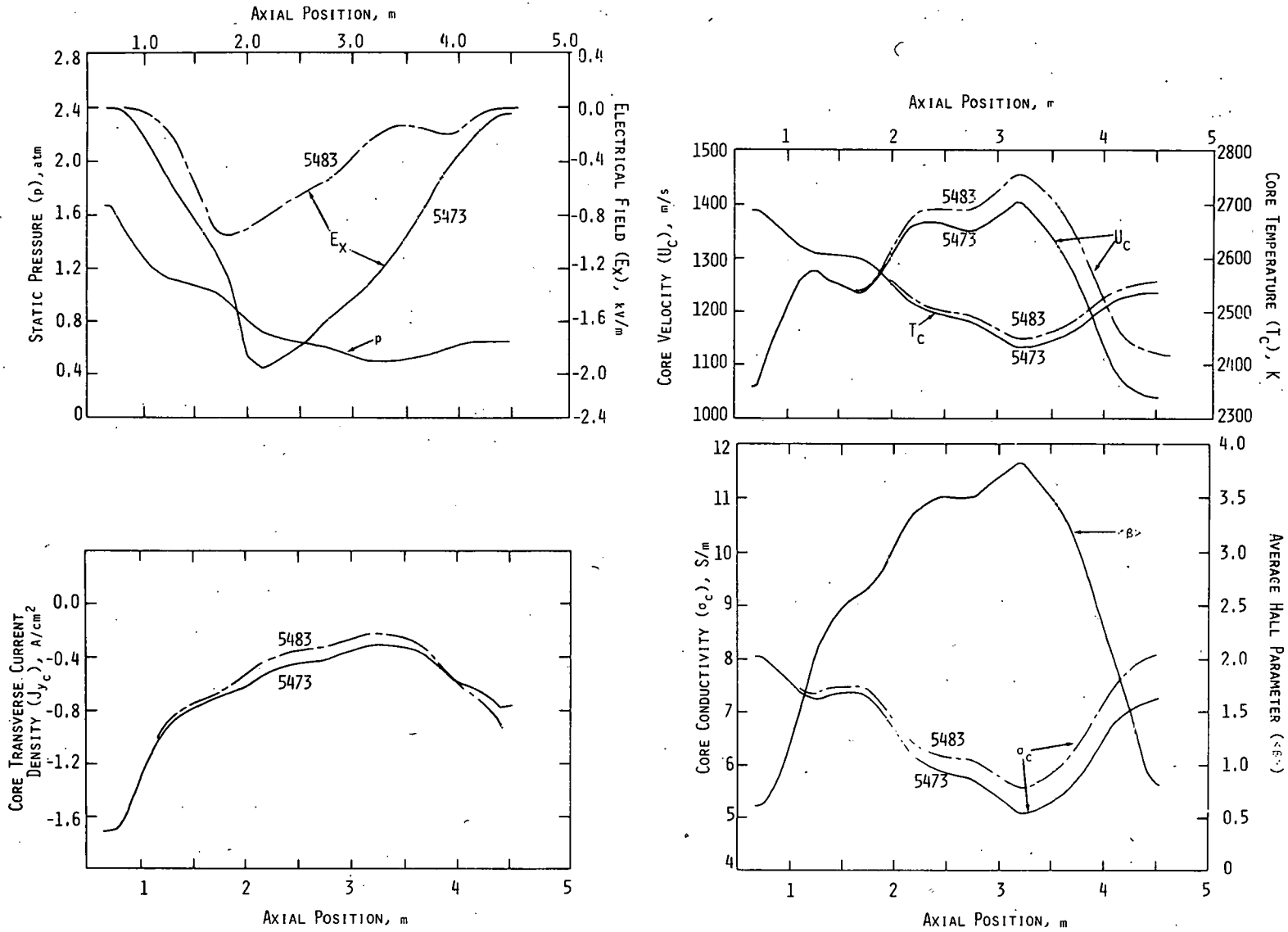


Fig. 6.3e Primary results of local analysis, Test No. 6; curves identified by ANL Meas No.; potassium seed; G = 4.5 kg/s, Ψ_{O_2} = 46 vol %, B = 5 T

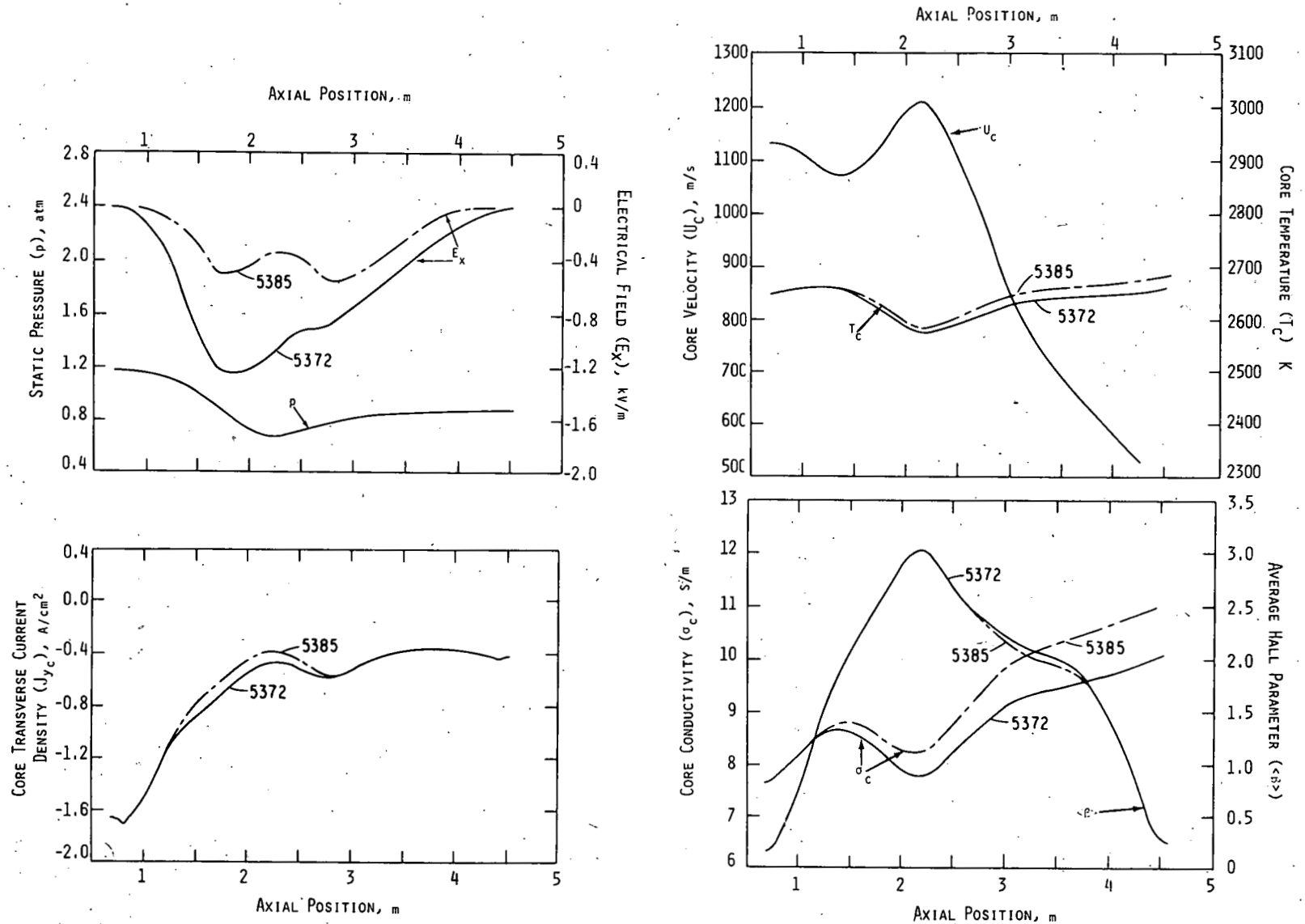


Fig. 6.3f Primary results of local analysis, Test No. 6; curves identified by ANL Meas No.; potassium seed; G = 3.6 kg/s, Ψ_{O_2} = 49 vol %, B = 5 T

core conductivity, and Hall parameter averaged over the cross section. The experimentally measured pressure distribution and the two axial field distributions for which calculations were made, are also shown in the figures.

It can be seen from these figures that, for all operating conditions with potassium seed, supersonic flow existed in the upstream portion of the channel; transition to subsonic flow was effected through a shock system. The location of the shock system depended, as in previous tests, on the mass flow rate; the location moved in the downstream direction with increasing mass flow rate. Beyond 4.5 kg/s, supersonic flow extended throughout the active portion of the channel. It appeared that, as the mass flow rate of combustion products increased, shock intensity was reduced. This may be the result of increased electromagnetic interaction.

For both tests, the low mass flow rate cases show a strong shock at approximately 2.5 m. At the same location, a depression in the axial field distribution develops as the load current is increased; this behavior may be associated with local separation resulting from the shock/boundary layer interaction.

For the cesium seed conditions, the flow is subsonic at the channel inlet, accelerates in the downstream direction to sonic speed, and remains close to sonic through most of the active portion of the channel. After the downstream takeoff region, the flow accelerates further, indicating a shock somewhere in the diffuser. It should be noted, from Fig. 6.3, that electrical loading has no significant effect on the distribution of gasdynamic parameters, despite the fact that load current was varied over a wide range in obtaining the V-I characteristics of the generator.

The results for the secondary parameters are presented, in Figs. 6.4a-6.4f, as axial distributions of boundary layer displacement thickness, enthalpy power law coefficient, and wall leakage resistance. The power law coefficient values for the higher mass flow rate cases of Test 7 are consistently at the level of 4 to 5. For these cases, the calculated displacement thickness changes very little over the first 2.5 m of the channel. For the

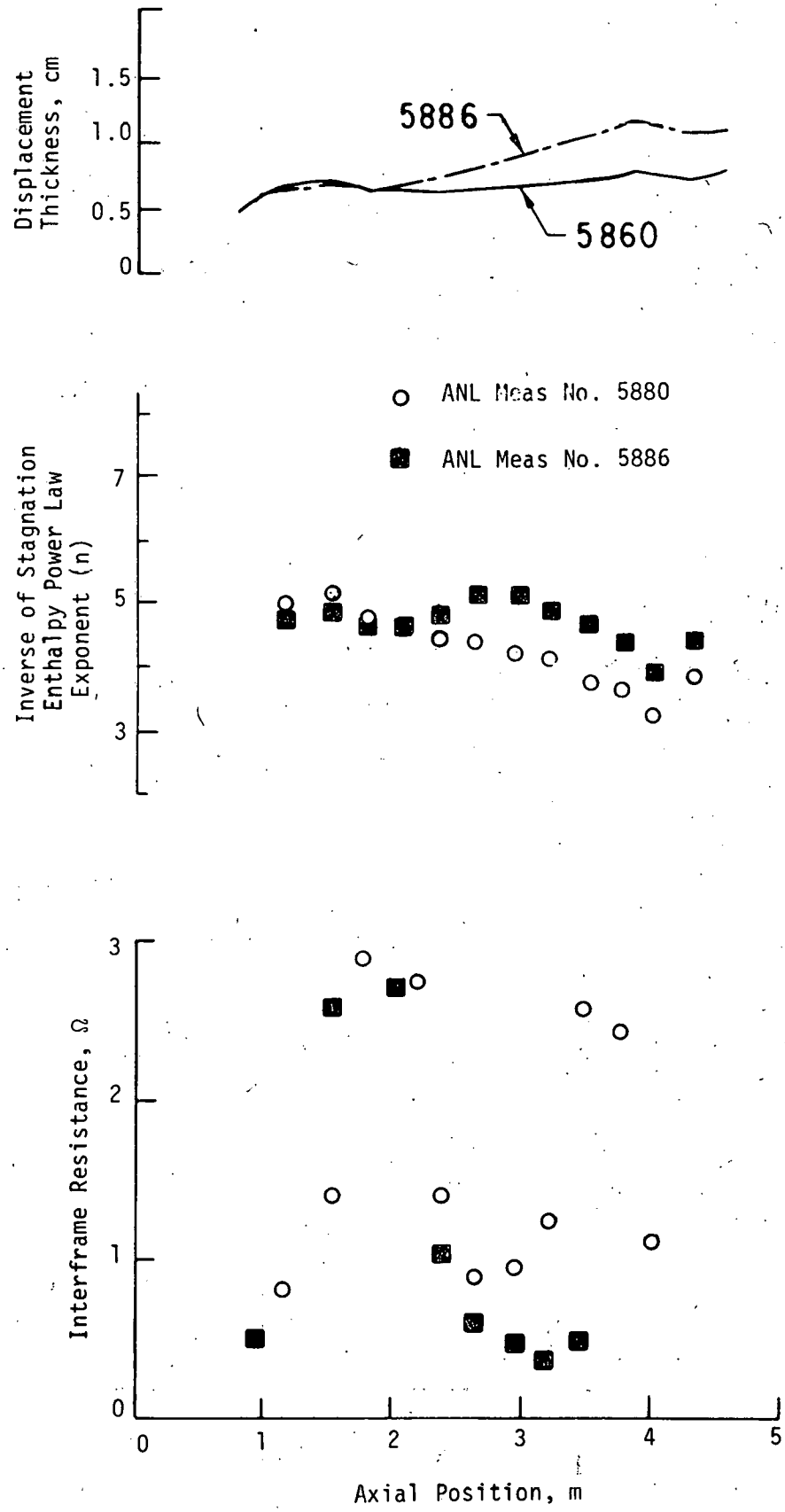


Fig. 6.4 a Variation with axial position of displacement thickness, of n, and of interframe resistance; Test No. 7, ANL Meas Nos. 5880 and 5886; Cs seed; G = 5 kg/s, inlet core conductivity = 11.7 S/m

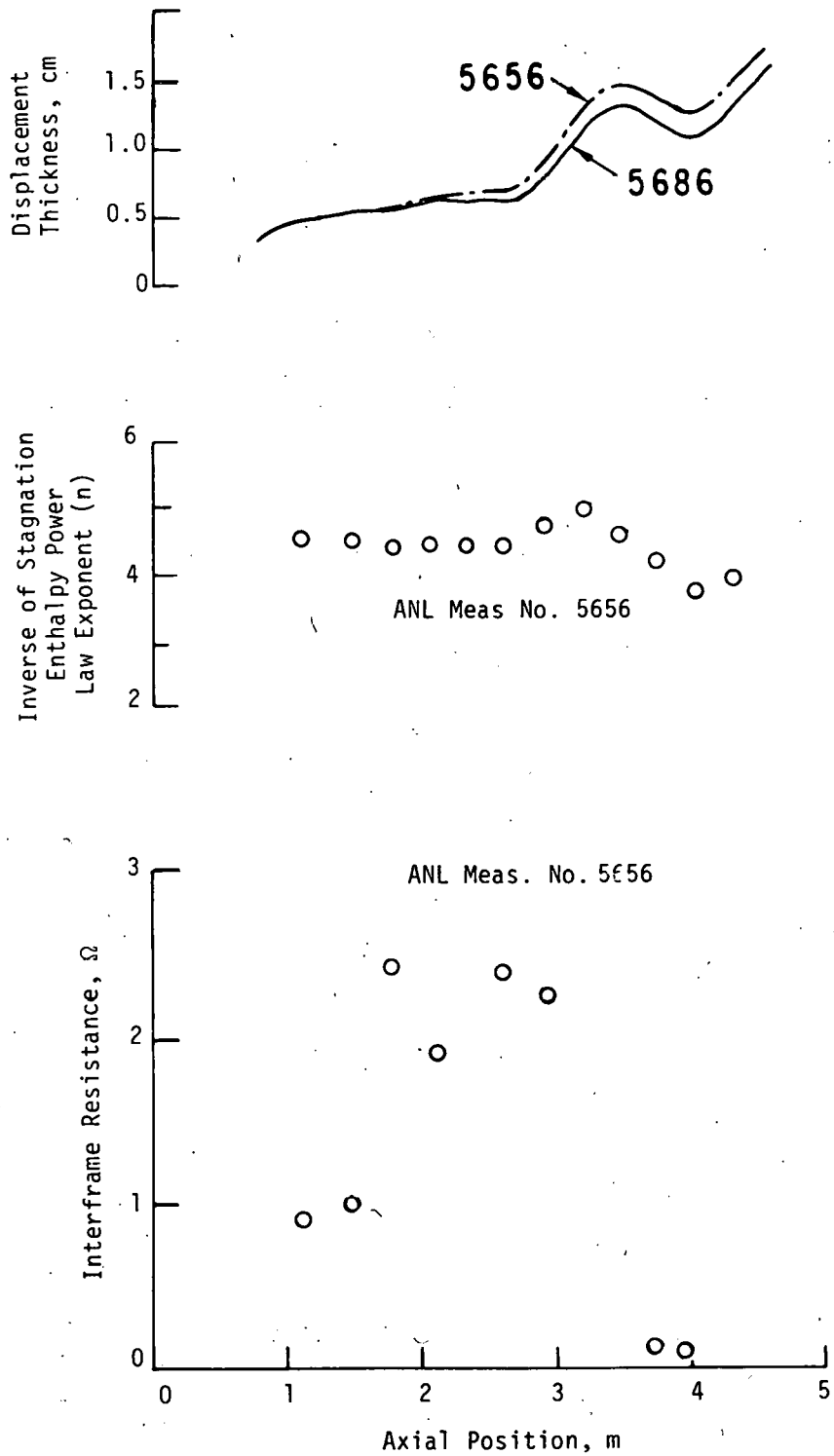


Fig. 6.4b Variation with axial position of displacement thickness, of n, and of interframe resistance; Test No. 7, ANL Meas Nos. 5656 and 5686; K seed; G = 5 kg/s, inlet core conductivity = 7.9 S/m

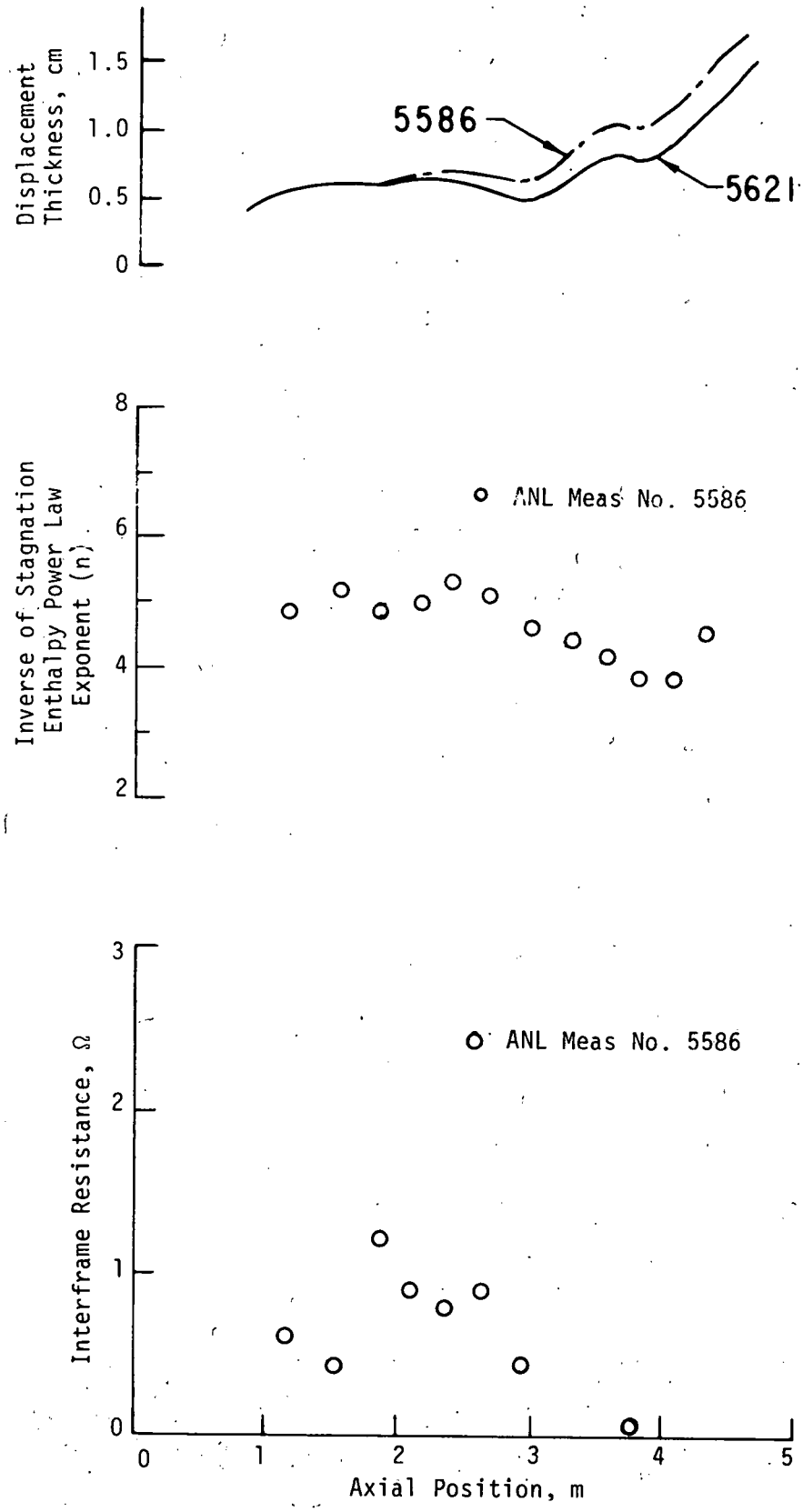


Fig. 6.4c Variation with axial position of displacement thickness, of n, and of interframe resistance; Test No. 7, ANL Meas Nos. 5621 and 5586; K seed; G = 4.5 kg/s, inlet core conductivity = 8.8 S/m

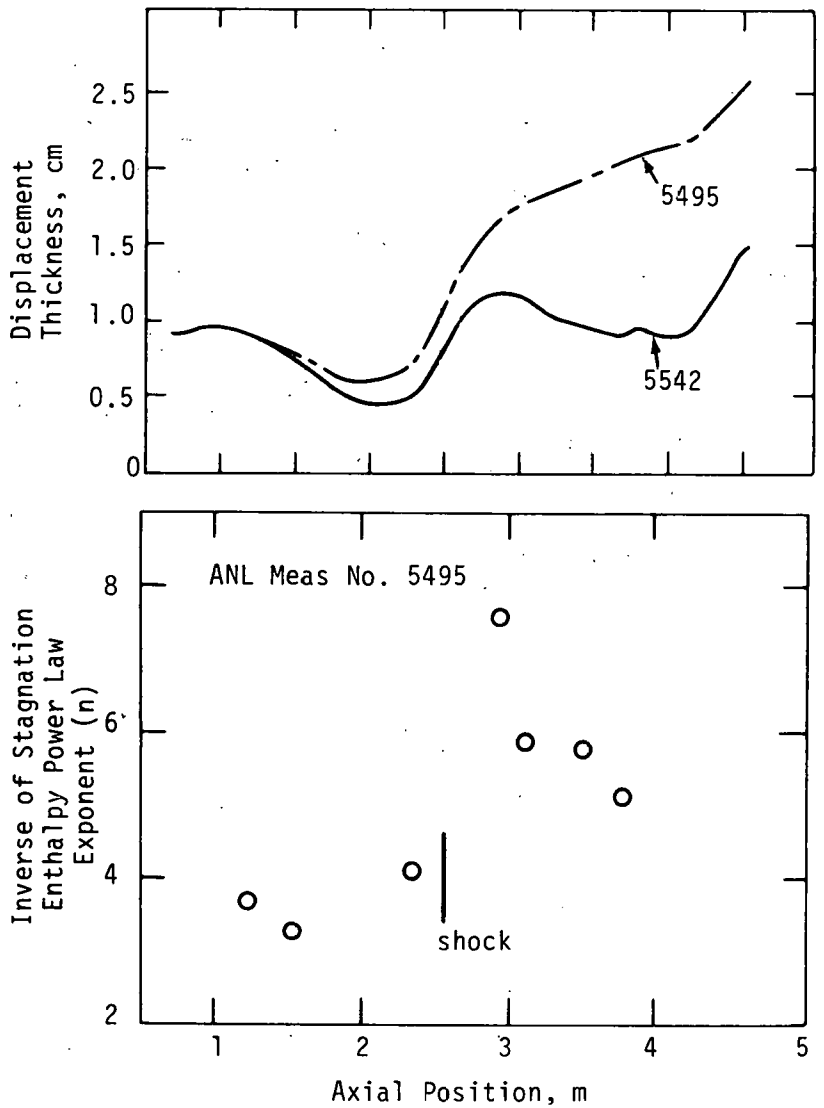


Fig. 6.4d Variation of displacement thickness and n with axial position; Test No. 7, ANL Meas Nos. 5495, 5542; K seed; G = 3.5 kg/s

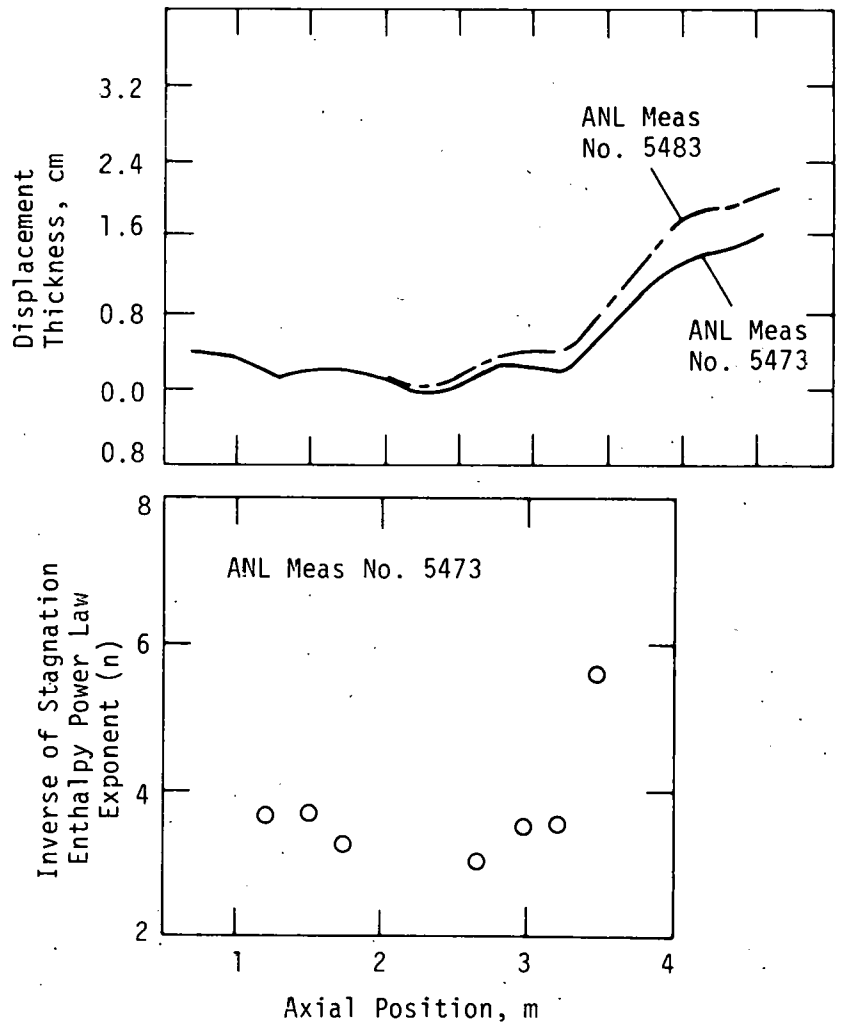


Fig. 6.4e Variation of displacement thickness and n with axial position; Test No. 6, ANL Meas Nos. 5473, 5483; K seed; G = 4.5 kg/s

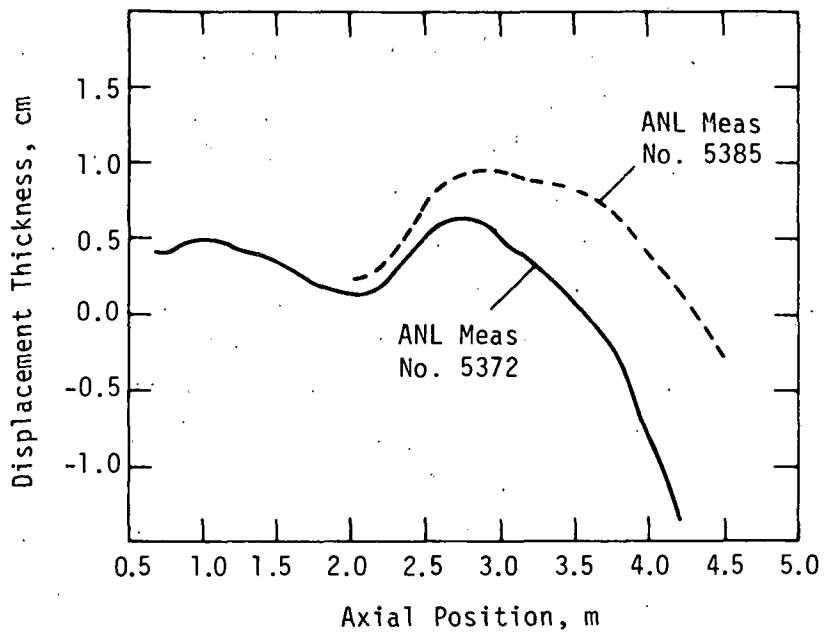


Fig. 6.4f Variation of displacement thickness with axial position; Test No. 6, measurement number is curve identification; potassium seed, G = 3.5 kg/s

remaining cases where a shock was present in the channel, the displacement thickness and power law coefficient show complex behavior, including regions of zero or negative displacement thickness. The results from Test No. 7 show that, at 3.5 kg/s, the displacement thickness decreases to zero upstream of the shock, then grows rapidly downstream of the shock location.

Interframe leakage resistances are presented only for the first 3 cases in Table 6.1; the results for the remaining cases were, generally, more scattered than for these cases and indicated lower values of leakage resistance. The values of the interframe resistances depend on the inlet conductivity values, although the trends of the axial distributions do not. This is in contrast to the primary quantity calculations, where the results are insensitive to inlet conditions. For this reason, and because it was felt that the inlet conductivities given in Table 6.2 were high, the leakage resistances were calculated for inlet conductivities equal to 85 % of those in Table 6.2. Under these conditions the general level of leakage resistance is 0.7 to 1.3 ohm; however, the results show considerable axial variation of the leakage resistance. Further analysis is necessary to determine if these variations are of significance.

A different approach than that described above can be used to determine the distribution of the gasdynamic parameters. According to this approach,

the distributions of the average gasdynamic and electrophysical plasma parameters are determined, using energy conservation considerations, from measured static pressure distribution, channel heat losses, and electrical power output. The calculated combustion temperatures are also used, after they are modified to allow for combustor heat losses, seed injection, and additional injection of cold air that enters through purges of the igniter, seed injection nozzles, and optical ports. Core values of the various parameters can be computed from average values, if appropriate boundary layer profile functions are introduced. In addition to the calculation of gasdynamic parameters, an electrical model similar to the one outlined above is used to obtain the local electrical parameters. This approach has been presented in more detail elsewhere [2].

Table 6.3 lists the results of studying the gasdynamic parameters by this method. It should be pointed out that these results depend on the measured pressure distribution. Because the pressure ports of the channel were not purged during the test, they became plugged intermittently, and yielded unreliable pressure readings. The only means of determining whether a pressure reading is reliable is to inspect the pressure history of a given port and determine whether it is responding to combustor pressure changes. Samples of these histories are given in Appendix A. The results given in Table 6.3 agree with those of Table 6.2 and Figs. 6.3a-6.3f. This confirms the accuracy of both methods in reducing the gasdynamic data obtained in the tests.

The latter method was also used to compute the coefficient, K_σ, that accounts for possible incomplete ionization, and the value of the nonuniformity parameter, α, for a power generating mode (IVTAN Meas No. 1864). The variation of K_σ with X is shown in Fig. 6.5, and that of α with X is shown in Fig. 6.6. As seen in Fig. 6.5, K_σ ranges between 0.9 and 1.0, indicating that the seed ionization process was nearly complete.

In performing these calculations, the effect of nonideal channel insulation was taken into account. The ratio of axial plasma resistance to the corresponding equivalent channel wall resistance was taken to be 0.025. The value for the equivalent wall channel resistance was obtained from measurements with an applied external source at the beginning of Test No. 6, shortly

Table 6.3

Distribution of Gasdynamic Parameters

During Tests No. 6 and No. 7 at the U-25B Facility

Test No.	IVTAN Meas No.	Operating Mode Parameters	x, m	p, kg/cm^2	p_o, kg/cm^2	$T_{p\ell}$, K	T_o, K	<U>, m/s	Mach No.
6	939	G = 3.29 kg/s	0.15	1.285	2.174	2730	2858	981	0.992
		p_{comb} = 2.21 kg/cm^2	0.70	1.185	2.148	2692	2335	1033	1.055
		Ψ_{O_2} = 49 vol %	1.20	0.899	1.955	2622	2807	1165	1.211
		B = 3.94 T	1.71	0.760	1.660	2587	2769	1157	1.214
		Power = 296.7 kW	2.21	0.579	1.410	2531	2734	1221	1.297
		V_x = 1541 V	2.72	0.776	1.125	2609	2698	794	0.829
		Seed: K = 0.98 mass %	3.22	0.842	1.060	2616	2673	625	0.651
			3.72	0.872	1.028	2607	2648	528	0.551
			4.23	0.886	1.013	2592	2625	472	0.494
			4.81	0.945	1.040	2576	2600	398	0.418
6	1091	G = 4.2 kg/s	0.15	1.906	2.852	2783	2883	870	0.867
		p_{comb} = 2.89 kg/cm^2	0.70	1.609	2.743	2721	2885	986	1.00
		Ψ_{O_2} = 48.9 vol %	1.20	1.010	2.690	2598	2830	1305	1.365
		B = 4.9 T	1.71	1.006	2.109	2614	2789	1133	1.181
		Power = 903 kW	2.21	0.711	1.844	2528	2753	1265	1.344
		V_x = 3451 V	2.72	0.591	1.525	2493	2713	1250	1.339
		Seed: K = 1.02 mass %	3.22	0.520	1.252	2474	2675	1196	1.287
			3.72	0.654	1.025	2532	2640	859	0.912
			4.23	0.693	0.972	2529	2612	743	0.789
			4.81	0.745	0.948	2520	2580	624	0.664

Table 6.3 (cont'd.)
Distribution of Gasdynamic Parameters
During Tests No. 6 and No. 7 at the U-25B Facility

Test No.	IVTAN Meas No.	Operating Mode Parameters	x, m	p, kg/cm^2	p_o, kg/cm^2	$T_{p\ell}$, K	T_o, K	<U>, m/s	Mach No.
7	1068	G = 4.49 kg/s	0.15	2.097	3.091	2799	2895	858	0.851
		p_{comb} = 3.29 kg/cm^2	0.70	1.626	2.962	2720	2870	1048	1.062
		Ψ_{O_2} = 50.9 vol %	1.20	0.996	3.117	2583	2854	1410	1.479
		B = 4.98 T	1.71	0.825	2.697	2542	2822	1423	1.507
		Power = 1115 kW	2.21	0.798	1.952	2568	2777	1231	1.302
		V_x = 4159 V	2.72	0.705	1.564	2555	2736	1161	1.226
		Seed: K = 1.02 mass %	3.22	0.637	1.289	2544	2701	1086	1.150
			3.72	0.639	1.101	2549	2671	952	1.007
			4.23	0.590	1.040	2527	2646	935	0.994
			4.81	0.803	1.025	2566	2623	636	0.670
7	1849	G = 5.04 kg/s	0.15	2.444	3.522	2830	2922	840	0.826
		p_{comb} = 3.96 kg/cm^2	0.70	2.358	3.449	2803	2899	850	0.842
		Ψ_{O_2} = 50.6 vol %	1.20	2.119	3.057	2777	2868	828	0.826
		B = 4.97 T	1.71	1.616	2.522	2720	2830	900	0.912
		Power = 1485 kW	2.21	1.245	2.055	2671	2794	943	0.968
		V_x = 4026 V	2.72	1.052	1.704	2644	2754	918	0.948
		Seed: Cs = 1.32 mass %	3.22	0.894	1.437	2612	2719	902	0.940
			3.72	0.762	1.244	2578	2688	909	0.955
			4.23	0.618	1.132	2525	2660	999	1.063
			4.81	0.617	1.017	2516	2629	903	0.963

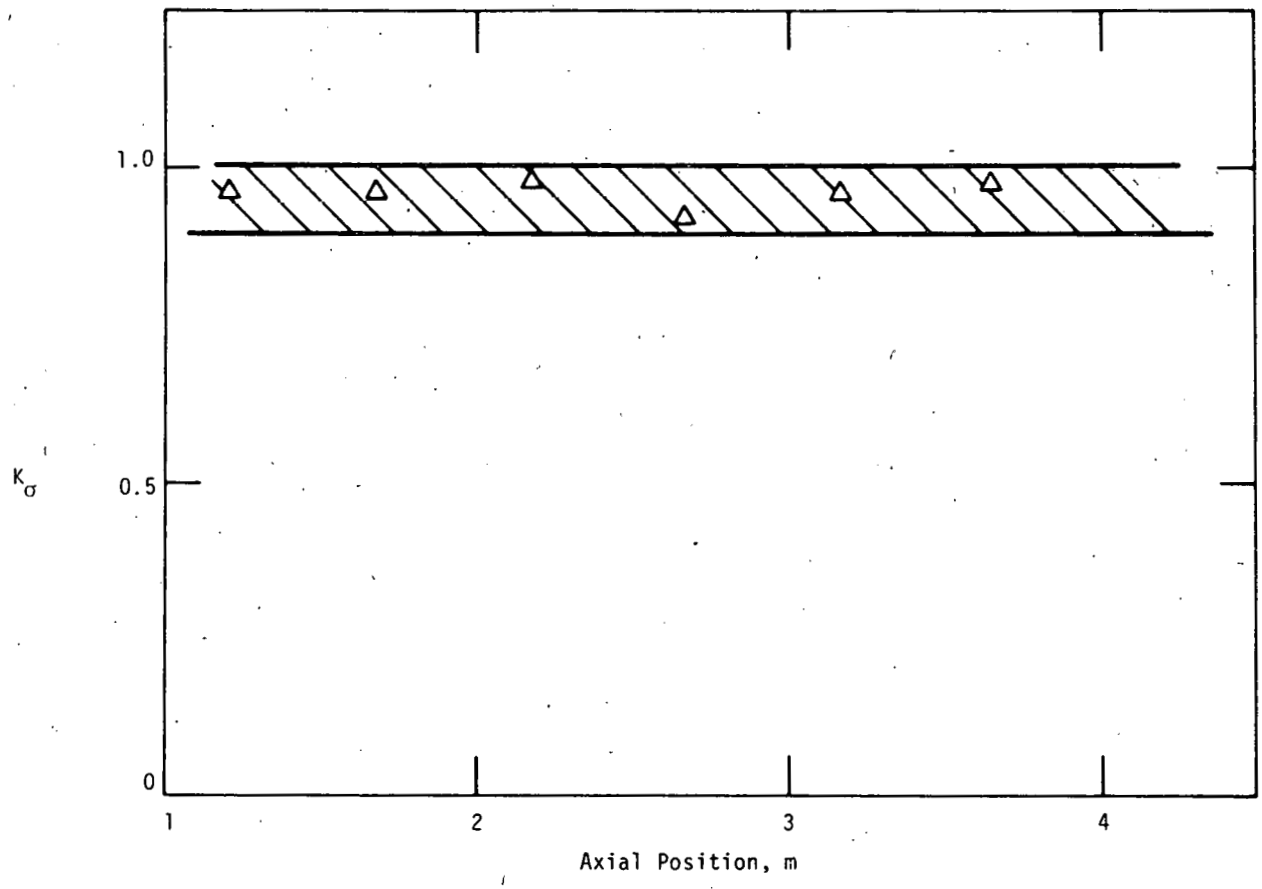


Fig. 6.5 Coefficient of seed ionization, K_σ, as a function of axial position during operation with Cs seed; Test No. 7, IVTAN Meas No. 1864

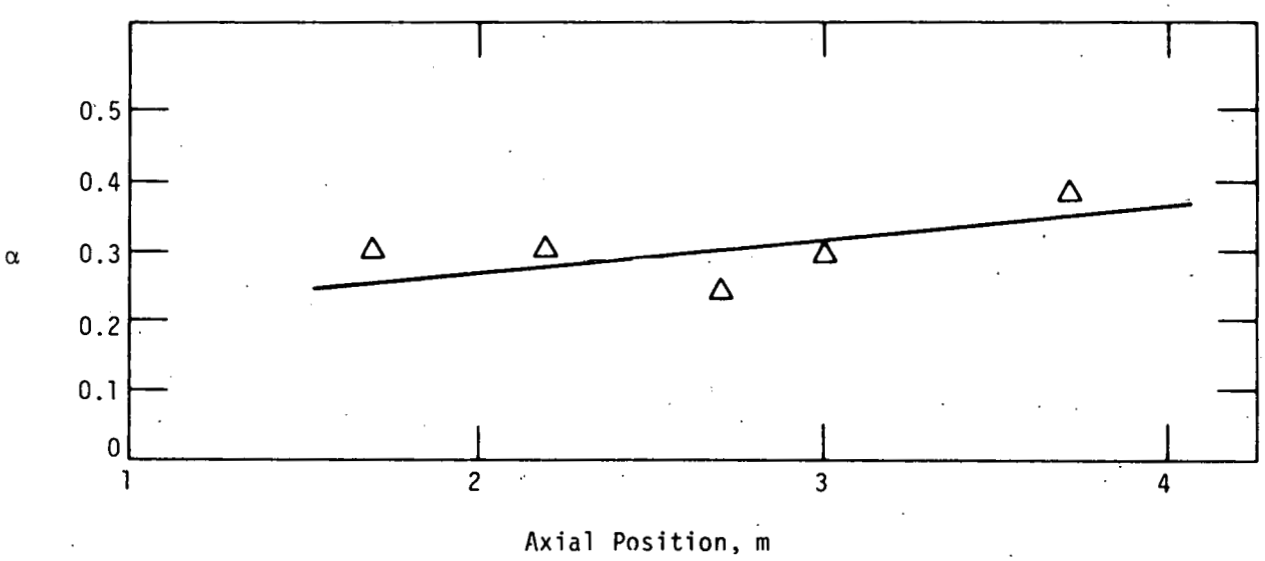


Fig. 6.6 Nonuniformity parameter, α, as a function of axial position during operation with Cs seed; Test No. 7, IVTAN Meas No. 1864

after seed injection was interrupted. In all probability, the resistance decreased in value with operation time of the channel and, consequently, the value 0.025 should be considered as a lower bound of the resistance ratio. At any rate, the power extracted from the channel during both tests, and the measured open-circuit voltage indicate that the channel had sufficient interframe insulation. The value of interframe resistance of a few ohms, assumed in the latter analysis, are of the same order of magnitude as the values of ~1 ohm obtained with the analysis presented at the beginning of this section. Other results of the two methods are compared in Table 6.4. In particular, average conductivity, average velocity, and the plasma resistance parameter, $\langle(1+\beta^2)/\sigma\rangle$, for several cross sections along the channel for the cesium seed case are compared. It is noted that there is close agreement (within 10 %) between the corresponding results.

Table 6.4
Comparison of "Local" Analyses

X, m	IVTAN σ_{exp}, S/m	U.S.A. σ_{exp}, S/m	IVTAN $(1+\beta^2)\ \langle 1/\sigma\rangle$, Ω•m	U.S.A. $(1+\beta^2)\ \langle 1/\sigma\rangle$, Ω•m	IVTAN $\langle U\rangle$, m/s	U.S.A. $\langle U\rangle$, m/s
1.2	13.28	10.5	0.38	0.33	830	880
1.7	10.48	9.0	0.6	0.47	896	920
2.21	8.68	9.5	0.81	0.55	972	970
2.72	7.38	9.2	0.88	0.67	925	1000
3.22	7.14	7.5	0.92	0.89	898	1000
3.72	6.47	6.4	0.98	0.89	911	1000

6.2 Comparison of Theoretical Predictions and Experimental Results

The performance of the channel was computed by using the ANL-developed quasi-three-dimensional MHD channel model [13] for Test No. 6 with potassium seed and for Test No. 7 with both potassium and cesium seeds, and the IVTAN quasi-one dimensional code [2,3] for Test No. 7 with cesium seed. A single terminal loading scheme was considered in the calculations, because the

inverter currents were basically balanced. The results of the calculations are compared with the experimental data in the following subsections.

6.2.1 Performance Prediction for Test No. 6

A high power-output case (ANL Meas No. 5473, 7/31/79, 19:37:52) and high load-current case (ANL Meas No. 5483, 7/31/79, 19:39:35) were selected for the analysis. The calculations were performed on the basis of the following assumptions:

1) heat loss, 8 % up to end of the constant area section (x = 0.6 m),
2) channel wall roughness, 1.0 mm,
3) channel wall temperature, 1650 K,
4) inlet (x = 0) boundary layer thickness, 0.01 m,
5) $K_\sigma = 1.0$.

For ANL Meas No. 5473, the conditions were: G = 4.345 kg/s; Ψ = 46 vol % B = 5 T; SR = 0.87, and I_L = 229 A. The best analytical predictions for the channel electrical performance were obtained with an assumed value of 0.5 Ω for interframe resistance. It should be mentioned that (as will be discussed in subsection 6.2.3) different assumptions about the magnitude of the wall temperature and, to a lesser degree, roughness, as well as actual conductivity levels different than those computed from the equilibrium property models, will result in different values for the interframe resistances necessary to provide satisfactory agreement between experiment and theory.

According to the analysis, the channel flow chokes near the end of the constant area section, then accelerates up to the station 3.5 meters from the inlet of the channel. The computed pressure distribution and the experimental data for Meas No. 5473 are shown in Fig. 6.7. The distribution for Meas No. 5483 is similar. Reasonably good agreement is observed. The experimental data indicate that there is a recovery of pressure at x ≈ 3.5 m, as a result of formation of shocks. The pressure histories shown in Appendix A indicate that some pressure taps were intermittently plugged during the test, so that the corresponding pressure readings are unreliable. These pressure measurements are identified in Fig. 6.7.

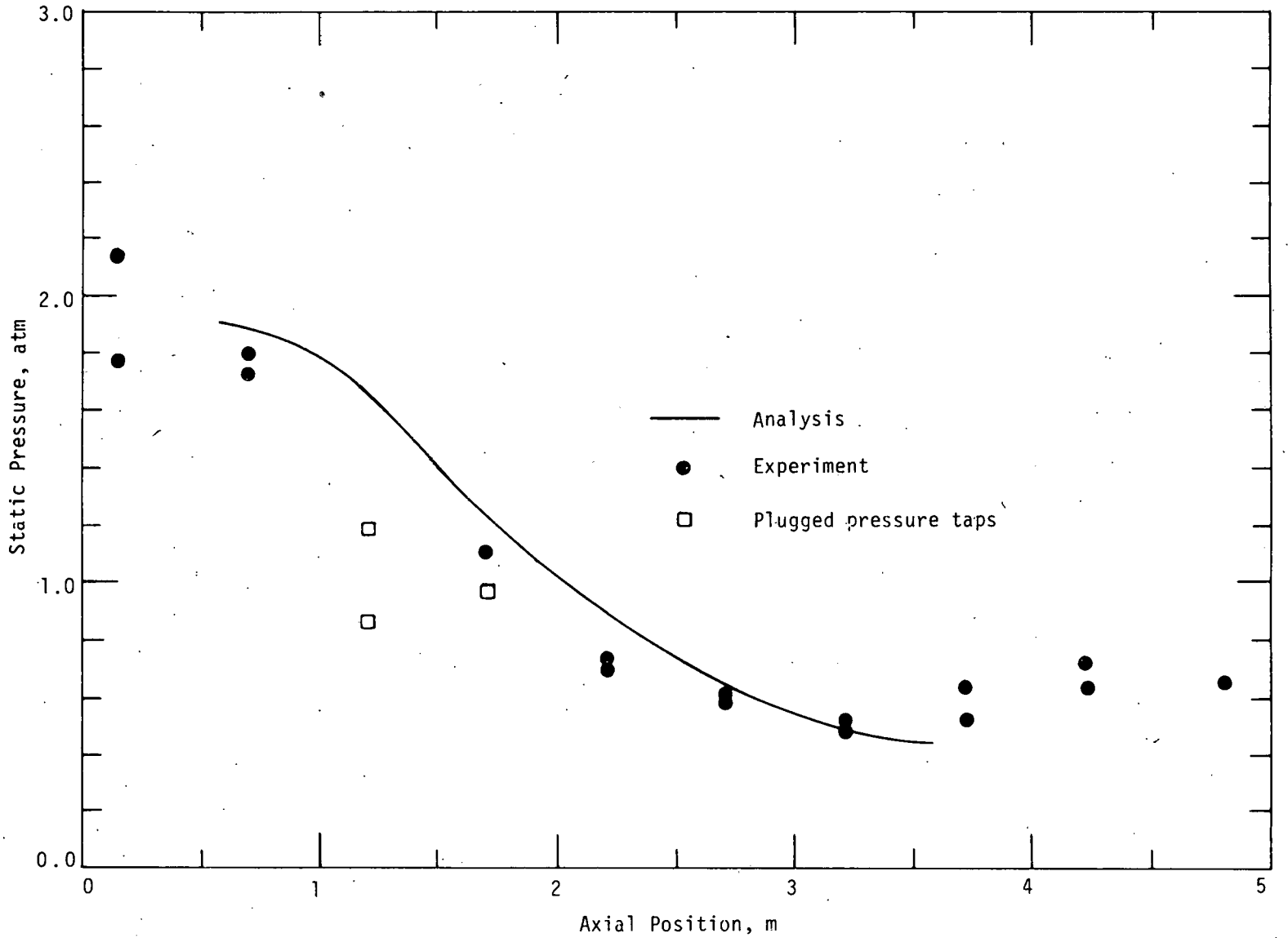


Fig. 6.7 Comparison of predicted with measured distribution of static pressure along the channel; Test No. 6, ANL Meas No. 5473 (19:37:52); B = 5 T, G = 4.3 kg/s, Ψ_{O_2} = 49 vol %, SR = 0.87

The calculated and measured voltage distributions for ANL Meas No. 5473 are plotted in Fig. 6.8. The predicted Hall voltage is 4234 V, compared with the measured voltage of 4270 V. The calculated operational points and the measured V-I characteristic of the channel are shown in Fig. 6.9.

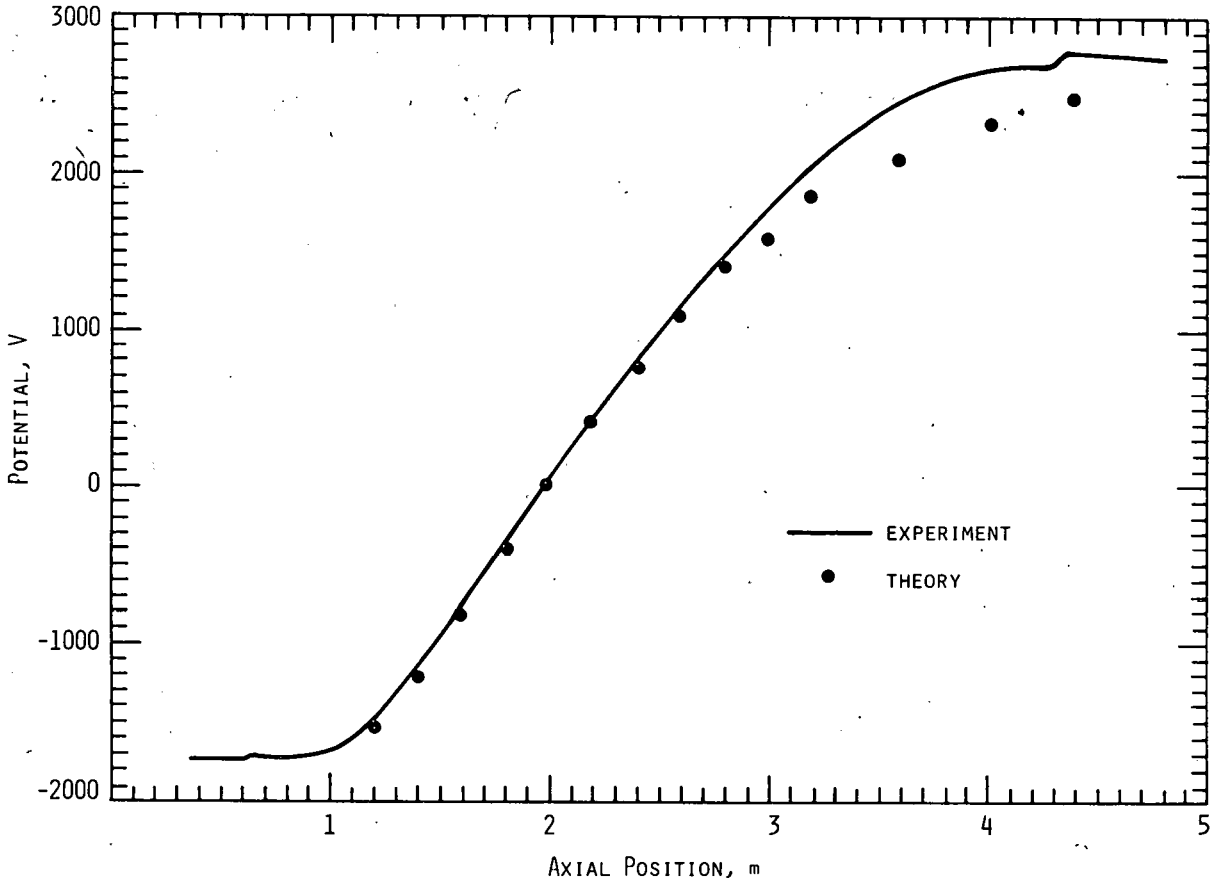
6.2.2 Performance Prediction for Test No. 7

Two sets of data were analyzed for Test No. 7; the first set is for high power-output runs with potassium seed, the other set for high power-output runs with cesium seed. The assumptions made in these analyses are similar to those of the subsection 6.2.1, except that 3.0 mm wall roughness is assumed and the heat loss is taken as 6 %.

Potassium Seed: Two sets of experimental data (ANL Meas No. 5586, 12/6/79, 21:54:52, and ANL Meas No. 5621, 12/6/79, 22:00:43) were analyzed. The operating conditions used in analysis of Meas No. 5621 are: $G = 4.6$ kg/s, $B = 5$ T, $\psi = 51$ vol %, SR = 0.87, and $I_L = 243$ A. An assumed value of 0.3 Ω for the interframe resistance was found to give results that best fit the experimental data for Hall potential and power output of the channel.

The calculated and measured pressure distributions along the channel for Meas No. 5621 are plotted in Fig. 6.10. The pressure distribution for Meas No. 5586 is similar. It is noted that, as in Test No. 6, some pressure taps were plugged during Test No. 7. These plugged taps are identified from the pressure histories and are noted in Fig. 6.10. As indicated by the analysis, the channel flow remains close to $M = 1.0$ in the first part of the channel, after the constant area section (up to $x = 1.4$ m). The flow then accelerates and a shock system occurs near $x = 4.0$ meters.

The calculated and measured voltage distributions for Meas No. 5621 are shown in Fig. 6.11. The calculated Hall voltage is 4896 V, compared with the measured voltage of 4777 V. The distribution of transverse current density, J_y, along the channel, as calculated by the quasi-three dimensional model, is compared in Fig. 6.12 with the values obtained from the local analysis given in Section 6.1.4. Fairly good agreement exists between these two calculations, except in the inlet region of the channel, where the magnetic field is



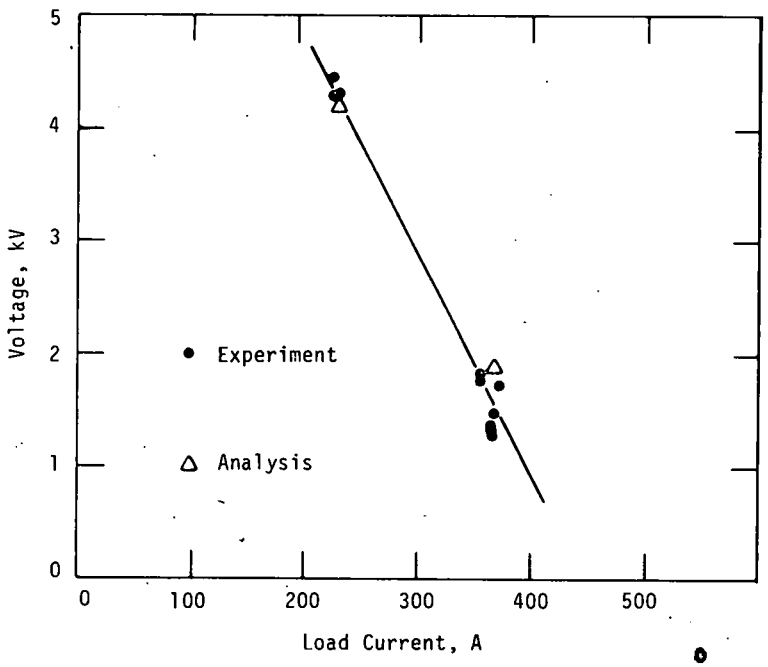


Fig. 6.8 Comparison of predicted with measured distribution of Hall potential along the channel; Test No. 6, ANL Meas No. 5473 (19:37:52) B = 5 T, G = 4.3 kg/s, SR = 0.87 Ψ_{O_2} = 49 vol %

Fig. 6.9 Predicted compared with measured V-I characteristics; Test No. 6, ANL Meas Nos. 5470-5490; T_w = 1650 K, roughness = 0.001 m, G = 4.3 kg/s, B = 5 T, SR = 0.87, Ψ_{O_2} = 49 vol %

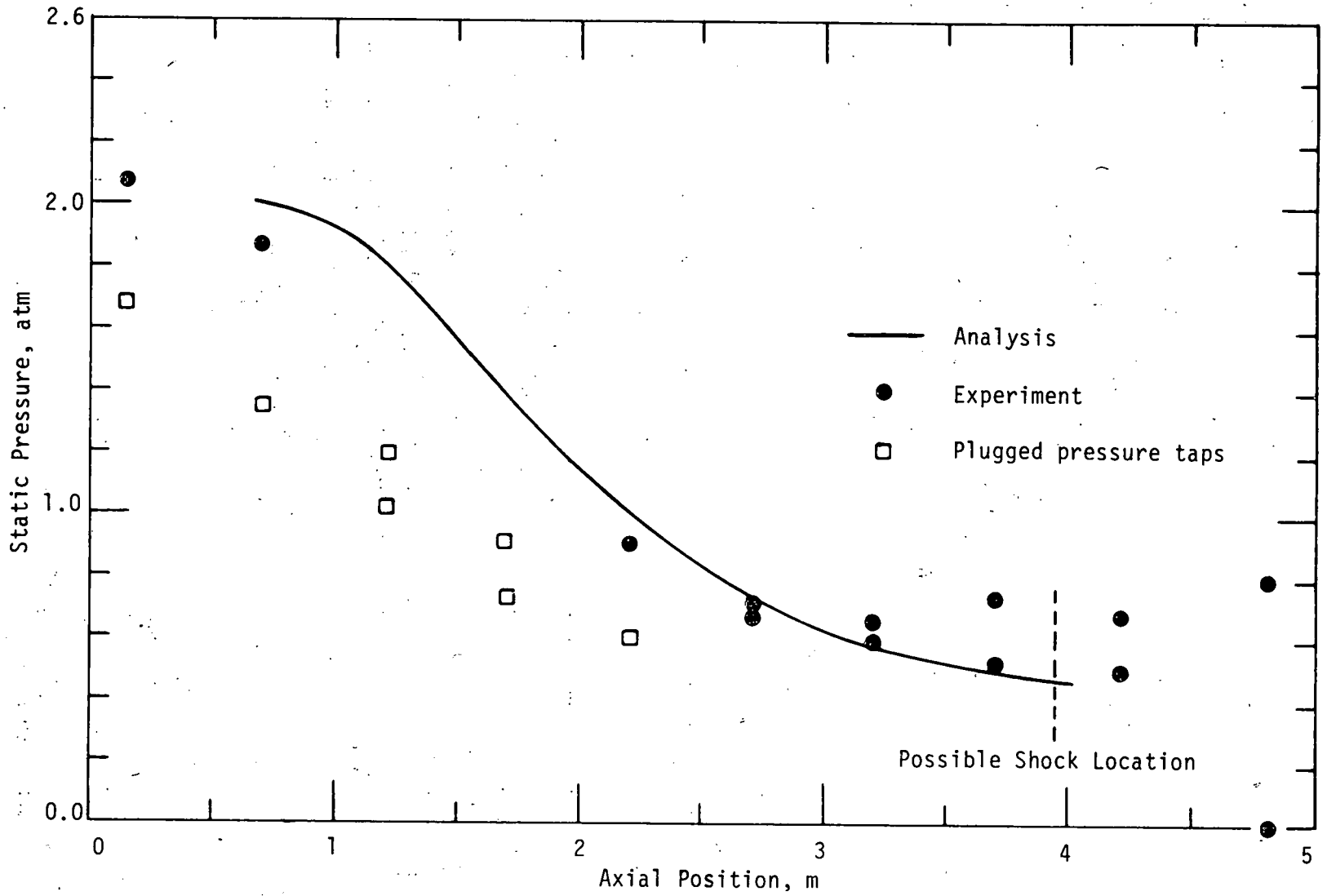
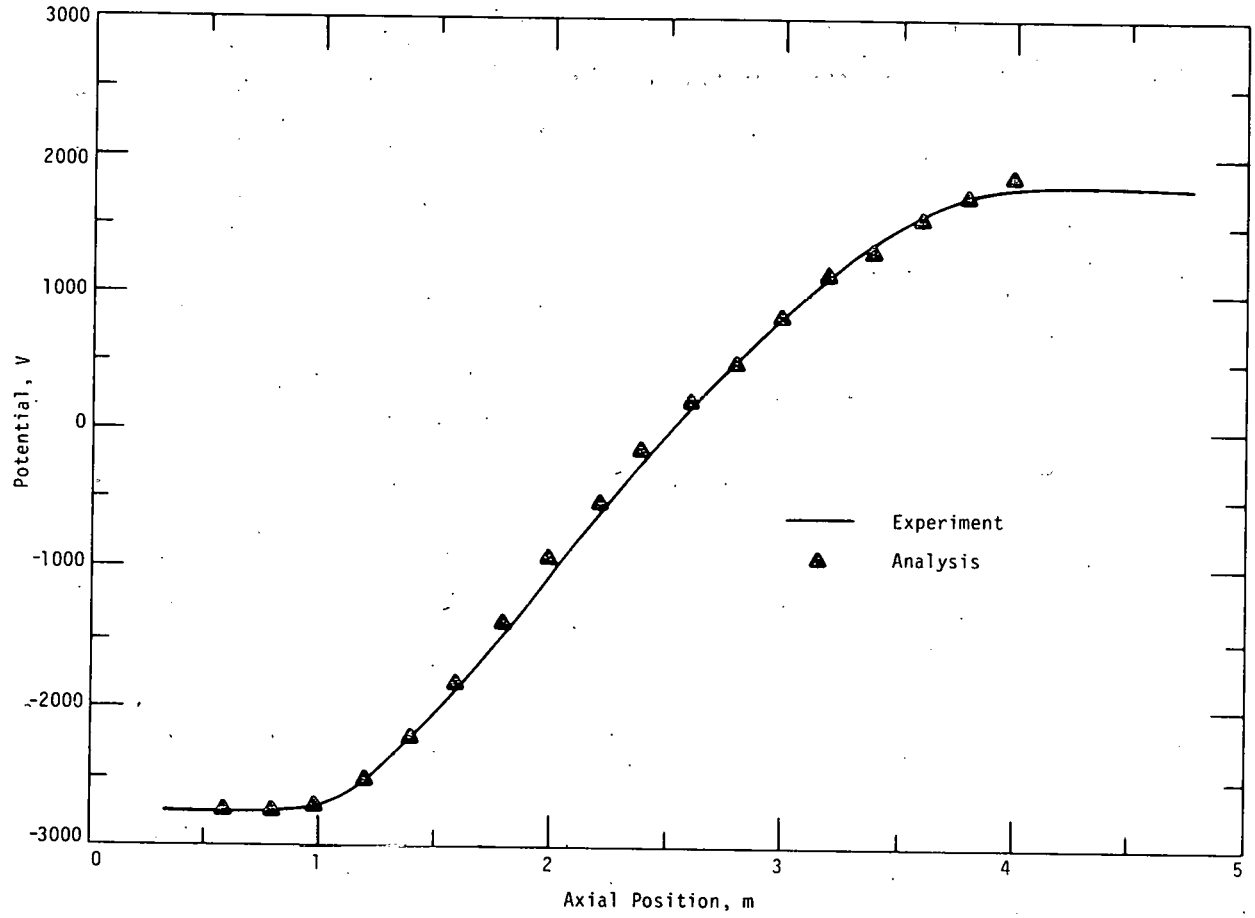


Fig. 6.10 Predicted compared with experimental distribution of static pressure along channel; Test No. 7, ANL Meas No. 5621 (22:00:43); G = 4.6 kg/s; B = 5 T; SR = 0.87; Ψ_{O_2} = 51 vol %



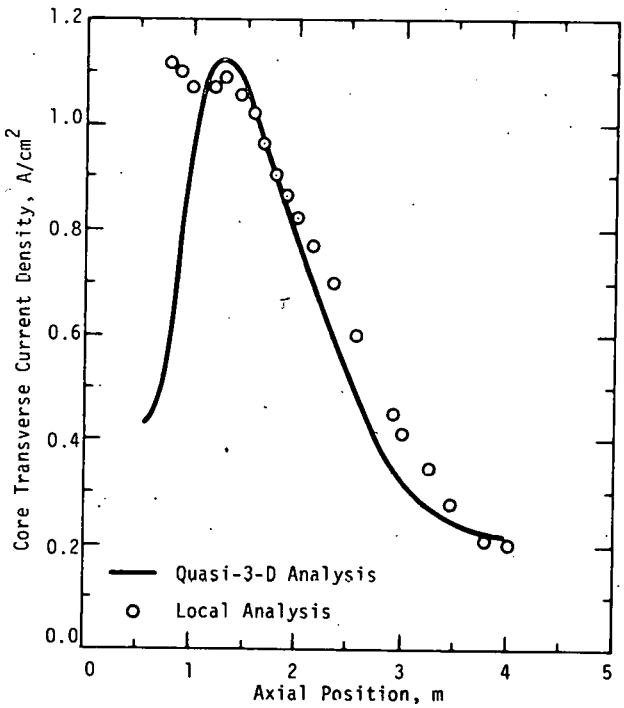
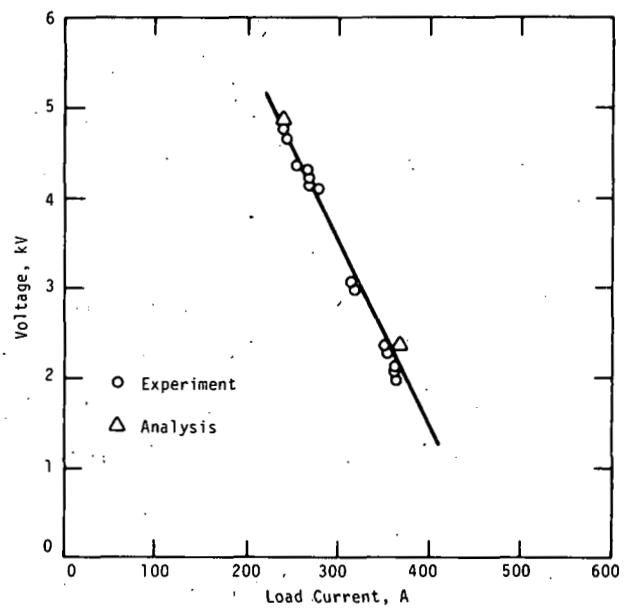
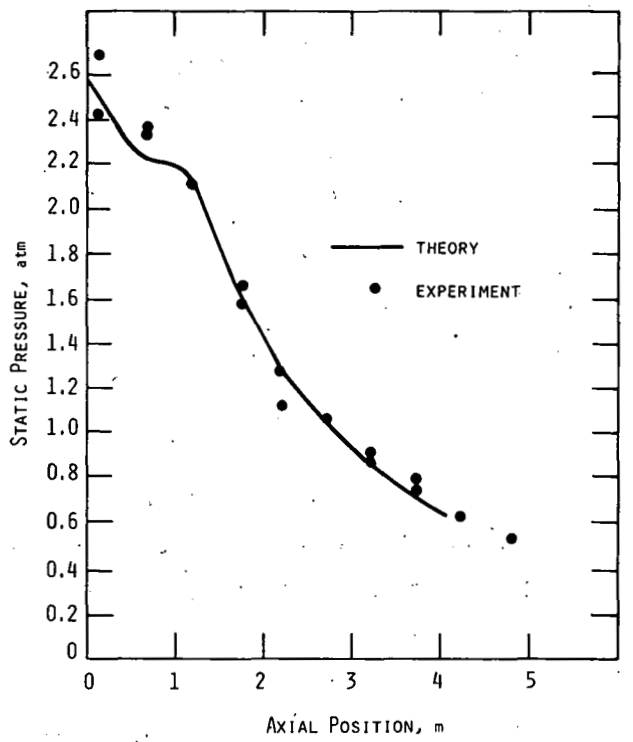


Fig. 6.11 (above) Comparison of calulated with measured distribution of Hall potential, and Fig. 6.12 (left), variation of core transverse density along the channel; Test No. 7, ANL Meas No. 5621; G = 4.6 kg/s, B = 5 T, Ψ_{O_2} = 51 vol %, SR = 0.87, T_w=1650 K, roughness = 0.003 m, potassium seed

Fig. 6.14 Comparison of calculated with measured distribution of static pressure along channel; Test No. 7, ANL Meas No. 5880; Cs seed = 1.1 mass %, G = 5 kg/s, B = 5 T, Ψ_{O_2} = 50 vol %

Fig. 6.13 Calculated compared with measured V-I characteristics; Test No. 7, ANL Meas Nos. 5619-5629, K seed; G = 4.6 kg/s, B = 5 T, SR = 0.87, Ψ_{O_2} = 51 vol %





weak. The computed and the measured V-I characteristics of the channel are plotted in Fig. 6.13.

Cesium Seed: Two experimental conditions, one at high-power output (ANL Meas No. 5880, 12/7/79, 00:30:22), the other at high-load current (ANL Meas No. 5886, 12/7/79, 00:31:22), were analyzed by use of the quasi-three dimensional model. The operating conditions used in the analysis for Meas No. 5880 are: G = 5.0 kg/s, B = 5 T, ψ = 50 vol %, SR = 0.87, Cs = 1.1 mass %, and I_L = 273 A. The interframe resistance that gave good agreement with the measured electrical performance of the channel was 0.25 Ω.

The analytical results for the axial pressure distribution and the experimental data for ANL Meas No. 5880 are plotted in Fig. 6.14. The pressure

histories for Test No. 7, given in Appendix A, show that some of the pressure ports that had not previously responded to the combustor pressure changes became responsive during the cesium run. Therefore, the reliability of the pressure measurements improved during the cesium runs. As shown in Fig. 6.14, very good agreement exists between the analytical results and the experimental data.

The calculated Mach number distributions obtained from the quasi-three dimensional MHD generator model and from the results of local analysis given in Section 1.4 are plotted in Fig. 6.15. In this case, the channel flow is subsonic in the first part of the channel, up to $x \approx 2.0$ m, where the flow chokes in the diverging section of the channel. Therefore, an "MHD throat" is created in the channel by the strong MHD interaction. The channel flow remains supersonic through the rest of the channel and shock formations occur beyond the location of the last pressure port in the channel.

The axial voltage variation obtained from the analysis is compared with the experimental data in Fig. 6.16. The calculated Hall voltage is 5069 V and the measured voltage for Meas No. 5880, is 5308 V. The measured V-I characteristics of the channel and the two calculated operational points are plotted in Fig. 6.17.

For operation with cesium seed, an analysis of integral MHD-channel characteristics was also performed, using the quasi-one-dimensional model [2,3], at the conditions of IVTAN Meas No. 1849 (12/7/79, 00:15:16) when output power was 1485 kW. In accordance with the experimental data, the following input parameters were used:

G_{seed}, L/h	297
G_{gas}, kg/s	0.659
G_{oxid}, kg/s	4.086
oxygen enrichment, vol %	50.6
G_{purge}, kg/s	0.145
aqueous seed solution concentration (mass).	0.5
seed type	cesium
magnetic field, T	5.0

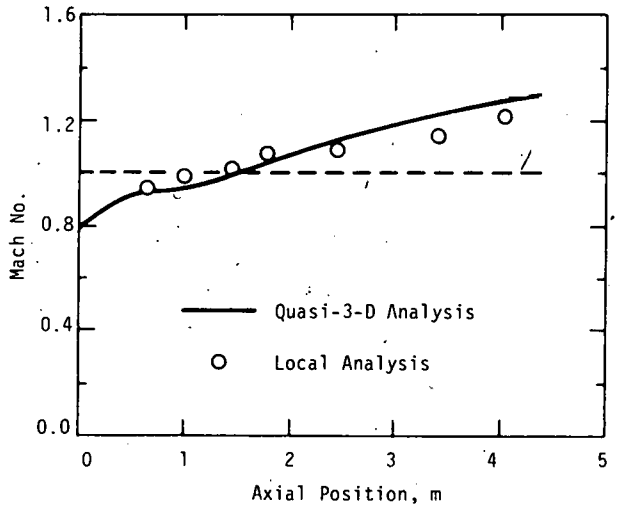


Fig. 6.15 Variation of Mach number at the centerline along the channel; Test No. 7, ANL Meas No. 5880; G = 5 kg/s, SR = 0.87, T_w = 1650 K, Ψ_{O_2} = 50 vol %, roughness = 0.003 m

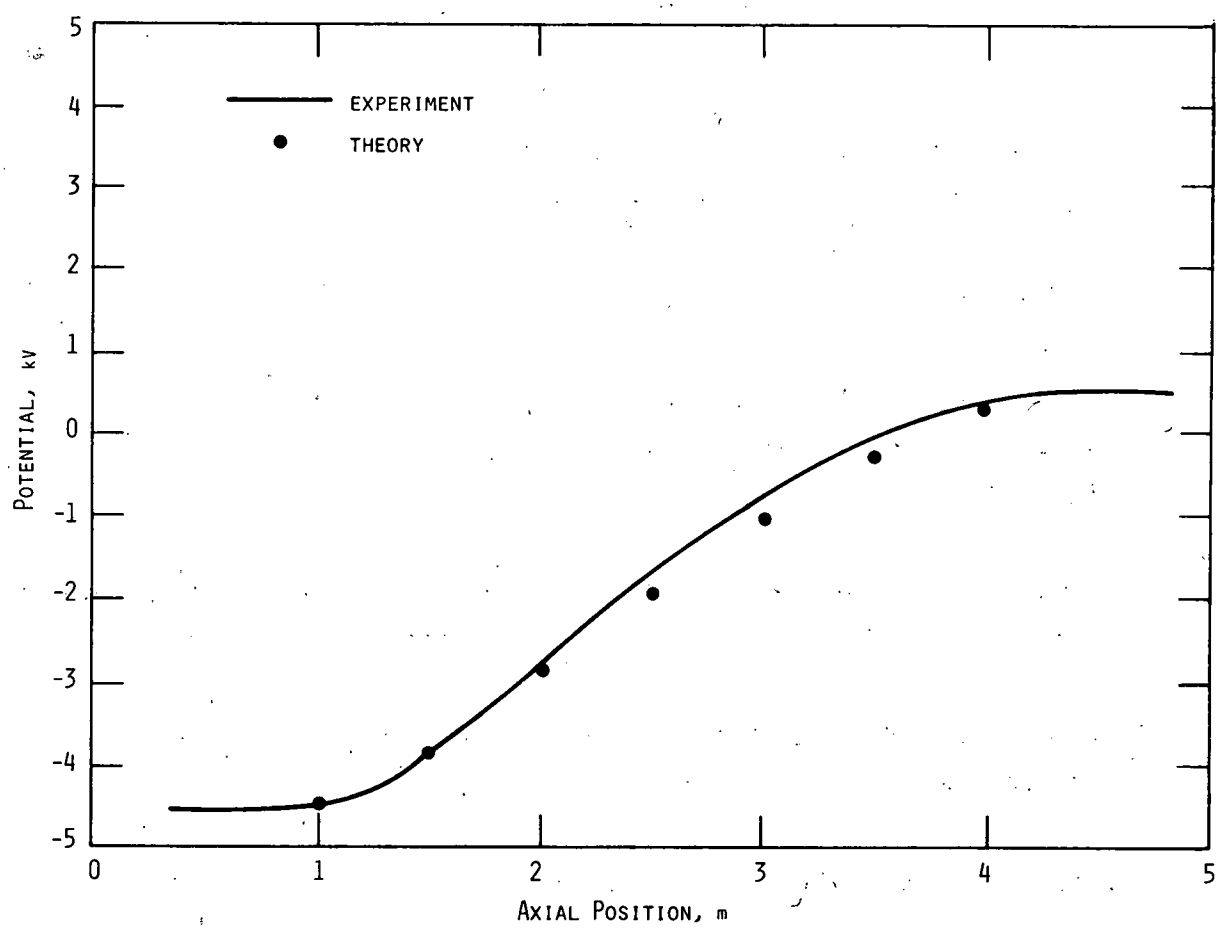


Fig. 6.16 Predicted compared with measured distribution of Hall potential; Test No. 7, ANL Meas No. 5880; G = 5 kg/s, B = 5 T, Cs = 1.1 mass %, Ψ_{O_2} = 50 vol %

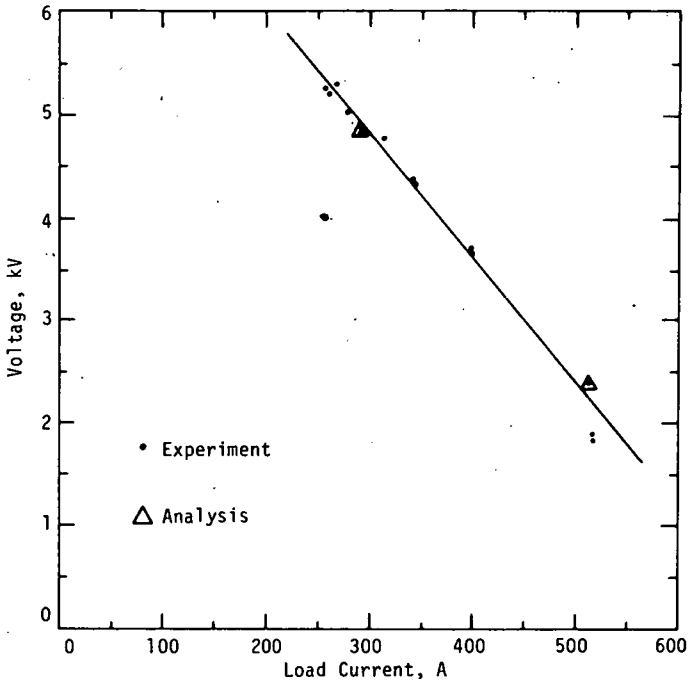


Fig. 6.17 Comparison of calculated with measured V-I characteristics; Test No. 7, ANL Meas Nos. 5859-5888; 1.1 mass % Cs seed; T_w = 1650 K, SR = 0.86, roughness = 0.003 m, B = 5 T, G = 5 kg/s, Ψ_{O_2} = 50 vol %

On the basis of the above data, the following input data for subsequent analysis of the MHD channnel were computed.

seed-to-water mass ratio	1.0
oxygen enrichment (in combustor), mass % .	52.8
stochiometric ratio	0.85
mass flow rate of combustion products through the channel, kg/s	5.0

A complete set of calculations for cesium was performed, including composition calculations and subsequent computation of conductivity.

In computing combustion temperature, the presence of combustible products in the seed was taken into account.

The following were the main channel inlet parameters:

stagnation pressure	3.6 ata
static pressure	2.6 ata
stagnation temperature	2950 K

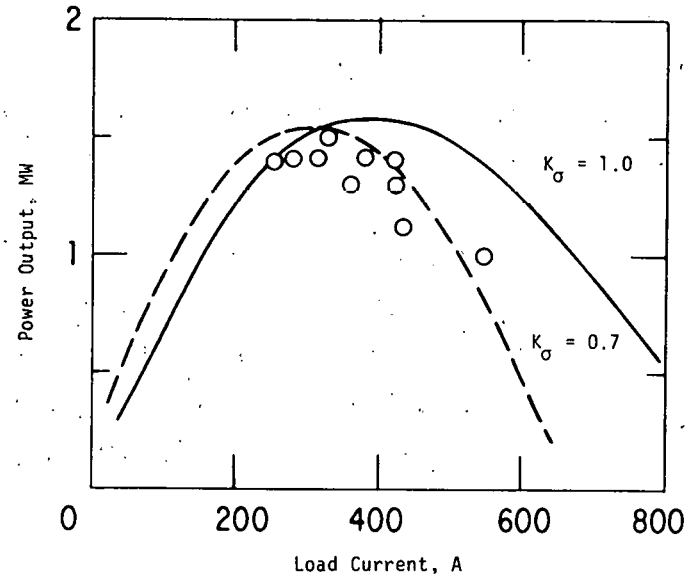


Fig. 6.18a Output power vs load current; comparison of calculated with measured (open circles) values; Test No. 7, Cs seed

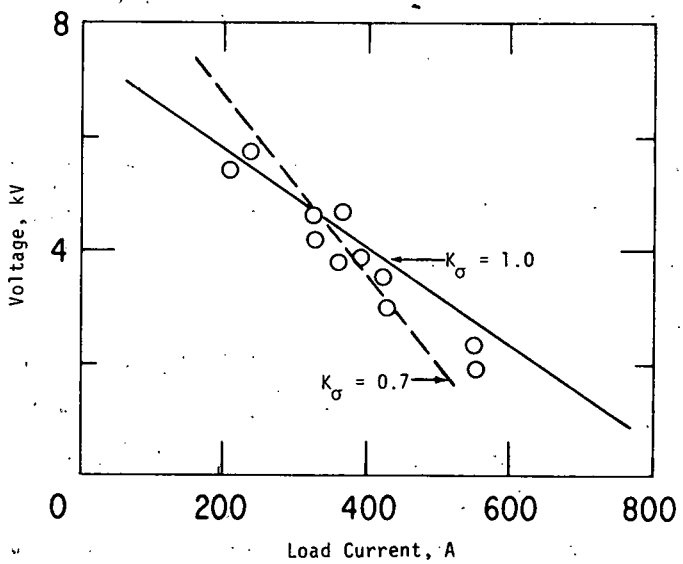


Fig. 6.18b Comparison of calculated with measured (open circles) V-I characteristics; Test No. 7, Cs seed

temperature . . . . . 2870 K
conductivity . . . . . 12 S/m

For the above conditions, the V-I characteristic was calculated for currents of between 250 and 500 A, in accordance with current levels achieved during the test.

Figure 6.18 compares experimental and calculated data, and good agreement (within 10-20 %) can be observed.

For instance, for the case of maximum power obtained during the test (1.5 MW), under a Hall potential of 4.0 kV, the calculated power is 1.6 MW and corresponding Hall potential is 4.4 kV.

Calculations also show that experimental electrical parameters achieved in Test No. 7 correspond to an operating point located to the right of the maximum of the power-load current curve. The current in Meas No. 1849 (365 A) approaches the optimum value as regards maximum output power. Therefore, further reduction of current and increase of voltage would not have led to significant gain in power.

The analyses of calculated and experimental results of Test No. 7 indicate that, during the last test, major parameters reached their design or near-design values.

Comparison of the experimental data of Test No. 7 with calculations of integral characteristics, shows close agreement for a coefficient of conductivity reduction, K_σ, of 0.7-1.0.

Figures 6.18a and 6.18b present theoretical results of power as a function of load current and V-I characeristics for K_σ = 0.7 and 1.0; experimental data points corresponding to the operating mode in question are also shown.

As pointed out earlier, K_σ values derived from "local analysis" of experimental electrical performance lie in the range of 0.9-1.0.

Consequently, local and integral analyses of experimental data point toward the conclusion that ionization of cesium seed was sufficiently high, and the experimental value of conductivity practically coincided with the theoretical value calculated on the basis of thermodynamic equilibrium. Good agreement of experimental results for the pressure and Hall potential distributions with theoretical results, using the quasi-one-dimensional models can be seen in Figure 6.19 and Figure 6.20.

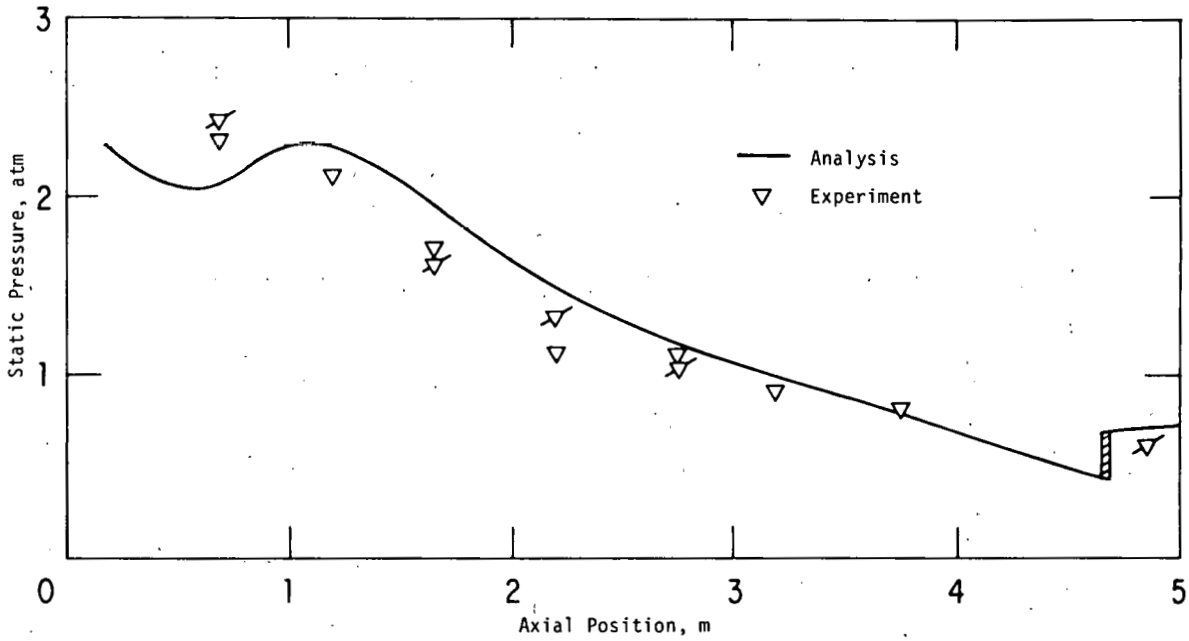


Fig. 6.19 Comparison of calculated with measured distribution of static pressure along the channel; Test No. 7, Cs seed

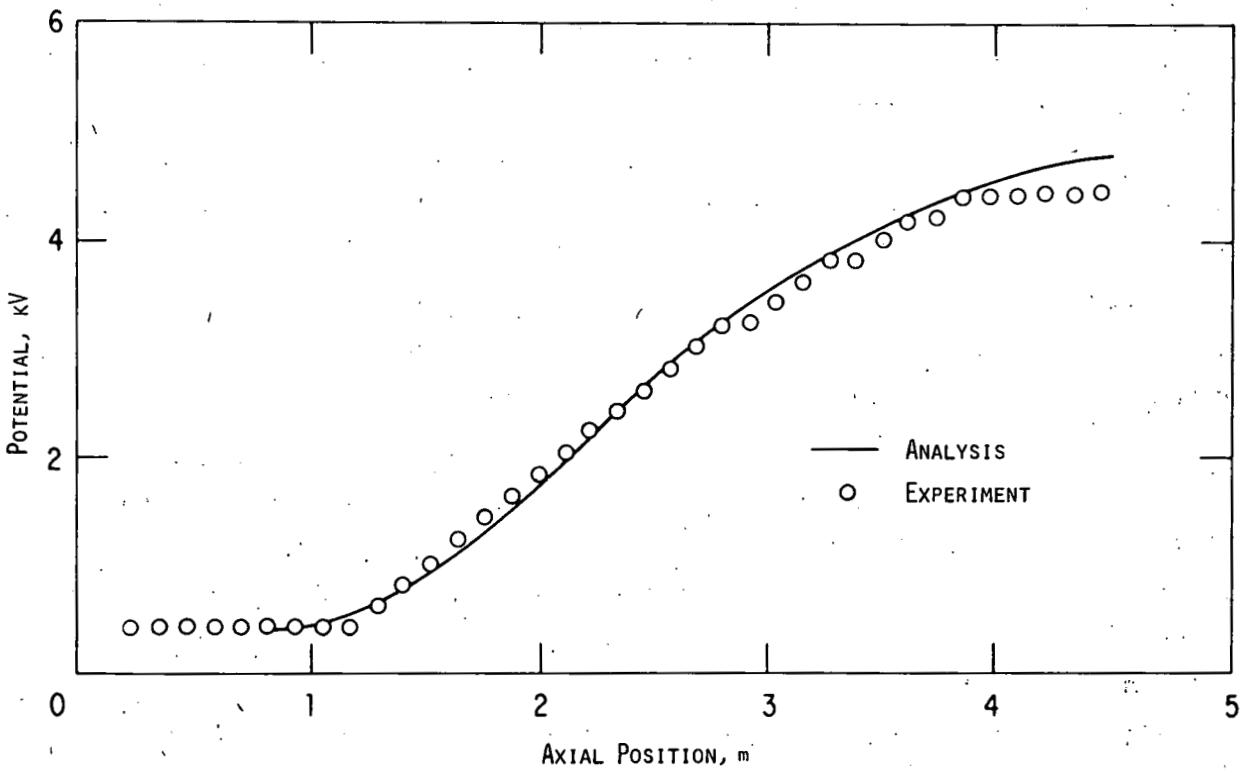


Fig. 6.20 Comparison of calculated with measured distribution of Hall potential along the channel; Test No. 7, Cs seed

All the above results, viewed in their totality, indicate that design performance has been achieved for all gasdynamic and electrical parameters, and experimental data are in good agreement with the results of computer models.

6.2.3 Effect of Interframe Resistance on Channel Performance

A study was performed of the effect of interframe resistance on the performance of the U-25B channel. Reduced electrical resistance between frames can be caused by deposition of seed on the interelectrode insulator surfaces. This was evident during the plasma conductivity measurement tests (see Section 5.5), when it was noticed that the channel wall resistance was substantially reduced after seed was injected.

A sensitivity analysis was performed for plasma conditions similar to those of Test No. 7 with cesium seed. Other parameters assumed in this study are: T_W = 1650 K, wall surface roughness = 0.003 m, K_σ = 1.0, ψ = 50 vol %, and SR = 0.88. Figure 6.21 presents the effect of assumed values of interframe resistances on the channel power output for mass flow rates of 5 kg/s and 3 kg/s. This figure indicates that the power output remains practically unchanged for interframe resistances of the order of 1.0 Ω or higher. However, the power output of the channel drops rapidly when the resistance is reduced below 1.0 Ω. These curves are subject, of course, to the assumptions used in the analytical predictions. Different wall temperatures, effective wall roughness, sidewall considerations, arcing model, three-dimensional effects, etc., can alter the results quantitatively; however, the trends presented in Fig. 6.21 are expected to persist.

In large-scale MHD channels, for low interelectrode resistance of the order of 1.0 Ω, the leakage current is expected to be approximately 100 A (for Hall field of 4 kV/m and electrode pitch of 0.025 m). This leakage current is insignificant compared with the total load current. Therefore, the outlook is encouraging that the wall current leakage resulting from the reduction of the interelectrode resistance will not significantly affect the power output of large-scale MHD channels.

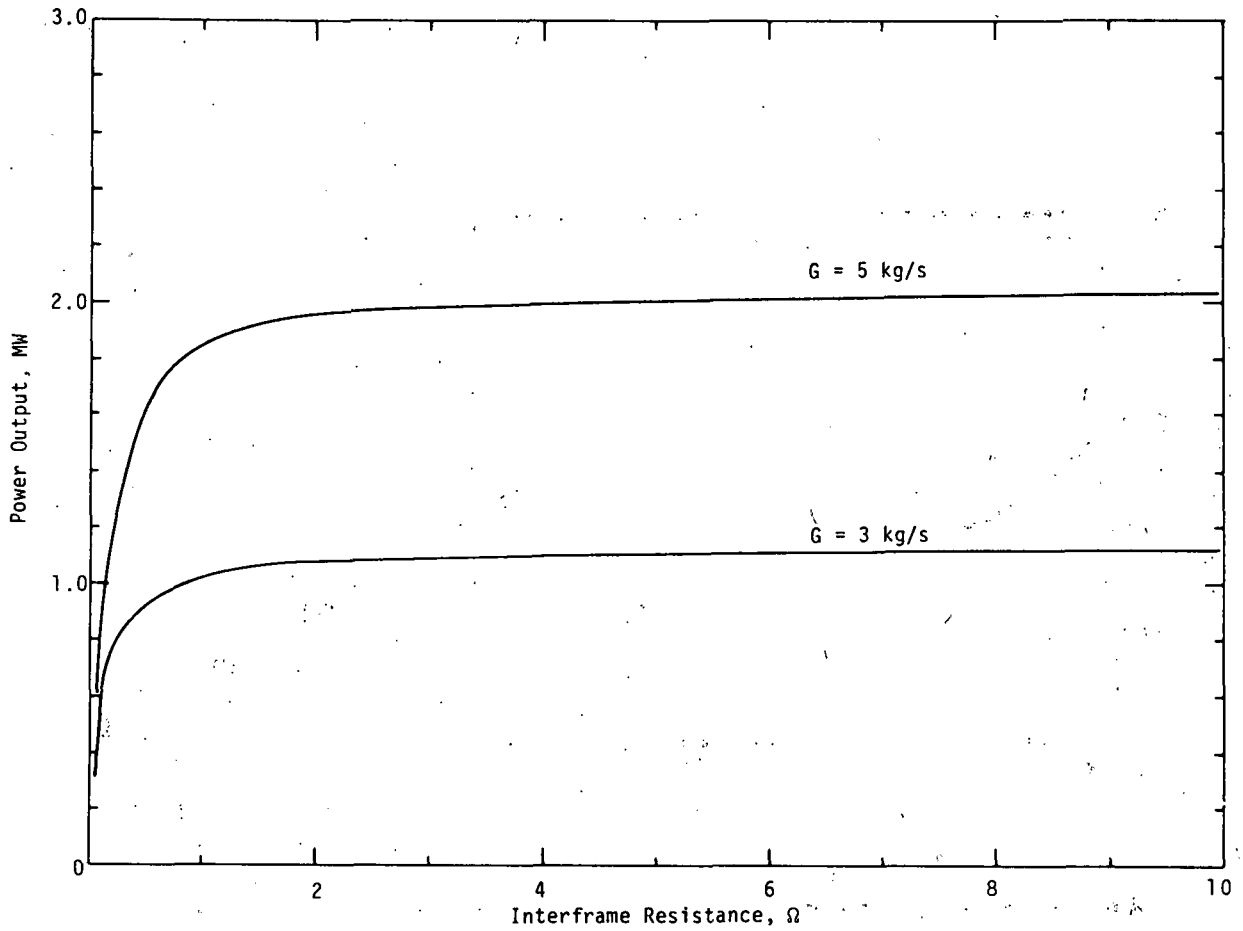


Fig. 6.21 Calculated effect of interframe resistance on channel power output; Test No. 7; Cs seed=1.1 mass %, T_W=1650 K, K =1.0, k_s=0.003 m, SR=0.88

6.3 Analysis of Current Distribution in the Power Takeoff Region

The model developed for the prediction of current takeoff distributions [13] was used in the analysis of the takeoff regions. Figures 6.22 and 6.23 show experimental and calculated takeoff frame current distributions for operating conditions corresponding to IVTAN Meas No. 1135 (7/31/79,19:34:29): G = 4.6 kg/s, Power = 1041 kW, I_L = 203 A, for Test No. 6, and ANL Meas No. 5800 (12/6/79, 23:58:56): G = 5 kg/s, Power=1.5 MW, I_L = 381 A for Test No. 7.

The small discrepancies between calculated and experimental distributions may be attributed to Hall field inhomogeneities. The load currents, I_L, used in the calculations were taken to be equal to the sum of the measured takeoff currents. In general, experimental results of Tests No. 6 and No. 7, and

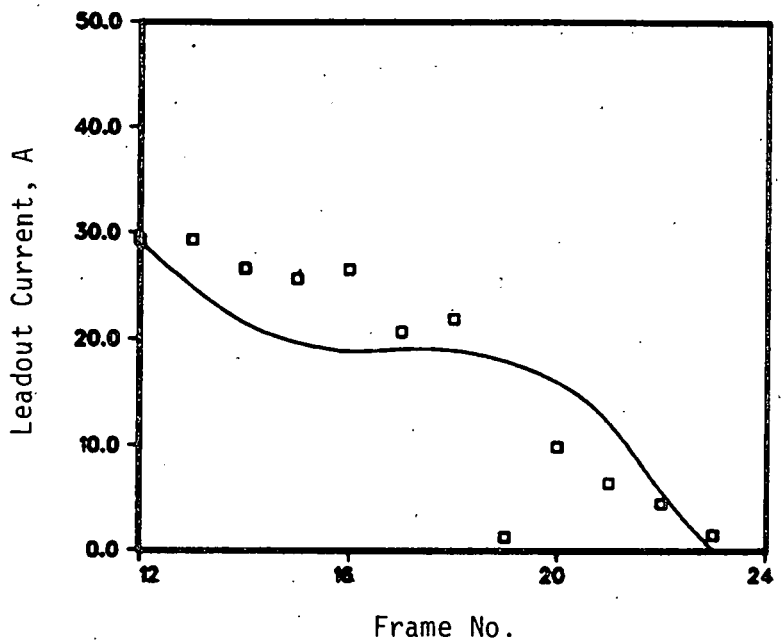


Fig. 6.22 Comparison of calculated with measured distribution of current at inlet power takeoff region; Test No. 6, IVTAN Meas No. 1135; G = 4.6 kg/s, I_L = 203 A

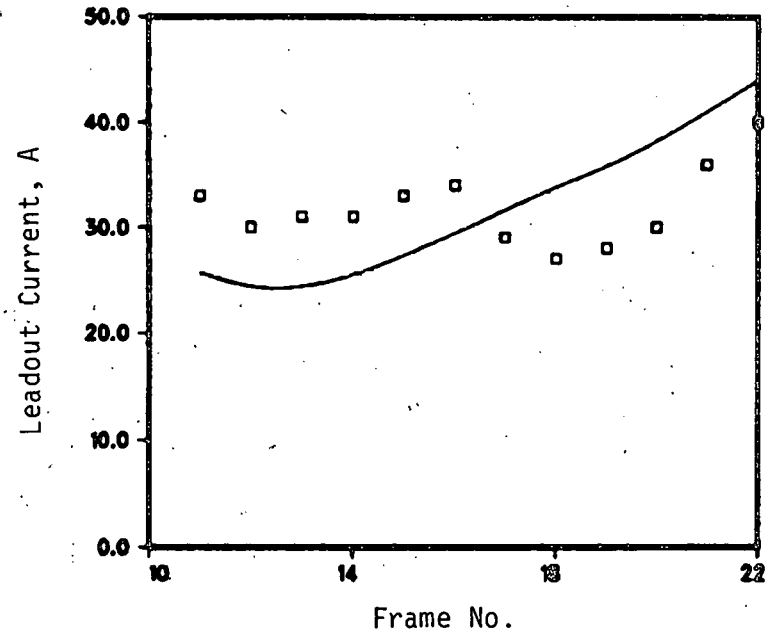


Fig. 6.23 Comparison of calculated with measured distribution of current at inlet power takeoff region; Test No. 6, ANL Meas No. 5800; G = 5 kg/s, I_L = 381 A

those of Test No. 4, [3], are in good agreement with those predicted by the aforementioned theoretical model. Comparison of the experimental distributions obtained from all the tests indicates that the takeoff arrangement during Test No. 7 was optimal.

7.0 CHANNEL POST-TEST INSPECTION RESULTS

Upon completion of Test No. 7, Channel No. 2 was inspected in the following sequence:

1. Inspection of internal channel surface.
2. Inspection of the exterior of the pressure vessel.
3. Pressure tests.
4. Tests of insulation properties.
5. Disassembly of pressure vessel.
6. Inspection of interior surface of the pressure vessel.

The inspection of the internal channel surface revealed loss of ceramic packing along almost the entire length of the channel to a depth of 3-4 mm. In the downstream section, loss of ceramic material from the cathode wall was higher. A photograph of the channel surface near a joint between two channel sections is shown in Fig. 7.1.

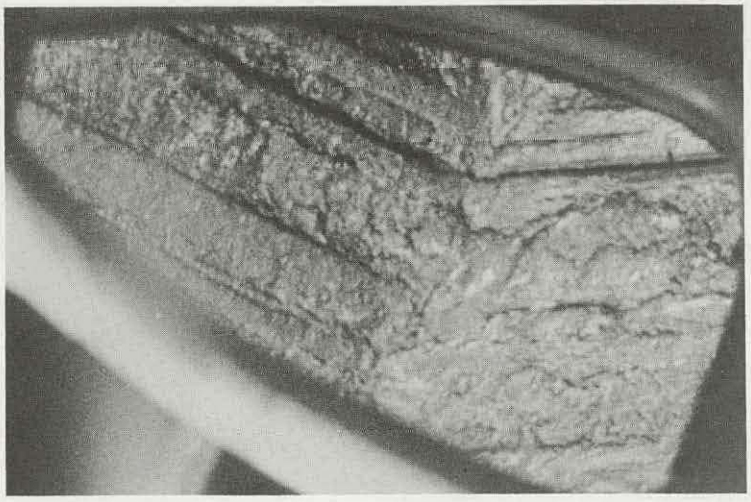


Fig. 7.1 Area of the internal surface of the channel, photographed with the aid of a mirror system; the deepest groove coincides with the joint between two adjacent modular channel sections

Inspection of the surface of the external pressure vessel after it was removed from the magnet revealed the presence of two areas with thermal damage: 1) along the anode wall in the region of frames 46-53, a darkened spot approximately 100 mm in diameter and 2) a darkened spot approximately 50 mm in diameter near the pressure vessel joint and in the region of frames 71-73.

Pressure tests using a positive pressure of 0.5 atm in the bore of the channel indicated a pressure loss of 0.12 atm after 20 min. Leakage was found along the interface of the pressure vessel with the exit flange and through the seals of the water connections to frames 1 and 53.

Inspection of static pressure transducers showed that transducers PC3, PC13, and PC17 were partially plugged; transducer PC10 was completely plugged.

Pressure testing of the cooling system showed that the system as a whole was leak-free except for a small internal leak in frame No. 3 and small external leaks in a number of frame fittings. Thermal sensors installed at frame coolant discharge tubes showed that discharge water temperature was within the range of 65-90 °C, except for frames 49, 51, and 53, where it exceeded 90 °C.

Interframe insulation resistance for the majority of frames varied between tens and hundreds of ohms. After the channel was dried with warm air for 48 hours, the number of interframe insulators with resistance of less than 1 kΩ decreased from 110 to 64. The lowest interframe resistance was observed between frames 57 and 58 (4.5 Ω), and frames 60-61 (50 Ω). Frame insulation to external electric circuits and ground was on the order of megohms. This confirms the reliability of all electrical measurements performed during the tests.

The fiberglass pressure vessel was disassembled, so that its internal surface could be inspected. In the vicinity of frames 46-53 and of 71-72, there was evidence of flame damage. Interelectrode insulation (MgO strips) in these locations was damaged over its entire width. It should be noted that damage locations are in the area of joints between channel sections. Possibly, this damage is the result of shortcomings in the procedure of assembling the multiple-section channel within the pressure vessel.

REFERENCES

1. "U.S./U.S.S.R. Cooperative Program in Open-Cycle MHD Electrical Power Generation, Joint Test Report No. 1," ANL-IVTAN/MHD-78-JT1, Argonne National Laboratory, Argonne, IL, April, 1978.

2. "U.S./U.S.S.R. Cooperative Program in Open-Cycle MHD Electrical Power Generation, Joint Test Report No. 2," ANL-IVTAN-JT2, Argonne National Laboratory, Argonne, IL, April, 1979.

3. "U.S./U.S.S.R. Cooperative Program in Open-Cycle MHD Electrical Power Generation, Joint Test Report No. 3," ANL-IVTAN-JT3, Argonne National Laboratory, Argonne, IL, July, 1980.

4. V. A. Kirillin, R. V. Shanklin, A. E. Scheindlin, M. Petrick, et al, "The U-25B Facility for Studies in Strong Magnetohydrodynamic Interaction," 17th Symposium on Engineering Aspects of MHD, Stanford University, Stanford, CA, March 27-29, 1978, p. F.1.1-1.12.

5. I. A. Vasil'eva, L. V. Deputatova, A. P. Nefedov, "Investigation of the Four Wings of Resonant Lines of Alkali Metals in Combustion Plasma," Proceedings, 2nd U.S./U.S.S.R. Colloquium on MHD Electrical Power Generation, Washington, D. C., June, 1975, p. 231-240.

6. A. V. Nedospasov, L. P. Poderezhsky, Yu. G. Chernov, Composition and Properties of Working Fluids in Open-Cycle MHD Generation, NAUKA, Moscow, 1977.

7. P. R. Smy, Advances in Physics, 25, No. 5, 517, 1976.

8. E. W. McDaniel and E. Mason, The Mobility and Diffusion of Ions in Gases, MEER, Moscow, 1976.

9. D. R. Bates, V. Malaviya, and N. A. Young, Proc. Royal Society, London, A320, 437, 1971.

10. B . V. Raushenbakh, Vibrational Combustion, Physmathiz, Moscow, 1961.

11. D. T. Harrje and G. F. Reardon, eds, Liquid Propellant Rocket Combustion Instability, MEER, Moscow, 1975.

12. S. P. Strelkov, Introduction to Oscillation Theory, NAUKA, Moscow, 1964.

13. R. K. Ahluwalia and E. D. Doss, "Quasi-Three-Dimensional Modeling of Flow in MHD Channels," Numerical Heat Transfer, Vol. 3, p. 67-87, 1980.

14. G. Rudins, M. Petrick, B. Picologlou, et al and A. Sheindlin, V. Batenin, B. Shumyatsky, et al, "A Study of the Operation of the U-25B Facility MHD Generator Under Conditions of Strong Electric and Magnetic Fields," 7th International Conference on MHD Electric Power Generation, Cambridge, MA, 1980.

15. D. Iserov, K. Tempelmeyer, et al, "Study of the U-25B MHD Generator Systems in Strong Electric and Magnetic Fields," 18th Symposium on Engineering Aspects of MHD, Butte, MO, 1979.

16. Y. C. Pan and E. D. Doss, "Power Take-off Analysis for Diagonally Connected MHD Channels," AIAA 18th Aerospace Sciences Meeting, Pasadena, CA, 1980, AIAA Paper No. 80-253.

17. A. E. Buznikov, et al, "Electrical Nonuniformities in U-25 MHD Channels," 18th Symposium on Engineering Aspects of MHD, Butte, MO, 1979.

18. A. Solbes and A. Lowenstein, "Electrical Nonuniformities and their Control in Linear MHD Channels," 15th Symposium on Engineering Aspects of MHD, Philadelphia, PA, 1976.

19. N. N. Baranov and V. I. Kovbasyuk, Teplophysica Vysokikh Temperature, 15, No. 6, 1977.

20. J. Teare, W. Unkel, J. Louis, and K. Koester, "Local Analysis of Electrical Performance of the U-25B Generator," 18th Symposium on Engineering Aspects of MHD, Butte, MO, June, 1979.

21. W. Unkel, "Approximate Three-Dimensional Solution for Finitely Segmented Frame-Type MHD Channel," 18th Symposium on Engineering Aspects of MHD, Butte, MO, June, 1979.

22. W. Unkel, J. Schwoerer, J. D. Teare, and J. F. Louis, "Investigative Data Analysis Technique for Diagnonal Wall MHD Generators," submitted to the AIAA 19th Aerospace Science Meeting, January, 1981.

APPENDIX A

HISTORIES OF COMBUSTOR AND CHANNEL STATIC PRESSURE MEASUREMENTS

Parameter Identification

PCC1 - Combustor Pressure, atm

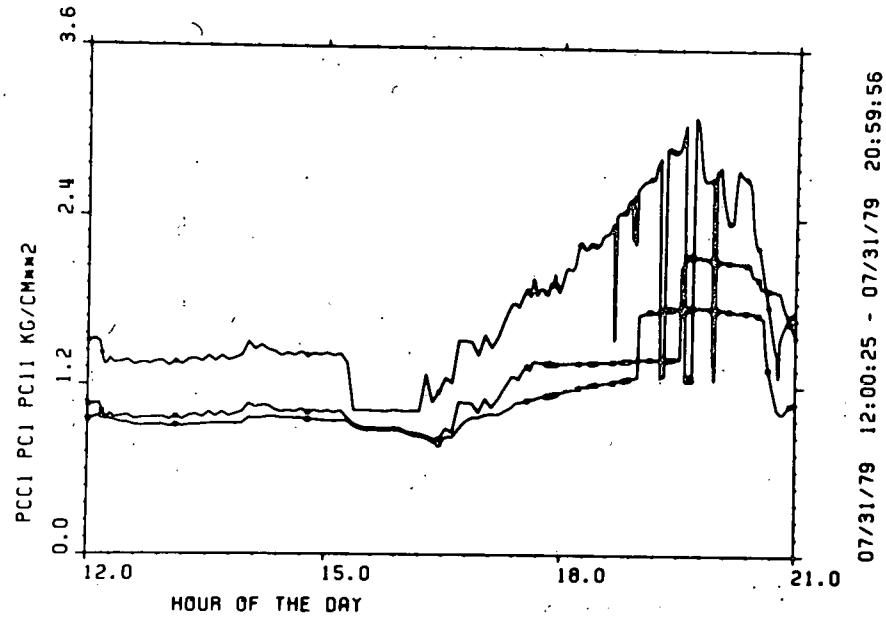
PC1 - PC19 - Static Pressures on the channel walls, atm

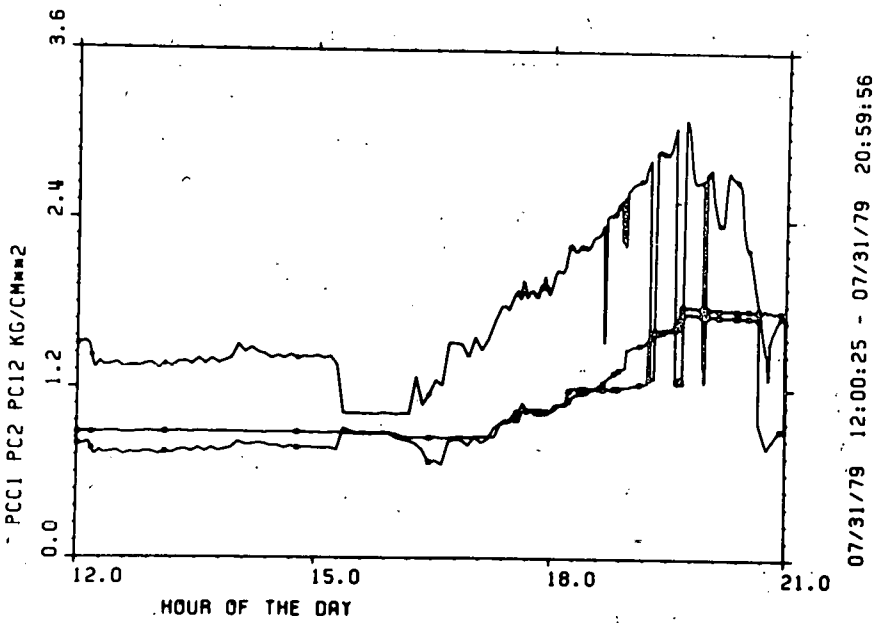
Notes

a. PC1 and PC11, PC2 and PC12 etc., are taken at the same axial locations on opposite channel walls

b. Each figure contains a history of the combustor pressure and histories of two pressure measurements taken at the same axial location. The combustor pressure history is identified with "+", the history of the pressure measurements at PC1-PC10 with "x", and the histories of the pressure measurements at PC11-PC19 with "*".

PRESSURE VERSUS TIME FOR TEST NO. 6





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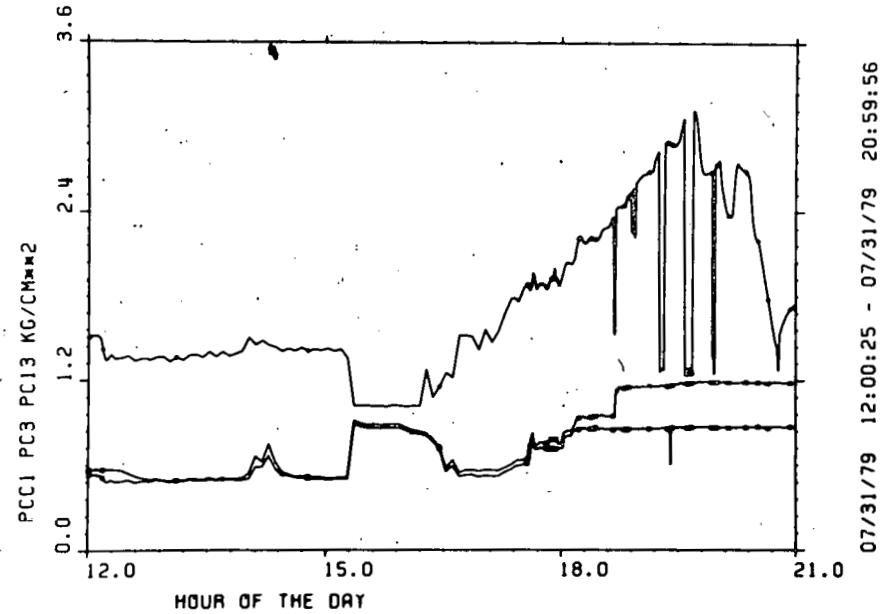

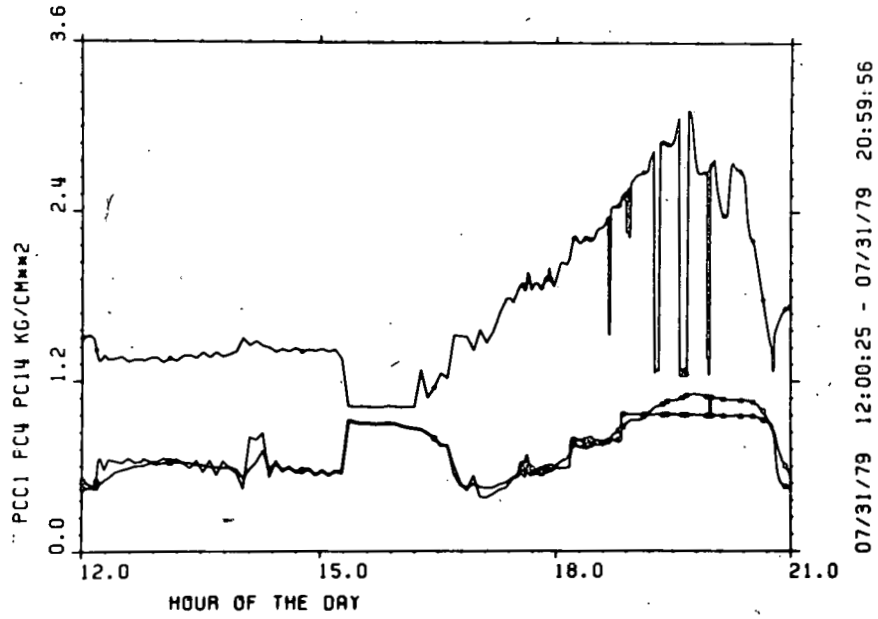

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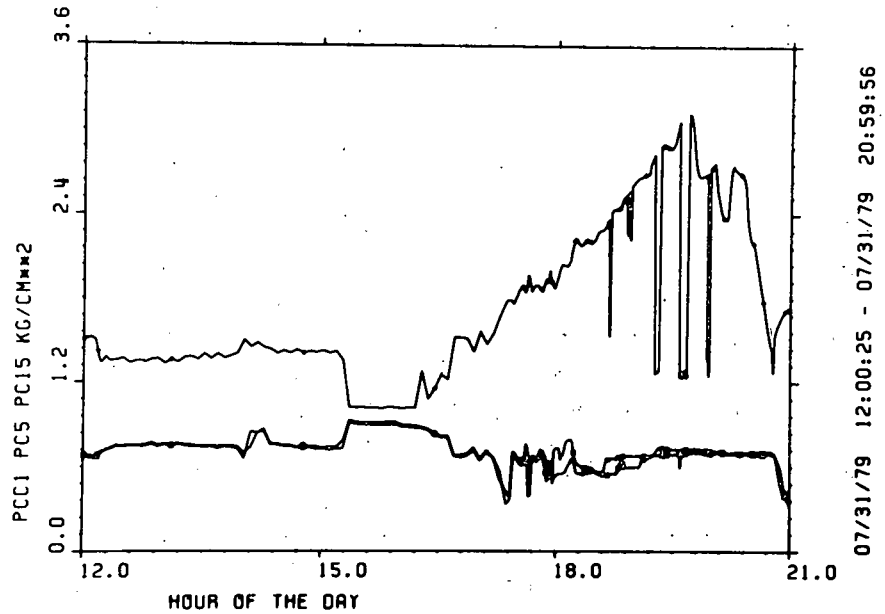

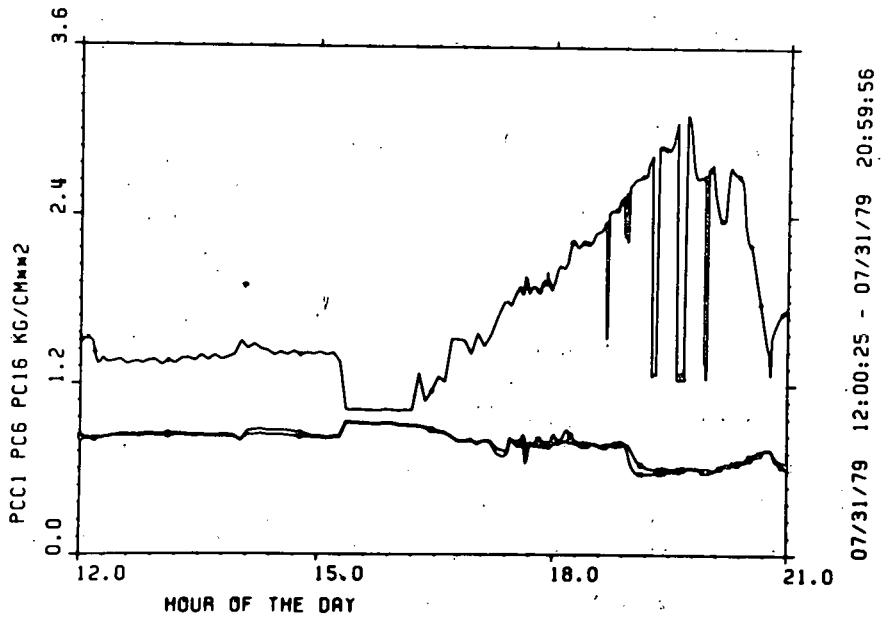

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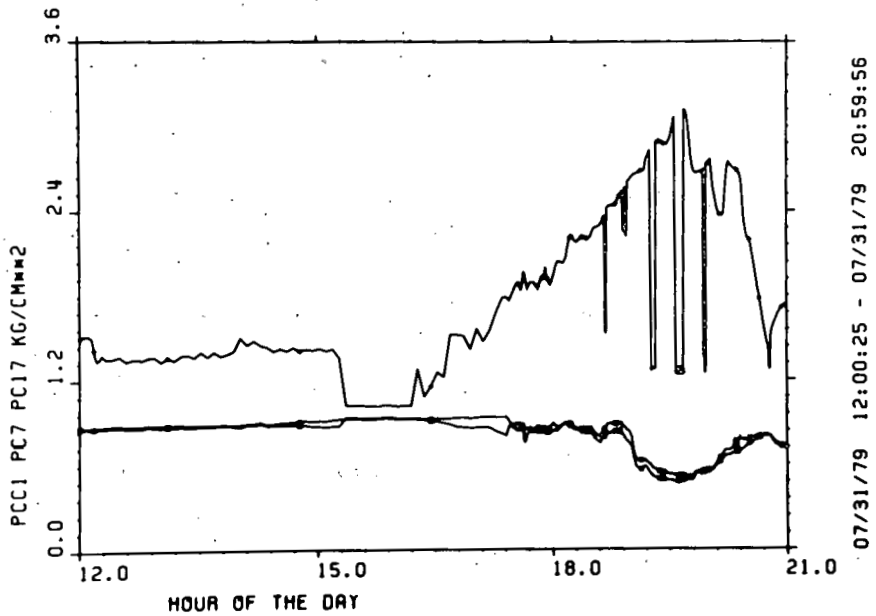

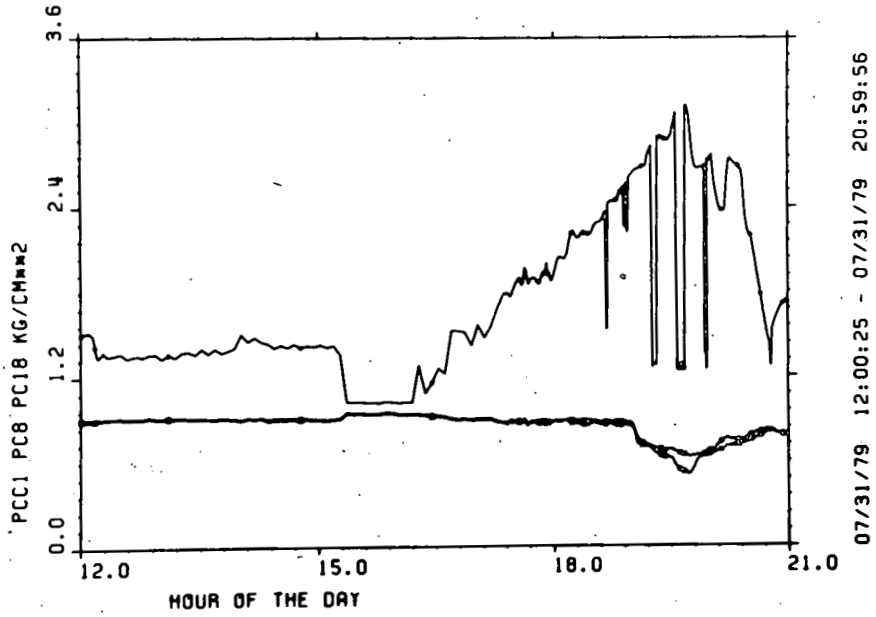

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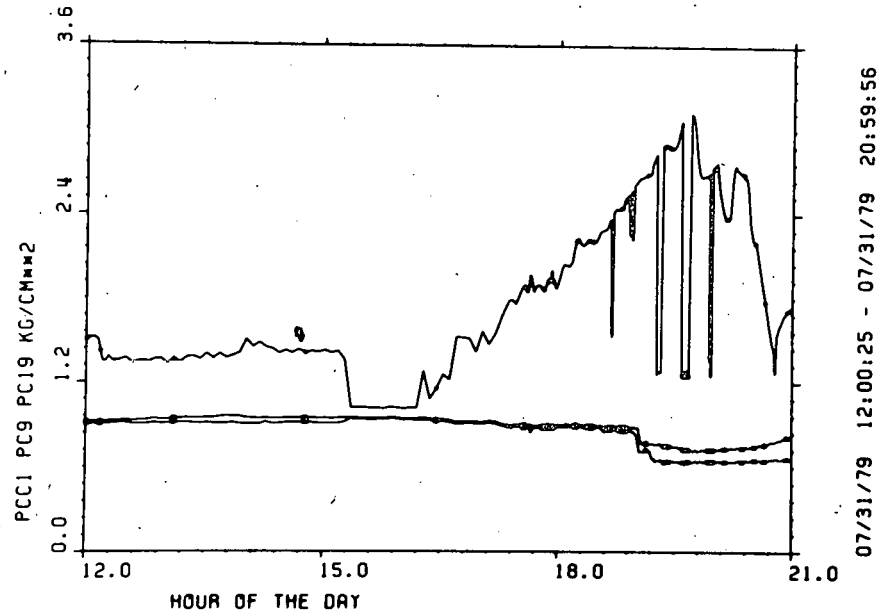

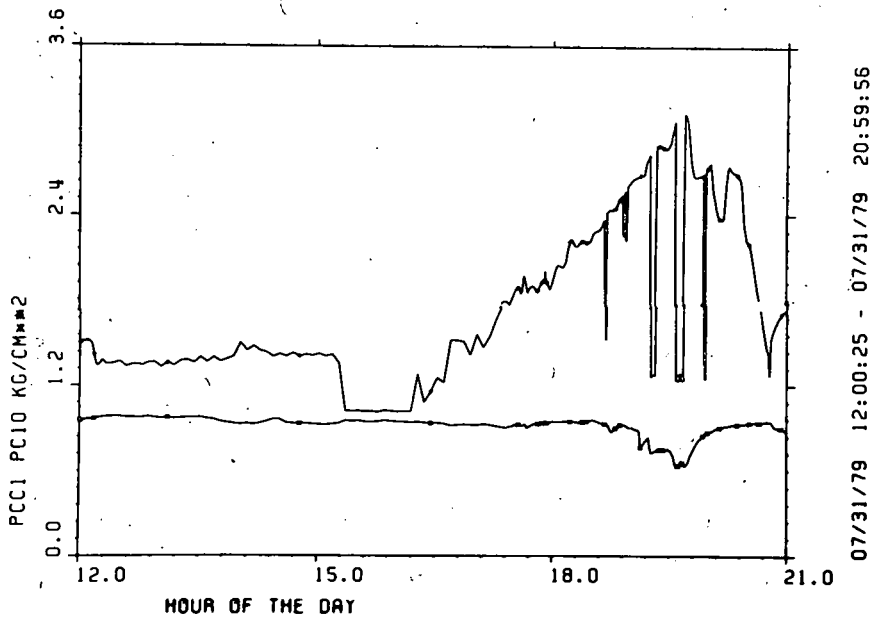

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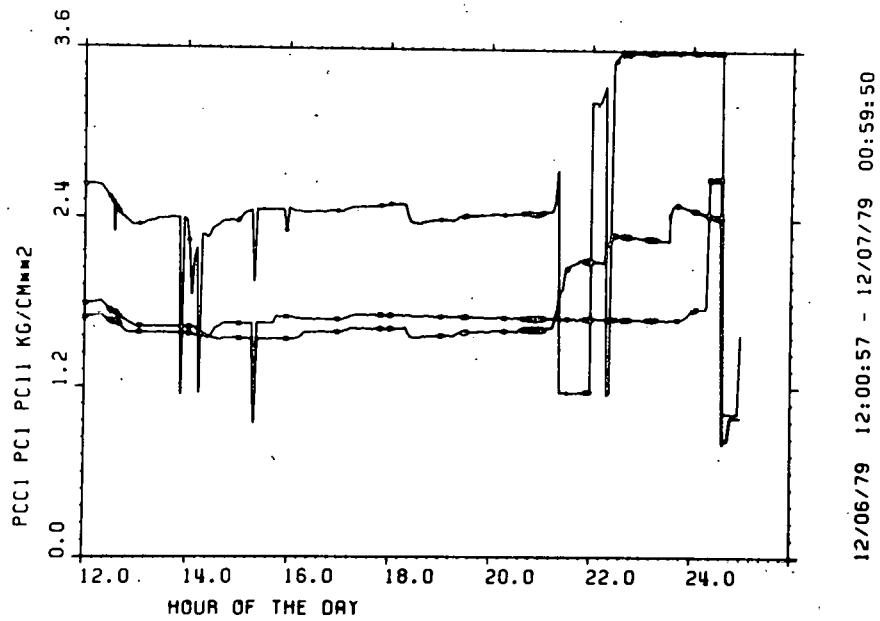

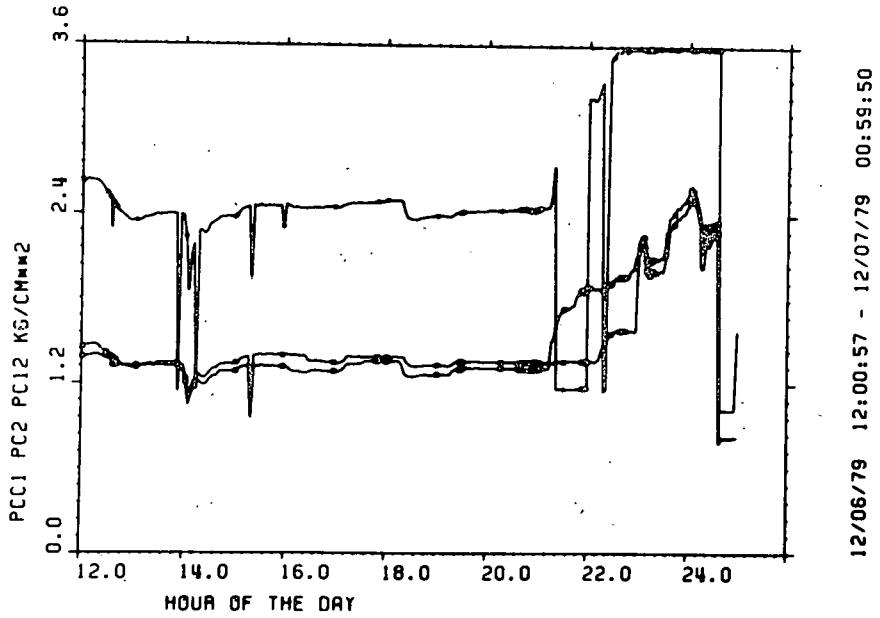

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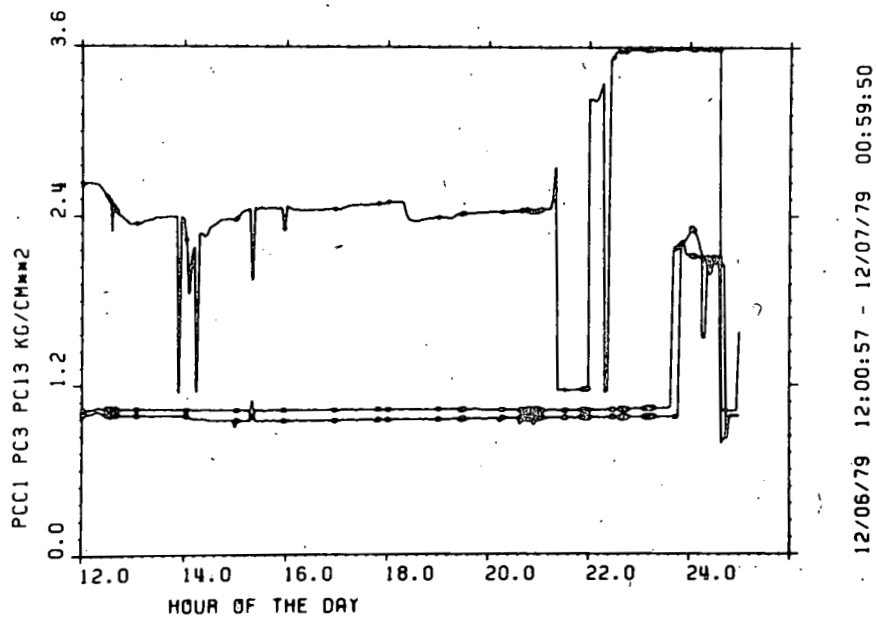

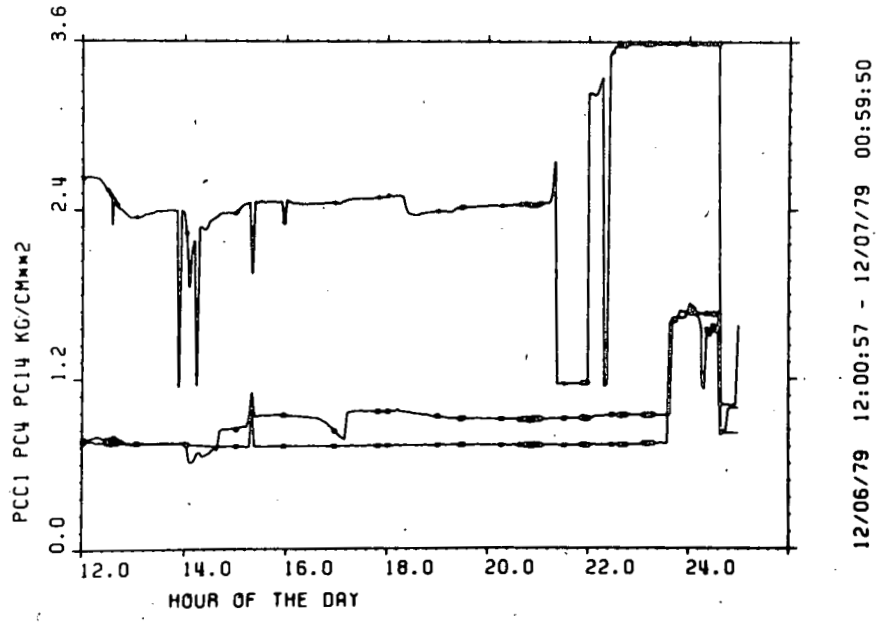

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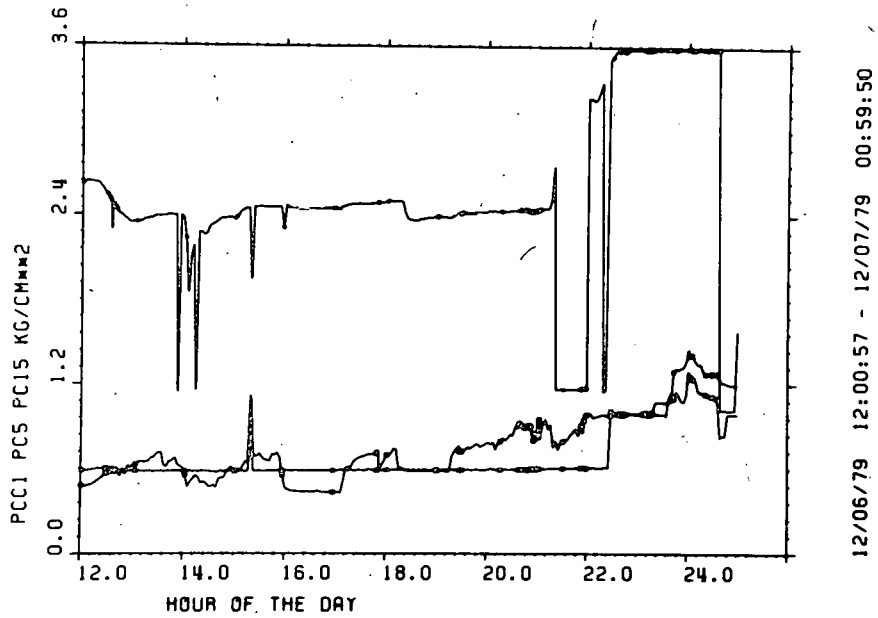

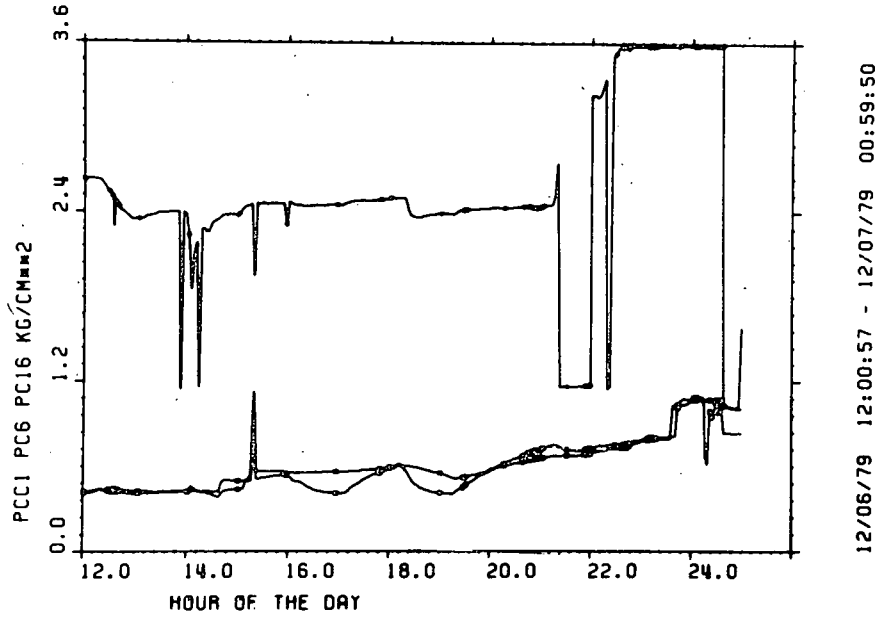

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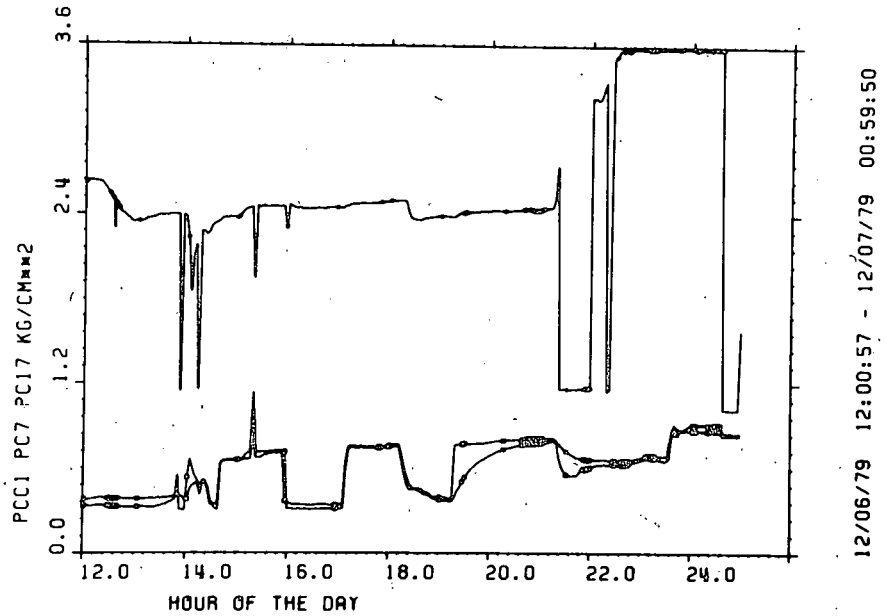

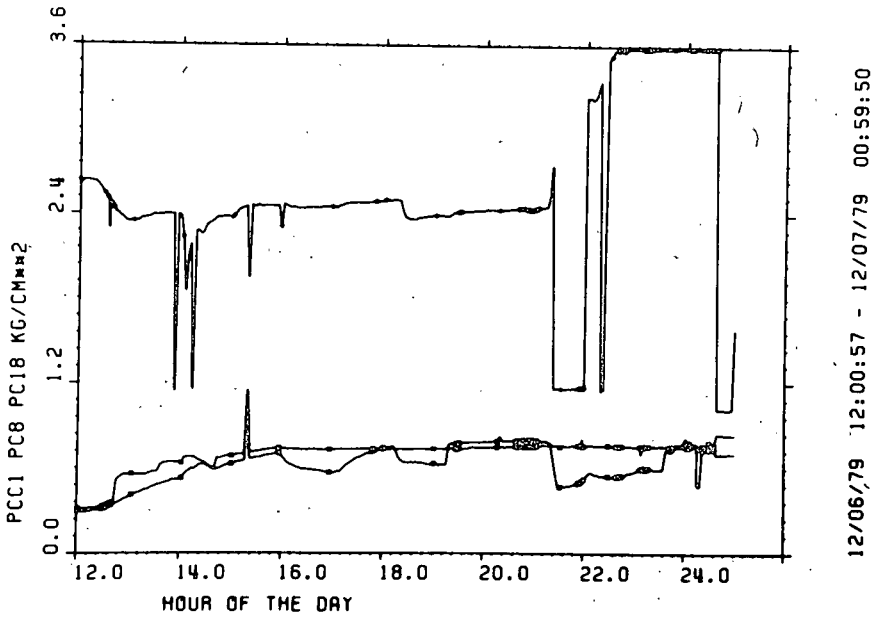

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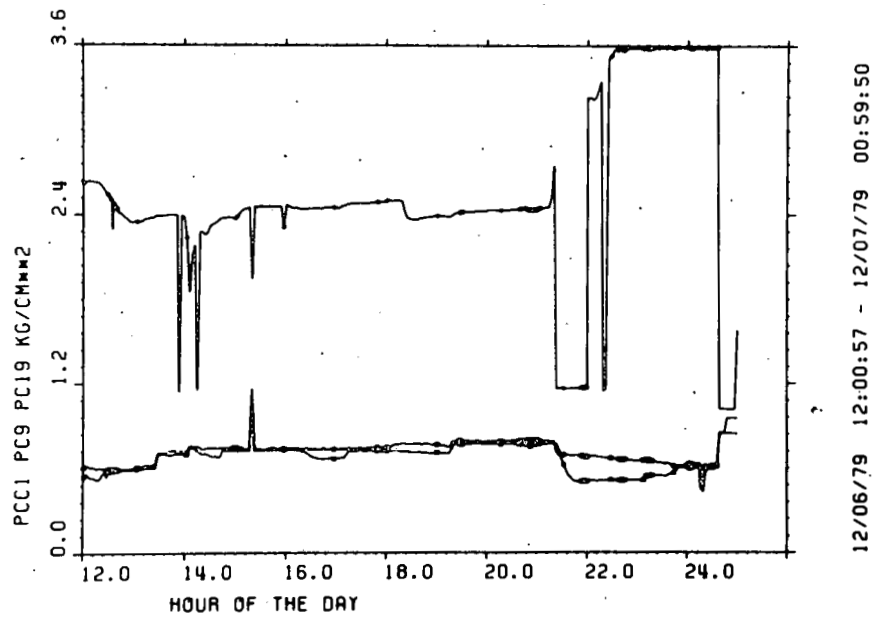

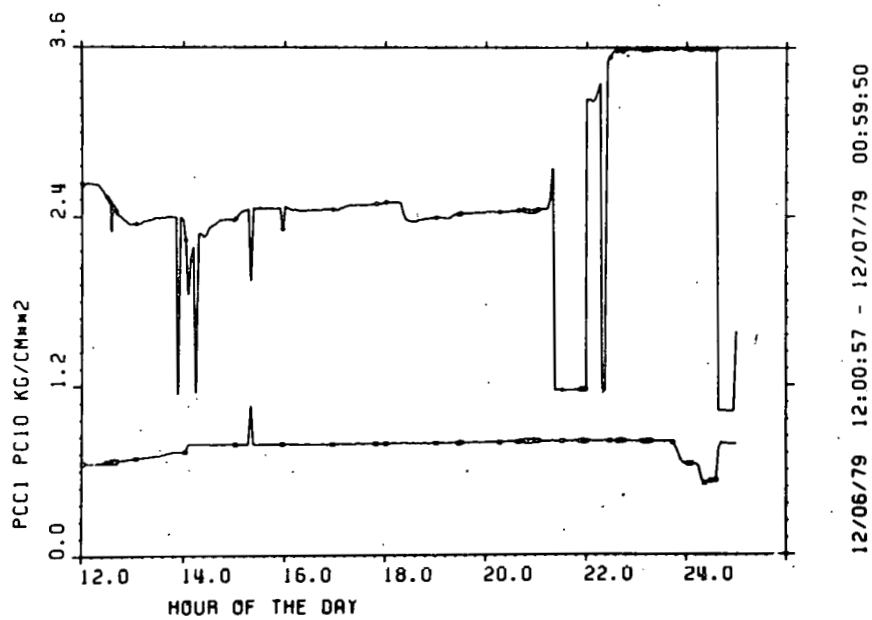

APPENDIX B

REPRESENTATIVE TEST DATA FOR TESTS NO. 6 AND NO. 7

Parameter Identification

1. Express Listing

DATE - Date (month, day, year)

TIME - Time of day (hour, minute, second)

RECN - Measurement number

B1 - Magnetic field intensity, T

ITOT1 - Total inverter current, A

ETOT1 - Total inverter voltage, V

HALL1 - Hall voltage, V

PTOT1 - Inverter power, kW

PCC1 - Combustor pressure, atm

PRC2 - Ratio of static pressure PC2 to PCC1

PRC12 - Ratio of static pressure PC12 to PCC1

TPH1 - Oxidizer preheat temperature, °C

TPCC1 - Plasma temperature at channel entrance, K

OX1 - Oxygen content in oxidizer (before preheaters), vol %

OX2 - Oxygen in oxizider (after preheaters), vol %

MOX1 - Mass flow rate of oxidizer, kg/s

MNG1 - Mass flow rate of fuel, kg/s

MS1 - Flow rate of seed solution, L/h

MTOT1 - Total mass flow rate, kg/s

ALFA1 - Stoichiometric ratio

2. Static Pressures

PCC1 - Combustor pressure, atm

PC1-PC20- Channel static pressures, atm

PD1-PD3 - Diffuser static pressures, atm

PDS1-PDS2 - Static pressures downstream of diffuser, atm

3. Cooling Water Parameters

MCW1 - Mass flow rate of combustor and nozzle cooling water, L/h

MCW2 - Mass flow rate of channel cooling water, L/h

MCW3 - Mass flow rate of diffuser cooling water, L/h

DTW1 - Temperature rise of combustor and nozzle cooling water, K

DTW2 - Temperature rise of channel cooling water, K

DTW3 - Temperature rise of diffuser cooling water, K

DQ1 - Combustor and nozzle heat loss, MW

DQ2 - Channel heat loss, MW

DQ3 - Diffuser heat loss, MW

HFR1 - Enthalpy at channel inlet, MW

DQCC1 - Combustor and nozzle heat loss, %

4. Power Take-off parameters

ITOT - Total inverter current, A

ETOT - Total inverter voltage, V

PTOT - Total inverter power, kW

ITNV17,19,21 - Current of inverter 17,19, 21, A

EINV17,19,21 - Voltage of inverter 17,19,21, V

PINV17,19,21 - Power of inverter 17,19,21, kW

HALL - Hall Voltage, V

I12 I13-I143 - Current of takeoff frames 12 - 143, A

IENT - Sum of upstream takeoff currents, A

IEXIT - Sum of downstream takeoff currents, A

5. Interframe Voltages

1 - Interframes voltage between frames 1 and 2, V

2 - Interframes voltage between frames 2 and 3, V

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160 - Interframe voltage between frames 160 and 161, V

DATA FROM TEST NO. 6

EXPRESS LISTING - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	B1	ITOT1	ETOT1	HALL1	PTOT1	PCC1	PRC2	PRC12	TPH1	TPCC1	OX1	OX2	MOX1	MNG1	MS1	MTOT1	ALFA1
07/31/79	19:27:49	1113	4.96	331	1373	1130	454	2.926	0.551	0.557	900	2682	48.5	49.0	3.477	0.468	365	4.092	1.039
07/31/79	19:28:09	1114	4.97	330	1367	1120	451	2.955	0.548	0.551	900	2666	49.2	48.9	3.532	0.468	371	4.149	1.055
07/31/79	19:28:32	1115	4.97	304	1890	1787	574	2.980	0.543	0.546	900	2668	49.0	49.0	3.531	0.472	364	4.150	1.048
07/31/79	19:28:54	1116	4.97	303	1826	1553	553	2.994	0.541	0.545	902	2662	48.2	48.9	3.583	0.470	377	4.205	1.065
07/31/79	19:29:11	1117	4.97	305	2159	2128	658	3.014	0.537	0.542	905	2651	47.9	48.9	3.582	0.478	389	4.216	1.048
07/31/79	19:29:37	1118	4.97	304	1954	1823	593	3.034	0.534	0.540	905	2649	47.0	48.3	3.633	0.476	386	4.265	1.054
07/31/79	19:29:59	1119	4.97	328	2036	1998	668	3.053	0.530	0.533	907	2651	46.8	47.9	3.606	0.487	399	4.255	1.014
07/31/79	19:30:16	1120	4.97	328	2053	2033	673	3.063	0.528	0.538	907	2654	46.7	47.4	3.590	0.487	421	4.247	1.000
07/31/79	19:30:42	1121	4.97	327	1831	1776	599	3.078	0.528	0.537	907	2677	46.7	47.1	3.594	0.486	416	4.248	0.999
07/31/79	19:30:59	1122	4.98	327	1813	1681	593	1.251	1.298	1.321	909	2651	46.7	47.1	3.656	0.485	416	4.308	1.017
07/31/79	19:31:26	1123	4.98	327	1861	1740	608	1.266	1.287	1.310	909	2660	46.9	47.1	3.673	0.488	418	4.329	1.015
07/31/79	19:31:44	1124	4.97	327	1819	1612	594	1.241	1.312	1.336	909	2639	47.0	47.1	3.652	0.486	419	4.306	1.015
07/31/79	19:32:01	1125	4.98	327	2013	1986	658	1.280	1.272	1.299	911	2645	47.2	47.1	3.620	0.497	418	4.285	0.984
07/31/79	19:32:21	1126	4.97	300	2476	2490	743	1.246	1.310	1.338	911	2637	47.5	47.1	3.648	0.495	417	4.311	0.995
07/31/79	19:32:44	1127	4.98	276	3003	3076	827	1.280	1.279	1.306	911	2623	47.8	47.1	3.670	0.495	415	4.332	1.001
07/31/79	19:33:01	1128	4.97	264	3278	3334	864	1.246	1.314	1.346	911	2631	47.8	47.1	3.670	0.494	413	4.331	1.002
07/31/79	19:33:21	1129	4.98	232	4064	4073	943	1.261	1.303	1.334	911	2615	48.1	46.9	3.648	0.495	402	4.305	0.991
07/31/79	19:33:34	1130	4.98	232	4069	4084	945	1.266	1.302	1.329	911	2617	48.3	46.9	3.670	0.493	408	4.327	1.000
07/31/79	19:33:48	1131	4.98	233	4169	4177	971	1.261	1.307	1.338	911	2610	48.7	46.7	3.624	0.498	415	4.289	0.972
07/31/79	19:33:57	1132	4.97	235	4351	4354	1021	1.261	1.307	1.342	911	2613	48.9	46.6	3.556	0.508	416	4.232	0.933
07/31/79	19:34:12	1133	4.98	235	4374	4366	1030	1.266	1.306	1.341	911	2636	49.0	46.4	3.635	0.548	415	4.350	0.883
07/31/79	19:34:22	1134	4.98	235	4409	4400	1038	1.280	1.291	1.325	911	2654	49.2	46.3	3.626	0.548	417	4.341	0.879
07/31/79	19:34:29	1135	4.97	235	4421	4412	1041	1.251	1.321	1.356	911	2640	49.2	46.3	3.626	0.548	416	4.341	0.879
07/31/79	19:34:45	1136	4.98	232	4609	4600	1068	1.256	1.320	1.354	911	2639	49.5	46.3	3.614	0.506	415	4.287	0.947
07/31/79	19:35:12	1137	4.98	372	1619	1447	602	1.246	1.373	1.373	911	2637	49.5	46.3	3.637	0.551	415	4.355	0.876
07/31/79	19:35:38	1138	4.98	372	1631	1471	606	1.256	1.428	1.366	911	2649	49.5	46.3	3.603	0.547	419	4.319	0.873
07/31/79	19:36:02	1139	4.97	372	1643	1541	611	1.251	1.430	1.372	911	2651	49.5	46.3	3.637	0.506	418	4.311	0.953
07/31/79	19:36:29	1140	4.98	373	1638	1553	611	1.271	1.408	1.358	911	2649	49.5	46.3	3.516	0.547	413	4.229	0.852
07/31/79	19:36:41	1141	4.98	373	1667	1622	622	1.280	1.398	1.348	911	2663	49.5	46.3	3.606	0.505	418	4.280	0.946
07/31/79	19:37:13	1142	4.98	361	1907	1927	689	3.117	0.574	0.555	911	2650	49.4	46.4	3.617	0.547	400	4.325	0.880
07/31/79	19:37:29	1143	4.98	361	1907	1916	688	3.117	0.574	0.555	911	2679	49.3	46.6	3.629	0.547	395	4.335	0.884
07/31/79	19:42:32	1144	4.98	339	1673	1740	567	2.838	0.629	0.612	891	2643	58.8	47.0	3.122	0.507	353	3.771	0.829
07/31/79	19:46:09	1145	4.98	373	1415	1506	527	2.666	0.669	0.651	891	2740	41.6	48.1	3.076	0.454	352	3.672	0.933
07/31/79	19:51:07	1146	4.98	315	2194	2279	692	2.612	0.681	0.663	423	2687	34.2	64.9	4.070	0.452	209	4.606	1.637
07/31/79	19:51:17	1147	4.98	315	1995	2069	628	2.681	0.664	0.646	900	2703	49.2	44.6	3.139	0.448	352	3.729	0.896
07/31/79	19:52:32	1148	4.98	278	1750	1811	487	2.691	0.660	0.643	900	0	48.8	47.0	3.192	0.435	352	3.769	0.989
07/31/79	19:52:43	1149	4.98	278	1732	1776	482	2.691	0.661	0.643	902	0	48.8	47.4	3.201	0.434	352	3.777	1.001

STATIC PRESSURES - (KG/CM**2) - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	PCC1	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PD1	PD2	PD3
				PC11	PC12	PC13	PC14	PC15	PC16	PC17	PC18	PC19	PC20		PDS1	PDS2
07/31/79	19:27:49	1113	2.926	2.029	1.613	1.179	1.062	0.686	0.588	0.481	0.671	0.637	0.725	0.906	0.979	0.896
				1.760	1.628	0.867	0.964	0.720	0.603	0.525	0.608	0.744	0.0		0.886	0.925
07/31/79	19:28:09	1114	2.955	2.043	1.618	1.179	1.062	0.686	0.588	0.481	0.671	0.637	0.720	0.901	0.979	0.896
				1.760	1.628	0.867	0.964	0.720	0.603	0.525	0.603	0.740	0.0		0.886	0.925
07/31/79	19:28:32	1115	2.980	2.048	1.618	1.179	1.062	0.686	0.588	0.481	0.671	0.637	0.715	0.906	0.979	0.896
				1.760	1.628	0.867	0.964	0.720	0.603	0.525	0.593	0.740	0.0		0.886	0.925
07/31/79	19:28:54	1116	2.994	2.058	1.618	1.179	1.067	0.686	0.588	0.481	0.666	0.637	0.705	0.901	0.979	0.896
				1.760	1.633	0.867	0.964	0.720	0.603	0.525	0.588	0.740	0.0		0.886	0.925
07/31/79	19:29:11	1117	3.014	2.063	1.618	1.179	1.067	0.691	0.588	0.481	0.666	0.637	0.700	0.906	0.979	0.896
				1.760	1.633	0.867	0.959	0.720	0.603	0.520	0.583	0.740	0.0		0.886	0.925
07/31/79	19:29:37	1118	3.034	2.068	1.618	1.179	1.067	0.691	0.588	0.481	0.666	0.637	0.695	0.901	0.979	0.896
				1.760	1.638	0.867	0.964	0.720	0.603	0.520	0.574	0.740	0.0		0.886	0.925
07/31/79	19:29:59	1119	3.053	2.068	1.618	1.179	1.072	0.691	0.588	0.481	0.666	0.637	0.676	0.906	0.979	0.901
				1.760	1.643	0.867	0.959	0.720	0.603	0.520	0.569	0.740	0.0		0.886	0.925
07/31/79	19:30:16	1120	3.063	2.068	1.618	1.179	1.072	0.691	0.588	0.481	0.661	0.637	0.661	0.906	0.979	0.896
				1.760	1.648	0.867	0.959	0.720	0.603	0.520	0.564	0.740	0.0		0.886	0.925
07/31/79	19:30:42	1121	3.078	2.112	1.623	1.179	1.072	0.691	0.593	0.481	0.661	0.637	0.647	0.906	0.979	0.901
				1.760	1.653	0.867	0.959	0.720	0.603	0.520	0.559	0.740	0.0		0.891	0.925
07/31/79	19:30:59	1122	1.251	2.126	1.623	1.179	1.076	0.691	0.593	0.481	0.661	0.637	0.622	0.901	0.979	0.896
				1.760	1.653	0.867	0.964	0.720	0.603	0.520	0.559	0.735	0.0		0.886	0.925
07/31/79	19:31:26	1123	1.266	2.126	1.628	1.179	1.076	0.691	0.593	0.481	0.656	0.637	0.622	0.901	0.979	0.901
				1.760	1.658	0.867	0.959	0.720	0.603	0.520	0.554	0.735	0.0		0.886	0.925
07/31/79	19:31:44	1124	1.241	2.131	1.628	1.179	1.076	0.691	0.593	0.476	0.656	0.637	0.622	0.901	0.979	0.901
				1.760	1.658	0.867	0.964	0.715	0.603	0.520	0.549	0.735	0.0		0.886	0.925
07/31/79	19:32:01	1125	1.280	2.131	1.628	1.179	1.076	0.691	0.593	0.481	0.656	0.637	0.622	0.901	0.979	0.896
				1.760	1.662	0.867	0.959	0.715	0.603	0.520	0.549	0.735	0.0		0.886	0.925
07/31/79	19:32:21	1126	1.246	2.131	1.633	1.179	1.081	0.691	0.593	0.481	0.656	0.637	0.627	0.906	0.979	0.901
				1.760	1.667	0.867	0.964	0.715	0.603	0.520	0.549	0.735	0.0		0.891	0.925
07/31/79	19:32:44	1127	1.280	2.136	1.638	1.179	1.081	0.695	0.598	0.476	0.656	0.637	0.632	0.906	0.979	0.901
				1.765	1.672	0.867	0.964	0.720	0.603	0.520	0.544	0.735	0.0		0.891	0.925
07/31/79	19:33:01	1128	1.246	2.136	1.638	1.179	1.081	0.691	0.598	0.481	0.652	0.637	0.637	0.906	0.979	0.901
				1.760	1.677	0.867	0.959	0.720	0.603	0.520	0.539	0.730	0.0		0.891	0.925
07/31/79	19:33:21	1129	1.261	2.136	1.643	1.179	1.081	0.691	0.598	0.481	0.652	0.637	0.637	0.906	0.979	0.901
				1.765	1.682	0.867	0.964	0.720	0.603	0.520	0.539	0.730	0.0		0.891	0.925
07/31/79	19:33:34	1130	1.266	2.136	1.648	1.179	1.086	0.695	0.598	0.481	0.652	0.637	0.637	0.906	0.979	0.896
				1.760	1.682	0.867	0.959	0.720	0.603	0.520	0.534	0.730	0.0		0.891	0.925
07/31/79	19:33:48	1131	1.261	2.136	1.648	1.179	1.086	0.695	0.598	0.481	0.652	0.637	0.637	0.906	0.979	0.901
				1.765	1.687	0.867	0.959	0.720	0.603	0.515	0.534	0.730	0.0		0.891	0.925
07/31/79	19:33:57	1132	1.261	2.136	1.648	1.179	1.086	0.695	0.598	0.481	0.647	0.637	0.642	0.906	0.979	0.901
				1.765	1.692	0.867	0.959	0.720	0.603	0.520	0.534	0.730	0.0		0.891	0.925
07/31/79	19:34:12	1133	1.266	2.136	1.653	1.179	1.086	0.695	0.598	0.481	0.647	0.637	0.647	0.906	0.979	0.896
				1.765	1.697	0.867	0.959	0.720	0.608	0.520	0.534	0.730	0.0		0.886	0.925
07/31/79	19:34:22	1134	1.280	2.141	1.653	1.179	1.086	0.695	0.598	0.481	0.647	0.637	0.652	0.906	0.979	0.901
				1.765	1.697	0.867	0.959	0.720	0.608	0.520	0.529	0.730	0.0		0.891	0.925
07/31/79	19:34:29	1135	1.251	2.141	1.653	1.179	1.086	0.695	0.598	0.481	0.647	0.637	0.652	0.906	0.979	0.901
				1.765	1.697	0.867	0.959	0.720	0.603	0.515	0.529	0.730	0.0		0.886	0.925
07/31/79	19:34:45	1136	1.256	2.136	1.658	1.179	1.091	0.695	0.598	0.481	0.647	0.637	0.656	0.906	0.979	0.901
				1.765	1.701	0.867	0.959	0.725	0.608	0.520	0.529	0.730	0.0		0.891	0.925
07/31/79	19:35:12	1137	1.246	2.136	1.711	1.179	1.091	0.695	0.603	0.486	0.647	0.637	0.666	0.906	0.979	0.901
				1.765	1.711	0.867	0.959	0.725	0.608	0.520	0.525	0.725	0.0		0.891	0.925

STATIC PRESSURES - (KG/CM**2) - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	PCC1	PC1 PC11	PC2 PC12	PC3 PC13	PC4 PC14	PC5 PC15	PC6 PC16	PC7 PC17	PC8 PC18	PC9 PC19	PC10 PC20	PD1	PD2 PDS1	PD3 PDS2
07/31/79	19:35:38	1138	1.256	2.136	1.794	1.179	1.091	0.695	0.603	0.486	0.642	0.637	0.671	0.906	0.979	0.901
				1.765	1.716	0.867	0.959	0.725	0.608	0.520	0.525	0.725	0.0		0.886	0.925
07/31/79	19:36:02	1139	1.251	2.136	1.789	1.184	1.096	0.695	0.603	0.486	0.642	0.637	0.661	0.906	0.979	0.896
				1.765	1.716	0.867	0.959	0.725	0.608	0.515	0.520	0.725	0.0		0.886	0.925
07/31/79	19:36:29	1140	1.271	2.136	1.789	1.184	1.096	0.695	0.603	0.486	0.642	0.637	0.656	0.906	0.979	0.896
				1.765	1.726	0.867	0.959	0.725	0.608	0.520	0.520	0.725	0.0		0.886	0.925
07/31/79	19:36:41	1141	1.280	2.136	1.789	1.179	1.096	0.695	0.603	0.486	0.642	0.637	0.652	0.906	0.979	0.901
				1.765	1.726	0.871	0.959	0.730	0.608	0.520	0.520	0.725	0.0		0.886	0.925
07/31/79	19:37:13	1142	3.117	2.131	1.789	1.184	1.101	0.695	0.608	0.486	0.637	0.637	0.647	0.906	0.979	0.901
				1.765	1.731	0.871	0.959	0.730	0.608	0.520	0.515	0.725	0.0		0.886	0.925
07/31/79	19:37:29	1143	3.117	2.131	1.789	1.184	1.101	0.695	0.608	0.486	0.637	0.637	0.642	0.906	0.979	0.901
				1.765	1.731	0.867	0.959	0.730	0.608	0.520	0.515	0.720	0.0		0.886	0.925
07/31/79	19:42:32	1144	2.838	2.126	1.784	1.184	1.106	0.700	0.613	0.486	0.627	0.637	0.700	0.910	0.979	0.901
				1.765	1.736	0.871	0.959	0.730	0.613	0.515	0.525	0.715	0.0		0.886	0.925
07/31/79	19:46:09	1145	2.666	2.121	1.784	1.189	1.101	0.700	0.613	0.529	0.637	0.642	0.774	0.915	0.979	0.896
				1.765	1.736	0.871	0.959	0.725	0.608	0.534	0.593	0.720	0.0		0.886	0.925
07/31/79	19:51:07	1146	2.612	2.112	1.779	1.189	1.096	0.700	0.598	0.539	0.642	0.642	0.837	0.915	0.979	0.896
				1.760	1.731	0.867	0.959	0.720	0.598	0.549	0.637	0.720	0.0		0.886	0.925
07/31/79	19:51:17	1147	2.681	2.112	1.779	1.189	1.096	0.700	0.598	0.539	0.642	0.642	0.842	0.915	0.979	0.896
				1.760	1.731	0.867	0.959	0.720	0.598	0.549	0.637	0.720	0.0		0.886	0.925
07/31/79	19:52:32	1148	2.691	2.112	1.775	1.189	1.091	0.700	0.598	0.544	0.642	0.642	0.852	0.915	0.979	0.901
				1.760	1.731	0.867	0.959	0.715	0.598	0.554	0.647	0.725	0.0		0.886	0.925
07/31/79	19:52:43	1149	2.691	2.112	1.779	1.189	1.091	0.700	0.598	0.544	0.642	0.642	0.852	0.915	0.979	0.901
				1.755	1.731	0.871	0.959	0.715	0.593	0.554	0.647	0.725	0.0		0.886	0.925

COOLING WATER PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	MCW1	MCW2	MCW3	DTCW1	DTCW2	DTCW3	DQ1	DQ2	DQ3	HFR1	DQCC1
07/31/79	19:27:49	1113	183.4	248.2	240.8	9.68	15.27	18.21	2.065	4.406	5.099	25.80	8.00
07/31/79	19:28:09	1114	184.8	249.7	242.3	9.69	15.01	18.28	2.084	4.360	5.149	25.82	8.07
07/31/79	19:28:32	1115	184.3	249.6	240.7	9.67	15.28	18.30	2.072	4.435	5.124	26.02	7.96
07/31/79	19:28:54	1116	186.3	247.6	244.5	9.68	15.16	18.47	2.098	4.365	5.253	26.01	8.07
07/31/79	19:29:11	1117	185.2	250.0	240.9	9.69	15.16	18.46	2.088	4.408	5.171	26.37	7.92
07/31/79	19:29:37	1118	184.4	248.6	241.3	9.71	15.23	18.55	2.082	4.402	5.207	26.35	7.90
07/31/79	19:29:59	1119	185.4	249.9	239.7	9.75	15.23	18.69	2.102	4.425	5.208	26.86	7.83
07/31/79	19:30:16	1120	185.5	248.7	242.3	9.83	15.45	18.81	2.121	4.469	5.299	26.84	7.90
07/31/79	19:30:42	1121	183.9	248.8	240.9	9.84	15.46	18.90	2.105	4.474	5.294	26.77	7.86
07/31/79	19:30:59	1122	185.6	248.5	241.7	9.89	15.58	19.07	2.136	4.503	5.361	26.80	7.97
07/31/79	19:31:26	1123	185.1	249.6	240.4	9.89	15.50	18.99	2.130	4.500	5.309	26.98	7.90
07/31/79	19:31:44	1124	185.2	247.8	240.9	9.92	15.54	19.07	2.136	4.480	5.343	26.84	7.96
07/31/79	19:32:01	1125	184.2	249.1	242.8	9.87	15.49	19.06	2.114	4.488	5.383	27.33	7.73
07/31/79	19:32:21	1126	185.7	249.4	240.3	9.91	15.56	19.03	2.140	4.512	5.320	27.28	7.84
07/31/79	19:32:44	1127	185.6	249.2	242.5	9.73	15.44	18.98	2.102	4.474	5.351	27.31	7.70
07/31/79	19:33:01	1128	184.2	249.5	243.2	9.76	15.38	18.75	2.091	4.464	5.304	27.27	7.67
07/31/79	19:33:21	1129	185.0	249.1	240.1	9.71	15.29	18.71	2.089	4.431	5.226	27.28	7.66
07/31/79	19:33:48	1131	185.0	248.5	242.4	9.79	15.36	18.61	2.106	4.438	5.247	27.42	7.68
07/31/79	19:33:57	1132	185.7	248.2	244.1	9.87	15.34	18.49	2.132	4.430	5.249	27.82	7.66
07/31/79	19:34:22	1134	186.0	249.3	239.2	9.77	15.36	18.55	2.115	4.453	5.162	29.76	7.11
07/31/79	19:34:45	1136	186.2	249.1	242.7	9.85	15.45	18.67	2.134	4.477	5.270	27.77	7.69
07/31/79	19:35:12	1137	183.6	247.3	242.5	9.85	15.42	18.73	2.105	4.436	5.281	29.90	7.04
07/31/79	19:35:38	1138	185.7	249.6	242.5	9.89	15.64	19.27	2.137	4.540	5.435	29.70	7.19
07/31/79	19:36:02	1139	184.7	247.6	240.5	9.92	15.70	19.67	2.131	4.522	5.502	27.79	7.67
07/31/79	19:36:29	1140	184.4	249.3	240.8	9.93	15.78	19.71	2.131	4.576	5.520	29.61	7.20
07/31/79	19:36:41	1141	186.4	251.5	240.7	9.97	15.82	19.63	2.162	4.628	5.494	27.72	7.80
07/31/79	19:37:13	1142	183.9	248.3	243.0	10.00	15.89	19.60	2.138	4.588	5.540	29.71	7.20
07/31/79	19:37:29	1143	186.3	249.2	242.3	10.07	15.89	19.54	2.181	4.606	5.504	29.73	7.34
07/31/79	19:52:32	1148	184.3	246.9	244.1	9.23	14.71	16.68	1.979	4.224	4.737	23.91	8.28

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

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RECN=1113                DATE      TIME     I12=27   I16=31   I20=26   I132=9   I136=0   I140=29   IP57=0   IN57=68
                      07/31/79  19:27:49    I13=31   I17=24   I21=22   I133=9   I137=19  I141=42   IP93=26  IN93=12
  ITOT= 331     ETOT=1373     PTOT= 454     I14=28   I18=27   I22=26   I134=12  I138=24  I142=46
IINV17= 337   EINV17= 635   PINV17= 214     I15=28   I19=1    I23=24   I135=11  I139=25  I143=75
IINV19= 331   EINV19= 478   PINV19= 158
IINV21= 315   EINV21= 260   PINV21=  82
                HALL=1130                                                                              IENT= 295  IEXIT= 301

RECN=1114                DATE      TIME     I12=28   I16=30   I20=25   I132=10  I136=0   I140=28   IP57=0   IN57=70
                      07/31/79  19:28:09    I13=30   I17=25   I21=22   I133=9   I137=18  I141=42   IP93=28  IN93=10
  ITOT= 330     ETOT=1367     PTOT= 451     I14=28   I18=28   I22=26   I134=10  I138=23  I142=46
IINV17= 337   EINV17= 635   PINV17= 214     I15=29   I19=1    I23=24   I135=10  I139=25  I143=75
IINV19= 331   EINV19= 466   PINV19= 154
IINV21= 312   EINV21= 266   PINV21=  83
                HALL=1120                                                                              IENT= 295  IEXIT= 296

RECN=1115                DATE      TIME     I12=27   I16=29   I20=22   I132=10  I136=0   I140=26   IP57=0   IN57=55
                      07/31/79  19:28:32    I13=30   I17=23   I21=17   I133=8   I137=17  I141=40   IP93=25  IN93=13
  ITOT= 304     ETOT=1890     PTOT= 574     I14=28   I18=26   I22=20   I134=9   I138=22  I142=44
IINV17= 308   EINV17= 905   PINV17= 279     I15=28   I19=1    I23=16   I135=8   I139=24  I143=75
IINV19= 302   EINV19= 800   PINV19= 241
IINV21= 294   EINV21= 185   PINV21=  54
                HALL=1787                                                                              IENT= 267  IEXIT= 283

RECN=1116                DATE      TIME     I12=27   I16=29   I20=22   I132=14  I136=0   I140=24   IP57=0   IN57=65
                      07/31/79  19:28:54    I13=30   I17=23   I21=17   I133=10  I137=14  I141=39   IP93=27  IN93=12
  ITOT= 303     ETOT=1826     PTOT= 553     I14=28   I18=26   I22=20   I134=9   I138=20  I142=44
IINV17= 308   EINV17= 865   PINV17= 266     I15=28   I19=1    I23=17   I135=7   I139=21  I143=75
IINV19= 302   EINV19= 683   PINV19= 206
IINV21= 290   EINV21= 278   PINV21=  81
                HALL=1553                                                                              IENT= 267  IEXIT= 278

RECN=1117                DATE      TIME     I12=29   I16=31   I20=21   I132=11  I136=0   I140=26   IP57=0   IN57=45
                      07/31/79  19:29:11    I13=32   I17=24   I21=15   I133=8   I137=16  I141=41   IP93=26  IN93=13
  ITOT= 305     ETOT=2159     PTOT= 658     I14=28   I18=26   I22=18   I134=8   I138=22  I142=44
IINV17= 308   EINV17= 987   PINV17= 304     I15=29   I19=1    I23=14   I135=9   I139=23  I143=75
IINV19= 304   EINV19= 929   PINV19= 282
IINV21= 296   EINV21= 243   PINV21=  72
                HALL=2128                                                                              IENT= 268  IEXIT= 283

RECN=1118                DATE      TIME     I12=29   I16=30   I20=21   I132=15  I136=0   I140=25   IP57=0   IN57=55
                      07/31/79  19:29:37    I13=31   I17=23   I21=17   I133=11  I137=14  I141=40   IP93=26  IN93=12
  ITOT= 304     ETOT=1954     PTOT= 593     I14=28   I18=27   I22=18   I134=10  I138=18  I142=45
IINV17= 308   EINV17= 929   PINV17= 286     I15=28   I19=1    I23=15   I135=8   I139=21  I143=75
IINV19= 302   EINV19= 806   PINV19= 243
IINV21= 294   EINV21= 220   PINV21=  65
                HALL=1823                                                                              IENT= 269  IEXIT= 281
```

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```
RECN=1119                DATE      TIME     I12=31   I16=32   I20=24   I132=13  I136=0   I140=28   IP57=0   IN57=40
                      07/31/79  19:29:59    I13=33   I17=25   I21=19   I133=10  I137=17  I141=45   IP93=26  IN93=15
  ITOT= 328     ETOT=2036     PTOT= 668     I14=30   I18=28   I22=20   I134=9   I138=22  I142=49
IINV17= 331   EINV17= 923   PINV17= 305     I15=30   I19=1    I23=18   I135=9   I139=24  I143=75
IINV19= 327   EINV19= 882   PINV19= 289
IINV21= 317   EINV21= 232   PINV21=  74
                HALL=1998                                                                   IENT= 290  IEXIT= 303

RECN=1120                DATE      TIME     I12=31   I16=32   I20=24   I132=14  I136=0   I140=28   IP57=0   IN57=37
                      07/31/79  19:30:16    I13=33   I17=24   I21=19   I133=11  I137=17  I141=45   IP93=26  IN93=16
  ITOT= 328     ETOT=2053     PTOT= 673     I14=30   I18=28   I22=21   I134=11  I138=21  I142=47
IINV17= 331   EINV17= 923   PINV17= 305     I15=30   I19=1    I23=17   I135=10  I139=24  I143=75
IINV19= 327   EINV19= 893   PINV19= 292
IINV21= 317   EINV21= 237   PINV21=  75
                HALL=2033                                                                   IENT= 290  IEXIT= 302

RECN=1121                DATE      TIME     I12=31   I16=31   I20=23   I132=16  I136=0   I140=26   IP57=0   IN57=46
                      07/31/79  19:30:42    I13=33   I17=25   I21=20   I133=12  I137=16  I141=44   IP93=25  IN93=14
  ITOT= 327     ETOT=1831     PTOT= 599     I14=30   I18=28   I22=21   I134=11  I138=19  I142=47
IINV17= 331   EINV17= 859   PINV17= 284     I15=30   I19=1    I23=18   I135=10  I139=22  I143=75
IINV19= 325   EINV19= 788   PINV19= 256
IINV21= 317   EINV21= 185   PINV21=  59
                HALL=1776                                                                   IENT= 290  IEXIT= 298

RECN=1122                DATE      TIME     I12=30   I16=30   I20=24   I132=16  I136=0   I140=25   IP57=0   IN57=51
                      07/31/79  19:30:59    I13=32   I17=25   I21=19   I133=13  I137=16  I141=43   IP93=26  IN93=14
  ITOT= 327     ETOT=1813     PTOT= 593     I14=30   I18=28   I22=22   I134=12  I138=20  I142=46
IINV17= 331   EINV17= 841   PINV17= 278     I15=30   I19=1    I23=19   I135=11  I139=22  I143=75
IINV19= 325   EINV19= 747   PINV19= 243
IINV21= 317   EINV21= 226   PINV21=  72
                HALL=1681                                                                   IENT= 289  IEXIT= 298

RECN=1123                DATE      TIME     I12=30   I16=31   I20=24   I132=16  I136=0   I140=25   IP57=0   IN57=47
                      07/31/79  19:31:26    I13=33   I17=25   I21=19   I133=13  I137=16  I141=43   IP93=26  IN93=14
  ITOT= 327     ETOT=1861     PTOT= 608     I14=30   I18=27   I22=21   I134=12  I138=20  I142=46
IINV17= 331   EINV17= 859   PINV17= 284     I15=30   I19=1    I23=19   I135=11  I139=22  I143=75
IINV19= 325   EINV19= 776   PINV19= 252
IINV21= 317   EINV21= 226   PINV21=  72
                HALL=1740                                                                   IENT= 289  IEXIT= 298

RECN=1124                DATE      TIME     I12=30   I16=31   I20=24   I132=16  I136=0   I140=24   IP57=0   IN57=55
                      07/31/79  19:31:44    I13=32   I17=25   I21=19   I133=13  I137=17  I141=42   IP93=26  IN93=15
  ITOT= 327     ETOT=1819     PTOT= 594     I14=30   I18=27   I22=21   I134=12  I138=20  I142=45
IINV17= 331   EINV17= 841   PINV17= 278     I15=30   I19=1    I23=19   I135=10  I139=21  I143=75
IINV19= 325   EINV19= 718   PINV19= 233
IINV21= 317   EINV21= 260   PINV21=  83
                HALL=1612                                                                   IENT= 289  IEXIT= 296
```

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```
RECN=1125                DATE       TIME     I12=30    I16=31    I20=24    I132=15   I136=0    I140=26   IP57=0    IN57=41
                      07/31/79   19:32:01    I13=33    I17=26    I21=19    I133=12   I137=17   I141=44   IP93=26   IN93=16
  ITOT= 327     ETOT=2013      PTOT= 658    I14=30    I18=28    I22=19    I134=11   I138=21   I142=45
IINV17= 331   EINV17= 923   PINV17= 305    I15=31    I19=1     I23=17    I135=10   I139=23   I143=75
IINV19= 325   EINV19= 865   PINV19= 281
IINV21= 317   EINV21= 226   PINV21=  72
                HALL=1986                                                                                IENT= 290  IEXIT= 299

RECN=1126                DATE       TIME     I12=30    I16=30    I20=20    I132=12   I136=0    I140=23   IP57=0    IN57=29
                      07/31/79   19:32:21    I13=32    I17=24    I21=16    I133=10   I137=15   I141=39   IP93=27   IN93=14
  ITOT= 300     ETOT=2476      PTOT= 743    I14=29    I18=26    I22=15    I134=10   I138=20   I142=42
IINV17= 304   EINV17=1075   PINV17= 327    I15=29    I19=1     I23=12    I135=10   I139=20   I143=75
IINV19= 300   EINV19=1069   PINV19= 321
IINV21= 290   EINV21= 331   PINV21=  96
                HALL=2490                                                                                IENT= 265  IEXIT= 277

RECN=1127                DATE       TIME     I12=28    I16=29    I20=17    I132=10   I136=0    I140=22   IP57=0    IN57=14
                      07/31/79   19:32:44    I13=31    I17=23    I21=13    I133=8    I137=14   I141=37   IP93=26   IN93=14
  ITOT= 276     ETOT=3003      PTOT= 827    I14=28    I18=24    I22=11    I134=8    I138=18   I142=38
IINV17= 278   EINV17=1222   PINV17= 340    I15=28    I19=1     I23=8     I135=8    I139=19   I143=75
IINV19= 276   EINV19=1298   PINV19= 359
IINV21= 267   EINV21= 484   PINV21= 129
                HALL=3076                                                                                IENT= 241  IEXIT= 257

RECN=1128                DATE       TIME     I12=27    I16=28    I20=16    I132=8    I136=0    I140=21   IP57=0    IN57=9
                      07/31/79   19:33:01    I13=31    I17=22    I21=11    I133=7    I137=14   I141=35   IP93=26   IN93=13
  ITOT= 264     ETOT=3278      PTOT= 864    I14=27    I18=23    I22=10    I134=8    I138=17   I142=37
IINV17= 267   EINV17=1310   PINV17= 349    I15=28    I19=1     I23=6     I135=7    I139=18   I143=72
IINV19= 265   EINV19=1397   PINV19= 370
IINV21= 255   EINV21= 571   PINV21= 146
                HALL=3334                                                                                IENT= 230  IEXIT= 244

RECN=1129                DATE       TIME     I12=27    I16=26    I20=11    I132=6    I136=0    I140=18   IP57=0    IN57=14
                      07/31/79   19:33:21    I13=28    I17=20    I21=7     I133=5    I137=13   I141=31   IP93=26   IN93=12
  ITOT= 232     ETOT=4064      PTOT= 943    I14=25    I18=21    I22=6     I134=5    I138=16   I142=32
IINV17= 235   EINV17=1491   PINV17= 351    I15=26    I19=1     I23=2     I135=6    I139=17   I143=62
IINV19= 233   EINV19=1708   PINV19= 399
IINV21= 224   EINV21= 865   PINV21= 193
                HALL=4073                                                                                IENT= 201  IEXIT= 211

RECN=1130                DATE       TIME     I12=27    I16=26    I20=11    I132=6    I136=0    I140=18   IP57=0    IN57=12
                      07/31/79   19:33:34    I13=29    I17=20    I21=7     I133=5    I137=12   I141=31   IP93=26   IN93=13
  ITOT= 232     ETOT=4069      PTOT= 945    I14=25    I18=22    I22=6     I134=5    I138=16   I142=32
IINV17= 235   EINV17=1503   PINV17= 354    I15=25    I19=1     I23=2     I135=6    I139=16   I143=61
IINV19= 233   EINV19=1726   PINV19= 403
IINV21= 224   EINV21= 841   PINV21= 188
                HALL=4084                                                                                IENT= 201  IEXIT= 210
```

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```
RECN=1131                DATE       TIME     I12=27    I16=26    I20=12    I132=6    I136=0    I140=19    IP57=0    IN57=16
                      07/31/79   19:33:48    I13=29    I17=20    I21=7     I133=5    I137=13   I141=32    IP93=26   IN93=13
  ITOT= 233     ETOT=4169      PTOT= 971    I14=26    I18=21    I22=6     I134=5    I138=17   I142=32
IINV17= 235   EINV17=1526    PINV17= 359    I15=25    I19=1     I23=2     I135=6    I139=17   I143=61
IINV19= 235   EINV19=1749    PINV19= 412
IINV21= 224   EINV21= 893    PINV21= 200
                HALL=4177                                                                                IENT= 201  IEXIT= 211

RECN=1132                DATE       TIME     I12=28    I16=26    I20=11    I132=5    I136=0    I140=20    IP57=0    IN57=19
                      07/31/79   19:33:57    I13=29    I17=20    I21=7     I133=4    I137=13   I141=33    IP93=28   IN93=11
  ITOT= 235     ETOT=4351      PTOT=1021    I14=26    I18=21    I22=5     I134=4    I138=17   I142=34
IINV17= 235   EINV17=1561    PINV17= 368    I15=26    I19=1     I23=2     I135=6    I139=18   I143=59
IINV19= 239   EINV19=1784    PINV19= 427
IINV21= 226   EINV21=1005    PINV21= 227
                HALL=4354                                                                                IENT= 202  IEXIT= 212

RECN=1133                DATE       TIME     I12=30    I16=26    I20=11    I132=5    I136=0    I140=20    IP57=0    IN57=22
                      07/31/79   19:34:12    I13=29    I17=20    I21=7     I133=4    I137=13   I141=33    IP93=28   IN93=11
  ITOT= 235     ETOT=4374      PTOT=1030    I14=26    I18=21    I22=5     I134=5    I138=16   I142=34
IINV17= 235   EINV17=1573    PINV17= 370    I15=25    I19=1     I23=2     I135=6    I139=18   I143=59
IINV19= 241   EINV19=1784    PINV19= 430
IINV21= 226   EINV21=1016    PINV21= 229
                HALL=4366                                                                                IENT= 203  IEXIT= 213

RECN=1134                DATE       TIME     I12=29    I16=27    I20=10    I132=5    I136=0    I140=20    IP57=0    IN57=21
                      07/31/79   19:34:22    I13=29    I17=20    I21=7     I133=4    I137=13   I141=34    IP93=28   IN93=10
  ITOT= 235     ETOT=4409      PTOT=1038    I14=26    I18=21    I22=5     I134=4    I138=16   I142=34
IINV17= 235   EINV17=1573    PINV17= 370    I15=26    I19=1     I23=1     I135=6    I139=18   I143=60
IINV19= 241   EINV19=1790    PINV19= 432
IINV21= 226   EINV21=1046    PINV21= 236
                HALL=4400                                                                                IENT= 203  IEXIT= 215

RECN=1135                DATE       TIME     I12=29    I16=26    I20=10    I132=5    I136=0    I140=20    IP57=0    IN57=20
                      07/31/79   19:34:29    I13=29    I17=21    I21=6     I133=3    I137=13   I141=34    IP93=28   IN93=9
  ITOT= 235     ETOT=4421      PTOT=1041    I14=27    I18=22    I22=4     I134=5    I138=16   I142=34
IINV17= 235   EINV17=1579    PINV17= 372    I15=26    I19=1     I23=1     I135=6    I139=18   I143=59
IINV19= 241   EINV19=1790    PINV19= 432
IINV21= 226   EINV21=1052    PINV21= 237
                HALL=4412                                                                                IENT= 203  IEXIT= 213

RECN=1136                DATE       TIME     I12=29    I16=26    I20=9     I132=3    I136=0    I140=20    IP57=0    IN57=24
                      07/31/79   19:34:45    I13=29    I17=21    I21=5     I133=3    I137=12   I141=34    IP93=31   IN93=6
  ITOT= 232     ETOT=4609      PTOT=1068    I14=26    I18=21    I22=4     I134=3    I138=16   I142=34
IINV17= 230   EINV17=1620    PINV17= 372    I15=25    I19=1     I23=1     I135=5    I139=18   I143=58
IINV19= 241   EINV19=1808    PINV19= 436
IINV21= 220   EINV21=1181    PINV21= 260
                HALL=4600                                                                                IENT= 198  IEXIT= 206
```

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RECN=1137	DATE	TIME	I12=35	I16=33	I20=27	I132=18	I136=0	I140=31	IP57=0	IN57=51		
	07/31/79	19:35:12	I13=35	I17=29	I21=26	I133=14	I137=18	I141=50	IP93=25	IN93=18		
ITOT= 372	ETOT=1619	PTOT= 602	I14=32	I18=31	I22=26	I134=14	I138=23	I142=53				
IINV17= 376	EINV17= 747	PINV17= 281	I15=32	I19=1	I23=26	I135=13	I139=26	I143=75				
IINV19= 370	EINV19= 635	PINV19= 235										
IINV21= 362	EINV21= 237	PINV21= 86										
	HALL=1447								IENT= 332	IEXIT= 335		
RECN=1138	DATE	TIME	I12=35	I16=33	I20=27	I132=17	I136=0	I140=31	IP57=0	IN57=46		
	07/31/79	19:35:38	I13=35	I17=30	I21=26	I133=14	I137=18	I141=49	IP93=25	IN93=18		
ITOT= 372	ETOT=1631	PTOT= 606	I14=32	I18=31	I22=26	I134=14	I138=23	I142=53				
IINV17= 376	EINV17= 741	PINV17= 279	I15=32	I19=1	I23=25	I135=14	I139=26	I143=75				
IINV19= 370	EINV19= 653	PINV19= 242										
IINV21= 362	EINV21= 237	PINV21= 86										
	HALL=1471								IENT= 333	IEXIT= 334		
RECN=1139	DATE	TIME	I12=34	I16=33	I20=27	I132=17	I136=0	I140=31	IP57=0	IN57=37		
	07/31/79	19:36:02	I13=34	I17=29	I21=25	I133=13	I137=19	I141=50	IP93=26	IN93=19		
ITOT= 372	ETOT=1643	PTOT= 611	I14=32	I18=31	I22=26	I134=13	I138=24	I142=53				
IINV17= 376	EINV17= 741	PINV17= 279	I15=32	I19=1	I23=26	I135=13	I139=26	I143=75				
IINV19= 370	EINV19= 694	PINV19= 257										
IINV21= 362	EINV21= 208	PINV21= 75										
	HALL=1541								IENT= 332	IEXIT= 334		
RECN=1140	DATE	TIME	I12=34	I16=33	I20=28	I132=17	I136=0	I140=31	IP57=0	IN57=35		
	07/31/79	19:36:29	I13=34	I17=28	I21=26	I133=13	I137=20	I141=49	IP93=25	IN93=20		
ITOT= 373	ETOT=1638	PTOT= 611	I14=33	I18=31	I22=27	I134=14	I138=24	I142=52				
IINV17= 376	EINV17= 736	PINV17= 277	I15=32	I19=1	I23=27	I135=14	I139=27	I143=75				
IINV19= 372	EINV19= 700	PINV19= 260										
IINV21= 364	EINV21= 202	PINV21= 74										
	HALL=1553								IENT= 332	IEXIT= 336		
RECN=1141	DATE	TIME	I12=34	I16=33	I20=28	I132=16	I136=0	I140=31	IP57=0	IN57=33		
	07/31/79	19:36:41	I13=34	I17=28	I21=25	I133=13	I137=19	I141=49	IP93=26	IN93=20		
ITOT= 373	ETOT=1667	PTOT= 622	I14=33	I18=31	I22=26	I134=14	I138=24	I142=53				
IINV17= 376	EINV17= 753	PINV17= 283	I15=32	I19=1	I23=26	I135=14	I139=27	I143=75				
IINV19= 372	EINV19= 730	PINV19= 271										
IINV21= 364	EINV21= 185	PINV21= 67										
	HALL=1622								IENT= 332	IEXIT= 335		
RECN=1142	DATE	TIME	I12=33	I16=32	I20=26	I132=15	I136=0	I140=29	IP57=0	IN57=25		
	07/31/79	19:37:13	I13=35	I17=28	I21=24	I133=12	I137=19	I141=46	IP93=26	IN93=21		
ITOT= 361	ETOT=1907	PTOT= 689	I14=32	I18=31	I22=24	I134=13	I138=23	I142=52				
IINV17= 364	EINV17= 829	PINV17= 302	I15=32	I19=1	I23=24	I135=14	I139=25	I143=75				
IINV19= 360	EINV19= 847	PINV19= 305										
IINV21= 353	EINV21= 232	PINV21= 82										
	HALL=1927								IENT= 322	IEXIT= 323		

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```
RECN=1143                DATE      TIME     I12=33   I16=32   I20=27   I132=14  I136=0   I140=29   IP57=0   IN57=22
                      07/31/79  19:37:29    I13=35   I17=28   I21=24   I133=12  I137=19  I141=47   IP93=26  IN93=22
  ITOT= 361     ETOT=1907     PTOT= 688     I14=31   I18=30   I22=25   I134=13  I138=24  I142=52
IINV17= 364   EINV17= 817   PINV17= 298     I15=32   I19=1    I23=24   I135=14  I139=26  I143=75
IINV19= 360   EINV19= 853   PINV19= 307
IINV21= 353   EINV21= 237   PINV21=  84
                HALL=1916                                                                          IENT= 321  IEXIT= 325

RECN=1144                DATE      TIME     I12=35   I16=32   I20=22   I132=8   I136=0   I140=32   IP57=0   IN57=59
                      07/31/79  19:42:32    I13=35   I17=28   I21=21   I133=8   I137=22  I141=47   IP93=11  IN93=11
  ITOT= 339     ETOT=1673     PTOT= 567     I14=32   I18=29   I22=19   I134=12  I138=27  I142=48
IINV17= 343   EINV17= 782   PINV17= 268     I15=32   I19=1    I23=18   I135=15  I139=29  I143=75
IINV19= 337   EINV19= 607   PINV19= 204
IINV21= 333   EINV21= 284   PINV21=  95
                HALL=1740                                                                          IENT= 304  IEXIT= 322

RECN=1145                DATE      TIME     I12=31   I16=32   I20=28   I132=17  I136=0   I140=31   IP57=0   IN57=1
                      07/31/79  19:46:09    I13=33   I17=28   I21=28   I133=20  I137=26  I141=43   IP93=7   IN93=4
  ITOT= 373     ETOT=1415     PTOT= 527     I14=31   I18=31   I22=30   I134=21  I138=30  I142=43
IINV17= 376   EINV17= 518   PINV17= 195     I15=30   I19=1    I23=32   I135=21  I139=30  I143=73
IINV19= 372   EINV19= 560   PINV19= 208
IINV21= 368   EINV21= 337   PINV21= 124
                HALL=1506                                                                          IENT= 334  IEXIT= 354

RECN=1146                DATE      TIME     I12=33   I16=30   I20=20   I132=11  I136=0   I140=28   IP57=0   IN57=11
                      07/31/79  19:51:07    I13=32   I17=26   I21=19   I133=13  I137=21  I141=39   IP93=8   IN93=6
  ITOT= 315     ETOT=2194     PTOT= 692     I14=30   I18=27   I22=17   I134=15  I138=25  I142=39
IINV17= 319   EINV17= 823   PINV17= 263     I15=29   I19=1    I23=17   I135=15  I139=26  I143=63
IINV19= 315   EINV19= 823   PINV19= 260
IINV21= 310   EINV21= 548   PINV21= 170
                HALL=2279                                                                          IENT= 282  IEXIT= 295

RECN=1147                DATE      TIME     I12=32   I16=29   I20=20   I132=11  I136=0   I140=27   IP57=0   IN57=21
                      07/31/79  19:51:17    I13=32   I17=25   I21=20   I133=13  I137=21  I141=38   IP93=8   IN93=5
  ITOT= 315     ETOT=1995     PTOT= 628     I14=30   I18=27   I22=19   I134=15  I138=25  I142=39
IINV17= 319   EINV17= 770   PINV17= 246     I15=28   I19=1    I23=19   I135=16  I139=26  I143=64
IINV19= 313   EINV19= 741   PINV19= 232
IINV21= 310   EINV21= 484   PINV21= 150
                HALL=2069                                                                          IENT= 281  IEXIT= 295

RECN=1148                DATE      TIME     I12=24   I16=26   I20=18   I132=9   I136=0   I140=24   IP57=0   IN57=67
                      07/31/79  19:52:32    I13=28   I17=21   I21=16   I133=11  I137=18  I141=33   IP93=9   IN93=6
  ITOT= 278     ETOT=1750     PTOT= 487     I14=26   I18=24   I22=19   I134=13  I138=22  I142=35
IINV17= 282   EINV17= 782   PINV17= 221     I15=23   I19=1    I23=17   I135=13  I139=22  I143=57
IINV19= 276   EINV19= 630   PINV19= 174
IINV21= 272   EINV21= 337   PINV21=  92
                HALL=1811                                                                          IENT= 244  IEXIT= 256
```

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

RECN=1149

DATE	TIME
07/31/79	19:52:43

ITOT= 278	ETOT=1732	PTOT= 482
IINV17= 282	EINV17= 776	PINV17= 219
IINV19= 276	EINV19= 624	PINV19= 172
IINV21= 272	EINV21= 331	PINV21= 90
	HALL=1776	

I12=24	I16=26	I20=18	I132=9	I136=0	I140=23	IP57=0
I13=28	I17=21	I21=16	I133=11	I137=18	I141=32	IP93=10
I14=25	I18=24	I22=19	I134=13	I138=22	I142=34	
I15=23	I19=1	I23=18	I135=13	I139=22	I143=58	

IN57=67
IN93=7

IENT= 244 IEXIT= 256

INTERFRAME VOLTAGES - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
07/31/79	19:27:49	1113	-2	0	-2	-1	-1	0	0	1	2	5	22	0	0	0	0	1	-1	-1	1	2
07/31/79	19:28:09	1114	-2	0	-1	-1	-1	0	0	1	2	5	22	0	0	1	-1	0	-2	-1	-1	2
07/31/79	19:28:32	1115	-2	-1	-2	-1	-1	0	0	1	2	5	22	0	0	1	-1	0	0	0	1	3
07/31/79	19:28:54	1116	-2	-1	-2	-1	-1	0	0	1	2	5	22	0	0	0	0	1	-2	0	0	3
07/31/79	19:29:11	1117	-2	-1	-2	-1	-1	0	0	1	2	5	21	0	0	0	0	1	0	0	1	3
07/31/79	19:29:37	1118	-2	-1	-2	-1	-1	0	0	1	2	5	20	0	0	1	-1	1	0	0	0	3
07/31/79	19:29:59	1119	-2	-1	-2	-1	-1	0	0	1	2	5	19	0	0	0	0	1	0	0	0	4
07/31/79	19:30:16	1120	-2	-1	-1	-1	-1	0	0	1	2	5	20	0	0	0	0	1	-1	0	-1	3
07/31/79	19:30:42	1121	-2	-1	-2	-1	-1	0	0	1	2	5	21	0	0	1	0	1	-1	0	-1	3
07/31/79	19:30:59	1122	-2	-1	-2	-1	-1	0	0	1	2	5	21	0	0	1	0	1	-2	0	0	3
07/31/79	19:31:26	1123	-2	-1	-2	-1	-1	0	0	1	2	5	22	0	0	0	0	0	-1	0	0	3
07/31/79	19:31:44	1124	-2	-1	-2	-1	-1	0	0	1	3	5	22	0	0	0	0	0	-1	0	1	3
07/31/79	19:32:01	1125	-2	-1	-2	-1	-1	0	0	1	2	5	21	0	0	1	0	0	-1	0	0	3
07/31/79	19:32:21	1126	-2	-1	-2	-1	-1	0	0	1	2	5	20	0	0	1	0	0	0	0	-1	3
07/31/79	19:32:44	1127	-2	-1	-2	-1	-1	0	0	1	2	4	19	0	0	1	0	1	1	0	0	3
07/31/79	19:33:01	1128	-3	-1	-2	-2	-1	0	0	1	2	4	18	0	0	0	0	0	0	0	-1	4
07/31/79	19:33:21	1129	-3	-1	-2	-1	-1	0	0	1	2	4	18	0	0	1	-2	0	-1	1	0	4
07/31/79	19:33:48	1131	-3	-2	-2	-2	-2	0	0	1	2	4	16	0	0	0	0	0	0	2	0	5
07/31/79	19:33:57	1132	-3	-2	-2	-2	-2	-1	0	1	1	4	15	0	0	1	0	0	0	0	0	5
07/31/79	19:34:22	1134	-3	-2	-2	-2	-2	-1	-1	0	1	4	13	1	0	1	0	0	0	1	1	5
07/31/79	19:34:45	1136	-3	-2	-2	-2	-2	-1	0	0	1	4	13	0	0	1	0	0	0	2	1	5
07/31/79	19:35:12	1137	-4	-3	-3	-3	-3	-1	-1	0	1	4	11	1	0	1	0	0	0	2	0	3
07/31/79	19:35:38	1138	-2	0	-1	-1	-1	0	0	1	3	5	19	0	0	1	0	0	0	0	-1	1
07/31/79	19:36:02	1139	-2	0	-1	-1	-1	0	0	1	3	5	19	0	0	1	-1	0	0	0	1	1
07/31/79	19:36:29	1140	-2	0	-1	-1	-1	0	0	1	3	5	19	0	-1	1	0	0	0	0	0	1
07/31/79	19:36:41	1141	-2	0	-1	-1	-1	0	0	1	3	5	19	0	0	1	0	0	0	0	1	1
07/31/79	19:37:13	1142	-2	0	-1	-1	-1	0	0	1	3	5	20	0	0	1	-1	0	0	0	-1	2
07/31/79	19:37:29	1143	-2	0	-1	-1	-1	0	0	1	3	5	19	0	0	1	0	0	0	0	-1	2
07/31/79	19:52:32	1148	-2	-1	-1	-1	-1	0	0	2	2	5	20	0	0	2	-1	0	0	0	0	1

INTERFRAME VOLTAGES - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
07/31/79	19:27:49	1113	0	0	0	-85	9	10	9	8	71	-32	34	1	3	38	-38	84	-76	103	0	0
07/31/79	19:28:09	1114	0	0	0	-86	8	9	7	7	67	-32	34	0	6	35	-33	73	-66	92	0	0
07/31/79	19:28:32	1115	0	0	0	-112	14	15	14	14	86	-39	42	2	2	51	-49	106	-97	119	0	0
07/31/79	19:28:54	1116	0	0	0	-112	14	15	12	13	90	-40	42	3	0	51	-49	101	-95	118	0	0
07/31/79	19:29:11	1117	0	0	0	-109	16	17	13	13	94	-42	43	4	1	55	-53	109	-102	119	0	0
07/31/79	19:29:37	1118	0	0	0	-113	16	17	13	12	92	-41	42	4	1	56	-53	106	-100	120	0	0
07/31/79	19:29:59	1119	0	0	0	-120	17	18	15	15	96	-43	44	5	0	59	-59	111	-109	122	0	0
07/31/79	19:30:16	1120	0	0	0	-111	15	16	13	12	88	-39	40	4	1	53	-51	104	-97	118	0	0
07/31/79	19:30:42	1121	0	0	0	-109	14	14	12	11	89	-37	40	3	1	49	-47	99	-92	116	0	0
07/31/79	19:30:59	1122	0	0	0	-105	13	15	10	10	86	-37	39	4	0	50	-47	99	-91	114	0	0
07/31/79	19:31:26	1123	0	0	0	-101	12	14	10	11	84	-36	38	5	0	48	-45	97	-91	114	0	0
07/31/79	19:31:44	1124	0	0	0	-105	13	14	10	10	85	-36	38	3	1	47	-47	95	-90	112	0	0
07/31/79	19:32:01	1125	0	0	0	-104	14	16	11	11	91	-38	40	5	0	51	-51	101	-93	115	0	0
07/31/79	19:32:21	1126	0	0	0	-121	19	20	16	16	98	-42	45	8	-2	60	-58	113	-110	122	0	0
07/31/79	19:32:44	1127	0	0	0	-123	22	22	20	20	106	-47	49	9	-2	69	-66	122	-118	123	0	0
07/31/79	19:33:01	1128	0	0	0	-125	117	-92	23	21	94	-30	35	25	-22	91	-91	127	-125	123	0	0
07/31/79	19:33:21	1129	0	0	0	-125	36	12	10	35	109	-50	54	7	-1	75	-72	125	-122	123	0	0
07/31/79	19:33:48	1131	0	0	0	-126	28	28	27	28	118	-57	60	9	-2	85	-82	129	-127	123	0	0
07/31/79	19:33:57	1132	0	0	0	-126	28	29	27	27	120	-56	58	9	-2	86	-84	129	-129	123	0	0
07/31/79	19:34:22	1134	0	0	0	-126	28	31	27	27	120	-55	59	8	-1	85	-83	129	-129	123	0	0
07/31/79	19:34:45	1136	0	0	0	-126	29	31	28	28	118	-59	61	8	-1	87	-83	129	-128	123	0	0
07/31/79	19:35:12	1137	0	0	0	-126	25	27	24	23	111	-50	53	6	0	67	-65	118	-118	123	0	0
07/31/79	19:35:38	1138	0	0	0	-97	11	13	10	10	75	-35	37	0	4	41	-39	92	-88	110	0	0
07/31/79	19:36:02	1139	0	0	0	-101	12	14	8	8	81	-36	39	1	3	41	-39	89	-90	108	0	0
07/31/79	19:36:29	1140	0	0	0	-99	12	14	7	7	81	-37	39	2	2	42	-38	92	-89	112	0	0
07/31/79	19:36:41	1141	0	0	0	-98	12	14	5	5	80	-36	39	2	2	40	-40	90	-84	112	0	0
07/31/79	19:37:13	1142	0	0	0	-101	12	15	9	9	84	-38	40	3	2	47	-43	101	-91	116	0	0
07/31/79	19:37:29	1143	0	0	0	-103	12	15	8	8	85	-38	41	3	1	46	-43	99	-92	116	0	0
07/31/79	19:52:32	1148	0	0	0	-102	13	10	2	9	92	-36	40	8	-3	53	-53	91	-89	105	0	0

INTERFRAME VOLTAGES - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
07/31/79	19:27:49	1113	0	0	1	0	33	22	13	27	31	23	11	24	39	10	19	17	43	13	15	48
07/31/79	19:28:09	1114	0	0	1	0	29	20	11	22	30	21	8	23	35	7	16	14	42	10	11	43
07/31/79	19:28:32	1115	0	0	1	0	44	30	20	40	42	24	26	31	53	16	31	26	55	20	25	59
07/31/79	19:28:54	1116	0	0	1	0	41	26	20	34	41	26	19	31	47	13	27	24	54	19	21	57
07/31/79	19:29:11	1117	0	0	1	0	46	30	23	38	45	29	25	35	55	17	31	26	59	22	26	62
07/31/79	19:29:37	1118	0	0	1	0	45	28	21	37	42	28	27	34	52	14	33	25	56	21	25	60
07/31/79	19:29:59	1119	0	0	1	0	50	31	26	41	47	31	30	39	57	18	38	31	62	23	28	65
07/31/79	19:30:16	1120	0	0	1	0	43	27	23	35	42	27	20	35	50	12	31	26	55	21	24	60
07/31/79	19:30:42	1121	0	0	1	0	42	27	20	34	42	26	21	35	49	13	30	24	53	19	23	59
07/31/79	19:30:59	1122	0	0	1	0	41	26	20	31	41	23	19	32	47	11	29	24	51	18	22	55
07/31/79	19:31:26	1123	0	0	1	0	42	25	18	33	40	23	20	33	46	14	29	23	52	20	22	58
07/31/79	19:31:44	1124	0	0	1	0	40	26	18	31	38	22	17	33	45	11	26	20	52	17	20	53
07/31/79	19:32:01	1125	0	0	1	0	42	25	22	33	41	22	24	33	49	13	30	23	53	18	24	60
07/31/79	19:32:21	1126	0	0	1	0	50	31	29	40	52	24	33	39	57	18	36	30	61	25	32	67
07/31/79	19:32:44	1127	0	0	1	0	55	36	31	47	56	27	36	47	64	22	44	33	70	31	45	50
07/31/79	19:33:01	1128	0	0	1	0	57	37	36	50	58	29	47	49	67	23	45	33	72	32	50	48
07/31/79	19:33:21	1129	0	0	1	0	57	39	33	49	58	29	43	49	68	23	47	36	75	31	52	50
07/31/79	19:33:48	1131	0	0	1	0	64	46	39	56	65	36	57	55	73	28	56	45	80	40	68	42
07/31/79	19:33:57	1132	0	0	1	0	65	45	43	58	67	43	56	59	79	30	58	47	81	39	64	59
07/31/79	19:34:22	1134	0	0	1	0	64	47	42	58	66	44	54	59	75	29	62	52	80	37	66	54
07/31/79	19:34:45	1136	0	0	1	0	64	48	42	59	65	44	55	59	78	28	62	51	80	35	67	58
07/31/79	19:35:12	1137	0	0	1	0	47	32	26	33	47	34	31	39	50	17	33	29	58	21	34	40
07/31/79	19:35:38	1138	0	0	1	0	37	25	15	27	36	24	19	30	42	4	19	22	49	14	19	41
07/31/79	19:36:02	1139	0	0	1	0	38	24	15	28	40	19	20	33	45	5	17	25	52	14	17	46
07/31/79	19:36:29	1140	0	0	1	0	39	23	16	27	42	13	22	35	43	10	15	24	51	17	13	47
07/31/79	19:36:41	1141	0	0	1	0	39	24	17	29	42	15	23	33	44	10	17	24	51	18	14	48
07/31/79	19:37:13	1142	0	0	1	0	41	26	19	31	45	16	27	36	48	12	21	25	55	22	17	49
07/31/79	19:37:29	1143	0	0	1	0	41	26	18	31	43	16	26	35	45	11	24	24	56	21	17	50
07/31/79	19:52:32	1148	0	0	1	0	43	21	19	33	35	11	24	30	44	6	17	18	60	5	22	46

INTERFRAME VOLTAGES - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
07/31/79	19:27:49	1113	13	21	19	18	15	9	23	13	10	7	4	34	11	14	14	22	13	10	19	15
07/31/79	19:28:09	1114	10	18	13	15	11	4	18	8	6	4	2	23	4	9	8	17	8	5	13	12
07/31/79	19:28:32	1115	23	32	28	23	28	15	36	23	16	13	10	50	21	25	24	31	20	21	27	25
07/31/79	19:28:54	1116	18	27	26	23	24	12	34	14	15	11	10	43	17	21	20	26	20	15	23	21
07/31/79	19:29:11	1117	23	34	31	26	30	18	41	21	20	15	12	54	21	25	24	31	24	22	29	26
07/31/79	19:29:37	1118	21	31	26	27	25	15	38	19	17	14	13	49	17	24	22	30	19	20	27	23
07/31/79	19:29:59	1119	25	38	35	31	36	19	47	27	22	19	18	58	26	30	30	35	28	27	33	30
07/31/79	19:30:16	1120	21	33	27	25	30	16	37	27	15	13	13	47	20	24	24	31	22	20	27	23
07/31/79	19:30:42	1121	21	30	27	24	27	15	36	25	15	11	13	47	19	23	25	31	22	19	28	22
07/31/79	19:30:59	1122	19	27	23	22	26	13	32	23	13	10	11	44	16	22	20	29	18	19	24	20
07/31/79	19:31:26	1123	20	29	23	22	28	13	32	23	12	11	12	46	17	22	23	31	19	20	24	22
07/31/79	19:31:44	1124	18	27	22	20	24	12	31	21	13	11	10	40	14	19	17	28	17	17	21	21
07/31/79	19:32:01	1125	20	31	27	21	27	15	35	23	15	13	13	44	17	24	23	30	21	18	26	22
07/31/79	19:32:21	1126	25	38	34	27	37	23	48	25	23	19	18	57	24	32	31	36	28	27	32	32
07/31/79	19:32:44	1127	41	46	43	29	44	31	52	29	28	28	21	68	30	39	37	39	37	32	41	39
07/31/79	19:33:01	1128	49	49	47	32	44	33	58	33	31	32	23	73	32	40	42	41	40	35	43	43
07/31/79	19:33:21	1129	49	48	51	33	46	32	45	30	35	33	21	63	35	42	42	43	41	35	42	42
07/31/79	19:33:48	1131	67	57	60	46	50	38	68	39	42	40	31	80	45	52	52	52	55	42	52	48
07/31/79	19:33:57	1132	63	59	59	50	50	36	71	43	43	44	29	81	47	52	56	53	52	44	55	48
07/31/79	19:34:22	1134	65	59	60	50	52	39	72	45	35	50	29	81	47	50	54	53	53	44	53	47
07/31/79	19:34:45	1136	67	58	59	51	53	37	72	49	25	58	26	81	48	50	56	54	54	46	54	45
07/31/79	19:35:12	1137	36	31	30	25	28	4	41	25	1	28	3	30	16	17	24	22	19	15	17	17
07/31/79	19:35:38	1138	25	24	24	19	21	8	33	18	1	21	4	31	14	15	24	22	19	17	15	18
07/31/79	19:36:02	1139	26	25	29	18	24	9	32	19	1	21	4	33	17	15	21	25	19	17	17	19
07/31/79	19:36:29	1140	25	24	28	17	26	12	32	19	1	21	6	34	19	17	21	25	20	18	18	19
07/31/79	19:36:41	1141	25	25	28	19	25	12	33	20	2	19	8	37	21	19	22	27	20	19	22	20
07/31/79	19:37:13	1142	28	30	32	22	28	15	37	23	3	24	10	43	22	24	26	29	24	21	23	23
07/31/79	19:37:29	1143	27	29	32	22	28	14	37	23	2	23	10	41	22	24	24	29	24	22	24	22
07/31/79	19:52:32	1148	24	20	22	12	19	7	32	13	0	14	9	42	14	13	26	24	17	20	18	19

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DATE	TIME	RECN	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
07/31/79	19:27:49	1113	6	10	14	10	7	7	7	13	6	5	4	4	23	14	4	13	0	-2	5	0
07/31/79	19:28:09	1114	3	7	8	1	4	3	0	5	4	-1	1	-6	29	19	6	17	0	-2	8	1
07/31/79	19:28:32	1115	15	18	23	22	16	12	14	21	11	15	9	13	28	20	10	22	3	0	12	2
07/31/79	19:28:54	1116	12	12	20	14	12	8	10	17	7	13	6	10	26	18	7	19	0	-2	7	1
07/31/79	19:29:11	1117	17	17	27	23	17	15	14	21	11	18	7	15	30	23	11	26	4	0	15	4
07/31/79	19:29:37	1118	16	15	24	21	15	15	14	19	11	17	6	16	32	22	9	22	2	0	13	5
07/31/79	19:29:59	1119	23	22	33	33	25	18	20	26	15	27	13	21	36	29	12	37	8	5	24	14
07/31/79	19:30:16	1120	16	18	27	23	23	15	16	21	10	23	8	15	32	22	7	27	3	3	14	10
07/31/79	19:30:42	1121	17	17	27	20	17	14	12	23	10	18	9	14	31	21	7	29	3	2	12	10
07/31/79	19:30:59	1122	17	13	24	18	16	11	11	20	9	15	8	12	27	21	6	22	1	-1	9	7
07/31/79	19:31:26	1123	17	14	22	19	18	13	12	22	8	15	8	13	27	19	8	20	1	0	12	6
07/31/79	19:31:44	1124	16	12	18	15	13	10	10	18	6	12	4	11	25	17	5	17	0	0	10	3
07/31/79	19:32:01	1125	17	15	23	22	14	12	14	20	8	17	8	13	29	20	9	24	2	2	14	6
07/31/79	19:32:21	1126	24	20	31	32	25	19	19	27	13	27	12	20	40	25	13	34	6	6	21	13
07/31/79	19:32:44	1127	30	24	36	37	35	22	23	34	18	33	14	25	43	32	17	44	10	11	28	17
07/31/79	19:33:01	1128	33	27	41	39	38	24	30	34	19	39	16	25	44	35	21	51	11	11	28	19
07/31/79	19:33:21	1129	33	27	40	40	39	24	27	39	15	40	17	28	48	35	22	50	13	13	33	23
07/31/79	19:33:48	1131	43	39	50	51	45	32	36	46	22	51	19	38	56	45	30	63	19	17	40	31
07/31/79	19:33:57	1132	44	42	50	54	48	32	41	46	20	54	19	40	60	48	32	68	24	25	43	34
07/31/79	19:34:22	1134	47	44	51	55	47	32	41	51	18	55	19	39	63	47	32	73	21	25	45	34
07/31/79	19:34:45	1136	49	43	49	53	48	35	40	49	17	55	22	36	65	46	33	72	21	28	48	34
07/31/79	19:35:12	1137	12	14	18	16	12	14	7	14	6	11	8	8	23	10	5	11	0	3	8	3
07/31/79	19:35:38	1138	14	13	14	18	13	12	9	14	7	12	7	8	26	10	6	13	0	2	9	1
07/31/79	19:36:02	1139	15	17	14	16	15	14	10	14	8	10	8	11	26	12	7	17	0	3	8	3
07/31/79	19:36:29	1140	15	17	16	21	13	15	11	17	8	10	11	10	25	14	5	17	1	3	10	3
07/31/79	19:36:41	1141	17	19	21	20	17	14	12	18	10	11	12	13	28	14	8	23	4	3	15	6
07/31/79	19:37:13	1142	20	19	24	26	19	18	14	20	11	16	12	14	31	17	8	24	5	6	17	6
07/31/79	19:37:29	1143	23	19	27	30	20	21	12	20	10	17	11	14	29	19	8	25	5	6	13	6
07/31/79	19:52:32	1148	9	15	17	18	6	14	9	14	5	7	4	3	21	9	2	12	0	-1	2	0

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DATE	TIME	RECN	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
07/31/79	19:27:49	1113	3	0	2	4	0	0	-9	-5	0	-7	-5	-3	-15	-4	-5	-11	-7	-5	-8	-14
07/31/79	19:28:09	1114	3	0	2	6	0	0	-6	-3	1	-4	-4	-3	-12	-3	-6	-8	-10	-4	-8	-11
07/31/79	19:28:32	1115	7	5	4	11	0	1	0	3	1	1	0	1	-8	0	0	-5	-5	-2	-5	-12
07/31/79	19:28:54	1116	5	3	2	7	0	1	-4	-4	0	-3	-2	-1	-14	-2	-5	-6	-8	-6	-7	-10
07/31/79	19:29:11	1117	12	5	7	12	1	2	2	2	4	4	1	1	-7	2	0	-2	-2	-2	-3	-5
07/31/79	19:29:37	1118	9	5	6	11	0	2	0	0	2	0	5	2	-8	0	-3	-5	-3	-3	-4	-5
07/31/79	19:29:59	1119	23	10	12	18	4	5	19	18	10	11	10	9	-1	8	3	2	2	2	2	2
07/31/79	19:30:16	1120	15	6	8	10	1	3	4	6	5	1	2	3	-4	2	0	-1	0	-3	0	-3
07/31/79	19:30:42	1121	15	6	6	11	1	3	3	6	4	2	0	1	-5	0	0	-4	-1	-3	-2	-7
07/31/79	19:30:59	1122	10	3	6	10	0	2	0	0	1	0	-2	-1	-10	-2	-1	-6	-4	-5	-5	-8
07/31/79	19:31:26	1123	9	4	7	11	0	2	0	2	2	0	-1	1	-5	0	-2	-6	-3	-4	-4	-7
07/31/79	19:31:44	1124	5	3	4	8	0	1	-1	0	1	-1	-2	0	-10	-2	-4	-8	-5	-6	-6	-9
07/31/79	19:32:01	1125	12	6	8	12	1	2	4	7	4	1	2	2	-4	2	-1	-3	-1	0	-2	-3
07/31/79	19:32:21	1126	20	12	12	18	4	7	10	14	10	8	7	8	0	7	3	1	1	3	4	3
07/31/79	19:32:44	1127	25	16	15	21	7	12	18	20	15	13	10	12	5	11	8	4	6	10	8	10
07/31/79	19:33:01	1128	26	21	15	26	7	15	22	25	13	18	12	12	9	14	10	5	10	10	11	12
07/31/79	19:33:21	1129	29	26	17	26	9	18	25	31	22	20	18	16	16	17	12	7	16	17	17	18
07/31/79	19:33:48	1131	35	36	16	36	16	21	28	35	27	23	19	21	17	19	15	11	20	17	18	22
07/31/79	19:33:57	1132	38	40	18	43	16	26	37	40	33	26	22	26	23	21	22	14	27	20	25	29
07/31/79	19:34:22	1134	39	42	18	45	18	24	38	41	33	27	22	26	23	21	24	13	26	21	25	31
07/31/79	19:34:45	1136	40	43	18	45	18	24	40	42	34	27	22	25	26	20	27	14	25	22	24	34
07/31/79	19:35:12	1137	6	7	1	6	0	1	-2	0	2	-2	-2	-1	-7	-4	-3	-3	-4	-4	-5	-11
07/31/79	19:35:38	1138	7	6	2	8	0	1	-2	0	3	-3	-1	-2	-6	-2	-4	-6	-3	-5	-7	-9
07/31/79	19:36:02	1139	7	7	3	7	0	1	0	0	4	-3	0	-1	-5	-2	-3	-7	-1	-6	-5	-7
07/31/79	19:36:29	1140	9	6	4	6	0	1	-1	2	5	-3	0	0	-4	-2	-2	-6	-1	-6	-5	-3
07/31/79	19:36:41	1141	15	12	6	11	1	2	5	6	6	0	2	2	-3	0	0	-3	0	-1	-1	0
07/31/79	19:37:13	1142	14	10	7	11	2	2	2	7	6	1	2	5	-3	0	0	-2	0	0	-1	-2
07/31/79	19:37:29	1143	13	10	7	11	2	2	4	8	7	0	2	4	-3	1	0	-3	0	-2	1	-1
07/31/79	19:52:32	1148	0	0	2	3	4	8	14	12	20	8	11	16	4	12	10	6	17	13	16	19

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DATE	TIME	RECN	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
07/31/79	19:27:49	1113	-15	-6	-3	-11	-10	-3	-3	0	-2	-2	-12	1	1	0	1	2	1	2	4	3
07/31/79	19:28:09	1114	-16	-7	-7	-10	-13	-5	-3	-4	-11	-4	-17	0	1	1	1	2	1	2	3	3
07/31/79	19:28:32	1115	-14	-6	-4	-10	-5	-3	-6	-2	-11	-3	-17	0	1	0	1	2	1	2	3	3
07/31/79	19:28:54	1116	-19	-9	-6	-12	-13	-6	-4	-5	-14	-9	-32	-1	0	0	1	2	1	2	3	4
07/31/79	19:29:11	1117	-13	-4	-1	-8	-10	-3	-3	-2	-10	-6	-33	-1	0	1	1	2	1	2	3	4
07/31/79	19:29:37	1118	-13	-6	-6	-7	-11	-5	-2	-2	-15	-10	-37	-1	0	0	1	1	1	2	4	4
07/31/79	19:29:59	1119	-4	0	1	-1	-5	1	0	0	-6	-3	-29	0	0	1	1	1	1	2	3	4
07/31/79	19:30:16	1120	-8	-2	0	-7	-9	-1	-1	-3	-9	-7	-34	-1	0	0	1	1	1	2	4	4
07/31/79	19:30:42	1121	-8	-3	-3	-6	-8	-1	-2	-4	-7	-6	-35	-1	0	0	0	2	1	3	4	4
07/31/79	19:30:59	1122	-14	-6	-3	-9	-14	-5	-4	-5	-11	-7	-42	-1	0	0	0	1	1	2	3	5
07/31/79	19:31:26	1123	-10	-4	-4	-7	-11	-3	-3	-4	-12	-7	-39	-1	0	1	0	2	1	2	3	5
07/31/79	19:31:44	1124	-13	-6	-7	-9	-14	-5	-4	-5	-12	-9	-43	-1	-1	0	0	2	1	2	3	5
07/31/79	19:32:01	1125	-8	-2	-2	-2	-9	-1	-2	-1	-9	-6	-35	-1	0	1	0	2	1	2	3	5
07/31/79	19:32:21	1126	-2	3	6	0	-5	2	0	3	-6	-4	-32	0	0	1	0	1	1	2	3	4
07/31/79	19:32:44	1127	0	4	7	2	0	6	3	7	-4	-3	-26	0	0	0	0	2	1	1	3	4
07/31/79	19:33:01	1128	5	6	9	4	2	6	5	8	-1	0	-23	1	0	1	1	2	1	1	3	4
07/31/79	19:33:21	1129	11	11	14	6	8	9	10	12	2	3	-11	2	1	2	0	1	1	1	3	4
07/31/79	19:33:48	1131	11	11	14	6	8	10	8	14	4	0	-8	2	2	1	0	1	1	1	3	4
07/31/79	19:33:57	1132	16	18	17	10	12	12	11	19	7	3	-2	2	5	2	0	2	1	2	3	3
07/31/79	19:34:22	1134	14	17	19	11	10	13	12	17	9	4	-2	3	4	2	0	2	1	2	3	4
07/31/79	19:34:45	1136	15	16	16	12	12	13	12	17	8	6	-1	3	4	3	0	2	1	2	3	4
07/31/79	19:35:12	1137	-7	-2	-5	-8	-7	-4	-6	-4	-11	-7	-35	-1	0	0	0	2	1	3	4	5
07/31/79	19:35:38	1138	-10	-2	-5	-5	-11	-5	-6	-3	-13	-7	-35	-1	0	0	0	2	1	3	4	5
07/31/79	19:36:02	1139	-11	-2	-6	-5	-10	-5	-6	-2	-14	-7	-35	-1	0	0	0	2	1	3	4	5
07/31/79	19:36:29	1140	-8	-2	-6	-2	-10	-4	-4	-3	-12	-7	-34	-1	0	0	0	2	1	2	4	5
07/31/79	19:36:41	1141	-3	0	0	-2	-5	-3	-2	-1	-13	-5	-29	0	0	0	0	3	1	2	4	5
07/31/79	19:37:13	1142	-3	0	-1	-2	-7	-2	-3	0	-12	-6	-30	0	0	0	0	2	1	3	4	4
07/31/79	19:37:29	1143	-4	0	-1	0	-5	-3	-2	-1	-12	-4	-30	0	0	1	0	2	1	2	4	5
07/31/79	19:52:32	1148	5	10	7	8	5	5	6	12	-1	1	-3	4	1	0	0	1	1	1	2	1

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DATE	TIME	RECN	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
07/31/79	19:27:49	1113	5	7	60	11	4	1	1	0	-1	-2	-7	-4	-3	-3	-1	0	0	0	0	-1
07/31/79	19:28:09	1114	6	8	64	9	5	1	1	0	-1	-2	-7	-4	-3	-3	-1	0	0	0	0	-1
07/31/79	19:28:32	1115	5	8	63	10	5	1	1	0	-1	-2	-7	-4	-3	-3	-1	0	0	0	0	-1
07/31/79	19:28:54	1116	5	9	66	11	5	2	2	0	-1	-2	-7	-4	-3	-3	-1	0	0	0	0	-1
07/31/79	19:29:11	1117	5	8	63	13	4	2	2	0	0	-2	-7	-4	-3	-3	-1	0	0	0	0	-1
07/31/79	19:29:37	1118	6	9	66	12	5	2	2	0	-2	-4	-6	-3	-3	-3	-1	-1	-1	0	-1	-1
07/31/79	19:29:59	1119	5	8	66	12	4	2	2	0	0	-2	-7	-4	-3	-3	-1	0	0	0	0	-1
07/31/79	19:30:16	1120	5	9	70	12	6	3	3	0	0	-2	-7	-4	-3	-3	-1	0	0	0	0	-1
07/31/79	19:30:42	1121	5	9	67	12	7	2	3	-1	-1	-3	-5	-3	-3	-2	-1	-1	-1	0	-1	0
07/31/79	19:30:59	1122	5	11	73	12	7	3	3	0	0	-2	-7	-4	-3	-3	-1	0	0	0	0	-1
07/31/79	19:31:26	1123	5	10	89	16	6	2	3	0	0	-2	-7	-4	-4	-3	-1	0	0	0	0	-1
07/31/79	19:31:44	1124	5	12	82	15	9	2	3	1	0	-2	-7	-4	-4	-3	-1	0	0	0	0	-1
07/31/79	19:32:01	1125	4	11	77	15	7	2	2	1	0	-2	-7	-4	-3	-3	-1	0	0	0	0	-1
07/31/79	19:32:21	1126	4	11	77	14	8	2	3	0	0	-3	-7	-5	-4	-3	-1	0	0	0	0	-1
07/31/79	19:32:44	1127	3	10	75	16	6	2	2	1	0	-3	-8	-5	-4	-4	-2	0	0	0	0	-2
07/31/79	19:33:01	1128	4	8	76	14	7	1	2	0	0	-4	-8	-5	-4	-4	-2	0	0	0	0	-2
07/31/79	19:33:21	1129	2	8	70	11	6	1	1	0	-1	-5	-9	-6	-4	-5	-3	-1	-1	-1	-1	-3
07/31/79	19:33:48	1131	2	6	73	9	4	1	1	0	-1	-4	-9	-6	-5	-5	-4	-1	-1	-1	-1	-3
07/31/79	19:33:57	1132	3	5	65	10	2	1	1	0	-2	-4	-8	-6	-4	-5	-4	-2	-2	-1	-2	-3
07/31/79	19:34:22	1134	2	5	61	9	3	1	1	0	-2	-4	-8	-6	-4	-5	-4	-2	-2	-1	-1	-3
07/31/79	19:34:45	1136	3	5	63	10	3	2	1	0	-1	-4	-8	-6	-4	-5	-4	-2	-2	-1	-2	-3
07/31/79	19:35:12	1137	6	13	63	19	7	5	5	1	0	-2	-6	-3	-3	-2	-1	0	0	0	0	0
07/31/79	19:35:38	1138	6	12	73	17	6	5	4	1	0	-2	-7	-4	-3	-2	-1	0	0	0	0	0
07/31/79	19:36:02	1139	6	12	71	16	7	4	3	1	0	-3	-7	-4	-3	-3	-1	0	0	0	0	0
07/31/79	19:36:29	1140	6	11	72	17	8	4	3	1	0	-3	-7	-4	-3	-3	-1	0	0	0	0	0
07/31/79	19:36:41	1141	6	11	69	17	6	3	3	1	0	-2	-7	-4	-3	-3	-1	0	0	0	0	0
07/31/79	19:37:13	1142	7	13	46	34	7	3	3	1	0	-2	-7	-4	-3	-3	-1	0	0	0	0	-1
07/31/79	19:37:29	1143	6	12	66	17	7	4	4	0	0	-2	-7	-3	-3	-3	-1	0	0	0	0	-1
07/31/79	19:52:32	1148	3	4	46	9	2	1	1	0	-1	-2	-6	-3	-2	-2	-1	0	0	0	0	-1

DATA FROM TEST NO. 7

EXPRESS LISTING - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	B1	ITOT1	ETOT1	HALL1	PTOT1	FCC1	PRC2	PRC12	TPH1	TPCC1	OX1	OX2	MOX1	MNG1	MS1	MTOT1	ALFA1
12/06/79	21:57:22	1448	4.98	320	3056	3053	979	1.168	1.164	1.595	900	2648	51.3	50.6	3.542	0.513	417	4.408	0.995
12/06/79	21:57:29	1449	4.98	270	3970	3955	1074	1.168	1.164	1.603	900	2648	51.5	50.6	3.588	0.600	419	4.540	0.862
12/06/79	21:57:34	1450	4.98	270	4028	4014	1089	1.168	1.164	1.616	900	2652	51.5	50.6	3.608	0.602	420	4.562	0.864
12/06/79	21:57:49	1451	4.98	270	4058	4037	1097	1.168	1.164	1.612	898	2657	51.7	50.7	3.553	0.513	419	4.418	1.001
12/06/79	21:57:52	1452	4.98	270	4016	4002	1086	1.168	1.164	1.603	898	2664	51.7	50.7	3.635	0.599	420	4.587	0.876
12/06/79	21:57:58	1453	4.98	270	4046	4026	1094	1.168	1.164	1.608	900	2654	51.7	50.7	3.620	0.599	419	4.571	0.872
12/06/79	21:58:01	1454	4.98	270	4046	4037	1094	1.168	1.164	1.608	898	2634	51.7	50.7	3.623	0.513	419	4.488	1.020
12/06/79	21:58:05	1455	4.98	270	4069	4014	1100	1.168	1.164	1.608	898	2653	51.7	50.7	3.577	0.512	420	4.442	1.009
12/06/79	21:58:10	1456	4.98	270	4070	4049	1100	1.168	1.164	1.608	900	2651	51.7	50.7	3.550	0.599	419	4.502	0.856
12/06/79	21:58:17	1457	4.98	270	4016	4002	1086	1.168	1.164	1.599	900	2668	51.7	50.7	3.631	0.513	420	4.497	1.023
12/06/79	21:58:28	1458	4.98	270	4040	4026	1093	1.168	1.164	1.608	900	2642	51.7	50.7	3.574	0.513	419	4.440	1.005
12/06/79	21:58:35	1459	4.98	270	4064	4049	1099	1.168	1.164	1.612	900	2655	51.7	50.7	3.550	0.599	419	4.502	0.856
12/06/79	21:58:40	1460	4.98	270	4034	4026	1091	1.168	1.164	1.612	898	2656	51.7	50.7	3.508	0.513	419	4.373	0.988
12/06/79	21:58:43	1461	4.98	261	4227	4177	1104	1.168	1.164	1.612	900	2648	51.7	50.8	3.620	0.599	420	4.571	0.874
12/06/79	21:58:54	1462	4.98	248	4550	4494	1130	1.168	1.164	1.612	900	2661	51.7	50.9	3.608	0.513	419	4.473	1.020
12/06/79	21:58:59	1463	4.98	248	4486	4459	1114	1.168	1.164	1.616	898	2650	51.7	50.9	3.597	0.599	418	4.548	0.870
12/06/79	21:59:03	1464	4.98	248	4496	4471	1117	1.168	1.164	1.616	900	2643	51.7	50.9	3.629	0.513	418	4.494	1.026
12/06/79	21:59:06	1465	4.98	249	4514	4482	1124	1.168	1.164	1.616	900	2646	51.7	50.9	3.620	0.599	419	4.571	0.876
12/06/79	21:59:11	1466	4.98	249	4497	4471	1120	1.168	1.164	1.608	900	2641	51.7	50.9	3.492	0.603	420	4.447	0.840
12/06/79	21:59:15	1467	4.98	248	4502	4471	1118	1.168	1.164	1.616	900	2623	51.7	50.9	3.471	0.513	416	4.334	0.981
12/06/79	21:59:30	1468	4.98	248	4491	4459	1115	1.168	1.164	1.620	898	2642	51.7	50.9	3.575	0.599	419	4.527	0.865
12/06/79	21:59:36	1469	4.98	248	4526	4482	1123	1.168	1.164	1.620	900	2637	51.7	51.0	3.606	0.513	419	4.471	1.021
12/06/79	21:59:44	1470	4.98	249	4550	4494	1133	1.168	1.164	1.624	898	2657	51.7	51.0	3.529	0.513	420	4.395	1.000
12/06/79	21:59:50	1471	4.98	248	4520	4459	1123	1.168	1.164	1.620	900	2655	51.7	51.1	3.630	0.599	420	4.582	0.882
12/06/79	22:00:20	1472	4.98	249	4508	4471	1123	3.230	0.421	0.586	898	2634	51.7	51.7	3.623	0.513	417	4.490	1.039
12/06/79	22:00:24	1473	4.98	249	4555	4494	1134	3.225	0.422	0.585	898	2653	51.7	51.7	3.620	0.599	420	4.574	0.889
12/06/79	22:01:20	1474	4.98	279	3941	3919	1101	3.230	0.421	0.584	898	2633	51.9	51.6	3.611	0.513	418	4.477	1.033
12/06/79	22:01:26	1475	4.98	280	3958	3931	1109	3.230	0.421	0.584	898	2643	51.9	51.6	3.611	0.600	419	4.564	0.884
12/06/79	22:01:39	1476	4.98	279	3952	3931	1104	3.230	0.421	0.583	898	2648	51.9	51.6	3.507	0.513	420	4.374	1.005
12/06/79	22:01:42	1477	4.98	279	4005	3967	1119	3.225	0.422	0.585	898	2651	51.9	51.6	3.519	0.600	419	4.471	0.862
12/06/79	22:01:48	1478	4.98	279	3982	3967	1112	3.230	0.421	0.584	898	2646	51.9	51.6	3.577	0.599	419	4.528	0.877
12/06/79	22:02:00	1479	4.98	279	3941	3919	1101	3.230	0.421	0.586	898	2646	51.9	51.6	3.623	0.513	419	4.488	1.037
12/06/79	22:02:08	1480	4.98	279	3946	3943	1102	3.230	0.421	0.583	898	2647	52.0	51.6	3.577	0.600	417	4.528	0.876
12/06/79	22:02:20	1481	4.98	274	4046	4014	1108	3.230	0.421	0.583	898	2646	52.0	51.6	3.473	0.513	416	4.338	0.995
12/06/79	22:02:26	1482	4.98	239	4386	4354	1049	3.225	0.422	0.584	898	2648	52.0	51.6	3.634	0.600	419	4.587	0.890
12/06/79	22:02:48	1483	4.98	247	4233	4213	1048	3.230	0.421	0.583	898	2640	52.2	51.6	3.613	0.599	419	4.566	0.836
12/06/79	22:02:56	1484	4.98	247	4257	4224	1049	3.230	0.420	0.583	898	2619	52.2	51.6	3.611	0.512	418	4.476	1.036
12/06/79	22:03:04	1485	4.98	247	4216	4201	1040	3.230	0.421	0.580	898	2642	52.2	51.6	3.625	0.600	416	4.577	0.888
12/06/79	22:03:21	1486	4.98	247	4245	4213	1049	3.230	0.421	0.580	898	2638	52.0	51.7	3.476	0.600	417	4.430	0.853
12/06/79	22:03:37	1487	4.98	247	4274	4236	1057	3.230	0.421	0.581	898	2665	52.0	51.7	3.614	0.600	420	4.567	0.887
12/06/79	22:03:54	1488	4.98	246	4274	4248	1052	3.230	0.421	0.583	898	2666	52.2	51.7	3.635	0.600	419	4.587	0.892
12/06/79	22:04:08	1489	4.98	247	4263	4236	1053	3.230	0.421	0.584	898	2656	52.2	51.8	3.577	0.513	416	4.442	1.029
12/06/79	22:04:18	1490	4.98	243	4379	4331	1064	3.230	0.421	0.586	898	2623	52.2	51.8	3.543	0.600	418	4.496	0.871
12/06/79	22:04:22	1491	4.98	239	4445	4412	1062	3.230	0.421	0.587	898	2641	52.1	51.8	3.520	0.600	419	4.472	0.865
12/06/79	22:04:50	1492	4.98	236	4480	4447	1058	3.230	0.421	0.586	898	2650	51.5	51.9	3.623	0.513	419	4.489	1.043
12/06/79	22:05:09	1493	4.98	256	4409	4366	1130	3.230	0.421	0.583	898	2667	51.5	51.9	3.517	0.600	417	4.469	0.866
12/06/79	22:05:27	1494	4.98	245	4579	4529	1122	3.210	0.424	0.585	898	2662	51.8	51.9	3.607	0.513	420	4.473	1.039
12/06/79	22:05:32	1495	4.98	244	4661	4576	1138	3.225	0.422	0.585	898	2658	51.8	51.9	3.595	0.599	418	4.547	0.887
12/06/79	22:05:59	1496	4.98	250	4579	4506	1145	3.220	0.422	0.583	898	2713	51.3	51.9	3.539	0.513	419	4.405	1.019
12/06/79	22:06:16	1497	4.98	250	4538	4494	1136	3.220	0.422	0.586	898	0	50.8	51.9	3.595	0.600	418	4.551	0.886

EXPRESS LISTING - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	B1	ITOT1	ETOT1	HALL1	PTOT1	PCC1	PRC2	PRC12	TPH1	TPCC1	OX1	OX2	MOX1	MNG1	MS1	MTOT1	ALFA1
12/06/79	22:06:36	1498	4.98	250	4567	4506	1142	3.220	0.422	0.582	898	0	50.6	52.1	3.435	0.600	419	4.387	0.849
12/06/79	22:06:40	1499	4.98	250	4550	4482	1136	3.220	0.422	0.582	898	0	50.8	52.1	3.493	0.600	418	4.445	0.864
12/06/79	22:06:59	1500	4.98	250	4526	4494	1133	3.215	0.423	0.587	898	2638	51.0	52.1	3.629	0.513	416	4.493	1.050
12/06/79	22:07:08	1501	4.98	283	4034	4002	1142	3.215	0.423	0.582	898	2630	51.1	52.1	3.605	0.599	417	4.556	0.892
12/06/79	22:07:17	1502	4.98	300	3753	3744	1127	3.215	0.423	0.582	898	2647	51.1	52.1	3.605	0.600	417	4.557	0.891
12/06/79	22:07:47	1503	4.98	372	2335	2372	868	3.215	0.423	0.581	898	2669	51.1	52.1	3.617	0.600	418	4.568	0.894
12/06/79	22:07:57	1504	4.98	375	2293	2338	860	3.215	0.423	0.581	898	2665	51.1	52.1	3.605	0.599	418	4.556	0.892
12/06/79	22:08:27	1505	4.98	388	2107	2150	817	3.215	0.423	0.579	898	2655	50.9	52.1	3.593	0.599	419	4.545	0.889
12/06/79	22:08:51	1506	4.98	387	2071	2104	801	3.215	0.423	0.576	898	2641	50.9	52.1	3.629	0.514	417	4.495	1.046
12/06/79	22:09:07	1507	4.98	388	2071	2116	803	3.215	0.423	0.581	898	2644	50.8	52.1	3.583	0.514	417	4.449	1.033
12/06/79	22:09:17	1508	4.98	387	2042	2081	790	3.215	0.423	0.578	898	2636	51.1	52.1	3.605	0.600	420	4.562	0.891
12/06/79	22:09:48	1509	4.98	387	2024	2057	783	3.215	0.423	0.578	898	2633	50.9	52.1	3.617	0.600	420	4.570	0.894
12/06/79	22:09:57	1510	4.98	387	2083	2128	805	3.215	0.423	0.578	898	2630	50.9	52.1	3.571	0.513	420	4.437	1.033
12/06/79	22:10:28	1511	4.98	386	2112	2138	815	3.220	0.422	0.577	898	2620	51.0	51.9	3.658	0.600	416	4.610	0.901
12/06/79	22:17:08	1512	4.98	400	1432	1459	573	3.347	0.431	0.555	902	2633	49.5	50.9	3.863	0.514	421	4.729	1.090
12/06/79	22:17:14	1513	4.98	401	1409	1447	565	3.347	0.431	0.555	902	2665	49.5	50.8	3.863	0.600	420	4.815	0.932
12/06/79	22:17:58	1514	4.98	400	1304	1319	522	3.367	0.431	0.552	905	2641	49.3	50.7	3.883	0.513	421	4.749	1.094
12/06/79	22:18:13	1515	4.98	400	1269	1271	508	3.372	0.432	0.550	905	2623	49.2	50.7	3.850	0.599	421	4.806	0.928
12/06/79	22:18:35	1516	4.98	400	1234	1224	493	3.332	0.439	0.558	905	2631	48.8	50.6	3.877	0.512	420	4.742	1.092
12/06/79	22:18:53	1517	4.98	400	1222	1177	488	1.168	1.256	1.591	905	2605	48.9	50.5	3.916	0.600	422	4.869	0.939
12/06/79	22:19:04	1518	4.98	400	1227	1154	491	1.153	1.272	1.612	905	2635	48.7	50.4	3.918	0.512	421	4.783	1.099
12/06/79	22:19:13	1519	4.98	400	1239	1166	496	1.148	1.282	1.622	905	2626	48.7	50.4	3.932	0.600	421	4.885	0.941
12/06/79	22:19:34	1520	4.98	400	1192	1002	476	1.153	1.277	1.616	905	2657	48.6	50.3	3.967	0.511	421	4.832	1.113
12/06/79	22:19:57	1521	4.98	400	1386	1248	554	1.153	1.281	1.616	905	2653	48.6	50.2	3.934	0.599	420	4.885	0.939
12/06/79	22:20:05	1522	4.98	400	1333	1154	533	1.153	1.285	1.616	905	2705	48.7	50.2	3.900	0.510	422	4.762	1.094
12/06/79	22:20:35	1523	4.98	401	1520	1541	609	1.153	1.290	1.633	905	2666	48.7	50.1	3.828	0.603	421	4.783	0.907
12/06/79	22:25:30	1524	4.98	398	1198	979	477	3.499	0.440	0.545	907	2650	49.2	49.2	4.006	0.599	422	4.958	0.940
12/06/79	22:25:51	1525	4.98	397	1076	862	427	3.504	0.440	0.544	907	2660	49.2	49.2	3.946	0.513	422	4.810	1.082
12/06/79	22:26:01	1526	4.98	396	1099	872	436	3.509	0.439	0.545	907	2640	49.4	49.2	4.019	0.600	422	4.970	0.942
12/06/79	22:26:15	1527	4.98	398	1145	931	456	3.509	0.440	0.545	907	2615	49.5	49.2	4.042	0.513	422	4.907	1.107
12/06/79	22:26:44	1528	4.98	396	1087	872	431	3.513	0.440	0.544	907	2618	49.3	49.2	4.031	0.599	422	4.982	0.946
12/06/79	22:26:51	1529	4.98	396	1122	896	445	3.513	0.440	0.543	907	2621	49.3	49.2	4.042	0.513	422	4.907	1.109
12/06/79	22:27:11	1530	4.98	396	1046	826	414	3.524	0.440	0.541	909	2625	49.3	49.2	4.027	0.599	421	4.980	0.945
12/06/79	22:27:49	1531	4.98	395	1023	803	404	3.524	0.440	0.542	909	2618	48.8	49.2	4.003	0.512	421	4.866	1.100
12/06/79	22:28:00	1532	4.98	394	952	721	375	3.524	0.440	0.542	909	2623	48.8	49.2	3.991	0.599	422	4.942	0.937
12/06/79	22:28:18	1533	4.98	396	1064	850	421	3.524	0.441	0.544	909	2607	49.1	49.2	4.063	0.512	422	4.927	1.116
12/06/79	22:28:38	1534	4.98	396	1069	838	423	3.524	0.441	0.544	909	2613	49.3	49.2	4.063	0.599	422	5.014	0.953
12/06/79	22:28:43	1535	4.98	398	1134	919	451	3.524	0.441	0.542	909	2607	49.4	49.2	3.980	0.512	422	4.842	1.093
12/06/79	22:29:00	1536	4.98	395	1016	779	402	3.524	0.441	0.542	909	2598	49.5	49.2	4.003	0.599	423	4.954	0.939
12/06/79	22:29:07	1537	4.98	396	1040	803	411	3.274	0.475	0.584	907	2590	49.4	49.2	4.019	0.511	422	4.881	1.106
12/06/79	22:30:08	1538	4.98	399	1257	1037	502	3.538	0.441	0.542	909	2639	49.0	49.2	4.038	0.602	422	4.993	0.943
12/06/79	22:33:56	1539	4.98	324	1890	1892	612	3.572	0.442	0.545	909	2572	49.1	49.2	4.075	0.599	441	5.032	0.956
12/06/79	22:34:15	1540	4.98	325	1878	1880	610	3.577	0.442	0.544	909	2590	49.0	49.2	4.050	0.602	441	5.011	0.946
12/06/79	22:36:44	1541	4.98	324	1749	1729	566	3.577	0.442	0.547	909	2507	49.3	48.9	4.110	0.602	456	5.076	0.954
12/06/79	22:37:02	1542	4.98	324	1755	1740	568	3.582	0.441	0.546	909	2531	49.2	48.9	4.133	0.602	456	5.100	0.960
12/06/79	22:37:15	1543	4.98	324	1726	1705	559	3.582	0.441	0.546	911	2543	49.2	48.9	4.129	0.514	454	5.008	1.122
12/06/79	22:37:23	1544	4.98	325	1778	1776	578	3.582	0.441	0.546	911	2554	49.2	48.9	4.129	0.599	455	5.093	0.963
12/06/79	22:39:12	1545	4.98	324	1702	1681	551	3.582	0.441	0.549	909	2546	49.4	48.9	4.085	0.515	453	4.968	1.108

EXPRESS LISTING - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	B1	ITOT1	ETOT1	HALL1	PTOT1	PCC1	PRC2	PRC12	TPH1	TPCC1	OX1	OX2	MOX1	MNG1	MS1	MTOT1	ALFA1
12/07/79	00:15:16	1849	4.97	368	4034	4026	1485	3.587	0.669	0.646	911	2566	51.6	50.6	4.086	0.659	297	5.042	0.893
12/07/79	00:21:05	1850	4.97	429	3172	3229	1361	3.587	0.661	0.639	911	2571	49.9	51.4	4.100	0.662	301	5.061	0.906
12/07/79	00:21:28	1851	4.97	414	2587	2620	1070	3.587	0.615	0.593	911	2534	50.2	51.4	4.053	0.665	305	5.018	0.892
12/07/79	00:25:04	1852	4.97	413	2792	2854	1153	3.587	0.631	0.608	911	2554	50.1	51.0	4.087	0.676	299	5.062	0.878
12/07/79	00:25:23	1853	4.97	413	2792	2831	1152	3.587	0.628	0.605	911	2587	50.3	51.0	4.076	0.665	297	5.037	0.890
12/07/79	00:25:44	1854	4.97	412	2774	2819	1142	3.587	0.628	0.606	911	2584	50.3	51.0	4.099	0.670	298	5.067	0.888
12/07/79	00:25:57	1855	4.97	413	2768	2831	1144	3.587	0.628	0.606	911	2633	50.1	51.0	4.064	0.676	297	5.038	0.873
12/07/79	00:26:06	1856	4.97	413	2762	2819	1140	3.587	0.627	0.605	911	2590	49.8	51.0	3.944	0.676	296	4.917	0.847
12/07/79	00:26:25	1857	4.97	414	2815	2878	1165	3.587	0.629	0.608	911	2568	49.6	51.0	3.968	0.670	297	4.937	0.859
12/07/79	00:26:29	1858	4.97	413	2862	2912	1182	3.587	0.634	0.612	911	2583	49.6	51.0	4.099	0.676	296	5.073	0.880
12/07/79	00:26:56	1859	4.97	363	3577	3581	1298	3.587	0.635	0.615	911	2552	49.3	51.0	4.064	0.676	298	5.039	0.873
12/07/79	00:27:16	1860	4.97	325	4174	4177	1358	3.587	0.638	0.616	911	2567	49.4	51.0	4.004	0.670	299	4.972	0.867
12/07/79	00:27:26	1861	4.97	325	4246	4236	1381	3.587	0.638	0.616	911	2552	49.6	51.0	4.004	0.673	300	4.976	0.863
12/07/79	00:27:55	1862	4.97	325	4280	4283	1392	3.587	0.640	0.620	911	2580	49.5	51.0	4.099	0.673	301	5.072	0.884
12/07/79	00:28:14	1863	4.97	326	4315	4307	1407	3.587	0.647	0.627	911	2568	49.6	51.0	4.064	0.676	302	5.039	0.873
12/07/79	00:28:24	1864	4.97	326	4321	4307	1409	3.587	0.647	0.625	911	2539	49.8	51.0	4.051	0.673	302	5.024	0.874
12/07/79	00:28:55	1865	4.97	269	4989	4963	1344	3.587	0.647	0.628	911	2562	50.1	50.8	3.980	0.668	303	4.948	0.862
12/07/79	00:28:59	1866	4.97	268	4996	4974	1339	3.587	0.650	0.629	911	2548	50.1	50.8	3.991	0.668	304	4.959	0.865
12/07/79	00:29:18	1867	4.97	269	5106	5045	1371	3.587	0.653	0.632	911	2558	50.1	50.8	4.039	0.670	304	5.010	0.872
12/07/79	00:29:46	1868	4.97	269	5095	5081	1368	3.587	0.654	0.634	911	2544	49.6	50.8	4.039	0.679	303	5.022	0.860
12/07/79	00:30:04	1869	4.97	269	5130	5092	1378	3.587	0.654	0.635	911	2528	49.6	50.8	4.051	0.676	304	5.027	0.867
12/07/79	00:30:26	1870	4.97	275	5030	5010	1385	3.587	0.657	0.636	911	2560	49.8	50.8	4.003	0.668	303	4.971	0.867
12/07/79	00:30:35	1871	4.97	275	5018	5010	1381	3.587	0.654	0.635	911	2563	49.7	50.8	4.028	0.668	305	4.996	0.873
12/07/79	00:30:54	1872	4.97	275	5060	5021	1393	3.587	0.655	0.635	911	2565	49.8	50.7	4.051	0.673	306	5.025	0.869
12/07/79	00:31:04	1873	4.97	275	5059	4998	1393	3.587	0.657	0.636	911	2570	49.7	50.7	3.980	0.673	305	4.954	0.853
12/07/79	00:31:29	1874	4.97	536	1849	1939	992	3.587	0.653	0.634	911	2554	49.7	50.6	4.038	0.662	306	5.000	0.879
12/07/79	00:31:37	1875	4.97	536	1772	1870	950	3.587	0.653	0.632	911	2539	49.7	50.6	4.050	0.676	305	5.027	0.863
12/07/79	00:32:05	1876	4.97	383	3612	3638	1384	3.587	0.650	0.629	911	2543	49.9	50.6	4.075	0.668	304	5.043	0.879
12/07/79	00:32:12	1877	4.97	383	3630	3662	1391	3.587	0.651	0.631	911	2544	50.2	50.6	4.050	0.673	306	5.025	0.867
12/07/79	00:32:37	1878	4.97	382	3642	3662	1392	3.587	0.653	0.632	911	2558	49.9	50.6	4.038	0.673	305	5.013	0.864
12/07/79	00:32:45	1879	4.97	382	3618	3650	1383	3.587	0.653	0.631	911	2552	49.8	50.5	3.990	0.665	303	4.958	0.863
12/07/79	00:33:13	1880	4.97	383	3630	3674	1391	3.587	0.653	0.632	911	2547	49.3	50.6	4.063	0.673	305	5.037	0.869
12/07/79	00:33:23	1881	4.97	382	3629	3650	1388	3.587	0.651	0.631	911	2560	49.3	50.6	4.015	0.670	305	4.986	0.863
12/07/79	00:33:54	1882	4.97	382	3629	3662	1388	3.587	0.653	0.631	911	2557	49.5	50.5	3.979	0.679	304	4.959	0.843
12/07/79	00:33:58	1883	4.97	382	3618	3650	1383	3.587	0.653	0.634	911	2514	49.6	50.5	3.955	0.676	305	4.932	0.841
12/07/79	00:34:26	1884	4.97	382	3630	3662	1388	3.587	0.655	0.634	911	2532	49.3	50.5	4.062	0.676	305	5.038	0.864
12/07/79	00:34:45	1885	4.97	382	3607	3638	1379	3.587	0.655	0.635	911	2529	49.4	50.6	3.955	0.673	305	4.929	0.846
12/07/79	00:34:55	1886	4.97	382	3624	3638	1385	3.587	0.653	0.632	911	2526	49.4	50.5	4.062	0.676	305	5.040	0.864
12/07/79	00:35:15	1887	4.97	377	3706	3721	1397	3.587	0.655	0.634	911	2531	49.4	50.5	4.050	0.676	304	5.027	0.862
12/07/79	00:35:34	1888	4.97	414	3260	3287	1349	3.587	0.657	0.635	911	2521	49.3	50.6	4.027	0.676	304	5.005	0.858
12/07/79	00:35:51	1889	4.97	366	3571	3604	1306	3.587	0.654	0.632	911	2549	49.3	50.5	4.062	0.676	303	5.040	0.864
12/07/79	00:35:57	1890	4.97	360	3724	3756	1341	3.587	0.655	0.635	911	2520	49.3	50.6	4.027	0.673	304	5.001	0.862
12/07/79	00:36:24	1891	4.97	324	4269	4271	1381	3.587	0.655	0.634	911	2540	49.6	50.6	4.003	0.676	304	4.979	0.853
12/07/79	00:36:31	1892	4.97	323	4263	4271	1376	3.587	0.654	0.632	911	2517	49.6	50.6	4.027	0.673	305	5.001	0.862
12/07/79	00:37:20	1893	4.97	6	4040	744	25	2.333	0.516	0.493	911	0	49.9	50.5	5.486	0.0	335	5.807	0.0
12/07/79	00:37:29	1894	4.97	6	3752	1002	23	1.932	0.509	0.489	900	0	47.6	50.4	4.504	0.0	331	4.824	0.0
12/07/79	00:38:04	1895	4.78	4	61	41	0	1.016	0.762	0.762	835	0	38.9	50.3	1.733	0.0	322	2.051	0.0
12/07/79	00:38:38	1896	4.55	4	61	41	0	1.016	0.762	0.762	805	0	31.3	50.2	1.209	0.0	249	1.500	0.0
12/07/79	00:38:59	1897	4.41	4	55	41	0	1.016	0.771	0.771	805	0	27.7	41.2	1.088	0.0	210	1.362	0.0
12/07/79	00:53:58	1898	1.17	4	55	41	0	1.016	0.814	0.810	743	0	22.7	20.8	0.0	0.0	0	0.266	0.0

STATIC PRESSURES - (KG/CM**2) - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	PCC1	PC1 PC11	PC2 PC12	PC3 PC13	PC4 PC14	PC5 PC15	PC6 PC16	PC7 PC17	PC8 PC18	PC9 PC19	PC10 PC20	PD1	PD2 PDS1	PD3 PDS2
12/06/79	21:57:22	1448	1.168	1.692	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.826	0.896	0.886
				2.102	1.863	0.969	0.920	0.988	0.725	0.603	0.505	0.681	0.0		0.881	0.896
12/06/79	21:57:29	1449	1.168	1.687	1.360	1.018	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.826	0.896	0.886
				2.102	1.872	0.969	0.920	0.988	0.725	0.603	0.505	0.681	0.0		0.881	0.896
12/06/79	21:57:34	1450	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.826	0.896	0.886
				2.102	1.887	0.969	0.920	0.988	0.725	0.603	0.505	0.681	0.0		0.881	0.896
12/06/79	21:57:49	1451	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.826	0.896	0.886
				2.097	1.882	0.969	0.920	0.988	0.725	0.603	0.505	0.681	0.0		0.881	0.896
12/06/79	21:57:52	1452	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.826	0.896	0.886
				2.102	1.872	0.969	0.920	0.988	0.725	0.603	0.510	0.681	0.0		0.881	0.896
12/06/79	21:57:58	1453	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.826	0.896	0.886
				2.102	1.877	0.969	0.920	0.988	0.725	0.603	0.510	0.681	0.0		0.881	0.896
12/06/79	21:58:01	1454	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.826	0.896	0.886
				2.102	1.877	0.969	0.920	0.988	0.725	0.603	0.510	0.681	0.0		0.881	0.896
12/06/79	21:58:05	1455	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.826	0.896	0.886
				2.097	1.877	0.969	0.920	0.988	0.725	0.603	0.510	0.681	0.0		0.881	0.896
12/06/79	21:58:10	1456	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.826	0.896	0.881
				2.102	1.877	0.969	0.920	0.979	0.725	0.603	0.510	0.681	0.0		0.881	0.896
12/06/79	21:58:17	1457	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.510	0.803	0.826	0.896	0.886
				2.097	1.867	0.969	0.920	0.979	0.725	0.603	0.510	0.681	0.0		0.881	0.896
12/06/79	21:58:28	1458	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.826	0.896	0.886
				2.097	1.877	0.969	0.920	0.984	0.725	0.603	0.515	0.681	0.0		0.881	0.896
12/06/79	21:58:35	1459	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.510	0.803	0.826	0.896	0.886
				2.102	1.882	0.969	0.920	0.988	0.725	0.603	0.515	0.681	0.0		0.881	0.896
12/06/79	21:58:40	1460	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.825	0.896	0.886
				2.097	1.882	0.969	0.920	0.988	0.725	0.603	0.515	0.681	0.0		0.881	0.896
12/06/79	21:58:43	1461	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.826	0.896	0.886
				2.097	1.882	0.969	0.920	0.988	0.725	0.603	0.515	0.681	0.0		0.881	0.896
12/06/79	21:58:54	1462	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.510	0.803	0.826	0.896	0.886
				2.102	1.882	0.969	0.920	0.988	0.725	0.603	0.515	0.681	0.0		0.881	0.896
12/06/79	21:58:59	1463	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.825	0.896	0.886
				2.097	1.887	0.969	0.920	0.988	0.725	0.603	0.515	0.681	0.0		0.881	0.896
12/06/79	21:59:03	1464	1.168	1.687	1.360	1.023	0.730	0.608	0.691	0.666	0.759	0.510	0.803	0.825	0.896	0.886
				2.097	1.887	0.969	0.920	0.988	0.725	0.603	0.520	0.681	0.0		0.881	0.896
12/06/79	21:59:06	1465	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.510	0.803	0.825	0.896	0.886
				2.097	1.887	0.969	0.920	0.988	0.725	0.603	0.520	0.681	0.0		0.881	0.896
12/06/79	21:59:11	1466	1.168	1.687	1.360	1.018	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.825	0.896	0.886
				2.097	1.877	0.969	0.920	0.988	0.725	0.603	0.520	0.681	0.0		0.881	0.896
12/06/79	21:59:15	1467	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.510	0.803	0.825	0.896	0.886
				2.102	1.887	0.969	0.920	0.988	0.725	0.603	0.520	0.681	0.0		0.881	0.896
12/06/79	21:59:30	1468	1.168	1.687	1.360	1.023	0.730	0.608	0.686	0.666	0.759	0.505	0.803	0.825	0.896	0.886
				2.097	1.892	0.969	0.920	0.988	0.725	0.608	0.520	0.676	0.0		0.881	0.896
12/06/79	21:59:36	1469	1.168	1.687	1.360	1.023	0.730	0.608	0.691	0.661	0.759	0.505	0.803	0.825	0.896	0.886
				2.097	1.892	0.969	0.920	0.988	0.725	0.608	0.525	0.681	0.0		0.881	0.896
12/06/79	21:59:44	1470	1.168	1.687	1.360	1.018	0.730	0.608	0.691	0.661	0.759	0.505	0.803	0.825	0.896	0.886
				2.097	1.897	0.969	0.920	0.988	0.725	0.608	0.525	0.676	0.0		0.876	0.896
12/06/79	21:59:50	1471	1.168	1.687	1.360	1.023	0.730	0.608	0.691	0.666	0.759	0.505	0.803	0.825	0.896	0.886
				2.097	1.892	0.969	0.920	0.988	0.730	0.608	0.525	0.681	0.0		0.881	0.896
12/06/79	22:00:20	1472	3.230	1.687	1.360	1.023	0.730	0.608	0.691	0.661	0.759	0.510	0.803	0.826	0.896	0.886
				2.097	1.892	0.969	0.920	0.988	0.730	0.608	0.529	0.676	0.0		0.876	0.896

STATIC PRESSURES - (KG/CM**2) - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	PCC1	PC1 PC11	PC2 PC12	PC3 PC13	PC4 PC14	PC5 PC15	PC6 PC16	PC7 PC17	PC8 PC18	PC9 PC19	PC10 PC20	PD1	PD2 PDS1	PD3 PDS2
12/06/79	22:00:24	1473	3.225	1.687	1.360	1.023	0.730	0.608	0.691	0.666	0.759	0.505	0.803	0.825	0.896	0.886
				2.097	1.887	0.969	0.920	0.988	0.730	0.608	0.529	0.676	0.0		0.876	0.896
12/06/79	22:01:20	1474	3.230	1.687	1.360	1.023	0.730	0.608	0.691	0.661	0.759	0.510	0.803	0.825	0.896	0.886
				2.097	1.887	0.969	0.920	0.988	0.730	0.608	0.534	0.686	0.0		0.881	0.896
12/06/79	22:01:26	1475	3.230	1.687	1.360	1.023	0.730	0.608	0.691	0.661	0.759	0.510	0.803	0.825	0.896	0.881
				2.097	1.887	0.969	0.920	0.988	0.730	0.608	0.539	0.681	0.0		0.876	0.896
12/06/79	22:01:39	1476	3.230	1.687	1.360	1.023	0.730	0.608	0.691	0.666	0.759	0.510	0.803	0.825	0.896	0.881
				2.097	1.882	0.969	0.920	0.988	0.730	0.608	0.539	0.681	0.0		0.876	0.896
12/06/79	22:01:42	1477	3.225	1.692	1.360	1.023	0.730	0.608	0.691	0.661	0.759	0.510	0.803	0.825	0.896	0.886
				2.097	1.887	0.969	0.920	0.988	0.730	0.608	0.539	0.681	0.0		0.881	0.896
12/06/79	22:01:48	1478	3.230	1.687	1.360	1.023	0.730	0.608	0.691	0.661	0.759	0.510	0.803	0.825	0.896	0.886
				2.097	1.887	0.969	0.920	0.988	0.730	0.608	0.539	0.681	0.0		0.881	0.896
12/06/79	22:02:00	1479	3.230	1.687	1.360	1.023	0.730	0.608	0.691	0.661	0.759	0.510	0.803	0.825	0.896	0.886
				2.097	1.892	0.969	0.920	0.988	0.730	0.608	0.539	0.681	0.0		0.881	0.896
12/06/79	22:02:08	1480	3.230	1.687	1.360	1.023	0.730	0.608	0.691	0.661	0.759	0.510	0.803	0.825	0.896	0.881
				2.097	1.882	0.969	0.920	0.988	0.730	0.613	0.539	0.681	0.0		0.876	0.896
12/06/79	22:02:20	1481	3.230	1.687	1.360	1.023	0.730	0.608	0.691	0.661	0.759	0.505	0.803	0.825	0.896	0.881
				2.097	1.882	0.969	0.920	0.988	0.730	0.613	0.539	0.681	0.0		0.876	0.896
12/06/79	22:02:26	1482	3.225	1.687	1.360	1.023	0.730	0.608	0.691	0.661	0.759	0.510	0.803	0.825	0.896	0.881
				2.097	1.882	0.969	0.920	0.988	0.730	0.613	0.544	0.681	0.0		0.881	0.896
12/06/79	22:02:48	1483	3.230	1.687	1.360	1.023	0.730	0.608	0.695	0.661	0.759	0.510	0.803	0.825	0.891	0.886
				2.097	1.882	0.969	0.920	0.988	0.735	0.613	0.544	0.681	0.0		0.876	0.896
12/06/79	22:02:56	1484	3.230	1.687	1.355	1.023	0.730	0.608	0.695	0.661	0.759	0.510	0.803	0.825	0.891	0.881
				2.097	1.882	0.969	0.920	0.988	0.730	0.613	0.544	0.681	0.0		0.876	0.896
12/06/79	22:03:04	1485	3.230	1.687	1.360	1.023	0.730	0.608	0.695	0.661	0.759	0.510	0.803	0.825	0.891	0.881
				2.097	1.872	0.969	0.920	0.988	0.735	0.613	0.544	0.681	0.0		0.876	0.896
12/06/79	22:03:21	1486	3.230	1.687	1.360	1.023	0.730	0.608	0.695	0.661	0.759	0.510	0.803	0.825	0.891	0.881
				2.097	1.872	0.969	0.920	0.988	0.735	0.613	0.549	0.681	0.0		0.876	0.896
12/06/79	22:03:37	1487	3.230	1.687	1.360	1.023	0.730	0.608	0.695	0.661	0.759	0.510	0.803	0.825	0.891	0.886
				2.097	1.877	0.969	0.920	0.988	0.735	0.613	0.549	0.681	0.0		0.876	0.896
12/06/79	22:03:54	1488	3.230	1.687	1.360	1.023	0.730	0.608	0.695	0.661	0.759	0.510	0.803	0.825	0.891	0.881
				2.097	1.882	0.969	0.920	0.988	0.735	0.613	0.549	0.681	0.0		0.876	0.896
12/06/79	22:04:08	1489	3.230	1.687	1.360	1.023	0.730	0.608	0.695	0.661	0.759	0.510	0.803	0.825	0.891	0.881
				2.097	1.887	0.969	0.920	0.988	0.735	0.613	0.554	0.681	0.0		0.876	0.896
12/06/79	22:04:18	1490	3.230	1.687	1.360	1.023	0.730	0.608	0.695	0.661	0.759	0.510	0.803	0.825	0.891	0.881
				2.097	1.892	0.969	0.925	0.988	0.735	0.613	0.554	0.681	0.0		0.876	0.896
12/06/79	22:04:22	1491	3.230	1.687	1.360	1.023	0.730	0.608	0.695	0.661	0.759	0.510	0.803	0.825	0.891	0.881
				2.097	1.897	0.969	0.925	0.988	0.735	0.617	0.554	0.681	0.0		0.876	0.896
12/06/79	22:04:50	1492	3.230	1.687	1.360	1.023	0.730	0.608	0.695	0.661	0.759	0.510	0.803	0.825	0.891	0.881
				2.097	1.892	0.969	0.925	0.988	0.735	0.617	0.559	0.681	0.0		0.876	0.896
12/06/79	22:05:09	1493	3.230	1.687	1.360	1.023	0.730	0.608	0.695	0.661	0.759	0.510	0.803	0.825	0.891	0.881
				2.097	1.882	0.969	0.925	0.988	0.735	0.617	0.559	0.676	0.0		0.876	0.896
12/06/79	22:05:27	1494	3.210	1.687	1.360	1.023	0.730	0.608	0.700	0.666	0.759	0.510	0.803	0.825	0.891	0.881
				2.097	1.877	0.969	0.925	0.988	0.735	0.617	0.559	0.676	0.0		0.876	0.896
12/06/79	22:05:32	1495	3.225	1.687	1.360	1.023	0.730	0.608	0.700	0.661	0.759	0.510	0.803	0.825	0.891	0.881
				2.097	1.887	0.969	0.925	0.988	0.735	0.617	0.559	0.676	0.0		0.876	0.896
12/06/79	22:05:59	1496	3.220	1.687	1.360	1.023	0.730	0.608	0.700	0.666	0.759	0.510	0.803	0.825	0.891	0.881
				2.097	1.877	0.969	0.925	0.988	0.735	0.622	0.564	0.681	0.0		0.881	0.896
12/06/79	22:06:16	1497	3.220	1.687	1.360	1.023	0.730	0.608	0.700	0.661	0.759	0.510	0.803	0.824	0.891	0.881
				2.097	1.887	0.969	0.925	0.988	0.740	0.622	0.564	0.681	0.0		0.876	0.896

STATIC PRESSURES - (KG/CM**2).- IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	PCC1	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PD1	PD2	PD3
				PC11	PC12	PC13	PC14	PC15	PC16	PC17	PC18	PC19	PC20		PDS1	PDS2
12/06/79	22:06:36	1498	3.220	1.687	1.360	1.023	0.730	0.608	0.700	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.097	1.872	0.969	0.930	0.988	0.740	0.622	0.564	0.681	0.0		0.881	0.896
12/06/79	22:06:40	1499	3.220	1.687	1.360	1.023	0.730	0.608	0.700	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.097	1.872	0.969	0.930	0.988	0.740	0.622	0.569	0.681	0.0		0.876	0.896
12/06/79	22:06:59	1500	3.215	1.687	1.360	1.023	0.730	0.608	0.700	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.097	1.887	0.969	0.930	0.988	0.740	0.622	0.569	0.676	0.0		0.876	0.896
12/06/79	22:07:08	1501	3.215	1.687	1.360	1.023	0.730	0.608	0.700	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.097	1.872	0.969	0.930	0.988	0.740	0.622	0.569	0.676	0.0		0.876	0.896
12/06/79	22:07:17	1502	3.215	1.687	1.360	1.023	0.730	0.608	0.700	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.097	1.872	0.969	0.930	0.988	0.740	0.622	0.569	0.681	0.0		0.876	0.896
12/06/79	22:07:47	1503	3.215	1.687	1.360	1.023	0.730	0.608	0.705	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.097	1.867	0.969	0.930	0.954	0.740	0.622	0.569	0.681	0.0		0.876	0.896
12/06/79	22:07:57	1504	3.215	1.687	1.360	1.023	0.730	0.608	0.700	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.097	1.867	0.969	0.930	0.949	0.740	0.622	0.569	0.681	0.0		0.876	0.896
12/06/79	22:08:27	1505	3.215	1.687	1.360	1.023	0.730	0.608	0.705	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.097	1.863	0.969	0.930	0.969	0.740	0.622	0.569	0.681	0.0		0.876	0.896
12/06/79	22:08:51	1506	3.215	1.687	1.360	1.023	0.730	0.608	0.705	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.097	1.853	0.969	0.930	0.974	0.740	0.622	0.569	0.681	0.0		0.876	0.896
12/06/79	22:09:07	1507	3.215	1.687	1.360	1.023	0.730	0.608	0.705	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.097	1.867	0.969	0.935	0.974	0.740	0.622	0.569	0.681	0.0		0.876	0.896
12/06/79	22:09:17	1508	3.215	1.687	1.360	1.023	0.730	0.608	0.705	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.097	1.858	0.969	0.935	0.974	0.740	0.622	0.569	0.681	0.0		0.876	0.896
12/06/79	22:09:48	1509	3.215	1.687	1.360	1.023	0.730	0.608	0.705	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.097	1.858	0.969	0.935	0.974	0.740	0.622	0.564	0.681	0.0		0.876	0.896
12/06/79	22:09:57	1510	3.215	1.687	1.360	1.023	0.730	0.608	0.705	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.092	1.858	0.969	0.935	0.974	0.740	0.622	0.564	0.681	0.0		0.876	0.896
12/06/79	22:10:28	1511	3.220	1.687	1.360	1.023	0.730	0.608	0.705	0.666	0.759	0.510	0.803	0.824	0.891	0.881
				2.092	1.858	0.969	0.935	0.969	0.740	0.622	0.564	0.681	0.0		0.876	0.896
12/06/79	22:17:08	1512	3.347	1.687	1.443	1.023	0.730	0.608	0.710	0.661	0.759	0.510	0.803	0.820	0.896	0.881
				2.092	1.858	0.969	0.935	0.979	0.744	0.622	0.554	0.676	0.0		0.876	0.896
12/06/79	22:17:14	1513	3.347	1.687	1.443	1.023	0.730	0.608	0.710	0.661	0.759	0.510	0.803	0.820	0.891	0.881
				2.092	1.858	0.969	0.935	0.979	0.744	0.622	0.554	0.676	0.0		0.876	0.896
12/06/79	22:17:58	1514	3.367	1.687	1.452	1.023	0.730	0.608	0.715	0.661	0.759	0.510	0.803	0.819	0.891	0.881
				2.092	1.858	0.969	0.935	0.979	0.749	0.622	0.554	0.676	0.0		0.876	0.896
12/06/79	22:18:13	1515	3.372	1.687	1.457	1.023	0.730	0.608	0.715	0.661	0.759	0.510	0.803	0.818	0.891	0.881
				2.092	1.853	0.969	0.935	0.979	0.749	0.627	0.554	0.676	0.0		0.876	0.896
12/06/79	22:18:35	1516	3.332	1.687	1.462	1.023	0.730	0.608	0.715	0.661	0.759	0.510	0.803	0.818	0.896	0.881
				2.092	1.858	0.969	0.935	0.979	0.749	0.622	0.554	0.671	0.0		0.876	0.896
12/06/79	22:18:53	1517	1.168	1.687	1.467	1.023	0.730	0.608	0.710	0.661	0.759	0.510	0.803	0.817	0.891	0.881
				2.092	1.858	0.969	0.935	0.979	0.749	0.627	0.549	0.676	0.0		0.876	0.896
12/06/79	22:19:04	1518	1.153	1.687	1.467	1.023	0.730	0.608	0.715	0.661	0.759	0.510	0.803	0.817	0.896	0.881
				2.092	1.858	0.969	0.940	0.979	0.749	0.622	0.549	0.671	0.0		0.876	0.896
12/06/79	22:19:13	1519	1.148	1.687	1.472	1.023	0.730	0.608	0.715	0.661	0.759	0.510	0.803	0.817	0.896	0.881
				2.092	1.863	0.969	0.940	0.979	0.749	0.627	0.549	0.671	0.0		0.876	0.896
12/06/79	22:19:34	1520	1.153	1.687	1.472	1.023	0.730	0.608	0.715	0.661	0.759	0.510	0.803	0.816	0.896	0.881
				2.092	1.863	0.969	0.940	0.979	0.749	0.622	0.549	0.671	0.0		0.876	0.896
12/06/79	22:19:57	1521	1.153	1.687	1.477	1.023	0.730	0.608	0.715	0.661	0.759	0.510	0.803	0.816	0.896	0.881
				2.219	1.863	0.969	0.940	0.979	0.749	0.622	0.549	0.676	0.0		0.876	0.896
12/06/79	22:20:05	1522	1.153	1.687	1.482	1.023	0.730	0.608	0.715	0.661	0.759	0.510	0.803	0.816	0.896	0.881
				2.219	1.863	0.969	0.940	0.979	0.749	0.627	0.549	0.671	0.0		0.876	0.896

STATIC PRESSURES - (KG/CM**2) - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	PCC1	PC1 PC11	PC2 PC12	PC3 PC13	PC4 PC14	PC5 PC15	PC6 PC16	PC7 PC17	PC8 PC18	PC9 PC19	PC10 PC20	PD1	PD2 PDS1	PD3 PDS2
12/06/79	22:20:35	1523	1.153	1.687	1.487	1.023	0.730	0.608	0.715	0.661	0.759	0.510	0.803	0.815	0.896	0.881
				2.229	1.882	0.969	0.940	0.979	0.749	0.627	0.549	0.676	0.0		0.876	0.896
12/06/79	22:25:30	1524	3.499	1.687	1.540	1.023	0.730	0.608	0.735	0.661	0.759	0.510	0.803	0.809	0.896	0.886
				2.273	1.906	0.969	0.940	0.954	0.749	0.627	0.544	0.671	0.0		0.881	0.896
12/06/79	22:25:51	1525	3.504	1.687	1.540	1.023	0.730	0.613	0.735	0.661	0.759	0.510	0.803	0.809	0.896	0.881
				2.273	1.906	0.969	0.940	0.974	0.749	0.622	0.544	0.671	0.0		0.876	0.896
12/06/79	22:26:01	1526	3.509	1.687	1.540	1.023	0.730	0.613	0.735	0.656	0.759	0.510	0.803	0.809	0.896	0.881
				2.278	1.911	0.969	0.940	0.979	0.749	0.622	0.544	0.671	0.0		0.881	0.896
12/06/79	22:26:15	1527	3.509	1.687	1.545	1.023	0.730	0.608	0.735	0.661	0.759	0.510	0.803	0.809	0.896	0.881
				2.278	1.911	0.969	0.940	0.979	0.749	0.622	0.544	0.671	0.0		0.881	0.896
12/06/79	22:26:44	1528	3.513	1.687	1.545	1.023	0.730	0.608	0.735	0.661	0.759	0.510	0.803	0.808	0.896	0.881
				2.278	1.911	0.969	0.940	0.984	0.749	0.622	0.544	0.666	0.0		0.881	0.896
12/06/79	22:26:51	1529	3.513	1.687	1.545	1.023	0.730	0.608	0.735	0.661	0.759	0.510	0.803	0.807	0.896	0.881
				2.278	1.906	0.969	0.940	0.984	0.749	0.627	0.544	0.666	0.0		0.881	0.896
12/06/79	22:27:11	1530	3.524	1.687	1.550	1.023	0.730	0.613	0.735	0.661	0.759	0.510	0.803	0.802	0.896	0.881
				2.283	1.906	0.969	0.940	0.984	0.749	0.627	0.544	0.671	0.0		0.881	0.896
12/06/79	22:27:49	1531	3.524	1.687	1.550	1.023	0.730	0.608	0.735	0.656	0.759	0.510	0.803	0.795	0.896	0.881
				2.283	1.911	0.969	0.940	0.979	0.749	0.627	0.544	0.666	0.0		0.881	0.896
12/06/79	22:28:00	1532	3.524	1.687	1.550	1.023	0.730	0.613	0.735	0.656	0.759	0.510	0.803	0.788	0.896	0.881
				2.283	1.911	0.969	0.940	0.979	0.749	0.622	0.544	0.666	0.0		0.876	0.896
12/06/79	22:28:18	1533	3.524	1.687	1.555	1.023	0.730	1.013	0.735	0.656	0.759	0.510	0.803	0.781	0.896	0.881
				2.287	1.916	0.969	0.940	0.984	0.749	0.627	0.544	0.666	0.0		0.876	0.896
12/06/79	22:28:38	1534	3.524	1.687	1.555	1.023	0.730	1.008	0.735	0.656	0.759	0.510	0.803	0.780	0.896	0.881
				2.287	1.916	0.969	0.940	0.984	0.749	0.627	0.544	0.666	0.0		0.876	0.896
12/06/79	22:28:43	1535	3.524	1.687	1.555	1.023	0.730	1.008	0.735	0.656	0.759	0.510	0.803	0.780	0.896	0.881
				2.287	1.911	0.969	0.940	0.984	0.749	0.622	0.544	0.666	0.0		0.881	0.896
12/06/79	22:29:00	1536	3.524	1.687	1.555	1.023	0.730	1.008	0.735	0.656	0.759	0.510	0.803	0.780	0.896	0.881
				2.287	1.911	0.969	0.940	0.984	0.749	0.622	0.544	0.666	0.0		0.881	0.896
12/06/79	22:29:07	1537	3.274	1.687	1.555	1.023	0.730	1.008	0.735	0.656	0.759	0.510	0.803	0.780	0.896	0.881
				2.287	1.911	0.969	0.940	0.984	0.749	0.622	0.544	0.666	0.0		0.881	0.896
12/06/79	22:30:08	1538	3.538	1.687	1.560	1.023	0.730	1.003	0.735	0.656	0.759	0.510	0.803	0.779	0.896	0.881
				2.283	1.916	0.969	0.940	0.988	0.749	0.622	0.539	0.671	0.0		0.881	0.896
12/06/79	22:33:56	1539	3.572	1.687	1.579	1.023	0.730	0.998	0.735	0.656	0.759	0.510	0.803	0.765	0.891	0.881
				2.283	1.945	0.969	0.940	0.988	0.754	0.627	0.539	0.666	0.0		0.881	0.896
12/06/79	22:34:15	1540	3.577	1.687	1.579	1.028	0.730	0.998	0.735	0.656	0.759	0.515	0.803	0.765	0.896	0.881
				2.283	1.945	0.969	0.940	0.988	0.754	0.622	0.539	0.666	0.0		0.881	0.896
12/06/79	22:36:44	1541	3.577	1.687	1.579	1.028	0.730	0.993	0.735	0.656	0.759	0.515	0.803	0.758	0.896	0.886
				2.283	1.955	0.969	0.940	0.988	0.754	0.622	0.544	0.666	0.0		0.881	0.896
12/06/79	22:37:02	1542	3.582	1.687	1.579	1.028	0.730	0.993	0.735	0.656	0.759	0.515	0.803	0.758	0.896	0.886
				2.283	1.955	0.969	0.940	0.988	0.754	0.627	0.544	0.661	0.0		0.881	0.896
12/06/79	22:37:15	1543	3.582	1.687	1.579	1.028	0.730	0.993	0.735	0.656	0.759	0.515	0.803	0.758	0.896	0.886
				2.283	1.955	0.969	0.940	0.988	0.754	0.627	0.544	0.661	0.0		0.881	0.896
12/06/79	22:37:23	1544	3.582	1.687	1.579	1.028	0.730	0.993	0.735	0.656	0.759	0.515	0.803	0.758	0.896	0.886
				2.283	1.955	0.969	0.945	0.988	0.754	0.627	0.544	0.666	0.0		0.881	0.896
12/06/79	22:39:12	1545	3.582	1.687	1.579	1.028	0.730	0.993	0.735	0.656	0.759	0.515	0.803	0.757	0.896	0.881
				2.278	1.965	0.969	0.940	0.988	0.754	0.627	0.544	0.661	0.0		0.881	0.896

STATIC PRESSURES - (KG/CM**2) - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	PCC1	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PD1	PD2	PD3
				PC11	PC12	PC13	PC14	PC15	PC16	PC17	PC18	PC19	PC20		PDS1	PDS2
12/07/79	00:15:16	1849	3.587	1.770	2.400	2.126	1.565	1.345	1.033	0.915	0.769	0.608	0.617	0.758	0.886	0.881
				2.444	2.317	2.112	1.667	1.145	1.072	0.871	0.754	0.627	0.0		0.876	0.896
12/07/79	00:21:05	1850	3.587	2.702	2.370	2.112	1.570	1.277	1.003	0.915	0.764	0.608	0.495	0.763	0.886	0.881
				2.434	2.292	2.107	1.667	1.135	1.072	0.867	0.735	0.613	0.0		0.881	0.896
12/07/79	00:21:28	1851	3.587	2.658	2.204	1.950	1.501	1.277	0.949	0.915	0.730	0.593	0.495	0.741	0.891	0.881
				2.434	2.126	2.107	1.667	1.130	1.072	0.867	0.735	0.608	0.0		0.881	0.896
12/07/79	00:25:04	1852	3.587	2.673	2.263	1.990	1.506	1.277	0.935	0.915	0.740	0.593	0.515	0.756	0.886	0.881
				2.424	2.180	2.107	1.662	1.125	1.072	0.867	0.735	0.608	0.0		0.876	0.896
12/07/79	00:25:23	1853	3.587	2.668	2.253	1.980	1.506	1.277	0.935	0.915	0.740	0.593	0.515	0.756	0.886	0.881
				2.424	2.170	2.107	1.667	1.125	1.072	0.867	0.740	0.608	0.0		0.881	0.896
12/07/79	00:25:44	1854	3.587	2.668	2.253	1.980	1.501	1.277	0.935	0.910	0.740	0.593	0.515	0.756	0.886	0.881
				2.424	2.175	2.102	1.662	1.125	1.072	0.867	0.735	0.608	0.0		0.876	0.896
12/07/79	00:25:57	1855	3.587	2.668	2.253	1.980	1.501	1.277	0.935	0.915	0.740	0.593	0.515	0.756	0.886	0.881
				2.424	2.175	2.102	1.667	1.120	1.072	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:26:06	1856	3.587	2.668	2.248	1.970	1.501	1.277	0.935	0.915	0.740	0.588	0.515	0.756	0.886	0.881
				2.424	2.170	2.107	1.667	1.120	1.072	0.867	0.740	0.608	0.0		0.876	0.896
12/07/79	00:26:25	1857	3.587	2.673	2.258	1.985	1.506	1.277	0.935	0.915	0.744	0.593	0.515	0.756	0.886	0.881
				2.424	2.180	2.102	1.667	1.120	1.072	0.867	0.740	0.608	0.0		0.881	0.896
12/07/79	00:26:29	1858	3.587	2.673	2.273	2.004	1.511	1.277	0.945	0.915	0.744	0.593	0.515	0.756	0.886	0.881
				2.424	2.195	2.102	1.662	1.120	1.072	0.862	0.735	0.608	0.0		0.881	0.896
12/07/79	00:26:56	1859	3.587	2.678	2.278	2.019	1.521	1.277	0.954	0.915	0.749	0.598	0.515	0.756	0.886	0.881
				2.424	2.204	2.102	1.662	1.120	1.072	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:27:16	1860	3.587	2.678	2.287	2.029	1.526	1.277	0.979	0.915	0.764	0.603	0.515	0.756	0.886	0.881
				2.424	2.209	2.102	1.662	1.120	1.072	0.867	0.735	0.613	0.0		0.881	0.896
12/07/79	00:27:26	1861	3.587	2.678	2.287	2.038	1.531	1.277	0.984	0.915	0.759	0.603	0.520	0.756	0.886	0.881
				2.424	2.209	2.102	1.662	1.120	1.072	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:27:55	1862	3.587	2.683	2.297	2.048	1.535	1.277	0.988	0.915	0.764	0.603	0.520	0.756	0.886	0.881
				2.419	2.224	2.102	1.662	1.120	1.072	0.867	0.740	0.608	0.0		0.881	0.896
12/07/79	00:28:14	1863	3.587	2.683	2.322	2.068	1.545	1.277	0.993	0.915	0.769	0.603	0.520	0.756	0.886	0.881
				2.419	2.248	2.102	1.662	1.115	1.072	0.867	0.735	0.608	0.0		0.881	0.896
12/07/79	00:28:24	1864	3.587	2.683	2.322	2.068	1.545	1.277	1.003	0.915	0.764	0.603	0.520	0.756	0.886	0.881
				2.419	2.243	2.102	1.662	1.115	1.072	0.867	0.735	0.608	0.0		0.881	0.896
12/07/79	00:28:55	1865	3.587	2.683	2.322	2.092	1.560	1.277	0.998	0.915	0.779	0.603	0.520	0.756	0.886	0.881
				2.419	2.253	2.102	1.662	1.115	1.072	0.867	0.740	0.608	0.0		0.881	0.896
12/07/79	00:28:59	1866	3.587	2.688	2.331	2.097	1.570	1.277	1.003	0.915	0.783	0.603	0.520	0.756	0.886	0.881
				2.419	2.258	2.102	1.662	1.115	1.072	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:29:18	1867	3.587	2.693	2.341	2.102	1.574	1.277	1.047	0.915	0.788	0.603	0.520	0.756	0.886	0.881
				2.419	2.268	2.102	1.662	1.115	1.072	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:29:46	1868	3.587	2.693	2.346	2.102	1.579	1.277	1.047	0.915	0.788	0.603	0.520	0.756	0.886	0.881
				2.419	2.273	2.102	1.662	1.115	1.072	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:30:04	1869	3.587	2.693	2.346	2.107	1.579	1.277	1.052	0.915	0.788	0.598	0.520	0.756	0.886	0.881
				2.414	2.278	2.102	1.662	1.111	1.072	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:30:26	1870	3.587	2.697	2.356	2.112	1.584	1.277	1.047	0.915	0.788	0.598	0.520	0.756	0.886	0.881
				2.414	2.283	2.102	1.662	1.111	1.072	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:30:35	1871	3.587	2.693	2.346	2.107	1.579	1.277	1.047	0.915	0.783	0.598	0.520	0.756	0.886	0.881
				2.414	2.278	2.102	1.662	1.111	1.072	0.862	0.740	0.613	0.0		0.876	0.896
12/07/79	00:30:54	1872	3.587	2.693	2.351	2.107	1.584	1.277	1.047	0.915	0.783	0.598	0.520	0.756	0.886	0.881
				2.414	2.278	2.102	1.662	1.111	1.072	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:31:04	1873	3.587	2.693	2.356	2.112	1.584	1.277	1.052	0.915	0.783	0.598	0.520	0.756	0.886	0.881
				2.414	2.283	2.102	1.662	1.111	1.072	0.867	0.740	0.613	0.0		0.881	0.896

STATIC PRESSURES - (KG/CM**2) - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	PCC1	PC1 PC11	PC2 PC12	PC3 PC13	PC4 PC14	PC5 PC15	PC6 PC16	PC7 PC17	PC8 PC18	PC9 PC19	PC10 PC20	PD1	PD2 PDS1	PD3 PDS2
12/07/79	00:31:29	1874	3.587	2.688	2.341	2.072	1.540	1.277	0.974	0.915	0.754	0.598	0.520	0.756	0.891	0.881
				2.414	2.273	2.102	1.662	1.111	1.067	0.867	0.740	0.617	0.0		0.881	0.896
12/07/79	00:31:37	1875	3.587	2.683	2.341	2.072	1.540	1.277	0.974	0.915	0.754	0.598	0.520	0.756	0.891	0.881
				2.414	2.268	2.102	1.662	1.111	1.072	0.867	0.740	0.617	0.0		0.881	0.896
12/07/79	00:32:05	1876	3.587	2.683	2.331	2.077	1.550	1.277	0.974	0.915	0.764	0.598	0.520	0.756	0.886	0.881
				2.414	2.258	2.102	1.662	1.106	1.067	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:32:12	1877	3.587	2.683	2.336	2.082	1.550	1.277	0.974	0.915	0.764	0.598	0.520	0.756	0.886	0.881
				2.414	2.263	2.102	1.662	1.106	1.072	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:32:37	1878	3.587	2.688	2.341	2.087	1.550	1.277	0.974	0.915	0.764	0.603	0.520	0.756	0.886	0.881
				2.414	2.268	2.097	1.662	1.106	1.067	0.862	0.740	0.613	0.0		0.881	0.896
12/07/79	00:32:45	1879	3.587	2.688	2.341	2.087	1.550	1.277	0.974	0.915	0.764	0.603	0.520	0.756	0.886	0.881
				2.409	2.263	2.097	1.662	1.106	1.067	0.862	0.740	0.613	0.0		0.881	0.896
12/07/79	00:33:13	1880	3.587	2.688	2.341	2.082	1.550	1.277	0.974	0.915	0.764	0.603	0.520	0.756	0.891	0.881
				2.409	2.268	2.097	1.662	1.106	1.072	0.862	0.740	0.613	0.0		0.881	0.896
12/07/79	00:33:23	1881	3.587	2.683	2.336	2.082	1.550	1.277	0.974	0.915	0.764	0.603	0.520	0.756	0.891	0.881
				2.409	2.263	2.097	1.662	1.106	1.072	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:33:54	1882	3.587	2.688	2.341	2.087	1.550	1.277	0.974	0.915	0.764	0.608	0.520	0.756	0.891	0.881
				2.409	2.263	2.097	1.662	1.106	1.067	0.862	0.740	0.613	0.0		0.881	0.896
12/07/79	00:33:58	1883	3.587	2.683	2.341	2.087	1.550	1.272	0.974	0.915	0.764	0.608	0.525	0.756	0.886	0.881
				2.409	2.273	2.097	1.662	1.106	1.067	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:34:26	1884	3.587	2.688	2.351	2.092	1.555	1.277	0.974	0.915	0.764	0.608	0.520	0.756	0.886	0.881
				2.409	2.273	2.097	1.662	1.101	1.067	0.862	0.740	0.613	0.0		0.881	0.896
12/07/79	00:34:45	1885	3.587	2.688	2.351	2.092	1.550	1.277	0.974	0.915	0.764	0.608	0.520	0.756	0.891	0.881
				2.409	2.278	2.097	1.662	1.101	1.067	0.862	0.740	0.613	0.0		0.881	0.896
12/07/79	00:34:55	1886	3.587	2.688	2.341	2.087	1.550	1.272	0.974	0.915	0.764	0.608	0.525	0.756	0.886	0.881
				2.409	2.268	2.097	1.658	1.101	1.067	0.862	0.740	0.613	0.0		0.881	0.896
12/07/79	00:35:15	1887	3.587	2.688	2.351	2.092	1.550	1.272	0.969	0.915	0.764	0.608	0.520	0.756	0.891	0.881
				2.409	2.273	2.097	1.662	1.101	1.067	0.862	0.740	0.613	0.0		0.881	0.896
12/07/79	00:35:34	1888	3.587	2.688	2.356	2.092	1.550	1.277	0.969	0.915	0.764	0.608	0.520	0.756	0.891	0.881
				2.404	2.278	2.097	1.662	1.101	1.067	0.862	0.740	0.613	0.0		0.881	0.896
12/07/79	00:35:51	1889	3.587	2.688	2.346	2.082	1.555	1.277	1.008	0.915	0.759	0.608	0.525	0.756	0.891	0.881
				2.404	2.268	2.097	1.662	1.101	1.067	0.867	0.740	0.613	0.0		0.881	0.896
12/07/79	00:35:57	1890	3.587	2.688	2.351	2.092	1.555	1.272	1.018	0.915	0.764	0.608	0.520	0.756	0.891	0.881
				2.404	2.278	2.097	1.662	1.101	1.067	0.862	0.740	0.613	0.0		0.881	0.896
12/07/79	00:36:24	1891	3.587	2.688	2.351	2.092	1.560	1.272	1.047	0.910	0.779	0.608	0.525	0.756	0.891	0.881
				2.404	2.273	2.092	1.658	1.096	1.067	0.862	0.735	0.613	0.0		0.881	0.896
12/07/79	00:36:31	1892	3.587	2.688	2.346	2.087	1.560	1.272	1.042	0.910	0.779	0.608	0.520	0.756	0.891	0.881
				2.404	2.268	2.092	1.658	1.096	1.067	0.862	0.735	0.613	0.0		0.881	0.896
12/07/79	00:37:20	1893	2.333	1.540	1.203	0.842	0.593	1.252	0.310	0.495	0.647	0.710	0.515	0.757	0.901	0.896
				1.457	1.150	2.077	0.608	0.437	1.057	0.852	0.691	0.720	0.0		0.886	0.901
12/07/79	00:37:29	1894	1.932	1.267	0.984	0.691	0.490	1.247	0.564	0.686	0.744	0.769	0.520	0.759	0.891	0.881
				1.203	0.945	2.072	0.495	0.354	1.052	0.852	0.691	0.779	0.0		0.876	0.896
12/07/79	00:38:04	1895	1.016	0.808	0.774	0.779	0.798	1.238	0.832	0.827	0.842	0.842	0.549	0.768	0.881	0.867
				0.788	0.774	2.068	0.798	0.822	1.052	0.852	0.695	0.847	0.0		0.852	0.881
12/07/79	00:38:38	1896	1.016	0.803	0.774	0.779	0.798	1.233	0.832	0.827	0.837	0.842	0.686	0.794	0.881	0.867
				0.793	0.774	2.063	0.803	0.822	1.047	0.852	0.700	0.847	0.0		0.852	0.881
12/07/79	00:38:59	1897	1.016	0.808	0.783	0.788	0.803	1.233	0.832	0.832	0.842	0.842	0.759	0.813	0.881	0.867
				0.798	0.783	2.063	0.808	0.822	1.047	0.852	0.700	0.852	0.0		0.852	0.881
12/07/79	00:53:58	1898	1.016	0.993	0.827	0.984	0.818	1.199	0.837	0.837	0.837	0.954	0.783	0.812	0.998	0.988
				0.988	0.822	0.979	0.993	0.988	1.008	0.852	0.705	0.847	0.0		0.998	1.033

COOLING WATER PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	MCW1	MCW2	MCW3	DTCW1	DTCW2	DTCW3	DQ1	DQ2	DQ3	HFR1	DQCC1
12/06/79	21:57:34	1450	186.6	250.8	242.5	8.08	49.31	20.12	1.752	14.380	5.674	32.25	5.43
12/06/79	21:57:49	1451	187.0	248.2	241.0	8.08	68.50	20.00	1.757	19.771	5.605	27.96	6.28
12/06/79	21:57:58	1453	187.0	248.2	242.0	8.05	52.71	19.95	1.751	15.212	5.615	32.12	5.45
12/06/79	21:58:10	1456	186.0	249.6	241.2	8.08	74.89	19.93	1.747	21.739	5.591	32.05	5.45
12/06/79	21:58:28	1458	187.0	248.7	243.7	8.06	46.23	19.95	1.754	13.372	5.653	28.02	6.26
12/06/79	21:58:40	1460	186.3	247.7	243.6	8.05	52.02	19.99	1.745	14.984	5.662	27.91	6.25
12/06/79	21:58:59	1463	186.5	248.6	241.0	8.06	71.63	19.95	1.749	20.714	5.590	32.09	5.45
12/06/79	21:59:11	1466	186.9	248.5	245.6	8.04	72.44	19.88	1.747	20.934	5.679	32.16	5.43
12/06/79	21:59:30	1468	187.1	247.2	243.1	8.02	73.95	19.88	1.746	21.264	5.622	32.06	5.45
12/06/79	21:59:44	1470	186.9	248.3	243.6	8.00	42.89	19.89	1.739	12.384	5.637	27.93	6.22
12/06/79	21:59:50	1471	186.4	248.6	242.4	8.05	34.10	19.91	1.745	9.858	5.612	32.13	5.43
12/06/79	22:00:20	1472	186.0	247.3	243.3	8.05	62.59	19.91	1.741	17.999	5.632	28.06	6.21
12/06/79	22:00:24	1473	185.7	248.4	241.9	8.09	52.60	19.88	1.747	15.196	5.592	32.11	5.44
12/06/79	22:01:20	1474	186.4	250.2	240.6	8.08	35.92	19.84	1.751	10.449	5.553	28.04	6.24
12/06/79	22:01:39	1476	186.3	246.9	242.5	8.10	44.02	20.11	1.756	12.640	5.671	27.91	6.29
12/06/79	22:01:48	1478	186.3	249.5	243.3	8.12	51.54	20.15	1.758	14.957	5.699	32.07	5.48
12/06/79	22:02:00	1479	186.2	247.6	244.4	8.13	87.43	20.11	1.760	25.171	5.714	28.06	6.27
12/06/79	22:02:20	1481	186.4	248.2	241.7	8.14	64.24	20.11	1.766	18.544	5.652	27.87	6.33
12/06/79	22:02:48	1483	186.6	249.8	241.8	8.16	50.54	20.09	1.770	14.686	5.651	32.10	5.51
12/06/79	22:03:04	1485	186.3	245.3	246.6	8.18	37.55	20.07	1.773	10.712	5.754	32.15	5.51
12/06/79	22:03:21	1486	186.3	249.9	241.9	8.17	74.91	20.09	1.770	21.769	5.653	31.99	5.53
12/06/79	22:03:37	1487	186.3	248.3	242.8	8.14	39.06	20.15	1.765	11.278	5.689	32.14	5.49
12/06/79	22:03:54	1488	186.1	248.1	243.9	8.20	67.27	20.04	1.774	19.406	5.685	32.16	5.52
12/06/79	22:04:18	1490	186.9	246.9	244.2	8.18	51.18	20.13	1.779	14.695	5.719	32.06	5.55
12/06/79	22:04:22	1491	186.3	248.1	242.2	8.17	37.56	20.07	1.770	10.839	5.652	32.04	5.53
12/06/79	22:04:50	1492	186.3	248.1	241.6	8.20	47.48	20.08	1.776	13.702	5.643	28.06	6.33
12/06/79	22:05:09	1493	187.0	248.2	241.7	8.18	40.15	20.11	1.779	11.588	5.653	32.03	5.55
12/06/79	22:05:27	1494	187.0	250.5	241.7	8.16	51.67	20.11	1.774	15.052	5.652	28.01	6.33
12/06/79	22:05:32	1495	186.4	247.1	240.8	8.22	52.65	19.97	1.782	15.133	5.593	32.09	5.55
12/06/79	22:05:59	1496	186.8	247.3	243.2	8.20	44.77	19.84	1.781	12.880	5.612	27.97	6.37
12/06/79	22:06:16	1497	186.7	247.4	241.1	8.21	55.11	19.68	1.783	15.853	5.519	32.12	5.55
12/06/79	22:06:36	1498	186.4	249.9	241.3	8.21	48.43	19.63	1.780	14.078	5.509	31.95	5.57
12/06/79	22:06:40	1499	186.3	247.6	242.4	8.18	39.43	19.59	1.773	11.353	5.523	32.01	5.54
12/06/79	22:07:08	1501	186.8	249.3	239.8	8.12	55.44	19.55	1.763	16.076	5.452	32.10	5.49
12/06/79	22:07:17	1502	186.9	249.1	241.0	8.17	31.11	19.60	1.776	9.014	5.494	32.13	5.53
12/06/79	22:07:47	1503	186.9	249.3	242.6	8.21	58.16	20.04	1.785	16.865	5.653	32.14	5.55
12/06/79	22:07:57	1504	187.1	249.2	240.8	8.16	64.91	20.46	1.775	18.815	5.732	32.10	5.53
12/06/79	22:08:27	1505	186.1	251.7	242.8	8.14	22.35	20.66	1.762	6.543	5.836	32.08	5.49
12/06/79	22:08:51	1506	186.9	250.0	241.8	8.17	31.64	20.76	1.776	9.200	5.836	28.11	6.32
12/06/79	22:09:07	1507	186.9	247.6	242.3	8.16	48.82	20.77	1.773	14.059	5.851	28.06	6.32
12/06/79	22:09:17	1508	186.9	249.0	240.8	8.13	29.95	20.76	1.767	8.673	5.812	32.13	5.50
12/06/79	22:09:48	1509	186.3	247.7	241.1	8.14	47.41	20.70	1.764	13.660	5.806	32.14	5.49
12/06/79	22:09:57	1510	186.5	247.5	243.7	8.12	81.88	20.64	1.760	23.568	5.849	27.98	6.29
12/06/79	22:10:28	1511	186.1	249.9	241.4	8.12	40.03	20.64	1.757	11.635	5.794	32.18	5.46
12/06/79	22:25:30	1524	186.4	249.3	240.4	8.83	51.75	22.20	1.915	15.002	6.208	32.56	5.88
12/06/79	22:33:56	1539	186.2	249.6	243.3	9.06	53.99	21.87	1.961	15.676	6.188	32.65	6.01
12/06/79	22:34:15	1540	186.1	250.1	242.1	9.06	50.74	21.64	1.961	14.762	6.095	32.76	5.99
12/06/79	22:36:44	1541	186.2	247.2	244.7	9.10	20.60	21.38	1.970	5.922	6.083	32.82	6.00
12/06/79	22:37:02	1542	185.9	249.6	241.0	9.10	65.73	21.33	1.967	19.079	5.977	32.85	5.99

COOLING WATER PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	MCW1	MCW2	MCW3	DTCW1	DTCW2	DTCW3	DQ1	DQ2	DQ3	HFR1	DQCC1
12/07/79	00:21:05	1850	187.4	250.3	242.4	9.83	52.16	27.37	2.142	15.184	7.717	35.65	6.01
12/07/79	00:21:28	1851	186.9	249.0	243.2	9.92	54.50	26.76	2.156	15.779	7.571	35.74	6.03
12/07/79	00:25:04	1852	186.3	252.1	243.8	9.84	13.37	26.06	2.132	3.919	7.389	36.32	5.87
12/07/79	00:25:23	1853	187.3	250.4	242.0	9.79	23.45	26.02	2.133	6.828	7.325	35.77	5.96
12/07/79	00:25:44	1854	186.8	252.6	241.8	9.84	44.73	26.13	2.138	13.143	7.348	36.05	5.93
12/07/79	00:25:57	1855	186.9	251.8	243.9	9.80	15.81	27.27	2.130	4.630	7.734	36.29	5.87
12/07/79	00:26:06	1856	184.9	250.7	244.4	9.77	38.16	28.34	2.102	11.125	8.055	36.16	5.81
12/07/79	00:26:25	1857	187.0	249.9	243.7	9.77	36.80	28.47	2.126	10.698	8.072	35.91	5.92
12/07/79	00:26:29	1858	187.5	249.8	245.2	9.81	67.61	28.20	2.140	19.641	8.042	36.33	5.89
12/07/79	00:26:56	1859	187.1	250.7	242.4	9.79	54.93	27.69	2.130	16.016	7.805	36.29	5.87
12/07/79	00:27:16	1860	187.5	250.2	243.5	9.80	48.20	27.18	2.137	14.026	7.695	35.95	5.94
12/07/79	00:27:26	1861	187.9	248.0	245.1	9.76	39.43	26.72	2.133	11.371	7.617	36.09	5.91
12/07/79	00:27:55	1862	187.6	249.2	244.5	9.77	63.14	26.59	2.133	18.299	7.562	36.19	5.89
12/07/79	00:28:14	1863	187.4	250.0	244.7	9.79	78.74	26.39	2.133	22.892	7.511	36.29	5.88
12/07/79	00:28:24	1864	186.3	258.0	246.0	9.79	27.68	26.30	2.120	8.306	7.525	36.14	5.87
12/07/79	00:28:55	1865	187.3	247.2	244.0	9.77	38.74	26.13	2.129	11.137	7.415	35.80	5.95
12/07/79	00:28:59	1866	186.8	251.4	243.1	9.80	64.39	26.11	2.130	18.823	7.382	35.81	5.95
12/07/79	00:29:18	1867	187.4	250.2	242.8	9.80	68.37	25.86	2.136	19.897	7.303	35.99	5.94
12/07/79	00:29:46	1868	187.4	252.3	243.2	9.76	29.68	25.61	2.128	8.710	7.244	36.40	5.84
12/07/79	00:30:04	1869	187.1	251.4	241.6	9.76	50.36	25.45	2.124	14.721	7.153	36.28	5.85
12/07/79	00:30:26	1870	187.3	247.8	245.0	9.75	48.28	25.36	2.123	13.914	7.225	35.83	5.93
12/07/79	00:30:35	1871	187.6	250.3	243.4	9.76	62.43	25.37	2.130	18.172	7.181	35.85	5.94
12/07/79	00:30:54	1872	187.0	251.3	242.3	9.77	40.61	25.38	2.126	11.868	7.155	36.14	5.88
12/07/79	00:31:04	1873	187.2	252.0	243.6	9.79	69.91	25.28	2.131	20.492	7.162	36.06	5.91
12/07/79	00:31:29	1874	186.8	252.4	242.7	9.75	34.95	25.58	2.117	10.258	7.221	35.59	5.95
12/07/79	00:31:37	1875	187.5	251.6	242.7	9.73	48.06	25.56	2.123	14.063	7.215	36.28	5.85
12/07/79	00:32:05	1876	187.0	248.6	243.3	9.76	34.55	25.58	2.123	9.988	7.239	35.90	5.91
12/07/79	00:32:12	1877	187.5	251.3	242.5	9.80	31.98	25.44	2.137	9.347	7.174	36.14	5.91
12/07/79	00:32:37	1878	187.4	251.3	244.5	9.75	58.22	25.28	2.124	17.016	7.188	36.13	5.88
12/07/79	00:32:45	1879	186.8	247.5	244.0	9.79	54.03	25.20	2.126	15.553	7.151	35.67	5.96
12/07/79	00:33:13	1880	187.4	251.9	243.7	9.79	46.11	25.16	2.133	13.512	7.130	36.15	5.90
12/07/79	00:33:23	1881	187.2	250.7	245.3	9.77	35.12	25.19	2.129	10.239	7.185	35.96	5.92
12/07/79	00:33:54	1882	186.9	251.1	243.4	9.77	30.69	25.16	2.125	8.963	7.123	36.34	5.85
12/07/79	00:33:58	1883	187.3	251.5	245.2	9.81	47.52	25.15	2.138	13.902	7.170	36.18	5.91
12/07/79	00:34:26	1884	187.2	250.5	245.5	9.81	48.75	25.11	2.137	14.202	7.168	36.29	5.89
12/07/79	00:34:45	1885	186.4	252.4	242.0	9.75	25.50	25.09	2.114	7.486	7.064	36.04	5.86
12/07/79	00:34:55	1886	187.5	248.0	244.1	9.75	48.43	25.05	2.126	13.971	7.111	36.29	5.86
12/07/79	00:35:15	1887	187.5	251.2	240.6	9.80	67.56	25.05	2.137	19.735	7.011	36.28	5.89
12/07/79	00:35:34	1888	185.6	249.3	242.7	9.80	40.42	25.03	2.115	11.720	7.063	36.25	5.83
12/07/79	00:35:51	1889	187.6	248.5	242.9	9.80	40.98	25.07	2.138	11.842	7.080	36.29	5.89
12/07/79	00:35:57	1890	187.4	250.3	243.5	9.79	38.04	25.05	2.133	11.074	7.095	36.11	5.91
12/07/79	00:36:24	1891	186.0	250.9	243.0	9.79	49.87	24.96	2.117	14.552	7.055	36.23	5.84
12/07/79	00:36:31	1892	186.8	250.5	242.7	9.80	25.77	24.95	2.130	7.508	7.043	36.11	5.90
12/07/79	00:37:29	1894	187.4	247.9	241.8	3.95	53.89	7.20	0.861	15.539	2.025	4.75	18.13
12/07/79	00:38:04	1895	187.3	251.0	240.4	2.65	45.95	2.77	0.578	13.414	0.775	1.70	34.05
12/07/79	00:38:38	1896	187.0	250.0	240.8	1.84	60.76	1.15	0.401	17.663	0.323	1.14	35.15
12/07/79	00:38:59	1897	187.1	246.7	242.4	1.63	67.86	1.46	0.355	19.475	0.411	1.03	34.58
12/07/79	00:53:58	1898	186.4	248.0	241.4	0.70	93.05	0.08	0.152	26.835	0.022	0.0	0.0

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

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RECN=1448                DATE      TIME      I9=0     I15=28   I21=28   I132=0   I138=25  I144=27   IP56=4   IN56=0
                      12/06/79  21:57:22    I10=0    I16=27   I22=33   I133=0   I139=25  I145=25   IP57=0   IN57=0
  ITOT= 320     ETOT=3056      PTOT= 979    I11=25   I17=22   I23=0    I134=0   I140=20  I146=22   IP92=0   IN92=0
IINV17= 321   EINV17=1034    PINV17= 332    I12=24   I18=21   I24=0    I135=0   I141=21  I147=24   IP93=5   IN93=8
IINV19= 319   EINV19=1514    PINV19= 484    I13=27   I19=22            I136=24  I142=25
IINV21= 321   EINV21= 507    PINV21= 163    I14=26   I20=23            I137=24  I143=35
                HALL=3053                                                                          IENT= 306  IEXIT= 298

RECN=1449                DATE      TIME      I9=0     I15=25   I21=21   I132=0   I138=21  I144=22   IP56=3   IN56=0
                      12/06/79  21:57:29    I10=0    I16=25   I22=20   I133=0   I139=20  I145=21   IP57=0   IN57=0
  ITOT= 270     ETOT=3970      PTOT=1074    I11=23   I17=18   I23=0    I134=0   I140=16  I146=19   IP92=0   IN92=0
IINV17= 270   EINV17=1263    PINV17= 342    I12=21   I18=18   I24=0    I135=0   I141=16  I147=20   IP93=5   IN93=7
IINV19= 270   EINV19=1825    PINV19= 494    I13=24   I19=18            I136=20  I142=21
IINV21= 270   EINV21= 882    PINV21= 238    I14=23   I20=18            I137=20  I143=29
                HALL=3955                                                                          IENT= 255  IEXIT= 245

RECN=1450                DATE      TIME      I9=0     I15=25   I21=20   I132=0   I138=21  I144=21   IP56=3   IN56=0
                      12/06/79  21:57:34    I10=0    I16=25   I22=19   I133=0   I139=20  I145=20   IP57=0   IN57=0
  ITOT= 270     ETOT=4028      PTOT=1089    I11=23   I17=18   I23=0    I134=0   I140=16  I146=18   IP92=0   IN92=0
IINV17= 270   EINV17=1268    PINV17= 343    I12=22   I18=18   I24=0    I135=0   I141=16  I147=20   IP93=5   IN93=6
IINV19= 270   EINV19=1843    PINV19= 498    I13=24   I19=18            I136=20  I142=21
IINV21= 270   EINV21= 917    PINV21= 248    I14=23   I20=18            I137=20  I143=30
                HALL=4014                                                                          IENT= 255  IEXIT= 245

RECN=1451                DATE      TIME      I9=0     I15=25   I21=20   I132=0   I138=21  I144=22   IP56=3   IN56=0
                      12/06/79  21:57:49    I10=0    I16=25   I22=20   I133=0   I139=20  I145=21   IP57=0   IN57=0
  ITOT= 270     ETOT=4058      PTOT=1097    I11=23   I17=18   I23=0    I134=0   I140=16  I146=18   IP92=0   IN92=0
IINV17= 270   EINV17=1280    PINV17= 346    I12=22   I18=18   I24=0    I135=0   I141=16  I147=20   IP93=5   IN93=6
IINV19= 270   EINV19=1855    PINV19= 501    I13=24   I19=18            I136=21  I142=21
IINV21= 270   EINV21= 923    PINV21= 250    I14=23   I20=18            I137=20  I143=29
                HALL=4037                                                                          IENT= 255  IEXIT= 244

RECN=1452                DATE      TIME      I9=0     I15=25   I21=21   I132=0   I138=21  I144=22   IP56=3   IN56=0
                      12/06/79  21:57:52    I10=0    I16=25   I22=20   I133=0   I139=20  I145=21   IP57=0   IN57=0
  ITOT= 270     ETOT=4016      PTOT=1086    I11=23   I17=18   I23=0    I134=0   I140=16  I146=18   IP92=0   IN92=0
IINV17= 270   EINV17=1274    PINV17= 345    I12=21   I18=18   I24=0    I135=0   I141=16  I147=20   IP93=5   IN93=7
IINV19= 270   EINV19=1843    PINV19= 498    I13=24   I19=18            I136=21  I142=21
IINV21= 270   EINV21= 899    PINV21= 243    I14=23   I20=18            I137=20  I143=29
                HALL=4002                                                                          IENT= 255  IEXIT= 245

RECN=1453                DATE      TIME      I9=0     I15=25   I21=20   I132=0   I138=21  I144=22   IP56=3   IN56=0
                      12/06/79  21:57:58    I10=0    I16=25   I22=19   I133=0   I139=20  I145=21   IP57=0   IN57=0
  ITOT= 270     ETOT=4046      PTOT=1094    I11=23   I17=18   I23=0    I134=0   I140=16  I146=18   IP92=0   IN92=0
IINV17= 270   EINV17=1280    PINV17= 346    I12=22   I18=18   I24=0    I135=0   I141=16  I147=20   IP93=5   IN93=6
IINV19= 270   EINV19=1855    PINV19= 501    I13=24   I19=18            I136=21  I142=21
IINV21= 270   EINV21= 911    PINV21= 246    I14=23   I20=18            I137=20  I143=29
                HALL=4026                                                                          IENT= 255  IEXIT= 244
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POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

```
RECN=1454                DATE      TIME      I9=0     I15=25   I21=20   I132=0   I138=21  I144=22  IP56=3   IN56=0
                      12/06/79  21:58:01     I10=0    I16=25   I22=19   I133=0   I139=20  I145=21  IP57=0   IN57=0
  ITOT= 270     ETOT=4046      PTOT=1094     I11=23   I17=18   I23=0    I134=0   I140=16  I146=18  IP92=0   IN92=0
IINV17= 270   EINV17=1274    PINV17= 345     I12=22   I18=18   I24=0    I135=0   I141=16  I147=20  IP93=5   IN93=6
IINV19= 270   EINV19=1855    PINV19= 501     I13=24   I19=18            I136=21  I142=21
IINV21= 270   EINV21= 917    PINV21= 248     I14=23   I20=18            I137=20  I143=29
                HALL=4037                                                                          IENT= 255  IEXIT= 245

RECN=1455                DATE      TIME      I9=0     I15=25   I21=20   I132=0   I138=21  I144=22  IP56=3   IN56=0
                      12/06/79  21:58:05     I10=0    I16=25   I22=20   I133=0   I139=20  I145=21  IP57=0   IN57=0
  ITOT= 270     ETOT=4069      PTOT=1100     I11=23   I17=18   I23=0    I134=0   I140=16  I146=19  IP92=0   IN92=0
IINV17= 270   EINV17=1280    PINV17= 346     I12=22   I18=18   I24=0    I135=0   I141=16  I147=20  IP93=5   IN93=6
IINV19= 270   EINV19=1866    PINV19= 505     I13=24   I19=18            I136=21  I142=21
IINV21= 270   EINV21= 923    PINV21= 250     I14=23   I20=18            I137=20  I143=29
                HALL=4014                                                                          IENT= 255  IEXIT= 245

RECN=1456                DATE      TIME      I9=0     I15=25   I21=20   I132=0   I138=21  I144=22  IP56=3   IN56=0
                      12/06/79  21:58:10     I10=0    I16=25   I22=20   I133=0   I139=20  I145=21  IP57=0   IN57=0
  ITOT= 270     ETOT=4070      PTOT=1100     I11=23   I17=18   I23=0    I134=0   I140=16  I146=18  IP92=0   IN92=0
IINV17= 270   EINV17=1280    PINV17= 346     I12=22   I18=18   I24=0    I135=0   I141=16  I147=20  IP93=5   IN93=6
IINV19= 270   EINV19=1861    PINV19= 503     I13=24   I19=18            I136=21  I142=21
IINV21= 270   EINV21= 929    PINV21= 251     I14=23   I20=18            I137=20  I143=29
                HALL=4049                                                                          IENT= 255  IEXIT= 245

RECN=1457                DATE      TIME      I9=0     I15=25   I21=20   I132=0   I138=21  I144=22  IP56=3   IN56=0
                      12/06/79  21:58:17     I10=0    I16=25   I22=20   I133=0   I139=20  I145=21  IP57=0   IN57=0
  ITOT= 270     ETOT=4016      PTOT=1086     I11=23   I17=18   I23=0    I134=0   I140=16  I146=18  IP92=0   IN92=0
IINV17= 270   EINV17=1268    PINV17= 343     I12=22   I18=18   I24=0    I135=0   I141=16  I147=20  IP93=5   IN93=6
IINV19= 270   EINV19=1843    PINV19= 498     I13=24   I19=18            I136=21  I142=21
IINV21= 270   EINV21= 905    PINV21= 245     I14=23   I20=18            I137=20  I143=30
                HALL=4002                                                                          IENT= 255  IEXIT= 245

RECN=1458                DATE      TIME      I9=0     I15=25   I21=21   I132=0   I138=21  I144=23  IP56=3   IN56=0
                      12/06/79  21:58:28     I10=0    I16=25   I22=20   I133=0   I139=20  I145=21  IP57=0   IN57=0
  ITOT= 270     ETOT=4040      PTOT=1093     I11=23   I17=18   I23=0    I134=0   I140=15  I146=19  IP92=0   IN92=0
IINV17= 270   EINV17=1280    PINV17= 346     I12=21   I18=18   I24=0    I135=0   I141=16  I147=20  IP93=5   IN93=6
IINV19= 270   EINV19=1855    PINV19= 501     I13=24   I19=18            I136=21  I142=21
IINV21= 270   EINV21= 905    PINV21= 245     I14=23   I20=18            I137=20  I143=29
                HALL=4026                                                                          IENT= 255  IEXIT= 245

RECN=1459                DATE      TIME      I9=0     I15=25   I21=21   I132=0   I138=21  I144=22  IP56=3   IN56=0
                      12/06/79  21:58:35     I10=0    I16=25   I22=21   I133=0   I139=20  I145=21  IP57=0   IN57=0
  ITOT= 270     ETOT=4064      PTOT=1099     I11=22   I17=18   I23=0    I134=0   I140=15  I146=19  IP92=0   IN92=0
IINV17= 270   EINV17=1274    PINV17= 345     I12=21   I18=18   I24=0    I135=0   I141=16  I147=20  IP93=5   IN93=7
IINV19= 270   EINV19=1861    PINV19= 503     I13=24   I19=18            I136=21  I142=21
IINV21= 270   EINV21= 929    PINV21= 251     I14=23   I20=18            I137=20  I143=29
                HALL=4049                                                                          IENT= 255  IEXIT= 245
```

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

RECN=1460		DATE	TIME	I9=0	I15=25	I21=20	I132=0	I138=21	I144=22	IP56=3	IN56=0	
		12/06/79	21:58:40	I10=0	I16=25	I22=20	I133=0	I139=20	I145=21	IP57=0	IN57=0	
ITOT= 270	ETOT=4034	PTOT=1091		I11=23	I17=18	I23=0	I134=0	I140=16	I146=18	IP92=0	IN92=0	
IINV17= 270	EINV17=1268	PINV17= 343		I12=22	I18=18	I24=0	I135=0	I141=16	I147=20	IP93=5	IN93=6	
IINV19= 270	EINV19=1843	PINV19= 498		I13=24	I19=18		I136=21	I142=21				
IINV21= 270	EINV21= 923	PINV21= 250		I14=23	I20=18		I137=20	I143=29				
	HALL=4026									IENT= 255	IEXIT= 245	
RECN=1461		DATE	TIME	I9=0	I15=25	I21=18	I132=0	I138=20	I144=22	IP56=3	IN56=0	
		12/06/79	21:58:43	I10=0	I16=24	I22=17	I133=0	I139=19	I145=20	IP57=0	IN57=0	
ITOT= 261	ETOT=4227	PTOT=1104		I11=23	I17=17	I23=0	I134=0	I140=15	I146=18	IP92=0	IN92=0	
IINV17= 261	EINV17=1327	PINV17= 346		I12=22	I18=18	I24=0	I135=0	I141=15	I147=19	IP93=5	IN93=6	
IINV19= 261	EINV19=1913	PINV19= 499		I13=24	I19=17		I136=20	I142=20				
IINV21= 263	EINV21= 987	PINV21= 259		I14=23	I20=17		I137=19	I143=28				
	HALL=4177									IENT= 246	IEXIT= 235	
RECN=1462		DATE	TIME	I9=0	I15=24	I21=16	I132=0	I138=19	I144=18	IP56=3	IN56=0	
		12/06/79	21:58:54	I10=0	I16=24	I22=14	I133=0	I139=19	I145=18	IP57=0	IN57=0	
ITOT= 248	ETOT=4550	PTOT=1130		I11=22	I17=16	I23=0	I134=0	I140=14	I146=16	IP92=0	IN92=0	
IINV17= 247	EINV17=1391	PINV17= 344		I12=21	I18=17	I24=0	I135=0	I141=14	I147=18	IP93=4	IN93=6	
IINV19= 249	EINV19=2007	PINV19= 500		I13=24	I19=16		I136=19	I142=19				
IINV21= 249	EINV21=1151	PINV21= 287		I14=22	I20=16		I137=19	I143=27				
	HALL=4494									IENT= 232	IEXIT= 222	
RECN=1463		DATE	TIME	I9=0	I15=24	I21=16	I132=0	I138=19	I144=19	IP56=3	IN56=0	
		12/06/79	21:58:59	I10=0	I16=23	I22=15	I133=0	I139=18	I145=18	IP57=0	IN57=0	
ITOT= 248	ETOT=4486	PTOT=1114		I11=22	I17=16	I23=0	I134=0	I140=14	I146=17	IP92=0	IN92=0	
IINV17= 247	EINV17=1380	PINV17= 341		I12=21	I18=17	I24=0	I135=0	I141=14	I147=18	IP93=4	IN93=6	
IINV19= 249	EINV19=1990	PINV19= 495		I13=24	I19=16		I136=19	I142=19				
IINV21= 249	EINV21=1116	PINV21= 278		I14=22	I20=16		I137=19	I143=28				
	HALL=4459									IENT= 232	IEXIT= 221	
RECN=1464		DATE	TIME	I9=0	I15=24	I21=16	I132=0	I138=19	I144=19	IP56=3	IN56=0	
		12/06/79	21:59:03	I10=0	I16=24	I22=14	I133=0	I139=18	I145=18	IP57=0	IN57=0	
ITOT= 248	ETOT=4496	PTOT=1117		I11=22	I17=16	I23=0	I134=0	I140=14	I146=17	IP92=0	IN92=0	
IINV17= 247	EINV17=1385	PINV17= 342		I12=21	I18=17	I24=0	I135=0	I141=14	I147=18	IP93=4	IN93=6	
IINV19= 249	EINV19=1995	PINV19= 497		I13=24	I19=17		I136=19	I142=19				
IINV21= 249	EINV21=1116	PINV21= 278		I14=22	I20=16		I137=19	I143=27				
	HALL=4471									IENT= 232	IEXIT= 222	
RECN=1465		DATE	TIME	I9=0	I15=24	I21=16	I132=0	I138=19	I144=19	IP56=3	IN56=0	
		12/06/79	21:59:06	I10=0	I16=23	I22=15	I133=0	I139=18	I145=18	IP57=0	IN57=0	
ITOT= 249	ETOT=4514	PTOT=1124		I11=22	I17=16	I23=0	I134=0	I140=14	I146=16	IP92=0	IN92=0	
IINV17= 249	EINV17=1391	PINV17= 346		I12=21	I18=17	I24=0	I135=0	I141=14	I147=18	IP93=5	IN93=6	
IINV19= 249	EINV19=2007	PINV19= 500		I13=23	I19=17		I136=19	I142=19				
IINV21= 249	EINV21=1116	PINV21= 278		I14=22	I20=16		I137=19	I143=27				
	HALL=4482									IENT= 232	IEXIT= 221	

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

```
RECN=1466                DATE      TIME      I9=0     I15=24   I21=16   I132=0   I138=19  I144=19   IP56=3   IN56=0
                      12/06/79  21:59:11    I10=0    I16=23   I22=15   I133=0   I139=18  I145=18   IP57=0   IN57=0
  ITOT= 249     ETOT=4497      PTOT=1120    I11=22   I17=16   I23=0    I134=0   I140=14  I146=16   IP92=0   IN92=0
IINV17= 249   EINV17=1391   PINV17= 346    I12=21   I18=17   I24=0    I135=0   I141=14  I147=18   IP93=5   IN93=6
IINV19= 249   EINV19=1995   PINV19= 497    I13=23   I19=17            I136=19  I142=19
IINV21= 249   EINV21=1111   PINV21= 277    I14=22   I20=16            I137=19  I143=27
                HALL=4471                                                                          IENT= 233  IEXIT= 221

RECN=1467                DATE      TIME      I9=0     I15=24   I21=16   I132=0   I138=19  I144=19   IP56=3   IN56=0
                      12/06/79  21:59:15    I10=0    I16=23   I22=15   I133=0   I139=19  I145=18   IP57=0   IN57=0
  ITOT= 248     ETOT=4502      PTOT=1118    I11=22   I17=17   I23=0    I134=0   I140=14  I146=16   IP92=0   IN92=0
IINV17= 247   EINV17=1385   PINV17= 342    I12=21   I18=17   I24=0    I135=0   I141=14  I147=18   IP93=5   IN93=6
IINV19= 249   EINV19=1995   PINV19= 497    I13=23   I19=17            I136=19  I142=19
IINV21= 249   EINV21=1122   PINV21= 279    I14=22   I20=16            I137=19  I143=27
                HALL=4471                                                                          IENT= 232  IEXIT= 221

RECN=1468                DATE      TIME      I9=0     I15=24   I21=16   I132=0   I138=19  I144=20   IP56=3   IN56=0
                      12/06/79  21:59:30    I10=0    I16=24   I22=14   I133=0   I139=18  I145=19   IP57=0   IN57=0
  ITOT= 248     ETOT=4491      PTOT=1115    I11=22   I17=17   I23=0    I134=0   I140=14  I146=16   IP92=0   IN92=0
IINV17= 247   EINV17=1391   PINV17= 344    I12=21   I18=17   I24=0    I135=0   I141=14  I147=18   IP93=5   IN93=6
IINV19= 249   EINV19=2001   PINV19= 498    I13=24   I19=17            I136=19  I142=19
IINV21= 249   EINV21=1099   PINV21= 274    I14=22   I20=16            I137=19  I143=26
                HALL=4459                                                                          IENT= 233  IEXIT= 221

RECN=1469                DATE      TIME      I9=0     I15=25   I21=15   I132=0   I138=19  I144=19   IP56=3   IN56=0
                      12/06/79  21:59:36    I10=0    I16=24   I22=13   I133=0   I139=18  I145=19   IP57=0   IN57=0
  ITOT= 248     ETOT=4526      PTOT=1123    I11=22   I17=17   I23=0    I134=0   I140=14  I146=16   IP92=0   IN92=0
IINV17= 249   EINV17=1397   PINV17= 348    I12=21   I18=17   I24=0    I135=0   I141=14  I147=18   IP93=4   IN93=6
IINV19= 247   EINV19=2001   PINV19= 494    I13=24   I19=16            I136=19  I142=19
IINV21= 249   EINV21=1128   PINV21= 281    I14=23   I20=15            I137=19  I143=26
                HALL=4482                                                                          IENT= 233  IEXIT= 221

RECN=1470                DATE      TIME      I9=0     I15=24   I21=16   I132=0   I138=19  I144=20   IP56=3   IN56=0
                      12/06/79  21:59:44    I10=0    I16=24   I22=14   I133=0   I139=18  I145=19   IP57=0   IN57=0
  ITOT= 249     ETOT=4550      PTOT=1133    I11=22   I17=17   I23=0    I134=0   I140=14  I146=17   IP92=0   IN92=0
IINV17= 249   EINV17=1409   PINV17= 351    I12=21   I18=17   I24=0    I135=0   I141=14  I147=18   IP93=5   IN93=6
IINV19= 249   EINV19=2013   PINV19= 501    I13=24   I19=17            I136=19  I142=19
IINV21= 249   EINV21=1128   PINV21= 281    I14=22   I20=16            I137=19  I143=26
                HALL=4494                                                                          IENT= 233  IEXIT= 221

RECN=1471                DATE      TIME      I9=0     I15=24   I21=16   I132=0   I138=19  I144=19   IP56=3   IN56=0
                      12/06/79  21:59:50    I10=0    I16=24   I22=13   I133=0   I139=18  I145=18   IP57=0   IN57=0
  ITOT= 248     ETOT=4520      PTOT=1123    I11=22   I17=16   I23=0    I134=0   I140=14  I146=17   IP92=0   IN92=0
IINV17= 247   EINV17=1403   PINV17= 347    I12=21   I18=17   I24=0    I135=0   I141=14  I147=18   IP93=4   IN93=6
IINV19= 249   EINV19=1995   PINV19= 497    I13=24   I19=16            I136=19  I142=19
IINV21= 249   EINV21=1122   PINV21= 279    I14=22   I20=16            I137=19  I143=26
                HALL=4459                                                                          IENT= 233  IEXIT= 222
```

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

RECN=1472	DATE	TIME	I9=0	I15=24	I21=16	I132=0	I138=19	I144=19	IP56=3	IN56=0	
	12/06/79	22:00:20	I10=0	I16=23	I22=15	I133=0	I139=18	I145=19	IP57=0	IN57=0	
ITOT= 249	ETOT=4508	PTOT=1123	I11=22	I17=17	I23=0	I134=0	I140=14	I146=17	IP92=0	IN92=0	
IINV17= 249	EINV17=1385	PINV17= 345	I12=21	I18=17	I24=0	I135=0	I141=14	I147=18	IP93=4	IN93=6	
IINV19= 249	EINV19=2001	PINV19= 498	I13=23	I19=17		I136=19	I142=19				
IINV21= 249	EINV21=1122	PINV21= 279	I14=22	I20=16		I137=19	I143=28				
	HALL=4471								IENT= 232	IEXIT= 222	
RECN=1473	DATE	TIME	I9=0	I15=24	I21=16	I132=0	I138=19	I144=19	IP56=3	IN56=0	
	12/06/79	22:00:24	I10=0	I16=24	I22=15	I133=0	I139=18	I145=18	IP57=0	IN57=0	
ITOT= 249	ETOT=4555	PTOT=1134	I11=22	I17=16	I23=0	I134=0	I140=14	I146=17	IP92=0	IN92=0	
IINV17= 249	EINV17=1391	PINV17= 346	I12=21	I18=17	I24=0	I135=0	I141=14	I147=18	IP93=4	IN93=6	
IINV19= 249	EINV19=2024	PINV19= 504	I13=23	I19=17		I136=19	I142=18				
IINV21= 249	EINV21=1139	PINV21= 284	I14=22	I20=16		I137=19	I143=27				
	HALL=4494								IENT= 233	IEXIT= 222	
RECN=1474	DATE	TIME	I9=0	I15=26	I21=21	I132=0	I138=22	I144=24	IP56=3	IN56=0	
	12/06/79	22:01:20	I10=0	I16=25	I22=22	I133=0	I139=21	I145=22	IP57=0	IN57=0	
ITOT= 279	ETOT=3941	PTOT=1101	I11=23	I17=19	I23=0	I134=0	I140=16	I146=19	IP92=0	IN92=0	
IINV17= 280	EINV17=1245	PINV17= 349	I12=22	I18=19	I24=0	I135=0	I141=16	I147=21	IP93=5	IN93=7	
IINV19= 278	EINV19=1808	PINV19= 503	I13=25	I19=19		I136=21	I142=21				
IINV21= 280	EINV21= 888	PINV21= 249	I14=24	I20=19		I137=21	I143=29				
	HALL=3919								IENT= 264	IEXIT= 254	
RECN=1475	DATE	TIME	I9=0	I15=25	I21=22	I132=0	I138=22	I144=24	IP56=3	IN56=0	
	12/06/79	22:01:26	I10=0	I16=25	I22=23	I133=0	I139=21	I145=22	IP57=0	IN57=0	
ITOT= 280	ETOT=3958	PTOT=1109	I11=23	I17=19	I23=0	I134=0	I140=16	I146=19	IP92=0	IN92=0	
IINV17= 280	EINV17=1240	PINV17= 347	I12=22	I18=19	I24=0	I135=0	I141=16	I147=21	IP93=5	IN93=7	
IINV19= 280	EINV19=1819	PINV19= 510	I13=24	I19=19		I136=21	I142=21				
IINV21= 280	EINV21= 899	PINV21= 252	I14=23	I20=19		I137=21	I143=29				
	HALL=3931								IENT= 264	IEXIT= 254	
RECN=1476	DATE	TIME	I9=0	I15=25	I21=22	I132=0	I138=22	I144=24	IP56=3	IN56=0	
	12/06/79	22:01:39	I10=0	I16=25	I22=23	I133=0	I139=21	I145=22	IP57=0	IN57=0	
ITOT= 279	ETOT=3952	PTOT=1104	I11=23	I17=19	I23=0	I134=0	I140=16	I146=20	IP92=0	IN92=0	
IINV17= 280	EINV17=1245	PINV17= 349	I12=22	I18=19	I24=0	I135=0	I141=16	I147=21	IP93=4	IN93=7	
IINV19= 278	EINV19=1814	PINV19= 505	I13=24	I19=19		I136=21	I142=21				
IINV21= 280	EINV21= 893	PINV21= 250	I14=23	I20=19		I137=21	I143=29				
	HALL=3931								IENT= 264	IEXIT= 254	
RECN=1477	DATE	TIME	I9=0	I15=26	I21=21	I132=0	I138=22	I144=24	IP56=3	IN56=0	
	12/06/79	22:01:42	I10=0	I16=25	I22=22	I133=0	I139=21	I145=22	IP57=0	IN57=0	
ITOT= 279	ETOT=4005	PTOT=1119	I11=23	I17=19	I23=0	I134=0	I140=16	I146=19	IP92=0	IN92=0	
IINV17= 280	EINV17=1257	PINV17= 352	I12=22	I18=19	I24=0	I135=0	I141=16	I147=21	IP93=4	IN93=7	
IINV19= 278	EINV19=1831	PINV19= 509	I13=25	I19=19		I136=22	I142=21				
IINV21= 280	EINV21= 917	PINV21= 257	I14=24	I20=19		I137=21	I143=29				
	HALL=3967								IENT= 264	IEXIT= 254	

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

```
RECN=1478                DATE      TIME      I9=0     I15=26   I21=22   I132=0   I138=22  I144=24  IP56=3   IN56=0
                      12/06/79  22:01:48     I10=0    I16=25   I22=22   I133=0   I139=21  I145=22  IP57=0   IN57=0
  ITOT= 279     ETOT=3982     PTOT=1112     I11=23   I17=19   I23=0    I134=0   I140=16  I146=20  IP92=0   IN92=0
IINV17= 280   EINV17=1240   PINV17= 347     I12=22   I18=19   I24=0    I135=0   I141=16  I147=21  IP93=4   IN93=7
IINV19= 278   EINV19=1819   PINV19= 506     I13=25   I19=19            I136=22  I142=21
IINV21= 280   EINV21= 923   PINV21= 259     I14=23   I20=19            I137=21  I143=29
                HALL=3967                                                                          IENT= 264  IEXIT= 254

RECN=1479                DATE      TIME      I9=0     I15=26   I21=21   I132=0   I138=22  I144=24  IP56=3   IN56=0
                      12/06/79  22:02:00     I10=0    I16=26   I22=22   I133=0   I139=21  I145=22  IP57=0   IN57=0
  ITOT= 279     ETOT=3941     PTOT=1101     I11=23   I17=19   I23=0    I134=0   I140=16  I146=19  IP92=0   IN92=0
IINV17= 280   EINV17=1245   PINV17= 349     I12=22   I18=19   I24=0    I135=0   I141=16  I147=21  IP93=5   IN93=7
IINV19= 278   EINV19=1808   PINV19= 503     I13=25   I19=19            I136=21  I142=21
IINV21= 280   EINV21= 888   PINV21= 249     I14=24   I20=19            I137=21  I143=29
                HALL=3919                                                                          IENT= 264  IEXIT= 254

RECN=1480                DATE      TIME      I9=0     I15=25   I21=22   I132=0   I138=22  I144=23  IP56=0   IN56=18
                      12/06/79  22:02:08     I10=0    I16=25   I22=23   I133=0   I139=21  I145=22  IP57=26  IN57=0
  ITOT= 279     ETOT=3946     PTOT=1102     I11=23   I17=19   I23=0    I134=0   I140=17  I146=19  IP92=0   IN92=0
IINV17= 280   EINV17=1263   PINV17= 354     I12=22   I18=19   I24=0    I135=0   I141=17  I147=21  IP93=4   IN93=6
IINV19= 278   EINV19=1760   PINV19= 490     I13=25   I19=19            I136=21  I142=21
IINV21= 280   EINV21= 923   PINV21= 259     I14=23   I20=19            I137=21  I143=30
                HALL=3943                                                                          IENT= 264  IEXIT= 254

RECN=1481                DATE      TIME      I9=0     I15=25   I21=22   I132=0   I138=22  I144=23  IP56=0   IN56=15
                      12/06/79  22:02:20     I10=0    I16=25   I22=23   I133=0   I139=21  I145=22  IP57=36  IN57=0
  ITOT= 274     ETOT=4046     PTOT=1108     I11=23   I17=19   I23=0    I134=0   I140=16  I146=19  IP92=0   IN92=0
IINV17= 280   EINV17=1280   PINV17= 359     I12=22   I18=19   I24=0    I135=0   I141=16  I147=21  IP93=1   IN93=14
IINV19= 267   EINV19=1866   PINV19= 497     I13=25   I19=19            I136=22  I142=21
IINV21= 280   EINV21= 899   PINV21= 252     I14=23   I20=19            I137=21  I143=29
                HALL=4014                                                                          IENT= 264  IEXIT= 254

RECN=1482                DATE      TIME      I9=0     I15=25   I21=23   I132=0   I138=22  I144=23  IP56=0   IN56=3
                      12/06/79  22:02:26     I10=0    I16=25   I22=24   I133=0   I139=21  I145=22  IP57=87  IN57=0
  ITOT= 239     ETOT=4386     PTOT=1049     I11=22   I17=19   I23=0    I134=0   I140=16  I146=20  IP92=0   IN92=0
IINV17= 280   EINV17=1240   PINV17= 347     I12=21   I18=19   I24=0    I135=0   I141=16  I147=21  IP93=0   IN93=75
IINV19= 204   EINV19=2359   PINV19= 481     I13=24   I19=19            I136=21  I142=21
IINV21= 280   EINV21= 788   PINV21= 221     I14=23   I20=19            I137=21  I143=29
                HALL=4354                                                                          IENT= 264  IEXIT= 254

RECN=1483                DATE      TIME      I9=0     I15=27   I21=30   I132=0   I138=21  I144=23  IP56=0   IN56=0
                      12/06/79  22:02:48     I10=0    I16=27   I22=32   I133=0   I139=21  I145=22  IP57=100 IN57=0
  ITOT= 247     ETOT=4233     PTOT=1048     I11=23   I17=22   I23=0    I134=0   I140=16  I146=19  IP92=0   IN92=0
IINV17= 317   EINV17=1052   PINV17= 334     I12=23   I18=21   I24=0    I135=0   I141=16  I147=20  IP93=0   IN93=74
IINV19= 206   EINV19=2393   PINV19= 493     I13=26   I19=22            I136=21  I142=21
IINV21= 280   EINV21= 788   PINV21= 221     I14=25   I20=23            I137=21  I143=31
                HALL=4213                                                                          IENT= 301  IEXIT= 254
```

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

```
RECN=1484                DATE      TIME      I9=0     I15=27   I21=30   I132=0   I138=21  I144=23  IP56=0   IN56=0
                      12/06/79  22:02:56     I10=0    I16=27   I22=33   I133=0   I139=21  I145=22  IP57=100 IN57=0
  ITOT= 247     ETOT=4257      PTOT=1049     I11=23   I17=22   I23=0    I134=0   I140=16  I146=19  IP92=0   IN92=0
IINV17= 315   EINV17=1034    PINV17= 326     I12=22   I18=21   I24=0    I135=0   I141=16  I147=20  IP93=0   IN93=74
IINV19= 206   EINV19=2423    PINV19= 499     I13=25   I19=22            I136=21  I142=22
IINV21= 280   EINV21= 800    PINV21= 224     I14=24   I20=24            I137=21  I143=31
                HALL=4224                                                                         IENT= 301  IEXIT= 254

RECN=1485                DATE      TIME      I9=0     I15=27   I21=29   I132=0   I138=22  I144=23  IP56=0   IN56=0
                      12/06/79  22:03:04     I10=0    I16=27   I22=32   I133=0   I139=21  I145=22  IP57=100 IN57=0
  ITOT= 247     ETOT=4216      PTOT=1040     I11=23   I17=22   I23=0    I134=0   I140=16  I146=19  IP92=0   IN92=0
IINV17= 315   EINV17=1040    PINV17= 328     I12=23   I18=21   I24=0    I135=0   I141=16  I147=20  IP93=0   IN93=74
IINV19= 206   EINV19=2399    PINV19= 494     I13=26   I19=22            I136=21  I142=21
IINV21= 280   EINV21= 776    PINV21= 218     I14=25   I20=23            I137=21  I143=30
                HALL=4201                                                                         IENT= 300  IEXIT= 254

RECN=1486                DATE      TIME      I9=0     I15=27   I21=30   I132=0   I138=21  I144=24  IP56=0   IN56=0
                      12/06/79  22:03:21     I10=0    I16=27   I22=33   I133=0   I139=21  I145=22  IP57=100 IN57=0
  ITOT= 247     ETOT=4245      PTOT=1049     I11=23   I17=22   I23=0    I134=0   I140=16  I146=19  IP92=0   IN92=0
IINV17= 317   EINV17=1040    PINV17= 330     I12=23   I18=21   I24=0    I135=0   I141=16  I147=21  IP93=0   IN93=74
IINV19= 206   EINV19=2417    PINV19= 498     I13=25   I19=22            I136=21  I142=21
IINV21= 280   EINV21= 788    PINV21= 221     I14=24   I20=24            I137=21  I143=30
                HALL=4213                                                                         IENT= 301  IEXIT= 254

RECN=1487                DATE      TIME      I9=0     I15=27   I21=29   I132=0   I138=21  I144=23  IP56=0   IN56=1
                      12/06/79  22:03:37     I10=0    I16=27   I22=33   I133=0   I139=20  I145=22  IP57=100 IN57=0
  ITOT= 247     ETOT=4274      PTOT=1057     I11=23   I17=22   I23=0    I134=0   I140=17  I146=19  IP92=0   IN92=0
IINV17= 317   EINV17=1052    PINV17= 334     I12=23   I18=21   I24=0    I135=0   I141=17  I147=20  IP93=0   IN93=74
IINV19= 206   EINV19=2417    PINV19= 498     I13=26   I19=22            I136=21  I142=22
IINV21= 280   EINV21= 806    PINV21= 226     I14=25   I20=23            I137=21  I143=31
                HALL=4236                                                                         IENT= 301  IEXIT= 254

RECN=1488                DATE      TIME      I9=0     I15=27   I21=29   I132=0   I138=21  I144=24  IP56=0   IN56=0
                      12/06/79  22:03:54     I10=0    I16=27   I22=32   I133=0   I139=20  I145=22  IP57=100 IN57=0
  ITOT= 246     ETOT=4274      PTOT=1052     I11=23   I17=22   I23=0    I134=0   I140=16  I146=19  IP92=0   IN92=0
IINV17= 315   EINV17=1040    PINV17= 328     I12=23   I18=21   I24=0    I135=0   I141=16  I147=21  IP93=0   IN93=74
IINV19= 206   EINV19=2440    PINV19= 503     I13=26   I19=22            I136=21  I142=21
IINV21= 278   EINV21= 794    PINV21= 221     I14=25   I20=23            I137=21  I143=31
                HALL=4248                                                                         IENT= 301  IEXIT= 254

RECN=1489                DATE      TIME      I9=0     I15=27   I21=29   I132=0   I138=21  I144=24  IP56=0   IN56=0
                      12/06/79  22:04:08     I10=0    I16=27   I22=32   I133=0   I139=20  I145=21  IP57=100 IN57=0
  ITOT= 247     ETOT=4263      PTOT=1053     I11=24   I17=22   I23=0    I134=0   I140=17  I146=19  IP92=0   IN92=0
IINV17= 317   EINV17=1040    PINV17= 330     I12=23   I18=21   I24=0    I135=0   I141=17  I147=20  IP93=0   IN93=74
IINV19= 206   EINV19=2429    PINV19= 500     I13=26   I19=22            I136=21  I142=22
IINV21= 280   EINV21= 794    PINV21= 222     I14=25   I20=23            I137=21  I143=31
                HALL=4236                                                                         IENT= 301  IEXIT= 254
```

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

RECN=1490	DATE	TIME	I9=0	I15=27	I21=25	I132=0	I138=21	I144=24	IP56=0	IN56=0
	12/06/79	22:04:18	I10=0	I16=27	I22=27	I133=0	I139=20	I145=21	IP57=98	IN57=0
ITOT= 243	ETOT=4379	PTOT=1064	I11=23	I17=21	I23=0	I134=0	I140=17	I146=19	IP92=0	IN92=0
IINV17= 298	EINV17=1139	PINV17= 339	I12=23	I18=20	I24=0	I135=0	I141=17	I147=20	IP93=0	IN93=74
IINV19= 206	EINV19=2440	PINV19= 503	I13=25	I19=21		I136=21	I142=21			
IINV21= 278	EINV21= 800	PINV21= 223	I14=24	I20=21		I137=21	I143=31			
	HALL=4331								IENT= 284	IEXIT= 254
RECN=1491	DATE	TIME	I9=0	I15=25	I21=21	I132=0	I138=21	I144=25	IP56=0	IN56=1
	12/06/79	22:04:22	I10=0	I16=25	I22=22	I133=0	I139=21	I145=22	IP57=82	IN57=0
ITOT= 239	ETOT=4445	PTOT=1062	I11=22	I17=19	I23=0	I134=0	I140=15	I146=19	IP92=0	IN92=0
IINV17= 276	EINV17=1257	PINV17= 347	I12=22	I18=19	I24=0	I135=0	I141=16	I147=21	IP93=0	IN93=74
IINV19= 206	EINV19=2411	PINV19= 497	I13=24	I19=19		I136=21	I142=21			
IINV21= 280	EINV21= 776	PINV21= 218	I14=23	I20=19		I137=21	I143=30			
	HALL=4412								IENT= 261	IEXIT= 254
RECN=1492	DATE	TIME	I9=0	I15=25	I21=20	I132=0	I138=21	I144=24	IP56=0	IN56=5
	12/06/79	22:04:50	I10=0	I16=24	I22=19	I133=0	I139=20	I145=22	IP57=73	IN57=0
ITOT= 236	ETOT=4480	PTOT=1058	I11=22	I17=18	I23=0	I134=0	I140=16	I146=19	IP92=0	IN92=0
IINV17= 265	EINV17=1310	PINV17= 347	I12=21	I18=18	I24=0	I135=0	I141=16	I147=21	IP93=0	IN93=74
IINV19= 206	EINV19=2388	PINV19= 492	I13=24	I19=18		I136=21	I142=20			
IINV21= 280	EINV21= 782	PINV21= 219	I14=23	I20=18		I137=21	I143=31			
	HALL=4447								IENT= 249	IEXIT= 254
RECN=1493	DATE	TIME	I9=0	I15=27	I21=29	I132=0	I138=19	I144=17	IP56=0	IN56=0
	12/06/79	22:05:09	I10=0	I16=27	I22=32	I133=0	I139=17	I145=17	IP57=80	IN57=0
ITOT= 256	ETOT=4409	PTOT=1130	I11=23	I17=22	I23=0	I134=0	I140=13	I146=15	IP92=0	IN92=0
IINV17= 312	EINV17=1069	PINV17= 333	I12=22	I18=20	I24=0	I135=0	I141=14	I147=17	IP93=5	IN93=5
IINV19= 239	EINV19=2077	PINV19= 497	I13=25	I19=22		I136=18	I142=18			
IINV21= 237	EINV21=1263	PINV21= 300	I14=24	I20=23		I137=18	I143=27			
	HALL=4366								IENT= 296	IEXIT= 210
RECN=1494	DATE	TIME	I9=0	I15=27	I21=29	I132=0	I138=16	I144=13	IP56=0	IN56=0
	12/06/79	22:05:27	I10=0	I16=27	I22=32	I133=0	I139=14	I145=12	IP57=80	IN57=0
ITOT= 245	ETOT=4579	PTOT=1122	I11=23	I17=22	I23=0	I134=0	I140=12	I146=12	IP92=0	IN92=0
IINV17= 312	EINV17=1058	PINV17= 330	I12=22	I18=20	I24=0	I135=0	I141=12	I147=14	IP93=31	IN93=0
IINV19= 239	EINV19=2007	PINV19= 480	I13=25	I19=22		I136=15	I142=16			
IINV21= 206	EINV21=1514	PINV21= 312	I14=24	I20=23		I137=16	I143=25			
	HALL=4529								IENT= 296	IEXIT= 178
RECN=1495	DATE	TIME	I9=0	I15=27	I21=28	I132=0	I138=16	I144=12	IP56=0	IN56=0
	12/06/79	22:05:32	I10=0	I16=27	I22=31	I133=0	I139=15	I145=12	IP57=80	IN57=0
ITOT= 244	ETOT=4661	PTOT=1138	I11=23	I17=22	I23=0	I134=0	I140=11	I146=12	IP92=0	IN92=0
IINV17= 312	EINV17=1081	PINV17= 337	I12=23	I18=21	I24=0	I135=0	I141=11	I147=14	IP93=32	IN93=0
IINV19= 239	EINV19=2018	PINV19= 483	I13=25	I19=22		I136=16	I142=16			
IINV21= 204	EINV21=1561	PINV21= 318	I14=25	I20=23		I137=16	I143=25			
	HALL=4576								IENT= 296	IEXIT= 176

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

```
RECN=1496                DATE      TIME      I9=0     I15=27   I21=30   I132=0   I138=17  I144=13  IP56=0   IN56=0
                      12/06/79  22:05:59     I10=0    I16=27   I22=34   I133=0   I139=16  I145=12  IP57=82  IN57=0
  ITOT= 250     ETOT=4579      PTOT=1145     I11=23   I17=22   I23=0    I134=0   I140=11  I146=13  IP92=0   IN92=0
IINV17= 319   EINV17=1034    PINV17= 330     I12=23   I18=21   I24=0    I135=0   I141=11  I147=14  IP93=33  IN93=0
IINV19= 245   EINV19=1995    PINV19= 489     I13=26   I19=23            I136=16  I142=16
IINV21= 210   EINV21=1550    PINV21= 325     I14=25   I20=24            I137=16  I143=25
                HALL=4506                                                                          IENT= 305  IEXIT= 182

RECN=1497                DATE      TIME      I9=0     I15=28   I21=29   I132=0   I138=17  I144=14  IP56=0   IN56=0
                      12/06/79  22:06:16     I10=0    I16=28   I22=33   I133=0   I139=16  I145=13  IP57=82  IN57=0
  ITOT= 250     ETOT=4538      PTOT=1136     I11=24   I17=22   I23=0    I134=0   I140=12  I146=13  IP92=0   IN92=0
IINV17= 319   EINV17=1034    PINV17= 330     I12=23   I18=21   I24=0    I135=0   I141=11  I147=14  IP93=33  IN93=0
IINV19= 245   EINV19=1978    PINV19= 485     I13=26   I19=22            I136=16  I142=16
IINV21= 210   EINV21=1526    PINV21= 321     I14=25   I20=24            I137=16  I143=24
                HALL=4494                                                                          IENT= 305  IEXIT= 182

RECN=1498                DATE      TIME      I9=0     I15=27   I21=30   I132=0   I138=17  I144=13  IP56=0   IN56=0
                      12/06/79  22:06:36     I10=0    I16=27   I22=33   I133=0   I139=16  I145=12  IP57=82  IN57=0
  ITOT= 250     ETOT=4567      PTOT=1142     I11=23   I17=22   I23=0    I134=0   I140=12  I146=13  IP92=0   IN92=0
IINV17= 319   EINV17=1034    PINV17= 330     I12=23   I18=21   I24=0    I135=0   I141=12  I147=14  IP93=33  IN93=0
IINV19= 245   EINV19=1995    PINV19= 489     I13=26   I19=23            I136=16  I142=17
IINV21= 210   EINV21=1538    PINV21= 323     I14=25   I20=24            I137=16  I143=24
                HALL=4506                                                                          IENT= 305  IEXIT= 182

RECN=1499                DATE      TIME      I9=0     I15=27   I21=30   I132=0   I138=17  I144=13  IP56=0   IN56=0
                      12/06/79  22:06:40     I10=0    I16=27   I22=34   I133=0   I139=16  I145=12  IP57=81  IN57=0
  ITOT= 250     ETOT=4550      PTOT=1136     I11=23   I17=22   I23=0    I134=0   I140=11  I146=13  IP92=0   IN92=0
IINV17= 319   EINV17=1010    PINV17= 323     I12=22   I18=21   I24=0    I135=0   I141=11  I147=14  IP93=33  IN93=0
IINV19= 245   EINV19=1990    PINV19= 488     I13=25   I19=23            I136=16  I142=17
IINV21= 210   EINV21=1550    PINV21= 325     I14=24   I20=24            I137=16  I143=24
                HALL=4482                                                                          IENT= 304  IEXIT= 182

RECN=1500                DATE      TIME      I9=0     I15=28   I21=29   I132=0   I138=17  I144=13  IP56=0   IN56=0
                      12/06/79  22:06:59     I10=0    I16=28   I22=33   I133=0   I139=15  I145=13  IP57=82  IN57=0
  ITOT= 250     ETOT=4526      PTOT=1133     I11=24   I17=22   I23=0    I134=0   I140=12  I146=13  IP92=0   IN92=0
IINV17= 319   EINV17=1034    PINV17= 330     I12=23   I18=21   I24=0    I135=0   I141=12  I147=14  IP93=33  IN93=0
IINV19= 245   EINV19=1972    PINV19= 483     I13=26   I19=22            I136=16  I142=17
IINV21= 210   EINV21=1520    PINV21= 319     I14=25   I20=24            I137=16  I143=24
                HALL=4494                                                                          IENT= 305  IEXIT= 182

RECN=1501                DATE      TIME      I9=0     I15=30   I21=38   I132=0   I138=19  I144=17  IP56=0   IN56=0
                      12/06/79  22:07:08     I10=0    I16=30   I22=43   I133=0   I139=18  I145=16  IP57=89  IN57=0
  ITOT= 283     ETOT=4034      PTOT=1142     I11=25   I17=26   I23=0    I134=0   I140=15  I146=15  IP92=0   IN92=0
IINV17= 366   EINV17= 806    PINV17= 295     I12=25   I18=24   I24=0    I135=0   I141=15  I147=16  IP93=38  IN93=0
IINV19= 280   EINV19=1831    PINV19= 513     I13=28   I19=27            I136=18  I142=19
IINV21= 239   EINV21=1397    PINV21= 334     I14=27   I20=29            I137=18  I143=27
                HALL=4002                                                                          IENT= 351  IEXIT= 213
```

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

RECN=1502	DATE	TIME	I9=0	I15=29	I21=38	I132=0	I138=19	I144=16	IP56=0	IN56=0	
	12/06/79	22:07:17	I10=0	I16=30	I22=43	I133=0	I139=19	I145=15	IP57=51	IN57=0	
ITOT= 300	ETOT=3753	PTOT=1127	I11=25	I17=27	I23=0	I134=0	I140=14	I146=15	IP92=0	IN92=0	
IINV17= 366	EINV17= 806	PINV17= 295	I12=24	I18=24	I24=0	I135=0	I141=15	I147=16	IP93=82	IN93=0	
IINV19= 325	EINV19=1444	PINV19= 470	I13=27	I19=27		I136=18	I142=20				
IINV21= 241	EINV21=1503	PINV21= 363	I14=27	I20=29		I137=19	I143=28				
	HALL=3744								IENT= 351	IEXIT= 214	
RECN=1503	DATE	TIME	I9=0	I15=30	I21=36	I132=0	I138=30	I144=35	IP56=0	IN56=10	
	12/06/79	22:07:47	I10=0	I16=31	I22=40	I133=0	I139=30	I145=31	IP57=12	IN57=0	
ITOT= 372	ETOT=2335	PTOT= 868	I11=27	I17=26	I23=0	I134=0	I140=23	I146=27	IP92=0	IN92=0	
IINV17= 366	EINV17= 870	PINV17= 319	I12=26	I18=24	I24=0	I135=0	I141=25	I147=29	IP93=3	IN93=9	
IINV19= 374	EINV19=1204	PINV19= 450	I13=28	I19=26		I136=29	I142=29				
IINV21= 380	EINV21= 260	PINV21= 99	I14=28	I20=28		I137=29	I143=40				
	HALL=2372								IENT= 351	IEXIT= 357	
RECN=1504	DATE	TIME	I9=0	I15=31	I21=38	I132=0	I138=30	I144=35	IP56=0	IN56=7	
	12/06/79	22:07:57	I10=0	I16=31	I22=42	I133=0	I139=30	I145=30	IP57=18	IN57=0	
ITOT= 375	ETOT=2293	PTOT= 860	I11=27	I17=27	I23=0	I134=0	I140=23	I146=27	IP92=0	IN92=0	
IINV17= 376	EINV17= 823	PINV17= 310	I12=26	I18=25	I24=0	I135=0	I141=25	I147=29	IP93=3	IN93=9	
IINV19= 374	EINV19=1210	PINV19= 452	I13=29	I19=27		I136=29	I142=29				
IINV21= 378	EINV21= 260	PINV21= 98	I14=28	I20=29		I137=29	I143=41				
	HALL=2338								IENT= 360	IEXIT= 357	
RECN=1505	DATE	TIME	I9=0	I15=31	I21=40	I132=0	I138=31	I144=35	IP56=0	IN56=6	
	12/06/79	22:08:27	I10=0	I16=32	I22=45	I133=0	I139=32	I145=32	IP57=18	IN57=0	
ITOT= 388	ETOT=2107	PTOT= 817	I11=27	I17=28	I23=0	I134=0	I140=25	I146=28	IP92=0	IN92=0	
IINV17= 388	EINV17= 764	PINV17= 296	I12=27	I18=25	I24=0	I135=0	I141=26	I147=30	IP93=3	IN93=10	
IINV19= 388	EINV19=1157	PINV19= 449	I13=29	I19=28		I136=30	I142=30				
IINV21= 392	EINV21= 185	PINV21= 72	I14=29	I20=31		I137=30	I143=42				
	HALL=2150								IENT= 373	IEXIT= 371	
RECN=1506	DATE	TIME	I9=19	I15=25	I21=28	I132=19	I138=26	I144=20	IP56=5	IN56=0	
	12/06/79	22:08:51	I10=19	I16=25	I22=30	I133=18	I139=26	I145=20	IP57=0	IN57=0	
ITOT= 387	ETOT=2071	PTOT= 801	I11=16	I17=22	I23=28	I134=18	I140=20	I146=21	IP92=0	IN92=0	
IINV17= 388	EINV17= 730	PINV17= 283	I12=17	I18=20	I24=30	I135=18	I141=21	I147=23	IP93=3	IN93=10	
IINV19= 386	EINV19=1151	PINV19= 444	I13=22	I19=22		I136=24	I142=26				
IINV21= 392	EINV21= 190	PINV21= 74	I14=21	I20=23		I137=25	I143=38				
	HALL=2104								IENT= 367	IEXIT= 363	
RECN=1507	DATE	TIME	I9=19	I15=25	I21=28	I132=19	I138=26	I144=20	IP56=5	IN56=0	
	12/06/79	22:09:07	I10=19	I16=26	I22=29	I133=18	I139=26	I145=20	IP57=0	IN57=0	
ITOT= 388	ETOT=2071	PTOT= 803	I11=17	I17=21	I23=27	I134=18	I140=20	I146=21	IP92=0	IN92=0	
IINV17= 388	EINV17= 741	PINV17= 287	I12=18	I18=20	I24=29	I135=18	I141=21	I147=23	IP93=3	IN93=10	
IINV19= 388	EINV19=1139	PINV19= 442	I13=22	I19=22		I136=24	I142=25				
IINV21= 392	EINV21= 190	PINV21= 74	I14=22	I20=23		I137=25	I143=38				
	HALL=2116								IENT= 367	IEXIT= 362	

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

RECN=1508	DATE	TIME	I9=19	I15=25	I21=28	I132=19	I138=26	I144=20	IP56=5	IN56=0		
	12/06/79	22:09:17	I10=19	I16=26	I22=29	I133=18	I139=26	I145=20	IP57=0	IN57=0		
ITOT= 387	ETOT=2042	PTOT= 790	I11=17	I17=21	I23=27	I134=18	I140=20	I146=21	IP92=0	IN92=0		
IINV17= 388	EINV17= 724	PINV17= 280	I12=18	I18=20	I24=29	I135=18	I141=21	I147=23	IP93=3	IN93=10		
IINV19= 386	EINV19=1134	PINV19= 437	I13=22	I19=22		I136=24	I142=25					
IINV21= 392	EINV21= 185	PINV21= 72	I14=22	I20=23		I137=25	I143=37					
	HALL=2081								IENT= 367	IEXIT= 362		
RECN=1509	DATE	TIME	I9=19	I15=25	I21=28	I132=20	I138=26	I144=20	IP56=5	IN56=0		
	12/06/79	22:09:48	I10=19	I16=26	I22=30	I133=18	I139=26	I145=20	IP57=0	IN57=0		
ITOT= 387	ETOT=2024	PTOT= 783	I11=17	I17=21	I23=28	I134=18	I140=20	I146=21	IP92=0	IN92=0		
IINV17= 388	EINV17= 730	PINV17= 283	I12=18	I18=20	I24=30	I135=18	I141=22	I147=23	IP93=3	IN93=10		
IINV19= 386	EINV19=1122	PINV19= 433	I13=22	I19=22		I136=24	I142=25					
IINV21= 392	EINV21= 173	PINV21= 68	I14=22	I20=23		I137=25	I143=38					
	HALL=2057								IENT= 367	IEXIT= 363		
RECN=1510	DATE	TIME	I9=19	I15=25	I21=28	I132=19	I138=26	I144=20	IP56=5	IN56=0		
	12/06/79	22:09:57	I10=19	I16=26	I22=29	I133=18	I139=26	I145=20	IP57=0	IN57=0		
ITOT= 387	ETOT=2083	PTOT= 805	I11=17	I17=21	I23=27	I134=18	I140=20	I146=20	IP92=0	IN92=0		
IINV17= 388	EINV17= 736	PINV17= 285	I12=18	I18=20	I24=29	I135=18	I141=21	I147=23	IP93=5	IN93=7		
IINV19= 386	EINV19=1128	PINV19= 435	I13=22	I19=22		I136=24	I142=25					
IINV21= 388	EINV21= 220	PINV21= 85	I14=22	I20=23		I137=25	I143=37					
	HALL=2128								IENT= 368	IEXIT= 358		
RECN=1511	DATE	TIME	I9=19	I15=25	I21=28	I132=18	I138=25	I144=19	IP56=5	IN56=0		
	12/06/79	22:10:28	I10=19	I16=26	I22=30	I133=17	I139=25	I145=19	IP57=0	IN57=0		
ITOT= 386	ETOT=2112	PTOT= 815	I11=16	I17=21	I23=28	I134=17	I140=19	I146=20	IP92=0	IN92=0		
IINV17= 388	EINV17= 724	PINV17= 280	I12=18	I18=20	I24=30	I135=17	I141=23	I147=22	IP93=7	IN93=4		
IINV19= 386	EINV19=1116	PINV19= 431	I13=22	I19=22		I136=24	I142=27					
IINV21= 382	EINV21= 272	PINV21= 104	I14=22	I20=23		I137=24	I143=37					
	HALL=2138								IENT= 367	IEXIT= 353		
RECN=1512	DATE	TIME	I9=17	I15=24	I21=31	I132=20	I138=25	I144=19	IP56=5	IN56=0		
	12/06/79	22:17:08	I10=17	I16=25	I22=34	I133=19	I139=25	I145=19	IP57=0	IN57=0		
ITOT= 400	ETOT=1432	PTOT= 573	I11=15	I17=22	I23=35	I134=18	I140=21	I146=19	IP92=0	IN92=0		
IINV17= 401	EINV17= 524	PINV17= 210	I12=16	I18=20	I24=37	I135=17	I141=25	I147=22	IP93=6	IN93=4		
IINV19= 399	EINV19= 817	PINV19= 326	I13=20	I19=23		I136=24	I142=29					
IINV21= 397	EINV21= 91	PINV21= 36	I14=20	I20=25		I137=24	I143=42					
	HALL=1459								IENT= 382	IEXIT= 368		
RECN=1513	DATE	TIME	I9=17	I15=24	I21=31	I132=20	I138=25	I144=19	IP56=5	IN56=0		
	12/06/79	22:17:14	I10=16	I16=25	I22=35	I133=19	I139=25	I145=19	IP57=0	IN57=0		
ITOT= 401	ETOT=1409	PTOT= 565	I11=14	I17=22	I23=35	I134=18	I140=20	I146=19	IP92=0	IN92=0		
IINV17= 401	EINV17= 513	PINV17= 206	I12=16	I18=20	I24=38	I135=17	I141=26	I147=22	IP93=6	IN93=4		
IINV19= 401	EINV19= 811	PINV19= 326	I13=20	I19=23		I136=24	I142=29					
IINV21= 397	EINV21= 85	PINV21= 34	I14=20	I20=25		I137=24	I143=42					
	HALL=1447								IENT= 382	IEXIT= 368		

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RECN=1514                DATE      TIME     I9=17    I15=23   I21=32   I132=21  I138=25  I144=19  IP56=5   IN56=0
                      12/06/79  22:17:58    I10=16   I16=25   I22=34   I133=19  I139=25  I145=19  IP57=0   IN57=0
  ITOT= 400     ETOT=1304     PTOT= 522    I11=14   I17=22   I23=36   I134=19  I140=19  I146=19  IP92=0   IN92=0
IINV17= 401   EINV17= 484   PINV17= 194    I12=16   I18=20   I24=38   I135=18  I141=26  I147=21  IP93=6   IN93=4
IINV19= 399   EINV19= 759   PINV19= 303    I13=20   I19=23            I136=23  I142=29
IINV21= 397   EINV21=  61   PINV21=  24    I14=20   I20=25            I137=24  I143=42
                HALL=1319                                                                          IENT= 382  IEXIT= 368

RECN=1515                DATE      TIME     I9=17    I15=23   I21=32   I132=21  I138=25  I144=19  IP56=5   IN56=0
                      12/06/79  22:18:13    I10=16   I16=25   I22=35   I133=19  I139=25  I145=19  IP57=0   IN57=0
  ITOT= 400     ETOT=1269     PTOT= 508    I11=14   I17=22   I23=36   I134=19  I140=20  I146=19  IP92=0   IN92=0
IINV17= 401   EINV17= 478   PINV17= 192    I12=16   I18=20   I24=38   I135=18  I141=25  I147=21  IP93=6   IN93=4
IINV19= 399   EINV19= 736   PINV19= 294    I13=20   I19=23            I136=24  I142=29
IINV21= 395   EINV21=  56   PINV21=  22    I14=20   I20=25            I137=24  I143=42
                HALL=1271                                                                          IENT= 382  IEXIT= 368

RECN=1516                DATE      TIME     I9=16    I15=23   I21=32   I132=21  I138=25  I144=19  IP56=5   IN56=0
                      12/06/79  22:18:35    I10=16   I16=24   I22=35   I133=19  I139=25  I145=19  IP57=0   IN57=0
  ITOT= 400     ETOT=1234     PTOT= 493    I11=14   I17=22   I23=36   I134=19  I140=20  I146=19  IP92=0   IN92=0
IINV17= 401   EINV17= 454   PINV17= 182    I12=16   I18=20   I24=39   I135=17  I141=25  I147=21  IP93=5   IN93=3
IINV19= 399   EINV19= 712   PINV19= 284    I13=20   I19=23            I136=24  I142=28
IINV21= 395   EINV21=  67   PINV21=  27    I14=19   I20=25            I137=24  I143=42
                HALL=1224                                                                          IENT= 381  IEXIT= 367

RECN=1517                DATE      TIME     I9=16    I15=23   I21=32   I132=21  I138=25  I144=19  IP56=5   IN56=0
                      12/06/79  22:18:53    I10=16   I16=24   I22=35   I133=19  I139=25  I145=19  IP57=0   IN57=0
  ITOT= 400     ETOT=1222     PTOT= 488    I11=13   I17=22   I23=37   I134=19  I140=20  I146=19  IP92=0   IN92=0
IINV17= 401   EINV17= 442   PINV17= 177    I12=15   I18=19   I24=40   I135=18  I141=25  I147=21  IP93=5   IN93=4
IINV19= 399   EINV19= 700   PINV19= 280    I13=19   I19=23            I136=23  I142=29
IINV21= 395   EINV21=  79   PINV21=  31    I14=19   I20=25            I137=24  I143=42
                HALL=1177                                                                          IENT= 381  IEXIT= 368

RECN=1518                DATE      TIME     I9=16    I15=23   I21=32   I132=21  I138=25  I144=19  IP56=5   IN56=0
                      12/06/79  22:19:04    I10=15   I16=24   I22=35   I133=19  I139=25  I145=18  IP57=0   IN57=0
  ITOT= 400     ETOT=1227     PTOT= 491    I11=13   I17=22   I23=37   I134=19  I140=20  I146=19  IP92=0   IN92=0
IINV17= 401   EINV17= 436   PINV17= 175    I12=15   I18=19   I24=41   I135=17  I141=25  I147=21  IP93=6   IN93=4
IINV19= 399   EINV19= 694   PINV19= 277    I13=19   I19=23            I136=24  I142=29
IINV21= 395   EINV21=  97   PINV21=  38    I14=19   I20=25            I137=24  I143=42
                HALL=1154                                                                          IENT= 381  IEXIT= 368

RECN=1519                DATE      TIME     I9=16    I15=23   I21=32   I132=22  I138=25  I144=19  IP56=5   IN56=0
                      12/06/79  22:19:13    I10=16   I16=25   I22=35   I133=19  I139=25  I145=19  IP57=0   IN57=0
  ITOT= 400     ETOT=1239     PTOT= 496    I11=14   I17=22   I23=36   I134=19  I140=19  I146=19  IP92=0   IN92=0
IINV17= 403   EINV17= 448   PINV17= 181    I12=16   I18=20   I24=39   I135=18  I141=25  I147=21  IP93=6   IN93=4
IINV19= 399   EINV19= 694   PINV19= 277    I13=20   I19=23            I136=24  I142=29
IINV21= 395   EINV21=  97   PINV21=  38    I14=19   I20=25            I137=24  I143=42
                HALL=1166                                                                          IENT= 381  IEXIT= 367
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RECN=1520	DATE	TIME	I9=15	I15=22	I21=33	I132=22	I138=25	I144=19	IP56=5	IN56=0	
	12/06/79	22:19:34	I10=15	I16=24	I22=36	I133=20	I139=25	I145=19	IP57=0	IN57=0	
ITOT= 400	ETOT=1192	PTOT= 476	I11=13	I17=22	I23=38	I134=19	I140=19	I146=19	IP92=0	IN92=0	
IINV17= 401	EINV17= 395	PINV17= 159	I12=15	I18=19	I24=42	I135=17	I141=26	I147=21	IP93=6	IN93=4	
IINV19= 399	EINV19= 635	PINV19= 254	I13=19	I19=23		I136=23	I142=30				
IINV21= 395	EINV21= 161	PINV21= 64	I14=18	I20=25		I137=24	I143=42				
	HALL=1002								IENT= 380	IEXIT= 367	
RECN=1521	DATE	TIME	I9=18	I15=25	I21=31	I132=22	I138=24	I144=19	IP56=5	IN56=0	
	12/06/79	22:19:57	I10=17	I16=26	I22=33	I133=20	I139=24	I145=19	IP57=0	IN57=0	
ITOT= 400	ETOT=1386	PTOT= 554	I11=15	I17=23	I23=32	I134=19	I140=19	I146=18	IP92=0	IN92=0	
IINV17= 401	EINV17= 530	PINV17= 213	I12=17	I18=21	I24=34	I135=18	I141=26	I147=21	IP93=6	IN93=4	
IINV19= 399	EINV19= 724	PINV19= 289	I13=21	I19=23		I136=23	I142=30				
IINV21= 395	EINV21= 132	PINV21= 52	I14=21	I20=25		I137=23	I143=42				
	HALL=1248								IENT= 382	IEXIT= 367	
RECN=1522	DATE	TIME	I9=17	I15=24	I21=31	I132=22	I138=24	I144=19	IP56=6	IN56=0	
	12/06/79	22:20:05	I10=17	I16=26	I22=33	I133=20	I139=24	I145=19	IP57=0	IN57=0	
ITOT= 400	ETOT=1333	PTOT= 533	I11=15	I17=23	I23=33	I134=19	I140=19	I146=18	IP92=0	IN92=0	
IINV17= 401	EINV17= 501	PINV17= 201	I12=17	I18=20	I24=35	I135=18	I141=26	I147=21	IP93=7	IN93=3	
IINV19= 399	EINV19= 683	PINV19= 273	I13=21	I19=23		I136=23	I142=30				
IINV21= 394	EINV21= 149	PINV21= 59	I14=21	I20=25		I137=23	I143=42				
	HALL=1154								IENT= 382	IEXIT= 366	
RECN=1523	DATE	TIME	I9=18	I15=25	I21=30	I132=20	I138=24	I144=19	IP56=5	IN56=0	
	12/06/79	22:20:35	I10=18	I16=26	I22=32	I133=19	I139=24	I145=19	IP57=0	IN57=0	
ITOT= 401	ETOT=1520	PTOT= 609	I11=16	I17=23	I23=30	I134=19	I140=19	I146=19	IP92=0	IN92=0	
IINV17= 403	EINV17= 607	PINV17= 245	I12=18	I18=21	I24=32	I135=18	I141=27	I147=21	IP93=6	IN93=4	
IINV19= 399	EINV19= 841	PINV19= 336	I13=22	I19=23		I136=23	I142=31				
IINV21= 395	EINV21= 73	PINV21= 29	I14=22	I20=25		I137=24	I143=42				
	HALL=1541								IENT= 383	IEXIT= 368	
RECN=1524	DATE	TIME	I9=17	I15=24	I21=31	I132=23	I138=24	I144=19	IP56=6	IN56=0	
	12/06/79	22:25:30	I10=17	I16=25	I22=33	I133=20	I139=24	I145=18	IP57=0	IN57=0	
ITOT= 398	ETOT=1198	PTOT= 477	I11=14	I17=23	I23=34	I134=19	I140=19	I146=18	IP92=0	IN92=0	
IINV17= 401	EINV17= 448	PINV17= 180	I12=17	I18=21	I24=37	I135=17	I141=24	I147=20	IP93=11	IN93=1	
IINV19= 399	EINV19= 565	PINV19= 226	I13=21	I19=23		I136=22	I142=28				
IINV21= 388	EINV21= 185	PINV21= 72	I14=20	I20=25		I137=23	I143=41				
	HALL= 979								IENT= 381	IEXIT= 358	
RECN=1525	DATE	TIME	I9=16	I15=24	I21=31	I132=24	I138=23	I144=18	IP56=6	IN56=0	
	12/06/79	22:25:51	I10=16	I16=25	I22=34	I133=19	I139=23	I145=18	IP57=0	IN57=0	
ITOT= 397	ETOT=1076	PTOT= 427	I11=14	I17=23	I23=35	I134=18	I140=19	I146=17	IP92=0	IN92=0	
IINV17= 401	EINV17= 401	PINV17= 161	I12=16	I18=20	I24=39	I135=17	I141=23	I147=20	IP93=16	IN93=0	
IINV19= 399	EINV19= 490	PINV19= 196	I13=20	I19=23		I136=22	I142=27				
IINV21= 380	EINV21= 185	PINV21= 70	I14=20	I20=25		I137=23	I143=40				
	HALL= 862								IENT= 381	IEXIT= 351	

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RECN=1526		DATE	TIME	I9=16	I15=24	I21=31	I132=23	I138=24	I144=18	IP56=6	IN56=0	
		12/06/79	22:26:01	I10=16	I16=25	I22=34	I133=19	I139=23	I145=18	IP57=0	IN57=0	
ITOT= 396	ETOT=1099	PTOT= 436		I11=14	I17=22	I23=35	I134=18	I140=19	I146=18	IP92=0	IN92=0	
IINV17= 401	EINV17= 401	PINV17= 161		I12=16	I18=20	I24=39	I135=17	I141=23	I147=20	IP93=14	IN93=0	
IINV19= 397	EINV19= 513	PINV19= 204		I13=20	I19=23		I136=22	I142=27				
IINV21= 382	EINV21= 185	PINV21= 71		I14=20	I20=25		I137=23	I143=41				
	HALL= 872									IENT= 381	IEXIT= 353	
RECN=1527		DATE	TIME	I9=16	I15=24	I21=31	I132=23	I138=24	I144=19	IP56=6	IN56=0	
		12/06/79	22:26:15	I10=16	I16=25	I22=34	I133=20	I139=23	I145=18	IP57=0	IN57=0	
ITOT= 398	ETOT=1145	PTOT= 456		I11=14	I17=23	I23=35	I134=19	I140=18	I146=18	IP92=0	IN92=0	
IINV17= 401	EINV17= 425	PINV17= 171		I12=16	I18=21	I24=38	I135=17	I141=24	I147=20	IP93=13	IN93=1	
IINV19= 399	EINV19= 542	PINV19= 216		I13=20	I19=24		I136=22	I142=28				
IINV21= 384	EINV21= 179	PINV21= 69		I14=20	I20=25		I137=23	I143=41				
	HALL= 931									IENT= 381	IEXIT= 355	
RECN=1528		DATE	TIME	I9=16	I15=23	I21=32	I132=23	I138=23	I144=18	IP56=6	IN56=0	
		12/06/79	22:26:44	I10=16	I16=25	I22=34	I133=19	I139=22	I145=18	IP57=0	IN57=0	
ITOT= 396	ETOT=1087	PTOT= 431		I11=13	I17=23	I23=36	I134=18	I140=20	I146=18	IP92=0	IN92=0	
IINV17= 401	EINV17= 401	PINV17= 161		I12=15	I18=20	I24=39	I135=17	I141=24	I147=20	IP93=15	IN93=0	
IINV19= 397	EINV19= 513	PINV19= 204		I13=20	I19=24		I136=22	I142=28				
IINV21= 382	EINV21= 173	PINV21= 66		I14=20	I20=25		I137=23	I143=40				
	HALL= 872									IENT= 381	IEXIT= 353	
RECN=1529		DATE	TIME	I9=16	I15=24	I21=31	I132=23	I138=23	I144=18	IP56=6	IN56=0	
		12/06/79	22:26:51	I10=16	I16=25	I22=34	I133=20	I139=23	I145=18	IP57=0	IN57=0	
ITOT= 396	ETOT=1122	PTOT= 445		I11=14	I17=23	I23=35	I134=19	I140=20	I146=18	IP92=0	IN92=0	
IINV17= 401	EINV17= 419	PINV17= 168		I12=16	I18=20	I24=38	I135=17	I141=23	I147=20	IP93=14	IN93=0	
IINV19= 397	EINV19= 518	PINV19= 206		I13=20	I19=23		I136=21	I142=28				
IINV21= 382	EINV21= 185	PINV21= 71		I14=20	I20=25		I137=23	I143=40				
	HALL= 896									IENT= 381	IEXIT= 353	
RECN=1530		DATE	TIME	I9=16	I15=23	I21=31	I132=24	I138=23	I144=18	IP56=6	IN56=0	
		12/06/79	22:27:11	I10=16	I16=25	I22=34	I133=19	I139=22	I145=18	IP57=0	IN57=0	
ITOT= 396	ETOT=1046	PTOT= 414		I11=13	I17=23	I23=36	I134=18	I140=20	I146=18	IP92=0	IN92=0	
IINV17= 401	EINV17= 389	PINV17= 156		I12=16	I18=20	I24=39	I135=17	I141=23	I147=19	IP93=17	IN93=0	
IINV19= 397	EINV19= 472	PINV19= 187		I13=20	I19=24		I136=21	I142=27				
IINV21= 380	EINV21= 185	PINV21= 70		I14=20	I20=25		I137=22	I143=40				
	HALL= 826									IENT= 381	IEXIT= 349	
RECN=1531		DATE	TIME	I9=16	I15=23	I21=31	I132=24	I138=23	I144=18	IP56=6	IN56=0	
		12/06/79	22:27:49	I10=16	I16=25	I22=34	I133=19	I139=23	I145=17	IP57=0	IN57=0	
ITOT= 395	ETOT=1023	PTOT= 404		I11=13	I17=23	I23=35	I134=18	I140=20	I146=18	IP92=0	IN92=0	
IINV17= 401	EINV17= 384	PINV17= 154		I12=16	I18=20	I24=39	I135=17	I141=22	I147=19	IP93=18	IN93=0	
IINV19= 397	EINV19= 454	PINV19= 180		I13=20	I19=24		I136=21	I142=27				
IINV21= 378	EINV21= 185	PINV21= 70		I14=20	I20=25		I137=22	I143=40				
	HALL= 803									IENT= 381	IEXIT= 348	

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

RECN=1532		DATE	TIME	I9=16	I15=23	I21=32	I132=24	I138=23	I144=18	IP56=6	IN56=0	
		12/06/79	22:28:00	I10=16	I16=24	I22=35	I133=19	I139=22	I145=17	IP57=0	IN57=0	
ITOT= 394	ETOT= 952	PTOT= 375		I11=13	I17=22	I23=36	I134=18	I140=20	I146=17	IP92=0	IN92=0	
IINV17= 401	EINV17= 349	PINV17= 140		I12=15	I18=20	I24=40	I135=16	I141=22	I147=19	IP93=21	IN93=0	
IINV19= 397	EINV19= 407	PINV19= 162		I13=20	I19=23		I136=21	I142=27				
IINV21= 374	EINV21= 196	PINV21= 73		I14=19	I20=25		I137=22	I143=40				
	HALL= 721									IENT= 380	IEXIT= 346	
RECN=1533		DATE	TIME	I9=16	I15=23	I21=31	I132=25	I138=23	I144=18	IP56=6	IN56=0	
		12/06/79	22:28:18	I10=16	I16=25	I22=34	I133=19	I139=22	I145=18	IP57=0	IN57=0	
ITOT= 396	ETOT=1064	PTOT= 421		I11=13	I17=23	I23=36	I134=18	I140=20	I146=18	IP92=0	IN92=0	
IINV17= 401	EINV17= 389	PINV17= 156		I12=16	I18=20	I24=39	I135=17	I141=23	I147=20	IP93=16	IN93=0	
IINV19= 397	EINV19= 490	PINV19= 195		I13=20	I19=24		I136=21	I142=28				
IINV21= 382	EINV21= 185	PINV21= 71		I14=20	I20=25		I137=22	I143=40				
	HALL= 850									IENT= 380	IEXIT= 351	
RECN=1534		DATE	TIME	I9=16	I15=23	I21=32	I132=25	I138=23	I144=18	IP56=6	IN56=0	
		12/06/79	22:28:38	I10=16	I16=24	I22=34	I133=19	I139=22	I145=18	IP57=0	IN57=0	
ITOT= 396	ETOT=1069	PTOT= 423		I11=13	I17=22	I23=36	I134=18	I140=20	I146=18	IP92=0	IN92=0	
IINV17= 401	EINV17= 389	PINV17= 156		I12=15	I18=20	I24=40	I135=17	I141=23	I147=20	IP93=16	IN93=0	
IINV19= 397	EINV19= 495	PINV19= 197		I13=20	I19=23		I136=21	I142=28				
IINV21= 380	EINV21= 185	PINV21= 70		I14=19	I20=25		I137=22	I143=40				
	HALL= 838									IENT= 380	IEXIT= 351	
RECN=1535		DATE	TIME	I9=18	I15=24	I21=30	I132=27	I138=23	I144=18	IP56=6	IN56=0	
		12/06/79	22:28:43	I10=17	I16=25	I22=33	I133=19	I139=22	I145=18	IP57=0	IN57=0	
ITOT= 398	ETOT=1134	PTOT= 451		I11=15	I17=22	I23=33	I134=18	I140=20	I146=18	IP92=0	IN92=0	
IINV17= 401	EINV17= 431	PINV17= 173		I12=17	I18=20	I24=36	I135=17	I141=23	I147=20	IP93=12	IN93=1	
IINV19= 399	EINV19= 518	PINV19= 207		I13=21	I19=23		I136=21	I142=28				
IINV21= 386	EINV21= 185	PINV21= 71		I14=21	I20=25		I137=23	I143=39				
	HALL= 919									IENT= 381	IEXIT= 356	
RECN=1536		DATE	TIME	I9=17	I15=24	I21=31	I132=25	I138=23	I144=18	IP56=6	IN56=0	
		12/06/79	22:29:00	I10=17	I16=25	I22=33	I133=19	I139=22	I145=18	IP57=0	IN57=0	
ITOT= 395	ETOT=1016	PTOT= 402		I11=14	I17=22	I23=34	I134=18	I140=20	I146=17	IP92=0	IN92=0	
IINV17= 401	EINV17= 389	PINV17= 156		I12=16	I18=20	I24=38	I135=17	I141=22	I147=19	IP93=17	IN93=0	
IINV19= 397	EINV19= 431	PINV19= 171		I13=21	I19=23		I136=21	I142=29				
IINV21= 378	EINV21= 196	PINV21= 74		I14=20	I20=25		I137=22	I143=39				
	HALL= 779									IENT= 381	IEXIT= 349	
RECN=1537		DATE	TIME	I9=17	I15=24	I21=31	I132=26	I138=23	I144=18	IP56=6	IN56=0	
		12/06/79	22:29:07	I10=17	I16=25	I22=33	I133=19	I139=22	I145=18	IP57=0	IN57=0	
ITOT= 396	ETOT=1040	PTOT= 411		I11=14	I17=22	I23=34	I134=18	I140=19	I146=17	IP92=0	IN92=0	
IINV17= 401	EINV17= 401	PINV17= 161		I12=16	I18=20	I24=37	I135=17	I141=22	I147=19	IP93=17	IN93=0	
IINV19= 397	EINV19= 442	PINV19= 176		I13=21	I19=23		I136=21	I142=28				
IINV21= 380	EINV21= 196	PINV21= 75		I14=20	I20=25		I137=22	I143=40				
	HALL= 803									IENT= 381	IEXIT= 349	

POWER TAKEOFF PARAMETERS - IVTAN DATA
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RECN=1538		DATE	TIME	I9=18	I15=24	I21=30	I132=25	I138=23	I144=18	IP56=6	IN56=0	
		12/06/79	22:30:08	I10=17	I16=25	I22=33	I133=20	I139=23	I145=18	IP57=0	IN57=0	
ITOT= 399	ETOT=1257	PTOT= 502		I11=15	I17=22	I23=32	I134=19	I140=20	I146=18	IP92=0	IN92=0	
IINV17= 401	EINV17= 478	PINV17= 192		I12=17	I18=20	I24=36	I135=17	I141=25	I147=20	IP93=8	IN93=2	
IINV19= 399	EINV19= 595	PINV19= 237		I13=22	I19=23		I136=22	I142=30				
IINV21= 392	EINV21= 185	PINV21= 72		I14=21	I20=25		I137=23	I143=40				
	HALL=1037									IENT= 381	IEXIT= 363	
RECN=1539		DATE	TIME	I9=16	I15=23	I21=32	I132=19	I138=19	I144=15	IP56=4	IN56=0	
		12/06/79	22:33:56	I10=15	I16=24	I22=38	I133=15	I139=18	I145=15	IP57=0	IN57=0	
ITOT= 324	ETOT=1890	PTOT= 612		I11=14	I17=22	I23=0	I134=14	I140=15	I146=15	IP92=0	IN92=0	
IINV17= 325	EINV17= 776	PINV17= 252		I12=15	I18=20	I24=0	I135=14	I141=16	I147=17	IP93=7	IN93=4	
IINV19= 323	EINV19= 976	PINV19= 315		I13=20	I19=23		I136=18	I142=23				
IINV21= 319	EINV21= 138	PINV21= 44		I14=19	I20=25		I137=19	I143=34				
	HALL=1892									IENT= 307	IEXIT= 286	
RECN=1540		DATE	TIME	I9=0	I15=25	I21=32	I132=0	I138=19	I144=18	IP56=4	IN56=0	
		12/06/79	22:34:15	I10=21	I16=25	I22=37	I133=21	I139=19	I145=17	IP57=0	IN57=0	
ITOT= 325	ETOT=1878	PTOT= 610		I11=16	I17=22	I23=0	I134=18	I140=16	I146=15	IP92=0	IN92=0	
IINV17= 325	EINV17= 776	PINV17= 252		I12=18	I18=21	I24=0	I135=16	I141=16	I147=18	IP93=8	IN93=4	
IINV19= 325	EINV19= 982	PINV19= 319		I13=22	I19=23		I136=19	I142=23				
IINV21= 319	EINV21= 120	PINV21= 38		I14=21	I20=25		I137=19	I143=33				
	HALL=1880									IENT= 308	IEXIT= 287	
RECN=1541		DATE	TIME	I9=0	I15=26	I21=32	I132=0	I138=23	I144=31	IP56=4	IN56=0	
		12/06/79	22:36:44	I10=0	I16=27	I22=38	I133=0	I139=22	I145=26	IP57=0	IN57=0	
ITOT= 324	ETOT=1749	PTOT= 566		I11=22	I17=23	I23=0	I134=0	I140=20	I146=22	IP92=0	IN92=0	
IINV17= 325	EINV17= 747	PINV17= 243		I12=21	I18=22	I24=0	I135=0	I141=20	I147=23	IP93=8	IN93=4	
IINV19= 323	EINV19= 923	PINV19= 298		I13=25	I19=24		I136=23	I142=26				
IINV21= 317	EINV21= 79	PINV21= 25		I14=23	I20=26		I137=23	I143=36				
	HALL=1729									IENT= 309	IEXIT= 294	
RECN=1542		DATE	TIME	I9=0	I15=26	I21=33	I132=0	I138=23	I144=32	IP56=4	IN56=0	
		12/06/79	22:37:02	I10=0	I16=27	I22=38	I133=0	I139=22	I145=26	IP57=0	IN57=0	
ITOT= 324	ETOT=1755	PTOT= 568		I11=22	I17=23	I23=0	I134=0	I140=20	I146=21	IP92=0	IN92=0	
IINV17= 325	EINV17= 741	PINV17= 241		I12=21	I18=22	I24=0	I135=0	I141=20	I147=23	IP93=8	IN93=4	
IINV19= 323	EINV19= 935	PINV19= 302		I13=24	I19=24		I136=23	I142=26				
IINV21= 319	EINV21= 79	PINV21= 25		I14=23	I20=26		I137=23	I143=36				
	HALL=1740									IENT= 309	IEXIT= 295	
RECN=1543		DATE	TIME	I9=0	I15=26	I21=34	I132=0	I138=23	I144=31	IP56=5	IN56=0	
		12/06/79	22:37:15	I10=0	I16=26	I22=39	I133=0	I139=22	I145=26	IP57=0	IN57=0	
ITOT= 324	ETOT=1726	PTOT= 559		I11=21	I17=23	I23=0	I134=0	I140=20	I146=21	IP92=0	IN92=0	
IINV17= 325	EINV17= 730	PINV17= 237		I12=21	I18=22	I24=0	I135=0	I141=20	I147=23	IP93=8	IN93=4	
IINV19= 323	EINV19= 923	PINV19= 298		I13=24	I19=24		I136=23	I142=26				
IINV21= 317	EINV21= 73	PINV21= 23		I14=23	I20=26		I137=23	I143=36				
	HALL=1705									IENT= 309	IEXIT= 294	

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

RECN=1544	DATE	TIME	I9=0	I15=26	I21=33	I132=0	I138=23	I144=31	IP56=4	IN56=0	
	12/06/79	22:37:23	I10=0	I16=27	I22=39	I133=0	I139=22	I145=26	IP57=0	IN57=0	
ITOT= 325	ETOT=1778	PTOT= 578	I11=21	I17=23	I23=0	I134=0	I140=20	I146=22	IP92=0	IN92=0	
IINV17= 325	EINV17= 747	PINV17= 243	I12=21	I18=22	I24=0	I135=0	I141=21	I147=23	IP93=8	IN93=4	
IINV19= 325	EINV19= 946	PINV19= 308	I13=24	I19=24		I136=23	I142=26				
IINV21= 319	EINV21= 85	PINV21= 27	I14=23	I20=26		I137=23	I143=36				
	HALL=1776								IENT= 309	IEXIT= 295	
RECN=1545	DATE	TIME	I9=0	I15=26	I21=33	I132=0	I138=23	I144=31	IP56=5	IN56=0	
	12/06/79	22:39:12	I10=0	I16=26	I22=39	I133=0	I139=22	I145=26	IP57=0	IN57=0	
ITOT= 324	ETOT=1702	PTOT= 551	I11=21	I17=23	I23=0	I134=0	I140=20	I146=22	IP92=0	IN92=0	
IINV17= 325	EINV17= 724	PINV17= 235	I12=21	I18=21	I24=0	I135=0	I141=20	I147=23	IP93=8	IN93=4	
IINV19= 323	EINV19= 905	PINV19= 293	I13=24	I19=24		I136=23	I142=25				
IINV21= 317	EINV21= 73	PINV21= 23	I14=23	I20=26		I137=23	I143=36				
	HALL=1681								IENT= 309	IEXIT= 294	

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

```
RECN=1849                DATE      TIME      I9=0     I15=30   I21=34   I132=0   I138=29  I144=22  IP56=2   IN56=0
                      12/07/79  00:15:16    I10=0    I16=31   I22=39   I133=0   I139=33  I145=20  IP57=0   IN57=0
  ITOT= 368     ETOT=4034      PTOT=1485    I11=29   I17=26   I23=0    I134=0   I140=27  I146=23  IP92=0   IN92=0
IINV17= 366   EINV17=1186    PINV17= 434    I12=26   I18=25   I24=0    I135=0   I141=33  I147=26  IP93=2   IN93=6
IINV19= 368   EINV19=1766    PINV19= 650    I13=28   I19=27            I136=26  I142=39
IINV21= 370   EINV21=1081    PINV21= 400    I14=28   I20=28            I137=29  I143=45
                HALL=4026                                                                         IENT= 351  IEXIT= 351

RECN=1850                DATE      TIME      I9=0     I15=32   I21=46   I132=0   I138=34  I144=32  IP56=2   IN56=0
                      12/07/79  00:21:05    I10=0    I16=34   I22=54   I133=0   I139=38  I145=27  IP57=0   IN57=0
  ITOT= 429     ETOT=3172      PTOT=1361    I11=30   I17=33   I23=0    I134=0   I140=32  I146=29  IP92=0   IN92=0
IINV17= 427   EINV17= 917    PINV17= 391    I12=27   I18=29   I24=0    I135=0   I141=38  I147=32  IP93=2   IN93=7
IINV19= 429   EINV19=1468    PINV19= 629    I13=29   I19=33            I136=31  I142=43
IINV21= 433   EINV21= 788    PINV21= 341    I14=29   I20=36            I137=34  I143=47
                HALL=3229                                                                         IENT= 413  IEXIT= 417

RECN=1851                DATE      TIME      I9=0     I15=26   I21=54   I132=0   I138=33  I144=28  IP56=4   IN56=2
                      12/07/79  00:21:28    I10=0    I16=29   I22=70   I133=0   I139=37  I145=24  IP57=0   IN57=0
  ITOT= 414     ETOT=2587      PTOT=1070    I11=22   I17=30   I23=0    I134=0   I140=32  I146=26  IP92=0   IN92=0
IINV17= 409   EINV17= 495    PINV17= 203    I12=19   I18=26   I24=0    I135=0   I141=38  I147=29  IP93=1   IN93=6
IINV19= 413   EINV19=1298    PINV19= 536    I13=22   I19=33            I136=29  I142=44
IINV21= 417   EINV21= 794    PINV21= 331    I14=21   I20=40            I137=32  I143=48
                HALL=2620                                                                         IENT= 392  IEXIT= 400

RECN=1852                DATE      TIME      I9=0     I15=30   I21=45   I132=0   I138=32  I144=33  IP56=2   IN56=0
                      12/07/79  00:25:04    I10=0    I16=32   I22=58   I133=0   I139=35  I145=27  IP57=0   IN57=0
  ITOT= 413     ETOT=2792      PTOT=1153    I11=28   I17=30   I23=0    I134=0   I140=30  I146=27  IP92=0   IN92=0
IINV17= 409   EINV17= 759    PINV17= 311    I12=25   I18=27   I24=0    I135=0   I141=35  I147=29  IP93=1   IN93=7
IINV19= 413   EINV19=1327    PINV19= 548    I13=27   I19=31            I136=29  I142=42
IINV21= 417   EINV21= 706    PINV21= 294    I14=27   I20=34            I137=31  I143=49
                HALL=2854                                                                         IENT= 395  IEXIT= 399

RECN=1853                DATE      TIME      I9=0     I15=30   I21=46   I132=0   I138=32  I144=33  IP56=3   IN56=0
                      12/07/79  00:25:23    I10=0    I16=31   I22=61   I133=0   I139=35  I145=27  IP57=0   IN57=0
  ITOT= 413     ETOT=2792      PTOT=1152    I11=27   I17=30   I23=0    I134=0   I140=30  I146=27  IP92=0   IN92=0
IINV17= 409   EINV17= 741    PINV17= 303    I12=24   I18=27   I24=0    I135=0   I141=35  I147=29  IP93=1   IN93=6
IINV19= 413   EINV19=1333    PINV19= 551    I13=26   I19=31            I136=29  I142=42
IINV21= 415   EINV21= 718    PINV21= 298    I14=26   I20=35            I137=31  I143=50
                HALL=2831                                                                         IENT= 395  IEXIT= 399

RECN=1854                DATE      TIME      I9=0     I15=30   I21=46   I132=0   I138=32  I144=33  IP56=3   IN56=0
                      12/07/79  00:25:44    I10=0    I16=31   I22=60   I133=0   I139=34  I145=27  IP57=0   IN57=0
  ITOT= 412     ETOT=2774      PTOT=1142    I11=27   I17=30   I23=0    I134=0   I140=30  I146=27  IP92=0   IN92=0
IINV17= 409   EINV17= 736    PINV17= 301    I12=24   I18=27   I24=0    I135=0   I141=35  I147=29  IP93=1   IN93=6
IINV19= 411   EINV19=1321    PINV19= 543    I13=26   I19=31            I136=29  I142=42
IINV21= 415   EINV21= 718    PINV21= 298    I14=26   I20=35            I137=31  I143=50
                HALL=2819                                                                         IENT= 395  IEXIT= 399
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LISTING PRODUCED ON OCTOBER 3, 1980

```
RECN=1855                DATE      TIME      I9=0     I15=30   I21=46   I132=0   I138=32  I144=33  IP56=3   IN56=0
                      12/07/79  00:25:57    I10=0    I16=31   I22=60   I133=0   I139=34  I145=27  IP57=0   IN57=0
  ITOT= 413     ETOT=2768      PTOT=1144    I11=28   I17=30   I23=0    I134=0   I140=30  I146=27  IP92=0   IN92=0
IINV17= 409   EINV17= 736    PINV17= 301    I12=24   I18=27   I24=0    I135=0   I141=35  I147=29  IP93=1   IN93=6
IINV19= 413   EINV19=1315    PINV19= 543    I13=27   I19=31            I136=29  I142=42
IINV21= 417   EINV21= 718    PINV21= 299    I14=26   I20=34            I137=31  I143=50
                HALL=2831                                                                          IENT= 395  IEXIT= 399

RECN=1856                DATE      TIME      I9=0     I15=30   I21=46   I132=0   I138=32  I144=33  IP56=2   IN56=0
                      12/07/79  00:26:06    I10=0    I16=31   I22=61   I133=0   I139=34  I145=27  IP57=0   IN57=0
  ITOT= 413     ETOT=2762      PTOT=1140    I11=27   I17=30   I23=0    I134=0   I140=30  I146=27  IP92=0   IN92=0
IINV17= 409   EINV17= 718    PINV17= 294    I12=24   I18=26   I24=0    I135=0   I141=35  I147=28  IP93=1   IN93=6
IINV19= 413   EINV19=1321    PINV19= 546    I13=26   I19=31            I136=29  I142=42
IINV21= 415   EINV21= 724    PINV21= 300    I14=26   I20=35            I137=31  I143=51
                HALL=2819                                                                          IENT= 394  IEXIT= 399

RECN=1857                DATE      TIME      I9=0     I15=30   I21=46   I132=0   I138=32  I144=33  IP56=2   IN56=0
                      12/07/79  00:26:25    I10=0    I16=31   I22=60   I133=0   I139=34  I145=27  IP57=0   IN57=0
  ITOT= 414     ETOT=2815      PTOT=1165    I11=28   I17=30   I23=0    I134=0   I140=30  I146=27  IP92=0   IN92=0
IINV17= 411   EINV17= 747    PINV17= 307    I12=25   I18=27   I24=0    I135=0   I141=35  I147=28  IP93=1   IN93=6
IINV19= 413   EINV19=1339    PINV19= 553    I13=27   I19=31            I136=29  I142=42
IINV21= 417   EINV21= 730    PINV21= 304    I14=27   I20=34            I137=31  I143=50
                HALL=2878                                                                          IENT= 395  IEXIT= 399

RECN=1858                DATE      TIME      I9=0     I15=30   I21=45   I132=0   I138=32  I144=33  IP56=2   IN56=0
                      12/07/79  00:26:29    I10=0    I16=32   I22=59   I133=0   I139=34  I145=27  IP57=0   IN57=0
  ITOT= 413     ETOT=2862      PTOT=1182    I11=28   I17=30   I23=0    I134=0   I140=30  I146=27  IP92=0   IN92=0
IINV17= 409   EINV17= 764    PINV17= 313    I12=25   I18=27   I24=0    I135=0   I141=35  I147=29  IP93=1   IN93=6
IINV19= 413   EINV19=1357    PINV19= 561    I13=27   I19=31            I136=29  I142=42
IINV21= 417   EINV21= 741    PINV21= 309    I14=27   I20=34            I137=31  I143=50
                HALL=2912                                                                          IENT= 395  IEXIT= 399

RECN=1859                DATE      TIME      I9=0     I15=29   I21=36   I132=0   I138=29  I144=23  IP56=2   IN56=1
                      12/07/79  00:26:56    I10=0    I16=29   I22=45   I133=0   I139=31  I145=21  IP57=0   IN57=0
  ITOT= 363     ETOT=3577      PTOT=1298    I11=27   I17=26   I23=0    I134=0   I140=27  I146=23  IP92=0   IN92=0
IINV17= 360   EINV17= 976    PINV17= 352    I12=24   I18=24   I24=0    I135=0   I141=32  I147=24  IP93=1   IN93=5
IINV19= 362   EINV19=1591    PINV19= 576    I13=26   I19=27            I136=26  I142=39
IINV21= 366   EINV21=1010    PINV21= 370    I14=25   I20=28            I137=28  I143=46
                HALL=3581                                                                          IENT= 346  IEXIT= 348

RECN=1860                DATE      TIME      I9=0     I15=27   I21=31   I132=0   I138=27  I144=16  IP56=2   IN56=1
                      12/07/79  00:27:16    I10=0    I16=27   I22=36   I133=0   I139=28  I145=16  IP57=0   IN57=0
  ITOT= 325     ETOT=4174      PTOT=1358    I11=24   I17=23   I23=0    I134=0   I140=24  I146=19  IP92=0   IN92=0
IINV17= 323   EINV17=1163    PINV17= 376    I12=22   I18=22   I24=0    I135=0   I141=29  I147=22  IP93=2   IN93=5
IINV19= 325   EINV19=1819    PINV19= 592    I13=24   I19=24            I136=23  I142=35
IINV21= 327   EINV21=1192    PINV21= 390    I14=23   I20=25            I137=25  I143=44
                HALL=4177                                                                          IENT= 308  IEXIT= 308
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POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

```
RECN=1861                DATE      TIME      I9=0     I15=27   I21=30   I132=0   I138=27  I144=16  IP56=3   IN56=1
                      12/07/79  00:27:26     I10=0    I16=27   I22=35   I133=0   I139=28  I145=16  IP57=0   IN57=0
  ITOT= 325     ETOT=4246     PTOT=1381     I11=25   I17=23   I23=0    I134=0   I140=23  I146=19  IP92=0   IN92=0
IINV17= 323   EINV17=1181   PINV17= 382     I12=22   I18=22   I24=0    I135=0   I141=29  I147=22  IP93=2   IN93=5
IINV19= 325   EINV19=1861   PINV19= 605     I13=24   I19=24            I136=23  I142=35
IINV21= 327   EINV21=1204   PINV21= 394     I14=24   I20=24            I137=25  I143=43
                HALL=4236                                                                          IENT= 308  IEXIT= 308

RECN=1862                DATE      TIME      I9=0     I15=27   I21=30   I132=0   I138=27  I144=16  IP56=3   IN56=1
                      12/07/79  00:27:55     I10=0    I16=28   I22=34   I133=0   I139=28  I145=16  IP57=0   IN57=0
  ITOT= 325     ETOT=4280     PTOT=1392     I11=25   I17=23   I23=0    I134=0   I140=24  I146=19  IP92=0   IN92=0
IINV17= 323   EINV17=1204   PINV17= 389     I12=22   I18=22   I24=0    I135=0   I141=29  I147=22  IP93=2   IN93=5
IINV19= 325   EINV19=1872   PINV19= 609     I13=25   I19=24            I136=23  I142=35
IINV21= 327   EINV21=1204   PINV21= 394     I14=24   I20=24            I137=25  I143=44
                HALL=4283                                                                          IENT= 308  IEXIT= 307

RECN=1863                DATE      TIME      I9=0     I15=27   I21=29   I132=0   I138=27  I144=15  IP56=2   IN56=1
                      12/07/79  00:28:14     I10=0    I16=28   I22=33   I133=0   I139=29  I145=16  IP57=0   IN57=0
  ITOT= 326     ETOT=4315     PTOT=1407     I11=26   I17=23   I23=0    I134=0   I140=24  I146=19  IP92=0   IN92=0
IINV17= 323   EINV17=1222   PINV17= 395     I12=23   I18=22   I24=0    I135=0   I141=29  I147=22  IP93=2   IN93=5
IINV19= 327   EINV19=1878   PINV19= 614     I13=25   I19=24            I136=23  I142=35
IINV21= 327   EINV21=1216   PINV21= 398     I14=24   I20=24            I137=25  I143=44
                HALL=4307                                                                          IENT= 308  IEXIT= 308

RECN=1864                DATE      TIME      I9=0     I15=27   I21=29   I132=0   I138=27  I144=15  IP56=2   IN56=1
                      12/07/79  00:28:24     I10=0    I16=28   I22=33   I133=0   I139=29  I145=16  IP57=0   IN57=0
  ITOT= 326     ETOT=4321     PTOT=1409     I11=26   I17=23   I23=0    I134=0   I140=24  I146=19  IP92=0   IN92=0
IINV17= 323   EINV17=1228   PINV17= 397     I12=23   I18=22   I24=0    I135=0   I141=29  I147=22  IP93=2   IN93=5
IINV19= 327   EINV19=1878   PINV19= 614     I13=25   I19=24            I136=23  I142=35
IINV21= 327   EINV21=1216   PINV21= 398     I14=24   I20=24            I137=25  I143=44
                HALL=4307                                                                          IENT= 308  IEXIT= 308

RECN=1865                DATE      TIME      I9=0     I15=25   I21=19   I132=0   I138=24  I144=3   IP56=2   IN56=1
                      12/07/79  00:28:55     I10=0    I16=25   I22=18   I133=0   I139=26  I145=8   IP57=0   IN57=0
  ITOT= 269     ETOT=4989     PTOT=1344     I11=24   I17=19   I23=0    I134=0   I140=21  I146=14  IP92=0   IN92=0
IINV17= 267   EINV17=1421   PINV17= 379     I12=21   I18=19   I24=0    I135=0   I141=26  I147=17  IP93=2   IN93=4
IINV19= 270   EINV19=2077   PINV19= 562     I13=23   I19=19            I136=18  I142=31
IINV21= 270   EINV21=1491   PINV21= 403     I14=22   I20=18            I137=22  I143=39
                HALL=4963                                                                          IENT= 252  IEXIT= 249

RECN=1866                DATE      TIME      I9=0     I15=25   I21=19   I132=0   I138=24  I144=3   IP56=2   IN56=1
                      12/07/79  00:28:59     I10=0    I16=25   I22=17   I133=0   I139=26  I145=7   IP57=0   IN57=0
  ITOT= 268     ETOT=4996     PTOT=1339     I11=24   I17=19   I23=0    I134=0   I140=21  I146=14  IP92=0   IN92=0
IINV17= 265   EINV17=1439   PINV17= 381     I12=21   I18=19   I24=0    I135=0   I141=26  I147=17  IP93=2   IN93=4
IINV19= 269   EINV19=2054   PINV19= 552     I13=23   I19=19            I136=18  I142=32
IINV21= 270   EINV21=1503   PINV21= 406     I14=22   I20=17            I137=22  I143=39
                HALL=4974                                                                          IENT= 251  IEXIT= 248
```

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

RECN=1867	DATE	TIME	I9=0	I15=25	I21=19	I132=0	I138=24	I144=4	IP56=2	IN56=1	
	12/07/79	00:29:18	I10=0	I16=25	I22=17	I133=0	I139=26	I145=8	IP57=0	IN57=0	
ITOT= 269	ETOT=5106	PTOT=1371	I11=24	I17=19	I23=0	I134=0	I140=21	I146=14	IP92=0	IN92=0	
IINV17= 267	EINV17=1468	PINV17= 391	I12=21	I18=19	I24=0	I135=0	I141=26	I147=17	IP93=2	IN93=4	
IINV19= 269	EINV19=2101	PINV19= 564	I13=23	I19=19		I136=18	I142=31				
IINV21= 270	EINV21=1538	PINV21= 416	I14=22	I20=18		I137=22	I143=39				
	HALL=5045								IENT= 251	IEXIT= 248	
RECN=1868	DATE	TIME	I9=0	I15=25	I21=19	I132=0	I138=24	I144=3	IP56=2	IN56=1	
	12/07/79	00:29:46	I10=0	I16=25	I22=17	I133=0	I139=26	I145=8	IP57=0	IN57=0	
ITOT= 269	ETOT=5095	PTOT=1368	I11=24	I17=19	I23=0	I134=0	I140=21	I146=14	IP92=0	IN92=0	
IINV17= 267	EINV17=1468	PINV17= 391	I12=21	I18=19	I24=0	I135=0	I141=26	I147=16	IP93=2	IN93=4	
IINV19= 269	EINV19=2095	PINV19= 563	I13=23	I19=19		I136=18	I142=32				
IINV21= 270	EINV21=1532	PINV21= 414	I14=22	I20=17		I137=22	I143=39				
	HALL=5081								IENT= 251	IEXIT= 248	
RECN=1869	DATE	TIME	I9=0	I15=25	I21=18	I132=0	I138=24	I144=3	IP56=2	IN56=1	
	12/07/79	00:30:04	I10=0	I16=25	I22=16	I133=0	I139=26	I145=8	IP57=0	IN57=0	
ITOT= 269	ETOT=5130	PTOT=1378	I11=24	I17=19	I23=0	I134=0	I140=21	I146=14	IP92=0	IN92=0	
IINV17= 267	EINV17=1480	PINV17= 394	I12=21	I18=19	I24=0	I135=0	I141=26	I147=16	IP93=2	IN93=4	
IINV19= 269	EINV19=2107	PINV19= 566	I13=24	I19=19		I136=18	I142=31				
IINV21= 270	EINV21=1544	PINV21= 417	I14=23	I20=17		I137=22	I143=39				
	HALL=5092								IENT= 252	IEXIT= 248	
RECN=1870	DATE	TIME	I9=0	I15=26	I21=19	I132=0	I138=25	I144=4	IP56=2	IN56=1	
	12/07/79	00:30:26	I10=0	I16=26	I22=18	I133=0	I139=26	I145=8	IP57=0	IN57=0	
ITOT= 275	ETOT=5030	PTOT=1385	I11=24	I17=19	I23=0	I134=0	I140=21	I146=14	IP92=0	IN92=0	
IINV17= 272	EINV17=1444	PINV17= 393	I12=22	I18=19	I24=0	I135=0	I141=27	I147=17	IP93=2	IN93=4	
IINV19= 276	EINV19=2077	PINV19= 574	I13=24	I19=20		I136=18	I142=32				
IINV21= 276	EINV21=1509	PINV21= 417	I14=23	I20=18		I137=22	I143=40				
	HALL=5010								IENT= 258	IEXIT= 255	
RECN=1871	DATE	TIME	I9=0	I15=26	I21=20	I132=0	I138=24	I144=5	IP56=2	IN56=1	
	12/07/79	00:30:35	I10=0	I16=25	I22=18	I133=0	I139=27	I145=8	IP57=0	IN57=0	
ITOT= 275	ETOT=5018	PTOT=1381	I11=24	I17=19	I23=0	I134=0	I140=21	I146=14	IP92=0	IN92=0	
IINV17= 272	EINV17=1444	PINV17= 393	I12=21	I18=19	I24=0	I135=0	I141=27	I147=17	IP93=2	IN93=4	
IINV19= 276	EINV19=2077	PINV19= 574	I13=24	I19=20		I136=18	I142=32				
IINV21= 276	EINV21=1497	PINV21= 414	I14=23	I20=18		I137=22	I143=39				
	HALL=5010								IENT= 258	IEXIT= 255	
RECN=1872	DATE	TIME	I9=0	I15=26	I21=19	I132=0	I138=24	I144=5	IP56=2	IN56=1	
	12/07/79	00:30:54	I10=0	I16=26	I22=17	I133=0	I139=26	I145=9	IP57=0	IN57=0	
ITOT= 275	ETOT=5060	PTOT=1393	I11=25	I17=19	I23=0	I134=0	I140=21	I146=14	IP92=0	IN92=0	
IINV17= 272	EINV17=1456	PINV17= 397	I12=22	I18=19	I24=0	I135=0	I141=26	I147=17	IP93=2	IN93=4	
IINV19= 276	EINV19=2095	PINV19= 579	I13=24	I19=19		I136=19	I142=32				
IINV21= 276	EINV21=1509	PINV21= 417	I14=23	I20=18		I137=22	I143=40				
	HALL=5021								IENT= 258	IEXIT= 255	

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

RECN=1873	DATE	TIME	I9=0	I15=26	I21=20	I132=0	I138=25	I144=4	IP56=2	IN56=1	
	12/07/79	00:31:04	I10=0	I16=26	I22=18	I133=0	I139=27	I145=8	IP57=0	IN57=0	
ITOT= 275	ETOT=5059	PTOT=1393	I11=24	I17=19	I23=0	I134=0	I140=21	I146=14	IP92=0	IN92=0	
IINV17= 272	EINV17=1450	PINV17= 395	I12=22	I18=19	I24=0	I135=0	I141=27	I147=17	IP93=2	IN93=4	
IINV19= 276	EINV19=2089	PINV19= 577	I13=24	I19=20		I136=18	I142=32				
IINV21= 276	EINV21=1520	PINV21= 420	I14=23	I20=18		I137=22	I143=40				
	HALL=4998								IENT= 258	IEXIT= 255	
RECN=1874	DATE	TIME	I9=0	I15=37	I21=64	I132=0	I138=41	I144=49	IP56=3	IN56=0	
	12/07/79	00:31:29	I10=0	I16=39	I22=86	I133=0	I139=45	I145=39	IP57=0	IN57=0	
ITOT= 536	ETOT=1849	PTOT= 992	I11=34	I17=40	I23=0	I134=0	I140=39	I146=38	IP92=0	IN92=0	
IINV17= 532	EINV17= 448	PINV17= 239	I12=31	I18=34	I24=0	I135=0	I141=46	I147=39	IP93=1	IN93=9	
IINV19= 536	EINV19= 999	PINV19= 536	I13=32	I19=40		I136=39	I142=52				
IINV21= 542	EINV21= 401	PINV21= 218	I14=33	I20=47		I137=40	I143=61				
	HALL=1939								IENT= 519	IEXIT= 530	
RECN=1875	DATE	TIME	I9=0	I15=37	I21=64	I132=0	I138=41	I144=49	IP56=3	IN56=0	
	12/07/79	00:31:37	I10=0	I16=39	I22=86	I133=0	I139=45	I145=39	IP57=0	IN57=0	
ITOT= 536	ETOT=1772	PTOT= 950	I11=34	I17=40	I23=0	I134=0	I140=39	I146=38	IP92=0	IN92=0	
IINV17= 532	EINV17= 436	PINV17= 232	I12=31	I18=35	I24=0	I135=0	I141=46	I147=39	IP93=0	IN93=8	
IINV19= 536	EINV19= 964	PINV19= 517	I13=32	I19=41		I136=39	I142=52				
IINV21= 542	EINV21= 372	PINV21= 202	I14=33	I20=47		I137=40	I143=62				
	HALL=1870								IENT= 519	IEXIT= 529	
RECN=1876	DATE	TIME	I9=0	I15=30	I21=38	I132=0	I138=31	I144=25	IP56=3	IN56=0	
	12/07/79	00:32:05	I10=0	I16=31	I22=46	I133=0	I139=33	I145=22	IP57=0	IN57=0	
ITOT= 383	ETOT=3612	PTOT=1384	I11=28	I17=28	I23=0	I134=0	I140=29	I146=24	IP92=0	IN92=0	
IINV17= 380	EINV17=1010	PINV17= 384	I12=25	I18=26	I24=0	I135=0	I141=34	I147=26	IP93=2	IN93=6	
IINV19= 384	EINV19=1620	PINV19= 622	I13=27	I19=28		I136=27	I142=40				
IINV21= 386	EINV21= 982	PINV21= 379	I14=27	I20=30		I137=29	I143=48				
	HALL=3638								IENT= 366	IEXIT= 368	
RECN=1877	DATE	TIME	I9=0	I15=30	I21=38	I132=0	I138=31	I144=24	IP56=2	IN56=0	
	12/07/79	00:32:12	I10=0	I16=31	I22=46	I133=0	I139=33	I145=22	IP57=0	IN57=0	
ITOT= 383	ETOT=3630	PTOT=1391	I11=29	I17=28	I23=0	I134=0	I140=28	I146=24	IP92=0	IN92=0	
IINV17= 380	EINV17=1022	PINV17= 388	I12=26	I18=26	I24=0	I135=0	I141=34	I147=26	IP93=2	IN93=6	
IINV19= 384	EINV19=1626	PINV19= 624	I13=28	I19=23		I136=27	I142=40				
IINV21= 386	EINV21= 982	PINV21= 379	I14=27	I20=29		I137=29	I143=49				
	HALL=3662								IENT= 366	IEXIT= 368	
RECN=1878	DATE	TIME	I9=0	I15=30	I21=38	I132=0	I138=31	I144=25	IP56=2	IN56=0	
	12/07/79	00:32:37	I10=0	I16=31	I22=47	I133=0	I139=33	I145=22	IP57=0	IN57=0	
ITOT= 382	ETOT=3642	PTOT=1392	I11=28	I17=28	I23=0	I134=0	I140=28	I146=24	IP92=0	IN92=0	
IINV17= 380	EINV17=1028	PINV17= 391	I12=25	I18=26	I24=0	I135=0	I141=34	I147=26	IP93=2	IN93=6	
IINV19= 382	EINV19=1632	PINV19= 623	I13=27	I19=28		I136=27	I142=40				
IINV21= 386	EINV21= 982	PINV21= 379	I14=27	I20=30		I137=29	I143=48				
	HALL=3662								IENT= 366	IEXIT= 368	

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LISTING PRODUCED ON OCTOBER 3, 1980

RECN=1879	DATE	TIME	I9=0	I15=30	I21=38	I132=0	I138=31	I144=25	IP56=2	IN56=0
	12/07/79	00:32:45	I10=0	I16=31	I22=47	I133=0	I139=33	I145=23	IP57=0	IN57=0
ITOT= 382	ETOT=3618	PTOT=1383	I11=28	I17=28	I23=0	I134=0	I140=28	I146=24	IP92=0	IN92=0
IINV17= 380	EINV17=1022	PINV17= 388	I12=25	I18=25	I24=0	I135=0	I141=34	I147=26	IP93=2	IN93=6
IINV19= 382	EINV19=1620	PINV19= 619	I13=27	I19=28		I136=27	I142=40			
IINV21= 386	EINV21= 976	PINV21= 376	I14=27	I20=30		I137=29	I143=48			
	HALL=3650								IENT= 366	IEXIT= 368
RECN=1880	DATE	TIME	I9=0	I15=31	I21=37	I132=0	I138=31	I144=25	IP56=2	IN56=0
	12/07/79	00:33:13	I10=0	I16=31	I22=45	I133=0	I139=33	I145=22	IP57=0	IN57=0
ITOT= 383	ETOT=3630	PTOT=1391	I11=29	I17=28	I23=0	I134=0	I140=28	I146=24	IP92=0	IN92=0
IINV17= 380	EINV17=1034	PINV17= 393	I12=26	I18=26	I24=0	I135=0	I141=33	I147=26	IP93=2	IN93=6
IINV19= 384	EINV19=1620	PINV19= 622	I13=28	I19=28		I136=27	I142=40			
IINV21= 386	EINV21= 976	PINV21= 376	I14=28	I20=29		I137=29	I143=48			
	HALL=3674								IENT= 366	IEXIT= 367
RECN=1881	DATE	TIME	I9=0	I15=30	I21=37	I132=0	I138=31	I144=25	IP56=0	IN56=17
	12/07/79	00:33:23	I10=0	I16=31	I22=46	I133=0	I139=33	I145=22	IP57=23	IN57=0
ITOT= 382	ETOT=3629	PTOT=1388	I11=29	I17=28	I23=0	I134=0	I140=28	I146=24	IP92=0	IN92=0
IINV17= 380	EINV17=1058	PINV17= 402	I12=26	I18=26	I24=0	I135=0	I141=34	I147=26	IP93=1	IN93=6
IINV19= 382	EINV19=1585	PINV19= 605	I13=28	I19=28		I136=27	I142=40			
IINV21= 386	EINV21= 987	PINV21= 381	I14=27	I20=30		I137=29	I143=48			
	HALL=3650								IENT= 366	IEXIT= 368
RECN=1882	DATE	TIME	I9=0	I15=30	I21=38	I132=0	I138=31	I144=25	IP56=0	IN56=30
	12/07/79	00:33:54	I10=0	I16=31	I22=47	I133=0	I139=33	I145=22	IP57=34	IN57=0
ITOT= 382	ETOT=3629	PTOT=1388	I11=28	I17=28	I23=0	I134=0	I140=28	I146=24	IP92=0	IN92=0
IINV17= 380	EINV17=1075	PINV17= 408	I12=25	I18=25	I24=0	I135=0	I141=34	I147=26	IP93=1	IN93=6
IINV19= 382	EINV19=1567	PINV19= 598	I13=27	I19=28		I136=27	I142=40			
IINV21= 386	EINV21= 987	PINV21= 381	I14=27	I20=30		I137=29	I143=48			
	HALL=3662								IENT= 366	IEXIT= 368
RECN=1883	DATE	TIME	I9=0	I15=30	I21=38	I132=0	I138=30	I144=26	IP56=0	IN56=30
	12/07/79	00:33:58	I10=0	I16=31	I22=47	I133=0	I139=34	I145=22	IP57=35	IN57=0
ITOT= 382	ETOT=3618	PTOT=1383	I11=29	I17=28	I23=0	I134=0	I140=28	I146=24	IP92=0	IN92=0
IINV17= 380	EINV17=1075	PINV17= 408	I12=26	I18=26	I24=0	I135=0	I141=34	I147=26	IP93=1	IN93=6
IINV19= 382	EINV19=1561	PINV19= 596	I13=27	I19=28		I136=27	I142=39			
IINV21= 386	EINV21= 982	PINV21= 379	I14=27	I20=30		I137=29	I143=48			
	HALL=3650								IENT= 366	IEXIT= 368
RECN=1884	DATE	TIME	I9=0	I15=30	I21=38	I132=0	I138=31	I144=25	IP56=0	IN56=30
	12/07/79	00:34:26	I10=0	I16=31	I22=47	I133=0	I139=33	I145=22	IP57=34	IN57=0
ITOT= 382	ETOT=3630	PTOT=1388	I11=29	I17=28	I23=0	I134=0	I140=28	I146=24	IP92=0	IN92=0
IINV17= 380	EINV17=1081	PINV17= 411	I12=26	I18=26	I24=0	I135=0	I141=34	I147=26	IP93=1	IN93=6
IINV19= 382	EINV19=1567	PINV19= 598	I13=27	I19=28		I136=27	I142=40			
IINV21= 386	EINV21= 982	PINV21= 379	I14=27	I20=30		I137=29	I143=48			
	HALL=3662								IENT= 366	IEXIT= 368

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

```
RECN=1885                DATE      TIME      I9=0     I15=30   I21=38   I132=0   I138=30  I144=26  IP56=0   IN56=30
                      12/07/79  00:34:45    I10=0    I16=31   I22=46   I133=0   I139=33  I145=22  IP57=34  IN57=0
  ITOT= 382     ETOT=3607      PTOT=1379    I11=29   I17=28   I23=0    I134=0   I140=28  I146=24  IP92=0   IN92=0
IINV17= 380   EINV17=1069    PINV17= 406    I12=26   I18=25   I24=0    I135=0   I141=34  I147=26  IP93=1   IN93=6
IINV19= 382   EINV19=1556    PINV19= 594    I13=28   I19=28            I136=27  I142=39
IINV21= 386   EINV21= 982    PINV21= 379    I14=27   I20=30            I137=29  I143=48
                HALL=3638                                                                         IENT= 366  IEXIT= 368

RECN=1886                DATE      TIME      I9=0     I15=30   I21=38   I132=0   I138=30  I144=26  IP56=0   IN56=30
                      12/07/79  00:34:55    I10=0    I16=31   I22=46   I133=0   I139=33  I145=22  IP57=34  IN57=0
  ITOT= 382     ETOT=3624      PTOT=1385    I11=29   I17=28   I23=0    I134=0   I140=28  I146=24  IP92=0   IN92=0
IINV17= 380   EINV17=1075    PINV17= 408    I12=26   I18=26   I24=0    I135=0   I141=34  I147=26  IP93=1   IN93=6
IINV19= 382   EINV19=1567    PINV19= 598    I13=27   I19=28            I136=27  I142=39
IINV21= 386   EINV21= 982    PINV21= 379    I14=27   I20=30            I137=29  I143=48
                HALL=3638                                                                         IENT= 366  IEXIT= 368

RECN=1887                DATE      TIME      I9=0     I15=30   I21=37   I132=0   I138=30  I144=24  IP56=0   IN56=30
                      12/07/79  00:35:15    I10=0    I16=31   I22=45   I133=0   I139=33  I145=21  IP57=35  IN57=0
  ITOT= 377     ETOT=3706      PTOT=1397    I11=29   I17=27   I23=0    I134=0   I140=28  I146=23  IP92=0   IN92=0
IINV17= 376   EINV17=1105    PINV17= 415    I12=25   I18=25   I24=0    I135=0   I141=33  I147=25  IP93=1   IN93=6
IINV19= 376   EINV19=1591    PINV19= 598    I13=27   I19=28            I136=27  I142=39
IINV21= 380   EINV21=1010    PINV21= 384    I14=27   I20=29            I137=29  I143=48
                HALL=3721                                                                         IENT= 361  IEXIT= 362

RECN=1888                DATE      TIME      I9=0     I15=32   I21=42   I132=0   I138=32  I144=31  IP56=0   IN56=26
                      12/07/79  00:35:34    I10=0    I16=33   I22=54   I133=0   I139=35  I145=26  IP57=31  IN57=0
  ITOT= 414     ETOT=3260      PTOT=1349    I11=30   I17=30   I23=0    I134=0   I140=30  I146=27  IP92=0   IN92=0
IINV17= 411   EINV17= 964    PINV17= 396    I12=27   I18=27   I24=0    I135=0   I141=36  I147=29  IP93=1   IN93=6
IINV19= 413   EINV19=1444    PINV19= 597    I13=29   I19=30            I136=29  I142=42
IINV21= 417   EINV21= 853    PINV21= 356    I14=29   I20=33            I137=31  I143=51
                HALL=3287                                                                         IENT= 397  IEXIT= 400

RECN=1889                DATE      TIME      I9=0     I15=31   I21=43   I132=0   I138=32  I144=32  IP56=0   IN56=14
                      12/07/79  00:35:51    I10=0    I16=33   I22=55   I133=0   I139=35  I145=26  IP57=100 IN57=0
  ITOT= 366     ETOT=3571      PTOT=1306    I11=29   I17=30   I23=0    I134=0   I140=30  I146=27  IP92=0   IN92=0
IINV17= 411   EINV17= 917    PINV17= 377    I12=26   I18=27   I24=0    I135=0   I141=35  I147=29  IP93=0   IN93=88
IINV19= 327   EINV19=1966    PINV19= 643    I13=28   I19=31            I136=29  I142=41
IINV21= 415   EINV21= 689    PINV21= 286    I14=28   I20=33            I137=31  I143=51
                HALL=3604                                                                         IENT= 397  IEXIT= 399

RECN=1890                DATE      TIME      I9=0     I15=31   I21=43   I132=0   I138=30  I144=24  IP56=0   IN56=12
                      12/07/79  00:35:57    I10=0    I16=33   I22=56   I133=0   I139=33  I145=21  IP57=100 IN57=0
  ITOT= 360     ETOT=3724      PTOT=1341    I11=29   I17=30   I23=0    I134=0   I140=27  I146=23  IP92=0   IN92=0
IINV17= 411   EINV17= 905    PINV17= 372    I12=26   I18=27   I24=0    I135=0   I141=33  I147=25  IP93=0   IN93=51
IINV19= 327   EINV19=1901    PINV19= 622    I13=28   I19=31            I136=26  I142=39
IINV21= 378   EINV21= 917    PINV21= 347    I14=28   I20=33            I137=29  I143=48
                HALL=3756                                                                         IENT= 397  IEXIT= 360
```

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

```
RECN=1891                DATE      TIME      I9=0     I15=31   I21=44   I132=0   I138=25  I144=6   IP56=0   IN56=7
                      12/07/79  00:36:24     I10=0    I16=33   I22=57   I133=0   I139=28  I145=10  IP57=100 IN57=0
  ITOT= 324     ETOT=4269     PTOT=1381     I11=28   I17=31   I23=0    I134=0   I140=23  I146=15  IP92=0   IN92=0
IINV17= 411   EINV17= 888   PINV17= 365     I12=26   I18=27   I24=0    I135=0   I141=28  I147=18  IP93=12  IN93=0
IINV19= 306   EINV19=1901   PINV19= 581     I13=28   I19=31            I136=19  I142=34
IINV21= 294   EINV21=1480   PINV21= 435     I14=28   I20=33            I137=23  I143=43
                HALL=4271                                                                          IENT= 396  IEXIT= 272

RECN=1892                DATE      TIME      I9=0     I15=31   I21=44   I132=0   I138=25  I144=6   IP56=0   IN56=8
                      12/07/79  00:36:31     I10=0    I16=33   I22=56   I133=0   I139=28  I145=10  IP57=100 IN57=0
  ITOT= 323     ETOT=4263     PTOT=1376     I11=29   I17=31   I23=0    I134=0   I140=23  I146=15  IP92=0   IN92=0
IINV17= 411   EINV17= 882   PINV17= 363     I12=26   I18=27   I24=0    I135=0   I141=28  I147=18  IP93=11  IN93=0
IINV19= 306   EINV19=1901   PINV19= 581     I13=28   I19=31            I136=20  I142=34
IINV21= 292   EINV21=1480   PINV21= 432     I14=28   I20=33            I137=23  I143=43
                HALL=4271                                                                          IENT= 356  IEXIT= 272

RECN=1893                DATE      TIME      I9=0     I15=12   I21=0    I132=0   I138=0   I144=1   IP56=1   IN56=0
                      12/07/79  00:37:20     I10=0    I16=0    I22=1    I133=0   I139=0   I145=0   IP57=0   IN57=1
  ITOT=   6     ETOT=4040     PTOT=  25     I11=0    I17=0    I23=0    I134=0   I140=0   I146=0   IP92=0   IN92=0
IINV17=   5   EINV17=1409   PINV17=   7     I12=0    I18=0    I24=0    I135=0   I141=0   I147=0   IP93=0   IN93=0
IINV19=   7   EINV19=1345   PINV19=   9     I13=0    I19=0             I136=0   I142=0
IINV21=   7   EINV21=1286   PINV21=   9     I14=0    I20=0             I137=0   I143=0
                HALL= 744                                                                          IENT=  14  IEXIT=   1

RECN=1894                DATE      TIME      I9=0     I15=13   I21=0    I132=0   I138=0   I144=1   IP56=1   IN56=0
                      12/07/79  00:37:29     I10=0    I16=0    I22=1    I133=0   I139=0   I145=0   IP57=0   IN57=0
  ITOT=   6     ETOT=3752     PTOT=  23     I11=0    I17=0    I23=0    I134=0   I140=0   I146=0   IP92=0   IN92=0
IINV17=   5   EINV17=1345   PINV17=   6     I12=0    I18=0    I24=0    I135=0   I141=0   I147=0   IP93=0   IN93=0
IINV19=   7   EINV19=1315   PINV19=   9     I13=0    I19=0             I136=0   I142=0
IINV21=   7   EINV21=1093   PINV21=   7     I14=0    I20=0             I137=0   I143=0
                HALL=1002                                                                          IENT=   5  IEXIT=   2

RECN=1895                DATE      TIME      I9=0     I15=0    I21=0    I132=0   I138=0   I144=0   IP56=0   IN56=0
                      12/07/79  00:38:04     I10=0    I16=0    I22=0    I133=0   I139=0   I145=0   IP57=0   IN57=0
  ITOT=   4     ETOT=  61     PTOT=   0     I11=0    I17=0    I23=0    I134=0   I140=0   I146=0   IP92=0   IN92=0
IINV17=   3   EINV17=  20   PINV17=   0     I12=0    I18=0    I24=0    I135=0   I141=0   I147=0   IP93=0   IN93=0
IINV19=   5   EINV19=  20   PINV19=   0     I13=0    I19=0             I136=0   I142=0
IINV21=   3   EINV21=  20   PINV21=   0     I14=0    I20=0             I137=0   I143=0
                HALL=  41                                                                          IENT=   2  IEXIT=   1

RECN=1896                DATE      TIME      I9=0     I15=0    I21=0    I132=0   I138=0   I144=0   IP56=0   IN56=0
                      12/07/79  00:38:38     I10=0    I16=0    I22=0    I133=0   I139=0   I145=0   IP57=0   IN57=0
  ITOT=   4     ETOT=  61     PTOT=   0     I11=0    I17=0    I23=0    I134=0   I140=0   I146=0   IP92=0   IN92=0
IINV17=   3   EINV17=  20   PINV17=   0     I12=0    I18=0    I24=0    I135=0   I141=0   I147=0   IP93=0   IN93=0
IINV19=   5   EINV19=  20   PINV19=   0     I13=0    I19=0             I136=0   I142=0
IINV21=   3   EINV21=  20   PINV21=   0     I14=0    I20=0             I137=0   I143=0
                HALL=  41                                                                          IENT=   2  IEXIT=   1
```

POWER TAKEOFF PARAMETERS - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3, 1980

```
RECN=1897                 DATE       TIME      I9=0     I15=0    I21=0    I132=0   I138=0   I144=0   IP56=0   IN56=0
                       12/07/79  00:38:59     I10=0    I16=0    I22=0    I133=0   I139=0   I145=0   IP57=0   IN57=0
  ITOT=   4     ETOT=  55     PTOT=   0      I11=0    I17=0    I23=0    I134=0   I140=0   I146=0   IP92=0   IN92=0
IINV17=   3   EINV17=  20   PINV17=   0      I12=0    I18=0    I24=0    I135=0   I141=0   I147=0   IP93=0   IN93=0
IINV19=   5   EINV19=  20   PINV19=   0      I13=0    I19=0             I136=0   I142=0
IINV21=   3   EINV21=  14   PINV21=   0      I14=0    I20=0             I137=0   I143=0
                 HALL=  41                                                                      IENT=   2  IEXIT=   1

RECN=1898                 DATE       TIME      I9=-1    I15=0    I21=-1   I132=-1  I138=-1  I144=-1  IP56=-1  IN56=-1
                       12/07/79  00:53:58     I10=-1   I16=-1   I22=-1   I133=-1  I139=-1  I145=-1  IP57=-1  IN57=-1
  ITOT=   4     ETOT=  55     PTOT=   0      I11=-1   I17=-1   I23=-1   I134=-1  I140=-1  I146=-1  IP92=-1  IN92=-1
IINV17=   3   EINV17=  20   PINV17=   0      I12=-1   I18=-1   I24=-1   I135=-1  I141=-1  I147=-1  IP93=-1  IN93=0
IINV19=   5   EINV19=  20   PINV19=   0      I13=-1   I19=-1            I136=-1  I142=-1
IINV21=   3   EINV21=  14   PINV21=   0      I14=-1   I20=-1            I137=-1  I143=-1
                 HALL=  41                                                                      IENT= -15  IEXIT= -16
```

INTERFRAME VOLTAGES - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
12/06/79	21:57:34	1450	-1	-2	-2	-1	-1	0	1	0	3	16	0	0	-1	2	0	-2	-1	-1	0	1
12/06/79	21:57:49	1451	-2	-3	-2	-1	-1	0	0	0	2	15	0	0	-1	2	0	-2	-1	0	0	2
12/06/79	21:57:58	1453	-2	-3	-2	-1	-1	0	0	0	3	15	0	0	-1	2	0	-2	0	0	1	2
12/06/79	21:58:10	1456	-2	-2	-2	-1	-1	0	0	0	2	15	0	0	-1	2	0	-2	0	0	0	2
12/06/79	21:58:28	1458	-2	-2	-2	-1	-1	0	0	0	3	16	0	0	-1	2	0	-2	0	0	1	2
12/06/79	21:58:40	1460	-2	-2	-2	-1	-1	0	0	0	2	16	0	0	-1	2	0	-2	-1	0	1	2
12/06/79	21:58:59	1463	-2	-3	-2	-2	-1	0	0	0	2	14	0	0	-1	2	0	-2	0	0	1	3
12/06/79	21:59:11	1466	-2	-3	-2	-2	-1	0	0	0	2	15	0	0	-1	2	0	-2	0	0	1	3
12/06/79	21:59:30	1468	-2	-3	-2	-2	-1	0	0	0	2	15	0	0	-1	2	0	-2	0	0	1	3
12/06/79	21:59:44	1470	-2	-3	-3	-2	-1	0	0	0	2	15	0	0	-1	2	0	-2	0	0	1	3
12/06/79	21:59:50	1471	-2	-3	-2	-2	-1	0	0	0	2	15	0	0	-1	2	0	-2	0	0	1	3
12/06/79	22:00:20	1472	-2	-3	-2	-1	-1	0	0	0	2	15	0	0	-1	2	0	-2	0	0	1	3
12/06/79	22:00:24	1473	-2	-3	-3	-2	-1	0	0	0	2	15	0	0	-1	2	0	-2	0	0	1	3
12/06/79	22:01:20	1474	-2	-3	-3	-2	-1	0	0	0	2	14	0	0	-1	2	0	-2	0	0	1	3
12/06/79	22:01:39	1476	-2	-3	-2	-1	-1	0	0	0	2	16	0	0	-1	2	0	-2	-1	0	1	1
12/06/79	22:01:48	1478	-2	-3	-2	-1	-1	0	0	0	2	15	0	0	-1	2	0	-2	0	0	1	2
12/06/79	22:02:00	1479	-2	-2	-2	-1	-1	0	0	0	2	15	0	0	-1	2	0	-2	0	0	1	2
12/06/79	22:02:20	1481	-2	-3	-2	-1	-1	0	0	0	2	16	0	0	-1	2	-1	-2	0	0	0	2
12/06/79	22:02:48	1483	-2	-3	-3	-2	-1	0	0	0	2	15	0	0	-1	2	0	-2	-1	0	0	2
12/06/79	22:03:04	1485	-2	-3	-2	-1	-1	0	0	0	2	16	0	0	-1	1	0	-3	-1	-1	0	0
12/06/79	22:03:21	1486	-2	-3	-2	-2	-1	0	0	0	2	16	0	0	-1	2	-1	-2	-1	0	0	1
12/06/79	22:03:37	1487	-2	-3	-2	-2	-1	0	0	0	2	16	0	0	-1	1	0	-3	-1	0	0	1
12/06/79	22:03:54	1488	-2	-3	-2	-1	-1	0	0	0	3	16	0	0	-1	1	0	-2	-1	-1	0	1
12/06/79	22:04:18	1490	-2	-3	-2	-2	-1	0	0	0	2	16	0	0	-1	1	0	-3	-1	-1	0	1
12/06/79	22:04:22	1491	-2	-3	-2	-2	-1	0	0	0	2	15	0	0	-1	2	0	-2	0	0	1	2
12/06/79	22:04:50	1492	-2	-3	-2	-2	-1	0	0	0	2	15	0	0	-1	2	0	-2	0	0	0	3
12/06/79	22:05:09	1493	-3	-3	-3	-2	-1	-1	0	0	2	14	0	0	-1	2	0	-2	0	0	0	2
12/06/79	22:05:27	1494	-2	-3	-3	-2	-1	0	0	0	2	15	0	0	-1	2	0	-2	-1	0	0	1
12/06/79	22:05:32	1495	-2	-3	-3	-2	-1	0	0	0	2	15	0	0	-1	2	0	-3	-1	-1	0	1
12/06/79	22:05:59	1496	-2	-3	-3	-2	-1	0	0	0	2	15	0	0	-1	1	0	-2	-1	-1	0	1
12/06/79	22:06:16	1497	-2	-3	-3	-2	-1	0	0	0	2	15	0	0	-1	1	-1	-2	-1	-1	0	0
12/06/79	22:06:36	1498	-2	-3	-3	-2	-1	0	0	0	2	15	0	-1	-1	2	0	-3	-1	-1	0	1
12/06/79	22:06:40	1499	-2	-3	-3	-2	-1	0	0	0	2	15	0	0	-1	1	0	-3	-1	0	0	1
12/06/79	22:07:08	1501	-2	-3	-2	-2	-1	0	0	0	2	15	0	-1	-1	1	0	-2	-1	0	0	1
12/06/79	22:07:17	1502	-2	-3	-2	-1	-1	0	0	0	2	17	0	-1	-1	1	-1	-3	-2	-1	0	0
12/06/79	22:07:47	1503	-1	-2	-2	-1	0	0	1	0	3	18	0	0	-1	1	0	-3	-1	-1	0	0
12/06/79	22:07:57	1504	-1	-2	-2	-1	0	0	1	0	3	18	0	-1	-1	1	0	-3	-2	-1	0	0
12/06/79	22:08:27	1505	-1	-2	-2	-1	0	0	1	0	3	18	0	-1	-1	1	-1	-3	-2	-2	0	0
12/06/79	22:08:51	1506	-1	-2	-2	-1	0	0	2	8	0	3	0	-1	-2	1	0	-3	-1	-1	0	1
12/06/79	22:09:07	1507	-1	-2	-2	-1	0	0	2	10	0	2	0	-1	-2	1	-1	-3	-1	-1	0	1
12/06/79	22:09:17	1508	-1	-2	-2	-1	0	0	2	10	0	2	0	-1	-2	1	-1	-3	-1	0	0	1
12/06/79	22:09:48	1509	-1	-2	-2	-1	0	0	2	10	0	2	0	-1	-2	1	-1	-3	-1	0	0	1
12/06/79	22:09:57	1510	-1	-2	-2	-1	0	0	2	10	0	2	0	-1	-2	1	0	-3	-1	0	0	1
12/06/79	22:10:28	1511	-1	-2	-2	-1	0	0	2	10	0	2	-1	-1	-2	1	0	-3	-1	-1	0	1
12/06/79	22:25:30	1524	-1	-2	-2	-1	0	0	1	12	0	2	-1	-1	-2	1	-1	-3	-1	-1	0	1
12/06/79	22:33:56	1539	-2	-2	-2	-1	-1	0	1	11	1	2	-1	-1	-2	1	-1	-3	-1	-1	0	1
12/06/79	22:34:15	1540	-2	-2	-2	-1	-1	0	1	11	1	2	-1	-1	-2	1	0	-4	-1	-2	0	0
12/06/79	22:36:44	1541	-2	-2	-2	-1	0	0	0	1	3	19	0	-1	-1	1	0	-3	-1	-1	0	0
12/06/79	22:37:02	1542	-1	-2	-2	-1	-1	0	0	1	4	19	0	-1	-1	1	-1	-4	-1	-1	0	0

INTERFRAME VOLTAGES - IVTAN DATA
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DATE	TIME	RECN	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
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12/06/79	21:57:49	1451	0	0	1	15	6	18	19	22	19	41	28	31	41	41	34	62	17	70	27	52
12/06/79	21:57:58	1453	0	-1	1	15	7	18	20	22	20	43	27	30	40	39	34	60	15	71	26	50
12/06/79	21:58:10	1456	0	0	2	13	7	19	21	22	20	42	27	31	41	39	34	60	15	72	27	52
12/06/79	21:58:28	1458	0	0	1	14	7	18	20	21	21	41	27	33	41	40	35	60	15	72	25	52
12/06/79	21:58:40	1460	0	0	1	12	7	16	20	22	20	41	27	32	40	39	34	60	15	73	24	51
12/06/79	21:58:59	1463	1	0	4	16	8	19	23	22	22	42	29	34	42	42	34	64	17	74	29	50
12/06/79	21:59:11	1466	1	0	4	19	9	20	24	22	21	45	27	39	41	42	36	64	19	76	30	50
12/06/79	21:59:30	1468	1	0	4	19	8	19	24	22	22	46	28	39	41	42	37	65	15	77	31	49
12/06/79	21:59:44	1470	1	0	3	19	7	21	25	20	23	44	30	38	41	41	38	65	14	76	29	49
12/06/79	21:59:50	1471	1	0	3	19	8	20	24	20	23	44	29	37	42	43	33	68	15	77	28	47
12/06/79	22:00:20	1472	1	0	3	18	7	20	23	22	22	44	28	37	41	41	38	65	14	79	26	45
12/06/79	22:00:24	1473	1	0	3	20	7	20	24	22	22	44	28	38	42	42	36	64	15	77	29	44
12/06/79	22:01:20	1474	1	0	3	19	6	21	24	23	21	45	25	38	42	41	38	65	15	78	26	42
12/06/79	22:01:39	1476	0	-1	1	12	4	18	20	22	15	42	20	34	39	39	31	61	9	75	25	30
12/06/79	22:01:48	1478	0	-1	1	15	4	18	19	22	15	40	21	35	36	39	33	60	8	76	25	28
12/06/79	22:02:00	1479	0	-1	1	15	4	19	20	21	15	43	21	33	36	39	35	61	8	77	25	28
12/06/79	22:02:20	1481	0	-1	1	13	4	18	19	21	15	43	22	34	38	41	33	62	8	75	27	29
12/06/79	22:02:48	1483	0	-2	1	13	4	17	21	19	16	44	23	31	38	38	33	60	8	76	24	31
12/06/79	22:03:04	1485	-1	-5	0	5	2	13	16	14	10	40	20	27	34	32	29	55	4	71	17	27
12/06/79	22:03:21	1486	-1	-4	0	9	2	14	18	12	13	40	18	26	34	33	31	54	5	71	16	29
12/06/79	22:03:37	1487	-1	-5	0	7	2	13	18	12	14	39	18	25	35	33	29	56	5	73	15	30
12/06/79	22:03:54	1488	-1	-5	0	5	2	14	16	13	13	38	18	27	34	33	30	54	5	70	16	30
12/06/79	22:04:18	1490	-1	-5	0	7	2	13	17	12	13	39	14	27	34	34	30	55	5	73	15	34
12/06/79	22:04:22	1491	0	0	1	17	5	19	23	17	21	43	21	35	40	40	34	63	10	80	25	39
12/06/79	22:04:50	1492	0	0	2	15	5	19	24	15	21	43	21	34	37	41	34	63	13	75	29	39
12/06/79	22:05:09	1493	0	0	1	17	4	20	24	15	20	44	22	35	39	39	36	63	12	76	26	40
12/06/79	22:05:27	1494	-1	-4	0	5	2	14	19	12	13	40	15	27	35	34	30	54	5	72	20	33
12/06/79	22:05:32	1495	-1	-4	0	7	2	15	18	11	14	40	12	28	33	33	30	55	5	68	19	32
12/06/79	22:05:59	1496	-1	-6	0	7	2	13	18	10	12	40	13	28	32	33	30	55	5	70	17	32
12/06/79	22:06:16	1497	-1	-5	0	6	2	13	18	9	13	38	13	28	33	33	31	54	5	70	18	32
12/06/79	22:06:36	1498	-1	-5	0	5	2	14	18	9	15	38	14	26	32	34	30	56	5	69	17	30
12/06/79	22:06:40	1499	-1	-6	0	7	2	15	19	8	15	39	16	25	34	33	29	54	5	71	15	30
12/06/79	22:07:08	1501	-1	-4	0	7	2	15	18	7	18	37	16	23	34	34	29	54	5	70	14	31
12/06/79	22:07:17	1502	-1	-14	-1	0	1	9	13	4	9	32	11	18	28	27	24	47	3	63	10	25
12/06/79	22:07:47	1503	-1	-16	0	1	1	10	15	5	9	35	12	20	27	28	25	48	3	64	10	22
12/06/79	22:07:57	1504	-1	-16	-1	1	1	9	14	5	6	36	10	20	28	28	23	46	3	63	8	19
12/06/79	22:08:27	1505	-1	-19	-1	-1	1	6	12	3	5	34	9	18	24	27	23	42	2	59	7	18
12/06/79	22:08:51	1506	0	0	0	-6	1	7	12	4	4	34	8	19	23	27	22	43	2	61	7	15
12/06/79	22:09:07	1507	0	0	0	-8	1	6	13	3	4	34	10	17	24	26	23	45	2	63	8	13
12/06/79	22:09:17	1508	0	0	0	-8	1	8	12	3	4	33	10	18	21	27	23	43	2	62	10	13
12/06/79	22:09:48	1509	0	0	0	-13	1	5	13	2	4	33	11	17	21	28	24	42	2	62	9	13
12/06/79	22:09:57	1510	0	0	0	-9	1	6	13	2	5	32	12	18	21	27	23	42	2	62	9	12
12/06/79	22:10:28	1511	0	0	0	-11	1	6	11	2	4	32	10	16	22	27	23	42	2	62	8	12
12/06/79	22:25:30	1524	0	-1	-1	-28	0	0	5	2	1	25	11	9	10	20	17	26	2	44	6	9
12/06/79	22:33:56	1539	0	-1	-5	-1	1	9	14	10	10	36	23	13	27	28	28	36	7	57	14	23
12/06/79	22:34:15	1540	-2	-15	-2	0	1	10	15	9	10	35	21	13	28	30	28	37	8	56	13	25
12/06/79	22:36:44	1541	-2	-17	-1	0	1	8	17	6	19	33	21	12	28	30	29	40	11	57	12	21
12/06/79	22:37:02	1542	-2	-18	-2	-1	1	9	17	5	18	32	22	9	31	28	27	35	8	58	11	21

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DATE	TIME	RECN	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
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12/06/79	21:57:49	1451	25	72	36	24	69	42	60	46	61	44	59	32	77	14	62	58	62	25	73	68
12/06/79	21:57:58	1453	25	69	38	19	70	42	58	45	58	47	60	32	77	12	62	58	63	25	72	71
12/06/79	21:58:10	1456	24	72	41	17	72	42	60	45	59	51	57	31	76	12	60	59	62	25	75	71
12/06/79	21:58:28	1458	24	72	40	16	72	42	59	46	58	55	61	31	80	8	66	60	63	24	75	71
12/06/79	21:58:40	1460	25	70	40	17	71	40	61	46	58	52	61	31	80	7	66	59	65	23	78	73
12/06/79	21:58:59	1463	32	70	41	26	72	44	60	48	58	57	65	32	85	5	70	62	69	24	81	75
12/06/79	21:59:11	1466	35	70	41	24	73	46	62	49	60	64	64	33	83	9	71	62	68	25	81	74
12/06/79	21:59:30	1468	37	70	42	25	74	42	63	49	60	65	64	32	84	8	69	63	70	23	81	75
12/06/79	21:59:44	1470	40	71	43	22	75	43	61	49	59	65	63	32	85	6	71	64	70	22	84	76
12/06/79	21:59:50	1471	42	68	42	24	74	41	62	47	59	70	62	34	82	6	73	62	69	23	83	76
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12/06/79	22:00:24	1473	44	68	42	22	75	42	62	48	59	70	62	30	84	5	74	63	71	21	85	77
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12/06/79	22:01:48	1478	45	64	38	14	72	36	59	43	54	67	56	24	81	15	70	58	64	19	79	70
12/06/79	22:02:00	1479	44	67	39	13	72	39	58	45	54	65	56	24	80	13	70	57	63	18	79	70
12/06/79	22:02:20	1481	44	65	37	14	73	38	58	46	54	66	57	24	80	16	76	29	76	18	79	72
12/06/79	22:02:48	1483	41	64	36	12	72	38	55	42	51	63	53	23	74	14	62	14	116	43	93	61
12/06/79	22:03:04	1485	34	64	25	12	67	29	53	39	45	57	49	17	69	11	55	17	55	95	85	78
12/06/79	22:03:21	1486	32	63	19	17	68	29	55	38	47	58	50	16	71	11	57	17	50	100	85	80
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12/06/79	22:05:32	1495	24	65	17	14	66	32	51	38	44	58	48	16	68	14	54	12	104	53	74	76
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12/06/79	22:07:08	1501	28	68	13	16	68	32	50	36	45	57	50	13	72	12	54	13	104	51	75	75
12/06/79	22:07:17	1502	17	61	8	10	59	24	44	30	37	49	41	11	58	9	49	15	66	30	54	56
12/06/79	22:07:47	1503	21	64	8	11	60	26	44	31	38	49	41	14	62	11	52	21	48	20	49	48
12/06/79	22:07:57	1504	22	63	5	11	61	22	44	31	36	48	40	13	58	13	49	19	49	18	52	47
12/06/79	22:08:27	1505	19	62	3	10	58	21	41	28	35	45	37	12	51	13	44	16	48	16	48	45
12/06/79	22:08:51	1506	18	59	4	9	58	20	42	28	34	43	37	12	54	12	44	17	50	15	51	45
12/06/79	22:09:07	1507	21	61	4	9	57	19	42	29	33	46	36	12	52	13	42	37	40	13	49	44
12/06/79	22:09:17	1508	19	62	3	9	58	21	42	29	34	45	37	12	53	13	39	35	40	12	48	44
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12/06/79	22:10:28	1511	16	65	2	7	59	20	41	28	35	45	35	11	53	11	39	34	40	14	48	43
12/06/79	22:25:30	1524	8	45	2	5	41	8	30	20	23	21	22	9	31	10	20	19	24	4	27	22
12/06/79	22:33:56	1539	19	55	13	14	55	20	43	29	37	30	34	17	49	13	33	33	38	15	43	36
12/06/79	22:34:15	1540	18	55	12	13	55	19	44	29	34	33	35	16	48	14	36	34	38	15	42	35
12/06/79	22:36:44	1541	16	55	13	13	53	17	44	28	34	30	33	17	47	11	34	32	35	14	40	35
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DATE	TIME	RECN	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
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12/06/79	21:57:49	1451	15	79	31	70	42	28	85	21	40	67	48	54	83	47	46	69	55	40	53	47
12/06/79	21:57:58	1453	14	79	32	67	42	25	83	20	39	72	48	57	77	46	45	67	52	41	53	46
12/06/79	21:58:10	1456	14	80	31	67	44	22	85	20	36	70	45	58	77	46	48	67	52	40	58	44
12/06/79	21:58:28	1458	13	83	31	68	46	15	89	20	37	74	43	59	79	46	50	67	50	41	53	43
12/06/79	21:58:40	1460	12	82	32	69	45	15	90	21	38	75	43	35	86	44	53	68	47	40	56	44
12/06/79	21:58:59	1463	15	83	34	73	48	17	95	22	42	78	49	68	81	47	55	71	49	42	60	45
12/06/79	21:59:11	1466	17	85	31	73	51	14	96	21	42	79	48	69	77	49	54	68	53	40	56	48
12/06/79	21:59:30	1468	16	84	34	71	52	14	95	24	43	82	49	63	83	48	52	69	54	40	59	47
12/06/79	21:59:44	1470	16	86	34	74	55	13	94	25	44	87	50	22	94	50	52	69	54	39	63	45
12/06/79	21:59:50	1471	16	86	33	75	52	13	98	27	48	52	66	15	101	54	49	71	58	39	62	46
12/06/79	22:00:20	1472	15	86	32	73	51	12	94	29	47	81	62	11	101	51	46	71	57	37	62	48
12/06/79	22:00:24	1473	14	85	31	73	55	12	98	28	46	82	63	10	102	53	47	71	58	36	62	46
12/06/79	22:01:20	1474	14	86	30	74	52	13	93	25	46	85	59	9	102	56	46	68	63	33	64	45
12/06/79	22:01:39	1476	8	87	18	71	52	10	88	18	32	79	54	9	99	51	36	68	62	28	60	41
12/06/79	22:01:48	1478	24	82	18	71	55	9	89	16	32	82	59	8	97	48	37	68	59	29	60	42
12/06/79	22:02:00	1479	25	81	18	69	55	10	89	15	33	77	58	8	95	51	38	68	62	29	59	43
12/06/79	22:02:20	1481	22	84	16	73	52	12	89	14	36	78	55	8	94	53	31	68	64	31	55	43
12/06/79	22:02:48	1483	56	86	42	79	60	43	87	57	54	57	51	24	108	62	52	76	62	41	70	54
12/06/79	22:03:04	1485	44	86	42	78	62	18	97	52	47	83	62	70	83	59	50	75	68	42	70	52
12/06/79	22:03:21	1486	41	89	41	81	69	22	45	84	47	84	59	71	86	58	50	72	71	41	71	51
12/06/79	22:03:37	1487	39	87	41	76	67	16	90	79	31	87	57	75	81	59	47	73	71	40	69	51
12/06/79	22:03:54	1488	38	92	31	81	71	12	95	76	22	93	58	63	88	59	49	72	73	38	68	53
12/06/79	22:04:18	1490	34	91	41	75	73	13	96	74	23	92	62	39	98	61	49	75	73	38	69	52
12/06/79	22:04:22	1491	31	95	33	77	72	13	96	73	23	88	60	74	81	59	43	76	76	35	67	52
12/06/79	22:04:50	1492	29	95	26	84	73	14	96	75	22	90	63	63	85	63	43	75	72	38	68	53
12/06/79	22:05:09	1493	25	98	17	82	70	13	89	72	24	84	59	73	78	60	38	73	71	36	66	52
12/06/79	22:05:27	1494	22	91	15	83	64	8	90	66	19	81	55	70	75	58	31	75	69	33	67	46
12/06/79	22:05:32	1495	22	94	15	79	62	9	87	64	18	83	55	64	78	58	29	73	70	32	63	46
12/06/79	22:05:59	1496	21	92	16	79	63	11	86	63	20	82	54	68	75	56	34	69	68	31	65	48
12/06/79	22:06:16	1497	19	94	17	77	62	12	85	62	22	83	53	68	75	59	31	73	68	31	61	48
12/06/79	22:06:36	1498	21	92	16	79	60	14	86	62	22	82	56	63	77	57	31	72	68	30	67	48
12/06/79	22:06:40	1499	21	92	15	79	64	11	88	61	22	79	55	61	80	58	34	72	68	29	68	49
12/06/79	22:07:08	1501	23	92	16	79	62	11	86	62	21	81	56	73	73	55	36	73	68	31	65	48
12/06/79	22:07:17	1502	17	66	12	58	45	2	58	43	12	55	34	45	59	44	26	59	55	16	52	36
12/06/79	22:07:47	1503	13	60	7	51	39	2	55	37	3	51	26	34	55	32	24	53	48	12	42	34
12/06/79	22:07:57	1504	12	61	3	52	38	2	52	36	4	53	29	24	60	33	27	51	49	13	39	33
12/06/79	22:08:27	1505	10	58	4	47	37	2	51	34	4	49	28	19	58	28	33	46	45	11	37	31
12/06/79	22:08:51	1506	10	59	4	46	34	2	49	34	4	49	26	15	59	27	34	47	47	11	36	32
12/06/79	22:09:07	1507	9	57	4	47	36	2	52	31	4	45	22	38	49	26	32	49	46	10	34	32
12/06/79	22:09:17	1508	9	56	4	48	34	2	54	30	4	43	21	39	49	25	34	47	45	10	33	32
12/06/79	22:09:48	1509	9	60	4	51	33	2	54	29	4	51	22	41	50	26	32	44	47	11	34	33
12/06/79	22:09:57	1510	9	53	3	46	35	2	53	24	4	50	17	36	48	24	33	46	47	8	34	31
12/06/79	22:10:28	1511	9	57	4	49	35	2	54	20	5	49	22	40	49	25	35	45	48	7	36	30
12/06/79	22:25:30	1524	5	32	2	20	17	2	26	12	2	24	3	15	28	13	13	28	22	9	16	20
12/06/79	22:33:56	1539	14	46	12	35	30	4	46	23	3	44	15	29	40	23	25	37	31	19	26	33
12/06/79	22:34:15	1540	15	46	12	33	31	4	43	25	3	42	16	31	44	22	27	39	32	19	28	30
12/06/79	22:36:44	1541	17	43	14	34	25	12	42	21	6	42	11	24	43	22	24	39	30	20	29	27
12/06/79	22:37:02	1542	16	42	13	33	24	12	41	21	6	44	14	29	43	22	23	37	32	21	25	28

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DATE	TIME	RECN	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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12/06/79	21:57:49	1451	44	46	40	49	48	44	44	36	53	36	46	51	35	36	42	60	31	36	37	38
12/06/79	21:57:58	1453	43	43	39	47	50	44	44	35	54	36	45	50	36	32	43	60	31	35	37	35
12/06/79	21:58:10	1456	45	47	39	49	48	45	43	37	54	35	46	50	36	32	44	60	30	34	37	35
12/06/79	21:58:28	1458	46	46	40	49	49	45	43	37	51	35	45	48	38	31	44	60	30	36	36	33
12/06/79	21:58:40	1460	43	46	39	53	49	43	46	36	54	35	45	50	40	30	44	61	30	35	37	35
12/06/79	21:58:59	1463	46	47	43	58	50	47	47	37	59	37	47	52	46	34	51	66	32	38	41	41
12/06/79	21:59:11	1466	48	46	44	58	50	47	48	40	58	41	50	53	44	37	50	62	35	37	42	41
12/06/79	21:59:30	1468	47	44	46	59	50	49	49	39	59	41	48	52	44	36	49	67	32	35	43	40
12/06/79	21:59:44	1470	47	45	46	59	51	48	48	40	56	42	49	53	43	37	48	67	31	34	42	41
12/06/79	21:59:50	1471	46	46	43	61	50	49	48	41	55	44	49	54	44	36	50	61	34	36	41	43
12/06/79	22:00:20	1472	47	43	43	58	51	50	50	40	51	48	48	54	46	36	48	65	32	38	41	40
12/06/79	22:00:24	1473	50	45	42	61	46	52	51	40	52	47	47	56	46	36	51	68	32	38	42	38
12/06/79	22:01:20	1474	48	47	43	59	52	50	50	37	53	46	48	56	45	37	50	68	32	35	43	38
12/06/79	22:01:39	1476	45	45	37	53	47	45	44	30	52	37	41	48	39	27	43	60	27	30	36	31
12/06/79	22:01:48	1478	44	45	38	53	44	46	46	30	53	36	43	48	40	30	42	63	29	30	38	31
12/06/79	22:02:00	1479	43	46	38	54	44	46	45	31	52	39	43	48	42	29	44	62	29	30	38	32
12/06/79	22:02:20	1481	43	45	36	55	45	47	46	30	53	38	44	45	41	29	45	63	29	32	37	29
12/06/79	22:02:48	1483	57	56	51	68	55	58	61	47	69	59	63	93	7	23	42	61	28	33	35	31
12/06/79	22:03:04	1485	61	57	50	66	53	60	61	49	65	61	65	93	3	22	40	59	26	35	33	30
12/06/79	22:03:21	1486	62	54	49	68	60	60	59	47	68	61	64	94	4	23	42	60	27	32	35	32
12/06/79	22:03:37	1487	62	55	49	67	58	61	59	47	64	62	64	96	3	23	40	62	25	31	37	26
12/06/79	22:03:54	1488	62	52	49	68	58	61	60	44	64	62	64	95	4	25	41	59	27	29	39	30
12/06/79	22:04:18	1490	61	57	50	69	56	62	58	44	69	59	64	91	5	23	37	62	28	27	39	31
12/06/79	22:04:22	1491	59	55	45	73	59	60	59	40	66	58	63	99	0	23	40	58	28	27	39	29
12/06/79	22:04:50	1492	60	54	43	71	60	61	60	45	36	70	70	95	-1	22	40	57	28	27	39	29
12/06/79	22:05:09	1493	56	50	41	65	58	57	57	39	51	56	58	62	48	40	53	69	35	40	46	44
12/06/79	22:05:27	1494	55	54	37	64	55	57	52	33	56	46	56	61	47	42	53	69	34	38	45	42
12/06/79	22:05:32	1495	52	52	38	63	52	55	51	32	56	39	52	50	61	51	60	74	38	42	50	48
12/06/79	22:05:59	1496	50	51	41	62	56	55	52	30	58	37	50	49	65	50	62	73	37	44	50	48
12/06/79	22:06:16	1497	47	51	38	62	56	53	51	32	58	36	51	47	67	50	62	71	37	42	50	48
12/06/79	22:06:36	1498	50	50	38	61	54	54	51	33	57	38	49	49	64	50	59	73	37	45	47	49
12/06/79	22:06:40	1499	51	53	38	64	52	56	50	34	58	38	51	48	65	50	61	70	39	43	49	48
12/06/79	22:07:08	1501	49	52	36	63	54	53	54	35	55	38	50	50	66	48	61	71	38	47	48	48
12/06/79	22:07:17	1502	35	39	26	42	40	37	36	21	34	25	33	13	81	57	63	70	38	46	44	44
12/06/79	22:07:47	1503	29	37	18	39	33	33	30	17	30	23	29	33	23	14	26	34	15	15	21	16
12/06/79	22:07:57	1504	31	37	18	40	34	33	29	17	33	21	31	34	22	15	26	36	16	14	21	16
12/06/79	22:08:27	1505	29	36	14	40	31	30	28	16	31	18	29	31	19	13	22	33	14	14	17	14
12/06/79	22:08:51	1506	29	34	16	38	30	30	29	17	30	19	28	31	18	11	21	30	14	12	16	13
12/06/79	22:09:07	1507	32	33	13	38	31	28	27	17	29	18	28	29	19	11	21	31	13	12	15	13
12/06/79	22:09:17	1508	30	32	15	38	31	29	26	18	29	18	29	28	20	11	20	33	13	14	14	14
12/06/79	22:09:48	1509	31	33	15	40	29	28	28	18	28	19	27	30	18	10	19	30	14	14	17	13
12/06/79	22:09:57	1510	29	33	12	40	29	30	27	18	26	18	27	25	27	12	24	32	15	14	19	15
12/06/79	22:10:28	1511	30	33	15	37	32	27	27	18	27	18	28	26	26	11	23	33	17	16	20	13
12/06/79	22:25:30	1524	2	21	8	17	18	16	12	12	13	4	15	5	21	6	10	14	-2	10	4	10
12/06/79	22:33:56	1539	22	26	16	29	25	25	20	20	19	14	21	14	28	13	18	26	1	14	15	15
12/06/79	22:34:15	1540	22	26	16	25	26	25	19	21	20	16	21	14	27	13	20	21	3	13	16	18
12/06/79	22:36:44	1541	21	25	14	24	28	20	19	20	20	11	19	18	23	10	17	23	0	12	15	14
12/06/79	22:37:02	1542	22	24	14	26	27	21	20	20	18	13	20	17	27	14	17	20	3	12	14	14

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DATE	TIME	RECN	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
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12/06/79	21:57:49	1451	36	33	35	37	34	27	29	42	28	30	13	33	21	0	33	13	22	17	21	37
12/06/79	21:57:58	1453	36	32	34	35	34	26	30	43	28	26	13	32	21	0	34	13	21	18	21	33
12/06/79	21:58:10	1456	35	33	33	37	33	27	30	43	30	26	13	33	22	0	34	12	22	17	20	37
12/06/79	21:58:28	1458	38	33	34	37	33	26	30	43	32	23	14	33	20	0	34	13	23	17	21	39
12/06/79	21:58:40	1460	38	33	34	38	30	27	30	45	32	23	15	34	18	0	34	14	25	16	21	37
12/06/79	21:58:59	1463	42	39	40	39	40	34	34	50	38	29	27	34	27	1	39	20	28	19	28	42
12/06/79	21:59:11	1466	42	37	40	42	38	33	36	49	36	27	32	29	27	1	39	20	29	20	26	41
12/06/79	21:59:30	1468	41	37	39	40	40	30	35	49	37	26	33	26	28	3	39	19	30	19	25	40
12/06/79	21:59:44	1470	41	37	39	42	41	30	35	49	35	27	33	28	22	11	36	19	28	21	26	39
12/06/79	21:59:50	1471	39	37	39	41	40	29	34	50	35	28	32	27	20	14	33	20	29	21	25	44
12/06/79	22:00:20	1472	42	38	39	43	40	31	36	52	34	28	32	25	23	19	30	22	29	22	25	40
12/06/79	22:00:24	1473	42	38	39	42	40	31	34	51	34	28	32	24	23	20	28	22	29	20	26	39
12/06/79	22:01:20	1474	44	39	40	44	41	30	36	52	35	27	33	24	21	21	25	23	30	18	27	44
12/06/79	22:01:39	1476	37	29	34	36	32	22	31	46	28	22	26	20	16	13	22	15	23	12	19	37
12/06/79	22:01:48	1478	37	30	33	35	33	23	28	46	28	22	27	19	16	13	23	14	25	11	20	33
12/06/79	22:02:00	1479	38	29	35	37	34	27	30	46	27	23	26	21	17	14	23	17	25	12	22	37
12/06/79	22:02:20	1481	41	30	35	37	33	26	30	46	27	22	25	21	17	13	24	17	24	13	20	35
12/06/79	22:02:48	1483	41	28	36	38	33	26	29	48	27	26	23	21	17	17	21	16	28	6	27	36
12/06/79	22:03:04	1485	38	29	35	38	33	23	30	46	29	25	23	22	14	17	21	17	25	11	22	35
12/06/79	22:03:21	1486	37	34	33	37	31	24	30	46	29	24	23	20	13	19	18	15	26	14	20	38
12/06/79	22:03:37	1487	40	35	34	38	30	24	32	47	30	25	25	21	12	21	18	17	27	11	20	36
12/06/79	22:03:54	1488	38	37	33	40	31	24	31	45	32	25	23	21	16	20	21	16	28	9	23	37
12/06/79	22:04:18	1490	37	34	33	41	29	26	30	44	33	25	22	22	15	18	22	13	28	12	22	37
12/06/79	22:04:22	1491	39	31	34	40	31	21	31	45	31	25	22	22	16	18	24	12	28	14	23	36
12/06/79	22:04:50	1492	39	30	31	39	31	23	29	46	31	24	22	21	15	16	26	11	27	12	22	38
12/06/79	22:05:09	1493	46	41	40	46	44	35	39	54	39	30	37	30	21	24	36	23	32	25	27	41
12/06/79	22:05:27	1494	46	44	40	46	43	33	36	53	38	30	35	30	21	24	35	21	34	22	29	42
12/06/79	22:05:32	1495	50	48	44	51	48	37	41	61	44	34	39	38	24	27	40	27	38	28	32	49
12/06/79	22:05:59	1496	51	48	44	51	48	39	40	59	42	35	40	35	23	28	37	28	39	26	32	47
12/06/79	22:06:16	1497	50	48	43	52	46	40	38	60	43	34	40	35	23	28	38	26	38	28	32	49
12/06/79	22:06:36	1498	51	47	42	53	46	39	39	60	42	37	39	33	26	26	40	27	38	26	32	49
12/06/79	22:06:40	1499	50	48	42	54	45	40	40	60	44	35	40	35	24	27	41	26	37	29	33	49
12/06/79	22:07:08	1501	50	47	42	52	45	40	38	60	44	35	39	36	24	27	39	24	37	27	33	49
12/06/79	22:07:17	1502	43	42	39	46	40	33	36	48	37	28	31	28	16	19	31	19	26	19	19	34
12/06/79	22:07:47	1503	19	17	8	22	16	6	12	21	13	3	6	8	-1	2	8	0	2	0	0	15
12/06/79	22:07:57	1504	18	21	4	24	16	6	13	20	13	1	7	7	-1	1	9	0	1	0	0	10
12/06/79	22:08:27	1505	15	18	2	22	13	3	11	19	10	0	3	6	-1	0	5	0	0	0	-1	8
12/06/79	22:08:51	1506	15	19	1	20	13	2	10	17	10	0	2	2	-1	1	1	0	0	0	-1	7
12/06/79	22:09:07	1507	11	20	1	20	13	2	10	17	10	0	1	0	-1	2	0	0	0	0	-1	1
12/06/79	22:09:17	1508	10	18	1	19	12	1	8	18	7	0	1	0	-1	0	0	0	0	0	-1	2
12/06/79	22:09:48	1509	11	17	0	17	14	2	8	15	7	0	1	0	-1	0	0	0	0	0	-1	0
12/06/79	22:09:57	1510	14	20	1	20	15	4	12	20	10	0	6	1	-1	1	2	0	0	0	-1	10
12/06/79	22:10:28	1511	16	20	1	21	14	5	10	19	10	0	6	2	-1	0	6	0	0	0	0	13
12/06/79	22:25:30	1524	0	4	0	3	1	0	0	0	2	0	0	-9	-13	0	0	-2	-1	-19	-4	-15
12/06/79	22:33:56	1539	7	14	0	20	5	0	0	18	2	0	0	0	-2	0	0	-1	0	-2	-2	-9
12/06/79	22:34:15	1540	9	15	0	17	5	0	0	11	2	0	0	0	-2	0	0	-1	0	0	-1	-6
12/06/79	22:36:44	1541	6	15	0	17	3	1	0	13	2	0	0	0	-2	0	0	-1	0	-1	-4	-18
12/06/79	22:37:02	1542	9	13	0	16	3	1	0	13	3	0	0	-1	-3	0	0	-1	0	0	-2	-14

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DATE	TIME	RECN	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
12/06/79	21:57:34	1450	0	24	2	0	2	2	1	1	1	0	1	7	1	0	-23	0	-1	1	1	0
12/06/79	21:57:49	1451	1	28	4	0	11	2	9	1	1	0	1	8	1	0	-22	0	-2	1	1	0
12/06/79	21:57:58	1453	1	26	7	0	12	2	10	1	1	1	2	9	1	0	-23	0	-2	1	1	0
12/06/79	21:58:10	1456	1	24	11	0	14	2	11	1	2	1	1	6	1	0	-24	0	-2	1	1	0
12/06/79	21:58:28	1458	1	21	11	0	18	2	10	1	4	1	1	5	1	0	-23	0	-2	1	1	0
12/06/79	21:58:40	1460	1	21	11	0	22	2	6	1	4	1	2	7	0	0	-24	0	-2	1	1	0
12/06/79	21:58:59	1463	2	30	15	0	33	2	12	2	10	1	2	13	1	0	-16	0	-1	2	1	0
12/06/79	21:59:11	1466	2	31	15	0	28	2	0	2	9	1	3	12	1	0	-17	0	-2	2	1	0
12/06/79	21:59:30	1468	3	26	17	0	28	2	0	2	9	1	3	11	1	0	-18	0	-1	2	1	0
12/06/79	21:59:44	1470	9	25	18	0	27	2	25	1	10	1	3	12	1	0	-15	0	-1	1	1	0
12/06/79	21:59:50	1471	2	20	27	0	23	2	13	1	9	1	3	11	1	0	-17	0	-2	2	1	0
12/06/79	22:00:20	1472	12	17	30	0	24	2	12	3	11	1	4	11	1	0	-13	0	-1	2	1	0
12/06/79	22:00:24	1473	12	17	30	0	24	2	23	1	11	2	4	10	1	1	-14	0	-1	1	1	0
12/06/79	22:01:20	1474	12	17	28	0	24	2	20	9	9	2	4	12	1	1	-17	0	-2	1	1	0
12/06/79	22:01:39	1476	4	14	21	0	13	2	9	14	1	1	3	5	1	0	-24	0	-2	1	1	0
12/06/79	22:01:48	1478	4	13	21	0	15	2	0	14	0	1	2	5	0	0	-24	0	-2	1	1	0
12/06/79	22:02:00	1479	3	13	22	0	15	2	12	14	0	1	3	5	1	0	-25	0	-2	1	1	0
12/06/79	22:02:20	1481	8	13	20	0	12	2	5	15	0	1	3	5	0	0	-24	0	-2	1	1	0
12/06/79	22:02:48	1483	12	13	23	0	15	2	7	20	1	1	4	5	0	0	-24	0	-1	1	1	0
12/06/79	22:03:04	1485	11	14	20	0	14	2	5	21	0	1	3	3	0	0	-26	0	-2	1	1	0
12/06/79	22:03:21	1486	6	13	21	0	13	2	6	21	1	1	4	3	0	0	-26	0	-2	1	1	0
12/06/79	22:03:37	1487	11	14	21	0	13	2	4	23	1	1	4	4	0	0	-24	0	-2	1	1	0
12/06/79	22:03:54	1488	10	16	21	0	14	3	5	23	1	1	5	2	0	0	-24	0	-2	1	1	0
12/06/79	22:04:18	1490	3	16	19	0	13	2	6	20	1	1	4	3	0	0	-25	-1	-1	1	1	0
12/06/79	22:04:22	1491	6	17	14	0	23	2	8	21	1	2	6	2	0	0	-25	-1	-1	1	1	0
12/06/79	22:04:50	1492	10	16	11	0	22	2	5	19	1	1	4	2	0	0	-25	-1	-2	1	1	0
12/06/79	22:05:09	1493	20	24	28	0	30	2	0	24	6	2	11	10	1	0	-8	0	-1	1	1	0
12/06/79	22:05:27	1494	18	23	26	0	32	2	13	23	6	2	13	10	1	1	-11	0	0	1	1	0
12/06/79	22:05:32	1495	25	29	32	0	39	3	0	26	12	10	15	13	2	2	0	0	0	2	1	0
12/06/79	22:05:59	1496	26	28	32	0	39	3	2	26	11	10	15	13	2	2	0	0	0	1	2	0
12/06/79	22:06:16	1497	23	30	30	0	39	2	0	28	12	11	14	12	2	2	0	0	0	1	2	0
12/06/79	22:06:36	1498	21	32	30	0	37	2	0	27	11	11	15	13	2	2	0	0	-1	2	1	0
12/06/79	22:06:40	1499	22	31	30	0	38	4	22	28	12	11	16	12	3	2	0	0	0	2	1	0
12/06/79	22:07:08	1501	22	32	29	0	35	11	15	24	12	12	14	12	2	1	-1	0	-1	1	1	0
12/06/79	22:07:17	1502	12	19	19	0	17	8	9	15	1	2	3	1	0	0	-21	-1	-2	1	1	0
12/06/79	22:07:47	1503	0	1	0	0	-1	1	0	0	0	0	-6	-1	0	-1	-42	-2	-2	1	1	0
12/06/79	22:07:57	1504	0	0	0	0	-1	1	0	0	0	0	-10	0	-1	-3	-42	-1	-2	1	1	0
12/06/79	22:08:27	1505	0	0	0	0	-1	1	0	0	0	-1	-10	0	-1	-5	-45	-3	-2	1	1	0
12/06/79	22:08:51	1506	0	0	0	0	-1	1	0	0	0	-1	-29	0	0	0	0	0	0	1	1	0
12/06/79	22:09:07	1507	0	0	0	0	-1	1	0	0	0	-1	-27	0	0	0	0	0	0	2	1	0
12/06/79	22:09:17	1508	0	0	0	0	-1	0	-1	0	0	-1	-34	0	0	0	0	0	0	1	1	0
12/06/79	22:09:48	1509	0	0	0	0	-1	0	0	0	0	-1	-31	0	0	0	0	0	0	2	1	0
12/06/79	22:09:57	1510	0	0	0	0	-1	1	0	0	0	-1	-27	0	1	0	0	0	0	2	1	0
12/06/79	22:10:28	1511	0	0	0	0	-1	1	0	0	0	-1	-33	0	0	0	0	0	0	1	1	0
12/06/79	22:25:30	1524	0	-20	-1	0	-2	0	0	0	-32	0	-39	-1	0	0	0	0	0	2	1	0
12/06/79	22:33:56	1539	0	-7	-2	0	-1	0	0	0	-28	0	-42	-1	0	0	0	0	-1	2	1	0
12/06/79	22:34:15	1540	0	-3	0	0	-1	0	-11	0	-22	0	-31	-15	0	0	0	0	-1	2	1	0
12/06/79	22:36:44	1541	-1	-4	0	0	-1	0	0	0	-22	0	-24	-14	-7	-17	-44	-3	-2	1	1	0
12/06/79	22:37:02	1542	-1	-3	0	0	-1	0	-19	0	-24	0	-21	-13	-5	-17	-47	-2	-3	1	1	0

INTERFRAME VOLTAGES - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
12/06/79	21:57:34	1450	0	1	2	1	1	15	15	9	3	-4	-7	-6	-4	-3	-2	-2	-2	-1	-2	-1
12/06/79	21:57:49	1451	0	0	2	1	1	14	14	8	3	-4	-8	-6	-4	-3	-2	-2	-2	-1	-2	-2
12/06/79	21:57:58	1453	0	0	2	1	1	15	15	8	3	-4	-7	-6	-4	-3	-2	-2	-2	-2	-2	-2
12/06/79	21:58:10	1456	0	0	3	1	1	15	15	8	3	-4	-8	-6	-4	-3	-2	-2	-2	-1	-2	-1
12/06/79	21:58:28	1458	0	0	2	1	1	14	14	10	3	-4	-7	-6	-5	-3	-2	-2	-2	-1	-2	-2
12/06/79	21:58:40	1460	0	0	3	1	1	14	14	10	3	-4	-8	-6	-4	-4	-2	-2	-2	-2	-2	-2
12/06/79	21:58:59	1463	0	0	2	0	2	15	15	8	3	-5	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	21:59:11	1466	0	0	2	0	1	14	14	9	3	-4	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	21:59:30	1468	0	0	1	0	1	14	14	10	3	-4	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	21:59:44	1470	0	0	1	0	1	16	16	7	3	-4	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	21:59:50	1471	0	0	2	0	0	16	16	6	3	-4	-8	-7	-5	-4	-3	-2	-3	-2	-2	-2
12/06/79	22:00:20	1472	0	0	1	1	1	14	14	10	3	-4	-8	-7	-5	-4	-3	-2	-2	-2	-2	-3
12/06/79	22:00:24	1473	0	0	1	0	1	16	16	7	3	-5	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	22:01:20	1474	0	0	1	0	1	14	15	10	3	-4	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	22:01:39	1476	0	1	1	0	1	15	15	9	3	-4	-8	-7	-5	-4	-2	-2	-2	-1	-2	-1
12/06/79	22:01:48	1478	0	0	2	1	1	15	15	8	3	-4	-8	-7	-5	-4	-2	-2	-2	-2	-2	-2
12/06/79	22:02:00	1479	0	0	1	1	0	15	16	9	3	-4	-8	-7	-4	-3	-2	-2	-2	-1	-1	-2
12/06/79	22:02:20	1481	0	0	2	0	1	15	15	7	3	-4	-8	-7	-5	-3	-2	-2	-2	-1	-2	-2
12/06/79	22:02:48	1483	0	0	1	0	1	14	14	11	3	-4	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	22:03:04	1485	0	0	2	0	1	15	16	10	3	-5	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	22:03:21	1486	0	0	2	0	1	16	16	9	3	-5	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	22:03:37	1487	0	0	2	0	1	15	14	12	3	-4	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	22:03:54	1488	0	0	1	1	1	15	15	11	3	-4	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	22:04:18	1490	0	0	2	1	1	16	16	10	3	-5	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	22:04:22	1491	0	0	1	0	1	16	16	12	3	-4	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	22:04:50	1492	0	0	2	0	0	15	15	11	3	-4	-8	-7	-5	-4	-3	-3	-3	-2	-2	-2
12/06/79	22:05:09	1493	0	0	1	0	1	16	16	9	3	-4	-8	-7	-5	-4	-3	-3	-2	-2	-2	-2
12/06/79	22:05:27	1494	0	0	3	0	0	15	15	9	3	-4	-8	-7	-5	-4	-3	-3	-3	-2	-2	-2
12/06/79	22:05:32	1495	0	0	2	0	1	15	15	9	3	-4	-8	-8	-5	-4	-3	-3	-3	-2	-2	-2
12/06/79	22:05:59	1496	0	0	2	0	0	14	15	9	3	-4	-8	-8	-5	-4	-3	-3	-2	-2	-2	-3
12/06/79	22:06:16	1497	0	0	2	0	0	16	16	7	3	-4	-8	-8	-5	-4	-3	-3	-3	-2	-2	-3
12/06/79	22:06:36	1498	0	0	2	0	0	14	14	9	3	-4	-8	-7	-5	-4	-3	-3	-3	-2	-2	-2
12/06/79	22:06:40	1499	0	0	2	0	1	15	14	8	3	-4	-8	-8	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	22:07:08	1501	0	0	3	0	1	15	15	8	3	-4	-8	-7	-5	-4	-3	-2	-2	-2	-2	-2
12/06/79	22:07:17	1502	0	1	1	1	1	16	16	9	3	-3	-7	-6	-4	-3	-2	-2	-1	-1	-1	-1
12/06/79	22:07:47	1503	0	0	2	1	1	17	17	9	3	-3	-6	-6	-4	-2	-1	-1	-1	0	-1	0
12/06/79	22:07:57	1504	0	1	2	1	1	17	17	9	3	-3	-7	-6	-4	-3	-1	-1	-1	0	-1	0
12/06/79	22:08:27	1505	0	0	3	1	1	18	18	8	3	-3	-7	-6	-4	-2	-1	-1	-1	0	-1	0
12/06/79	22:08:51	1506	0	1	2	1	1	17	16	8	3	-3	-7	-5	-4	-3	-1	-1	-1	0	-1	0
12/06/79	22:09:07	1507	0	1	2	1	1	16	17	8	3	-3	-7	-5	-4	-2	-1	-1	-1	0	-1	0
12/06/79	22:09:17	1508	0	1	1	1	1	17	16	7	3	-3	-7	-5	-4	-2	-1	-1	-1	0	-1	0
12/06/79	22:09:48	1509	0	1	2	1	1	16	16	8	3	-3	-7	-5	-4	-2	-1	-1	-1	0	0	0
12/06/79	22:09:57	1510	0	1	1	1	1	17	17	7	3	-4	-7	-6	-4	-3	-1	-1	-1	0	-1	0
12/06/79	22:10:28	1511	0	1	1	3	1	16	16	8	3	-4	-7	-6	-4	-3	-1	-1	-1	0	-1	0
12/06/79	22:25:30	1524	0	0	2	3	1	23	23	9	3	-3	-6	-7	-6	-4	-1	-2	-1	0	0	0
12/06/79	22:33:56	1539	0	1	3	0	2	21	21	14	3	-3	-7	-8	-7	-4	-2	-2	-1	-1	-2	-2
12/06/79	22:34:15	1540	0	1	3	1	2	21	21	12	3	-3	-7	-8	-6	-4	-2	-2	-1	-1	-1	-2
12/06/79	22:36:44	1541	0	0	3	0	1	23	23	14	3	-3	-7	-7	-6	-4	-2	-2	-1	-1	-2	-2
12/06/79	22:37:02	1542	0	1	4	0	2	23	23	11	3	-3	-7	-7	-6	-4	-2	-2	-1	-1	-1	-2

INTERFRAME VOLTAGES - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
12/07/79	00:21:05	1850	-1	-2	-2	-1	0	0	0	0	2	12	1	0	-2	1	-1	-4	-2	-3	0	0
12/07/79	00:21:28	1851	-1	-2	-2	-1	0	0	0	0	2	11	1	0	-2	0	-2	-5	-3	-3	-1	0
12/07/79	00:25:04	1852	-1	-2	-2	-1	0	0	0	0	3	11	1	0	-2	1	-1	-4	-2	-2	-1	0
12/07/79	00:25:23	1853	-1	-2	-2	-1	0	0	0	0	3	11	1	0	-2	1	-1	-4	-2	-2	-1	0
12/07/79	00:25:44	1854	-1	-2	-2	-1	0	0	0	0	3	11	1	0	-2	1	-1	-4	-2	-2	0	0
12/07/79	00:25:57	1855	-1	-2	-2	-1	0	0	0	0	3	10	1	0	-2	1	-1	-4	-2	-2	0	0
12/07/79	00:26:06	1856	-1	-2	-2	-1	0	0	0	0	2	11	1	0	-2	1	-1	-4	-2	-3	0	0
12/07/79	00:26:25	1857	-1	-2	-2	-1	0	0	0	0	3	11	1	0	-2	1	-1	-4	-2	-2	-1	0
12/07/79	00:26:29	1858	-1	-2	-2	-1	0	0	0	0	3	11	1	0	-2	1	-1	-4	-2	-2	0	0
12/07/79	00:26:56	1859	-1	-2	-2	-1	0	0	0	0	2	11	1	0	-2	1	-1	-4	-2	-2	-1	0
12/07/79	00:27:16	1860	-2	-3	-2	-1	-1	0	0	0	2	10	1	0	-1	1	0	-3	-1	-1	1	1
12/07/79	00:27:26	1861	-2	-3	-2	-1	-1	0	0	0	2	9	1	0	-1	1	-1	-3	-1	-1	1	1
12/07/79	00:27:55	1862	-2	-3	-2	-1	-1	0	0	0	2	10	1	0	-1	1	-1	-3	-1	-1	1	1
12/07/79	00:28:14	1863	-2	-3	-2	-1	-1	0	0	0	2	9	1	0	-1	1	0	-3	-1	-1	1	1
12/07/79	00:28:24	1864	-2	-3	-2	-1	-1	0	0	0	2	10	1	0	-1	1	0	-3	-1	-1	1	1
12/07/79	00:28:55	1865	-2	-3	-2	-1	-1	0	0	0	2	10	1	0	-1	1	-1	-3	-1	-1	0	1
12/07/79	00:28:59	1866	-2	-3	-3	-1	-1	-1	0	0	2	9	1	0	-1	1	0	-3	0	0	1	2
12/07/79	00:29:18	1867	-2	-3	-3	-2	-1	-1	0	0	2	9	1	0	-1	1	0	-2	0	0	3	3
12/07/79	00:29:46	1868	-2	-3	-3	-2	-1	-1	0	0	2	9	1	0	-1	1	0	-2	0	0	3	2
12/07/79	00:30:04	1869	-2	-3	-3	-2	-1	-1	0	0	2	9	1	0	-1	1	0	-2	0	0	1	2
12/07/79	00:30:26	1870	-2	-3	-3	-1	-1	-1	0	0	2	9	1	0	-1	1	0	-3	0	0	0	2
12/07/79	00:30:35	1871	-2	-3	-2	-1	-1	-1	0	0	2	9	1	0	-1	1	0	-3	0	0	3	2
12/07/79	00:30:54	1872	-2	-3	-3	-2	-1	-1	0	0	2	9	1	0	-1	1	0	-3	0	0	3	2
12/07/79	00:31:04	1873	-2	-3	-2	-2	-1	-1	0	0	2	9	1	0	-1	1	0	-2	0	0	2	2
12/07/79	00:31:29	1874	-1	-2	-1	0	0	0	1	1	3	12	1	0	-2	0	-1	-5	-3	-4	-2	-2
12/07/79	00:31:37	1875	-1	-2	-1	0	0	0	1	1	3	12	2	0	-2	0	-1	-5	-3	-4	-3	-2
12/07/79	00:32:05	1876	-1	-2	-1	0	0	0	1	1	3	11	1	0	-2	0	-1	-5	-3	-4	-2	-2
12/07/79	00:32:12	1877	-2	-2	-2	-1	-1	0	0	0	2	10	1	0	-1	1	-1	-4	-1	-1	0	0
12/07/79	00:32:37	1878	-2	-2	-2	-1	-1	0	0	0	2	10	1	0	-2	1	-1	-4	-1	-1	0	0
12/07/79	00:32:45	1879	-2	-2	-2	-1	-1	0	0	0	2	10	1	0	-1	1	-1	-4	-1	-1	1	0
12/07/79	00:33:13	1880	-2	-2	-2	-1	-1	0	0	0	2	10	1	0	-1	1	-1	-4	-1	-1	0	0
12/07/79	00:33:23	1881	-2	-2	-2	-1	0	0	0	0	2	10	1	0	-1	1	-1	-3	-1	-1	0	0
12/07/79	00:33:54	1882	-2	-2	-2	-1	-1	0	0	0	2	10	1	0	-2	1	-1	-3	-1	-1	0	0
12/07/79	00:33:58	1883	-2	-2	-2	-1	-1	0	0	0	2	10	1	0	-1	1	-1	-4	-1	-2	0	0
12/07/79	00:34:26	1884	-2	-2	-2	-1	0	0	0	0	2	10	1	0	-1	1	-1	-3	-1	-1	0	0
12/07/79	00:34:45	1885	-2	-2	-2	-1	0	0	0	0	2	11	1	0	-1	1	-1	-4	-1	-1	0	0
12/07/79	00:34:55	1886	-2	-2	-2	-1	0	0	0	0	2	10	1	0	-1	1	-1	-3	-1	-1	1	0
12/07/79	00:35:15	1887	-2	-2	-2	-1	0	0	0	0	2	10	1	0	-1	1	-1	-4	-2	-1	1	0
12/07/79	00:35:34	1888	-1	-2	-2	-1	0	0	0	0	2	11	1	0	-1	1	-1	-4	-1	-2	0	0
12/07/79	00:35:51	1889	-1	-2	-2	-1	0	0	0	0	2	10	1	0	-2	1	-1	-4	-2	-2	0	0
12/07/79	00:35:57	1890	-2	-3	-2	-1	-1	0	0	0	2	10	1	0	-2	1	-1	-4	-2	-2	0	0
12/07/79	00:36:24	1891	-2	-3	-2	-1	-1	0	0	0	2	10	1	0	-2	1	-1	-4	-2	-2	0	0
12/07/79	00:36:31	1892	-2	-3	-2	-1	-1	0	0	0	2	10	1	0	-2	1	-1	-4	-2	-2	0	0
12/07/79	00:37:29	1894	58	119	60	99	97	90	107	93	90	31	1	0	0	2	0	-2	0	-1	0	0
12/07/79	00:38:04	1895	0	0	0	1	1	1	2	1	1	3	0	0	-1	2	0	-1	0	0	0	0
12/07/79	00:38:38	1896	0	0	0	0	1	1	1	1	1	2	0	0	-1	2	0	-1	0	0	0	0
12/07/79	00:38:59	1897	0	0	0	0	1	1	1	0	1	2	0	0	-1	2	0	-1	0	0	0	0
12/07/79	00:53:58	1898	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

INTERFRAME VOLTAGES - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
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12/07/79	00:21:28	1851	-6	-42	-15	-12	-1	1	4	6	6	10	10	18	14	9	5	10	10	10	11	16
12/07/79	00:25:04	1852	-7	-21	-10	-4	2	5	7	7	7	10	8	20	26	15	11	41	27	26	26	36
12/07/79	00:25:23	1853	-7	-20	-10	-3	2	6	7	7	7	10	9	19	27	15	11	41	28	25	26	34
12/07/79	00:25:44	1854	-7	-19	-10	-2	2	5	7	7	6	10	8	21	25	14	12	41	27	25	25	34
12/07/79	00:25:57	1855	-7	-19	-9	-3	2	6	7	6	7	11	8	20	24	15	10	41	28	25	26	34
12/07/79	00:26:06	1856	-7	-21	-10	-3	2	5	6	7	6	10	8	20	23	16	10	42	28	25	27	34
12/07/79	00:26:25	1857	-7	-20	-10	-3	2	4	6	6	6	9	8	20	24	15	9	41	27	26	27	35
12/07/79	00:26:29	1858	-6	-19	-10	-3	3	6	7	8	7	10	8	21	23	15	11	40	28	24	27	34
12/07/79	00:26:56	1859	-7	-18	-8	-3	3	6	8	8	7	11	8	22	25	16	12	43	29	25	28	34
12/07/79	00:27:16	1860	-2	-8	0	8	11	14	14	16	14	17	23	30	34	24	21	57	39	41	39	46
12/07/79	00:27:26	1861	-1	-7	2	8	10	13	15	15	13	19	19	33	33	23	23	57	40	42	39	48
12/07/79	00:27:55	1862	-1	-8	2	7	10	11	15	16	14	20	16	36	40	23	24	55	40	41	38	48
12/07/79	00:28:14	1863	-2	-6	2	9	11	12	15	16	14	20	16	37	40	24	25	57	39	43	40	50
12/07/79	00:28:24	1864	-1	-6	2	8	10	13	17	17	14	22	14	40	42	24	27	55	42	42	39	49
12/07/79	00:28:55	1865	-1	-7	2	7	10	12	16	16	14	22	12	40	41	24	25	55	40	42	39	49
12/07/79	00:28:59	1866	1	-1	8	16	14	17	20	22	19	25	25	42	46	27	30	64	48	50	45	56
12/07/79	00:29:18	1867	1	-1	9	16	14	18	20	22	18	27	25	43	49	31	30	62	48	50	45	58
12/07/79	00:29:46	1868	1	0	10	15	14	16	21	22	16	28	21	47	48	32	30	62	48	49	45	57
12/07/79	00:30:04	1869	1	0	10	15	13	17	21	22	19	23	19	50	49	33	30	62	49	49	45	58
12/07/79	00:30:26	1870	1	-1	8	15	13	16	19	22	18	28	17	52	47	31	30	61	47	49	45	57
12/07/79	00:30:35	1871	1	-1	8	15	13	17	20	22	17	23	18	52	45	34	31	61	48	49	45	57
12/07/79	00:30:54	1872	1	-1	8	14	13	16	21	22	18	26	18	50	47	32	31	60	48	49	44	57
12/07/79	00:31:04	1873	1	-1	9	16	13	16	21	21	17	32	13	52	45	34	32	60	47	48	44	56
12/07/79	00:31:29	1874	-11	-28	-14	-10	0	-1	1	2	2	7	5	19	16	6	4	30	20	18	16	24
12/07/79	00:31:37	1875	-10	-33	-15	-12	0	-1	1	1	2	5	5	18	15	7	3	28	19	17	17	27
12/07/79	00:32:05	1876	-10	-32	-14	-11	0	-4	0	1	2	5	5	14	12	7	3	27	17	16	16	25
12/07/79	00:32:12	1877	-4	-11	-1	3	5	12	12	10	9	25	7	38	35	19	16	49	36	34	34	45
12/07/79	00:32:37	1878	-4	-10	-2	4	6	10	12	10	10	26	7	39	34	19	19	48	36	35	33	45
12/07/79	00:32:45	1879	-3	-11	-2	4	7	10	11	10	10	25	7	37	34	19	19	49	37	35	34	44
12/07/79	00:33:13	1880	-4	-11	-1	4	6	10	12	10	10	26	7	40	34	20	19	49	36	35	34	44
12/07/79	00:33:23	1881	-4	-10	-1	4	6	11	12	10	10	24	7	39	33	20	19	48	36	34	34	44
12/07/79	00:33:54	1882	-4	-10	-2	4	6	10	12	10	10	26	7	39	33	20	18	50	35	35	33	44
12/07/79	00:33:58	1883	-4	-11	-2	3	6	10	13	10	9	24	7	37	32	21	18	49	34	34	33	43
12/07/79	00:34:26	1884	-4	-9	-2	5	7	11	13	10	10	24	7	39	34	21	19	50	37	35	34	44
12/07/79	00:34:45	1885	-4	-10	-1	4	6	10	13	10	10	25	7	37	32	22	18	50	35	35	34	44
12/07/79	00:34:55	1886	-4	-11	-2	3	7	10	12	10	10	26	7	38	33	21	17	50	36	36	34	44
12/07/79	00:35:15	1887	-4	-11	-2	3	6	11	12	10	9	24	7	38	31	21	17	49	36	35	35	44
12/07/79	00:35:34	1888	-5	-13	-6	1	5	8	10	9	9	22	6	35	29	18	14	45	32	33	31	39
12/07/79	00:35:51	1889	-6	-14	-6	1	4	8	11	8	9	22	6	34	30	19	6	50	32	30	31	40
12/07/79	00:35:57	1890	-5	-13	-5	1	3	8	9	8	9	20	6	33	28	18	7	49	32	30	30	39
12/07/79	00:36:24	1891	-6	-14	-5	1	4	7	9	8	8	20	6	35	30	17	7	49	33	30	29	39
12/07/79	00:36:31	1892	-5	-14	-5	2	4	8	9	8	9	21	6	32	29	16	7	47	32	29	31	38
12/07/79	00:37:29	1894	-1	-62	-72	-96	0	-26	-4	-5	-1	-8	2	-46	-3	-10	-26	-111	0	-4	-2	0
12/07/79	00:38:04	1895	0	0	0	0	1	0	0	0	0	0	3	0	0	0	-1	0	0	1	-2	1
12/07/79	00:38:38	1896	0	0	0	0	1	0	0	0	0	0	2	0	0	0	-1	0	0	1	-2	1
12/07/79	00:38:59	1897	0	0	0	0	1	0	0	0	0	0	2	0	0	0	-1	0	0	1	-2	1
12/07/79	00:53:58	1898	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

INTERFRAME VOLTAGES - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
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12/07/79	00:21:28	1851	17	16	17	20	24	21	23	20	25	26	26	25	26	27	25	32	6	35	23	31
12/07/79	00:25:04	1852	34	30	28	33	38	32	38	32	37	39	39	40	35	33	37	51	8	58	29	39
12/07/79	00:25:23	1853	36	29	29	33	38	31	39	32	37	38	40	40	35	31	38	51	7	59	29	38
12/07/79	00:25:44	1854	35	29	28	32	37	32	38	32	38	38	40	39	36	32	39	50	8	58	27	43
12/07/79	00:25:57	1855	35	29	27	32	38	32	37	34	38	36	40	38	34	32	40	49	8	60	28	46
12/07/79	00:26:06	1856	35	29	26	32	38	32	39	32	37	37	40	39	34	32	40	51	9	58	26	46
12/07/79	00:26:25	1857	35	29	28	32	39	32	39	32	38	37	41	40	35	31	40	51	8	60	27	49
12/07/79	00:26:29	1858	36	31	27	34	38	32	40	34	37	38	41	39	37	33	40	51	8	62	28	48
12/07/79	00:26:56	1859	38	30	28	34	38	33	39	34	39	37	41	40	36	34	40	54	8	62	29	48
12/07/79	00:27:16	1860	48	43	40	47	51	47	54	47	48	56	53	53	46	41	51	76	11	82	37	59
12/07/79	00:27:26	1861	49	44	39	48	51	46	53	47	51	58	56	55	51	46	53	74	10	82	41	63
12/07/79	00:27:55	1862	48	45	39	47	52	47	52	48	50	61	55	54	50	46	54	76	10	82	42	63
12/07/79	00:28:14	1863	48	45	39	49	52	47	54	47	50	62	56	55	52	50	54	73	10	84	40	66
12/07/79	00:28:24	1864	49	44	39	49	52	48	54	48	50	64	55	56	51	50	54	75	10	86	43	51
12/07/79	00:28:55	1865	48	45	38	49	52	47	53	48	51	62	56	56	52	47	56	75	10	85	44	58
12/07/79	00:28:59	1866	56	52	48	56	59	56	62	55	58	72	64	62	57	56	63	86	12	94	48	59
12/07/79	00:29:18	1867	55	51	47	56	59	55	62	54	58	75	61	63	57	60	62	83	11	93	50	69
12/07/79	00:29:46	1868	55	52	46	55	58	55	61	53	58	73	63	64	58	61	61	84	11	94	56	40
12/07/79	00:30:04	1869	54	52	47	56	58	56	60	54	59	74	63	64	59	62	60	83	11	95	55	40
12/07/79	00:30:26	1870	54	51	46	56	57	54	61	53	58	71	62	62	58	63	58	81	11	91	52	69
12/07/79	00:30:35	1871	54	51	46	55	58	55	61	52	58	72	61	64	58	61	59	81	10	90	51	70
12/07/79	00:30:54	1872	55	51	47	56	57	54	61	52	57	73	62	64	56	61	60	81	10	90	53	70
12/07/79	00:31:04	1873	54	50	46	55	57	54	61	50	58	72	62	64	58	59	59	82	10	91	52	70
12/07/79	00:31:29	1874	25	22	17	25	26	24	29	20	29	32	29	28	25	26	26	38	4	46	21	21
12/07/79	00:31:37	1875	24	20	19	25	27	24	29	19	28	30	29	28	25	23	27	39	3	46	18	19
12/07/79	00:32:05	1876	24	17	16	23	23	23	27	19	29	28	29	28	26	22	28	42	4	50	22	18
12/07/79	00:32:12	1877	43	39	35	43	45	43	48	32	48	56	47	48	46	42	45	66	8	74	38	47
12/07/79	00:32:37	1878	43	38	35	44	45	42	48	34	47	54	47	48	46	44	45	65	9	73	38	43
12/07/79	00:32:45	1879	43	38	35	44	45	43	48	35	48	53	49	49	45	45	44	65	8	76	44	22
12/07/79	00:33:13	1880	43	38	34	43	45	41	48	33	48	55	49	50	45	46	44	65	7	77	45	17
12/07/79	00:33:23	1881	43	39	35	43	45	42	48	33	48	53	48	49	46	45	48	52	11	78	48	15
12/07/79	00:33:54	1882	43	37	34	44	45	43	49	32	48	55	48	49	47	46	52	43	11	80	47	13
12/07/79	00:33:58	1883	43	39	34	43	44	42	47	35	47	55	47	48	46	46	51	43	11	81	45	11
12/07/79	00:34:26	1884	43	38	36	44	45	44	48	35	48	56	49	50	45	45	51	44	11	81	47	11
12/07/79	00:34:45	1885	43	37	34	43	45	42	46	34	47	55	49	49	45	42	54	42	10	80	46	10
12/07/79	00:34:55	1886	42	37	34	43	45	41	48	35	47	54	48	49	45	43	54	42	12	81	49	10
12/07/79	00:35:15	1887	43	39	35	43	46	42	48	34	48	54	48	49	45	44	54	43	11	80	49	10
12/07/79	00:35:34	1888	39	36	30	40	42	37	44	32	44	48	43	46	42	40	49	38	10	74	45	10
12/07/79	00:35:51	1889	39	34	30	39	42	33	42	33	42	49	44	45	41	35	45	34	21	91	52	24
12/07/79	00:35:57	1890	39	34	30	39	41	38	43	31	43	47	43	44	41	34	43	29	42	90	52	20
12/07/79	00:36:24	1891	38	35	31	39	40	37	43	31	40	47	43	43	41	33	42	26	50	93	57	17
12/07/79	00:36:31	1892	38	34	30	39	41	39	42	30	42	47	43	42	41	33	41	26	49	96	58	12
12/07/79	00:37:29	1894	-1	-31	-3	-5	-42	-10	-3	-42	-81	-36	-57	-26	-55	-22	-30	-2	-1	-72	-42	-3
12/07/79	00:38:04	1895	0	-1	-1	0	0	0	0	-3	0	0	0	0	0	0	0	0	0	0	0	1
12/07/79	00:38:38	1896	0	0	-1	0	0	0	0	-3	0	0	0	0	0	0	0	0	0	0	0	1
12/07/79	00:38:59	1897	0	0	-1	-1	0	0	0	-3	0	0	0	0	0	0	0	0	0	0	0	1
12/07/79	00:53:58	1898	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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DATE	TIME	RECN	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
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12/07/79	00:21:28	1851	30	29	29	25	30	31	19	35	22	27	24	43	25	30	20	33	23	31	25	30
12/07/79	00:25:04	1852	47	42	44	23	39	48	24	52	33	27	19	69	32	47	23	50	27	42	30	45
12/07/79	00:25:23	1853	47	41	44	22	39	48	23	52	32	27	16	72	32	47	22	52	26	42	30	46
12/07/79	00:25:44	1854	45	41	47	23	39	45	22	51	33	27	15	71	32	46	22	51	27	43	29	44
12/07/79	00:25:57	1855	46	39	48	22	39	48	23	53	32	27	15	71	33	47	22	52	26	43	29	46
12/07/79	00:26:06	1856	46	41	47	21	41	48	23	54	32	27	15	72	32	47	21	53	24	44	29	47
12/07/79	00:26:25	1857	43	41	48	21	41	48	23	52	32	27	15	74	33	48	21	53	24	42	29	46
12/07/79	00:26:29	1858	46	41	47	21	39	48	22	53	32	29	16	74	31	50	22	53	24	44	29	47
12/07/79	00:26:56	1859	47	42	48	22	42	49	22	54	33	29	15	75	32	49	23	54	25	45	29	47
12/07/79	00:27:16	1860	62	51	61	31	53	65	30	76	48	40	47	32	54	69	31	72	32	54	38	57
12/07/79	00:27:26	1861	64	51	65	29	56	69	31	74	48	40	51	62	56	66	30	71	32	58	39	60
12/07/79	00:27:55	1862	64	53	64	28	56	68	31	74	48	42	50	73	54	65	28	69	31	58	39	61
12/07/79	00:28:14	1863	63	53	64	28	58	69	30	74	49	42	51	81	52	63	27	70	32	56	38	62
12/07/79	00:28:24	1864	67	54	64	28	60	68	31	76	48	42	52	82	48	62	27	69	31	57	39	61
12/07/79	00:28:55	1865	64	55	64	27	59	70	31	74	49	43	52	82	48	64	26	68	31	57	39	61
12/07/79	00:28:59	1866	74	61	74	34	50	83	33	89	57	45	61	45	65	71	30	77	35	63	44	67
12/07/79	00:29:18	1867	73	58	72	34	67	79	33	85	57	47	60	58	67	69	31	78	34	65	46	69
12/07/79	00:29:46	1868	82	61	73	33	68	79	35	85	57	46	62	65	61	68	31	76	34	64	47	69
12/07/79	00:30:04	1869	83	62	73	32	68	78	34	85	57	48	67	43	70	69	31	76	34	65	47	68
12/07/79	00:30:26	1870	68	59	72	32	66	77	35	81	56	48	59	69	58	67	33	73	33	65	47	66
12/07/79	00:30:35	1871	68	60	72	32	67	76	34	82	56	47	61	59	60	68	33	74	33	65	48	66
12/07/79	00:30:54	1872	69	60	72	31	68	76	35	83	56	46	61	70	57	66	33	74	33	66	48	66
12/07/79	00:31:04	1873	66	61	71	31	68	76	35	80	55	46	57	80	51	66	33	73	34	64	48	66
12/07/79	00:31:29	1874	42	28	34	12	31	34	17	39	23	21	22	43	25	36	13	40	14	33	22	33
12/07/79	00:31:37	1875	41	27	35	12	31	36	15	38	21	20	19	44	26	37	12	41	11	35	22	32
12/07/79	00:32:05	1876	48	32	39	15	35	41	20	46	26	26	27	55	33	45	16	48	19	41	28	42
12/07/79	00:32:12	1877	60	48	57	21	53	59	28	63	42	37	41	73	42	56	24	61	25	51	37	52
12/07/79	00:32:37	1878	61	47	55	23	51	59	29	64	42	38	41	73	41	55	24	62	23	52	37	52
12/07/79	00:32:45	1879	67	49	57	22	52	59	28	63	43	38	39	74	42	55	24	62	23	53	36	54
12/07/79	00:33:13	1880	69	49	57	22	54	59	27	63	42	37	40	73	41	56	23	63	23	53	36	53
12/07/79	00:33:23	1881	71	48	57	21	53	59	27	65	41	39	40	73	41	56	23	62	23	54	35	53
12/07/79	00:33:54	1882	73	49	57	22	54	61	27	65	42	39	39	75	42	56	24	62	22	53	35	54
12/07/79	00:33:58	1883	74	49	57	22	53	61	27	65	42	39	39	73	42	55	23	63	21	54	35	53
12/07/79	00:34:26	1884	74	48	58	23	53	60	27	66	42	39	38	73	43	56	22	63	19	54	36	53
12/07/79	00:34:45	1885	74	48	57	21	53	60	28	65	41	39	36	74	43	55	22	63	21	53	35	54
12/07/79	00:34:55	1886	73	49	59	20	55	60	28	66	40	39	36	74	42	56	22	63	19	54	34	54
12/07/79	00:35:15	1887	74	48	58	19	54	61	28	65	40	39	37	75	41	56	22	64	20	55	34	54
12/07/79	00:35:34	1888	68	44	54	17	50	55	26	60	38	37	28	71	40	51	20	60	18	51	32	49
12/07/79	00:35:51	1889	80	54	65	28	59	68	32	75	48	41	46	84	47	61	28	69	28	59	40	61
12/07/79	00:35:57	1890	81	53	64	27	60	68	33	73	50	43	51	62	53	59	28	70	28	60	41	60
12/07/79	00:36:24	1891	84	57	67	28	65	71	34	78	52	43	53	79	51	63	28	72	28	63	43	64
12/07/79	00:36:31	1892	87	57	69	27	65	70	34	76	53	42	53	79	51	63	29	72	29	62	43	64
12/07/79	00:37:29	1894	-14	-29	-56	-20	-22	-50	-34	-28	-22	-27	-19	-52	-1	-49	0	-23	-23	-44	-1	-25
12/07/79	00:38:04	1895	0	0	0	0	1	0	0	0	1	-1	0	0	0	0	0	1	-1	0	0	0
12/07/79	00:38:38	1896	0	0	0	0	1	0	0	0	1	-1	0	0	0	0	0	1	-1	0	0	0
12/07/79	00:38:59	1897	0	0	0	0	1	0	0	0	1	-1	0	0	0	0	0	1	-1	0	0	0
12/07/79	00:53:58	1898	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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DATE	TIME	RECN	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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12/07/79	00:21:28	1851	25	25	22	34	24	31	20	29	23	23	33	8	27	25	23	25	16	16	24	17
12/07/79	00:25:04	1852	26	31	19	51	29	38	23	39	26	32	41	6	32	35	30	38	26	18	33	21
12/07/79	00:25:23	1853	26	31	18	52	29	38	22	38	25	32	41	5	31	36	31	39	26	19	32	21
12/07/79	00:25:44	1854	26	31	16	52	29	40	21	38	25	33	41	7	29	35	31	38	26	19	33	22
12/07/79	00:25:57	1855	25	31	19	52	29	40	22	40	25	32	43	6	31	36	31	38	27	19	35	22
12/07/79	00:26:06	1856	24	30	17	51	29	39	21	40	25	32	42	5	30	37	29	39	25	19	33	21
12/07/79	00:26:25	1857	24	30	20	50	29	40	22	40	25	33	42	8	30	37	30	40	26	19	34	21
12/07/79	00:26:29	1858	24	30	18	52	30	40	21	41	24	35	44	5	30	37	30	38	27	19	35	22
12/07/79	00:26:56	1859	25	29	19	53	29	40	23	39	25	33	43	4	32	38	30	42	27	19	34	23
12/07/79	00:27:16	1860	35	38	30	74	37	50	34	56	34	45	53	23	43	49	40	61	37	28	48	31
12/07/79	00:27:26	1861	34	39	29	73	38	53	35	56	35	48	56	20	45	53	42	59	37	28	48	32
12/07/79	00:27:55	1862	33	41	29	72	39	54	35	58	36	48	57	19	46	52	42	61	35	29	49	31
12/07/79	00:28:14	1863	34	42	27	73	38	54	36	58	36	48	57	18	46	53	41	61	35	28	49	31
12/07/79	00:28:24	1864	34	43	28	73	40	54	36	58	36	48	57	17	48	52	41	61	35	28	50	30
12/07/79	00:28:55	1865	34	44	27	72	40	55	35	58	37	49	58	15	50	53	41	59	35	28	50	30
12/07/79	00:28:59	1866	39	47	34	85	43	58	42	65	42	53	65	21	53	56	50	49	47	33	59	36
12/07/79	00:29:18	1867	39	49	34	82	44	61	40	67	44	53	65	20	53	58	46	67	43	33	58	35
12/07/79	00:29:46	1868	39	51	32	81	44	63	41	66	45	53	66	18	55	58	47	66	44	31	60	35
12/07/79	00:30:04	1869	38	51	32	81	43	62	41	67	45	54	65	18	58	58	46	65	43	32	61	34
12/07/79	00:30:26	1870	39	51	30	81	43	62	41	66	42	54	66	16	58	56	48	63	43	31	60	34
12/07/79	00:30:35	1871	38	51	31	80	43	62	41	64	45	54	65	17	57	57	49	63	42	30	61	34
12/07/79	00:30:54	1872	38	51	32	81	43	62	41	64	45	55	65	19	58	56	48	64	42	31	61	34
12/07/79	00:31:04	1873	39	49	31	81	43	62	41	63	45	53	64	20	55	57	48	63	42	29	61	33
12/07/79	00:31:29	1874	19	21	17	36	22	29	15	28	19	27	32	5	19	26	23	25	16	12	23	12
12/07/79	00:31:37	1875	18	21	14	39	21	29	14	29	18	26	30	4	19	26	22	25	17	12	24	13
12/07/79	00:32:05	1876	24	26	20	50	29	39	21	38	25	34	42	10	29	39	32	40	26	19	35	22
12/07/79	00:32:12	1877	30	36	23	63	34	48	30	49	32	44	53	4	44	46	38	49	30	23	44	25
12/07/79	00:32:37	1878	30	36	22	63	35	48	30	49	32	45	54	4	43	46	38	49	30	22	44	25
12/07/79	00:32:45	1879	30	36	22	64	34	48	30	49	32	43	55	4	45	46	38	49	31	22	46	24
12/07/79	00:33:13	1880	30	35	23	63	33	49	29	49	32	44	54	4	45	45	38	48	30	21	46	24
12/07/79	00:33:23	1881	30	36	22	63	33	50	29	50	33	43	54	4	45	45	37	49	31	22	46	24
12/07/79	00:33:54	1882	31	36	21	64	34	49	30	50	33	44	54	3	45	46	37	49	31	21	46	24
12/07/79	00:33:58	1883	31	34	22	63	34	49	29	50	33	43	53	3	45	45	37	49	31	22	45	23
12/07/79	00:34:26	1884	31	35	20	65	34	49	29	50	32	43	54	3	44	46	36	49	30	22	46	24
12/07/79	00:34:45	1885	31	35	21	64	34	48	28	51	31	43	54	3	45	47	37	49	31	22	46	24
12/07/79	00:34:55	1886	32	35	22	65	34	49	29	51	33	43	53	3	46	47	37	49	31	22	46	24
12/07/79	00:35:15	1887	32	35	22	64	34	49	29	51	33	43	55	3	44	46	37	49	31	21	45	24
12/07/79	00:35:34	1888	29	33	18	59	31	45	26	46	30	40	49	3	41	43	34	44	28	20	42	21
12/07/79	00:35:51	1889	36	40	29	76	38	56	36	59	39	51	62	30	20	38	32	43	26	19	42	19
12/07/79	00:35:57	1890	37	42	27	73	37	54	36	56	41	46	55	22	52	54	43	64	41	30	55	33
12/07/79	00:36:24	1891	36	45	29	77	40	57	38	60	41	49	61	19	53	57	47	62	42	32	57	34
12/07/79	00:36:31	1892	36	45	29	77	40	58	39	60	41	49	61	18	55	57	47	62	40	32	59	34
12/07/79	00:37:29	1894	-15	-12	-22	-55	-38	-16	-16	-18	0	-26	-37	-2	-46	-16	-41	-39	-4	-2	-10	-1
12/07/79	00:38:04	1895	0	1	1	0	0	0	-1	0	0	-3	2	0	0	0	0	0	-2	-1	0	0
12/07/79	00:38:38	1896	0	1	1	0	0	0	-2	0	0	-3	1	0	0	0	0	0	-2	-1	0	0
12/07/79	00:38:59	1897	0	1	1	0	0	0	-2	0	0	-3	1	0	0	0	0	0	-2	-1	0	0
12/07/79	00:53:58	1898	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

INTERFRAME VOLTAGES - IVTAN DATA
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DATE	TIME	RECN	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
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12/07/79	00:21:28	1851	18	18	17	25	19	16	13	28	16	17	14	9	13	13	1	21	12	15	12	13
12/07/79	00:25:04	1852	24	24	20	34	26	21	15	40	21	18	18	9	14	9	2	23	15	18	16	10
12/07/79	00:25:23	1853	24	24	18	35	25	20	15	42	22	19	18	10	14	9	3	22	16	17	16	9
12/07/79	00:25:44	1854	23	24	20	34	26	21	15	42	21	18	17	10	13	8	11	20	15	17	15	9
12/07/79	00:25:57	1855	23	23	20	35	25	20	15	44	21	19	18	9	12	9	11	20	16	17	16	9
12/07/79	00:26:06	1856	23	23	19	33	25	20	15	43	20	18	17	9	12	9	9	19	16	17	16	9
12/07/79	00:26:25	1857	23	23	20	34	25	20	15	44	21	20	16	10	12	9	9	19	16	17	15	10
12/07/79	00:26:29	1858	24	23	19	34	27	21	15	44	21	19	17	10	13	10	8	21	16	18	17	8
12/07/79	00:26:56	1859	23	24	20	34	27	22	14	45	21	19	17	10	12	10	9	22	16	18	17	8
12/07/79	00:27:16	1860	34	33	30	51	38	33	21	63	32	27	28	22	21	17	23	30	25	29	24	31
12/07/79	00:27:26	1861	34	34	31	53	38	34	21	64	32	28	28	22	20	16	21	29	25	28	23	34
12/07/79	00:27:55	1862	35	34	31	53	38	34	21	64	31	29	29	21	19	18	18	30	25	28	23	35
12/07/79	00:28:14	1863	34	34	32	53	37	34	21	64	31	29	29	22	19	18	15	32	26	28	22	36
12/07/79	00:28:24	1864	35	34	31	54	37	34	21	64	33	29	29	21	20	19	14	33	26	30	24	34
12/07/79	00:28:55	1865	35	35	32	54	37	35	21	64	33	30	28	21	20	20	14	33	26	29	25	36
12/07/79	00:28:59	1866	42	39	38	61	44	41	26	74	40	36	33	29	26	24	29	37	31	37	32	44
12/07/79	00:29:18	1867	42	40	38	63	44	42	25	74	41	37	34	28	26	24	30	37	30	38	32	48
12/07/79	00:29:46	1868	42	41	38	63	44	42	25	74	41	38	34	29	25	25	30	37	30	37	31	48
12/07/79	00:30:04	1869	45	41	38	62	45	41	26	72	43	39	34	27	25	25	27	38	31	39	32	47
12/07/79	00:30:26	1870	43	41	38	62	44	41	26	70	43	39	33	28	22	27	23	39	29	40	31	47
12/07/79	00:30:35	1871	45	41	37	61	45	41	24	71	43	39	33	28	23	28	18	40	31	40	32	44
12/07/79	00:30:54	1872	45	41	37	60	44	40	26	71	42	40	32	29	23	28	16	40	30	40	32	47
12/07/79	00:31:04	1873	45	40	36	61	45	39	25	68	42	38	30	26	21	29	5	42	29	37	29	40
12/07/79	00:31:29	1874	15	16	14	22	18	11	10	27	12	17	5	4	3	9	1	13	6	10	9	10
12/07/79	00:31:37	1875	15	15	13	22	18	10	10	27	12	15	6	4	3	8	1	12	6	9	9	8
12/07/79	00:32:05	1876	25	24	22	39	29	20	18	46	23	25	16	13	8	15	3	26	18	23	22	25
12/07/79	00:32:12	1877	30	28	27	45	35	24	20	52	29	28	17	15	12	20	2	30	18	24	20	25
12/07/79	00:32:37	1878	31	29	25	45	34	25	19	52	30	28	15	15	12	20	2	29	19	25	20	25
12/07/79	00:32:45	1879	32	29	26	45	35	25	19	53	29	28	14	16	11	19	2	30	20	25	20	23
12/07/79	00:33:13	1880	32	29	25	45	36	25	20	52	31	28	12	15	11	19	2	30	19	25	20	24
12/07/79	00:33:23	1881	32	29	25	45	35	26	19	53	30	28	13	16	12	19	2	30	20	25	21	22
12/07/79	00:33:54	1882	32	29	26	45	35	25	20	53	31	28	13	15	11	19	2	31	21	24	21	22
12/07/79	00:33:58	1883	32	29	26	45	35	26	20	53	29	29	15	14	12	19	2	31	20	24	22	19
12/07/79	00:34:26	1884	32	30	25	45	36	26	19	53	29	29	14	13	12	20	2	30	20	26	22	17
12/07/79	00:34:45	1885	33	29	26	46	35	26	20	53	30	29	13	12	13	19	2	31	20	25	22	16
12/07/79	00:34:55	1886	32	29	26	45	35	26	20	53	30	28	15	11	12	19	3	30	20	25	21	20
12/07/79	00:35:15	1887	33	29	26	45	36	26	20	53	29	29	14	12	12	20	3	30	20	24	22	14
12/07/79	00:35:34	1888	30	26	22	41	32	23	17	48	25	26	10	9	10	17	2	28	17	22	21	11
12/07/79	00:35:51	1889	30	25	23	40	32	21	17	49	24	26	9	8	9	16	2	27	16	21	20	5
12/07/79	00:35:57	1890	42	37	35	58	44	36	27	70	40	35	30	24	24	23	29	35	29	34	30	36
12/07/79	00:36:24	1891	44	38	35	61	45	37	28	70	41	37	30	26	23	24	29	36	29	34	30	46
12/07/79	00:36:31	1892	45	39	34	61	45	37	28	70	41	37	30	26	23	25	30	36	30	34	29	48
12/07/79	00:37:29	1894	-11	-11	-8	-13	0	-9	-7	-83	0	-12	0	-1	-2	-1	0	-6	-2	-12	-35	-10
12/07/79	00:38:04	1895	0	0	0	0	1	0	0	0	2	0	0	-1	-2	0	0	-1	0	0	-1	0
12/07/79	00:38:38	1896	0	0	0	0	1	0	0	0	2	0	0	-1	-2	0	0	-1	0	0	-1	0
12/07/79	00:38:59	1897	0	0	0	0	1	0	0	0	2	0	0	-1	-2	0	0	-1	0	0	-1	0
12/07/79	00:53:58	1898	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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DATE	TIME	RECN	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
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12/07/79	00:21:28	1851	14	13	12	12	9	10	5	11	4	5	5	-4	2	-4	-8	-2	0	2	0	3
12/07/79	00:25:04	1852	20	15	13	12	11	12	5	10	8	6	4	-2	2	-3	-5	-3	0	1	1	1
12/07/79	00:25:23	1853	19	16	13	12	10	12	12	10	8	6	3	-1	2	-3	-6	-3	0	1	1	1
12/07/79	00:25:44	1854	19	15	13	12	11	11	4	9	9	5	3	-2	3	-4	-6	-3	0	1	1	1
12/07/79	00:25:57	1855	20	15	14	12	11	11	6	10	9	6	3	-1	3	-4	-6	-3	0	1	1	1
12/07/79	00:26:06	1856	20	15	13	12	11	11	4	10	8	5	4	-1	2	-4	-6	-3	0	1	1	1
12/07/79	00:26:25	1857	20	16	13	12	11	11	10	10	9	6	4	0	2	-3	-6	-2	0	1	1	1
12/07/79	00:26:29	1858	21	16	14	12	12	11	6	10	9	6	4	0	3	-3	-5	-3	0	1	1	1
12/07/79	00:26:56	1859	21	16	14	12	12	12	5	10	9	5	3	-2	3	-3	-5	-3	0	1	1	1
12/07/79	00:27:16	1860	26	25	22	21	21	20	15	17	17	15	11	8	11	2	-1	0	1	2	1	2
12/07/79	00:27:26	1861	27	25	22	21	21	20	18	17	15	15	11	5	11	3	-1	0	1	1	1	1
12/07/79	00:27:55	1862	27	24	21	21	21	20	16	16	15	15	12	7	11	2	-1	0	1	2	1	2
12/07/79	00:28:14	1863	27	24	21	21	21	21	19	17	15	16	11	6	11	1	-1	0	1	2	1	2
12/07/79	00:28:24	1864	28	24	20	21	22	21	16	16	14	16	11	7	11	2	-1	1	1	2	1	2
12/07/79	00:28:55	1865	28	24	21	21	22	21	16	16	14	16	12	7	11	2	-1	1	1	2	1	2
12/07/79	00:28:59	1866	35	31	26	29	27	30	24	24	20	22	17	15	16	8	4	4	2	2	1	2
12/07/79	00:29:18	1867	33	30	26	27	27	31	22	24	19	22	18	14	17	8	5	4	2	2	1	2
12/07/79	00:29:46	1868	33	30	26	27	27	31	29	24	18	22	19	14	16	8	5	4	2	3	1	2
12/07/79	00:30:04	1869	35	30	27	27	28	32	25	23	17	23	18	14	17	7	5	3	2	2	1	2
12/07/79	00:30:26	1870	33	30	25	26	27	30	23	23	16	21	17	12	16	7	4	4	2	2	1	2
12/07/79	00:30:35	1871	34	31	26	27	28	30	23	23	16	22	17	13	16	7	4	3	2	2	1	2
12/07/79	00:30:54	1872	33	30	26	27	28	30	27	23	16	22	18	13	16	6	5	3	2	2	2	2
12/07/79	00:31:04	1873	31	27	24	24	23	26	22	20	12	17	13	6	11	2	-1	1	1	2	1	2
12/07/79	00:31:29	1874	11	8	7	5	4	6	5	3	1	0	-1	-5	-1	-7	-11	-5	-1	0	0	1
12/07/79	00:31:37	1875	11	8	7	5	4	5	1	4	1	0	-1	-5	-2	-8	-11	-5	-1	0	0	1
12/07/79	00:32:05	1876	24	19	17	17	16	18	13	13	10	11	9	3	6	0	-4	-1	0	1	1	1
12/07/79	00:32:12	1877	24	20	16	16	17	19	13	13	9	11	9	2	5	-1	-4	-1	0	1	1	1
12/07/79	00:32:37	1878	24	20	17	16	17	18	12	12	9	12	9	2	6	0	-3	-1	0	1	1	1
12/07/79	00:32:45	1879	25	20	16	16	16	17	13	11	9	12	9	3	5	-1	-3	-1	0	1	1	1
12/07/79	00:33:13	1880	25	20	16	16	16	17	12	11	9	12	8	3	5	-1	-3	-1	0	1	1	1
12/07/79	00:33:23	1881	26	20	16	16	17	17	15	12	8	12	9	2	6	0	-2	-1	0	1	1	1
12/07/79	00:33:54	1882	26	20	16	16	17	17	13	12	8	11	9	1	5	-1	-2	-1	0	1	1	1
12/07/79	00:33:58	1883	27	20	17	16	17	17	11	12	8	12	9	4	6	-1	-2	-1	0	1	1	1
12/07/79	00:34:26	1884	27	21	16	16	17	17	12	11	9	11	9	3	6	-1	-2	-1	0	1	1	1
12/07/79	00:34:45	1885	27	21	17	17	17	17	15	12	8	11	9	2	6	-1	-2	-1	0	1	1	1
12/07/79	00:34:55	1886	27	20	16	16	17	17	15	12	8	11	10	3	5	-1	-2	-1	0	1	1	1
12/07/79	00:35:15	1887	28	20	16	16	18	17	16	12	8	11	9	3	5	-1	-2	-1	0	1	1	1
12/07/79	00:35:34	1888	26	18	13	14	14	14	14	10	7	9	6	1	4	-3	-2	-2	0	1	1	1
12/07/79	00:35:51	1889	26	18	12	14	14	13	12	9	6	7	6	0	3	-4	-3	-2	0	1	1	1
12/07/79	00:35:57	1890	34	30	24	26	26	27	24	22	15	22	17	14	15	7	3	3	2	2	1	2
12/07/79	00:36:24	1891	34	29	24	27	27	27	27	22	14	21	17	14	15	7	4	2	2	2	1	2
12/07/79	00:36:31	1892	33	29	23	25	26	28	25	21	14	21	17	12	14	8	3	3	2	2	1	2
12/07/79	00:37:29	1894	-7	-26	-3	-14	-24	-22	-32	-20	-13	-22	-17	-71	-47	-34	-22	-6	0	-2	-1	-1
12/07/79	00:38:04	1895	0	0	0	0	-1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/07/79	00:38:38	1896	0	0	0	0	-1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/07/79	00:38:59	1897	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/07/79	00:53:58	1898	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

INTERFRAME VOLTAGES - IVTAN DATA
LISTING PRODUCED ON OCTOBER 3,1980

DATE	TIME	RECN	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
12/07/79	00:21:05	1850	0	3	3	5	3	21	21	10	12	0	-1	-1	-2	-2	-2	-3	-3	-2	-2	-1
12/07/79	00:21:28	1851	0	2	3	4	3	21	20	11	12	0	-1	-1	-2	-2	-2	-3	-3	-2	-2	-1
12/07/79	00:25:04	1852	0	2	3	4	3	16	16	11	11	0	-1	-2	-2	-2	-2	-3	-3	-2	-2	-2
12/07/79	00:25:23	1853	0	1	3	4	3	15	16	11	11	0	-1	-2	-2	-2	-2	-3	-3	-2	-2	-1
12/07/79	00:25:44	1854	0	2	3	4	3	15	15	11	11	0	-1	-2	-2	-2	-2	-3	-3	-2	-2	-1
12/07/79	00:25:57	1855	0	1	3	4	3	15	15	11	11	0	-1	-2	-2	-2	-2	-3	-3	-2	-2	-2
12/07/79	00:26:06	1856	0	1	4	4	3	15	15	12	10	0	-1	-2	-2	-2	-2	-3	-3	-2	-2	-1
12/07/79	00:26:25	1857	0	1	4	4	3	15	15	12	10	0	-1	-2	-2	-2	-2	-3	-3	-2	-2	-2
12/07/79	00:26:29	1858	0	1	3	4	3	15	15	11	10	0	-1	-2	-2	-2	-2	-3	-3	-2	-2	-2
12/07/79	00:26:56	1859	0	1	3	4	3	15	15	12	10	0	-1	-2	-2	-2	-2	-3	-3	-2	-2	-2
12/07/79	00:27:16	1860	0	1	3	4	2	14	14	11	10	0	-2	-2	-3	-3	-3	-3	-4	-3	-3	-3
12/07/79	00:27:26	1861	0	1	3	3	2	14	14	11	10	0	-2	-3	-3	-3	-3	-4	-4	-3	-3	-3
12/07/79	00:27:55	1862	1	1	3	4	2	14	14	12	10	0	-2	-3	-3	-3	-3	-4	-4	-3	-3	-3
12/07/79	00:28:14	1863	0	1	3	3	2	14	14	12	10	0	-3	-3	-3	-3	-3	-4	-4	-3	-3	-3
12/07/79	00:28:24	1864	1	1	3	3	2	14	14	11	10	0	-3	-3	-3	-3	-3	-4	-4	-3	-3	-3
12/07/79	00:28:55	1865	1	1	2	4	2	13	13	12	10	0	-3	-3	-3	-3	-3	-4	-4	-3	-3	-3
12/07/79	00:28:59	1866	1	1	2	3	2	13	13	12	10	0	-4	-4	-4	-3	-3	-4	-4	-4	-3	-3
12/07/79	00:29:18	1867	1	2	2	3	1	13	13	12	10	0	-4	-4	-4	-3	-3	-4	-4	-4	-3	-3
12/07/79	00:29:46	1868	1	1	2	4	2	13	13	12	10	0	-4	-3	-4	-3	-3	-4	-4	-4	-3	-3
12/07/79	00:30:04	1869	1	2	2	3	2	13	13	12	10	0	-3	-4	-4	-3	-3	-4	-4	-4	-3	-3
12/07/79	00:30:26	1870	1	2	2	3	2	13	12	12	10	0	-4	-4	-4	-3	-3	-4	-4	-4	-3	-3
12/07/79	00:30:35	1871	1	2	2	4	2	12	12	12	10	0	-3	-4	-4	-3	-3	-4	-4	-4	-3	-3
12/07/79	00:30:54	1872	1	2	2	4	1	13	12	12	10	0	-3	-4	-4	-3	-4	-4	-4	-4	-3	-3
12/07/79	00:31:04	1873	1	2	2	4	2	13	13	11	10	0	-2	-3	-3	-2	-3	-3	-3	-3	-2	-2
12/07/79	00:31:29	1874	0	2	3	4	3	15	14	11	10	0	-1	-1	-2	-1	-2	-2	-2	-2	-1	-1
12/07/79	00:31:37	1875	0	2	4	4	3	14	14	11	10	0	-1	-1	-2	-1	-2	-2	-2	-2	-1	-1
12/07/79	00:32:05	1876	0	2	3	4	2	13	13	11	10	0	-2	-2	-2	-2	-2	-3	-3	-3	-2	-2
12/07/79	00:32:12	1877	0	2	3	3	2	13	13	12	10	0	-2	-2	-2	-2	-2	-3	-3	-3	-2	-2
12/07/79	00:32:37	1878	0	2	2	4	3	13	13	12	10	0	-2	-2	-2	-2	-2	-3	-3	-3	-2	-2
12/07/79	00:32:45	1879	1	2	3	4	2	13	13	12	10	0	-2	-2	-2	-2	-2	-3	-3	-3	-2	-2
12/07/79	00:33:13	1880	0	2	3	4	2	13	13	12	10	0	-2	-2	-2	-2	-2	-3	-3	-3	-2	-2
12/07/79	00:33:23	1881	0	2	3	4	3	13	13	12	10	0	-2	-2	-2	-2	-2	-3	-3	-3	-2	-2
12/07/79	00:33:54	1882	0	2	3	4	2	13	13	12	10	0	-2	-2	-2	-2	-2	-3	-3	-3	-2	-2
12/07/79	00:33:58	1883	0	2	3	4	2	13	13	12	10	0	-3	-2	-2	-2	-2	-3	-3	-3	-2	-2
12/07/79	00:34:26	1884	0	2	3	4	2	13	13	12	10	0	-2	-2	-2	-2	-2	-3	-3	-3	-2	-2
12/07/79	00:34:45	1885	0	2	3	4	2	13	13	13	10	0	-3	-2	-2	-2	-2	-3	-3	-3	-2	-2
12/07/79	00:34:55	1886	0	2	3	4	2	13	13	12	10	0	-2	-2	-2	-2	-2	-3	-3	-3	-2	-2
12/07/79	00:35:15	1887	0	2	3	4	2	12	12	12	10	0	-2	-2	-3	-2	-2	-3	-3	-3	-2	-2
12/07/79	00:35:34	1888	0	2	3	4	2	13	13	13	10	0	-2	-2	-2	-2	-2	-3	-3	-2	-2	-2
12/07/79	00:35:51	1889	1	1	3	4	3	13	13	12	10	0	-3	-2	-3	-2	-2	-3	-3	-3	-2	-2
12/07/79	00:35:57	1890	1	2	2	3	2	12	12	12	10	0	-3	-3	-3	-2	-3	-4	-4	-3	-3	-3
12/07/79	00:36:24	1891	0	2	2	4	2	12	12	12	10	0	-3	-3	-3	-2	-3	-4	-4	-3	-3	-3
12/07/79	00:36:31	1892	1	2	2	4	2	12	12	12	10	0	-3	-3	-3	-3	-3	-4	-4	-3	-3	-3
12/07/79	00:37:29	1894	1	5	6	-1	0	12	11	56	82	46	74	67	63	61	47	53	56	57	40	42
12/07/79	00:38:04	1895	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0
12/07/79	00:38:38	1896	0	0	0	0	0	0	0	0	0	-1	-1	0	0	0	0	0	0	0	0	0
12/07/79	00:38:59	1897	0	0	0	0	0	0	0	0	0	-1	-1	0	0	0	0	0	0	0	0	0
12/07/79	00:53:58	1898	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0

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