# CERTIFIED TEST DATA

TURBINE-DRIVEN GENERATOR SET

PACKAGE MODEL CGS001
ENGINE MODEL TAURUS 60S

PERFORMANCE ACCEPTANCE CERTIFICATE

| CUSTOMER REFERENCE NO.: | SOLAR PROJECT NO.: |
|---|---|
| **NR-04819** | **59731** |

| CUSTOMER NAME: | SOLAR NAME: | UNIT NO.: |
|---|---|---|
| **Mobile Taurus 60 Power Generation Unit** | **PPS-1** | **1** |

SERIAL NUMBERS

| PACKAGE | ENGINE | GEARBOX | GENERATOR |
|---|---|---|---|
| **TG01137** | **1006T** | **SGK00-21327** | **001098-01** |

PACKAGE ACCEPTANCE APPROVAL

Solar Turbines Incorporated at San Diego certifies that the equipment identified above was tested as described herein and found to meet applicable requirements of the Solar Project Definition, the engineering specifications and the contractual requirements.

STATIC TEST ENGINEER: _____ DATE: 2-7-01
R. Stoneman

PRODUCTION TEST ENGINEER: _____ DATE: 1/29/01
S. Rueter

MANAGER, PRODUCTION TEST ENGINEERING: _____ DATE: 6FEB01
T.M. Huang

PROJECT MANAGER: _____ DATE: 2/15/01
J. Plescia

## TEST CONDITIONS AND TEST DATA

The generator package was tested with the turbine engine, reduction gearbox and generator mounted on the package base. The package controls were mounted on-skid and were used for the test.

The generator nameplate rating is 5,300 kw; rated voltage is 13,200 volts.

Full load for all package testing was determined by either the nameplate rating of the generator, or the engine performance curve adjusted for air inlet temperature, sea level and zero duct losses whichever was lower, per Solar Engineering Specification ES2091.

### ITEM 1. ACCEPTANCE TEST

The attached figures labeled "Control Console Software Verification", "Control Console Hardware Verification", "Universal Generator Set Acceptance Test" and "Final Visual Acceptance Test" are the specific test agenda for this unit. They were prepared to reflect contractual requirements and compliance with Solar Engineering Specifications ES2091 and ES2220.

### ITEM 2. TURBINE ENGINE PERFORMANCE

The attached figure labeled "Taurus 60S, T7300 One-Shaft Engine Performance, Nat. Gas Fuel" depicts engine performance test data as noted on the computer analysis printout. The upper portion shows measured parameters and the lower portion shows calculated results corrected to conditions of standard temperature, sea level, and zero duct losses. The acceptance criteria for the engine performance results is contained in ES2091.

It is noted that oil flow of 58.5 gpm to the gearbox (FGB.OIL) exceeded the specification limit by 0.6 gpm during the engine performance run. This condition was documented on Withholding Notice 8058334; reviewed and accepted by Engineering's Material Review Board as non-detrimental to engine performance.

Based on the T5/T3 ratio determined during the engine performance test, the software base T5 with SIV open is 1222 degrees Fahrenheit and T5 with SIV closed is 1246 degrees Fahrenheit.

The attached table labeled "Engine K-values" consists of data points required for customer's software.

### ITEM 3. FREQUENCY (SPEED) AND VOLTAGE REGULATION

The attached figure labeled "Frequency (Speed) and Voltage Regulation" shows the regulation of this unit with the speed governor and voltage regulator adjusted for isochronous operation. Regulation was verified at each load point after all transients had decayed, as the load was varied from no load to full load to no load.

**ITEM 4. OPERATING PARAMETERS**

The attached figure labeled "Operating Parameters - Taurus Generator Set" provides "new condition" operating parameters for comparative purposes. Data was compiled from various load runs after engineering evaluation.

**ITEM 5. VIBRATION DATA**

The attached figures labeled "Machinery Vibration Signature" are the spectrum plots for each vibration probe recorded during the engine full load run.

**ITEM 6. *SUDDEN LOAD TESTS***

The attached digitized trace shows the sudden load testing of this unit at 1500 KW on-load and 3300 KW off-load corrected to sea level and zero duct losses per Solar Engineering Specification ES2220.

Frequency (speed) deviation during load application did not exceed the specification limit of minus 5.0 percent from rated speed and recovery was within a plus or minus 0.50 percent band within 15.0 seconds. Frequency deviation during load rejection was within 7.0 percent and recovery was within a plus or minus 0.50 percent band within 10.0 seconds.

Voltage deviation during load application did not exceed specification limit of plus or minus 17.0 percent from rated voltage and recovery was within a plus or minus 5.0 percent band within 2.0 seconds for this high performance generator. Voltage deviation during load rejection was within plus or minus 22.0 percent and recovery was within a plus or minus 5.0 percent band within 2.0 seconds.

**ITEM 7. DRY EMISSIONS**

The attached figures labeled "Dry Emissions" document the results of emissions testing without water injection. The component concentration levels are corrected to 15% oxygen and ISO conditions per Solar ES9-97. The NOx and CO emissions limits are 25 ppm and 50 ppm, respectively.

# ITEM 1. ACCEPTANCE TEST

| Solar Turbines<br>*A Caterpillar Company* | CONTROL CONSOLE SOFTWARE VERIFICATION | Page: 1 of 9 | Date:11/30/00 |
|---|---|---|---|
| **CUSTOMER:** | **PROJECT: 2-59731** | **UNIT: 1 of 2** | |

| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 1a<br>Phase I | Begin Software Test | To verify that the release of the project software and the separation of the wiring diagram from the legal drawing packet are both done per ISO procedures | TE 14 |
| 4<br>Phase I | A/C Display Scaling and Program Constants (Software) | To verify that the correct program constants are used in the software and the A/C values are properly scaled and displayed | TE 14 |
| 7<br>Phase I | Channel Mapping and I/O Overview Configuration Verification | Verify that the Channel mapping and the I/O configuration are complete and correctly set up using the electrical schematic – vs – the PLC | TE 14 |
| 8<br>Phase II | Fire System Software Verification | To verify that all required software and software addressing is present and correct for the fire system | TL 14 |
| 51<br>Phase II | IPG Vibration Transmitters (Software) | To verify the IPG vibration system configuration and setpoints | 305 |
| 1b<br>Phase II | Begin Software Test | To add simulation file for software testing | 305 |
| 2<br>Phase II | Verify Engineering Units per PTI | Verify that the customer specified engineering units are shown on each of the display screens | TE 14 |
| 3<br>Phase II | Program Constants (F13) and Timers (T4) | Verify that the PLC software constants and timers are set correctly for the sales order requirements This operation also verifies the temperature and speed set points in the electrical drawings | 305 |
| 5a<br>Phase II | Analog Scaling (Phase II) | To verify the analog scaling in the electrical drawing, PLC program, and display software is correct | TE 14 |
| 6a<br>Phase II | Address Check, PLC vs Print (Phase II) | To ensure that addresses are matched between electrical schematic and PLC software | TE 14 |
| 30<br>Phase II | A/C Direct Drive Starter | To verify the starter system operation during test crank and start sequences | TE 14 |

*** ENSURE ALL STAMPS ARE LEGIBLE AND IN BLACK INK ***

Phase I – Required to support Hardware verification
Phase II – Required to support Dynamic testing.
Phase III – Required to complete software testing.

| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 31<br>Phase II | AC Starter High Motor Temperature | To verify that when a high motor temperature occurs during starter operation a shutdown will occur and prevent a restart within thirty (30) minutes | TE 14 |
| 32<br>Phase II | VFD Starter Configuration | To verify that "VFD Configuration" can be enabled from the display when the starter is not on Also verify correct configuration of the data file and appropriate alarm and shutdowns | TL 14 |
| 39<br>Phase II | Gas Fuel Run Sequence - IPG | To verify proper operation of the gas fuel run sequence in the T60 gas fuel IPG Transmitter fail logic will be verified along with the 10 possible gas valve check fails | TE 14 |
| 41<br>Phase II | Liquid Fuel Run Sequence | To verify the primary functions of a run up to on load followed by a normal stop The following functions will be checked pre-lube lube pump check, liquid fuel valves, purge, ignition, ready to load, on load, and stopping | TE 14 |
| 42<br>Phase II | Fail to Crank | To verify logic is included to generate a shutdown if the NGP speed fails to reach 15% NGP within 20 seconds of the starter command | TE 14 |
| 43<br>Phase II | Ignition Fail | To verify logic is included to generate a shutdown if the T5 temp fails to reach ignition temperature within 10 seconds of the ignition command | TE 14 |
| 44<br>Phase II | Fail to Start | To verify logic is included to generate a shutdown if the unit fails to reach starter dropout speed 120 seconds after ignition | TE 14 |
| 52<br>Phase II | Combustible Gas Monitoring | To verify the gas monitoring software in the PLC is operating correctly Alarms should be generated by transmitter fail and gas level above 30% of LEL A shutdown is generated when gas level is above 50% of LEL | TE 14 |
| 55<br>Phase II | Remote Start (S510) | To verify that the remote start option will only start the unit when Remote mode is selected | TE 14 |
| 56<br>Phase II | Local Stop, Normal (S111) | To verify that when the unit is running and the local normal stop switch (S111) is depressed a cooldown stop occurs | TL 14 |
| 57<br>Phase II | Remote Stop, Normal (S511) | To verify that the remote normal stop option will stop the unit while in the remote or local mode | TE 14 |

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| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 58<br>Phase II | Emergency Stop, Local (S112) | To verify that the local fast stop option will stop the unit regardless of the local control mode | TE 14 |
| 59<br>Phase II | Emergency Stop, Skid (S312) | To verify that the skid fast stop option will stop the unit regardless of the local control mode | TE 14 |
| 60<br>Phase II | Emergency Stop, Remote (S512) | To verify that the remote fast stop option will stop the unit regardless of the local control mode | TE 14 |
| 61<br>Phase II | Start/Stop from Customer PLC | To verify that the customer PLC stop option will stop the unit regardless of the local control mode To verify that the customer PLC start bit will only start the unit in remote mode | TE 14 |
| 62<br>Phase II | NGP Setpoint, Local (S154/S155) | To verify that the NGP speed set point can be controlled locally only when "Local" mode is selected | TE 14 |
| 70<br>Phase II | Start Temp and Speed Control | To verify that the gas fuel actuator control ramps up from start to engine light-off and not allow an over-temperature or over-speed condition during the start or running conditions | TE 14 |
| 73<br>Phase II | Min Fuel | Verify that the PLC Logic for Min Fuel exists | TE 14 |
| 76<br>Phase II | Load Control (S/C/T60 GS) | To verify the existence of Load-Speed Control logic in the PLC program | TE 14 |
| 97<br>Phase II | Gas DP Control (PECC) | To verify that when GASDP_PSID (TPD343_1) is above gas DP schedule (GASDP_SCH) value at a given speed, "GAS_DP" control mode is activated, and FUEL_CMD decreases | TE 14 |
| 110<br>Phase II | Verify T1 | To verify existence of logic for a T1 RTD failure | TE 14 |
| 111<br>Phase II | Verify T5 | To verify the accuracy of the engine T5 temperature | TE 14 |

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| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 113<br>Phase II | High/Low/Delta T5 | To verify that if one or more T5 thermocouples fail that an alarm or shutdown occurs | TE 14 |
| 114<br>Phase II | High T5 Alarm and Shutdown | To verify the alarm and shutdown set point for the engine T5 temperature | TE 14 |
| 120<br>Phase II | NGP Speed Sensor Fail | Verify that a shutdown occurs if an NGP speed sensor fails | TE 14 |
| 121<br>Phase II | NGP Overspeed | Verify that a fast stop shutdown occurs if NGP speed exceeds the overspeed setpoint | TE 14 |
| 122<br>Phase II | Turbine Underspeed (GS) | Verify that a fast stop shutdown occurs if NGP or NPT speed falls below 90% | TE 14 |
| 125<br>Phase II | Backup Overspeed and Open Probe | Verify that a shutdown occurs if the backup overspeed probe fails or the unit exceeds the backup overspeed setpoint | TE 14 |
| 138<br>Phase II | Thrust Bearing Temp, Engine (RT320/RT321) | To verify the accuracy of the engine thrust bearing temperature measurement and associated alarm and shutdown functionality | TE 14 |
| 145<br>Phase II | P/P Lube Pump - Pump Check | To verify that the backup lube pump and auxiliary (P/P) lube pump(s) perform their respective pump checks properly before permitting the lube oil system to enter pre-lube | TE 14 |
| 146<br>Phase II | P/P Lube Pump - Pre-Lube | To verify that a pre-lube fail shutdown occurs if the pre-lube pressure is not above the pre-lube pressure low limit for the required duration during pre-lube | TE 14 |
| 147<br>Phase II | P/P Lube Pump - Engine Running | To verify that the auxiliary lube pump(s) operate to maintain pressure within the allowable limits between the completion of pre-lube and the start of post-lube | TE 14 |
| 148<br>Phase II | P/P Lube Pump - Post-Lube | To verify that the post-lube cycle occurs as required for the condition of the engine when it was shut down | TE 14 |

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| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 152<br>Phase II | B/U Lube Pump - Pre-Lube | To verify that the backup pump will not come on during pre-lube | TE 14 |
| 154<br>Phase II | B/U Lube Pump - Post-Lube | To verify that the backup pump will perform an engine post-lube if the auxiliary pump(s) are failed | TE 14 |
| 155<br>Phase II | Lube Oil System - Fire Detected | To verify that the auxiliary lube pump turns off after engine rundown and compressor rolldown and stays off for 20 minutes after which time the post lube will be performed | TE 14 |
| 162<br>Phase II | Lube Oil Cooler | To verify the proper operation of the lube oil cooler and associated inhibits | TE 14 |
| 164<br>Phase II | Lube Oil Temp High Alarm and Shutdown (RT380) | To verify the proper function of the lube oil header temperature high alarm and shutdown and the lube oil header temperature RTD failure shutdown | TE 14 |
| 166<br>Phase II | Lube Oil Temp Low | To verify the existence of minimum operating lube oil temperature alarm logic | TE 14 |
| 168<br>Phase II | Lube Oil Tank Temp Low Alarm and Shutdown (RT390) | To verify the proper function of the lube oil tank temperature low alarm and start inhibit and the lube oil tank temperature RTD failure start inhibit | TE 14 |
| 170<br>Phase II | Lube Oil Pressure Low Alarm and Shutdown (TP380) | To verify the proper lube oil pressure low alarm and shutdown schedules | TE 14 |
| 174<br>Phase II | Lube Oil Pressure Post-Lube Alarm and Shutdown | To verify the proper setpoints and functionality of post-lube alarm and shutdown | TE 14 |
| 176<br>Phase II | Lube Oil Header Pressure Transmitter Fail | To verify that a Lube Oil Header Pressure Transmitter Fail Shutdown occurs if the transmitter signal falls outside the range of 3 5-20 5 mA | TE 14 |
| 180<br>Phase II | Lube Oil Tank Level High/Low Alarm and Shutdown (S388) | To verify the proper function of the lube tank level alarms and shutdowns | TE 14 |

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| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 182<br>Phase II | Lube Oil Tank Pressure High Alarm and Shutdown (S324) | To verify the proper function of the lube tank pressure alarm and shutdown (if applicable) | TE 14 |
| 184<br>Phase II | Lube Oil Filter DP High Alarm (S397-1) | To verify the proper function of the lube oil filter delta-P alarm | TE 14 |
| 187<br>Phase II | Backup Pump Check (S322-5) | To verify the proper operation of the daily and manually-requested backup pump checks for engines with a S322-5 switch | TE 14 |
| 195<br>Phase II | Gas Fuel Pressure Low Alarm (S386/TP386) | To verify the existence and correct operation of the low gas fuel pressure alarm logic | TE 14 |
| 196<br>Phase II | Gas Fuel Pressure High Shutdown (S386/TP386) | To verify the existence and correct operation of the high gas fuel pressure control logic | TE 14 |
| 197<br>Phase II | Start Gas Fuel Flow High Shutdown (S341-1) | To verify that a high gas fuel flow condition will cause a shutdown if lightoff has not already occurred, otherwise the shutdown logic is disabled | TE 14 |
| 198<br>Phase II | Flameout (S349/TP349) | To verify existence of logic for flameout fails | TE 14 |
| 202<br>Phase II | Liquid Fuel Pressure Low Alarm | To verify existence of logic for low liquid fuel pressure | TE 14 |
| 204<br>Phase II | Dual Fuel Transfer | To verify proper fuel transfer sequence from gas to liquid, and vice versa | TE 14 |
| 207<br>Phase II | Gas Fuel Filter DP | To verify existence of logic for gas fuel filter Delta-P fail | TE 14 |
| 218<br>Phase II | Generator Winding Temp | To verify existence of logic for generator winding temps fail | TE 14 |

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| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 219<br>Phase II | Generator Bearing Temp | To verify existence of logic for generator bearing temps fail | TE 14 |
| 221<br>Phase II | Under/Over Voltage | To verify the proper operation of the under/over voltage software logic | TE 14 |
| 223<br>Phase II | Switchgear Malfunction | To verify existence of logic for switch gear malfunction fail | TE 14 |
| 224<br>Phase II | Differential or Ground Fault | To verify existence of logic for differential or ground fault fail | TE 14 |
| 225<br>Phase II | KW Control | To verify the correct operation of the KW control modes | TE 14 |
| 285<br>Phase II | Enclosure Vent Fan | To verify the enclosure vent fan turns on and remains on whenever the lube oil system is in operation and turns off if a fire is detected | TE 14 |
| 287<br>Phase II | Air Inlet Filter DP Alarm and Shutdown (S799) | To ensure the air inlet filter Delta-P alarm and shutdown logic is present and functional | TE 14 |
| 300<br>Phase II | Water Wash (L390) | To verify the water wash solenoid operates when selected, provided speed is above 15% | TE 14 |
| 301<br>Phase II | Online Water Wash | To verify the on-line water wash only operates at speeds above 90%, and that on-line cleaning is secured if a cleaning fluid pressure low alarm occurs | TE 14 |
| 306<br>Phase II | 120 Vdc Battery Charger Alarm (M) | To ensure the 120 Vdc battery charger alarm logic is present and functional | TE 14 |
| 307<br>Phase II | PLC Rack Fault | To verify the correct functionality of the PLC Rack Fault and Rack Queue Full Shutdowns | TE 14 |

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| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 310<br>Phase II | Verify 24 Vdc Alarm and Shutdown Setpoints | To verify the correct setpoints for the 24 Vdc voltage high alarm and voltage low alarm and shutdown features | TE 14 |
| 312<br>Phase II | Output Module Failure | To verify the output module failure logic for commands that have output command feedback | TE 14 |
| 340<br>Phase II | Display - Operation Summary Screen | Verify the operation screen has the proper information and is functionnl | TE 14 |
| 341<br>Phase II | Display - Temperature Summary Screen | To verify the temperature summary screen shows all the temperatures monitored on the unit | TE 14 |
| 342<br>Phase II | Display - Menu Selections | To verify the menu selection screen shows all options available for the unit | TE 14 |
| 343<br>Phase II | Display - Alarm Summary | To verify the alarm screen displays all the acknowledged and unacknowledged alarms and/or shutdowns in the order of time in which they have occurred | TE 14 |
| 344<br>Phase II | Display - First Out Alarms | To verify the first out alarm screen displays all the unacknowledged alarms and shutdowns in the order in which they occurred | TE 14 |
| 345<br>Phase II | Display - Discrete Event Log | To verify the discrete event log screen displays any change in the discrete inputs. It gives the new status of all discrete states and the time they were changed | TE 14 |
| 346<br>Phase II | Display - System Manager | To verify the system manager screen controls access to restricted display functions | TE 14 |
| 348<br>Phase II | Display - Strip Chart/Running Time | To verify that the strip chart screen will continually update any four selected analog parameter in real time It displays over a period of 6 or 12 minutes of data and it is updated every second | TE 14 |
| 349<br>Phase II | Display - Analog History | To verify that the analog history screen displays four historical average analog values These values represent data points collected during package operation when NGP is above 65% and averaged into intervals | TE 14 |

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| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 351<br>Phase II | Display - Trigger Log | To verify that the trigger log screen displays up to four analog variables from the files saved These data are non-averaged snapshot of every analog signal taken every data update period whether or not the engine is in the running mode This feature includes strip charts and digital display of selected analogs up to six minutes of data points These data can also be printed if the printer option has been purchased. | TE 14 |
| 354<br>Phase II | Display - Playback | To verify that the online playback modes of the T37 display function properly | TE 14 |
| 375<br>Phase III | Complete Software Test | To verify software PTI folder is returned to the test engineer after software testing is complete | |

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| Solar Turbines<br>*A Caterpillar Company* | CONTROL CONSOLE<br>HARDWARE VERIFICATION | Page: 1 of 4 | Date:12/01/00 |
|---|---|---|---|
| **CUSTOMER:** | **PROJECT: 2-59731** | **UNIT: 1 of 2** | |

| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 5 | Console Wiring and Shortages (Can) | To ensure that the console components and wiring are in accordance with the legal wiring diagram. Verify that any missing components are recorded in the test log and placed on order. | TE 14 |
| 7 | Allen Bradley Module Switches and Jumper Settings | Verify that the switches and jumpers on the A/B modules and the backplane of the PLC rack are set in accordance with the electrical schematic Also, verify that all modules are correctly positioned in the rack. | TE 14 |
| 8 | Horn/Hour Meter/Start Counter Disconnect | To disable the alarm horn, hour meter, and start counter during test. | TE 14 |
| 10 | Connect External DC Power | To search for any "short" circuits between OVDC and frame, and 24VDC and fiame before applying DC power to the control console Also, verify that each circuit breaker powers its respective circuit/bus only per electrical print | 727 |
| 12 | Prepare Programming Terminal and Load PLC Program | Connect the programming terminal (PC) to the control console PLC and load the project application software to the PLC. | 727 |
| 15 | Load Display Program (TT2000) | Load the display software into the contro console display terminal/computer. | TE 14 |
| 16 | Load Display Program (PV1000) | Load the display software into the control console Panel View 900 | 727 |
| 21 | PLC LED's All Green | Verify no communication error exists between the PLC and the display. | 727 |
| 22 | Clear All Malfunctions | To lock-up the backup relay system | 727 |
| 24 | Block Transfer Error - Controlnet | To verify the correct alarm and/or shutdown functionality associated with ControlNet communication errors for units with CAN or ACNR modules | TE 14 A |
| 25 | PLC I/O Hardware Check | To verify that all PLC I/O channels (except those related to the fire, vibration, and backup system) are functioning properly in accordance with the legal electrical schematic diagram | TE 14 A |

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| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 31 | IPG Vibration Accelerometer Transmitter | To ensure that the vibration acceleration transmitters are providing the correct output for a given input | P TE 14 A |
| 32 | IPG Vibration Velocity Transmitter | To ensure that the vibration velocity transmitters are providing the correct output for a given input | P TE 14 A |
| 49 | Lamp Test | To verify the lamps on the turbine control panel are operational | 727 |
| 61 | Start Counter | To verify the start counter is incremented once during every start that engine lightoff (T5>400 Deg F) occurs | P TE 14 A |
| 62 | Hour Meter | To verify the hour meter begins counting when the engine reaches starter dropout speed | P TE 14 A |
| 63 | Alarm Horn | To verify the horn is sounded on any alarm or shutdown condition and silenced when the alarm/shutdown condition is cleared or when "horn silence" or reset is selected | TE 14 |
| 69 | PLC Powerup | To verify that the I/O modules communicate properly and a fast stop shutdown occurs on initial PLC powerup | P TE 14 A |
| 75 | 24 Vdc Voltage Divider | To verify the accuracy of the 24 Vdc measurement resistor network with a calibrated meter. | 727 |
| 90 | Backup System Fast Stop | Ensure that the backup system will de-energize the starter, fuel valves, bleed valve, and guide vane independently of the PLC | P TE 14 A |
| 91 | Relay Backup - Fire Signal (K298) | Verify that in the event of a fire and a PLC failure, the backup system activates the pre/post lube oil pump while the rolldown timer (KD298) is timing | P TE 14 A |
| 94 | Backup System Lube Pump Control (S/C/T60) | Verify that in the event of PLC failure, the auxiliary lube oil pump is turned on If S322-2 does not see pressure (auxiliary lube oil pump failed), then the backup lube oil pump turns on and auxiliary lube oil pump turns off immediately | P TE 14 A |

| Solar Turbines<br>*A Caterpillar Company* | CONTROL CONSOLE HARDWARE VERIFICATION | Page: 3 of 4 | Date:12/01/00 |
|---|---|---|---|
| **CUSTOMER:** | **PROJECT: 2-59731** | **UNIT: 1 of 2** | |

| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 115 | T37 Keyboard Commands | To verify that the display terminal's two sealed-membrane keypads (the Function Keypad and the numeric Keypad) are functional | TE 14 |
| 116 | Printer/Logger | To verify that the printer and data logging functions are operable. | TE 14 |
| 117 | Set Console Timers | To verify that all electrical timers are set per the legal drawing and torque painted | 727 |
| 130 | A/C Visual Inspection | To verify the correct selection of the A/C meters and their proper wiring. | 744 |
| 131 | A/C Simulator Hookup | To provide a consistent and logical method for connecting the A/C simulator. | 744 |
| 132 | A/C LSM Module Verification (Hardware) | To verify that the LSM is installed and functions properly | 744 |
| 133 | A/C Metering Accuracy | To verify the accuracy of the AC meters and the CRT displayed AC parameters | 744 |
| 134 | A/C Voltage Droop Verification | To verify initial setup of the voltage droop feature of the Basler voltage regulator | 744 |
| 135 | A/C KVAR/P F Control | To verify the Basler KVAR/PF controller is operating properly | 744 |
| 136 | A/C Motorized Voltage Adjust | To verify that the motorized potentiometer and associated control assembly function correctly | 744 |
| 137 | A/C Voltage Regulator | To verify the circuitry and operation of the voltage regulator. | 744 |

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| Solar® Turbines<br>*A Caterpillar Company* | CONTROL CONSOLE<br>HARDWARE VERIFICATION | Page: 4 of 4 | Date:12/01/00 |
|---|---|---|---|
| **CUSTOMER:** | **PROJECT: 2-59731** | **UNIT: 1 of 2** | |

| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 139 | A/C Single Unit Auto Sync (Hot Bus) | To verify the unit will automatically synchronize with a live bus | |
| 140 | A/C Single Unit Auto Sync (Dead Bus) | The purpose of this operation is to verify statically that the control console is tuned to automatically synchronize to a dead bus | |
| 150 | Clear Open Discrepancies | To verify all operations have been performed and the Automated Test Log (ATL) is reviewed. | |
| 152 | Legal Drawings Clear | To verify all changes shown on the legal electrical drawing have been performed and the legal drawing is signed by the test engineer | |
| 154 | Console Complete and Authorized for Disconnect | To obtain authorization from test engineer to disconnect the turbine controls and verify all test equipment and accessories are disconnected | |
| 155 | Post-Test Visual Inspection | The purpose of this operation is to compare the wiring of the controls with the legal electrical drawing, log any discrepancies discovered, and take the necessary corrective action. | |
| 158 | Final I/O Check | To verify if new I/O modules or channels were added and perform a hardware check on them | |
| 159 | Load PLC Program | To ensure the latest revision of the controls software is downloaded to the PLC | |
| 165 | Test Cell Acceptance (New Production) | To ensure the package test engineer has accepted the turbine controls by signing the test verification sheet 12/6/2000 for T.E. | |

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# UNIVERSAL GENERATOR SET ACCEPTANCE TEST

CUSTOMER: UNIT: 1 PD: 2-59731

MO: 3100245 PKG S/N: TG01137 ENG S/N: 1006T

| STATION 3 OPERATIONS | | | | |
|---|---|---|---|---|
| OPER NO | OPERATION | REV DATE | DESCRIPTION | STAMP |
| SKID TEST OPERATIONS (STATION 3) | | | | |
| 2000 | SAFETY INSTRUCTIONS AND FAMILIARIZATION | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE OPERATOR IS FULLY AWARE OF THE PROJECT REQUIREMENTS AND GENERAL SAFETY PRECAUTIONS TO BE FOLLOWED WHEN OPERATING TURBO MACHINERY IN SUPPORT OF PRODUCTION TEST OPERATIONS. | 755 |
| 2002 | SKID INSPECTION | 8/98 | THE PURPOSE OF THIS OPERATION IS TO PERFORM A PRELIMINARY INSPECTION OF THE SKID FOR PROPER ASSEMBLY AND COMPLETENESS. | 755 |
| 2005 | SHORTAGES | 9/99 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT ALL SHORTAGES ARE RECOGNIZED AND DOCUMENTED. | 755 |
| 2020 (AC) | LUBE OIL TANK AND CIRCULATION HEATER CHECK | 6/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE PART NUMBER AND INTEGRITY OF THE LUBE OIL TANK AND CIRCULATION HEATERS, AS APPLICABLE | 981 |
| 2025 (AC) | AC MOTOR SPACE HEATERS | 4/00 | THE PURPOSE OF THIS OPERATION IS TO MEASURE THE DC RESISTANCE AND VERIFY CONTINUITY OF EACH PACKAGE MOTOR SPACE HEATER | 981 |
| 2030 (AC) | GENERATOR SPACE HEATER | 5/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE INTEGRITY OF THE GENERATOR SPACE HEATERS | 981 |
| 2035 (AC) | GENERATOR WINDING INSULATION RESISTANCE | 5/00 | THE PURPOSE OF THIS OPERATION IS TO MEASURE THE INSULATION RESISTANCE OF THE GENERATOR WINDINGS | 304 |
| 2040 (AC) | GENERATOR EXCITER FIELD DC RESISTANCE | 5/00 | THE PURPOSE OF THIS OPERATION IS TO MEASURE THE DC RESISTANCE OF THE GENERATOR'S EXCITER FIELD | 981 |
| 2045 | VIBRATION SYSTEM INSTALLATION VERIFICATION | 3/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE PROPER INSTALLATION OF THE VIBRATION SYSTEM COMPONENTS | 755 |
| 2050 | PRELIMINARY FACILITY ATTACHMENTS | 12/98 | THE PURPOSE OF THIS OPERATION IS TO PREPARE VARIOUS PACKAGE SYSTEMS AND CONNECTIONS FOR HOOKUP IN THE TEST CELL | 730 |
| 2055 | INSTRUMENTATION HOOKUP I | 4/99 | THE PURPOSE OF THIS OPERATION IS TO PROVIDE GUIDELINES FOR THE HOOKUPS AND INSTALLATION OF FACILITY HARNESSES AND TEST EQUIPMENT. | 730 |
| 2060 | CIRCUIT TO GROUND RESISTANCE CHECK | 10/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THERE IS A MINIMUM RESISTANCE BETWEEN ANY CIRCUIT AND SKID GROUND | 730 |
| 2085 | PACKAGE ELECTRICAL END DEVICES | 7/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE ACCURACY OF THE PACKAGE MOUNTED END DEVICES THROUGH THE ELECTRICAL INTERCONNECT | TE 75 |
| 2090 | SKID INTERCONNECT AND SKID DC POWER HOOKUP | 6/00 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT THE CORRECT INTERCONNECTS AND DC POWER HOOKUPS ARE HOOKED UP PER THE "LEGAL" WIRING DIAGRAM | 755 |
| CONSOLE/CONTROL SYSTEMS TEST OPERATIONS (STATION 3) | | | | |
| 2100 | OUTPUT MODULE WIRING VERIFICATION | 5/00 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT NONE OF THE OUTPUT CIRCUITS FROM THE PLC ARE SHORTED TO "0V" OR GROUND | 755 |

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| OPER NO | OPERATION | REV DATE | DESCRIPTION | STAMP |
| 2120 | PLC SOFTWARE REVISION PROCEDURE | 4/99 | THE PURPOSE OF THIS OPERATION IS TO OUTLINE THE PROCEDURE FOR INSTALLING NEW SOFTWARE REVISIONS TO THE PROGRAM LOGIC CONTROLLER (PLC) | 755 |
| 2125 | SOFTWARE LOADING | 4/99 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT THE SOFTWARE IS LOADED PROPERLY. | 755 |
| 2130 | CONSOLE/SKID LOCKUP | 7/97 | THE PURPOSE OF THIS OPERATION IS TO PREPARE THE CONSOLE AND SKID FOR TESTING. | 755 |
| 2132 | VIB MONITOR SYSTEM CHECK | 8/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE ON-SKID VIBRATION PROBES ARE CONNECTED TO THE CORRECT VIBRATION CHANNEL OF THE CONTROL SYSTEM'S VIBRATION MONITORING EQUIPMENT. | 755 |
| 2135 | OFF/LOCAL/REMOTE SWITCH (S101) | 7/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT WHEN THE OFF/LOCAL/REMOTE SWITCH (S101) IS IN THE OFF MODE, THE UNIT DOES NOT RESPOND TO THE START SIGNAL AND LOCKOUT SHUTDOWN IS ANNUNCIATED. | 755 |
| 2140 | FAST STOP | 2/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE LOCAL/SKID/REMOTE FAST STOP SWITCHES WILL STOP THE UNIT WHILE IN THE LOCAL OR REMOTE MODE. | 755 |

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## STATION 4 OPERATIONS

| OPER. NO. | OPERATION | REV DATE | DESCRIPTION | STAMP |
|---|---|---|---|---|
| 2300 | SKID SUPPORT LOCATION | 5/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE SKID SUPPORTS ARE UNDER THE CUSTOMERS BOLT-DOWN POINTS. | 755 |
| 2305 | FACILITY INLET/EXHAUST ATTACHMENTS | 4/00 | THE PURPOSE OF THIS OPERATION IS TO PROVIDE INSTRUCTION TO ATTACH THE FACILITY INLET AND EXHAUST DUCTS TO THE PACKAGE | 755 |
| 2315 | PLC SOFTWARE REVISION PROCEDURE | 4/97 | THE PURPOSE OF THIS OPERATION IS TO OUTLINE THE PROCEDURE FOR INSTALLING NEW SOFTWARE REVISIONS TO THE PROGRAM LOGIC CONTROLLER (PLC) | 755 |
| 2320 | SOFTWARE LOADING | 4/99 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT THE SOFTWARE IS LOADED PROPERLY. | 755 |
| 2325 | FACILITY OIL FILTER INSTALLATION | 3/00 | THE PURPOSE OF THIS OPERATION IS TO PROVIDE GUIDELINES FOR THE INSTALLATION OF FACILITY EQUIPMENT FOR TEST MEASUREMENT AND PACKAGE OIL SYSTEM PROTECTION. | 755 |
| 2330 | LOW LUBE OIL LEVEL AL/SD AND LUBE TANK FILL | 9/97 | THE PURPOSE OF THIS OPERATION IS TO FILL THE LUBE OIL TANK, AND VERIFY THE LOW OIL LEVEL SWITCH FUNCTIONS PROPERLY | 808 |
| 2345 | SKID FAST STOP | 4/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE SKID FAST STOP PUSH-BUTTON SHUTS THE UNIT DOWN AND THE ASSOCIATED DISPLAY MESSAGES ARE DEPICTED ON THE DISPLAY MONITOR. | 755 |
| 2350 | IGV CALIBRATION (SOLONOX) | 4/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE IGVS ARE CALIBRATED CORRECTLY. IF THE IGVS ARE SUSPECTED TO BE INCORRECTLY CALIBRATED, DEPT 377 (ENGINE BUILD) SHOULD BE REQUESTED TO RECALIBRATE THE IGVS. | 755 |
| 2355 | GEARBOX/ENGINE INSTALLATION | 7/95 | THE PURPOSE OF THIS OPERATION IS TO INSTALL ENGINE AND/OR GEARBOX ON THE SKID CORRECTLY, EFFICIENTLY, AND SAFELY. | 755 |
| 2360 (AC) | GENERATOR LOAD CABLE HOOKUP | 6/00 | THE PURPOSE OF THIS OPERATION IS TO SAFELY ATTACH THE GENERATOR LOAD CABLES TO THE FACILITY LOAD TESTING NETWORK | 981 |
| 2365 (AC) | FACILITY LOAD TESTING SETUP | 5/00 | THE PURPOSE OF THIS OPERATION IS TO SETUP THE FACILITY LOAD TESTING CIRCUIT BREAKER OVERCURRENT TRIP RELAYS AND PREPARE THE FACILITY LOAD BANKS FOR TESTING. | 981 |
| 2370 | FACILITY HOOKUP (TESTCELL) | 12/98 | THE PURPOSE OF THIS OPERATION IS TO CONNECT VARIOUS PACKAGE SYSTEMS TO TEST CELL FACILITIES. | 755 |
| 2375 | FACILITY COMPUTER LOADING | 3/00 | THE PURPOSE OF THIS OPERATION IS TO LOAD THE SALES ORDER SPECIFIC TEST DEFINITION PROGRAM INTO THE FACILITY COMPUTER SYSTEM | 808 |
| 2380 | INTERCONNECT HOOKUPS | 7/97 | THE PURPOSE OF THIS OPERATION IS TO PLUG IN THE PACKAGE, CONSOLE AND FACILITY TEST INTERCONNECTS TO PERMANENTLY MOUNTED TEST CELL FACILITY CABLE RUN CONNECTORS. | 755 |
| 2385 | INSTRUMENTATION HOOKUP II | 6/95 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT INSTRUMENTATION HOOKUPS ARE PERFORMED SAFELY AND PROPERLY. | 755 |
| 2390 (AC) | GENERATOR FACILITY INTERCONNECTS | 6/00 | THE PURPOSE OF THIS OPERATION IS TO COMPLETE THE GENERATOR FACILITY AC HARNESS CONNECTIONS | 981 |
| 2395 | FACILITY VIBRATION MONITOR VERIFICATION | 3/00 | THE PURPOSE OF THIS OPERATION IS TO CONNECT THE FACILITY VIBRATION MONITOR SYSTEM AND SET THE APPROPRIATE ALARM AND SHUTDOWN SETPOINTS | 755 |

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|---|---|---|---|---|
| OPER. NO. | OPERATION | REV DATE | DESCRIPTION | STAMP |
| 2400 | ZERO INSTRUMENTATION CHECK | 2/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT ALL INSTRUMENTATION READINGS MEET THE FACILITY COMPUTERS ZERO CHECK CONDITIONS. | |
| 2410 (AC) | AC MOTOR CONNECTION | 8/98 | THE PURPOSE OF THIS OPERATION IS TO PROVIDE A SAFE PROCEDURE FOR THE WIRING OF THE PACKAGE AC MOTOR CONNECTIONS | |
| 2415 (AC) | VFD CONFIGURATION | 5/99 | THE PURPOSE OF THIS OPERATION IS TO SAFELY SET UP AND CONFIGURE ALL PACKAGE VARIABLE FREQUENCY DRIVES (VFD'S) | |
| 2420 | PRELUBE PACKAGE | 3/00 | THE PURPOSE OF THIS OPERATION IS TO MAKE PRELIMINARY CHECKS AND ADJUSTMENTS TO LUBE OIL SYSTEM PRIOR TO FIRST CRANK. | |
| 2430 | AUX AND B/U LUBE OIL PUMP SHUTDOWNS | 8/97 | THE PURPOSE OF THIS OPERATION IS TO INSURE PROPER OPERATION OF THE AUXILIARY AND BACKUP LUBE PUMPS AND ASSOCIATED SOFTWARE LOGIC | |
| 2440 | LIQUID FUEL SYSTEM LEAK TEST | 6/99 | THE PURPOSE OF THIS OPERATION IS TO LEAK TEST MOST OF THE LIQUID FUEL SYSTEM PRIOR TO STARTING THE UNIT IN LIQUID FUEL. | |
| 2445 | GAS FUEL SYSTEM LEAK TEST | 6/99 | THE PURPOSE OF THIS OPERATION IS TO CHECK THE GAS FUEL SYSTEM FOR LEAKS PRIOR TO CONNECTING THE NATURAL GAS TO THE SYSTEM DURING THIS TEST THE PILOT AIR SUPPLY PRESSURE AND TORCH PRESSURE WILL BE SET PER THE MECHANICAL LEGAL DRAWINGS. | |
| 2450 | PECC FUEL VALVE SETUP | 4/97 | THE PURPOSE OF THIS OPERATION IS TO STATICALLY VERIFY THE PROPER OPERATION OF THE PECC GAS FUEL CONTROL VALVE. | |
| SPEC OP "A" | T60 SINGLE SHAFT ADRE SET UP | 12/00 | THE PURPOSE OF THIS OPERATION IS TO SETUP THE ADRE FOR VIBRATION MONITORING OF T60 SINGLE SHAFT ENGINES | |
| 2462 | "AFI" AND "FORCE" SEARCH | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE PROGRAM AND CONSOLE ARE CHECKED FOR AFI'S, FORCE'S, AND TEST JUMPERS WHICH WERE INSTALLED OR OVERLOOKED DURING THE STATIC PORTION OF TESTING AND REMOVE THEM, IF POSSIBLE, BEFORE CRANKING THE ENGINE. | |
| 2465 | AIR INLET INSPECTION | 9/98 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE AIR INLET DUCT IS CLEAN AND FREE OF FOREIGN OBJECTS AND DEBRIS. | |
| TEST ENGINEER OR SUPERVISOR'S INITIALS, UNIT READY TO CRANK | | | | |
| 2470 | FIRST CRANK | 4/00 | THE PURPOSE OF THIS OPERATION IS TO CONDUCT THE UNIT'S "FIRST CRANK". | |
| 2475 | FIRST LIGHT OFF | 4/00 | THE PURPOSE OF THIS INSTRUCTION IS TO PROVIDE FOR AN ORDERLY AND DOCUMENTED PROCEDURE FOR PERFORMING "FIRST LIGHT-OFF". | |
| 2480 | OVERSPEED | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE THREE SEPARATE OVERSPEED SHUTDOWNS, PLC CONTROLLED INSTANTANEOUS AND DELAYED AND THE SEPARATE SKID MOUNTED BACK-UP OVERSPEED MONITOR. | |
| 2485 | NGP SPEED LOSS SHUTDOWN | 3/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT UPON LOSS OF ONE SPEED PICKUP CONDUCTOR, THE UNIT WILL SHUTDOWN. | |
| 2490 | FUEL VALVE FAIL (GAS AND DUAL FUEL) | 6/00 | THE PURPOSE OF THIS OPERATION IS TO INSURE PROPER OPERATION OF BOTH THE PRIMARY AND SECONDARY FUEL VALVES | |

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| OPER. NO. | OPERATION | REV DATE | DESCRIPTION | STAMP |
| 2495 | OIL PRESSURE ALARM AND SHUTDOWN | 6/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY PROPER ALARM AND SHUTDOWN RESPONSES TO LOW LUBE OIL PRESSURE CONDITION | 808 |
| 2497 | HIGH LUBE OIL HEADER TEMPERATURE ALARM AND SHUTDOWN | 6/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE PROPER ALARM AND SHUTDOWN RESPONSES TO HIGH LUBE OIL HEADER TEMPERATURE CONDITIONS | 808 |
| 2500 | MANUAL COOLDOWN AND FAST STOP | 6/00 | THE PURPOSE OF THIS OPERATION IS TO PROVIDE FOR AN ORDERLY AND DOCUMENTED PROCEDURE FOR PERFORMING BOTH A MANUAL COOLDOWN AND FAST STOP | 808 |
| 2530 | T5 TEMPERATURE TOPPING, SETPOINT, AND CONTROLS | 6/00 | THE PURPOSE OF THIS OPERATION IS TO INSURE THAT THE FUEL SYSTEM FUNCTIONS PROPERLY IN ORDER TO RELIABLY START THE PACKAGE AND ALSO PREVENT A HIGH TEMP S/D | 808 |
| 2540 | GENERATOR BEARING OIL PRESSURE SHUTDOWN | 4/97 | THE PURPOSE OF THIS OPERATION IS TO INSURE THE PROPER OPERATION OF THE GENERATOR BEARING LOW OIL PRESSURE SHUTDOWN | A |
| 2545 (AC) | PMG VOLTAGE AND FREQUENCY CHECK | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT PRIOR TO VOLTAGE BUILD, THE GENERATOR'S PMG PRODUCES THE PROPER VOLTAGE AND FREQUENCY | 808 |
| 2550 (AC) | VOLTAGE BUILD-UP | 6/00 | THE PURPOSE OF THIS OPERATION IS TO PERFORM THE INITIAL VOLTAGE BUILD | 808 |
| 2560 | BLEED VALVE SEQUENCE | 3/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE BLEED VALVE OPENS AND CLOSES IN THE CORRECT SEQUENCE AND SPEED OR LOAD VALUES. | 808 |
| 2575 | GEARBOX AND ENGINE BREAK-IN | 6/00 | THIS OPERATION DETAILS THE PROCEDURE FOR THE GEARBOX BREAK-IN RUNS AS SPECIFIED IN THE APPLICABLE ENGINE ACCEPTANCE SPECIFICATION. | 808 |
| 2580 | ENGINE ACCEPTANCE | 6/00 | THIS OPERATION DETAILS THE PROCEDURE FOR THE ENGINE ACCEPTANCE RUN(S) AS SPECIFIED IN THE APPLICABLE ENGINE ACCEPTANCE SPECIFICATION. | 808 |
| 2585 | EMISSIONS | 6/00 | THIS OPERATION DETAILS THE PROCEDURE FOR THE ENGINE EMISSIONS RUN(S) AS SPECIFIED IN THE APPLICABLE ENGINE ACCEPTANCE SPECIFICATION. | 808 |
| 2590 | GENERATOR WINDING RTD VERIFICATION | 6/00 | THE PURPOSE OF THIS OPERATION IS TO MEASURE AND RECORD ALL GENERATOR WINDING RTD READINGS | 761 |
| 2610 | PRELIMINARY LEAK CHECK | 6/00 | THE PURPOSE OF THIS OPERATION IS TO IDENTIFY AND FIX AS MANY AIR, OIL, FUEL OR WATER LEAKS AS POSSIBLE BEFORE CONTINUED TESTING. | 761 |
| 2620 | MOTOR ROTATION ARROW VERIFICATION | 6/00 | THE PURPOSE OF THIS INSTRUCTION IS TO ENSURE THAT THE MOTOR ROTATION ARROWS ARE CORRECTLY INSTALLED NEAR EACH MOTOR OR MOTOR/PUMP COMBINATION AND THEY ARE ACCURATE IN THEIR DEPICTION. | 761 |
| 2625 (AC) | VOLTAGE AND SPEED RANGE ADJUST | 6/00 | THE PURPOSE OF THIS OPERATION IS TO MANUALLY VERIFY PACKAGE VOLTAGE AND SPEED ADJUSTABILITY | 738 |
| 2630 (AC) | SPEED DROOP | 6/00 | THE PURPOSE OF THIS OPERATION IS TO ADJUST AND VERIFY THE OPERATION OF THE SPEED DROOP FEATURE OF THE GENERATOR CONTROL SYSTEM | 981 |
| 2635 (AC) | SPEED ISOCH TO SPEED DROOP BUMPLESS TRANSFER | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE SPEED ISOCH TO SPEED DROOP BUMPLESS TRANSFER FEATURE | 738 |

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| OPER. NO. | OPERATION | REV DATE | DESCRIPTION | STAMP |
| 2645 (AC) | VOLTAGE DROOP | 6/00 | THE PURPOSE THIS OPERATION IS TO VERIFY THE VOLTAGE DROOP FEATURE OF THE VOLTAGE REGULATOR | 738 |
| 2655 (AC) | SPEED AND VOLTAGE REGULATION | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT SPEED AND VOLTAGE ARE PROPERLY REGULATED OVER A RANGE OF LOAD POINTS | 806 |
| 2660 (AC) | LOAD TRANSIENT TUNING | 4/99 | THE PURPOSE OF THIS OPERATION IS TO TUNE THE CONTROL SYSTEM SUCH THAT THE SPEED AND VOLTAGE RECOVERY TIMES AND EXCURSIONS ARE WITHIN THE SPECIFIED LIMITS PRIOR TO PERFORMING THE "AUTOSYNC" OPERATION. | 755 |
| 2665 (AC) | SINGLE UNIT SYNCHRONIZATIOIN | 11/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE UNITS ABILITY TO SYNCHRONIZE VOLTAGE, FREQUENCY, AND PHASE ANGLE WITH A SIMULATED 3-PHASE BUS AND CLOSE THE OUTPUT BREAKER WHEN AN AUTOSYNCH OR MANUAL SNYC COMMAND IS INITIATED. | 506 |
| 2670 (AC) | LOAD TRANSIENTS | 4/99 | THE PURPOSE OF THIS OPERATION IS TO DOCUMENT THE UNIT'S ABILITY TO RECOVER FROM AN EXTREME ON OR OFF LOAD CONDITION WITHIN SPECIFIED LIMITS | 738 |
| 2680 (AC) | KW & EXPORT/IMPORT CONTROL | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE UNIT'S KW CONTROL FEATURE AND IMPORT/EXPORT CONTROL (IF APPLICABLE) | 981 |
| 2685 (AC) | KVAR/PF CONTROL (ISLAND MODE) | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE KVAR/PF CONTROL WILL CHANGE GENERATOR VOLTAGE AS THE KVAR/PF SETPOINT IS VARIED | 806 |
| 2695 | F13/T4 PRELIMINARY SETPOINTS | 6/00 | THE PURPOSE OF THIS OPERATION IS TO DOCUMENT PRELIMINARY F13 AND T4 VALUES AT THE END OF SUDDEN LOADS, IF SINGLE FUEL ONLY, AND AT THE END OF FUEL CHANGEOVERS IF THE UNIT IS DUAL FUEL. | 808 |
| 2700 | START RELIABILITY AND ACCELERATION | 4/97 | THE PURPOSE OF THIS OPERATION IS TO DEMONSTRATE AND VERIFY THE CAPABILITY OF THE UNIT IN STARTING RELIABLY AND SUCCESSFULLY FOR FOUR CONSECUTIVE TIMES. | 808 |
| 2705 | CUSTOMER OBSERVE OPERATIONS | 6/00 | THE PURPOSE OF THIS OPERATION IS TO DEMONSTRATE FOR THE CUSTOMER ALL REQUIRED OPERATIONS PER THE PACKAGE APPLICATION CHECK SHEET (ACS) AND THE INSPECTION AND TEST PLAN (ITP). | 808 |
| 2740 | TEST CRANK | 4/97 | THE PURPOSE OF THIS OPERATION IS TO INSURE PROPER OPERATION OF THE TEST CRANK FUNCTION FOR UNITS WITHOUT THE ON-CRANK WATER WASH OPTION. | 761 |
| 2745 | WATER WASH (ON-CRANK AND ON-LINE) | 6/00 | THE PURPOSE OF THIS OPERATION IS TO PROVIDE FOR A DOCUMENTED AND ORDERLY PROCEDURE FOR TESTING THE PACKAGE WATER WASH SYSTEM(S) | 758 |
| 2750 | DATA TABULATION | 3/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT ALL OFFICIAL DATA REQUIRED FOR A PARTICULAR PROJECT HAS BEEN TAKEN AND THOROUGHLY CHECKED BY TECHNICIAN, LEAD PERSON, AND TE, AND CLEARLY DOCUMENTED IN THE PTI. | 808 |
| TEST ENGINEER'S INITIALS, UNIT OK TO DEPREP | | | | SM |
| 2765 | VIBRATION AND TEMP SUPPLEMENTARY DATA | 4/97 | THE PURPOSE OF THIS OPERATION IS TO PERFORM A VISUAL CHECK OF THE CONSOLE'S DATA DISPLAYS WHILE RUNNING | 808 |
| 2770 | FINAL LEAK CHECK I - PREP AND INITIAL VISUAL | 4/97 | THE PURPOSE OF THIS OPERATION IS TO PREPARE UNIT FOR FINAL LEAK CHECK | 808 |

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| OPER. NO. | OPERATION | REV DATE | DESCRIPTION | STAMP |
| 2775 | FINAL LEAK CHECK II - FUEL SYSTEM CHECK | 4/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THERE ARE NO FUEL LEAKS PRESENT ON THE UNIT PRIOR TO PACKAGE PULL | 808 |
| 2780 | FINAL LEAK CHECK III - AIR SYSTEM CHECK | 4/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THERE ARE NO AIR LEAKS ON THE UNIT PRIOR TO PACKAGE PULL | 808 |
| 2785 | FINAL LEAK CHECK IV - OIL SYSTEM CHECK | 4/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THERE ARE NO OIL LEAKS ON THE UNIT IN IT'S FIELD CONFIGURATION PRIOR TO PACKAGE PULL | 808 |
| 2790 | FINAL LEAK CHECK V - CONCLUSION | 4/97 | THE PURPOSE OF THIS OPERATION IS TO CONCLUDE THE FINAL LEAK CHECK OPERATIONS AND ENSURE THAT THERE ARE NO FLUID LEAKS ON THE UNIT PRIOR TO PACKAGE PULL | 808 |
| 2800 | AS-TEST PROGRAM SAVE AND PROGRAM CONSTANTS | 4/99 | THE PURPOSE OF THIS OPERATION IS TO SAVE A COPY OF THE "AS-TESTED" SOFTWARE TO THE "S" DRIVE AND PRINT THE PROGRAM CONSTANTS | 755 |
| 2805 | TEST COMPLETE - READY TO PRESERVE | 1/99 | THE PURPOSE OF THIS OPERATION IS TO TO VERIFY ALL GREEN CHANGES, TEST OPERATIONS AND DISCREPANCIES HAVE BEEN STAMPED OFF OR ADDRESSED AND THAT THE PACKAGE TEST IS COMPLETE TO WHERE THE ENGINE AND FUEL SYSTEM CAN BE PRESERVED. | 755 |
| TEST ENGINEER'S INITIALS, UNIT OK TO PRESERVE | | | | SK 1/23/01 |
| 2820 | ENGINE AND FUEL SYSTEM PRESERVATION | 3/00 | THE PURPOSE OF THIS OPERATION IS TO SAFELY AND PROPERLY PRESERVE THE PACKAGE FUEL SYSTEM(S) AND THE ENGINE UPON CONCLUSION OF DYNAMIC TEST | 755 |
| 2822 (AC) | CURRENT TRANSFORMER WIRING | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE WIRING FOR THE DIFFERENTIAL AND NEUTRAL CURRENT TRANSFORMER LEADS IS PER THE LEGAL ELECTRICAL SCHEMATIC AND WIRING DIAGRAM . | 819 |
| 2825 (AC) | GENERATOR AND AC FACILITY DISCONNECT | 6/00 | THE PURPOSE OF THIS OPERATION IS TO DISCONNECT THE GENERATOR PACKAGE LOAD CABLES AND GENERATOR INSTRUMENTATION | 819 |
| 2835 | PACKAGE DE-PREP | 1/99 | THE PURPOSE OF THIS OPERATION IS TO PREPARE THE PACKAGE FOR REMOVAL FROM THE TEST CELL. | 808 |
| 2837 | CONSOLE (CONTROL SYSTEM) DE-PREP | 12/99 | THE PURPOSE OF THIS OPERATION IS TO REMOVE ALL FACILITY TEST EQUIPMENT, RESET ALL PACKAGE TIMERS, AND PREPARE THE OFF SKID CONSOLE FOR REMOVAL FROM TEST. | 808 |
| 2840 | POST-TEST AUDIT | 4/97 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT A POST-TEST AUDIT IS PERFORMED ON THE UNIT BEFORE PACKAGE PULL. | 808 |
| 2845 | TEST VERIFICATION | 12/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT ALL ITEMS IN THE TEST PAPERWORK ARE SIGNED OR STAMPED OFF AS COMPLETE, THAT UNRESOLVED PACKAGE TEST DISCREPANCIES ARE DOCUMENTED ON THE TEST VERIFICATION SHEET, AND THAT ALL DISCREPANCIES HAVE BEEN CLEARED FROM THE TEST LOG. | 808 |
| 2846 | PACKAGE REMOVAL | 3/00 | THE PURPOSE OF THIS OPERATION IS TO REMOVE THE PACKAGE FROM THE TEST CELL | 808 |
| 2850 | PAPERWORK COMPLETE | 2/99 | THE PURPOSE OF THIS OPERATION IS TO RETURN THE COMPLETED PACKAGE PAPERWORK TO THE APPROPRIATE LOCATIONS. | 808 |

**Solar Turbines**
*A Caterpillar Company*

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# FINAL VISUAL ACCEPTANCE TEST

CUSTOMER: _____ PD #: 2-59731 UNIT #: 1 OF 2 PKG S/N: TG01137

| OPER. NO. | OPERATION | REV. DATE | DESCRIPTION | STAMP |
|---|---|---|---|---|
| 9020 | LEGAL DRAWING VERIFICATION | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO OBTAIN THE REQUIRED PROJECT "LEGAL" DRAWINGS AND VERIFY THEIR COMPLETENESS<br>CONSOLE ELECTRICAL LEGAL<br>(APPLICABLE TO ON-SKID CONTROLS ONLY)<br>SKID ELECTRICAL LEGAL<br>MECHANICAL LEGAL | 809<br>809<br>809 |
| 9040 | SKID GROUND CHECK (DRIVER SKID) | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT ON THE DRIVER SKID THERE IS A MINIMUM RESISTANCE BETWEEN ALL CIRCUITS AND SKID GROUND | 367 |
| 9060 | SKID GROUND CHECK (DRIVEN SKID) | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT ON THE DRIVEN SKID THERE IS A MINIMUM RESISTANCE BETWEEN ALL CIRCUITS AND SKID GROUND | N/A |
| 9080 | PRELIMINARY FINAL VISUAL - DRIVER SKID | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO PERFORM A PRELIMINARY FINAL VISUAL INSPECTION OF THE DRIVER SKID TO DETERMINE ALL WIRING IS PER THE "LEGAL" WIRING DIAGRAM | 367 |
| 9100 | PRELIMINARY FINAL VISUAL - DRIVEN SKID | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO PERFORM A PRELIMINARY FINAL VISUAL INSPECTION OF THE DRIVEN SKID TO DETERMINE ALL WIRING IS PER THE "LEGAL" WIRING DIAGRAM | N/A |
| 9820 | CLEAR PLC MEMORY (ON SKID CONTROLS ONLY) | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE PLC MEMORY IS WIPED CLEAR PRIOR TO SHIPMENT | 367 |
| 9840 | DISCREPANCY VERIFICATION | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT ALL DISCREPANCIES HAVE BEEN CLEARED | 809 |
| 9860 | FINAL VISUAL COMPLETE | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT ALL GREEN CHANGES HAVE BEEN WORKED. | 809 |
| 9880 | FINAL PAPERWORK | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO COPY AND DISTRIBUTE THE ENCLOSURE AND FINAL VISUAL STAMP OFF SHEET | 809 |
| 9900 | DISPATCH LEGAL DRAWINGS | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO INSURE THAT ALL THE LEGAL DRAWINGS ARE RETURNED TO THEIR PROPER LOCATION | 809 |

# ITEM 2. TURBINE ENGINE PERFORMANCE

TAURUS 60S, T7300 ONE-SHAFT ENGINE PERFORMANCE, NAT. GAS FUEL
ENGINE S/N 1006T
CELL - 08 TEST DEF= 99 9 DATA TAKEN: 19-JAN-01 20:59:44 P.F.= 0.99

| | | |
|---|---|---|
| IGV -DEG. : | 5.000 | INLET GUIDE VANE ANGLE (OPERATOR SET) |
| P.BARO -IN.HG : | 29.780 | PRESS., BAROMETRIC (T.BARO= 32. DEG.F) |
| %R.H. -% : | 55.016 | PERCENT RELATIVE HUMIDITY |
| T.AMB -DEG.F : | 55.975 | TEMP., OUTSIDE AMBIENT AIR |
| STD.TEMP-DEG.F : | 80.000 | TEMP., STANDARD CONDITIONS (0= TO.AVG) |
| P.LOSS.A- : | 652.000 | CODE: POWER LOSS COEFF'S, ACT. G/B & GEN |
| P.LOSS.C- : | 652.000 | CODE: POWER LOSS COEFF'S, CUST.G/B & GEN |
| NTURB -RPM : | 14599.697 | SHAFT SPEED, 1-SHAFT TURBINE ENGINE ROTOR |
| NT.100% -RPM : | 14951.000 | 100% SHAFT SPEED, 1-SHAFT TURBINE ENGINE R |
| GEN.KW -KW : | 4415.193 | GENERATOR LOAD |
| DRY.WA -PPS : | 45.944 | AIRFLOW, AIR INLET VENTURI, W/O HUMIDITY |
| P0.AVG -IN.H2O: | -5.483 | PRESS., AIR INLET TOTAL, AVG. OF PROBES |
| P0.PKG -IN.H2O: | -5.818 | PRESS., AIR INLET WALL STATIC, PKG. MUFF |
| P1AV.PKG-IN.H2O: | -80.697 | PRESS., ENG. COMPR. INLET STATIC, AVG. |
| PCD -PSIG : | 151.942 | PRESS., COMPRESSOR DISCHARGE |
| P7.AVG -IN.H2O: | 8.761 | PRESS., EXHAUST WALL STATIC, AVG OF TAPS |
| T0.AVG -DEG.F : | 56.421 | TEMP., AIR INLET, AVG. OF PROBES |
| T2.AVG -DEG.F : | 660.617 | TEMP., COMPRESSOR DISCHARGE, AVG, PROBES |
| T5.AVG -DEG.F : | 1147.040 | TEMP., 3RD STAGE TURB INLET, AVG, T/C'S |
| T7.AVG -DEG.F : | 870.912 | TEMP., EXHAUST GAS, AVG. OF PROBES |
| FUELTYPE- : | 1.000 | FUEL CODE: 1=NATURAL GAS, 3=LIQUID: DIES#2 |
| WF.MASS -PPH : | 2516.447 | FUEL MASSFLOW, METER #1 |
| WF.MASS2-PPH : | 2526.422 | FUEL MASSFLOW, METER #2 |
| DWF.MASS-% : | 0.396 | DELTA FUEL FLOW, METERS #1 & #2, (% OF AVG |
| LHV.NGAS-BTU/LB: | 20513.533 | LOWER HEATING VALUE, NATURAL GAS FUEL |
| TNG.AVG -DEG.F : | 52.979 | TEMP., NATURAL GAS FUEL, AVG. OF PROBES |
| H/C.GAS - : | 0.320 | HYDROGEN/CARBON RATIO, NATURAL GAS |
| WA.BLEED-PPS : | 0.000 | FLOW, AIR BLEED TO AMBIENT, SOLONOX |
| RUN.# - : | 1.000 | TEST RUN NO./DATAPOINT (OPERATOR SET) |

ADJUSTED INPUTS:

| | | |
|---|---|---|
| WF.AVG : | 2521.435 | |

RESULTS CORRECTED TO 80.0 DEG.F AIR TEMP,
SEA LEVEL, & NO DUCT LOSSES.

| | | |
|---|---|---|
| CORR PCT-SPEED, CORR.%NT | 100.04 | ( 99.70 - 100.30) |
| CORR MAX TEMP FROM WORK, TRIT/TH(STD) | 1884.6 | ( 1865. - 1885.) |
| CORR.KW | 4766.6 | ( 4615. - MIN) |
| SFC, BTU/KW-HR | 11460. | ( 11933. - MAX) |
| CORR SHP | 6766.1 | |
| SFC, BTU/HP-HR | 8073. | |
| COMPR PRESS RATIO, R(C) | 11.669 | ( 11.00 - MIN) |
| CORR COMPR MASS FLOW, WA(PPS) | 45.57 | ( 46.70 - MAX) |
| T5(R)/TRIT(R) | 0.7172 | ( 0.6972 - 0.7612) |
| CORR PT INLET TEMP, T5/TH(STD) | 1221.7 | |
| CORR EGT, T7 | 925.3 | ( 900. - MIN) |
| ACTUAL TEMP FROM WORK, TRIT | 1788.7 | |
| CORR.WF, LBS N.GAS/HR | 2650.4 | |
| CORR.WF, MILLION BTU/HR | 54.625 | |
| EFF. G/B, % (ASSUMED) | 98.00 | |
| EFF. GEN., % (ASSUMED) | 96.40 | |
| HEAT.BAL | 0.9928 | |

| ENGINE S/N K-values | 1006T |
|---|---|
| PD #: | 2-59731 |
| PD NAME<br>UNIT # | #1 |
| MODEL # | TAURUS 60 - 7301S |
| TEST ENGINEER | S. Rueter (01/26/01) |
| F13:509<br>ENGSRLNUM | 1006T |
| F13:281 or 645 or 646<br>BASET5_GAS | 1222. |
| F13:282<br>BASET5_LIQ | n/a |
| 1-Shaft | |
| FUEL | Gas |
| % PILOT 2 | 3.6%half load<br>2.7%full load |
| ORIFICE DIA (mm) | n/a |
| F13:687<br>VARPLT_Y1 | 27.0 |
| F13:688<br>VARPLT_Y2 | 27.0 |
| F13:370<br>SIVKWSPLO | 93.0 |
| F13:371<br>SIVKWSPHI | 94.5 |
| F13:645<br>T5SIVOPEN<br>(Base T5 SIV's Open) | 1222 |
| F13:646<br>T5SIVCLOSED<br>(Base T5 SIV's Closed) | 1246 |
| F13:xxx<br>GV59TPZ_SP | n/a |
| F13:372<br>VGV59SP_G | 1200 |
| F13:384<br>T5T3_LO_LD | n/a |
| F13:385<br>T5T3_HI_LD | n/a |
| F13:389<br>PZCBAIR_RT | .4573 |
| F13:392<br>PRCNTLO_LD | n/a |
| F13:393<br>PRCNTHI_LD | n/a |

# ITEM 3. FREQUENCY (SPEED) AND VOLTAGE REGULATION

## Frequency (SPEED) and Voltage Regulation

| | | | | | | |
|---|---|---|---|---|---|---|
| Customer | : | Unit No | :1 | Turbine S/N | :1006T | |
| Project | :2X59731 | Model | :T7301S | Package S/N | :TG01137 | |
| Fuel Type | :GAS | Date | :18-JAN-01 | Time | :12:20:25 | |

| | | 0000 KW | 1600 KW | 3200 KW | FULL KW | 0000 KW |
|---|---|---|---|---|---|---|
| Generator AC Load: | | | | | | |
| Power Measured (KW) | GEN.KW | 8. | 1615. | 3219. | 4731. | 9. |
| Power no losses (KW) | CORR.KW | 8. | 1737. | 3348. | 4963. | 9. |
| Power Factor | P.F. | 0.00 | 1.00 | 1.00 | 0.99 | 0.00 |
| Facility Inlet Duct: | | | | | | |
| Average Temp.(DegF) | T0.AVG | 61.43 | 62.66 | 65.28 | 64.31 | 64.34 |
| Speed (Freq.) (%) | Min | 99.95 | 99.95 | 100.00 | 100.00 | 99.95 |
| Speed (Freq.) (%) | %NTURB | 99.97 | 99.96 | 100.02 | 100.04 | 99.96 |
| Speed (Freq.) (%) | Max | 99.98 | 99.98 | 100.03 | 100.06 | 99.98 |
| Generator Volt (%) | Min | 100.03 | 100.18 | 100.35 | 100.43 | 100.04 |
| Generator Volt (%) | %.VOLT | 100.05 | 100.18 | 100.36 | 100.44 | 100.04 |
| Generator Volt (%) | Max | 100.05 | 100.19 | 100.37 | 100.44 | 100.05 |
| Voltage Balance (2% Max) | VOLT.H-L | 0.02 | 0.18 | 0.20 | 0.18 | 0.02 |
| Freq Regulation (.25% Max) | | 0.00 | 0.02 | -0.05 | -0.06 | 0.01 |
| Volt Regulation(1.0% Max) | | 0.00 | -0.14 | -0.31 | -0.39 | 0.00 |

# ITEM 4. OPERATING PARAMETERS

OPERATING PARAMETERS - TAURUS GENERATOR SET

CUSTOMER:
PROJECT : 59731

UNIT NO: 1
MODEL : TAURUS 60S

TURBINE S/N: 1006T
PACKAGE S/N: TG01137

| PARAMETER | NAME | LIMIT | 0 KW | 1600 KW | 3200 KW | DRY F/L |
|---|---|---|---|---|---|---|
| DATE | | | 19-JAN-01 | 19-JAN-01 | 19-JAN-01 | 20-JAN-01 |
| TIME | | | 16:42:30 | 16:58:07 | 17:48:18 | 09:01:49 |
| TEST CELL | | | 08 | 08 | 08 | 08 |
| FUEL | | | GAS | GAS | GAS | GAS |
| **GENERATOR AC LOAD** | | | | | | |
| POWER-MEASURED (KW) | GEN.KW | | -1. | 1456. | 3033. | 4943. |
| POWER-NO LOSSES (KW) | CORR.KW | | -1. | 1604. | 3216. | 5192. |
| VOLTAGE (VOLTS) | VOLT.AVG | | 13210.5 | 13217.2 | 13230.0 | 13224.1 |
| VOLTAGE BALANCE (%) | VOLT.H-L | 2.0 MAX | 0.0 | 0.1 | 0.3 | 0.4 |
| CURRENT (AMPS) | AMP.AVG | | 0. | 64. | 133. | 217. |
| POWER FACTOR | P.F. | | 0.00 | 0.99 | 1.00 | 0.99 |
| FREQUENCY (HZ) | GEN.FREQ | | 58.8 | 58.9 | 58.9 | 60.0 |
| **GENERATOR WINDING TEMP (DEG.C)** | | | | | | |
| PHASE A | T.GEN.A | | 37. | 37. | 40. | 55. |
| PHASE B | T.GEN.B | | 40. | 40. | 48. | 59. |
| PHASE C | T.GEN.C | | 37. | 37. | 39. | 50. |
| **ENGINE SPEED (%)** | | | | | | |
| ENGINE SPEED | %NTURB | | 98.09 | 97.90 | 97.94 | 99.93 |
| **LUBRICATION** | | | | | | |
| OIL TEMPERATURE (DEG.F) | TPKG.OIL | 140. - 155. | 141. | 142. | 143. | 147. |
| GEARBOX OIL PRESSURE (PSI) | PGB.OIL | 45. - 65. | 52. | 48. | 46. | 47. |
| TURBINE LT OIL PRESSURE (PSI) | P.COMP.L | 45. - 65. | 57. | 55. | 55. | 54. |
| OIL MANIFOLD PRESSURE (PSI) | P.OIL | | 74. | 72. | 71. | 72. |
| GEARBOX OIL FLOW (GPM) | FGB.OIL | 41.2 - 66.0 | 54.7 | 57.3 | 58.0 | 59.3 |
| TURBINE LT OIL FLOW (GPM) | F.COMP.L | | 32.1 | 31.8 | 31.2 | 32.8 |
| **ENGINE TEMPERATURE (DEG.F)** | | | | | | |
| FAC AIR INLET DUCT | T0.AVG | | 60.7 | 58.8 | 57.2 | 58.7 |
| THIRD STAGE TURBINE INLET | T5.AVG | 1246. MAX (SIV C)<br>1222. MAX (SIV O) | 518. | 729. | 1173. | 1219. |
| THIRD STAGE TURBINE INLET 1 | T5/1 | | 486. | 674. | 1152. | 1188. |
| THIRD STAGE TURBINE INLET 2 | T5/2 | | 539. | 752. | 1172. | 1234. |
| THIRD STAGE TURBINE INLET 3 | T5/3 | | 491. | 702. | 1176. | 1249. |
| THRID STAGE TURBINE INLET 4 | T5/4 | | 541. | 727. | 1162. | 1183. |
| THIRD STAGE TURBINE INLET 5 | T5/5 | | 521. | 762. | 1176. | 1230. |
| THIRD STAGE TURBINE INLET 6 | T5/6 | | 527. | 757. | 1199. | 1231. |
| ENGINE EXHAUST DUCT | T7.AVG | | 408.2 | 541.7 | 951.8 | 924.3 |
| **THRUST BEARING TEMPERATURES (DEG.F)** | | | | | | |
| FWD. THRUST BRG.#1 RTD | TGP.TBRG | 230. MAX | 180. | 182. | 182. | 186. |
| FWD. THRUST BRG.#2 RTD | TGPTBRG2 | 230. MAX | 189. | 193. | 192. | 196. |
| **ENGINE PRESSURE** | | | | | | |
| COMPRESSOR DISCHARGE (PSI) | PCD | | 120.5 | 131.6 | 108.6 | 158.8 |
| OIL TANK SUMP (IN.H2O) | PSUMP | | 0.3 | 0.3 | 0.2 | 0.4 |

CUSTOMER: UNIT NO: 1 TURBINE S/N: 1006T
PROJECT : 59731 MODEL : TAURUS 60S PACKAGE S/N: TG01137

| PARAMETER | | NAME | LIMIT | 0 KW | 1600 KW | 3200 KW | DRY F/L |
|---|---|---|---|---|---|---|---|
| DATE | | | | 19-JAN-01 | 19-JAN-01 | 19-JAN-01 | 20-JAN-01 |
| TIME | | | | 16:42:30 | 16:58:07 | 17:48:18 | 09:01:49 |
| TEST CELL | | | | 08 | 08 | 08 | 08 |
| FUEL | | | | GAS | GAS | GAS | GAS |
| FUEL | | | | | | | |
| GAS FLOW | (CFM) | WF.NG | | 25.80 | 34.10 | 42.82 | 60.18 |
| GAS TEMPERATURE | (DEG.F) | T.NG | | 62.5 | 59.9 | 55.5 | 50.8 |
| GAS PRESSURE | (PSI) | P.NG | | 227.7 | 226.9 | 225.6 | 222.7 |
| VIBRATION | | | | | | | |
| COMPRESSOR HORIZ VEL | (15-2000HZ)(IPS-RMS) | V.COMP.H | 0.28 MAX | 0.06 | 0.07 | 0.07 | 0.06 |
| TURBINE VERT VEL | (15-2000HZ)(IPS-RMS) | V.TURB.V | 0.40 MAX | 0.08 | 0.08 | 0.08 | 0.09 |
| GEARBOX HOR. VEL | (15-1000HZ)(IPS-RMS) | VGB.HOR | 0.28 MAX | 0.05 | 0.06 | 0.07 | 0.09 |
| GEARBOX VERT ACCEL | (15-12000HZ)(G'S-RMS) | VGB.VERA | 16.0 MAX | 1.3 | 2.7 | 5.5 | 6.2 |
| GEN DRIVEN END VERT | (15-90HZ) (IPS-RMS) | VGENDR.V | 0.10 MAX | 0.02 | 0.02 | 0.02 | 0.02 |
| GEN EXCITER END VERT | (15-90HZ) (IPS-RMS) | VGENEXCV | 0.10 MAX | 0.02 | 0.02 | 0.01 | 0.02 |
| BEARING 1 VERT DISP | (5-1000HZ) (MILS) | VBRG.1.V | 3.50 MAX | 1.02 | 1.03 | 0.90 | 0.32 |
| BEARING 1 HORIZ DISP | (5-1000HZ) (MILS) | VBRG.1.H | 3.50 MAX | 1.01 | 0.97 | 0.87 | 0.39 |
| BEARING 2 VERT DISP | (5-1000HZ) (MILS) | VBRG.2.V | 3.50 MAX | 0.42 | 0.48 | 0.50 | 0.23 |
| BEARING 2 HORIZ DISP | (5-1000HZ) (MILS) | VBRG.2.H | 3.50 MAX | 0.43 | 0.51 | 0.54 | 0.28 |
| BEARING 3 VERT DISP | (5-1000HZ) (MILS) | VBRG.3.V | 3.50 MAX | 0.36 | 0.45 | 0.43 | 0.32 |
| BEARING 3 HORIZ DISP | (5-1000HZ) (MILS) | VBRG.3.H | 3.50 MAX | 0.41 | 0.52 | 0.45 | 0.37 |

# ITEM 5. VIBRATION DATA

# MACHINERY VIBRATION SIGNATURE

V.COMP.H
20-JAN-01
09:12:57
CELL: 8
2-59731 1
1006T

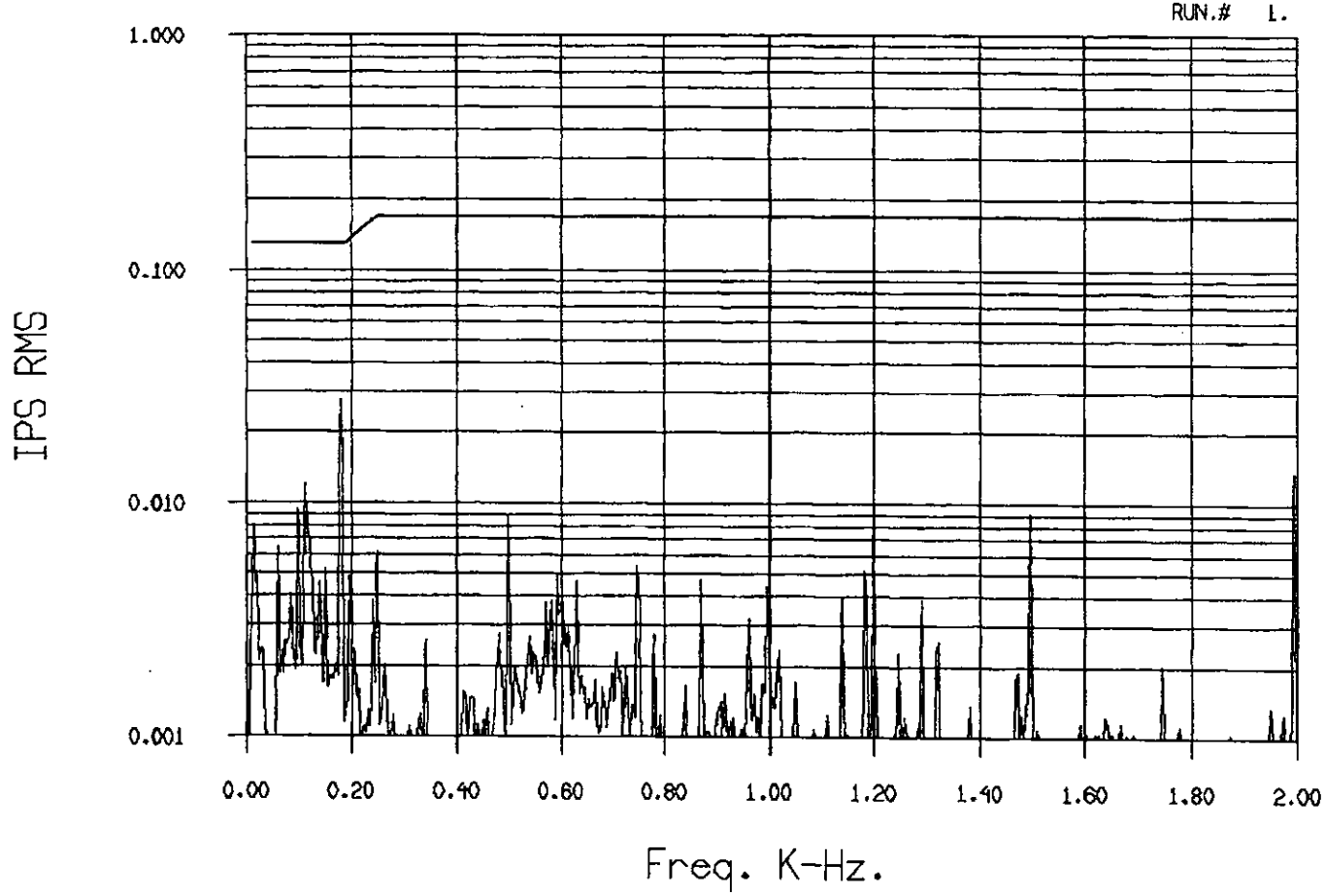
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 13.5= 0.008 | 248.9= 0.006 |
| 60.3= 0.006 | 497.9= 0.009 |
| 98.6= 0.009 | 1199.1= 0.009 |
| 113.5= 0.012 | 1494.0= 0.009 |
| 179.8= 0.028 | 1991.9= 0.014 |

1-E:
NTURB
248.9 Hz.
0.006

OIL TEMP:147. DEG.F
LOAD: 4921. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

V.TURB.V
20-JAN-01
09:12:57
CELL: 8
2-59731 1
1006T

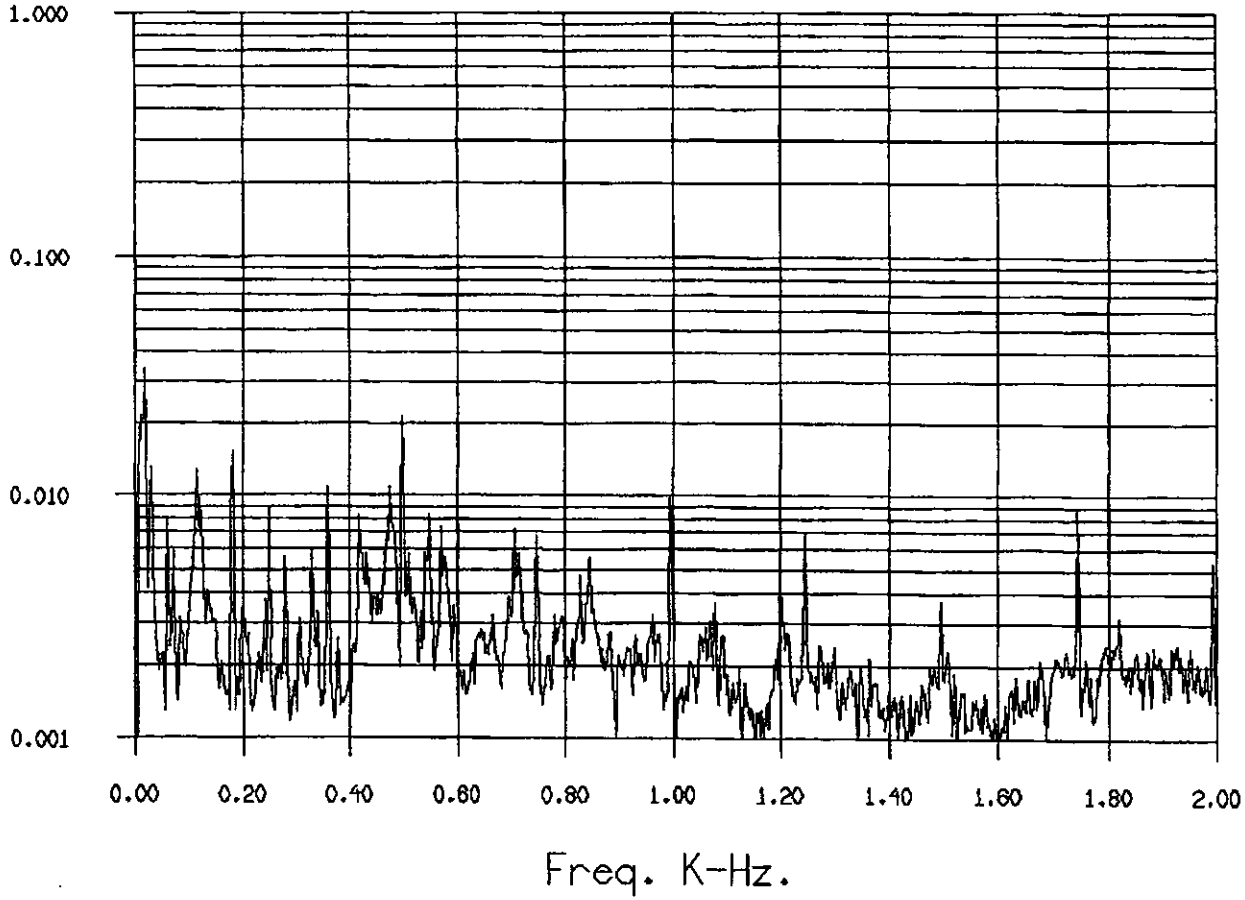
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 16.9= 0.034 | 359.4= 0.011 |
| 29.6= 0.013 | 476.1= 0.011 |
| 114.1= 0.013 | 498.0= 0.021 |
| 179.9= 0.015 | 995.9= 0.010 |
| 248.9= 0.009 | 1742.9= 0.009 |

1-E:
NTURB
248.9 Hz.
0.009

OIL TEMP:147. DEG.F
LOAD: 4921. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VGB.HOR
20-JAN-01
09:12:28
CELL: 8
2-59731 1
1006T

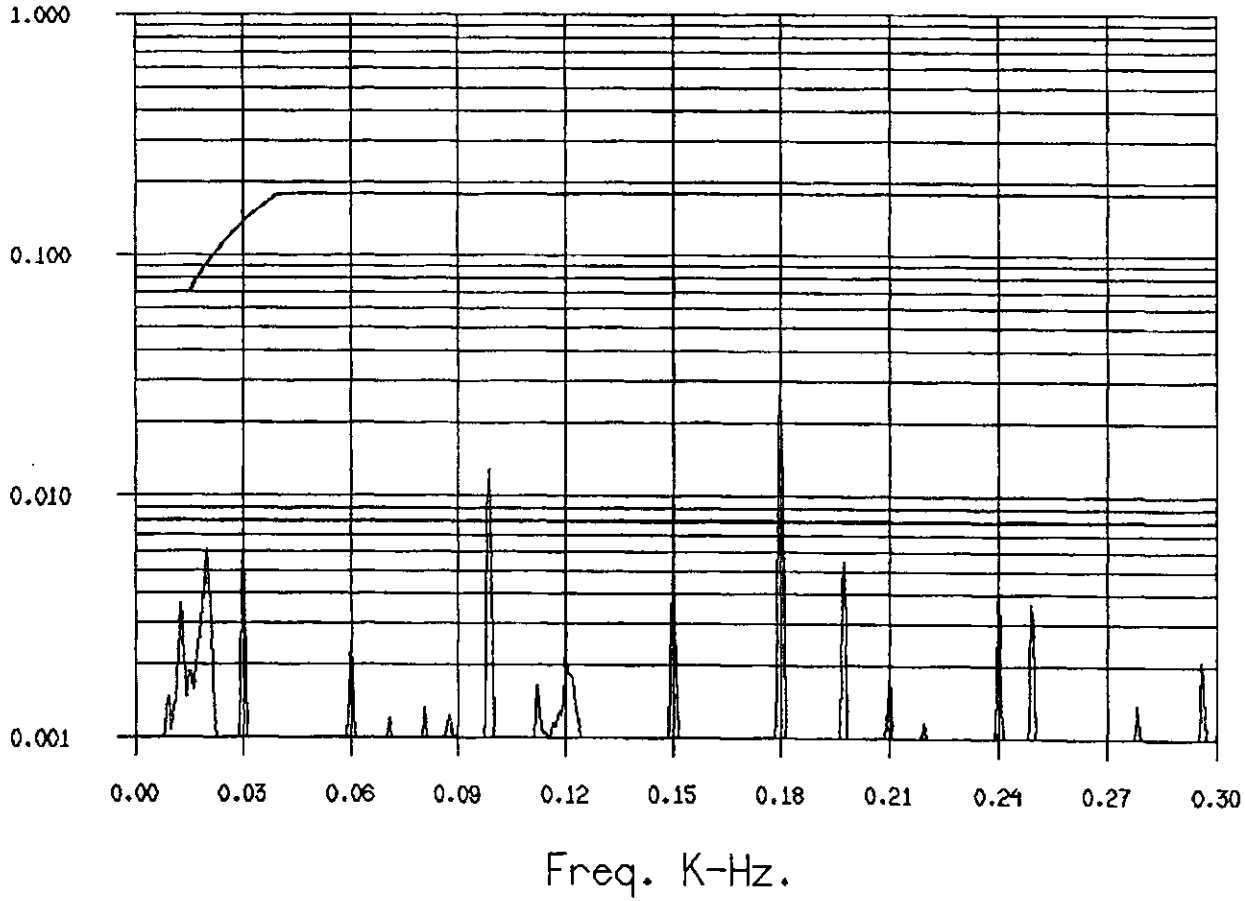
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 12.8= 0.004 | 149.9= 0.005 |
| 20.3= 0.006 | 179.9= 0.030 |
| 30.0= 0.007 | 197.2= 0.005 |
| 59.9= 0.003 | 239.8= 0.005 |
| 98.6= 0.013 | 249.0= 0.004 |

1-E:
GEN
30.0 Hz.
0.007

OIL TEMP:147. DEG.F
LOAD: 4921. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VGB.HOR
20-JAN-01
09:18:04
CELL: 8
2-59731 1
1006T

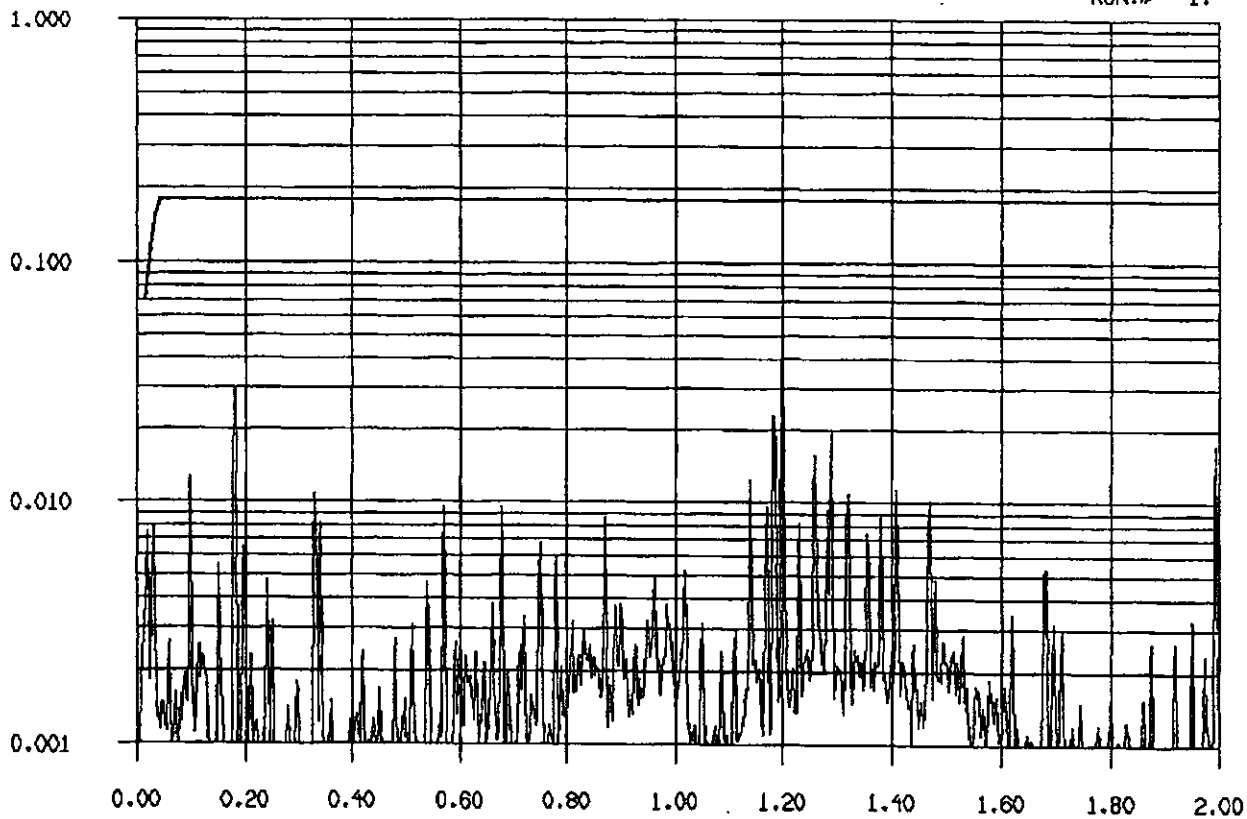
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 98.6= 0.013 | 1199.2= 0.047 |
| 179.9= 0.030 | 1259.3= 0.016 |
| 329.8= 0.011 | 1289.2= 0.019 |
| 1139.3= 0.012 | 1409.0= 0.011 |
| 1183.5= 0.023 | 1992.1= 0.017 |

1-E:
NTURB
249.0 Hz.
0.003

OIL TEMP:147. DEG.F
LOAD: 4922. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

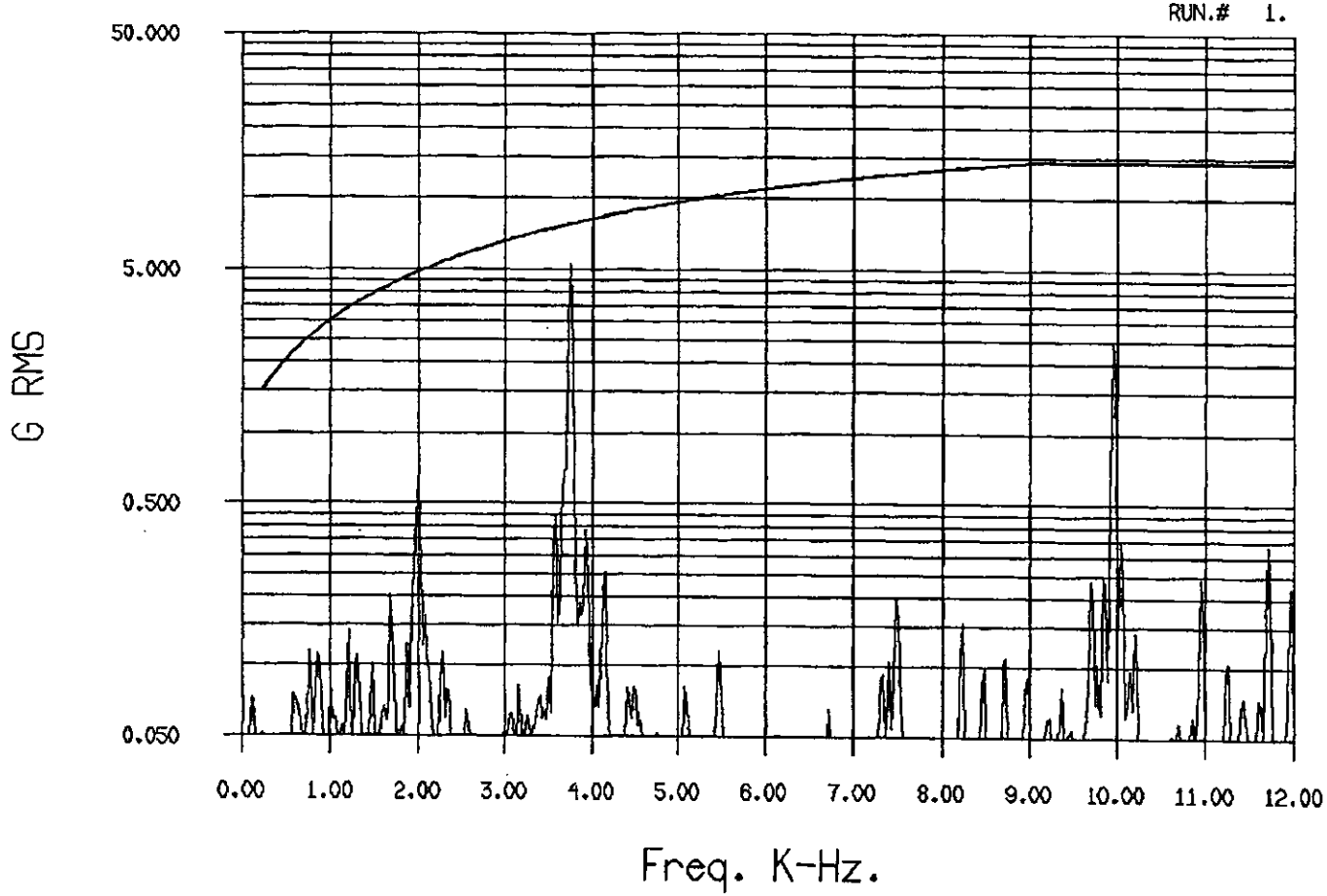
VGB.VERA
20-JAN-01
09:17:36
CELL: 8
2-59731 1
1006T

PEAKS (FREQ= AMPL):
1992.5= 0.626 9861.6= 0.246
3567.2= 0.444 9959.4= 2.492
3747.0= 5.281 10058.1= 0.348
3930.1= 0.385 10956.0= 0.242
4137.7= 0.254 11702.2= 0.337

1-E:
RGM
9959.4 Hz.
2.492

OIL TEMP:147. DEG.F
LOAD: 4922. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

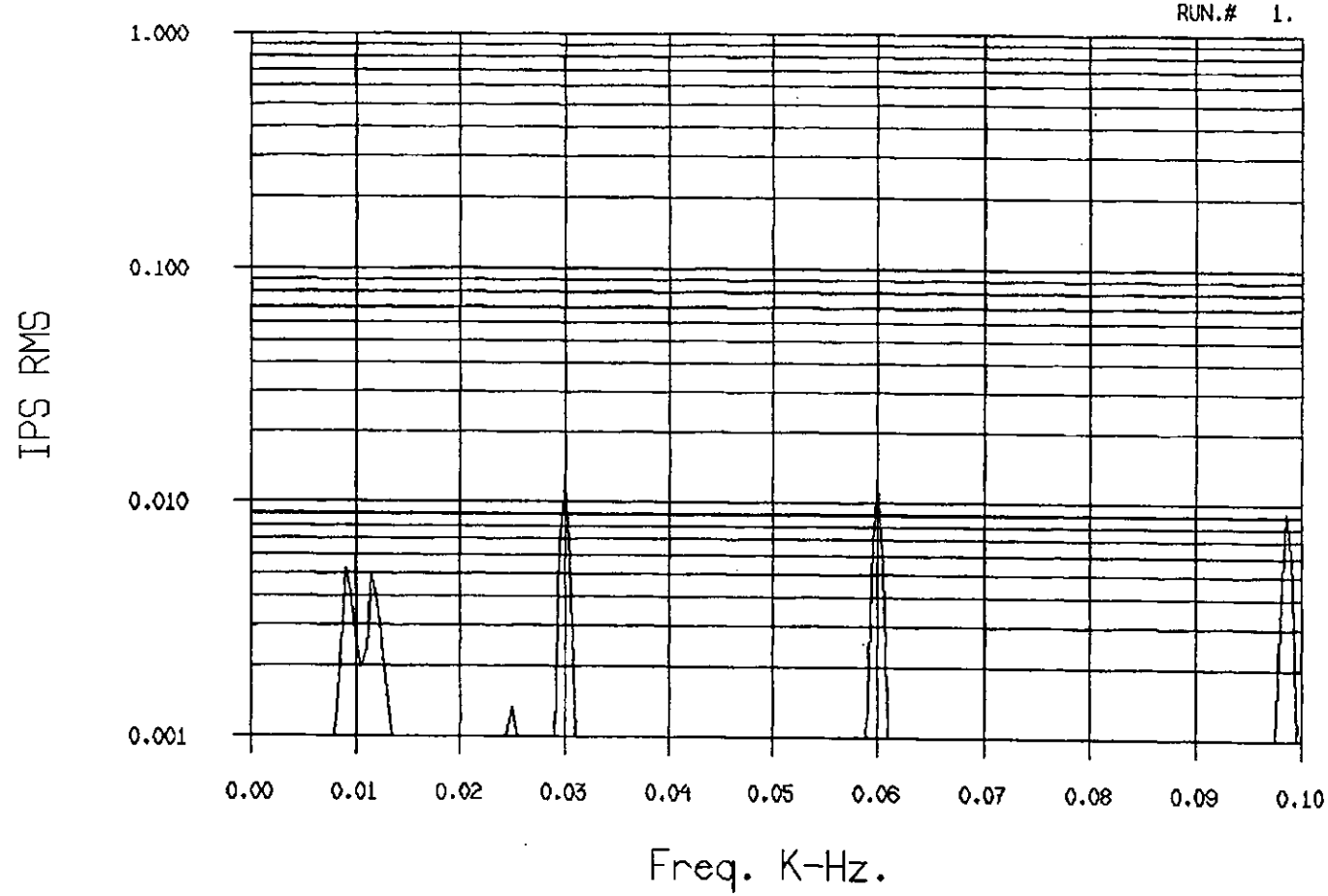
VGENDR.V
20-JAN-01
09:17:05
CELL: 8
2-59731 1
1006T

PEAKS (FREQ= AMPL):
9.2= 0.005
11.7= 0.005
24.8= 0.001
30.0= 0.012
60.0= 0.012
98.6= 0.009

1-E:
GEN
30.0 Hz.
0.012

OIL TEMP:147. DEG.F
LOAD: 4922. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

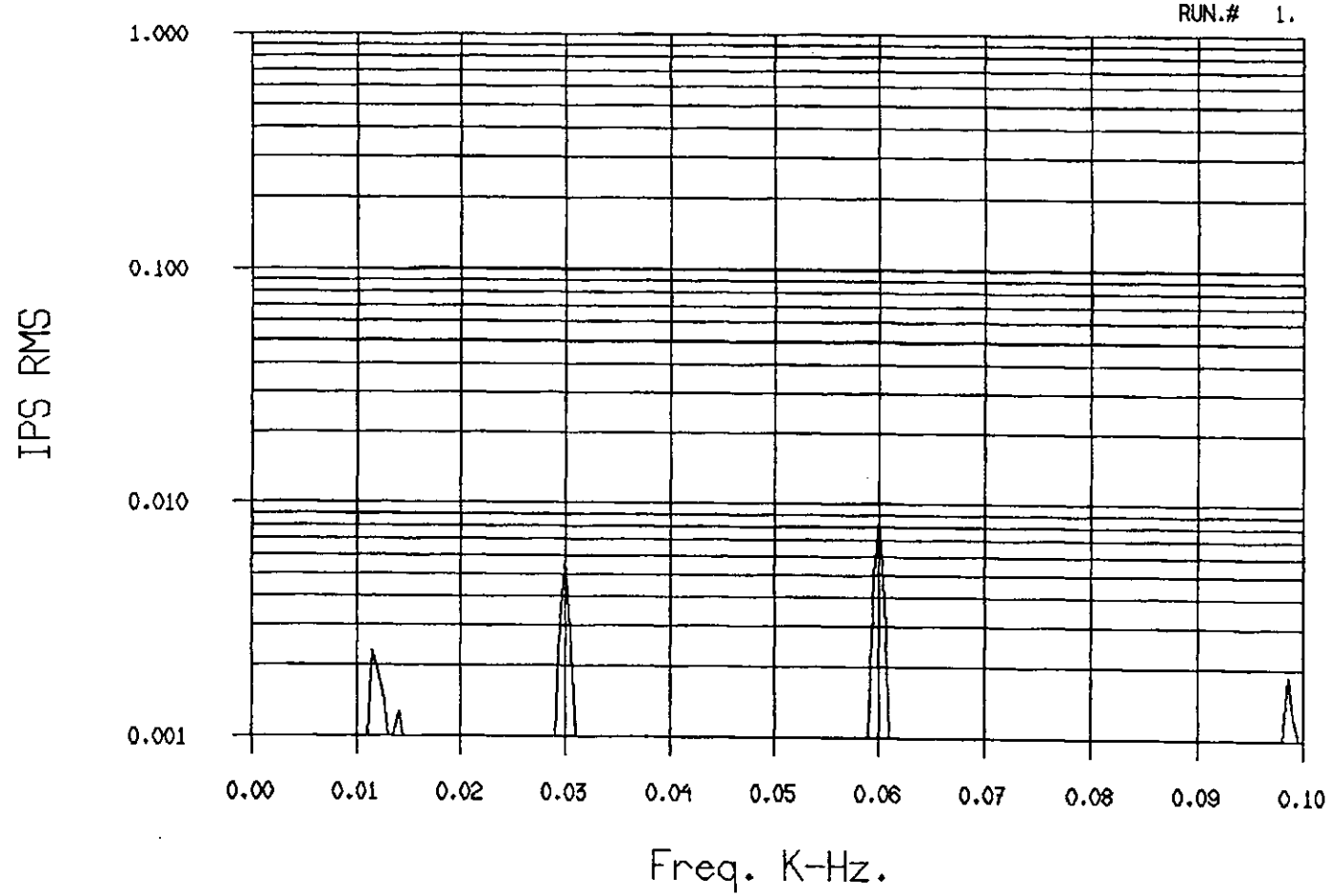
VGENEXCV
20-JAN-01
09:17:05
CELL: 8
2-59731 1
1006T

PEAKS (FREQ= AMPL):
11.7= 0.002
13.8= 0.001
30.0= 0.006
60.0= 0.009
98.6= 0.002

1-E:
GEN
30.0 Hz.
0.006

OIL TEMP:147. DEG.F
LOAD: 4922. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.1.V
20-JAN-01
09:14:26
CELL: 8
2-59731 1
1006T

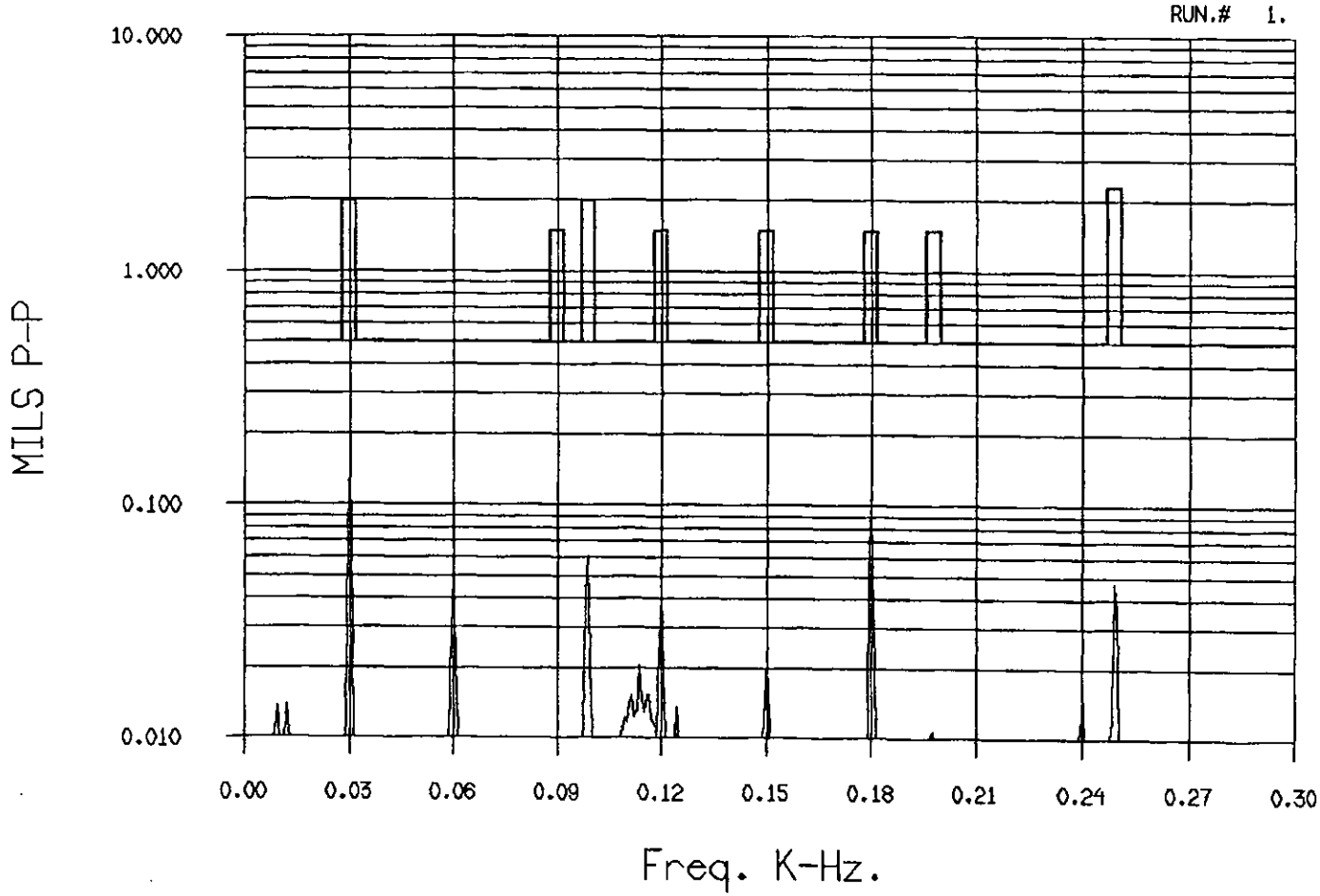
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 12.2= 0.014 | 119.9= 0.042 |
| 30.0= 0.151 | 149.9= 0.022 |
| 59.9= 0.050 | 179.9= 0.100 |
| 98.6= 0.061 | 239.8= 0.016 |
| 114.0= 0.021 | 249.0= 0.047 |

1-E:
GEN
30.0 Hz.
0.151

OIL TEMP:147. DEG.F
LOAD: 4921. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.1.V
20-JAN-01
09:13:30
CELL: 8
2-59731 1
1006T

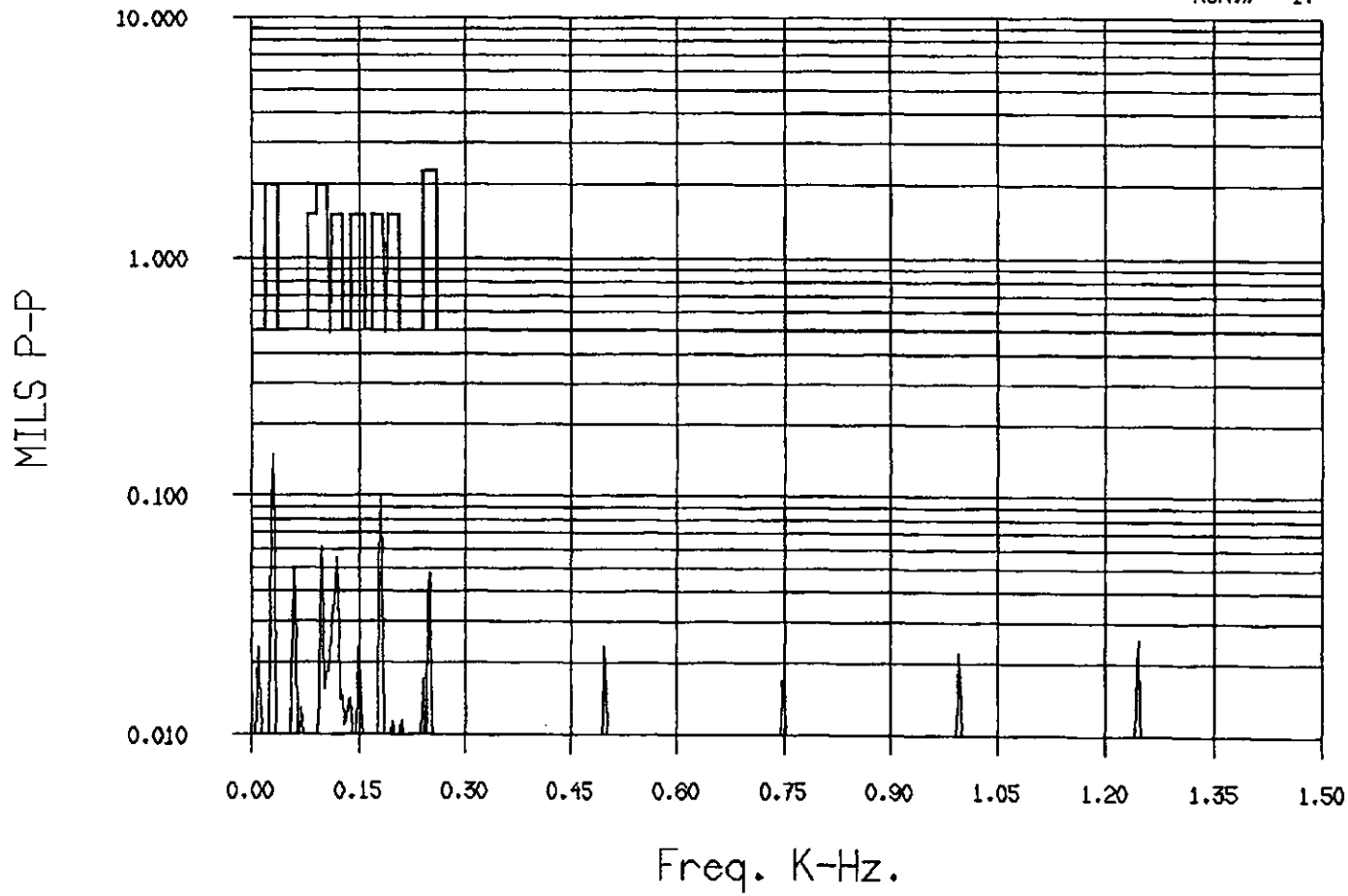
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 9.2= 0.023 | 149.6= 0.026 |
| 30.0= 0.148 | 179.8= 0.100 |
| 59.9= 0.050 | 249.0= 0.047 |
| 98.6= 0.061 | 498.0= 0.024 |
| 118.9= 0.055 | 1244.8= 0.026 |

1-E:
NTURB
249.0 Hz.
0.047

OIL TEMP:147. DEG.F
LOAD: 4925. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.1.H
20-JAN-01
09:13:30
CELL: 8
2-59731 1
1006T

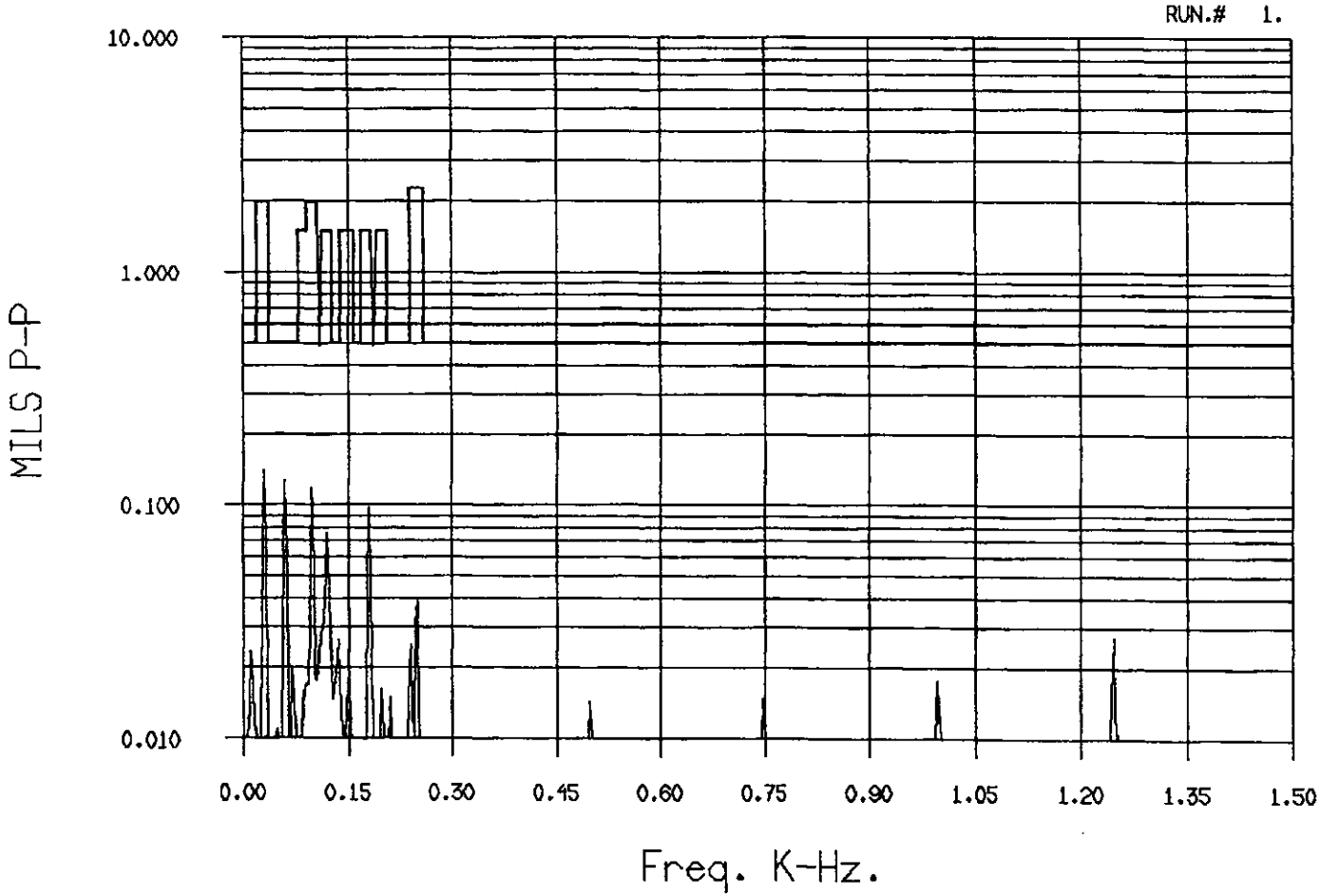
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 11.0= 0.023 | 133.9= 0.026 |
| 30.0= 0.140 | 179.8= 0.098 |
| 59.9= 0.126 | 239.7= 0.025 |
| 98.6= 0.118 | 249.0= 0.039 |
| 119.2= 0.076 | 1244.8= 0.027 |

1-E:
NTURB
249.0 Hz.
0.039

OIL TEMP:147. DEG.F
LOAD: 4925. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.1.H
20-JAN-01
09:14:26
CELL: 8
2-59731 1
1006T

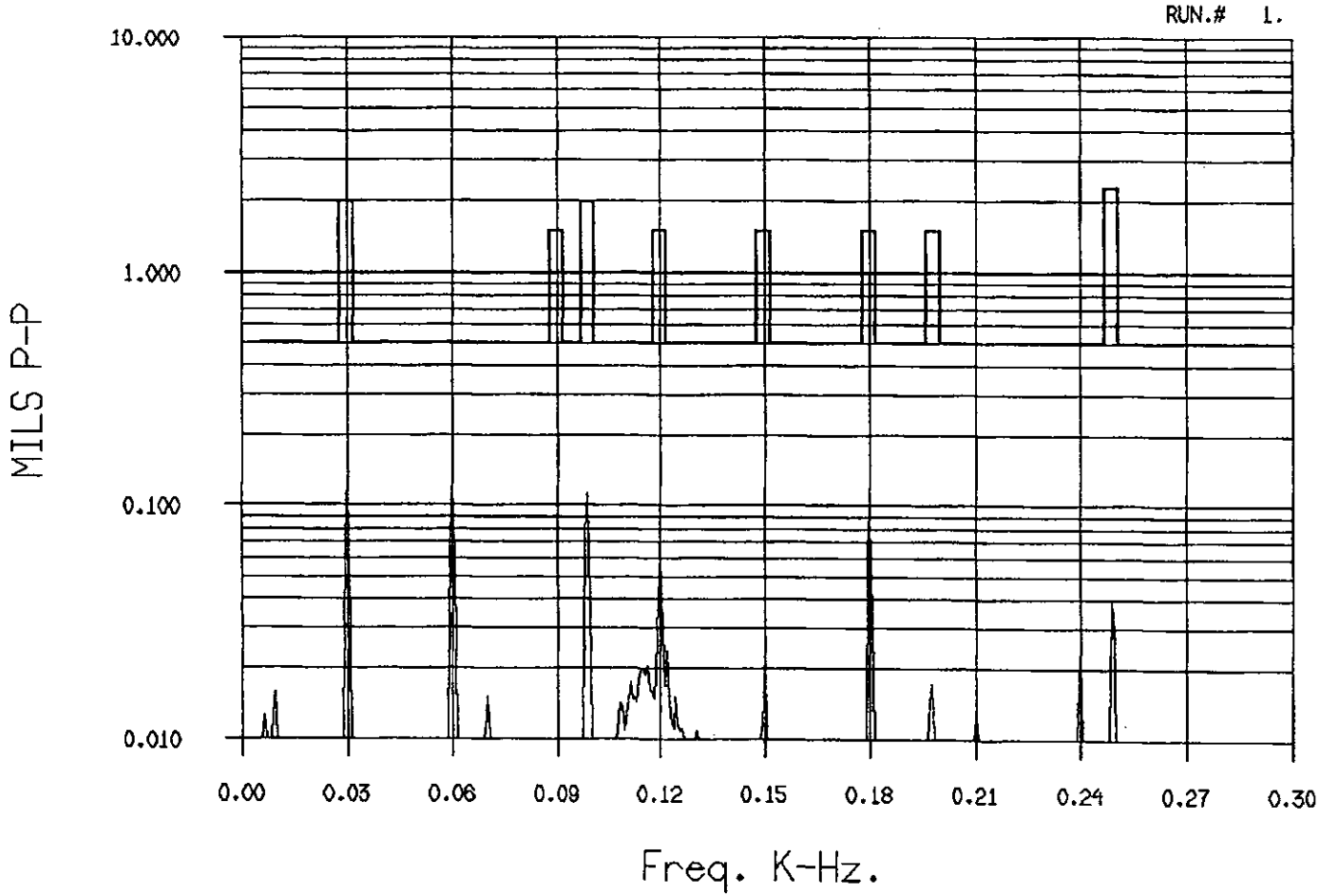
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 30.0= 0.136 | 149.9= 0.018 |
| 59.9= 0.130 | 179.8= 0.097 |
| 98.6= 0.113 | 197.2= 0.017 |
| 119.9= 0.063 | 239.8= 0.023 |
| 121.6= 0.024 | 249.0= 0.039 |

1-E:
GEN
30.0 Hz.
0.136

OIL TEMP:147. DEG.F
LOAD: 4921. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.2.V
20-JAN-01
09:15:18
CELL: 8
2-59731 1
1006T

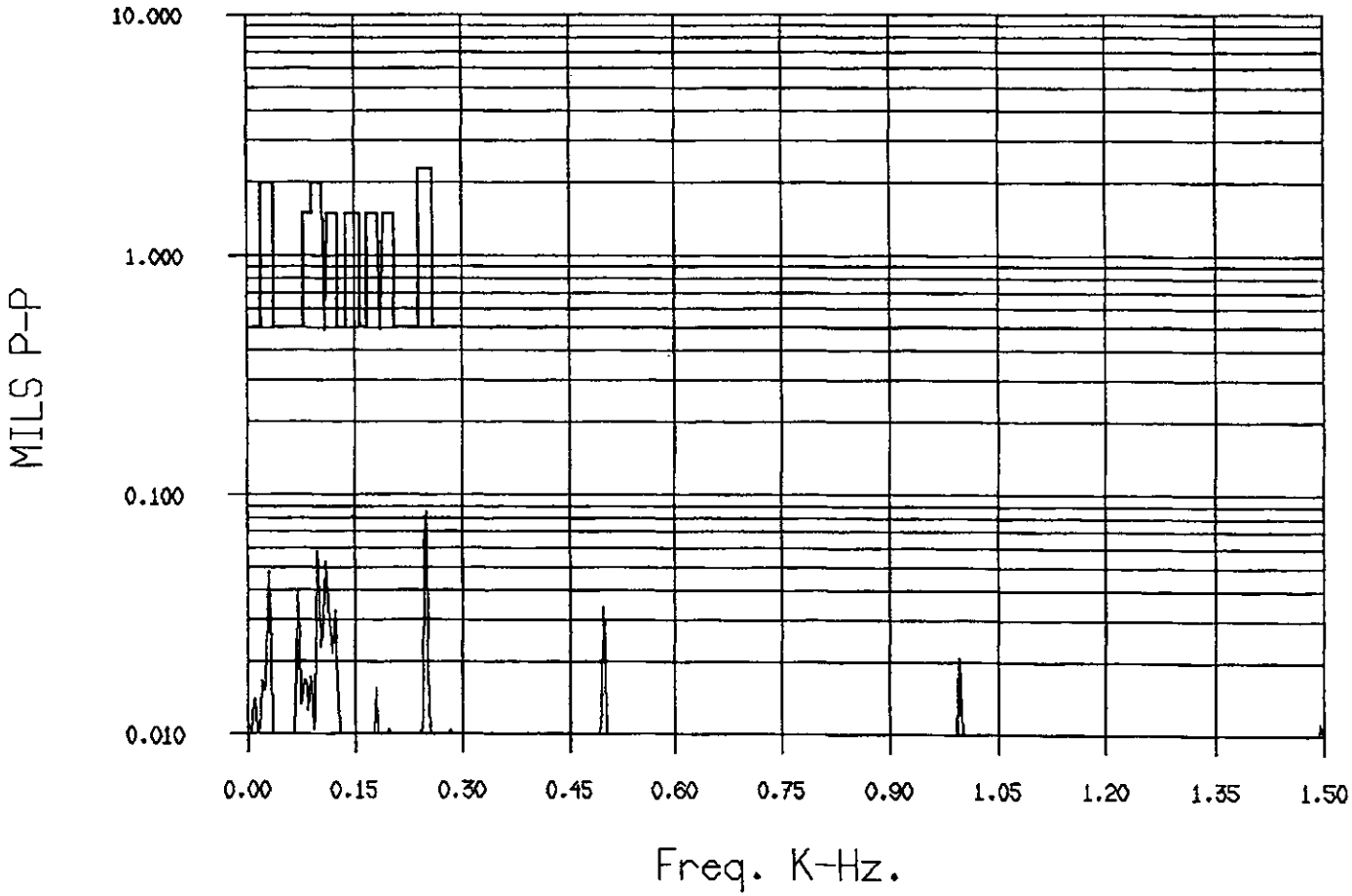
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 29.4= 0.048 | 179.8= 0.016 |
| 70.6= 0.040 | 249.0= 0.085 |
| 98.7= 0.058 | 498.0= 0.034 |
| 108.8= 0.052 | 995.9= 0.021 |
| 121.7= 0.033 | 1493.9= 0.011 |

1-E:
NTURB
249.0 Hz.
0.085

OIL TEMP:147. DEG.F
LOAD: 4922. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.2.H
20-JAN-01
09:15:18
CELL: 8
2-5972
1006T

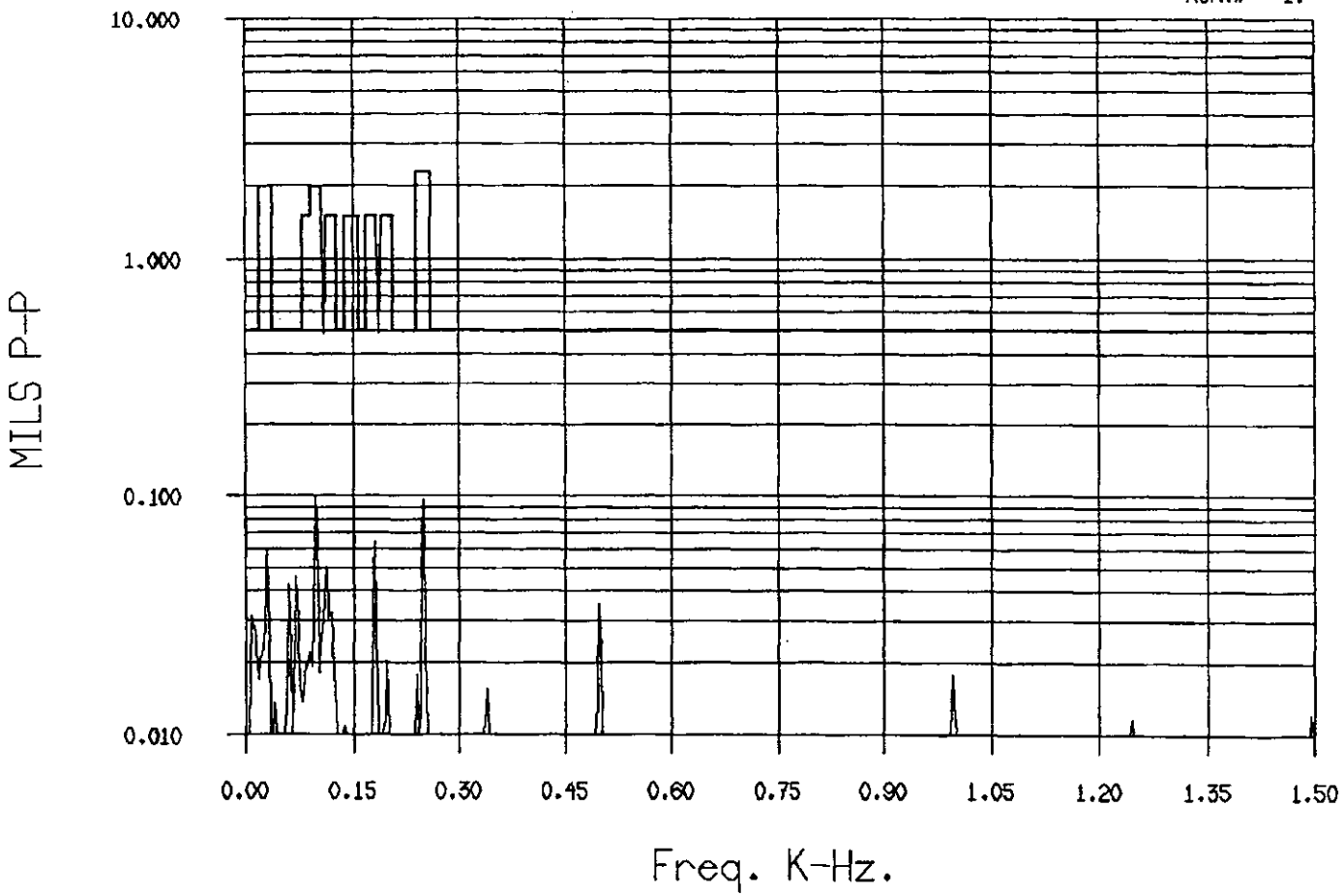
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 29.5= 0.060 | 179.8= 0.064 |
| 60.1= 0.042 | 197.2= 0.020 |
| 70.6= 0.046 | 239.9= 0.018 |
| 98.5= 0.100 | 249.0= 0.097 |
| 111.4= 0.050 | 498.0= 0.035 |

1-E:
NTURB
249.0 Hz.
0.097

OIL TEMP:147. DEG.F
LOAD: 4922. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.3.V
20-JAN-01
09:16:09
CELL: 8
2-59731 1
1006T

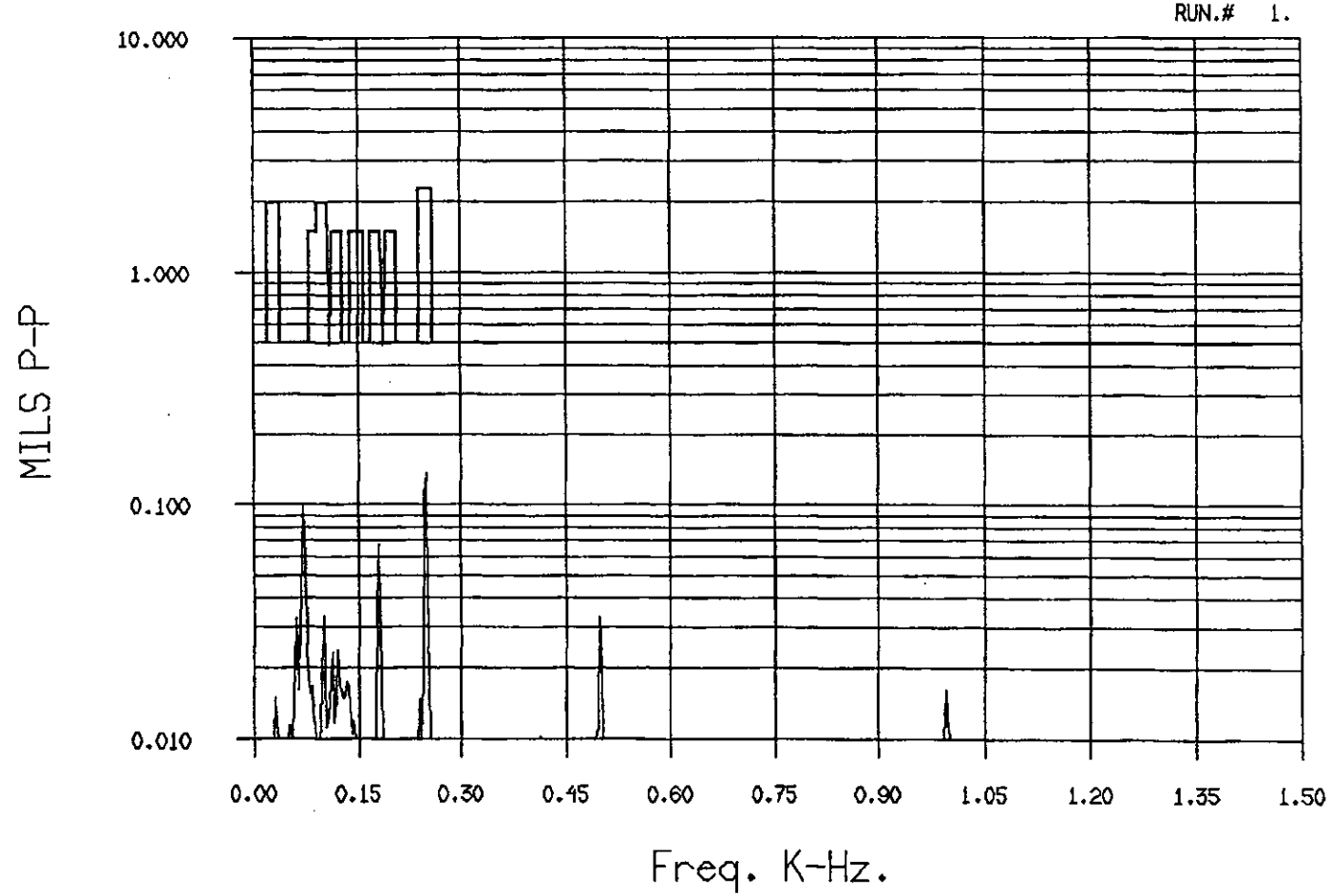
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 29.5= 0.015 | 121.0= 0.024 |
| 59.4= 0.033 | 179.8= 0.067 |
| 69.5= 0.098 | 249.0= 0.138 |
| 98.8= 0.033 | 498.0= 0.033 |
| 111.3= 0.023 | 996.0= 0.016 |

1-E:
NTURB
249.0 Hz.
0.138

OIL TEMP:147. DEG.F
LOAD: 4922. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.3.H
20-JAN-01
09:16:09
CELL: 8
2-59731 1
1006T

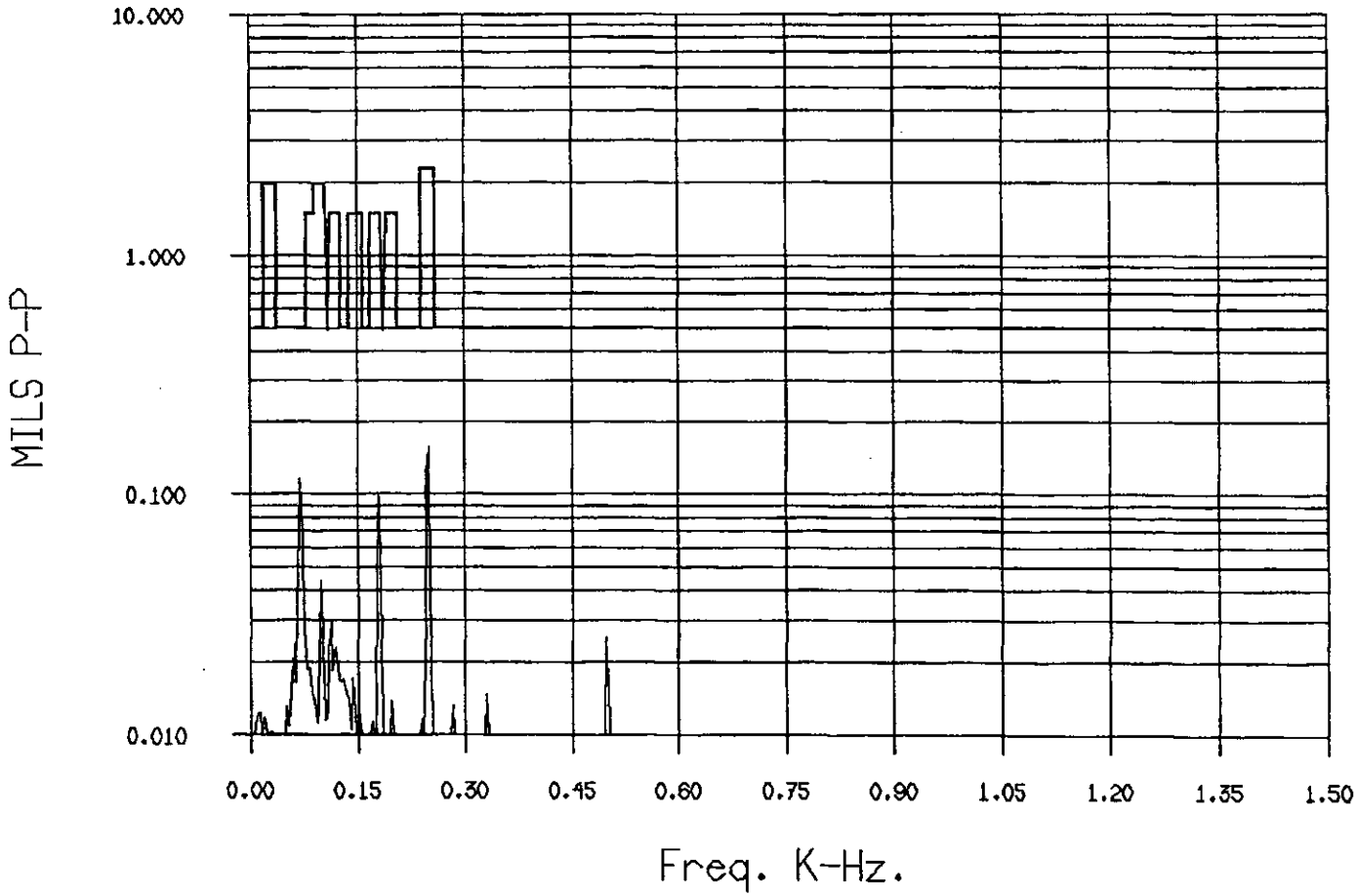
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 70.5= 0.115 | 197.1= 0.014 |
| 98.7= 0.044 | 249.0= 0.157 |
| 111.4= 0.030 | 281.3= 0.013 |
| 143.6= 0.017 | 329.5= 0.015 |
| 179.9= 0.099 | 498.1= 0.026 |

1-E:
NTURB
249.0 Hz.
0.157

OIL TEMP:147. DEG.F
LOAD: 4922. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.

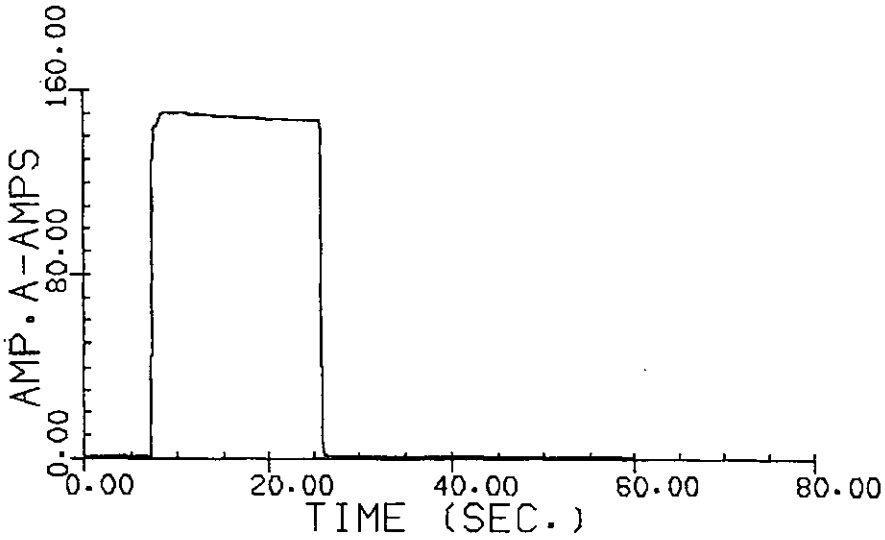


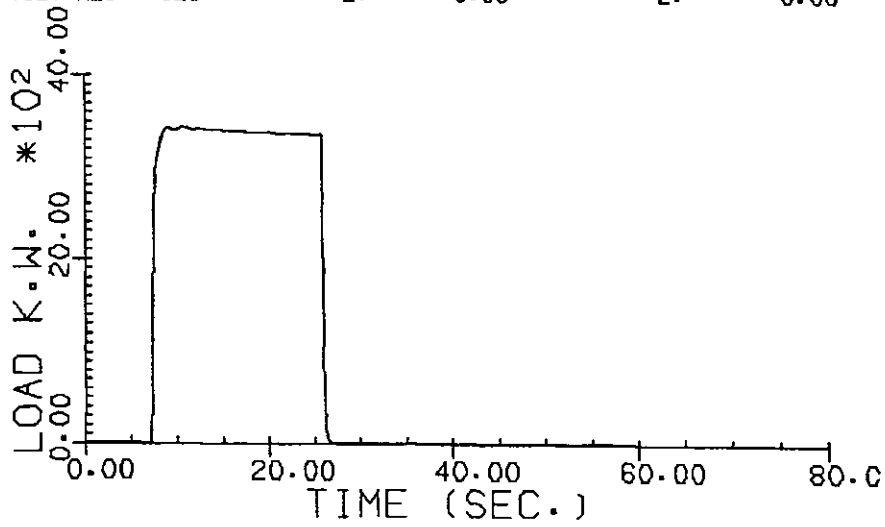
# ITEM 6. SUDDEN LOAD TESTS

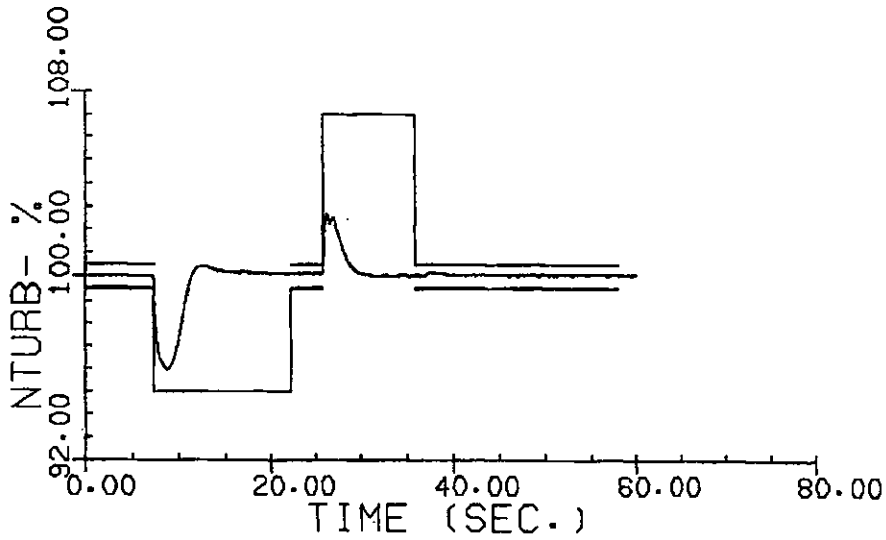
# SOLAR TURBINES INCORPORATED

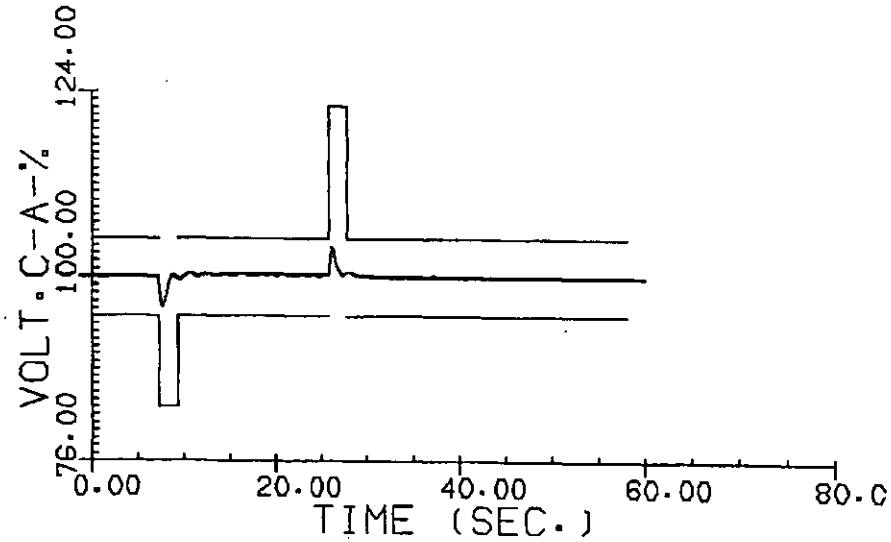
| | | | |
|---|---|---|---|
| 20-JAN-01 17:46:45 08 | UNIT NO. | : 1 | |
| CUSTOMER NAME : | FUEL | : NAT.GAS | |
| P.O.NO. : 2X59731 | ENG S/N | : 1006T | |
| AIR INLET TEMP.: 62.8 | KW (ACTUAL) | : 3401. | |
| POWER FACTOR : 0.99 | KW (NO LOSSES) | : 3514. | |

| | ON LOAD | | OFF LOAD | |
|---|---|---|---|---|
| | LIM | ACT | LIM | ACT |
| SPEED DEV-% : | 5. | 4.03 | 7. | 2.64 |
| SPEED REC.-SEC: | 15. | 3.79 | 10. | 2.98 |
| VOLTAGE DEV-% : | 17. | 3.80 | 22. | 3.82 |
| VOLT REC.- SEC: | 2. | 0.00 | 2. | 0.00 |



# ITEM 7. DRY EMISSIONS

Engine ID :TDSDAA-1500-007
Engine S/N :1006T
Fuel Type :NATURAL GAS
Test Def File: TT73GEN
Data Taken :20-JAN-01 11:05:38
Load : 2373.70 ( 50.%) KW

| | | | | |
|---|---|---|---|---|
| T.AMB | - | DEG.F | : | 66.7749 |
| T.NG | - | DEG.F | : | 64.6202 |
| P.BARO | - | IN.HG | : | 29.7799 |
| %R.H. | - | % | : | 32.5469 |
| F.WATER | - | GPM | : | 0.0000 |
| WF.AVG | - | PPH | : | 1756.7422 |
| WA | - | PPS | : | 29.8192 |
| T2.AVG | - | DEG.F | : | 587.8238 |
| %NTURB | - | % | : | 99.9130 |
| T5.AVG | - | DEG.F | : | 1190.9446 |
| T7.AVG | - | DEG.F | : | 1001.2639 |
| FUELTYPE | - | | : | 1.0000 |
| RUN.# | - | | : | 1.0000 |
| PCD | - | PSIG | : | 94.7082 |
| TRIT | - | DEG.F | : | 1780.8925 |
| TPZ.C | - | DEG.F | : | 3196.7649 |
| TPZ.O | - | DEG.F | : | 0.0000 |
| T5.SETPT | - | DEG.F | : | 1250.0000 |

| | | |
|---|---|---|
| SPEED_INSTABILITY : | 0.03 | % |
| LOAD_INSTABILITY : | 0.00 | %KW |
| T7AVG_INSTABILITY : | 1.24 | DEG.F |

| | | | | MIN SAMPLE | MAX SAMPLE | (***NOT LIMITS***) |
|---|---|---|---|---|---|---|
| CO | - | ppmv | : | 32. | 30. | 34. |
| CO2 | - | % | : | 3.11 | 3.09 | 3.13 |
| NO | - | ppmv | : | 6. | 6. | 7. |
| NOX | - | ppmv | : | 11. | 9. | 12. |
| UHC | - | ppmv | : | 6. | 5. | 9. |
| O2 | - | % | : | 15.68 | 15.63 | 15.72 |

Fuel Factor 1.68

RESULTS CORRECTED TO 15% OXYGEN DRY BASIS

| | FA(ppmv) | CO2(ppmv) | O2(ppmv) | O2(pph) |
|---|---|---|---|---|
| ISO NOX | 12. | 12. | 12. | |
| NOX | 13. | 12. | 13. | 1.83 |
| CO | 37. | 35. | 36. | 3.14 |
| UHC | 8. | 8. | 8. | 0.38 |

*** ISO CONDITIONS: SEA LEVEL, 60%RH, 14.696 PSIA, 59 DEGF ***

Engine ID :TDSDAA-1500-007
Engine S/N :1006T
Fuel Type :NATURAL GAS
Test Def File: TT73GEN
Data Taken :20-JAN-01 11:40:28
Load : 3485.84 ( 95.%) KW

| | | | | |
|---|---|---|---|---|
| T.AMB | - | DEG.F | : | 69.7059 |
| T.NG | - | DEG.F | : | 67.7383 |
| P.BARO | - | IN.HG | : | 29.7636 |
| %R.H. | - | % | : | 31.2969 |
| F.WATER | - | GPM | : | 0.0000 |
| WF.AVG | - | PPH | : | 2124.4268 |
| WA | - | PPS | : | 37.3358 |
| T2.AVG | - | DEG.F | : | 635.8766 |
| %NTURB | - | % | : | 100.0424 |
| T5.AVG | - | DEG.F | : | 1186.8838 |
| T7.AVG | - | DEG.F | : | 931.0914 |
| FUELTYPE | - | | : | 1.0000 |
| RUN.# | - | | : | 1.0000 |
| PCD | - | PSIG | : | 122.2907 |
| TRIT | - | DEG.F | : | 1799.1903 |
| TPZ.C | - | DEG.F | : | 3179.7510 |
| TPZ.O | - | DEG.F | : | 0.0000 |
| T5.SETPT | - | DEG.F | : | 1250.0000 |

| | | | |
|---|---|---|---|
| SPEED_INSTABILITY | : | 0.03 | % |
| LOAD_INSTABILITY | : | 0.05 | %KW |
| T7AVG_INSTABILITY | : | 2.44 | DEG.F |

| | | | | | MIN SAMPLE | MAX SAMPLE | (***NOT LIMITS***) |
|---|---|---|---|---|---|---|---|
| CO | - | ppmv | : | 21. | 18. | 23. | |
| CO2 | - | % | : | 3.02 | 2.99 | 3.05 | |
| NO | - | ppmv | : | 7. | 6. | 7. | |
| NOX | - | ppmv | : | 11. | 10. | 12. | |
| UHC | - | ppmv | : | 2. | 1. | 3. | |
| O2 | - | % | : | 15.84 | 15.78 | 15.87 | |

Fuel Factor 1.68

RESULTS CORRECTED TO 15% OXYGEN DRY BASIS

| | FA(ppmv) | CO2(ppmv) | O2(ppmv) | O2(pph) |
|---|---|---|---|---|
| ISO NOX | 13. | 12. | 12. | |
| NOX | 13. | 13. | 13. | 2.24 |
| CO | 25. | 23. | 24. | 2.52 |
| UHC | 3. | 2. | 3. | 0.15 |

*** ISO CONDITIONS: SEA LEVEL, 60%RH, 14.696 PSIA, 59 DEGF ***

Engine ID :TDSDAA-1500-007
Engine S/N :1006T
Fuel Type :NATURAL GAS
Test Def File: TT73GEN
Data Taken :20-JAN-01 09:01:49
Load : 4942.97 ( 100.%) KW

| | | | | |
|---|---|---|---|---|
| T.AMB | - | DEG.F | : | 56.4836 |
| T.NG | - | DEG.F | : | 50.8442 |
| P.BARO | - | IN.HG | : | 29.7859 |
| %R.H. | - | % | : | 47.5625 |
| F.WATER | - | GPM | : | 0.0000 |
| WF.AVG | - | PPH | : | 2766.8784 |
| WA | - | PPS | : | 46.8983 |
| T2.AVG | - | DEG.F | : | 684.5793 |
| %NTURB | - | % | : | 99.9340 |
| T5.AVG | - | DEG.F | : | 1218.9596 |
| T7.AVG | - | DEG.F | : | 924.3422 |
| FUELTYPE | - | | : | 1.0000 |
| RUN.# | - | | : | 1.0000 |
| PCD | - | PSIG | : | 158.8045 |
| TRIT | - | DEG.F | : | 1887.3583 |
| TPZ.C | - | DEG.F | : | 0.0000 |
| TPZ.O | - | DEG.F | : | 3040.1985 |
| T5.SETPT | - | DEG.F | : | 1250.0000 |

| | | |
|---|---|---|
| SPEED_INSTABILITY : | 0.05 | % |
| LOAD_INSTABILITY : | 0.03 | %KW |
| T7AVG_INSTABILITY : | 0.66 | DEG.F |

| | | | | MIN SAMPLE | MAX SAMPLE | (***NOT LIMITS***) |
|---|---|---|---|---|---|---|
| CO | - | ppmv | : | 17. | 16. | 18. |
| CO2 | - | % | : | 3.14 | 3.12 | 3.16 |
| NO | - | ppmv | : | 7. | 7. | 7. |
| NOX | - | ppmv | : | 11. | 10. | 11. |
| UHC | - | ppmv | : | 2. | 2. | 3. |
| O2 | - | % | : | 15.65 | 15.59 | 15.72 |

Fuel Factor 1.67

RESULTS CORRECTED TO 15% OXYGEN DRY BASIS

| | FA(ppmv) | CO2(ppmv) | O2(ppmv) | O2(pph) |
|---|---|---|---|---|
| ISO NOX | 12. | 12. | 12. | |
| NOX | 13. | 12. | 12. | 2.77 |
| CO | 20. | 19. | 19. | 2.64 |
| UHC | 3. | 3. | 3. | 0.21 |

*** ISO CONDITIONS: SEA LEVEL, 60%RH, 14.696 PSIA, 59 DEGF ***

# CERTIFIED TEST DATA

TURBINE-DRIVEN GENERATOR SET

PACKAGE MODEL CGS001
ENGINE MODEL TAURUS 60S

PERFORMANCE ACCEPTANCE CERTIFICATE

| CUSTOMER REFERENCE NO.: | SOLAR PROJECT NO.: |
|---|---|
| **YM53513 RW** | **70221** |

| CUSTOMER NAME: | SOLAR NAME: | UNIT NO.: |
|---|---|---|
| | **PPS-2** | **1** |

SERIAL NUMBERS

| PACKAGE | ENGINE | GEARBOX | GENERATOR |
|---|---|---|---|
| **TG01585** | **1058T** | **APR01-00685** | **011025-01** |

PACKAGE ACCEPTANCE APPROVAL

Solar Turbines Incorporated at San Diego certifies that the equipment identified above was tested as described herein and found to meet applicable requirements of the Solar Project Definition, the engineering specifications and the contractual requirements.

STATIC TEST ENGINEER: U. Tran DATE: 6/5/01

PRODUCTION TEST ENGINEER: S. Rueter DATE: 7/9/01

MANAGER, PRODUCTION TEST ENGINEERING: T.M. Huang DATE: 11JUL01

PROJECT MANAGER: U. Plescia DATE: 7/17/01

## TEST CONDITIONS AND TEST DATA

The generator package was tested with the turbine engine, reduction gearbox and generator mounted on the package base. The package controls were mounted on-skid and were used for the test.

The generator nameplate rating is 5,300 kw; rated voltage is 13,200 volts.

Full load for all package testing was determined by either the nameplate rating of the generator, or the engine performance curve adjusted for air inlet temperature, sea level and zero duct losses whichever was lower, per Solar Engineering Specification ES2091.

### ITEM 1. ACCEPTANCE TEST

The attached figures labeled "Control Console Software Verification", "Control Console Hardware Verification", "Universal Generator Set Acceptance Test" and "Final Visual Acceptance Test" are the specific test agenda for this unit. They were prepared to reflect contractual requirements and compliance with Solar Engineering Specifications ES2091 and ES2220. The "Control Console Software" for this project was an exact copy of the software used on project PPS-1 (2-59731). This software was used to perform dynamic testing.

### ITEM 2. TURBINE ENGINE PERFORMANCE

The attached figure labeled "Taurus 60S, T7300 One-Shaft Engine Performance, Nat. Gas Fuel" depicts engine performance test data as noted on the computer analysis printout. The upper portion shows measured parameters and the lower portion shows calculated results corrected to conditions of standard temperature, sea level, and zero duct losses. The acceptance criteria for the engine performance results is contained in ES2091.

Based on the T5/T3 ratio determined during the engine performance test, the software base T5 with SIV open is 1218 degrees Fahrenheit and T5 with SIV closed is 1241 degrees Fahrenheit.

The attached table labeled "Engine K-values" consists of data points required for customer's software.

### ITEM 3. FREQUENCY (SPEED) AND VOLTAGE REGULATION

The attached figure labeled "Frequency (Speed) and Voltage Regulation" shows the regulation of this unit with the speed governor and voltage regulator adjusted for isochronous operation. Regulation was verified at each load point after all transients had decayed, as the load was varied from no load to full load to no load.

### ITEM 4. OPERATING PARAMETERS

The attached figure labeled "Operating Parameters - Taurus Generator Set" provides "new condition" operating parameters for comparative

**ITEM 5. VIBRATION DATA**

The attached figures labeled "Machinery Vibration Signature" are the spectrum plots for each vibration probe recorded during the engine full load run.

**ITEM 6. SUDDEN LOAD TESTS**

The attached digitized trace shows the sudden load testing of this unit at 1500 KW on-load and 3300 KW off-load corrected to sea level and zero duct losses per Solar Engineering Specification ES2220.

Frequency (speed) deviation during load application did not exceed the specification limit of minus 5.0 percent from rated speed and recovery was within a plus or minus 0.50 percent band within 15.0 seconds. Frequency deviation during load rejection was within 7.0 percent and recovery was within a plus or minus 0.50 percent band within 10.0 seconds.

Voltage deviation during load application did not exceed specification limit of plus or minus 17.0 percent from rated voltage and recovery was within a plus or minus 5.0 percent band within 2.0 seconds for this high performance generator. Voltage deviation during load rejection was within plus or minus 22.0 percent and recovery was within a plus or minus 5.0 percent band within 2.0 seconds.

**ITEM 7. DRY EMISSIONS**

The attached figures labeled "Dry Emissions" document the results of emissions testing without water injection. The component concentration levels are corrected to 15% oxygen and ISO conditions per Solar ES9-97. The NOx and CO emissions limits are 25 ppm and 50 ppm, respectively.

# ITEM 1. ACCEPTANCE TEST

**CONTROL CONSOLE**
**SOFTWARE VERIFICATION**
**CUSTOMER ( 2-70221)**

**( 2-70221 ) WAS NOT CHECKED SOFTWARE BECAUSE SOFTWARE OF THIS JOB WAS CLONED FROM PPS_1 (2-59731 ) . WE RAN COMPARE SOFTWARE AND CHECKED THE DIFFERENCE OF AC ( VOLTAGE , CURRENT ,KW ECT... )**

**CONTROL TEST ENGINEER**
**UT TRAN**
Uthuntia TE 59

| Solar Turbines<br>*A Caterpillar Company* | CONTROL CONSOLE HARDWARE VERIFICATION | Page: 2 of 3 | Date:04/12/01 |
|---|---|---|---|
| **CUSTOMER:** | **PROJECT: 2-70221** | **UNIT: 1 of 3** | |

| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 63 | Alarm Horn | To verify the horn is sounded on any alarm or shutdown condition and silenced when the alarm/shutdown condition is cleared or when "horn silence" or reset is selected | 456 |
| 75 | 24 Vdc Voltage Divider | To verify the accuracy of the 24 Vdc measurement resistor network with a calibrated meter | 456 |
| 95 | Backup System (IPG) | Verify the basic IPG backup system | 456 |
| 115 | T37 Keyboard Commands | To verify that the display terminal's two sealed-membrane keypads (the Function Keypad and the numeric Keypad) are functional | 727 |
| 116 | Printer/Logger | To verify that the printer and data logging functions are operable | 727 |
| 117 | Set Console Timers | To verify that all electrical timers are set per the legal drawing and torque painted | 456 |
| 130 | A/C Visual Inspection | To verify the correct selection of the A/C meters and their proper wiring | 744 |
| 131 | A/C Simulator Hookup | To provide a consistent and logical method for connecting the A/C simulator | 744 |
| 132 | A/C LSM Module Verification (Hardware) | To verify that the LSM is installed and functions properly | 744 |
| 133 | A/C Metering Accuracy | To verify the accuracy of the AC meters and the CRT displayed AC parameters | 786 |
| 134 | A/C Voltage Droop Verification | To verify initial setup of the voltage droop feature of the Basler voltage regulator | 786 |

*** ENSURE ALL STAMPS ARE LEGIBLE AND IN BLACK INK ***

| Solar® Turbines<br>*A Caterpillar Company* | CONTROL CONSOLE HARDWARE VERIFICATION | Page: 3 of 3 | Date:04/12/01 |
|---|---|---|---|
| **CUSTOMER:** | **PROJECT: 2-70221** | **UNIT: 1 of 3** | |

| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 135 | A/C KVAR/P F Control | To verify the Basler KVAR/PF controller is operating properly | 786 |
| 136 | A/C Motorized Voltage Adjust | To verify that the motorized potentiometer and associated control assembly function correctly | 786 |
| 137 | A/C Voltage Regulator | To verify the circuitry and operation of the voltage regulator | 786 |
| 139 | A/C Single Unit Auto Sync (Hot Bus) | To verify the unit will automatically synchronize with a live bus | 786 |
| 140 | A/C Single Unit Auto Sync (Dead Bus) | The purpose of this operation is to verify statically that the control console is tuned to automatically synchronize to a dead bus | N/A TE 69 K |
| 150 | Clear Open Discrepancies | To verify all operations have been performed and the Automated Test Log (ATL) is reviewed | 727 |
| 152 | Legal Drawings Clear | To verify all changes shown on the legal electrical drawing have been performed and the legal drawing is signed by the test engineer | 734 |
| 154 | Console Complete and Authorized for Disconnect | To obtain authorization from test engineer to disconnect the turbine controls and verify all test equipment and accessories are disconnected | 734 |
| 159 | Load PLC Program | To ensure the latest revision of the controls software is downloaded to the PLC | 734 |
| 165 | Test Cell Acceptance (New Production) | To ensure the package test engineer has accepted the turbine controls by signing the test verification sheet | 727 |

*** ENSURE ALL STAMPS ARE LEGIBLE AND IN BLACK INK ***

| Solar Turbines<br>*A Caterpillar Company* | CONTROL CONSOLE HARDWARE VERIFICATION | Page: 1 of 3 | Date 04/12/01 |
|---|---|---|---|
| **CUSTOMER:** | **PROJECT: 2-70221** | **UNIT: 1 of 3** | |

| OPERATION | TITLE | PURPOSE OF OPERATION | STAMP |
|---|---|---|---|
| 5 | Console Wiring and Shortages (Can) | To ensure that the console components and wiring are in accordance with the legal wiring diagram Verify that any missing components are recorded in the test log and placed on order | 734 |
| 7 | Allen Bradley Module Switches and Jumper Settings | Verify that the switches and jumpers on the A/B modules and the backplane of the PLC rack are set in accordance with the electrical schematic Also, verify that all modules are correctly positioned in the rack | 734 |
| 8 | Horn/Hour Meter/Start Counter Disconnect | To disable the alarm horn, hour meter, and start counter during test | 734 |
| 10 | Connect External DC Power | To search for any "short" circuits between OVDC and frame, and 24VDC and frame before applying DC power to the control console Also, verify that each circuit breaker powers its respective circuit/bus only per electrical print | 456 |
| 12 | Prepare Programming Terminal and Load PLC Program | Connect the programming terminal (PC) to the control console PLC and load the project application software to the PLC | 456 |
| 15 | Load Display Program (TT2000) | Load the display software into the control console display terminal/computer Set switch and jumper setting for Z501 per schematic sheet 9 and make sure PLC communicate to Z501 | 727 |
| 16 | Load Display Program (PV1000) | Load the display software into the control console Panel View 900 | 456 |
| 21 | PLC LED's All Green | Verify no communication error exists between the PLC and the display | 456 |
| 22 | Clear All Malfunctions | To lock-up the backup relay system | 456 |
| 24 | Block Transfer Error - Controlnet | To verify the correct alarm and/or shutdown functionality associated with ControlNet communication errors for units with CAN or ACNR modules | 456 |
| 49 | Lamp Test | To verify the lamps on the turbine control panel are operational | 456 |

*** ENSURE ALL STAMPS ARE LEGIBLE AND IN BLACK INK ***

# UNIVERSAL GENERATOR SET ACCEPTANCE TEST

CUSTOMER | UNIT 1 | PD 2-70221

MO 3100313 | PKG S/N TG01585 | ENG S/N 1058T

| STATION 3 OPERATIONS | | | | |
|---|---|---|---|---|
| OPER NO | OPERATION | REV DATE | DESCRIPTION | STAMP |
| **SKID TEST OPERATIONS** | | | | |
| 2000 | SAFETY INSTRUCTIONS AND FAMILIARIZATION | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE OPERATOR IS FULLY AWARE OF THE PROJECT REQUIREMENTS AND GENERAL SAFETY PRECAUTIONS TO BE FOLLOWED WHEN OPERATING TURBO MACHINERY IN SUPPORT OF PRODUCTION TEST OPERATIONS. | 341 |
| 2002 | SKID INSPECTION | 8/98 | THE PURPOSE OF THIS OPERATION IS TO PERFORM A PRELIMINARY INSPECTION OF THE SKID FOR PROPER ASSEMBLY AND COMPLETENESS. | 341 |
| 2005 | SHORTAGES | 9/99 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT ALL SHORTAGES ARE RECOGNIZED AND DOCUMENTED. | 783 |
| 2020 (AC) | LUBE OIL TANK AND CIRCULATION HEATER CHECK | 6/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE PART NUMBER AND INTEGRITY OF THE LUBE OIL TANK AND CIRCULATION HEATERS, AS APPLICABLE | 760 |
| 2025 (AC) | AC MOTOR SPACE HEATERS | 4/00 | THE PURPOSE OF THIS OPERATION IS TO MEASURE THE DC RESISTANCE AND VERIFY CONTINUITY OF EACH PACKAGE MOTOR SPACE HEATER | 787 |
| 2030 (AC) | GENERATOR SPACE HEATER | 5/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE INTEGRITY OF THE GENERATOR SPACE HEATERS | 092 |
| 2035 (AC) | GENERATOR WINDING INSULATION RESISTANCE | 5/00 | THE PURPOSE OF THIS OPERATION IS TO MEASURE THE INSULATION RESISTANCE OF THE GENERATOR WINDINGS | 092 |
| 2040 (AC) | GENERATOR EXCITER FIELD DC RESISTANCE | 5/00 | THE PURPOSE OF THIS OPERATION IS TO MEASURE THE DC RESISTANCE OF THE GENERATOR'S EXCITER FIELD | 760 |
| 2045 | VIBRATION SYSTEM INSTALLATION VERIFICATION | 3/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE PROPER INSTALLATION OF THE VIBRATION SYSTEM COMPONENTS | 341 |
| 2050 | PRELIMINARY FACILITY ATTACHMENTS | 12/98 | THE PURPOSE OF THIS OPERATION IS TO PREPARE VARIOUS PACKAGE SYSTEMS AND CONNECTIONS FOR HOOKUP IN THE TEST CELL | 341 |
| 2055 | INSTRUMENTATION HOOKUP I | 4/99 | THE PURPOSE OF THIS OPERATION IS TO PROVIDE GUIDELINES FOR THE HOOKUPS AND INSTALLATION OF FACILITY HARNESSES AND TEST EQUIPMENT. | 341 |
| 2060 | CIRCUIT TO GROUND RESISTANCE CHECK | 10/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THERE IS A MINIMUM RESISTANCE BETWEEN ANY CIRCUIT AND SKID GROUND | 341 |
| 2085 | PACKAGE ELECTRICAL END DEVICES | 7/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE ACCURACY OF THE PACKAGE MOUNTED END DEVICES THROUGH THE ELECTRICAL INTERCONNECT | 809 |
| 2090 | SKID INTERCONNECT AND SKID DC POWER HOOKUP | 6/00 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT THE CORRECT INTERCONNECTS AND DC POWER HOOKUPS ARE HOOKED UP PER THE "LEGAL" WIRING DIAGRAM | 783 |
| **CONSOLE/CONTROL SYSTEMS TEST OPERATIONS** | | | | |
| 2100 | OUTPUT MODULE WIRING VERIFICATION | 5/00 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT NONE OF THE OUTPUT CIRCUITS FROM THE PLC ARE SHORTED TO "0V" OR GROUND | 741 |
| 2130 | CONSOLE/SKID LOCKUP | 7/97 | THE PURPOSE OF THIS OPERATION IS TO PREPARE THE CONSOLE AND SKID FOR TESTING. | 783 |

# UNIVERSAL GENERATOR SET ACCEPTANCE TEST

CUSTOMER UNIT **1** PD **2-70221**

MO **3100313** PKG S/N **TG01585** ENG S/N **1058T**

| STATION 3 OPERATIONS | | | | |
|---|---|---|---|---|
| **OPER NO** | **OPERATION** | **REV DATE** | **DESCRIPTION** | **STAMP** |
| 2065 (AC) | CSA INSULATION DIELECTRIC STRENGTH TEST | 5/99 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT INSULATION BREAKDOWN DID NOT OCCUR WHEN PACKAGE WIRING WAS PULLED THROUGH CONDUIT | 783 |
| 2135 | OFF/LOCAL/REMOTE SWITCH (S101) | 7/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT WHEN THE OFF/LOCAL/REMOTE SWITCH (S101) IS IN THE OFF MODE, THE UNIT DOES NOT RESPOND TO THE START SIGNAL AND LOCKOUT SHUTDOWN IS ANNUNCIATED | 783 |

# UNIVERSAL GENERATOR SET ACCEPTANCE TEST

CUSTOMER UNIT 1 PD 2-70221

MO 3100313 PKG S/N TG01585 ENG S/N 1058T

| STATION 4 OPERATIONS | | | | |
|---|---|---|---|---|
| OPER. NO. | OPERATION | REV DATE | DESCRIPTION | STAMP |
| 2300 | SKID SUPPORT LOCATION | 5/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE SKID SUPPORTS ARE UNDER THE CUSTOMERS BOLT-DOWN POINTS. | 341 |
| 2305 | FACILITY INLET/EXHAUST ATTACHMENTS | 4/00 | THE PURPOSE OF THIS OPERATION IS TO PROVIDE INSTRUCTION TO ATTACH THE FACILITY INLET AND EXHAUST DUCTS TO THE PACKAGE | 341 |
| 2315 | PLC SOFTWARE REVISION PROCEDURE | 4/97 | THE PURPOSE OF THIS OPERATION IS TO OUTLINE THE PROCEDURE FOR INSTALLING NEW SOFTWARE REVISIONS TO THE PROGRAM LOGIC CONTROLLER (PLC) | 783 |
| 2320 | SOFTWARE LOADING | 4/99 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT THE SOFTWARE IS LOADED PROPERLY. | 783 |
| 2325 | FACILITY OIL FILTER INSTALLATION | 3/00 | THE PURPOSE OF THIS OPERATION IS TO PROVIDE GUIDELINES FOR THE INSTALLATION OF FACILITY EQUIPMENT FOR TEST MEASUREMENT AND PACKAGE OIL SYSTEM PROTECTION. | 341 |
| 2330 | LOW LUBE OIL LEVEL AL/SD AND LUBE TANK FILL | 9/97 | THE PURPOSE OF THIS OPERATION IS TO FILL THE LUBE OIL TANK, AND VERIFY THE LOW OIL LEVEL SWITCH FUNCTIONS PROPERLY | 341 |
| 2345 | SKID FAST STOP | 4/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE SKID FAST STOP PUSH-BUTTON SHUTS THE UNIT DOWN AND THE ASSOCIATED DISPLAY MESSAGES ARE DEPICTED ON THE DISPLAY MONITOR. | 783 |
| 2350 | IGV CALIBRATION (SOLONOX) | 4/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE IGV'S ARE CALIBRATED CORRECTLY IF THE IGV'S ARE SUSPECTED TO BE INCORRECTLY CALIBRATED, DEPT 377 (ENGINE BUILD) SHOULD BE REQUESTED TO RECALIBRATE THE IGV'S. | 341 |
| 2355 | GEARBOX/ENGINE INSTALLATION | 7/95 | THE PURPOSE OF THIS OPERATION IS TO INSTALL ENGINE AND/OR GEARBOX ON THE SKID CORRECTLY, EFFICIENTLY, AND SAFELY. | 783 |
| 2360 (AC) | GENERATOR LOAD CABLE HOOKUP | 6/00 | THE PURPOSE OF THIS OPERATION IS TO SAFELY ATTACH THE GENERATOR LOAD CABLES TO THE FACILITY LOAD TESTING NETWORK | 750 |
| 2365 (AC) | FACILITY LOAD TESTING SETUP | 5/00 | THE PURPOSE OF THIS OPERATION IS TO SETUP THE FACILITY LOAD TESTING CIRCUIT BREAKER OVERCURRENT TRIP RELAYS AND PREPARE THE FACILITY LOAD BANKS FOR TESTING. | 787 |
| 2370 | FACILITY HOOKUP (TESTCELL) | 12/98 | THE PURPOSE OF THIS OPERATION IS TO CONNECT VARIOUS PACKAGE SYSTEMS TO TEST CELL FACILITIES. | 790 |
| 2375 | FACILITY COMPUTER LOADING | 3/00 | THE PURPOSE OF THIS OPERATION IS TO LOAD THE SALES ORDER SPECIFIC TEST DEFINITION PROGRAM INTO THE FACILITY COMPUTER SYSTEM | 741 |
| 2385 | INSTRUMENTATION HOOKUP II | 6/95 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT INSTRUMENTATION HOOKUPS ARE PERFORMED SAFELY AND PROPERLY. | 790 |
| 2390 (AC) | GENERATOR FACILITY INTERCONNECTS | 6/00 | THE PURPOSE OF THIS OPERATION IS TO COMPLETE THE GENERATOR FACILITY AC HARNESS CONNECTIONS | 750 |
| 2395 | FACILITY VIBRATION MONITOR VERIFICATION | 3/00 | THE PURPOSE OF THIS OPERATION IS TO CONNECT THE FACILITY VIBRATION MONITOR SYSTEM AND SET THE APPROPRIATE ALARM AND SHUTDOWN SETPOINTS | 790 |
| 2400 | ZERO INSTRUMENTATION CHECK | 2/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT ALL INSTRUMENTATION READINGS MEET THE FACILITY COMPUTERS ZERO CHECK CONDITIONS. | 341 |

# UNIVERSAL GENERATOR SET ACCEPTANCE TEST

CUSTOMER UNIT 1 PD 2-70221

MO 3100313 PKG S/N TG01585 ENG S/N 1058T

| STATION 4 OPERATIONS | | | | |
|---|---|---|---|---|
| OPER. NO. | OPERATION | REV DATE | DESCRIPTION | STAMP |
| 2410 (AC) | AC MOTOR CONNECTION | 8/98 | THE PURPOSE OF THIS OPERATION IS TO PROVIDE A SAFE PROCEDURE FOR THE WIRING OF THE PACKAGE AC MOTOR CONNECTIONS | 760 |
| 2415 (AC) | VFD CONFIGURATION | 5/99 | THE PURPOSE OF THIS OPERATION IS TO SAFELY SET UP AND CONFIGURE ALL PACKAGE VARIABLE FREQUENCY DRIVES (VFD'S) | 760 |
| 2420 | PRELUBE PACKAGE | 3/00 | THE PURPOSE OF THIS OPERATION IS TO MAKE PRELIMINARY CHECKS AND ADJUSTMENTS TO LUBE OIL SYSTEM PRIOR TO FIRST CRANK. | 790 |
| 2430 | AUX AND B/U LUBE OIL PUMP SHUTDOWNS | 7/00 | THE PURPOSE OF THIS OPERATION IS TO INSURE PROPER OPERATION OF THE AUXILIARY AND BACKUP LUBE PUMPS AND ASSOCIATED SOFTWARE LOGIC | 790 |
| 2440 | LIQUID FUEL SYSTEM LEAK TEST | 6/99 | THE PURPOSE OF THIS OPERATION IS TO LEAK TEST MOST OF THE LIQUID FUEL SYSTEM PRIOR TO STARTING THE UNIT IN LIQUID FUEL. | 760 |
| 2445 | GAS FUEL SYSTEM LEAK TEST | 6/99 | THE PURPOSE OF THIS OPERATION IS TO CHECK THE GAS FUEL SYSTEM FOR LEAKS PRIOR TO CONNECTING THE NATURAL GAS TO THE SYSTEM DURING THIS TEST THE PILOT AIR SUPPLY PRESSURE AND TORCH PRESSURE WILL BE SET PER THE MECHANICAL LEGAL DRAWINGS. | 341 |
| 2450 | PECC FUEL VALVE SETUP | 4/97 | THE PURPOSE OF THIS OPERATION IS TO STATICALLY VERIFY THE PROPER OPERATION OF THE PECC GAS FUEL CONTROL VALVE. | 790 |
| 2462 | "AFI" AND "FORCE" SEARCH | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE PROGRAM AND CONSOLE ARE CHECKED FOR AFI'S FORCE'S, AND TEST JUMPERS WHICH WERE INSTALLED OR OVERLOOKED DURING THE STATIC PORTION OF TESTING AND REMOVE THEM, IF POSSIBLE, BEFORE CRANKING THE ENGINE. | 855 |
| SPEC OP "A" | T60 ADRE DATA MONITORING | 12/00 | THE PURPOSE OF THIS OPERATION IS TO SETUP THE ADRE FOR VIBRATION MONITORING OF T60 SINGLE SHAFT ENGINES | 855 |
| 2465 | AIR INLET INSPECTION | 9/98 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE AIR INLET DUCT IS CLEAN AND FREE OF FOREIGN OBJECTS AND DEBRIS. | 341 |
| TEST ENGINEER OR TEAM LEADER'S INITIALS, UNIT READY TO CRANK | | | | KC |
| 2470 | FIRST CRANK | 4/00 | THE PURPOSE OF THIS OPERATION IS TO CONDUCT THE UNIT'S "FIRST CRANK". | 855 |
| 2475 | FIRST LIGHT OFF | 4/00 | THE PURPOSE OF THIS INSTRUCTION IS TO PROVIDE FOR AN ORDERLY AND DOCUMENTED PROCEDURE FOR PERFORMING "FIRST LIGHT-OFF". | 869 |
| 2480 | OVERSPEED | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE THREE SEPARATE OVERSPEED SHUTDOWNS, PLC CONTROLLED INSTANTANEOUS AND DELAYED AND THE SEPARATE SKID MOUNTED BACK-UP OVERSPEED MONITOR. | 869 |
| 2485 | NGP SPEED LOSS SHUTDOWN | 3/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT UPON LOSS OF ONE SPEED PICKUP CONDUCTOR, THE UNIT WILL SHUTDOWN. | 869 |
| 2490 | FUEL VALVE FAIL (GAS AND DUAL FUEL) | 6/00 | THE PURPOSE OF THIS OPERATION IS TO INSURE PROPER OPERATION OF BOTH THE PRIMARY AND SECONDARY FUEL VALVES | 869 |
| 2495 | OIL PRESSURE ALARM AND SHUTDOWN | 6/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY PROPER ALARM AND SHUTDOWN RESPONSES TO LOW LUBE OIL PRESSURE CONDITION | 869 |

# UNIVERSAL GENERATOR SET ACCEPTANCE TEST

CUSTOMER | UNIT 1 | PD 2-70221

MO 3100313 | PKG S/N TG01585 | ENG S/N 1058T

**STATION 4 OPERATIONS**

| OPER. NO. | OPERATION | REV DATE | DESCRIPTION | STAMP |
|---|---|---|---|---|
| 2497 | HIGH LUBE OIL HEADER TEMPERATURE ALARM AND SHUTDOWN | 6/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE PROPER ALARM AND SHUTDOWN RESPONSES TO HIGH LUBE OIL HEADER TEMPERATURE CONDITIONS | 869 |
| 2500 | MANUAL COOLDOWN AND FAST STOP | 6/00 | THE PURPOSE OF THIS OPERATION IS TO PROVIDE FOR AN ORDERLY AND DOCUMENTED PROCEDURE FOR PERFORMING BOTH A MANUAL COOLDOWN AND FAST STOP | 869 |
| 2530 | T5 TEMPERATURE TOPPING, SETPOINT, AND CONTROLS | 6/00 | THE PURPOSE OF THIS OPERATION IS TO INSURE THAT THE FUEL SYSTEM FUNCTIONS PROPERLY IN ORDER TO RELIABLY START THE PACKAGE AND ALSO PREVENT A HIGH TEMP S/D | T83 |
| 2545 (AC) | PMG VOLTAGE AND FREQUENCY CHECK 276 V 120 HZ | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT PRIOR TO VOLTAGE BUILD, THE GENERATOR'S PMG PRODUCES THE PROPER VOLTAGE AND FREQUENCY | 760 |
| 2550 (AC) | VOLTAGE BUILD-UP | 6/00 | THE PURPOSE OF THIS OPERATION IS TO PERFORM THE INITIAL VOLTAGE BUILD | 787 |
| 2560 | BLEED VALVE SEQUENCE | 3/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE BLEED VALVE OPENS AND CLOSES IN THE CORRECT SEQUENCE AND SPEED OR LOAD VALUES. | 781 |
| 2575 | GEARBOX AND ENGINE BREAK-IN | 2/01 | THIS OPERATION DETAILS THE PROCEDURE FOR THE GEARBOX BREAK-IN RUNS AS SPECIFIED IN THE APPLICABLE ENGINE ACCEPTANCE SPECIFICATION. | 841 |
| 2580 | ENGINE ACCEPTANCE | 2/01 | THIS OPERATION DETAILS THE PROCEDURE FOR THE ENGINE ACCEPTANCE RUN(S) AS SPECIFIED IN THE APPLICABLE ENGINE ACCEPTANCE SPECIFICATION. | 815 |
| 2585 | EMISSIONS | 2/01 | THIS OPERATION DETAILS THE PROCEDURE FOR THE ENGINE EMISSIONS RUN(S) AS SPECIFIED IN THE APPLICABLE ENGINE ACCEPTANCE SPECIFICATION. | 815 |
| 2590 | GENERATOR WINDING RTD VERIFICATION | 6/00 | THE PURPOSE OF THIS OPERATION IS TO MEASURE AND RECORD ALL GENERATOR WINDING RTD READINGS | 815 |
| 2610 | PRELIMINARY LEAK CHECK | 6/00 | THE PURPOSE OF THIS OPERATION IS TO IDENTIFY AND FIX AS MANY AIR, OIL, FUEL OR WATER LEAKS AS POSSIBLE BEFORE CONTINUED TESTING. | 730 |
| 2620 | MOTOR ROTATION ARROW VERIFICATION | 6/00 | THE PURPOSE OF THIS INSTRUCTION IS TO ENSURE THAT THE MOTOR ROTATION ARROWS ARE CORRECTLY INSTALLED NEAR EACH MOTOR OR MOTOR/PUMP COMBINATION AND THEY ARE ACCURATE IN THEIR DEPICTION. | 730 |
| 2625 (AC) | VOLTAGE AND SPEED RANGE ADJUST | 6/00 | THE PURPOSE OF THIS OPERATION IS TO MANUALLY VERIFY PACKAGE VOLTAGE AND SPEED ADJUSTABILITY | 760 |
| 2630 (AC) | SPEED DROOP | 6/00 | THE PURPOSE OF THIS OPERATION IS TO ADJUST AND VERIFY THE OPERATION OF THE SPEED DROOP FEATURE OF THE GENERATOR CONTROL SYSTEM | 760 |
| 2635 (AC) | SPEED ISOCH TO SPEED DROOP BUMPLESS TRANSFER | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE SPEED ISOCH TO SPEED DROOP BUMPLESS TRANSFER FEATURE | 760 |
| 2645 (AC) | VOLTAGE DROOP | 6/00 | THE PURPOSE THIS OPERATION IS TO VERIFY THE VOLTAGE DROOP FEATURE OF THE VOLTAGE REGULATOR | 760 |
| 2655 (AC) | SPEED AND VOLTAGE REGULATION | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT SPEED AND VOLTAGE ARE PROPERLY REGULATED OVER A RANGE OF LOAD POINTS | TE 75 |

# UNIVERSAL GENERATOR SET ACCEPTANCE TEST

CUSTOMER UNIT 1 PD 2-70221

MO 3100313 PKG S/N TG01585 ENG S/N 1058T

| STATION 4 OPERATIONS | | | | |
|---|---|---|---|---|
| OPER. NO. | OPERATION | REV DATE | DESCRIPTION | STAMP |
| 2665 (AC) | SINGLE UNIT SYNCHRONIZATION | 11/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE UNITS ABILITY TO SYNCHRONIZE VOLTAGE, FREQUENCY, AND PHASE ANGLE WITH A SIMULATED 3-PHASE BUS AND CLOSE THE OUTPUT BREAKER WHEN AN AUTOSYNCH OR MANUAL SNYC COMMAND IS INITIATED. | 787 |
| 2670 | LOAD TRANSIENTS | 12/00 | THE PURPOSE OF THIS OPERATION IS TO DOCUMENT THE UNIT'S ABILITY TO RECOVER FROM AN EXTREME ON OR OFF LOAD CONDITION WITHIN SPECIFIED LIMITS | 783 |
| 2680 (AC) | KW & EXPORT/IMPORT CONTROL | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE UNIT'S KW CONTROL FEATURE AND IMPORT/EXPORT CONTROL (IF APPLICABLE) | 787 |
| 2685 (AC) | KVAR/PF CONTROL (ISLAND MODE) | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE KVAR/PF CONTROL WILL CHANGE GENERATOR VOLTAGE AS THE KVAR/PF SETPOINT IS VARIED | 787 |
| 2695 | F13/T4 PRELIMINARY SETPOINTS | 6/00 | THE PURPOSE OF THIS OPERATION IS TO DOCUMENT PRELIMINARY F13 AND T4 VALUES AT THE END OF SUDDEN LOADS, IF SINGLE FUEL ONLY, AND AT THE END OF FUEL CHANGEOVERS IF THE UNIT IS DUAL FUEL. | 783 |
| 2700 | START RELIABILITY AND ACCELERATION | 4/97 | THE PURPOSE OF THIS OPERATION IS TO DEMONSTRATE AND VERIFY THE CAPABILITY OF THE UNIT IN STARTING RELIABLY AND SUCCESSFULLY FOR FOUR CONSECUTIVE TIMES. | 783 |
| 2705 | CUSTOMER OBSERVE OPERATIONS | 6/00 | THE PURPOSE OF THIS OPERATION IS TO DEMONSTRATE FOR THE CUSTOMER ALL REQUIRED OPERATIONS PER THE PACKAGE APPLICATION CHECK SHEET (ACS) AND THE INSPECTION AND TEST PLAN (ITP). | TE 76 A |
| 2740 | TEST CRANK | 4/97 | THE PURPOSE OF THIS OPERATION IS TO INSURE PROPER OPERATION OF THE TEST CRANK FUNCTION FOR UNITS WITHOUT THE ON-CRANK WATER WASH OPTION. | 783 |
| 2745 | WATER WASH (ON-CRANK AND ON-LINE) | 6/00 | THE PURPOSE OF THIS OPERATION IS TO PROVIDE FOR A DOCUMENTED AND ORDERLY PROCEDURE FOR TESTING THE PACKAGE WATER WASH SYSTEM(S) | 730 |
| 2750 | DATA TABULATION | 3/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT ALL OFFICIAL DATA REQUIRED FOR A PARTICULAR PROJECT HAS BEEN TAKEN AND THOROUGHLY CHECKED BY TECHNICIAN, LEAD PERSON, AND TE, AND CLEARLY DOCUMENTED IN THE PTI. | 730 |
| TEST ENGINEER'S INITIALS, UNIT OK TO DEPREP | | | | |
| 2765 | VIBRATION AND TEMP SUPPLEMENTARY DATA | 4/97 | THE PURPOSE OF THIS OPERATION IS TO PERFORM A VISUAL CHECK OF THE CONSOLE'S DATA DISPLAYS WHILE RUNNING | 730 |
| 2770 | FINAL LEAK CHECK I - PREP AND INITIAL VISUAL | 4/97 | THE PURPOSE OF THIS OPERATION IS TO PREPARE UNIT FOR FINAL LEAK CHECK | 730 |
| 2775 | FINAL LEAK CHECK II - FUEL SYSTEM CHECK | 4/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THERE ARE NO FUEL LEAKS PRESENT ON THE UNIT PRIOR TO PACKAGE PULL | 730 |
| 2780 | FINAL LEAK CHECK III - AIR SYSTEM CHECK | 4/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THERE ARE NO AIR LEAKS ON THE UNIT PRIOR TO PACKAGE PULL | 730 |
| 2785 | FINAL LEAK CHECK IV - OIL SYSTEM CHECK | 4/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THERE ARE NO OIL LEAKS ON THE UNIT IN IT'S FIELD CONFIGURATION PRIOR TO PACKAGE PULL | 730 |

# UNIVERSAL GENERATOR SET ACCEPTANCE TEST

CUSTOMER | UNIT 1 | PD 2-70221

MO 3100313 | PKG S/N TG01585 | ENG S/N 1058T

| STATION 4 OPERATIONS | | | | |
|---|---|---|---|---|
| OPER. NO. | OPERATION | REV DATE | DESCRIPTION | STAMP |
| 2790 | FINAL LEAK CHECK V - CONCLUSION | 4/97 | THE PURPOSE OF THIS OPERATION IS TO CONCLUDE THE FINAL LEAK CHECK OPERATIONS AND ENSURE THAT THERE ARE NO FLUID LEAKS ON THE UNIT PRIOR TO PACKAGE PULL. | 730 |
| 2800 | AS-TEST PROGRAM SAVE AND PROGRAM CONSTANTS | 4/99 | THE PURPOSE OF THIS OPERATION IS TO SAVE A COPY OF THE "AS-TESTED" SOFTWARE TO THE "S" DRIVE AND PRINT THE PROGRAM CONSTANTS | 730 |
| 2805 | TEST COMPLETE - READY TO PRESERVE | 1/99 | THE PURPOSE OF THIS OPERATION IS TO TO VERIFY ALL GREEN CHANGES, TEST OPERATIONS AND DISCREPANCIES HAVE BEEN STAMPED OFF OR ADDRESSED AND THAT THE PACKAGE TEST IS COMPLETE TO WHERE THE ENGINE AND FUEL SYSTEM CAN BE PRESERVED. | 730 |
| TEST ENGINEER'S INITIALS, UNIT OK TO PRESERVE | | | | SA 5/24/01 1320 |
| 2820 | ENGINE AND FUEL SYSTEM PRESERVATION | 3/00 | THE PURPOSE OF THIS OPERATION IS TO SAFELY AND PROPERLY PRESERVE THE PACKAGE FUEL SYSTEM(S) AND THE ENGINE UPON CONCLUSION OF DYNAMIC TEST | 341 |
| 2822 (AC) | CURRENT TRANSFORMER WIRING | 6/00 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE WIRING FOR THE DIFFERENTIAL AND NEUTRAL CURRENT TRANSFORMER LEADS IS PER THE LEGAL ELECTRICAL SCHEMATIC AND WIRING DIAGRAM. | TE 75 A |
| 2825 (AC) | GENERATOR AND AC FACILITY DISCONNECT | 6/00 | THE PURPOSE OF THIS OPERATION IS TO DISCONNECT THE GENERATOR PACKAGE LOAD CABLES AND GENERATOR INSTRUMENTATION | 506 |
| 2835 | PACKAGE DE-PREP | 1/99 | THE PURPOSE OF THIS OPERATION IS TO PREPARE THE PACKAGE FOR REMOVAL FROM THE TEST CELL. | 341 |
| 2837 | CONSOLE (CONTROL SYSTEM) DE-PREP | 12/99 | THE PURPOSE OF THIS OPERATION IS TO REMOVE ALL FACILITY TEST EQUIPMENT, RESET ALL PACKAGE TIMERS, AND PREPARE THE OFF SKID CONSOLE FOR REMOVAL FROM TEST. | 341 |
| 2840 | POST-TEST AUDIT | 4/97 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT A POST-TEST AUDIT IS PERFORMED ON THE UNIT BEFORE PACKAGE PULL. | 341 |
| 2845 | TEST VERIFICATION | 12/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT ALL ITEMS IN THE TEST PAPERWORK ARE SIGNED OR STAMPED OFF AS COMPLETE, THAT UNRESOLVED PACKAGE TEST DISCREPANCIES ARE DOCUMENTED ON THE TEST VERIFICATION SHEET, AND THAT ALL DISCREPANCIES HAVE BEEN CLEARED FROM THE TEST LOG. | 341 |
| 2846 | PACKAGE REMOVAL | 3/00 | THE PURPOSE OF THIS OPERATION IS TO REMOVE THE PACKAGE FROM THE TEST CELL | 341 |
| 2850 | PAPERWORK COMPLETE | 2/99 | THE PURPOSE OF THIS OPERATION IS TO RETURN THE COMPLETED PACKAGE PAPERWORK TO THE APPROPRIATE LOCATIONS. | 341 |

# UNIVERSAL GENERATOR SET ACCEPTANCE TEST

CUSTOMER UNIT 1 PD 2-70221

MO 3100313 PKG S/N TG01585 ENG S/N 1058T

| ENCLOSURE SYSTEMS TEST OPERATIONS - QUANTUM FIRE SYSTEM | | | | |
|---|---|---|---|---|
| 3140 | SIMULATOR / TEST EQUIPMENT STAGING | 8/97 | THE PURPOSE OF THIS OPERATION IS TO ENSURE ALL OF THE REQUIRED TEST EQUIPMENT, SIMULATORS, EXPENDABLE SUPPLIES, AND SALES ORDER "LEGAL" DRAWINGS ARE LOCATED AND AVAILABLE FOR ENCLOSURE AND ANCILLARY TESTING. | 809 |
| 3500 | GAS SENSORS | 8/97 | THE PURPOSE OF THIS INSTRUCTION IS TO VERIFY PROPER OPERATION OF THE GAS SENSOR USED ON THE ENCLOSURE GAS DETECTION SYSTEM. | 809 |
| 3600 (AC) | AC ENCLOSURE LIGHTS | 7/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE INSTALLATION AND THE OPERATION OF THE AC ENCLOSURE LIGHT SYSTEM | |
| 3740 | FIRE SHUTTERS | 8/97 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE FIRE SHUTTER WILL CLOSE ONLY AFTER THE FIRE SHUTTER SOLENOID IS ENERGIZED. | TE 75 |
| 3200 | FIRE SYSTEM SETUP | 4/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY PROPER FIRE SYSTEM WIRING AND TO INITIALLY "LOCK-UP" THE FIRE SYSTEM | 809 |
| 3220 | FIRE SYSTEM FAULTS | 4/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE ABILITY OF THE FIRE & GAS SYSTEM TO DETECT AND ANNUNCIATE MODULE FAULTS AT THE MODULE, LCU, AND PLC | 809 |
| 3240 | FIRE SYSTEM HORN TEST | 4/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE FIRE SYSTEM HORN IS OPERATIONAL AND SOUNDS WHEN REQUIRED | 809 |
| 3260 | FIRE SYSTEM RELEASE STROBES TEST | 4/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE FIRE SYSTEM RELEASE STROBES ARE OPERATIONAL AND THAT THEY OPERATE WHEN REQUIRED | 809 |
| 3280 | FIRE EYE TEST | 4/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE ENCLOSURE MOUNTED FIRE EYES ARE WORKING AND WILL CAUSE A PACKAGE SHUTDOWN | 809 |
| 3300 | HEAT SENSOR TEST | 4/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE ENCLOSURE MOUNTED THERMAL SWITCHES OPERATE PROPERLY AND WILL CAUSE A PACKAGE SHUTDOWN | 809 |
| 3320 | RELEASE CONFIRM SWITCH | 4/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE PROPER OPERATION OF THE FIRE SYSTEM DISCHARGE PRESSURE SWITCH AND ITS ASSOCIATED PACKAGE INDICATIONS | 809 |
| 3340 | FIRE SYSTEM AUTO/INHIBIT TEST | 4/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THE OPERATION OF THE AUTO/INHIBIT SWITCH AND TO VERIFY THAT IN "INHIBIT" A DETECTED FIRE WILL NOT CAUSE RELEASE SOLENOIDS TO BE ENERGIZED | 809 |
| 3360 | MANUAL RELEASE SWITCH TEST | 4/99 | THE PURPOSE OF THIS OPERATION IS TO VERIFY (IN AUTO & INHIBIT) THAT THE MANUAL RELEASE SWITCH WILL ACTIVATE THE FIRE SYSTEM & RELEASE SOLONOIDS | 809 |
| 3800 | CUSTOMER OBSERVE - ENCLOSURE TEST | N/A | TO DEMONSTRATE TO A CUSTOMER REPRESENTATIVE THAT ALL ENCLOSURE SYSTEMS OPERATE AS INTENDED | N/A |

**Solar Turbines**
*A Caterpillar Company*

# ENCLOSURE AND FINAL VISUAL ACCEPTANCE TEST

CUSTOMER: _____ PD #: 2-70221 UNIT #: 1 OF 3 PKG S/N: TG01585

| OPER. NO. | OPERATION | REV. DATE | DESCRIPTION | STAMP |
|---|---|---|---|---|
| 9020 | LEGAL DRAWING VERIFICATION | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO OBTAIN THE REQUIRED PROJECT "LEGAL" DRAWINGS AND VERIFY THEIR COMPLETENESS<br>CONSOLE ELECTRICAL LEGAL<br>(APPLICABLE TO ON-SKID CONTROLS ONLY)<br>SKID ELECTRICAL LEGAL<br>MECHANICAL LEGAL | |
| 9040 | SKID GROUND CHECK (DRIVER SKID) | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT ON THE DRIVER SKID THERE IS A MINIMUM RESISTANCE BETWEEN ALL CIRCUITS AND SKID GROUND | |
| 9060 | SKID GROUND CHECK (DRIVEN SKID) | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT ON THE DRIVEN SKID THERE IS A MINIMUM RESISTANCE BETWEEN ALL CIRCUITS AND SKID GROUND | N/A |
| 9080 | PRELIMINARY FINAL VISUAL - DRIVER SKID | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO PERFORM A PRELIMINARY FINAL VISUAL INSPECTION OF THE DRIVER SKID TO DETERMINE ALL WIRING IS PER THE "LEGAL" WIRING DIAGRAM | |
| 9100 | PRELIMINARY FINAL VISUAL - DRIVEN SKID | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO PERFORM A PRELIMINARY FINAL VISUAL INSPECTION OF THE DRIVEN SKID TO DETERMINE ALL WIRING IS PER THE "LEGAL" WIRING DIAGRAM | N/A |
| 9820 | CLEAR PLC MEMORY (ON SKID CONTROLS ONLY) | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT THE PLC MEMORY IS WIPED CLEAR PRIOR TO SHIPMENT | |
| 9840 | DISCREPANCY VERIFICATION | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO VERIFY THAT ALL DISCREPANCIES HAVE BEEN CLEARED | |
| 9860 | FINAL VISUAL COMPLETE | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO ENSURE THAT ALL GREEN CHANGES HAVE BEEN WORKED | |
| 9880 | FINAL PAPERWORK | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO COPY AND DISTRIBUTE THE ENCLOSURE AND FINAL VISUAL STAMP OFF SHEET | |
| 9900 | DISPATCH LEGAL DRAWINGS | 01/10/01 | THE PURPOSE OF THIS OPERATION IS TO INSURE THAT ALL THE LEGAL DRAWINGS ARE RETURNED TO THEIR PROPER LOCATION | |

# ITEM 2. TURBINE ENGINE PERFORMANCE

TAURUS 60S, T7300 ONE-SHAFT ENGINE PERFORMANCE, NAT. GAS FUEL
ENGINE S/N 1058T
CELL - 03 TEST DEF= 99 9 DATA TAKEN: 21-MAY-01 14:31:35 P.F.= 0.99

| | | |
|---|---|---|
| IGV -DEG. : | 5.000 | INLET GUIDE VANE ANGLE (OPERATOR SET) |
| P.BARO -IN.HG : | 29.439 | PRESS., BAROMETRIC (T.BARO= 32. DEG.F) |
| %R.H. -% : | 65.844 | PERCENT RELATIVE HUMIDITY |
| T.AMB -DEG.F : | 71.490 | TEMP., OUTSIDE AMBIENT AIR |
| STD.TEMP-DEG.F : | 59.000 | TEMP., STANDARD CONDITIONS (0= TO.AVG) |
| P.LOSS.A- : | 652.000 | CODE: POWER LOSS COEFF'S, ACT. G/B & GEN |
| P.LOSS.C- : | 652.000 | CODE: POWER LOSS COEFF'S, CUST.G/B & GEN |
| NTURB -RPM : | 15114.988 | SHAFT SPEED, 1-SHAFT TURBINE ENGINE ROTOR |
| NT.100% -RPM : | 14951.000 | 100% SHAFT SPEED, 1-SHAFT TURBINE ENGINE R |
| GEN.KW -KW : | 4986.773 | GENERATOR LOAD |
| DRY.WA -PPS : | 45.809 | AIRFLOW, AIR INLET VENTURI, W/O HUMIDITY |
| PO.AVG -IN.H2O: | -5.678 | PRESS., AIR INLET TOTAL, AVG. OF PROBES |
| PO.PKG -IN.H2O: | -7.151 | PRESS., AIR INLET WALL STATIC, PKG. MUFF |
| P1AV.PKG-IN.H2O: | -86.847 | PRESS., ENG. COMPR. INLET STATIC, AVG. |
| PCD -PSIG : | 160.346 | PRESS., COMPRESSOR DISCHARGE |
| P7.AVG -IN.H2O: | 3.075 | PRESS., EXHAUST WALL STATIC, AVG OF TAPS |
| TO.AVG -DEG.F : | 70.015 | TEMP., AIR INLET, AVG. OF PROBES |
| T2.AVG -DEG.F : | 715.573 | TEMP., COMPRESSOR DISCHARGE, AVG, PROBES |
| T5.AVG -DEG.F : | 1276.849 | TEMP., 3RD STAGE TURB INLET, AVG, T/C'S |
| T7.AVG -DEG.F : | 952.539 | TEMP., EXHAUST GAS, AVG. OF PROBES |
| FUELTYPE- : | 1.000 | FUEL CODE: 1=NATURAL GAS, 3=LIQUID: DIES#2 |
| WF.MASS -PPH : | 2805.642 | FUEL MASSFLOW, METER #1 |
| WF.MASS2-PPH : | 2792.015 | FUEL MASSFLOW, METER #2 |
| DWF.MASS-% : | 0.487 | DELTA FUEL FLOW, METERS #1 & #2, (% OF AVG |
| LHV.NGAS-BTU/LB: | 20604.471 | LOWER HEATING VALUE, NATURAL GAS FUEL |
| TNG.AVG -DEG.F : | 71.555 | TEMP., NATURAL GAS FUEL, AVG. OF PROBES |
| H/C.GAS - : | 0.320 | HYDROGEN/CARBON RATIO, NATURAL GAS |
| WA.BLEED-PPS : | 0.000 | FLOW, AIR BLEED TO AMBIENT, SOLONOX |
| RUN.# - : | 1.000 | TEST RUN NO./DATAPOINT (OPERATOR SET) |

ADJUSTED INPUTS:

| | | |
|---|---|---|
| WF.AVG : | 2798.829 | |

RESULTS CORRECTED TO 59.0 DEG.F AIR TEMP,
SEA LEVEL, & NO DUCT LOSSES.

| | | | |
|---|---|---|---|
| CORR PCT-SPEED, CORR.%NT | 99.93 | ( 99.70 - 100.30) | |
| CORR MAX TEMP FROM WORK, TRIT/TH(STD) | 1893.7 | ( 1875. - 1895.) | |
| CORR.KW | 5151.7 | ( 5043. - MIN) | |
| SFC, BTU/KW-HR | 11334. | ( 11615. - MAX) | |
| CORR SHP | 7312.7 | | |
| SFC, BTU/HP-HR | 7984. | | |
| COMPR PRESS RATIO, R(C) | 12.383 | ( 12.00 - MIN) | REF.ONLY |
| CORR COMPR MASS FLOW, WA(PPS) | 47.65 | ( 49.60 - MAX) | REF.ONLY |
| T5(R)/TRIT(R) | 0.7224 | ( 0.6518 - 0.7580) | |
| CORR PT INLET TEMP, T5/TH(STD) | 1240.4 | | |
| CORR EGT, T7 | 914.7 | ( 891. - MIN) | REF.ONLY |
| ACTUAL TEMP FROM WORK, TRIT | 1939.7 | | |
| CORR.WF, LBS N.GAS/HR | 2833.0 | | |
| CORR.WF, MILLION BTU/HR | 58.388 | | |
| EFF. G/B, % (ASSUMED) | 98.00 | | |
| EFF. GEN., % (ASSUMED) | 96.40 | | |
| HEAT.BAL | 0.9849 | | |

Engine

| ENGINE S/N K-values | 1058T |
|---|---|
| PD #: | 2-70221 |
| PD NAME<br>UNIT # | #1 |
| MODEL # | T7301S |
| TEST ENGINEER | S. RUETER 5/25/01 |
| F13:509<br>ENGSRLNUM | 1058T |
| F13:281 or 645 or 646<br>BASET5_GAS | (See below) |
| F13:282<br>BASET5_LIQ | N/A |
| 1-Shaft | |
| FUEL | GAS |
| % PILOT 2 | 2 5% half load<br>2 3% full load |
| ORIFICE DIA (mm) | N/A |
| F13:687<br>VARPLT_Y1 | 26.0 |
| F13:688<br>VARPLT_Y2 | 26 0 |
| F13:370<br>SIVKWSPLO | N/A |
| F13:371<br>SIVKWSPHI | N/A |
| F13:645<br>T5SIVOPEN<br>(Base T5 SIV's Open) | 1218 |
| F13:646<br>T5SIVCLOSED<br>(Base T5 SIV's Closed) | 1241 |
| F13:xxx<br>GV59TPZ_SP | N/A |
| F13:372<br>VGV59SP_G | 1200 |
| F13:384<br>T5T3_LO_LD | N/A |
| F13:385<br>T5T3_HI_LD | N/A |
| F13:389<br>PZCBAIR_RT | .45730 |
| F13:392<br>PRCNTLO_LD | N/A |
| F13:393<br>PRCNTHI_LD | N/A |

# ITEM 3. FREQUENCY (SPEED) AND VOLTAGE REGULATION

## Frequency (SPEED) and Voltage Regulation

| | | | | |
|---|---|---|---|---|
| Customer : | Unit No | :1 | Turbine S/N:1058T | |
| Project :2X70221 | Model | :T73018 | Package S/N:TG01585 | |
| Fuel Type :GAS | Date | :22-MAY-01 | Time | :09:19:30 |

| | | 0000 KW | 1600 KW | 3200 KW | FULL KW | 0000 KW | KW |
|---|---|---|---|---|---|---|---|
| Generator AC Load: | | | | | | | |
| Power Measured (KW) | GEN.KW | 5. | 1605. | 3206. | 4604. | 7. | 5. |
| Power no losses (KW) | CORR.KW | 5. | 1703. | 3344. | 4810. | 7. | 6. |
| Power Factor | P.F. | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Facility Inlet Duct: | | | | | | | |
| Average Temp.(DegF) | TO.AVG | 64.90 | 65.08 | 65.89 | 65.72 | 66.17 | 66.21 |
| Speed (Freq.) (%) | Min | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Speed (Freq.) (%) | %NTURB | 100.18 | 100.22 | 100.23 | 100.26 | 100.16 | 100.18 |
| Speed (Freq.) (%) | Max | 100.18 | 100.23 | 100.23 | 100.28 | 100.18 | 100.18 |
| Generator Volt (%) | Min | 100.01 | 99.98 | 99.76 | 99.67 | 100.05 | 100.03 |
| Generator Volt (%) | %.VOLT | 100.02 | 100.00 | 99.80 | 99.68 | 100.05 | 100.04 |
| Generator Volt (%) | Max | 100.04 | 100.02 | 99.83 | 99.69 | 100.05 | 100.05 |
| Voltage Balance (2% Max) | VOLT.H-L | 0.04 | 0.09 | 0.08 | 0.06 | 0.04 | 0.05 |
| Freq Regulation (.25% Max) | | 0.00 | -0.04 | -0.05 | -0.08 | 0.02 | 0.00 |
| Volt Regulation(1.0% Max) | | 0.00 | 0.02 | 0.22 | 0.34 | -0.03 | -0.02 |

# ITEM 4. OPERATING PARAMETERS

OPERATING PARAMETERS - TAURUS GENERATOR SET 

CUSTOMER: UNIT NO: 1 TURBINE S/N: 1058T
PROJECT : 70221 MODEL : TAURUS 60S PACKAGE S/N: TG01585

| PARAMETER | NAME | LIMIT | 0 KW | 1600 KW | 3200 KW | DRY F/L |
|---|---|---|---|---|---|---|
| DATE | | | 21-MAY-01 | 21-MAY-01 | 21-MAY-01 | 21-MAY-01 |
| TIME | | | 08:01:07 | 08:32:28 | 11:14:58 | 16:49:44 |
| TEST CELL | | | 03 | 03 | 03 | 03 |
| FUEL | | | GAS | GAS | GAS | GAS |
| **GENERATOR AC LOAD** | | | | | | |
| POWER-MEASURED (KW) | GEN.KW | | 0. | 1518. | 3164. | 4731. |
| POWER-NO LOSSES (KW) | CORR.KW | | 0. | 1606. | 3236. | 4953. |
| VOLTAGE (VOLTS) | VOLT.AVG | | 13208.8 | 13193.8 | 13224.4 | 13218.0 |
| VOLTAGE BALANCE (%) | VOLT.H-L | 2.0 MAX | 0.0 | 0.1 | 0.1 | 0.2 |
| CURRENT (AMPS) | AMP.AVG | | 0. | 67. | 139. | 208. |
| POWER FACTOR | P.F. | | 0.00 | 1.00 | 1.00 | 0.99 |
| FREQUENCY (HZ) | GEN.FREQ | | 60.3 | 60.4 | 60.4 | 60.1 |
| **GENERATOR WINDING TEMP (DEG.C)** | | | | | | |
| PHASE A | T.GEN.A | | 31. | 34. | 44. | 66. |
| PHASE B | T.GEN.B | | 32. | 35. | 44. | 63. |
| PHASE C | T.GEN.C | | 31. | 33. | 42. | 63. |
| **ENGINE SPEED (%)** | | | | | | |
| ENGINE SPEED | %NTURB | | 100.38 | 100.51 | 100.59 | 100.09 |
| **LUBRICATION** | | | | | | |
| OIL TEMPERATURE (DEG.F) | TPKG.OIL | 140. - 155. | 144. | 145. | 145. | 148. |
| GEARBOX OIL PRESSURE (PSI) | PGB.OIL | 45. - 65. | 52. | 48. | 50. | 47. |
| TURBINE LT OIL PRESSURE (PSI) | P.COMP.L | 45. - 65. | 55. | 54. | 58. | 53. |
| OIL MANIFOLD PRESSURE (PSI) | P.OIL | | 71. | 69. | 73. | 69. |
| GEARBOX OIL FLOW (GPM) | FGB.OIL | 41.2 - 66.0 | 52.4 | 55.3 | 58.1 | 57.1 |
| TURBINE LT OIL FLOW (GPM) | F.COMP.L | | 31.1 | 30.8 | 31.0 | 31.4 |
| **ENGINE TEMPERATURE (DEG.F)** | | | | | | |
| FAC AIR INLET DUCT | T0.AVG | | 61.2 | 61.3 | 65.6 | 66.1 |
| THIRD STAGE TURBINE INLET | T5.AV | 1241. MAX (SIV C)<br>1218. MAX (SIV O) | 537. | 756. | 1195. | 1237. |
| THIRD STAGE TURBINE INLET 1 | T5/1 | | 532. | 756. | 1198. | 1231. |
| THIRD STAGE TURBINE INLET 2 | T5/2 | | 545. | 780. | 1184. | 1246. |
| THIRD STAGE TURBINE INLET 3 | T5/3 | | 538. | 787. | 1218. | 1256. |
| THRID STAGE TURBINE INLET 4 | T5/4 | | 533. | 710. | 1187. | 1209. |
| THIRD STAGE TURBINE INLET 5 | T5/5 | | 522. | 740. | 1197. | 1230. |
| THIRD STAGE TURBINE INLET 6 | T5/6 | | 554. | 765. | 1185. | 1252. |
| ENGINE EXHAUST DUCT | T7.AVG | | 412.8 | 548.2 | 968.4 | 917.6 |
| **THRUST BEARING TEMPERATURES (DEG.F)** | | | | | | |
| FWD. THRUST BRG.#1 RTD | TGP.TBRG | 230. MAX | 197. | 199. | 193. | 202. |
| FWD. THRUST BRG.#2 RTD | TGPTBRG2 | 230. MAX | 187. | 190. | 184. | 194. |
| **ENGINE PRESSURE** | | | | | | |
| COMPRESSOR DISCHARGE (PSI) | PCD | | 124.8 | 136.2 | 110.9 | 157.9 |
| OIL TANK SUMP (IN.H2O) | PSUMP | | 0.1 | 0.2 | 0.2 | 0.5 |

OPERATING PARAMETERS - TAURUS GENERATOR SET

CUSTOMER: UNIT NO: 1 TURBINE S/N: 1058T
PROJECT : 70221 MODEL : TAURUS 60S PACKAGE S/N: TG01585

| PARAMETER | NAME | LIMIT | 0 KW | 1600 KW | 3200 KW | DRY F/L |
|---|---|---|---|---|---|---|
| DATE | | | 21-MAY-01 | 21-MAY-01 | 21-MAY-01 | 21-MAY-01 |
| TIME | | | 08:01:07 | 08:32:28 | 11:14:58 | 16:49:44 |
| TEST CELL | | | 03 | 03 | 03 | 03 |
| FUEL | | | GAS | GAS | GAS | GAS |
| FUEL | | | | | | |
| GAS FLOW (CFM) | WF.NG | | 30.65 | 37.78 | 45.33 | 62.05 |
| GAS TEMPERATURE (DEG.F) | T.NG | | 59.3 | 59.4 | 63.6 | 70.3 |
| GAS PRESSURE (PSI) | P.NG | | 225.6 | 224.5 | 223.6 | 220.2 |
| VIBRATION | | | | | | |
| COMPRESSOR HORIZ VEL(15-2000HZ)(IPS-RMS) | V.COMP.H | 0.28 MAX | 0.10 | 0.11 | 0.10 | 0.13 |
| TURBINE VERT VEL (15-2000HZ)(IPS-RMS) | V.TURB.V | 0.40 MAX | 0.17 | 0.13 | 0.08 | 0.13 |
| GEARBOX HOR. VEL (15-1000HZ)(IPS-RMS) | VGB.HOR | 0.28 MAX | 0.06 | 0.09 | 0.07 | 0.09 |
| GEARBOX VERT ACCEL (15-12000HZ)(G'S-RMS) | VGB.VERA | 16.0 MAX | 0.9 | 1.6 | 4.2 | 6.5 |
| GEN DRIVEN END VERT (15-90HZ) (IPS-RMS) | VGENDR.V | 0.10 MAX | 0.02 | 0.02 | 0.02 | 0.02 |
| GEN EXCITER END VERT (15-90HZ) (IPS-RMS) | VGENEXCV | 0.10 MAX | 0.02 | 0.02 | 0.01 | 0.02 |
| BEARING 1 VERT DISP(5-1000HZ) (MILS) | VBRG.1.V | 3.50 MAX | 1.03 | 1.13 | 0.93 | 0.61 |
| BEARING 1 HORIZ DISP(5-1000HZ) (MILS) | VBRG.1.H | 3.50 MAX | 0.99 | 1.06 | 0.93 | 0.64 |
| BEARING 2 VERT DISP(5-1000HZ) (MILS) | VBRG.2.V | 3.50 MAX | 0.63 | 0.76 | 0.71 | 0.68 |
| BEARING 2 HORIZ DISP(5-1000HZ) (MILS) | VBRG.2.H | 3.50 MAX | 0.89 | 0.86 | 0.74 | 0.73 |
| BEARING 3 VERT DISP(5-1000HZ) (MILS) | VBRG.3.V | 3.50 MAX | 0.39 | 0.40 | 0.23 | 0.47 |
| BEARING 3 HORIZ DISP(5-1000HZ) (MILS) | VBRG.3.H | 3.50 MAX | 0.55 | 0.56 | 0.32 | 0.61 |

# ITEM 5. VIBRATION DATA

# MACHINERY VIBRATION SIGNATURE

V.COMP.H
21-MAY-01
17:03:41
CELL: 3
2-70221 1
1058T

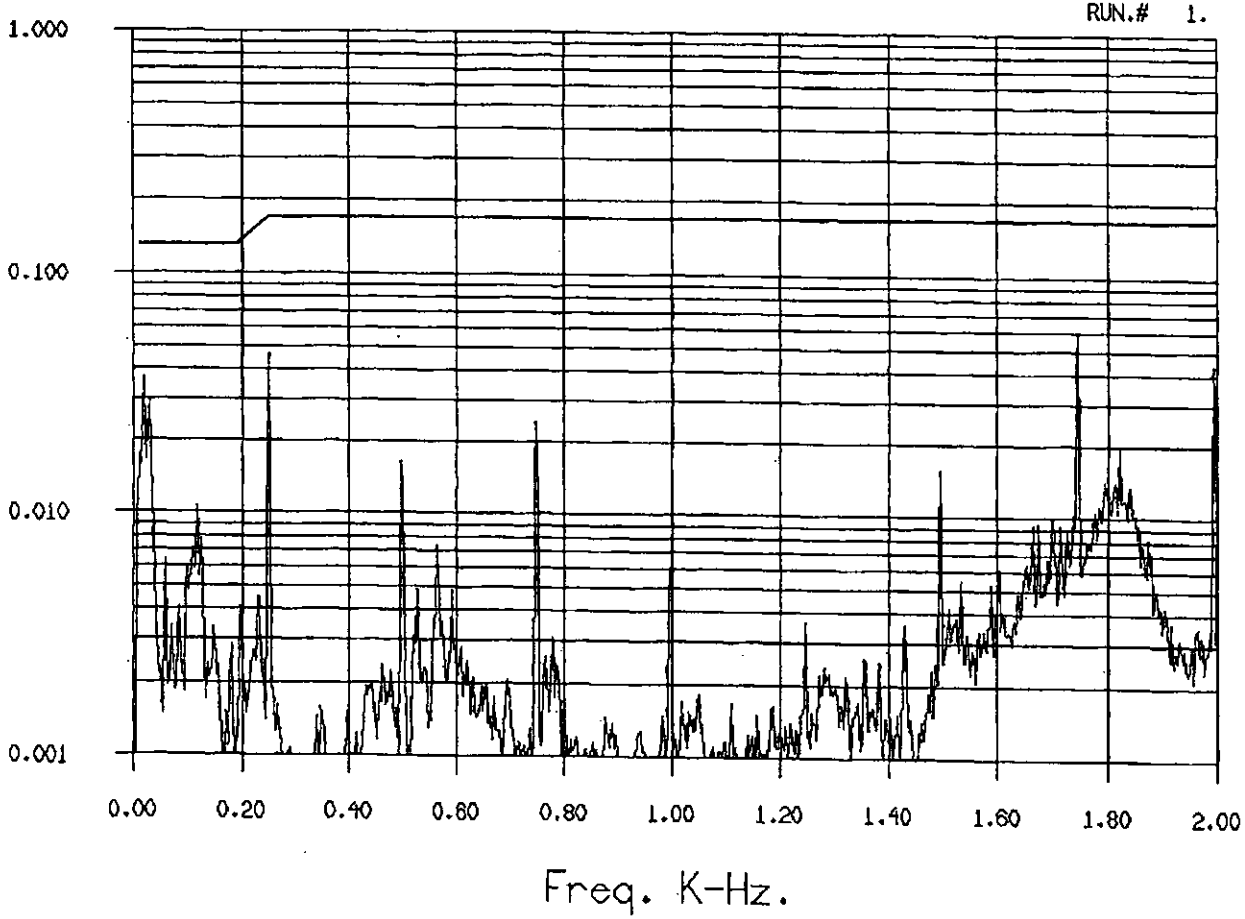
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 19.0= 0.037 | 747.5= 0.024 |
| 28.8= 0.030 | 1495.2= 0.016 |
| 118.7= 0.011 | 1744.1= 0.061 |
| 249.1= 0.046 | 1821.5= 0.020 |
| 498.4= 0.016 | 1993.3= 0.044 |

1-E:
NTURB
249.1 Hz.
0.046

OIL TEMP:148. DEG.F
LOAD: 4732. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

V.TURB.V
21-MAY-01
17:03:41
CELL: 3
2-70221 1
1058T

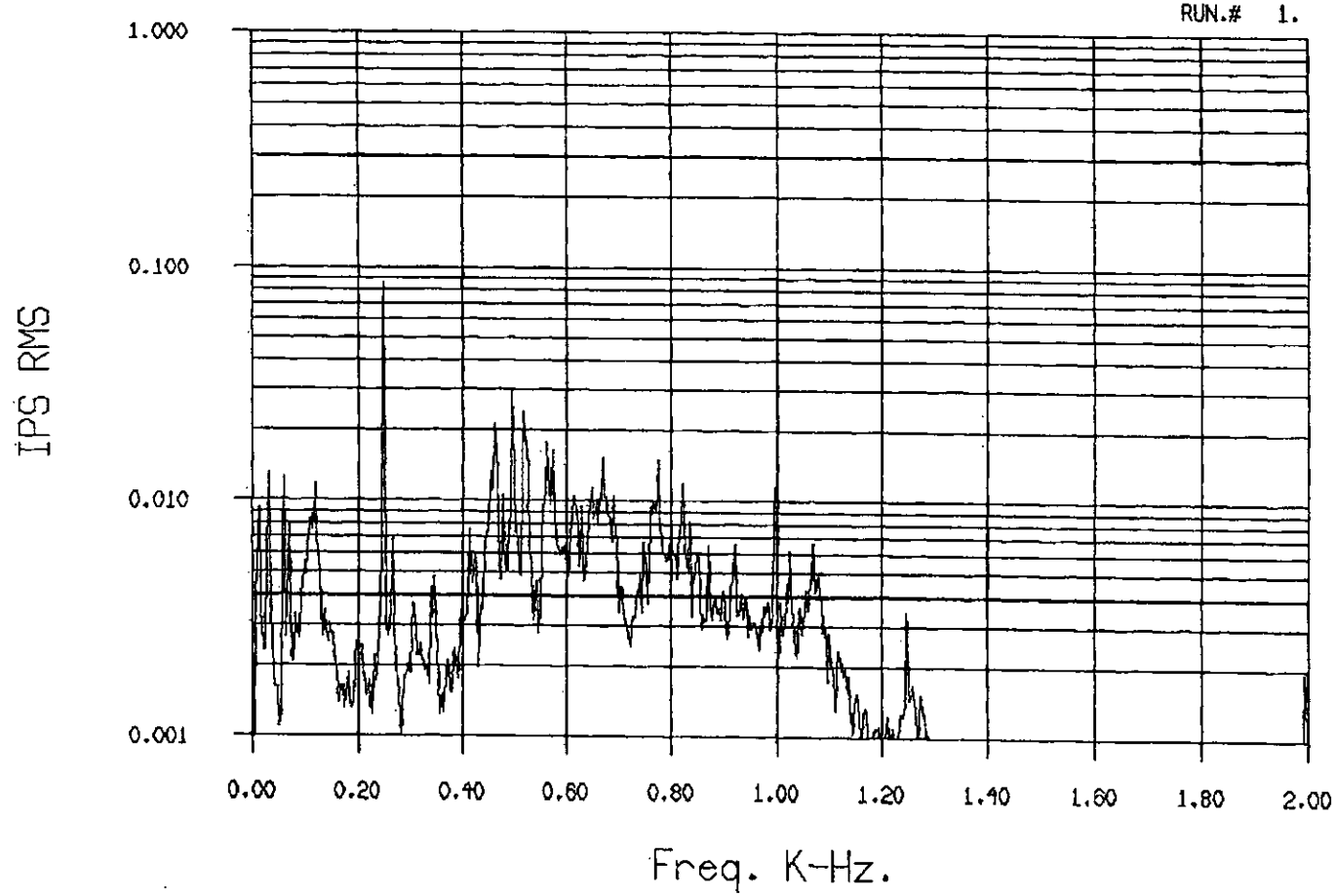
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 30.2= 0.013 | 521.0= 0.024 |
| 59.9= 0.013 | 563.6= 0.018 |
| 249.2= 0.086 | 573.9= 0.017 |
| 463.7= 0.021 | 671.0= 0.015 |
| 498.2= 0.030 | 774.0= 0.015 |

1-E:
NTURB
249.2 Hz.
0.086

OIL TEMP:148. DEG.F
LOAD: 4732. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VGB.HOR
21-MAY-01
17:03:12
CELL: 3
2-70221 1
1058T

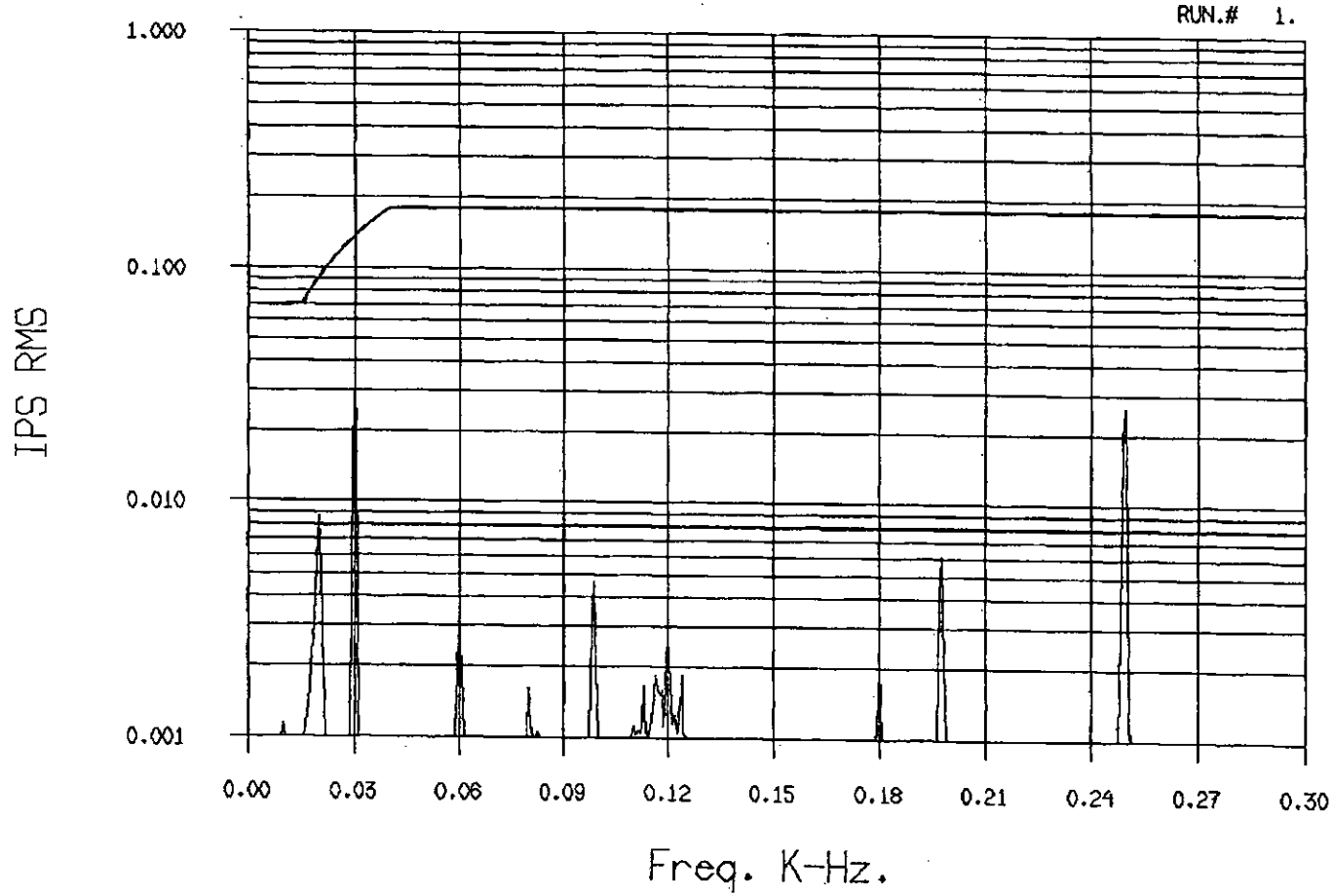
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 19.8= 0.009 | 119.8= 0.003 |
| 30.0= 0.035 | 123.4= 0.002 |
| 60.0= 0.004 | 180.0= 0.002 |
| 98.7= 0.005 | 197.4= 0.006 |
| 112.8= 0.002 | 249.2= 0.027 |

1-E:
GEN
30.0 Hz.
0.035

OIL TEMP:148. DEG.F
LOAD: 4733. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VGB.HOR
21-MAY-01
17:02:40
CELL: 3
2-70221 1
1058T

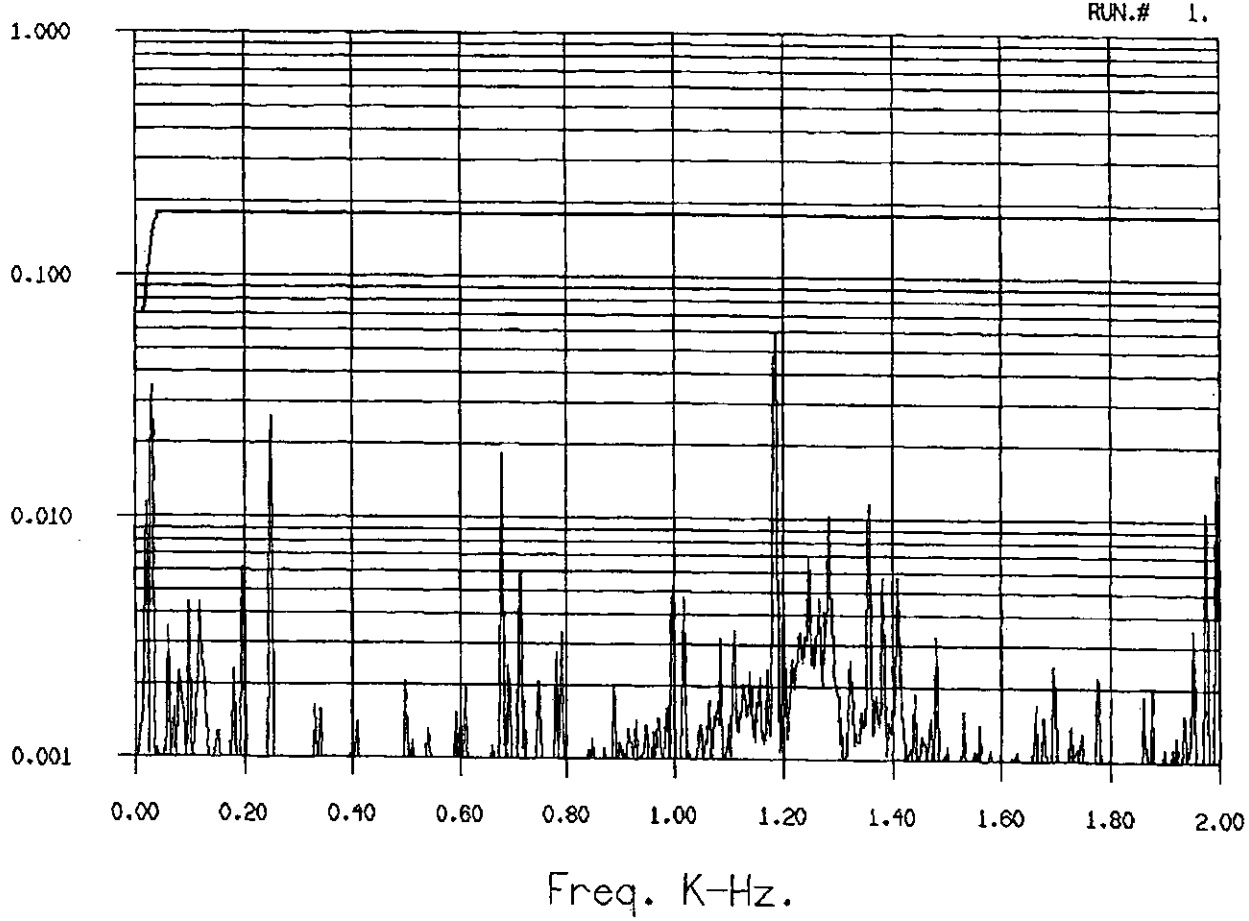
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 19.7= 0.011 | 1246.1= 0.007 |
| 30.0= 0.035 | 1283.0= 0.010 |
| 249.2= 0.026 | 1356.4= 0.012 |
| 678.2= 0.018 | 1973.6= 0.011 |
| 1184.2= 0.060 | 1993.3= 0.016 |

1-E:
NTURB
249.2 Hz.
0.026

OIL TEMP:148. DEG.F
LOAD: 4733. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



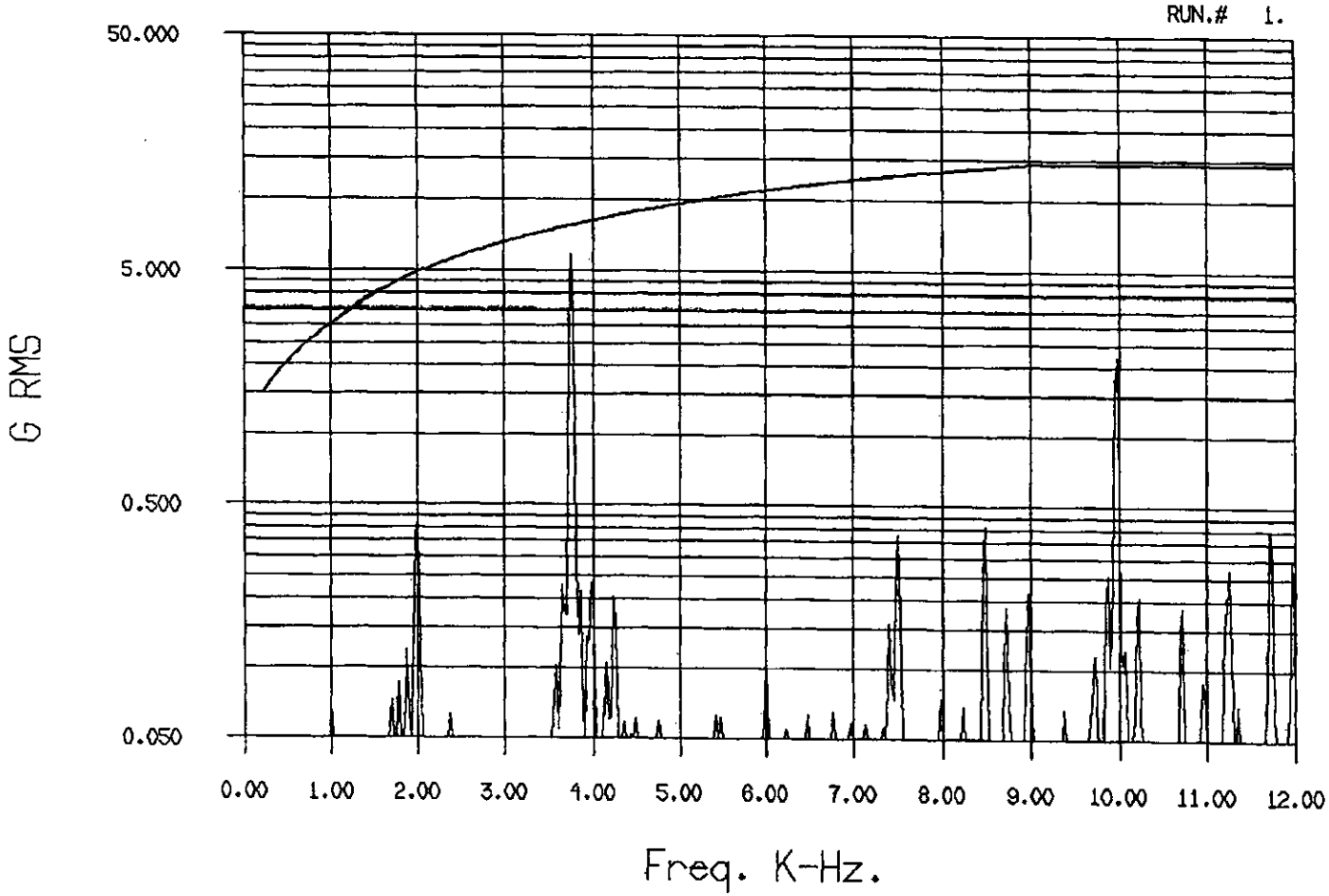
# MACHINERY VIBRATION SIGNATURE

VGB.VERA
21-MAY-01
17:02:12
CELL: 3
2-70221 1
1058T

PEAKS (FREQ= AMPL):
1987.6= 0.435 9867.0= 0.254
3750.4= 5.854 9966.4= 2.229
3986.3= 0.232 11241.9= 0.272
7497.8= 0.377 11710.8= 0.404
8471.5= 0.411 11959.8= 0.292

1-E:
RGM
9966.4 Hz.
2.229

OIL TEMP:148. DEG.F
LOAD: 4732. KW -UNCORRECTED
FUEL: NGAS



# MACHINERY VIBRATION SIGNATURE

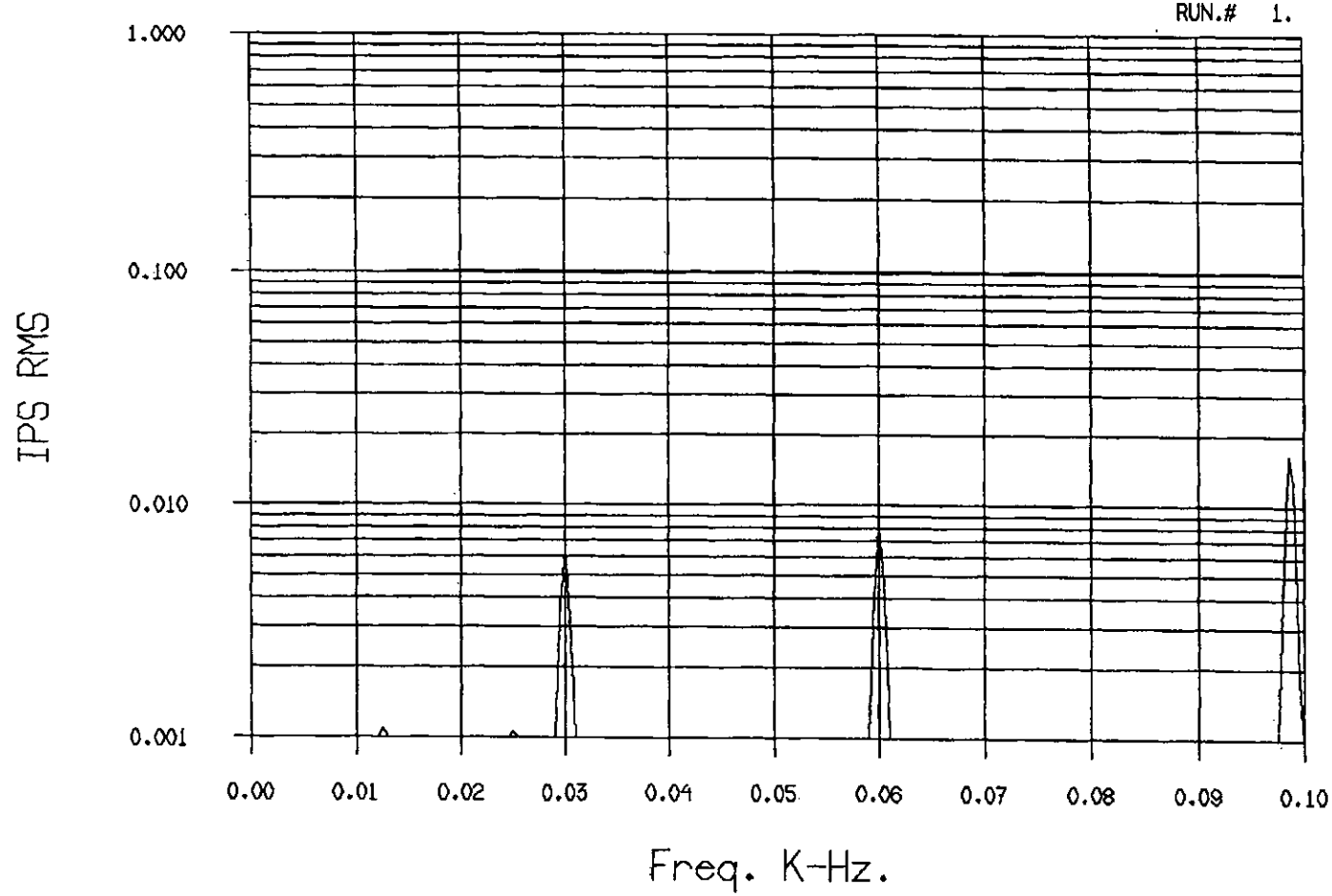
VGENDR.V
21-MAY-01
17:01:41
CELL: 3
2-70221 1
1058T

PEAKS (FREQ= AMPL):
12.3= 0.001
25.2= 0.001
30.0= 0.007
60.0= 0.008
98.7= 0.016

1-E:
GEN
30.0 Hz.
0.007

OIL TEMP:148. DEG.F
LOAD: 4732. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

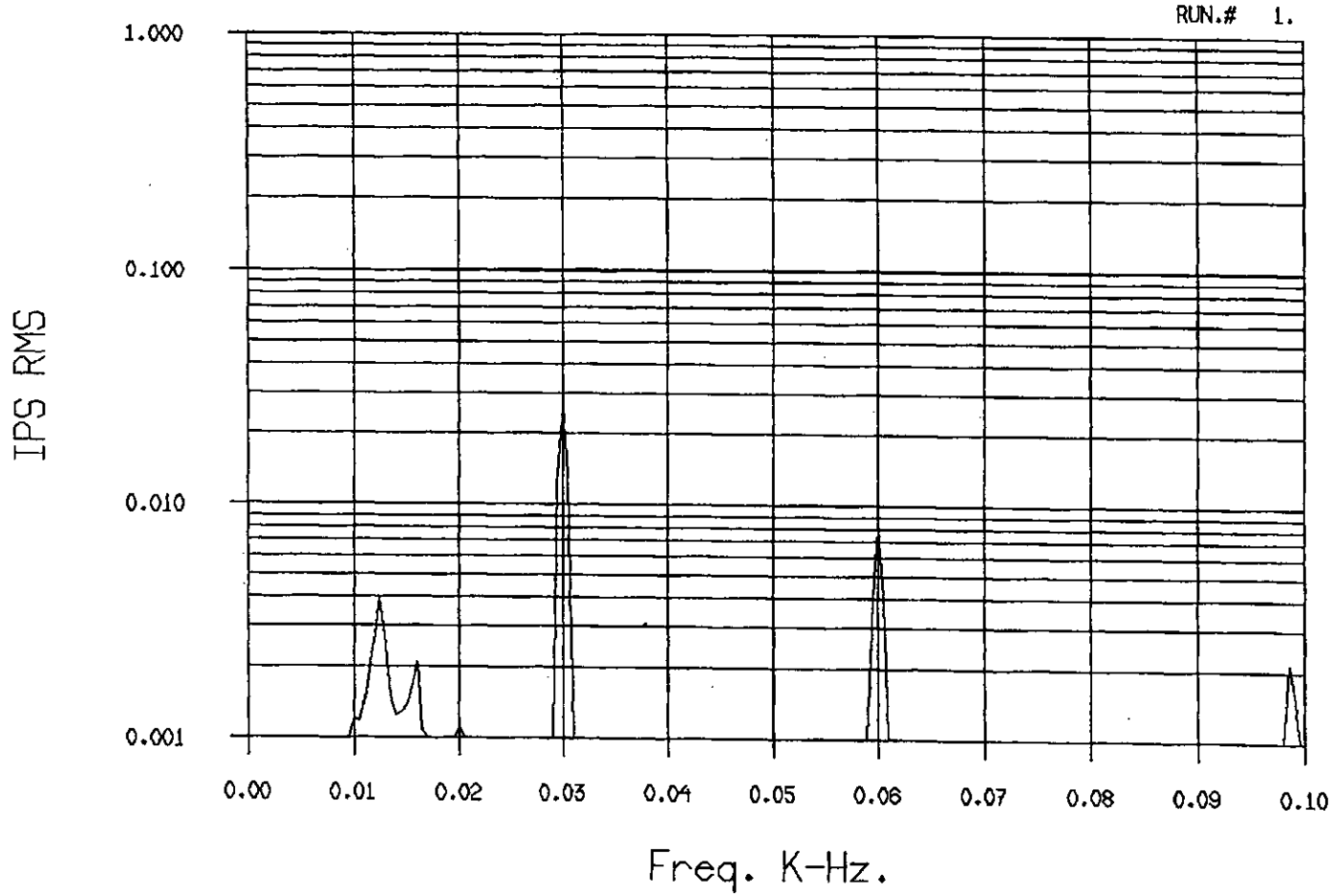
VGENEXCV
21-MAY-01
17:01:41
CELL: 3
2-70221 1
1058T

PEAKS (FREQ= AMPL):
12.3= 0.004
15.8= 0.002
30.0= 0.027
60.0= 0.008
98.7= 0.002

1-E:
GEN
30.0 Hz.
0.027

OIL TEMP:148. DEG.F
LOAD: 9732. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

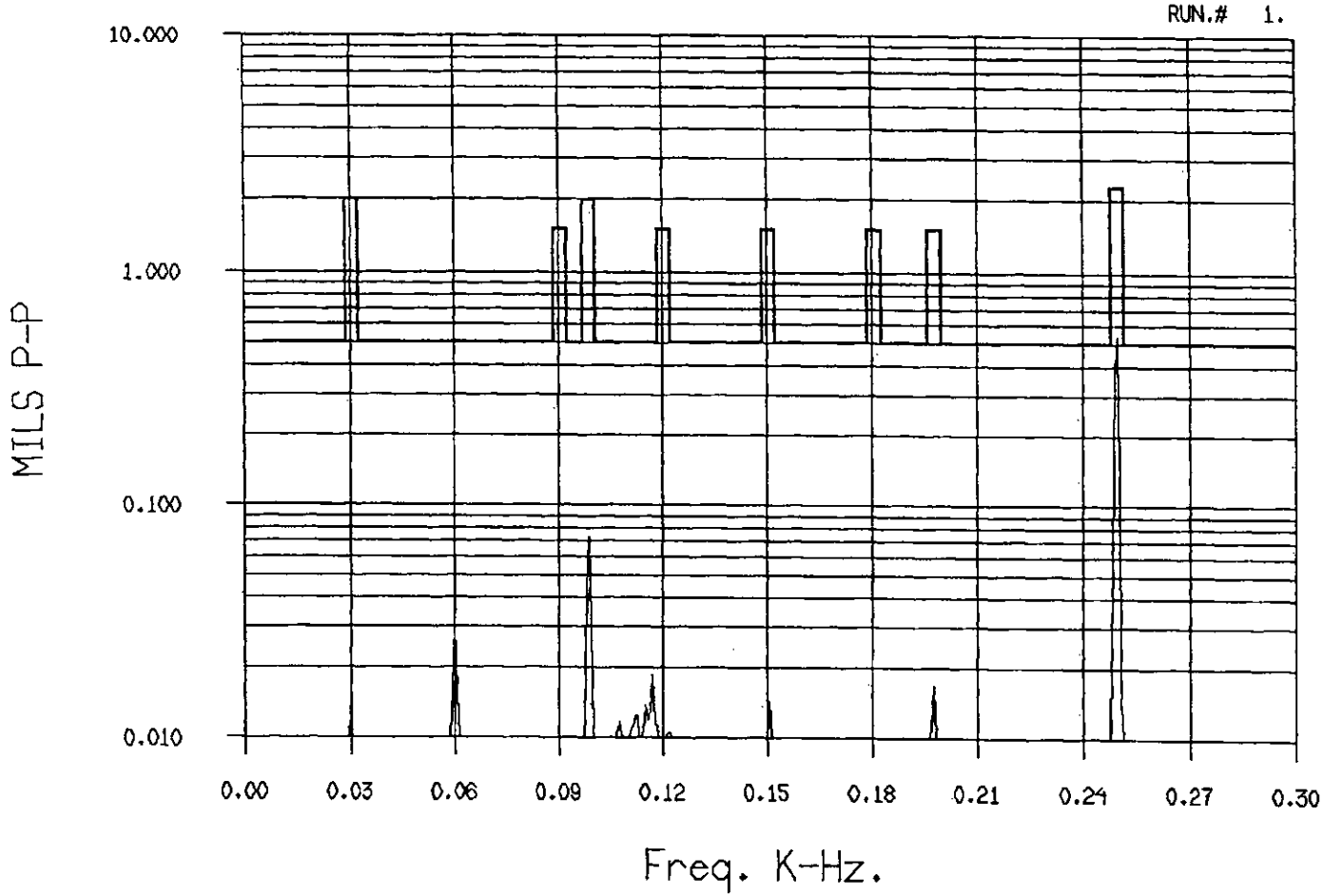
VBRG.1.V
21-MAY-01
16:58:33
CELL: 3
2-70221 1
1058T

PEAKS (FREQ= AMPL):
30.0= 0.015
60.0= 0.031
98.7= 0.073
116.6= 0.019
150.5= 0.014
197.4= 0.017
249.2= 0.531

1-E:
GEN
30.0 Hz.
0.015

OIL TEMP:148. DEG.F
LOAD: 4732. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

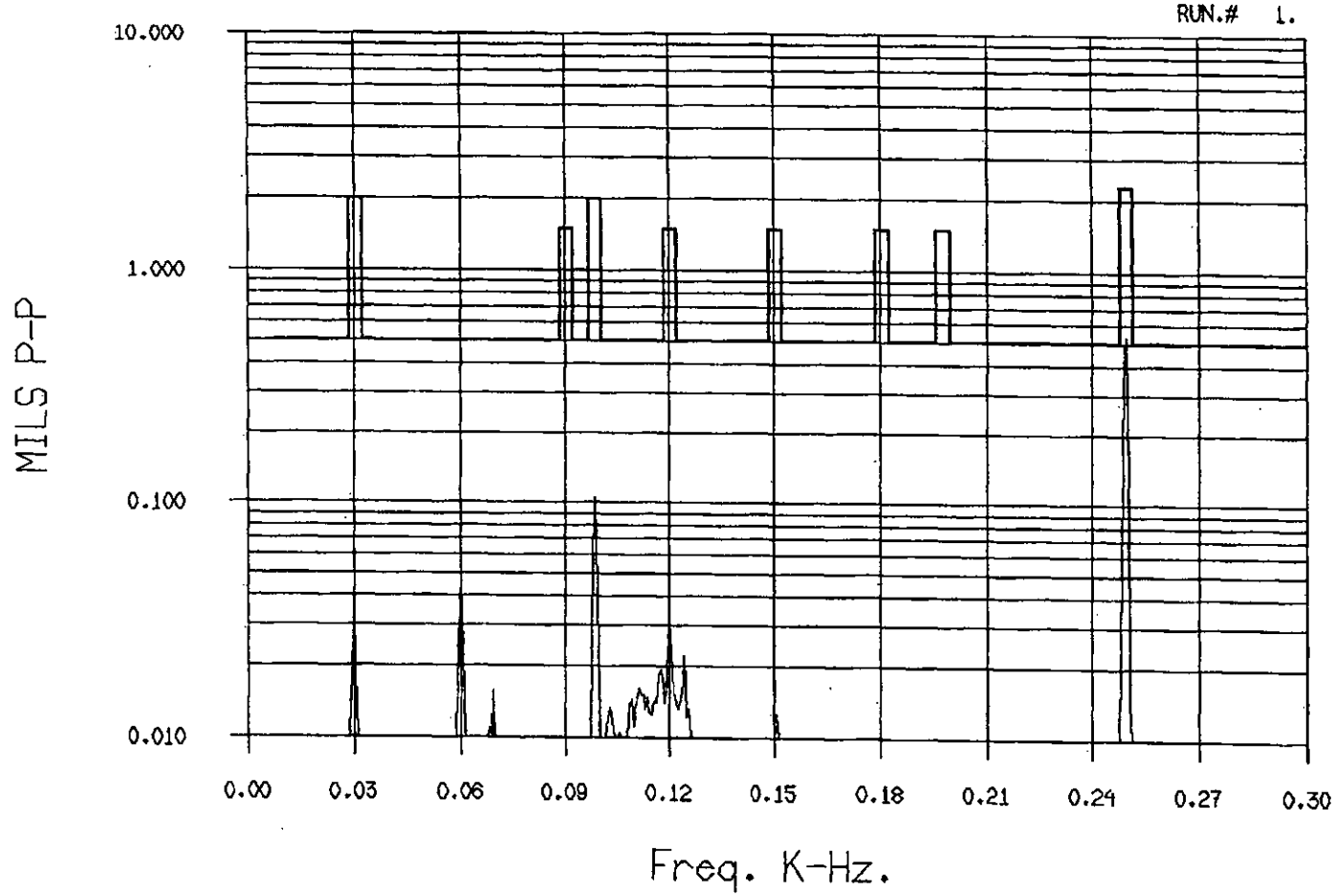
VBRG.1.H
21-MAY-01
16:58:33
CELL: 3
2-70221 1
1058T

PEAKS (FREQ= AMPL):
30.0= 0.038
60.0= 0.048
69.6= 0.016
98.7= 0.105
120.3= 0.032
124.1= 0.022
249.2= 0.532

1-E:
GEN
30.0 Hz.
0.038

OIL TEMP:148. DEG.F
LOAD: 4732. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.1.V
21-MAY-01
16:57:36
CELL: 3
2-70221 1
1058T

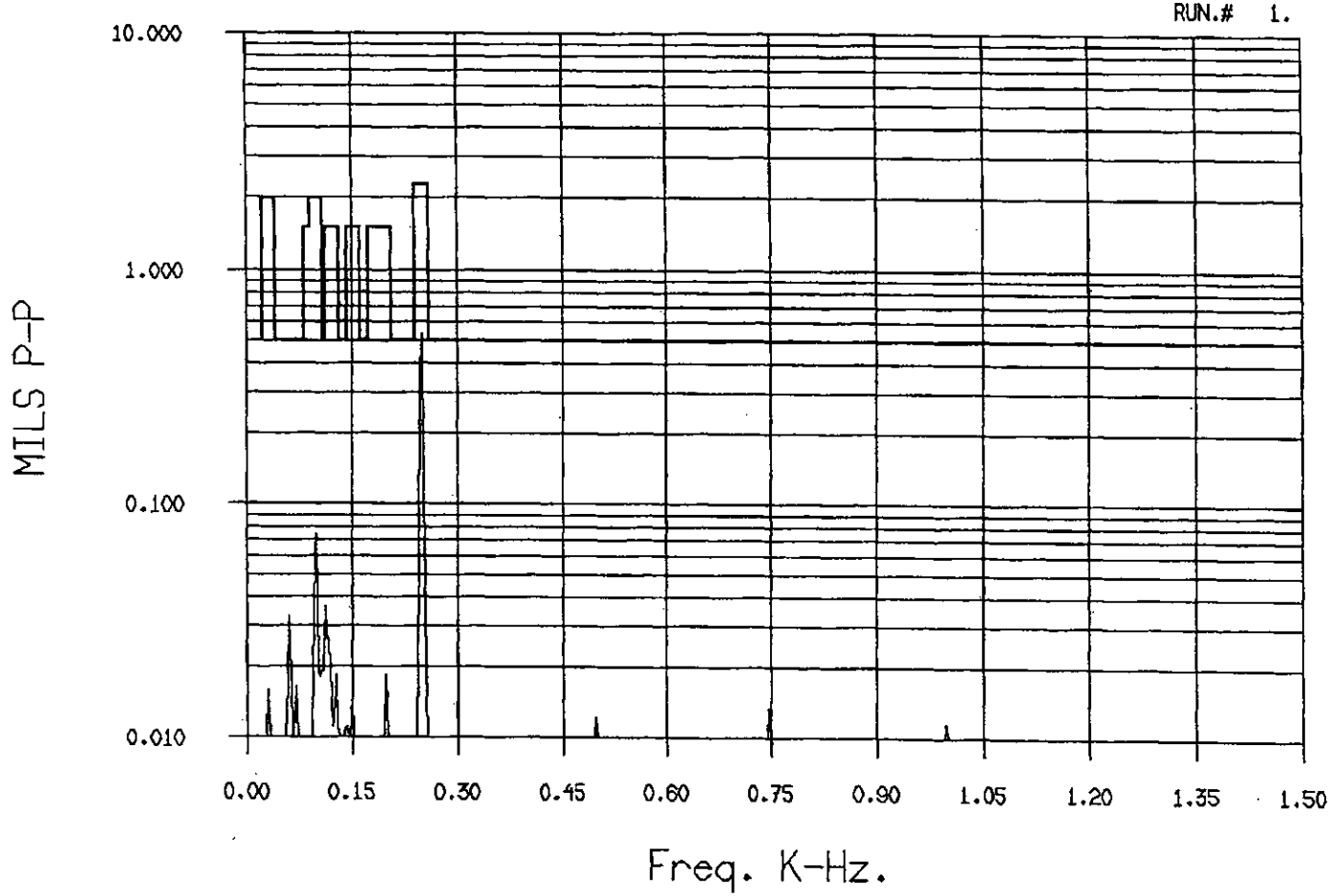
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 29.7= 0.016 | 126.8= 0.019 |
| 60.2= 0.033 | 150.5= 0.015 |
| 69.0= 0.016 | 197.3= 0.019 |
| 98.8= 0.074 | 249.2= 0.534 |
| 113.6= 0.037 | 747.6= 0.013 |

1-E:
NTURB
249.2 Hz.
0.534

OIL TEMP:148. DEG.F
LOAD: 4732. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.1.H
21-MAY-01
16:57:36
CELL: 3
2-70221 1
1058T

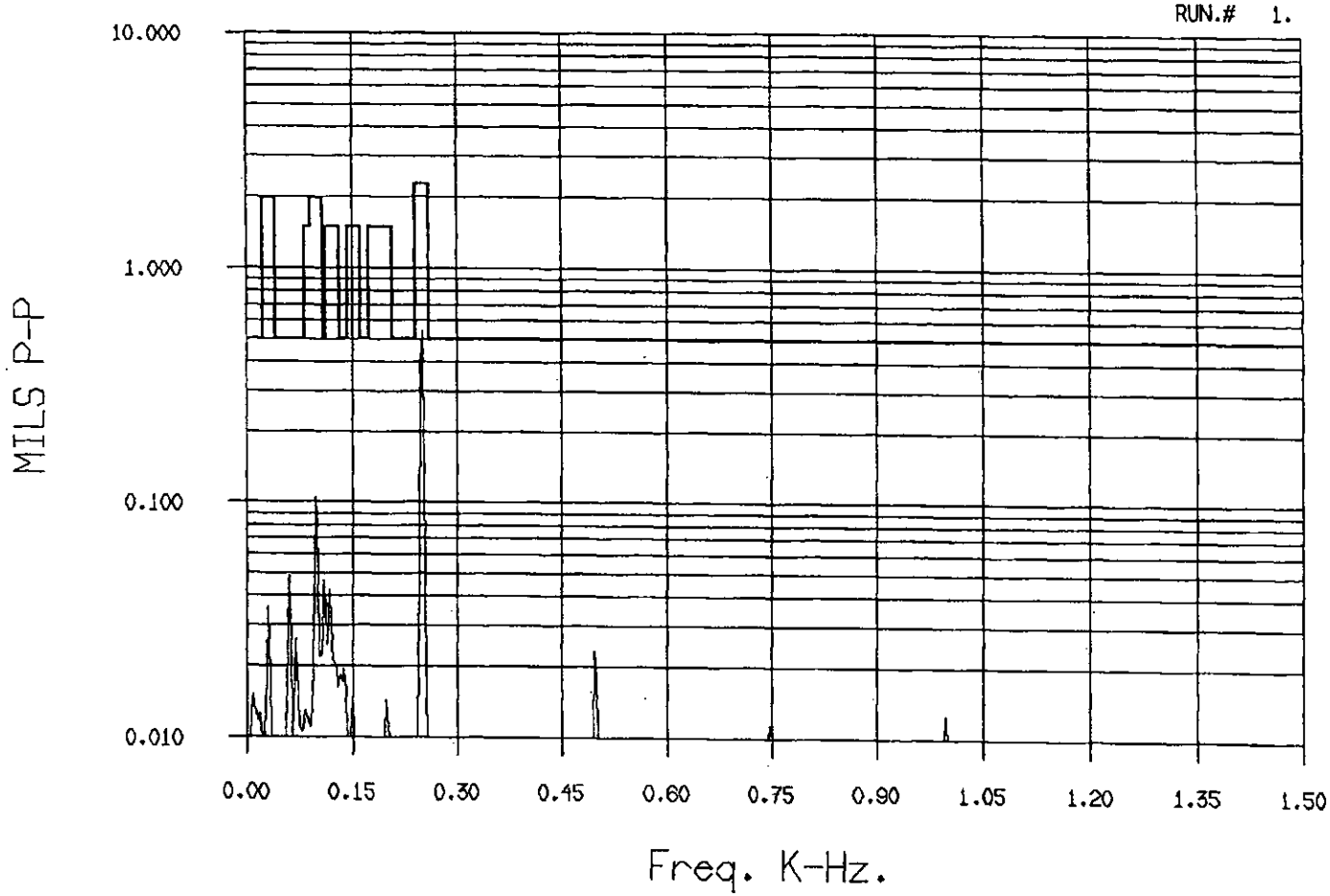
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 29.9= 0.036 | 118.5= 0.042 |
| 60.1= 0.049 | 198.6= 0.014 |
| 69.1= 0.026 | 249.2= 0.541 |
| 98.6= 0.105 | 498.4= 0.023 |
| 111.2= 0.046 | 996.7= 0.013 |

1-E:
NTURB
249.2 Hz.
0.541

OIL TEMP:148. DEG.F
LOAD: 4732. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.2.V
21-MAY-01
16:59:28
CELL: 3
2-70221 1
1058T

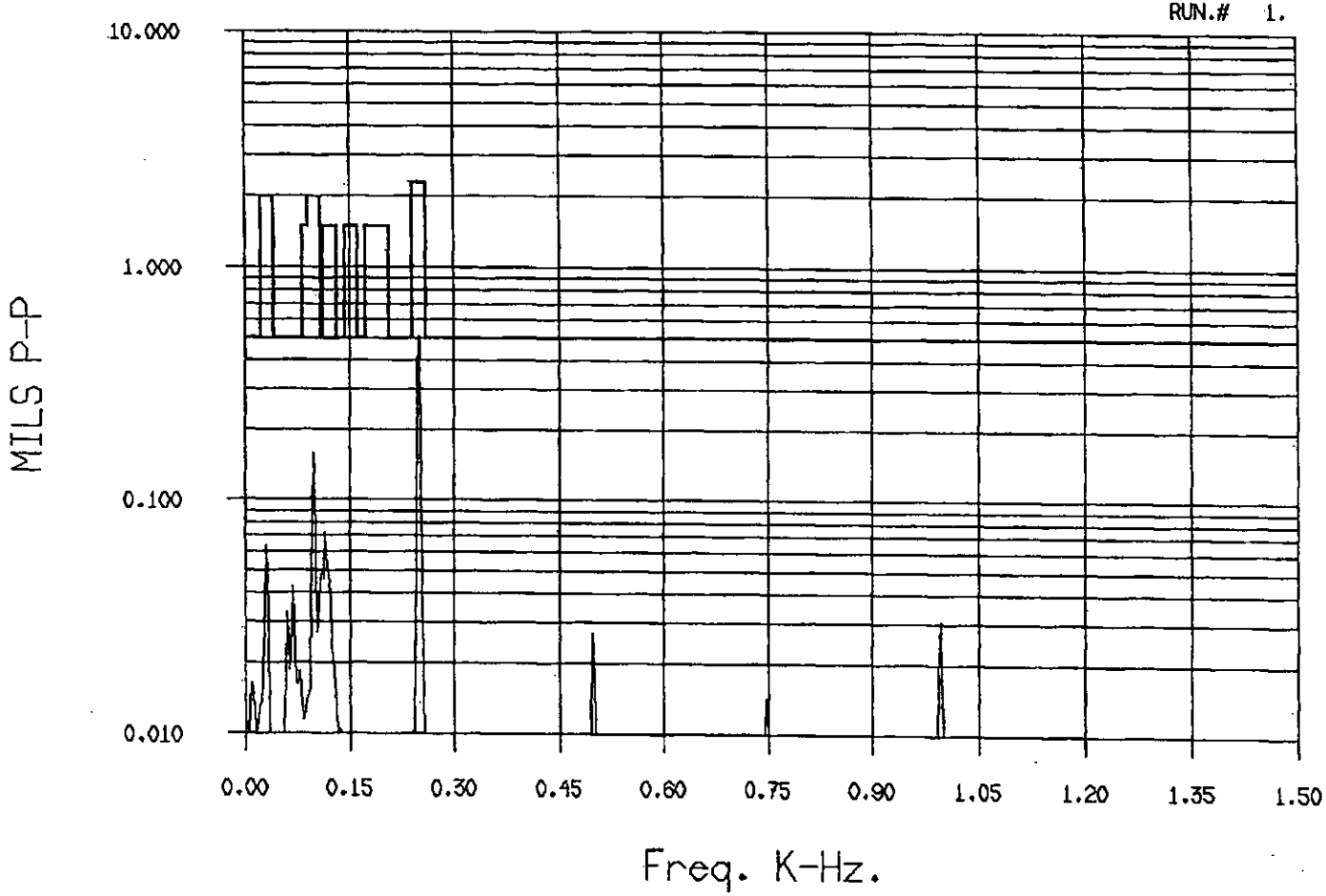
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 29.6= 0.063 | 249.1= 0.511 |
| 60.3= 0.033 | 498.2= 0.027 |
| 68.4= 0.042 | 747.3= 0.014 |
| 98.5= 0.160 | 996.4= 0.030 |
| 115.9= 0.073 | |

1-E:
NTURB
249.1 Hz.
0.511

OIL TEMP:148. DEG.F
LOAD: 4732. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.2.H
21-MAY-01
16:59:28
CELL: 3
2-70221 1
1058T

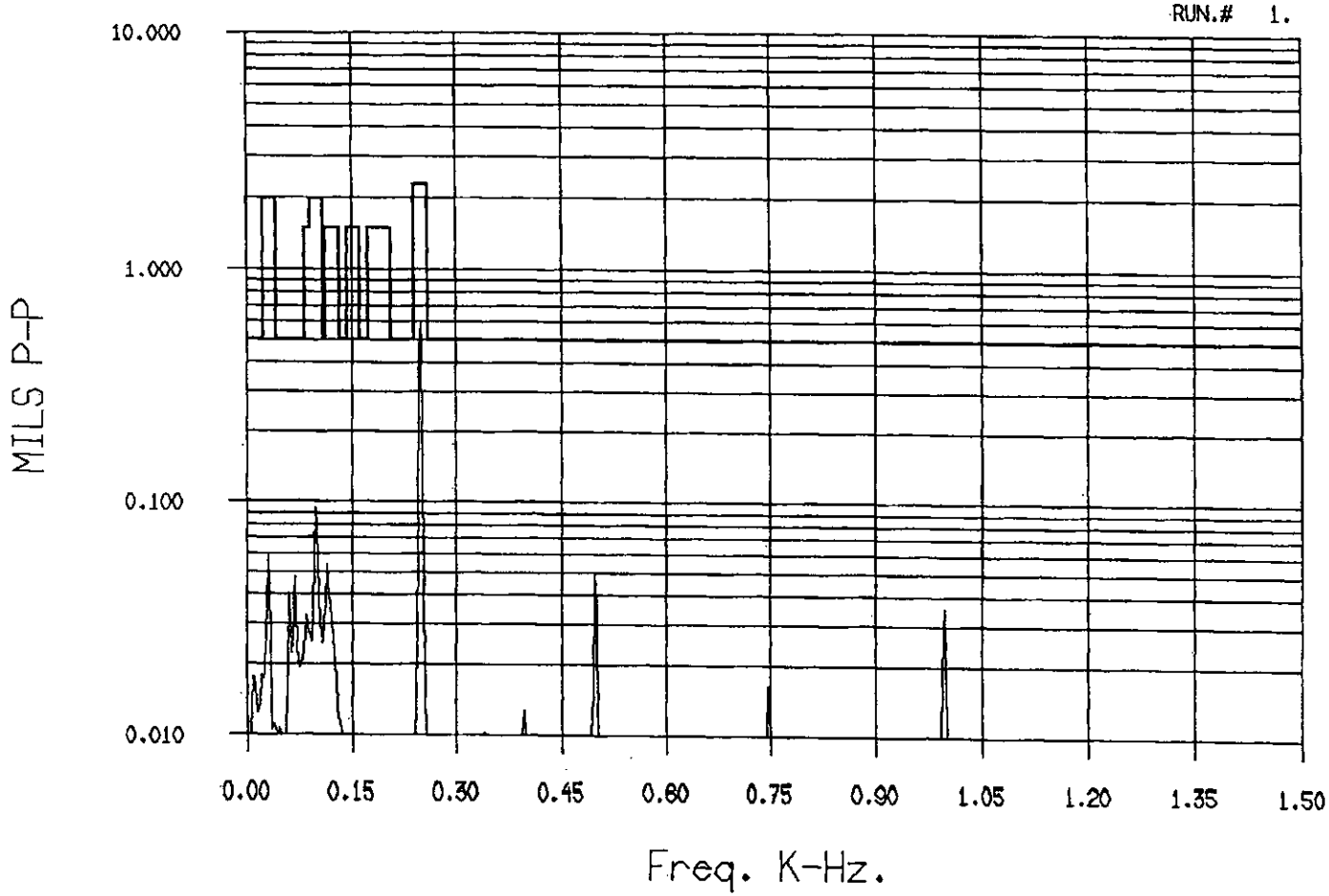
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 29.4= 0.058 | 249.1= 0.596 |
| 60.3= 0.040 | 396.3= 0.013 |
| 68.3= 0.048 | 498.2= 0.050 |
| 98.7= 0.094 | 747.3= 0.017 |
| 116.2= 0.054 | 996.4= 0.036 |

1-E:
NTURB
249.1 Hz.
0.596

OIL TEMP:148. DEG.F
LOAD: 4732. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.3.V
21-MAY-01
17:00:20
CELL: 3
2-70221 1
1058T

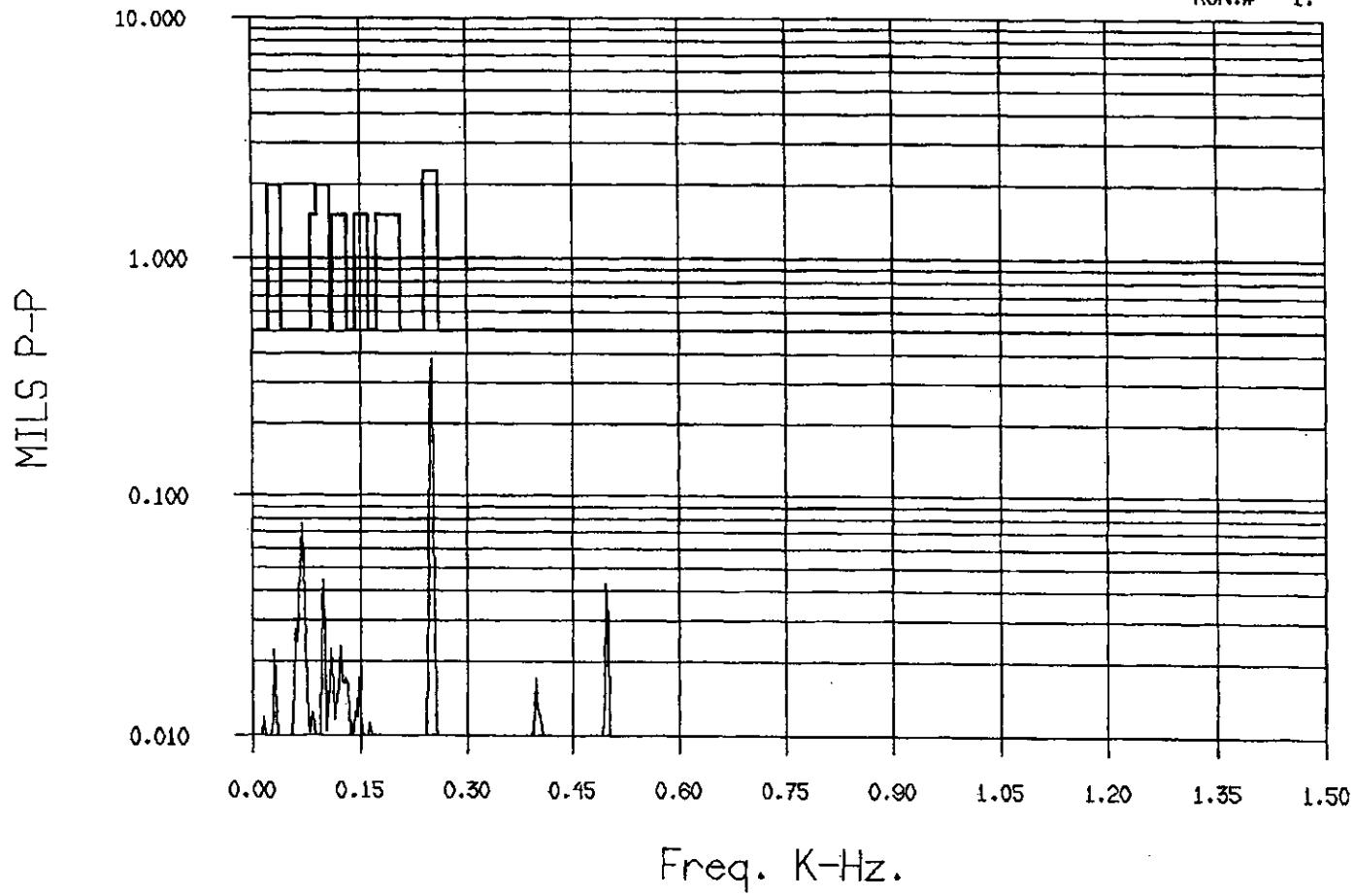
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 16.0= 0.012 | 123.6= 0.023 |
| 30.2= 0.022 | 148.6= 0.017 |
| 68.8= 0.076 | 249.1= 0.378 |
| 98.8= 0.044 | 398.7= 0.017 |
| 111.1= 0.023 | 498.2= 0.043 |

1-E:
NTURB
249.1 Hz.
0.378

OIL TEMP:148. DEG.F
LOAD: 4732. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.



# MACHINERY VIBRATION SIGNATURE

VBRG.3.H
21-MAY-01
17:00:20
CELL: 3
2-70221 1
1058T

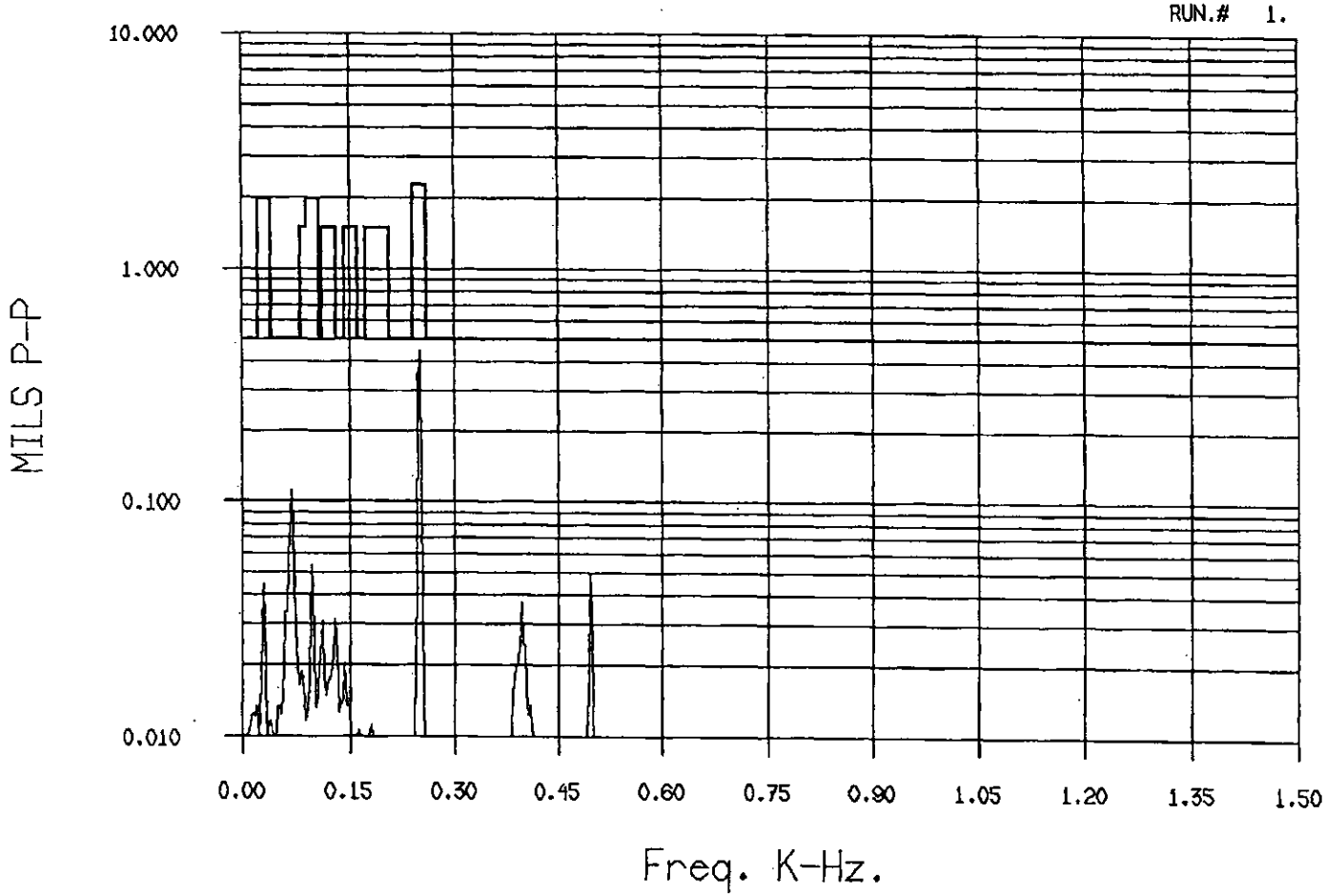
PEAKS (FREQ= AMPL):

| | |
|---|---|
| 29.6= 0.044 | 141.3= 0.020 |
| 68.8= 0.112 | 180.9= 0.011 |
| 98.6= 0.053 | 249.1= 0.442 |
| 111.4= 0.030 | 398.4= 0.037 |
| 131.2= 0.031 | 498.2= 0.050 |

1-E:
NTURB
249.1 Hz.
0.442

OIL TEMP:148. DEG.F
LOAD: 4732. KW -UNCORRECTED
FUEL: NGAS

RUN.# 1.

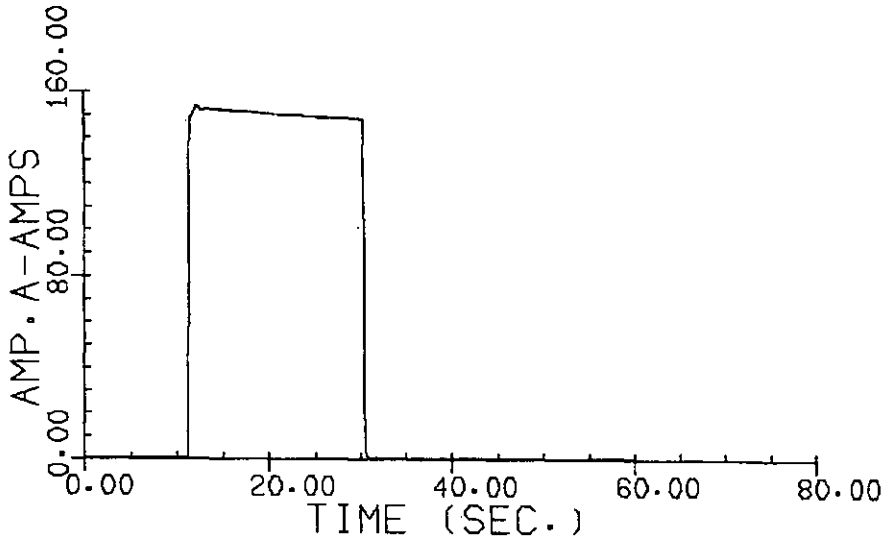


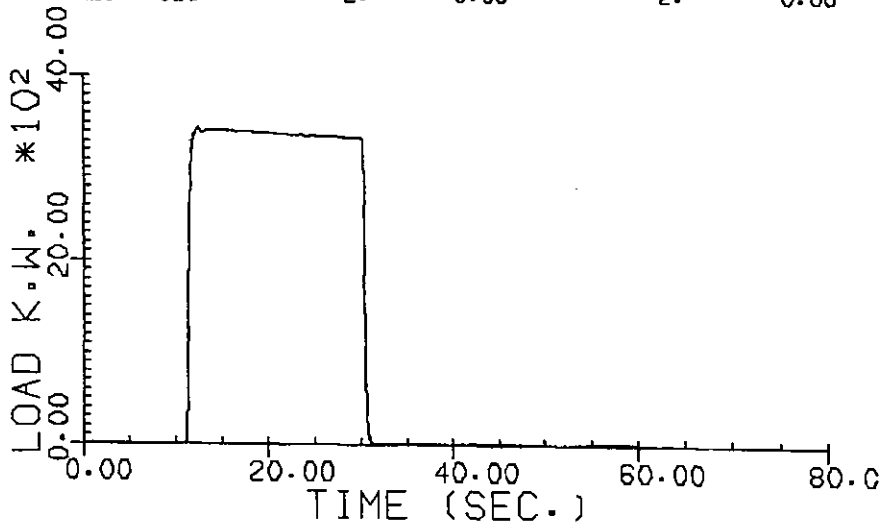
# ITEM 6. SUDDEN LOAD TESTS

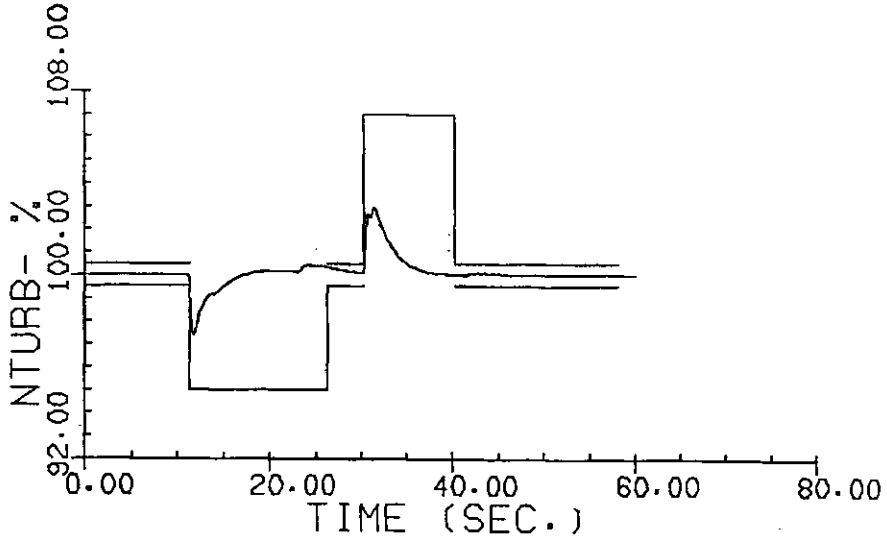
# SOLAR TURBINES INCORPORATED

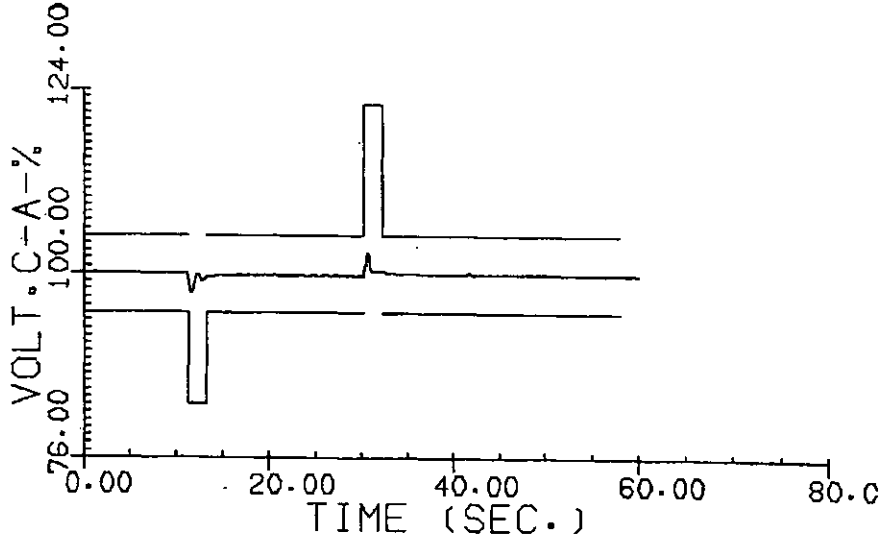
| | | | |
|---|---|---|---|
| 22-MAY-01 09:47:59 03 | UNIT NO. | : 1 | |
| CUSTOMER NAME : | FUEL | : NAT.GAS | |
| P.O.NO. : 2X70221 | ENG S/N | : 1058T | |
| AIR INLET TEMP.: 65.9 | KW (ACTUAL) | : 3416. | |
| POWER FACTOR : 0.95 | KW (NO LOSSES) | : 3606. | |

| | ON LOAD | | OFF LOAD | |
|---|---|---|---|---|
| | LIM | ACT | LIM | ACT |
| SPEED DEV-% : | 5. | 2.63 | 7. | 2.35 |
| SPEED REC.-SEC: | 15. | 3.91 | 10. | 4.32 |
| VOLTAGE DEV-% : | 17. | 2.52 | 22. | 2.64 |
| VOLT REC.- SEC: | 2. | 0.00 | 2. | 0.00 |



# ITEM 7. DRY EMISSIONS

DRY Emissions (REV 1.0) Page - 1

Engine ID :TDSDAA-1500-007
Engine S/N :1058T
Fuel Type :NATURAL GAS
Test Def File: TT73GEN
Data Taken :21-MAY-01 17:51:25
Load : 2371.25 ( 50.%) KW

| | | | | |
|---|---|---|---|---|
| T.AMB | - | DEG.F | : | 65.1985 |
| T.NG | - | DEG.F | : | 67.2507 |
| P.BARO | - | IN.HG | : | 29.4415 |
| %R.H. | - | % | : | 75.3219 |
| F.WATER | - | GPM | : | 0.0000 |
| WF.AVG | - | PPH | : | 1745.5088 |
| WA | - | PPS | : | 28.5404 |
| T2.AVG | - | DEG.F | : | 581.3564 |
| %NTURB | - | % | : | 100.0336 |
| T5.AVG | - | DEG.F | : | 1198.3258 |
| T7.AVG | - | DEG.F | : | 1023.0867 |
| FUELTYPE | - | | : | 1.0000 |
| RUN.# | - | | : | 1.0000 |
| PCD | - | PSIG | : | 92.8471 |
| TRIT | - | DEG.F | : | 1808.6537 |
| TPZ.C | - | DEG.F | : | 3265.1470 |
| TPZ.O | - | DEG.F | : | 0.0000 |
| T5.SETPT | - | DEG.F | : | 1250.0000 |

| | | | |
|---|---|---|---|
| SPEED_INSTABILITY | : | 0.03 | % |
| LOAD_INSTABILITY | : | 0.00 | %KW |
| T7AVG_INSTABILITY | : | 0.00 | DEG.F |

| | | | | MIN SAMPLE | MAX SAMPLE | (***NOT LIMITS***) |
|---|---|---|---|---|---|---|
| CO | - | ppmv | : | 24. | 24. | 25. |
| CO2 | - | % | : | 3.15 | 3.12 | 3.17 |
| NO | - | ppmv | : | 5. | 5. | 6. |
| NOX | - | ppmv | : | 10. | 9. | 11. |
| UHC | - | ppmv | : | 3. | 2. | 3. |
| O2 | - | % | : | 15.51 | 15.47 | 15.56 |

Fuel Factor 1.71

RESULTS CORRECTED TO 15% OXYGEN DRY BASIS

| | FA(ppmv) | CO2(ppmv) | O2(ppmv) | O2(pph) |
|---|---|---|---|---|
| ISO NOX | 12. | 12. | 12. | |
| NOX | 11. | 11. | 11. | 1.62 |
| CO | 27. | 26. | 26. | 2.30 |
| UHC | 3. | 3. | 3. | 0.16 |

*** ISO CONDITIONS: SEA LEVEL, 60%RH, 14.696 PSIA, 59 DEGF ***

Engine ID :TDSDAA-1500-007
Engine S/N :1058T
Fuel Type :NATURAL GAS
Test Def File: TT73GEN
Data Taken :21-MAY-01 20:10:31
Load : 3599.42 ( 75%) KW

| | | | | |
|---|---|---|---|---|
| T.AMB | - | DEG.F | : | 64.0751 |
| T.NG | - | DEG.F | : | 63.5176 |
| P.BARO | - | IN.HG | : | 29.4487 |
| %R.H. | - | % | : | 78.3594 |
| F.WATER | - | GPM | : | 0.0000 |
| WF.AVG | - | PPH | : | 2155.7742 |
| WA | - | PPS | : | 35.9084 |
| T2.AVG | - | DEG.F | : | 617.1818 |
| %NTURB | - | % | : | 100.1696 |
| T5.AVG | - | DEG.F | : | 1197.0696 |
| T7.AVG | - | DEG.F | : | 946.0603 |
| FUELTYPE | - | | : | 1.0000 |
| RUN.# | - | | : | 1.0000 |
| PCD | - | PSIG | : | 120.4195 |
| TRIT | - | DEG.F | : | 1826.5980 |
| TPZ.C | - | DEG.F | : | 3261.8708 |
| TPZ.O | - | DEG.F | : | 0.0000 |
| T5.SETPT | - | DEG.F | : | 1250.0000 |

| | | |
|---|---|---|
| SPEED_INSTABILITY : | 0.03 | % |
| LOAD_INSTABILITY : | 0.05 | %KW |
| T7AVG_INSTABILITY : | 0.00 | DEG.F |

| | | | | MIN SAMPLE | MAX SAMPLE | (***NOT LIMITS***) |
|---|---|---|---|---|---|---|
| CO | - | ppmv | : | 15. | 14. | 16. |
| CO2 | - | % | : | 3.08 | 3.07 | 3.10 |
| NO | - | ppmv | : | 6. | 5. | 7. |
| NOX | - | ppmv | : | 11. | 10. | 11. |
| UHC | - | ppmv | : | 2. | 1. | 2. |
| O2 | - | % | : | 15.64 | 15.59 | 15.69 |

Fuel Factor 1.70

RESULTS CORRECTED TO 15% OXYGEN DRY BASIS

| | FA(ppmv) | CO2(ppmv) | O2(ppmv) | O2(pph) |
|---|---|---|---|---|
| ISO NOX | 13. | 12. | 13. | |
| NOX | 12. | 12. | 12. | 2.10 |
| CO | 16. | 16. | 16. | 1.76 |
| UHC | 2. | 2. | 2. | 0.15 |

*** ISO CONDITIONS: SEA LEVEL, 60%RH, 14.696 PSIA, 59 DEGF ***

DRY Emissions (REV 1.0) Page - 1

Engine ID :TDSDAA-1500-007
Engine S/N :1058T
Fuel Type :NATURAL GAS
Test Def File: TT73GEN
Data Taken :21-MAY-01 16:49:44
Load : 4730.99 ( 100.%) KW

| | | | | |
|---|---|---|---|---|
| T.AMB | - | DEG.F | : | 67.6749 |
| T.NG | - | DEG.F | : | 70.3339 |
| P.BARO | - | IN.HG | : | 29.4370 |
| %R.H. | - | % | : | 70.8594 |
| F.WATER | - | GPM | : | 0.0000 |
| WF.AVG | - | PPH | : | 2663.8372 |
| WA | - | PPS | : | 45.3024 |
| T2.AVG | - | DEG.F | : | 700.4052 |
| %NTURB | - | % | : | 100.0921 |
| T5.AVG | - | DEG.F | : | 1237.2924 |
| T7.AVG | - | DEG.F | : | 917.5505 |
| FUELTYPE | - | | : | 1.0000 |
| RUN.# | - | | : | 1.0000 |
| PCD | - | PSIG | : | 157.9448 |
| TRIT | - | DEG.F | : | 1882.4611 |
| TPZ.C | - | DEG.F | : | 3285.2642 |
| TPZ.O | - | DEG.F | : | 0.0000 |
| T5.SETPT | - | DEG.F | : | 1250.0000 |

| | | |
|---|---|---|
| SPEED_INSTABILITY : | 0.05 | % |
| LOAD_INSTABILITY : | 0.04 | %KW |
| T7AVG_INSTABILITY : | 0.11 | DEG.F |

| | | | | MIN SAMPLE | MAX SAMPLE | (***NOT LIMITS***) |
|---|---|---|---|---|---|---|
| CO | - | ppmv | : | 8. | 7. | 8. |
| CO2 | - | % | : | 3.03 | 3.01 | 3.05 |
| NO | - | ppmv | : | 9. | 8. | 9. |
| NOX | - | ppmv | : | 12. | 11. | 13. |
| UHC | - | ppmv | : | <1 | <1 | <1 |
| O2 | - | % | : | 15.73 | 15.69 | 15.78 |

Fuel Factor 1.71

RESULTS CORRECTED TO 15% OXYGEN DRY BASIS

| | FA(ppmv) | CO2(ppmv) | O2(ppmv) | O2(pph) |
|---|---|---|---|---|
| ISO NOX | 14. | 14. | 14. | |
| NOX | 14. | 13. | 13. | 2.93 |
| CO | 9. | 9. | 9. | 1.17 |
| UHC | 2. | 2. | 2. | 0.18 |

*** ISO CONDITIONS: SEA LEVEL, 60%RH, 14.696 PSIA, 59 DEGF ***