



# Section 1 – Description

## GENERAL TURBINE INFORMATION

**TURBINE TYPE:** LAND BASED TURBINE-GENERATOR (Direct Drive)

**RATING:** 24,000 KWE                      **RATED SPEED:** 3600 RPM

**GOVERNING SYSTEM:** MARK V SIMPLEX

### STEAM CONDITIONS:

**INLET PRESSURE** ..... 850 PSIA

**INLET TEMPERATURE** ..... 900°F

**EXHAUST PRESSURE** ..... 1.5" HGA

### ALARM & TRIP CONDITIONS

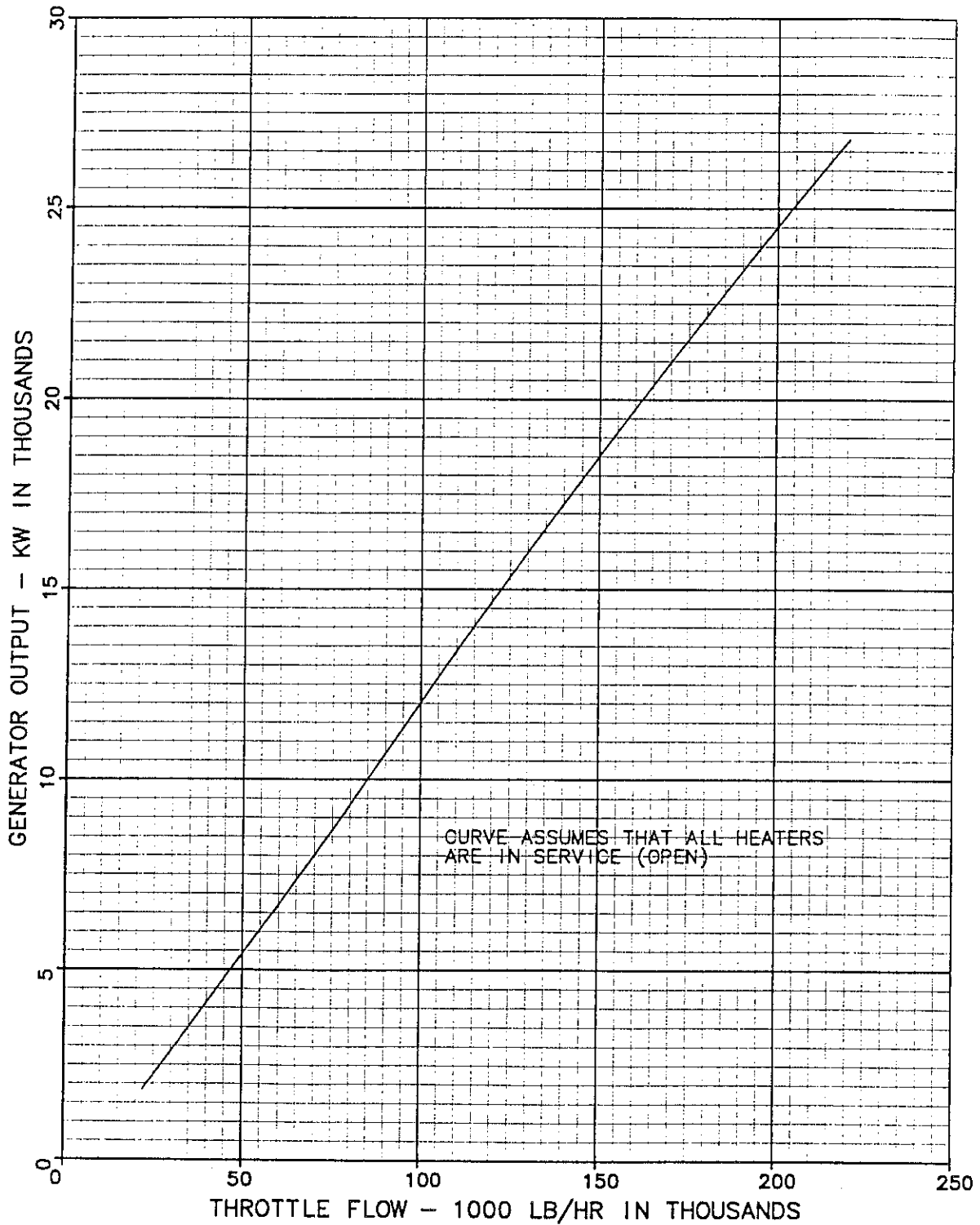
(See Bill of Material, Fig. A23, for complete setting information)

| ITEM   | ALARM SETTING                             | TRIP SETTING                               |
|--|---|--|
| HIGH VIBRATION (TURBINE/GENERATOR)                                       | 4 mils                                    | 6 mils                                     |
| ROTOR AXIAL POSITION   | 5 <del>10</del> mils (SEE PAGE 1-7)       | 10 <del>20</del> mils (SEE PAGE 1-7)       |
| LOW LUBE OIL PRESSURE  | 8 PSIG DECR PRESS<br>BELOW NORMAL @ PI508 | 10 PSIG DECR PRESS<br>BELOW NORMAL @ PI508 |
| DIFF. PRESS. ACROSS LUBE FILTER  | 20 PSIG INCR Δ P                          | ---  |
| LOW CONTROL OIL PRESSURE   | 90 PSIG DECR PRESS                        | ---  |
| DIFF. PRESS. ACROSS CONTROL OIL FILTER                                   | 35 PSIG INCR Δ P                          | ---  |
| HIGH-LOW TANK OIL LEVEL  | SEE BOM (FIG. A23)                        |  |
| HIGH EXHAUST TEMPERATURE   | 175°F                                     |  |
| HIGH EXHAUST PRESSURE  | 8.5" HGA INCR Δ P                         |  |
| PRIMARY OVERSPEED TRIP   |   | 3960 RPM                                   |
| EMERGENCY OVERSPEED TRIP   |   | 3996 RPM                                   |
| FOR RTD ALARM & TRIP SETTINGS, SEE BILL OF MATERIAL (Fig. A23)           |   |  |
| MANUAL TRIP BUTTON (Located on Front Standard and at the Mark V Cabinet) |   |  |

# GENERATOR OUTPUT VS THROTTLE FLOW

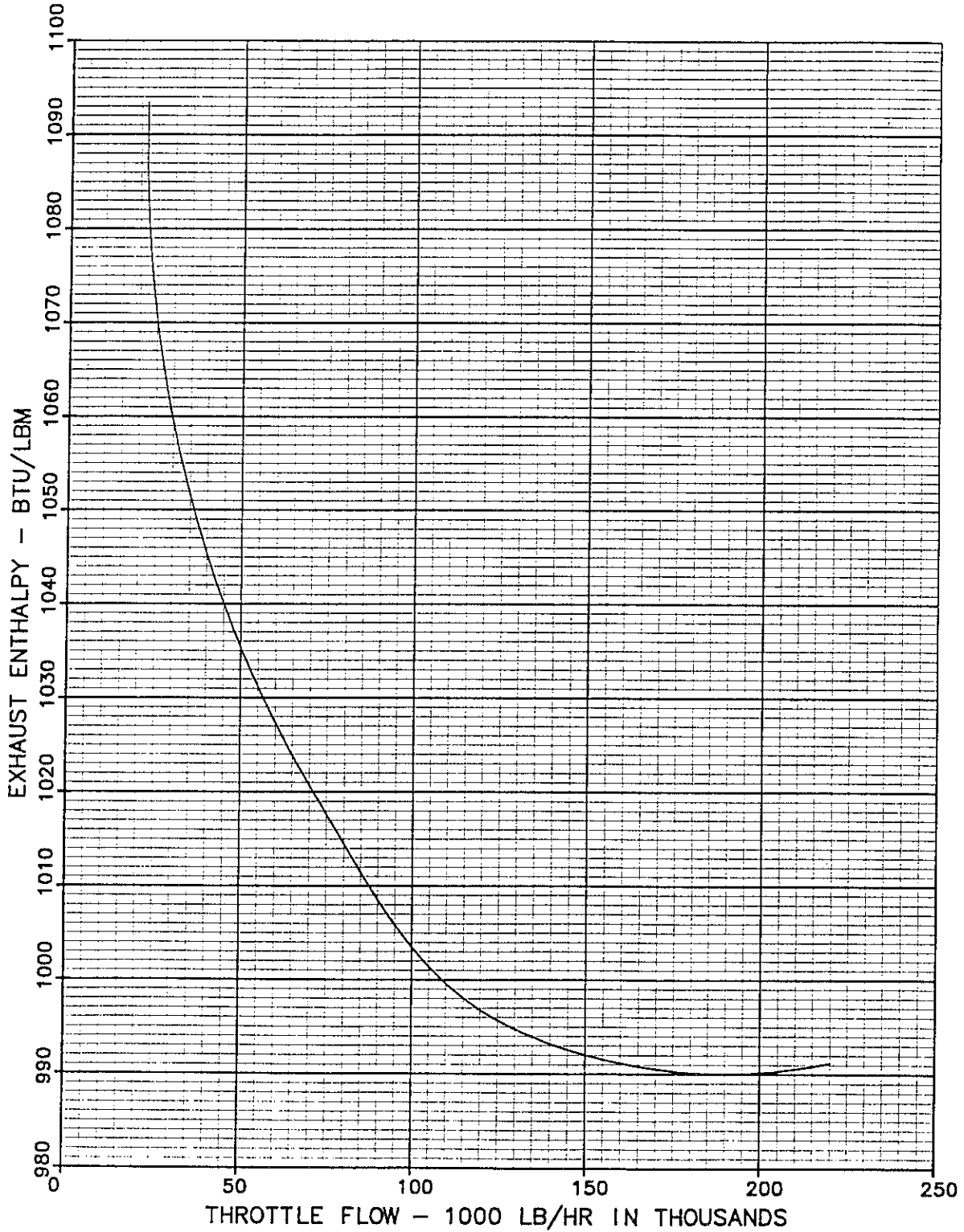
850 PSIG - 900 F - 1.5 IN. HG.  
3600 RPM.

EXPECTED DATA - NOT GUARANTEED



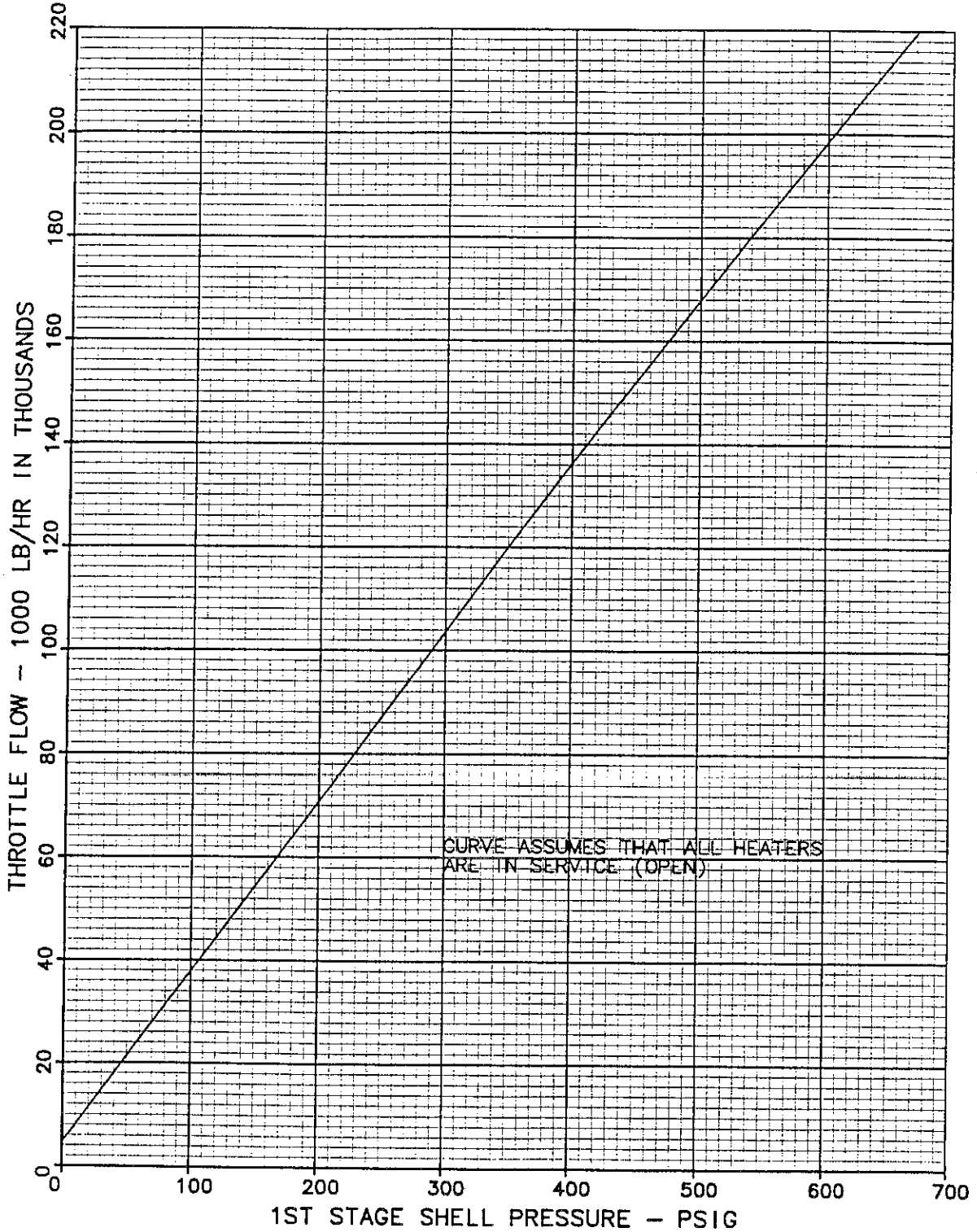
EXHAUST ENTHALPY VS THROTTLE FLOW

850 PSIG - 900 F - 1.5 IN. HG.  
3600 RPM  
EXPECTED DATA - NOT GUARANTEED



# THROTTLE FLOW VS 1ST STAGE SHELL PRESSURE

850 PSIG - 900 F - 1.5 IN. HG.  
3600 RPM  
EXPECTED DATA - NOT GUARANTEED

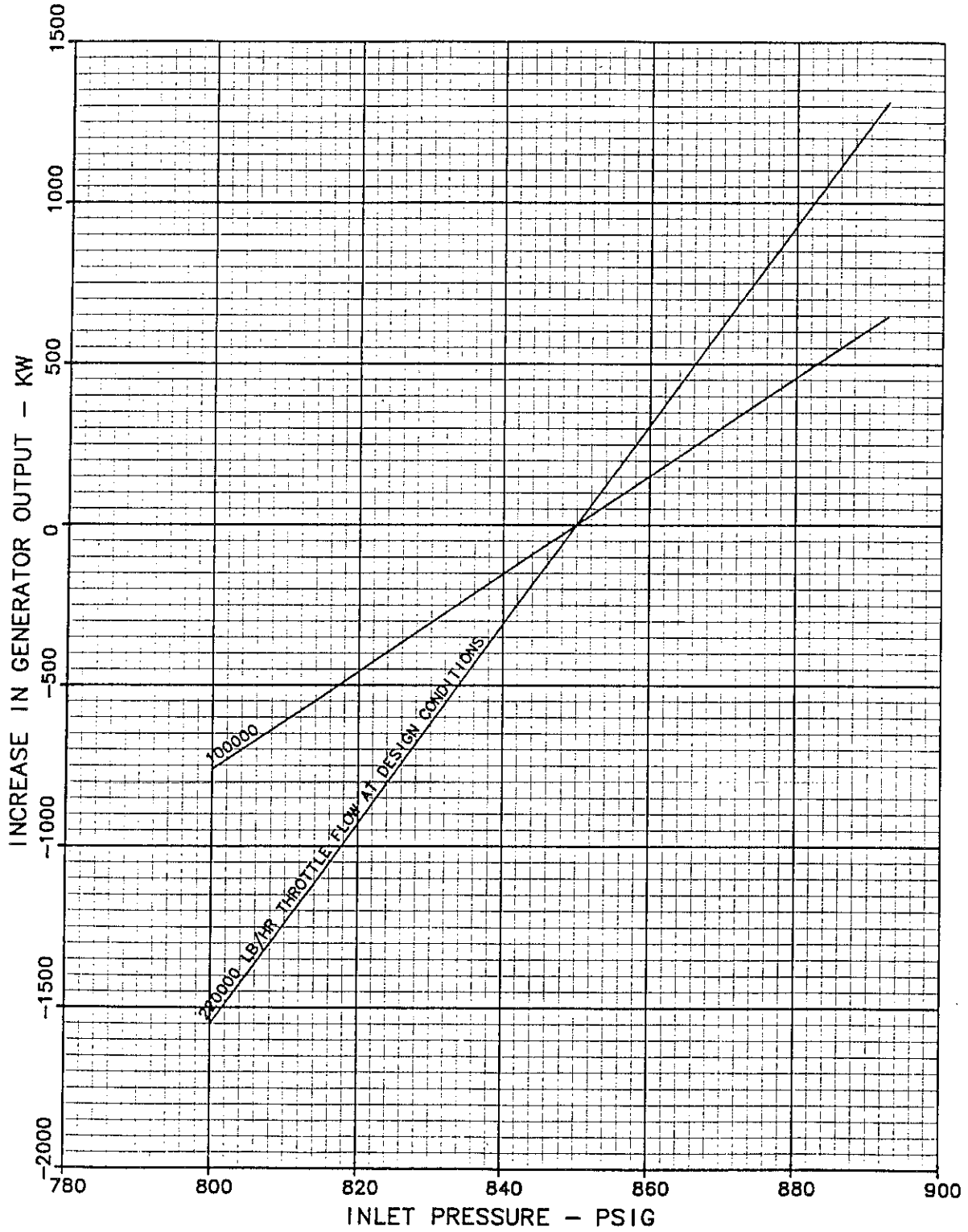


# INCREASE IN GENERATOR OUTPUT VS INLET PRESSURE

850 PSIG - 900 F - 1.5 IN. HG.

3600 RPM

EXPECTED DATA - NOT GUARANTEED

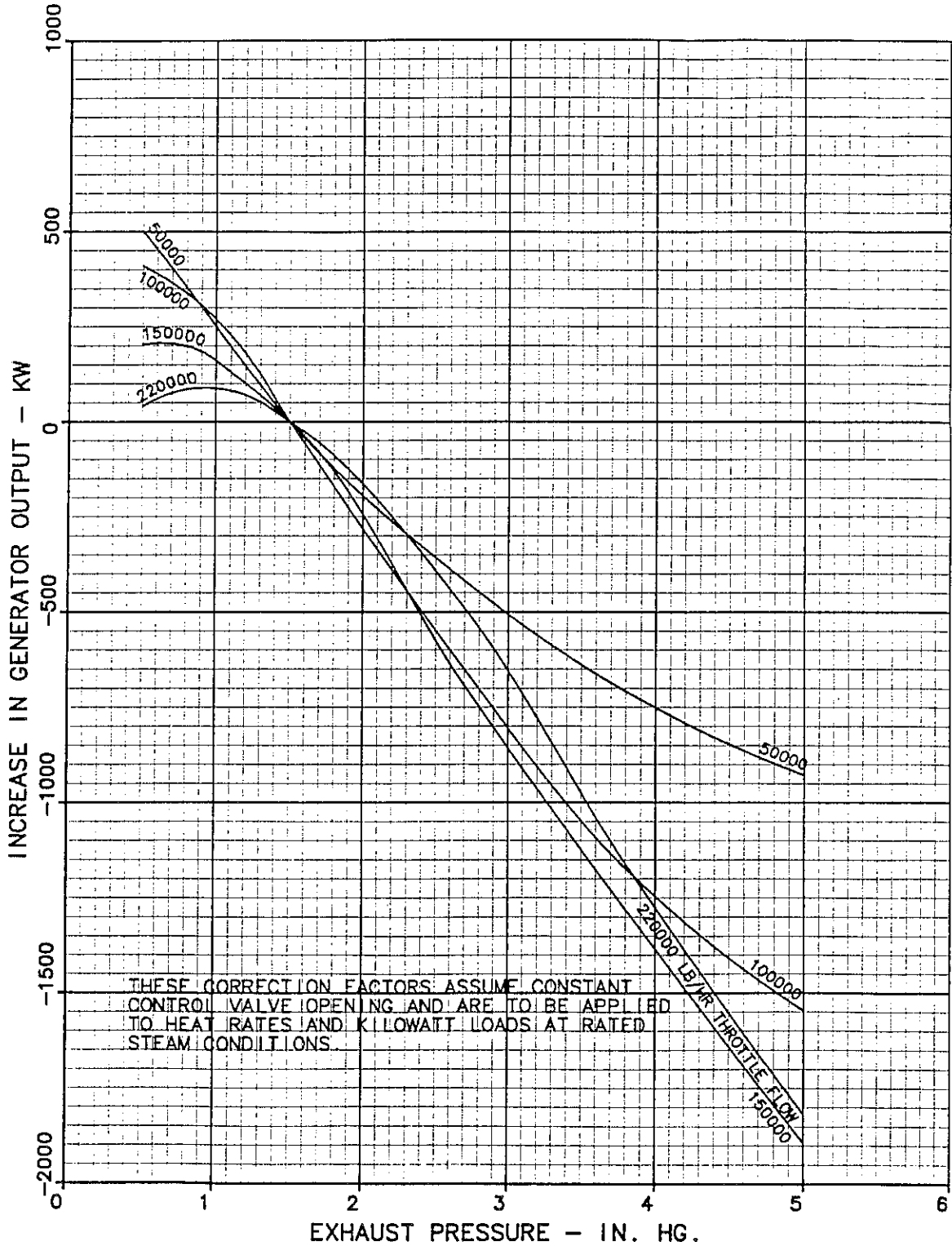


# INCREASE IN GENERATOR OUTPUT VS EXHAUST PRESSURE

850 PSIG - 900 F - 1.5 IN. HG.

3600 RPM

EXPECTED DATA - NOT GUARANTEED

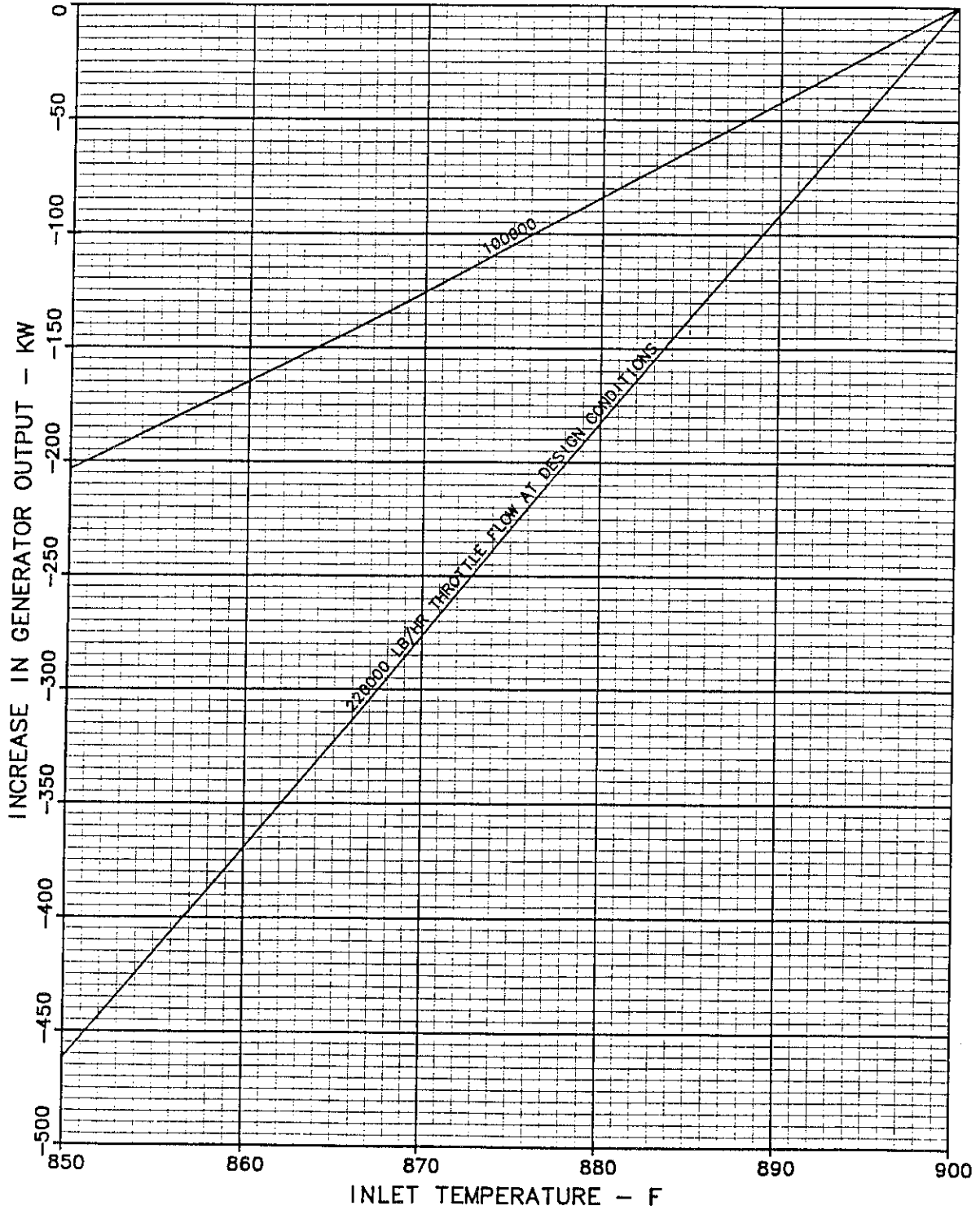


# INCREASE IN GENERATOR OUTPUT VS INLET TEMPERATURE

850 PSIG - 900 F - 1.5 IN. HG.

3600 RPM

EXPECTED DATA - NOT GUARANTEED





RATING: 24000 KWE  
INLET PRESS: 850 PSIA

RPM: 3600  
INLET TMP: 900 DEG F

INLET SIZE: 10"-900#  
CONDENSING: ---

EXH SIZE: 90" SF DOWN  
EXH PRESS: 1.5" HGA

NONCONDENSING: YES

ROTATION: CCW

ROTOR: SOLID X BUILT UP ---

VLV GEAR: MR34

FRONT END: T2

OIL SYS: LOCAL ---

GOV: MARK V SIMPLEX

REMOTE VF950

CONT SYS: 1100#

BASE MTD: TURBINE ONLY

REMARKS: \*\*\* SEE BMTX SCREEN TEXT CODE TL FOR ROTOR STAGING

GEN: 5A4PRO

\*\*\*\* FOR ADDITIONAL INFO SEE BMTX SCREEN - TEXT CODE TL \*\*\*\*

DATE 97/03/25





March 1998

# GE Power Systems Generator

## Generator Design Data



### Nameplate Data

2 Poles, 3 Phase, WYE Connected, 60 Hertz, 3,600 rpm

Total Temperature at Rating Guaranteed not to Exceed: 110°C on Armature by Detector  
125°C on Field by Resistance

Maximum Cold Air Temperature 40°C

|                        | <b>Rating</b> |
|------------------------|---------------|
| kVA .....              | 31,765        |
| Armature Amperes ..... | 1,329         |
| Armature Volts .....   | 13,800        |
| Field Amperes .....    | 760           |
| Exciter Volts .....    | 125           |
| Power Factor .....     | 0.85          |

### Design Data

Voltage Range at 60 Hertz ..... ± 5 Percent

### Collector and Brush Data

Shaft Grounding Brushes, 2 per set ..... Recommended Grade, National Carbon 634

### Gas Cooler Data

Inlet Water Temperature ..... 95°F  
Water Flow at Rated Load ..... 750 gpm  
Head Loss Through Cooler ..... 11.6 ft  
Maximum Coolant Operating Pressure ..... 125 PSI

*These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes the matter should be referred to the GE Company.*

## ESTIMATED GENERATOR DATA

| Reactance Data (Per Unit)       | Direct Axis                  | Quadrature Axis            |
|---------------------------------|------------------------------|----------------------------|
| Saturated Synchronous           | (X <sub>dv</sub> ) 2.015     | (X <sub>qv</sub> ) 1.874   |
| Unsaturated Synchronous         | (X <sub>di</sub> ) 2.015     | (X <sub>qi</sub> ) 1.874   |
| Saturated Transient             | (X' <sub>dv</sub> ) 0.202    |                            |
| Unsaturated Transient           | (X' <sub>di</sub> ) 0.275    | (X' <sub>q</sub> ) 0.414   |
| Saturated Subtransient          | (X'' <sub>dv</sub> ) 0.140   | (X'' <sub>qv</sub> ) 0.137 |
| Unsaturated Subtransient        | (X'' <sub>di</sub> ) 0.193   | (X'' <sub>qi</sub> ) 0.190 |
| Saturated Negative Sequence     | (X <sub>2v</sub> ) 0.134     |                            |
| Unsaturated Negative Sequence   | (X <sub>2i</sub> ) 0.185     |                            |
| Saturated Zero Sequence         | (X <sub>0v</sub> ) 0.081     |                            |
| Unsaturated Zero Sequence       | (X <sub>0i</sub> ) 0.105     |                            |
| Leakage Reactance, Overexcited  | (X <sub>LM,OEX</sub> ) 0.168 |                            |
| Leakage Reactance, Underexcited | (X <sub>LM,UEX</sub> ) 0.168 |                            |

## Field Time Constant Data (sec at 125°C)

|   |                            |                            |
|---|----------------------------|----------------------------|
| Open Circuit                            | (T' <sub>do</sub> ) 5.464  | (T' <sub>qo</sub> ) 0.508  |
| Three Phase Short Circuit Transient     | (T' <sub>d3</sub> ) 0.546  | (T' <sub>q</sub> ) 0.508   |
| Line to Line Short Circuit Transient    | (T' <sub>d2</sub> ) 0.854  |                            |
| Line to Neutral Short Circuit Transient | (T' <sub>d1</sub> ) 1.020  |                            |
| Short Circuit Subtransient              | (T'' <sub>d</sub> ) 0.015  | (T'' <sub>q</sub> ) 0.015  |
| Open Circuit Subtransient               | (T'' <sub>do</sub> ) 0.022 | (T'' <sub>qo</sub> ) 0.045 |

## Armature DC Component Time Constant Data (sec at 100°C)

|                               |                          |
|-------------------------------|--------------------------|
| Three Phase Short Circuit     | (T <sub>a3</sub> ) 0.229 |
| Line to Line Short Circuit    | (T <sub>a2</sub> ) 0.229 |
| Line to Neutral Short Circuit | (T <sub>a1</sub> ) 0.198 |

## Armature Winding Sequence Resistance Data (Per Unit)

|          |                         |
|----------|-------------------------|
| Positive | (R <sub>1</sub> ) 0.005 |
| Negative | (R <sub>2</sub> ) 0.015 |
| Zero     | (R <sub>0</sub> ) 0.008 |

|   |                       |
|---|-----------------------|
| Rotor Short-Time Thermal Capacity, (I <sub>2</sub> ) <sup>2</sup> t   | 10                    |
| Turbine-Generator Combined Inertia Constant, H  | kW sec/kVA            |
| Three Phase Armature Winding Capacitance  | 0.278 microfarads     |
| Armature Winding dc Resistance (Per Phase)  | 0.00934 ohms at 100°C |
| Field Winding dc Resistance   | 0.121 ohms at 125°C   |
| Field Current at Rated kVA, Armature Voltage and PF   | 715.0 amperes         |
| Field Current at Rated kVA and Armature Voltage, 0 PF Lagging<br>(FOR SYSTEMS STUDY ONLY - NOT ALLOWABLE OPERATING POINT) | 863.7 amperes         |



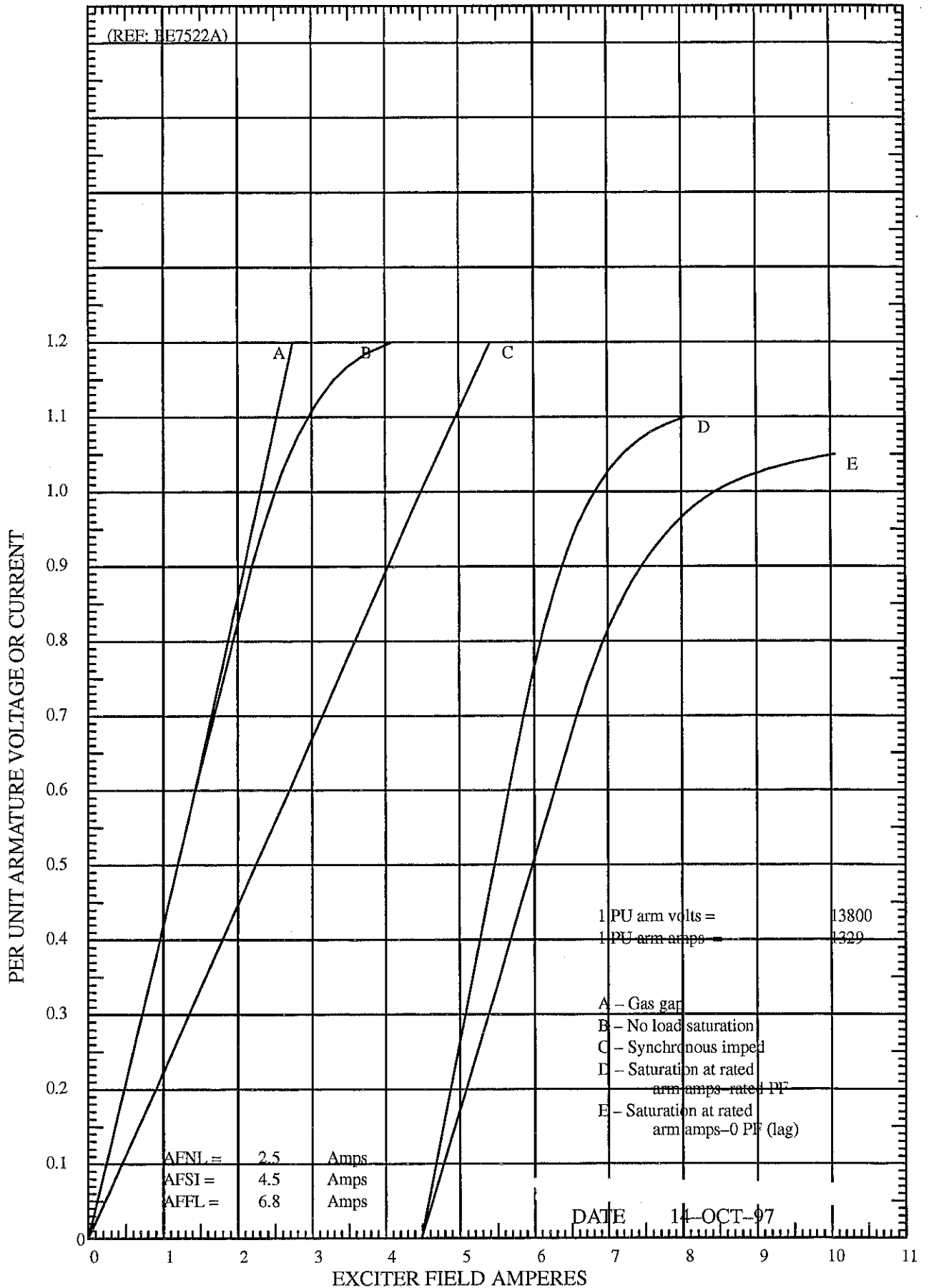
**GE Power Systems**

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ESTIMATED SATURATION AND SYNCHRONOUS IMPEDANCE CURVES

31765 KVA - 3600 RPM - 13800 VOLTS - 0.85 PF

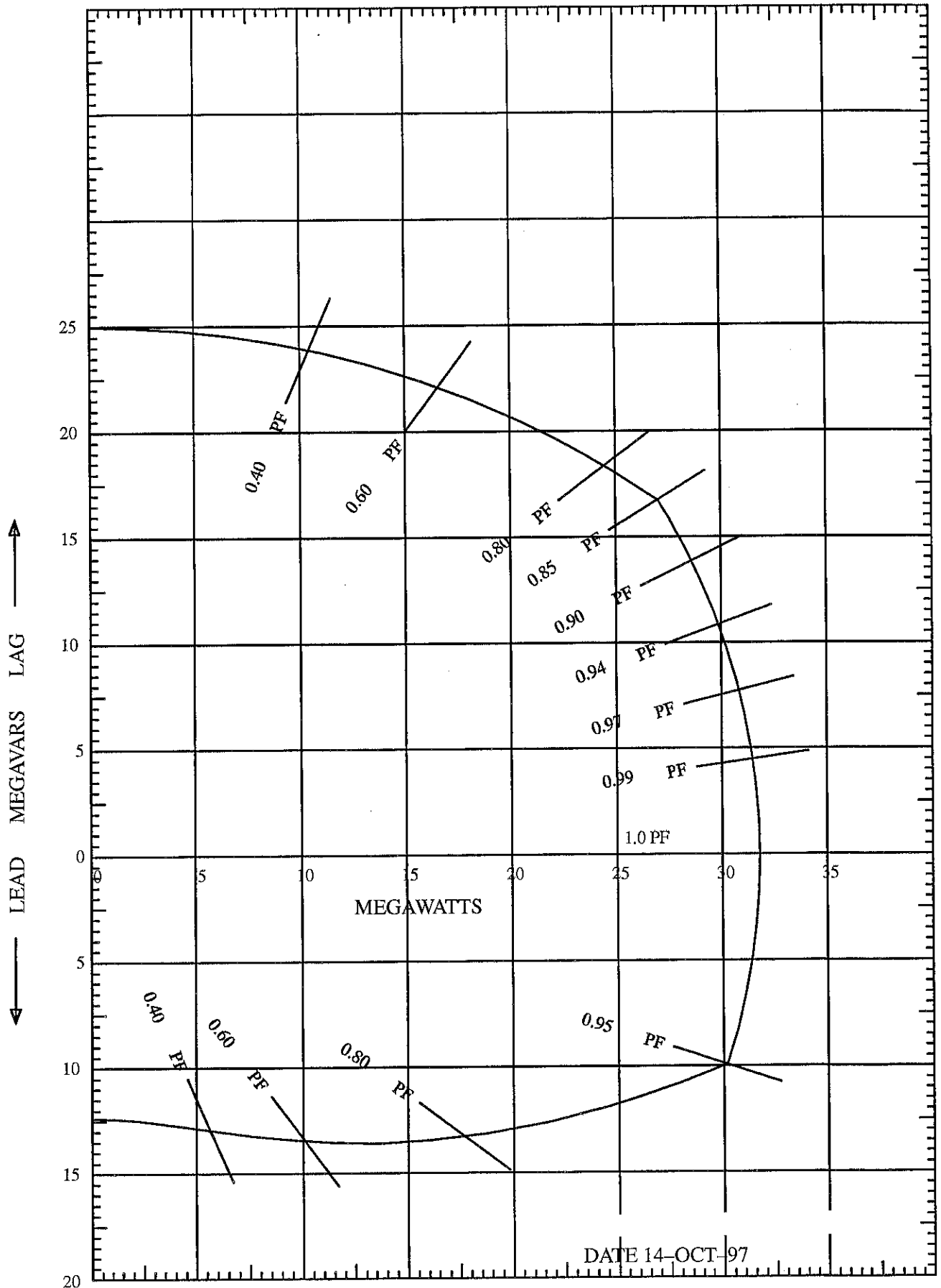
0.53 SCR - 3300 FT ALT - 125 FLD VOLTS



# ESTIMATED REACTIVE CAPABILITY CURVES

31765 KVA - 3600 RPM - 13800 VOLTS - 0.85 PF

0.53 SCR - 3300 FT ALT - 125 FLD VOLTS



# ESTIMATED EXCITATION V CURVES



31765 KVA - 3600 RPM - 13800 VOLTS - 0.85 PF

0.53 SCR - 3300 FT ALT - 125 FLD VOLTS

