

BEARING MATERIALS FOR ROPER A, F, 3600, AND Z SERIES PUMPS

BRONZE

Bronze is the standard bearing material for A, F, 3600 and Z series pumps, and it is the best choice in most applications. As the attached charts show, bronze bearings are suitable for most combinations of speed, pressure, and viscosity in the pump's operating range.

Bronze bearings have good resistance to abrasion and may be used on thin or non-lubricating liquids at low pressures and speeds. These bearings contain a substantial percentage of lead and should not be used with liquids where contact with lead is a problem.

IRON

Cast iron bearings are available on all four series of pumps. They have excellent abrasion resistance, but can be used on thin liquids only at very low pressures and speeds. Gear pumps are not designed for liquid which contains particles of solid matter, but if the particles are smaller than .002", they may sometimes be used. When gear pumps are used on liquid containing abrasive particles, the wear in the bearings is usually the most severe; using iron bearings allows these pumps to handle some moderately abrasive liquids.

CARBON (not available on "F" series pumps)

Roper's carbon bearings are made from carbon graphite impregnated with a plastic resin. They have excellent lubricating properties, and should always be used on non-lubricating liquids. They also allow the highest pressures and speeds on thin liquids.

Carbon bearings have very low abrasion resistance and should not be used on any liquid with abrasive particles because they will wear rapidly.

BEARING CAPABILITY AT OPERATING CONDITIONS

After determining the speed, flow, and horsepower for your application, check the bearing capability of the pump you have chosen.

Turn to the applicable Bearing Capability graph.

The PV limit for the bearings is a product of the bearing operating pressure, P , and the shaft surface velocity, V . PV limit is an established parameter used to define the limiting conditions under which a pump can operate without hydrodynamic effects. Since you will not have all of the data necessary to calculate the PV limit, the calculations have been made for you and plotted in the Bearing Capability graph.

To use this graph, draw a line up from the RPM and from left to right at the pressure at which your pump will be operating. If the intersection of these lines is below the PV limit line for the bearing material that you will be using, the pump bearings are capable of operating at the speed and pressure of your application at any viscosity between 30 and 10,000 SSU. If the intersection of the lines is above the PV limit line for the bearing material that you will be using, you will have to determine the hydrodynamic capability of the bearings. This is done by drawing a line from the zero point through the intersection of the speed and pressure lines that were previously drawn. Next, interpolate the viscosity that this line would represent. The pump that you have chosen will operate at the application speed and pressure as long as the liquid viscosity is **equal to or higher** than the viscosity represented by the line that you have drawn. If the bearing capability of the pump you have chosen does not fall within the limits shown by the Bearing Capability graph, you will have to pick a different pump.

What "PV" means and how to use II

When two bearing surfaces rub against each other, wear is inevitable. The rate of wear is influenced by the pressure they exert against each other (P), the velocity at which they move over each other (V), the length of time they are in contact (T), and a wear factor constant (K), unique for each combination of surfaces. K is a function of the surface characteristics (roughness, coefficient of friction [COF], hardness, ability to resist deformation under load, etc.).

The standard formula for calculating wear is:

$$W = KPVT$$

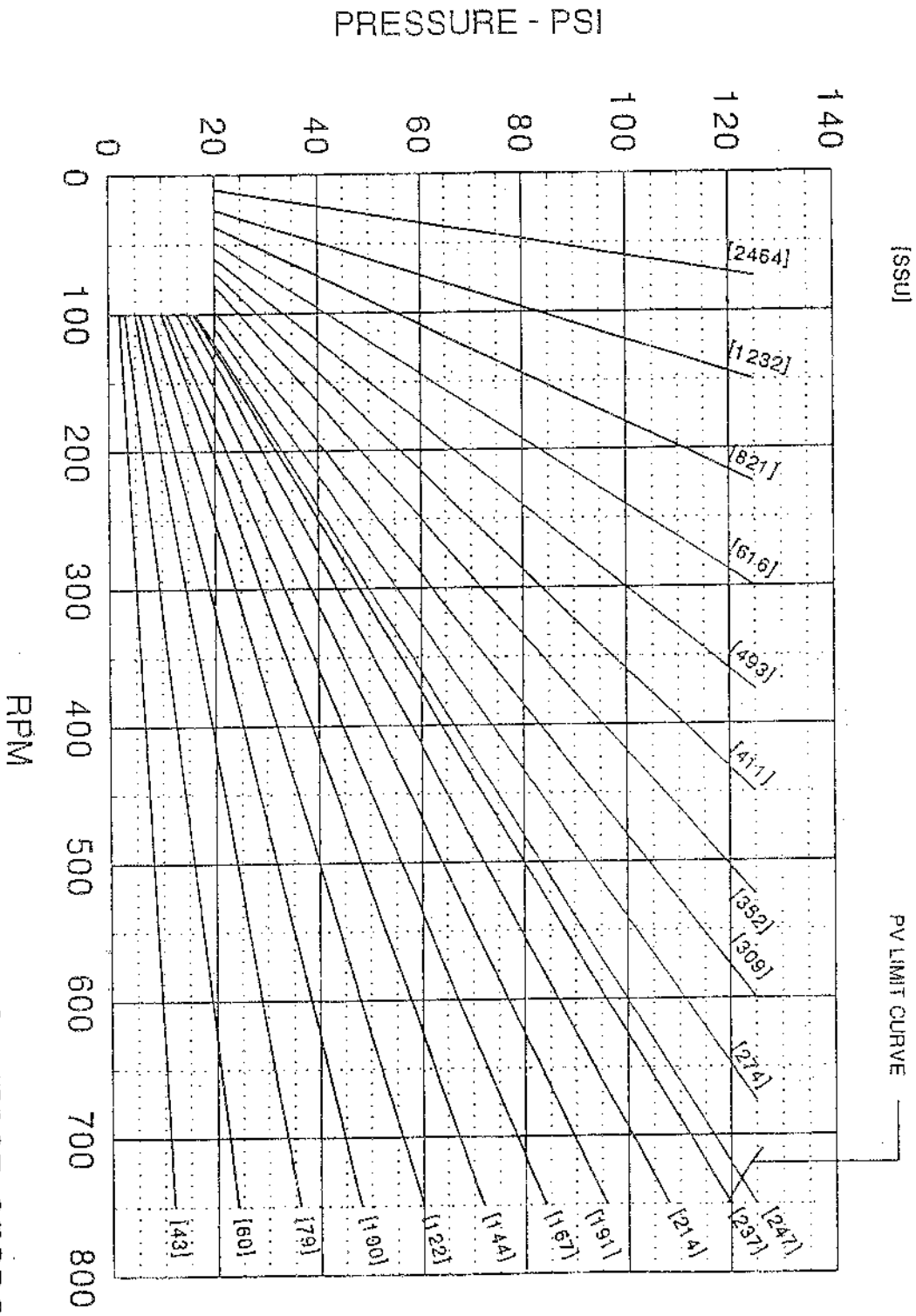
Wear	= material (thickness) worn away in inches or millimeters.
K	= wear rate constant unique to surfaces in contact, given in $\text{in}^3 \cdot \text{min}/\text{ft} \cdot \text{lb} \cdot \text{hr}$ or $\text{mm}^3/\text{m} \cdot \text{Nhr}$.
Pressure	= force between the surfaces in lbs/in^2 or N/mm^2 .
Velocity	= rate of motion in ft/min or m/min .
Time	= duration of contact or operation in hrs or min.

If K and the thickness or wear tolerance of the bearing surfaces are known, then the service life of the bearing may be calculated for various combinations of Pressure and Velocity, or "PV factors."

The amount of wear and service life will be directly proportional to PV factors below a certain limit. This "limiting PV factor" is the point at which increasing P or V converts normal wear into accelerated wear, often leading to catastrophic failure of the bearing.

Several factors influence the Limiting PV factor, including temperature. Surfaces moving in contact generate heat which must be dissipated if the bearing is to survive. Low COF materials (lubricants, coatings) reduce the rate at which heat is generated and help preserve the bearing. All bearing materials, including fluoropolymer coatings, must be used below their limiting PV factor to avoid failure.

3611, 3711, 4611, 4711
 (BRONZE BEARINGS)



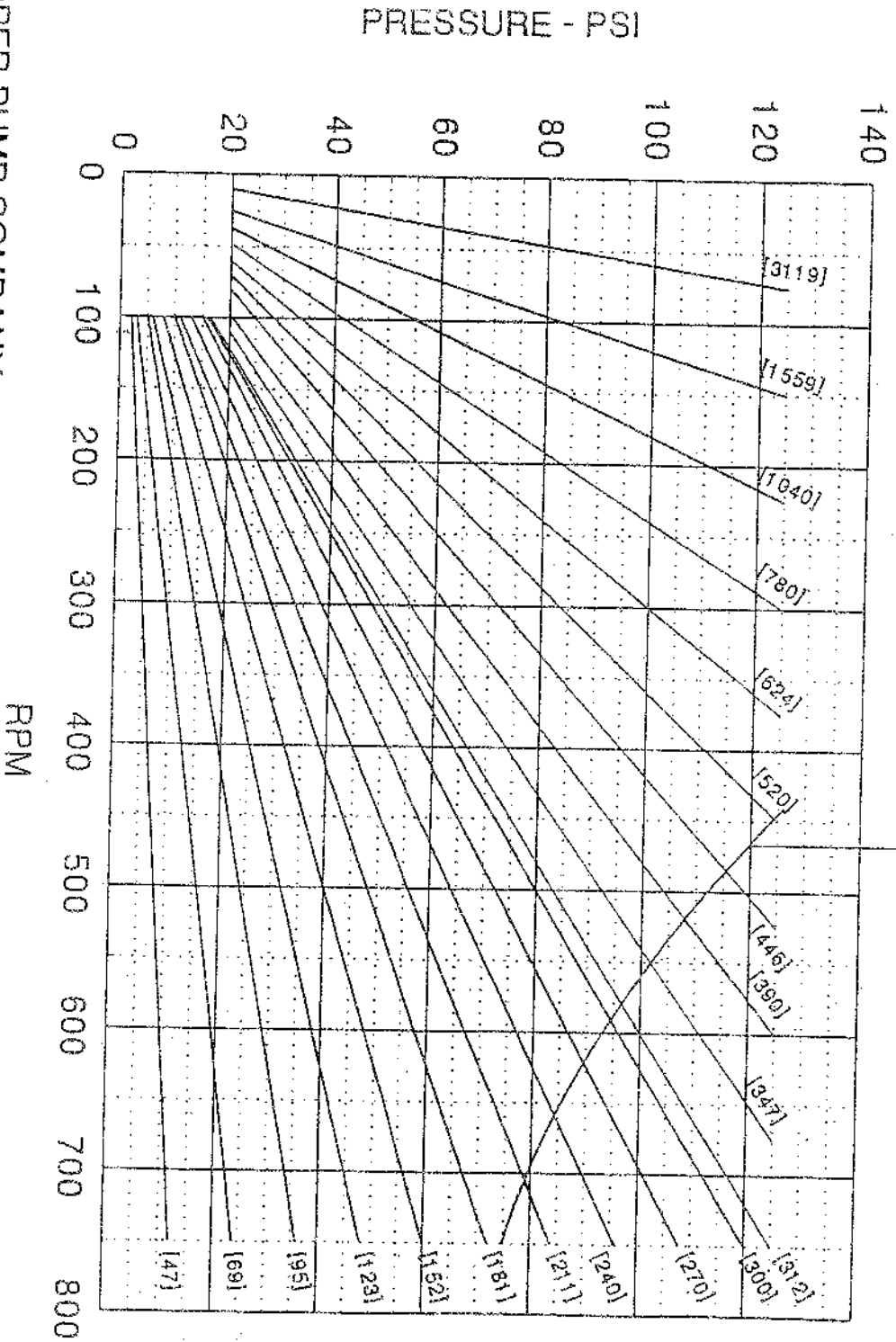
ROPER PUMP COMPANY
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COMMERCE, GEORGIA

3611, 3711, 4611, 4711
(IRON BEARINGS)

[SSU]

PV LIMIT CURVE

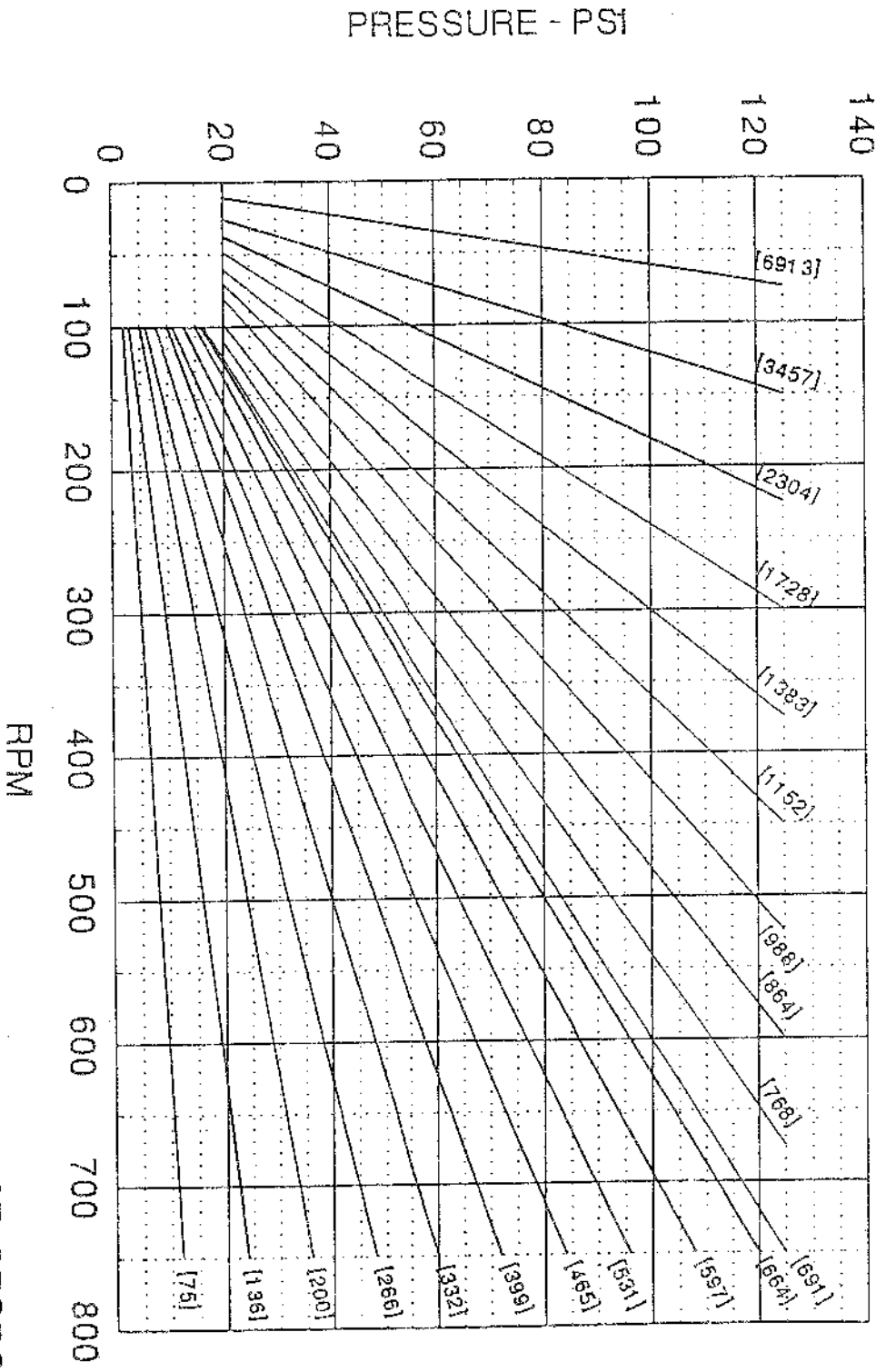


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COMMERCE, GEORGIA

3611, 3711, 4611, 4711
 (CARBON BEARINGS)

[SSU]



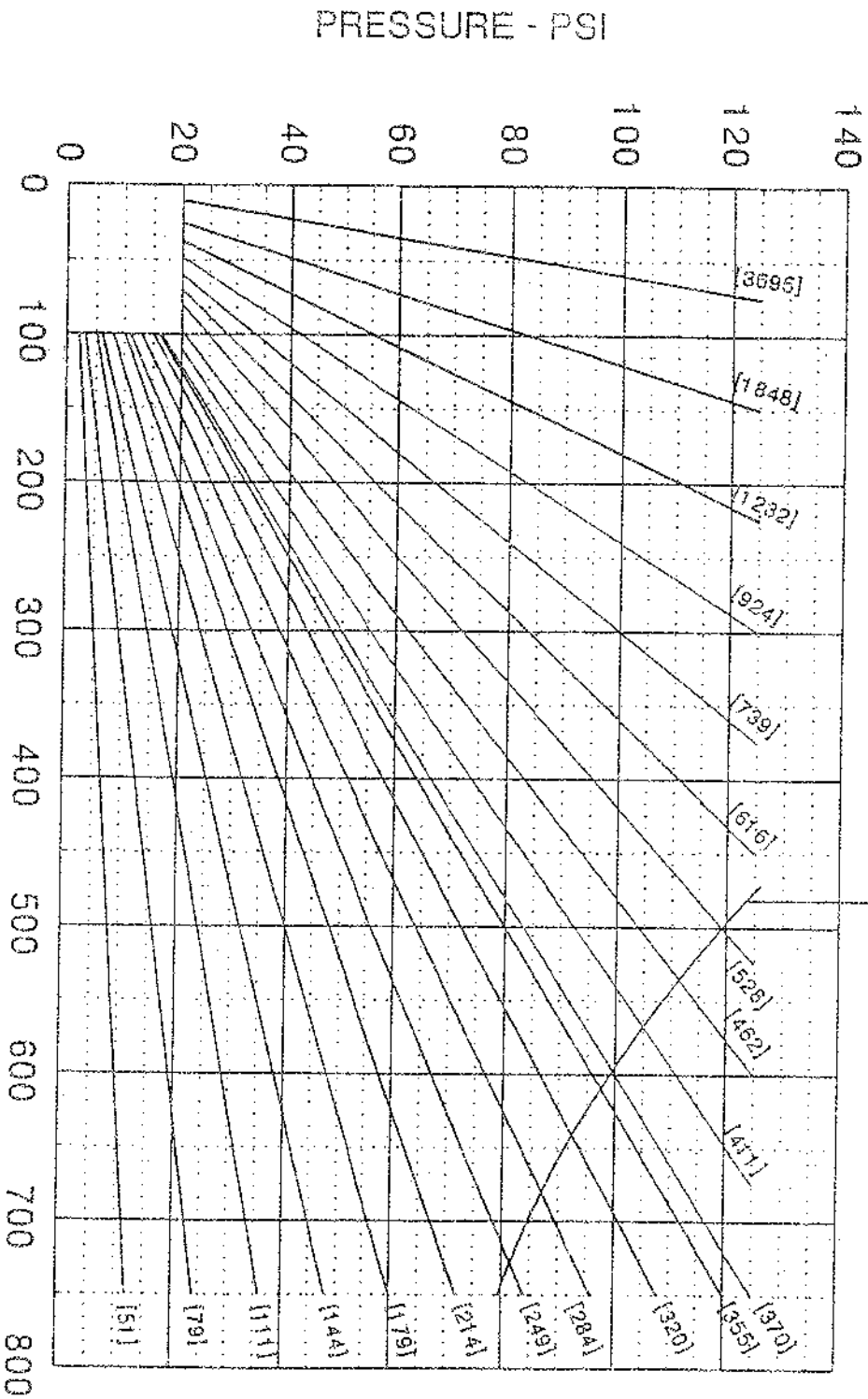
ROPER PUMP COMPANY
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COMMERCE, GEORGIA

3617,3717,4617,4717
(BRONZE BEARINGS)

[ISSU]

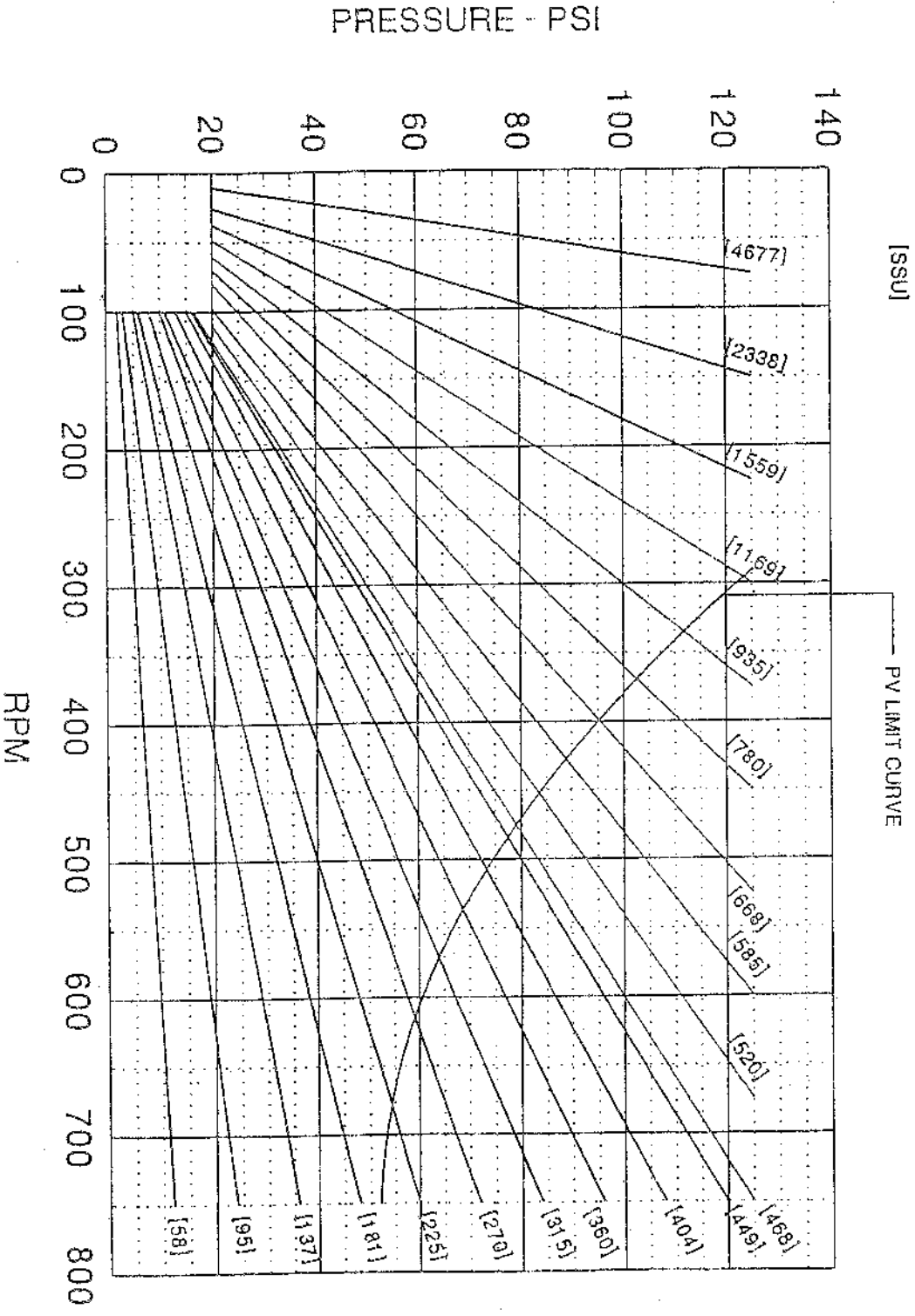
PV LIMIT CURVE



ROPER PUMP COMPANY
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COMMERCE, GEORGIA

361 7,371 7,461 7,471 7
 (IRON BEARINGS)

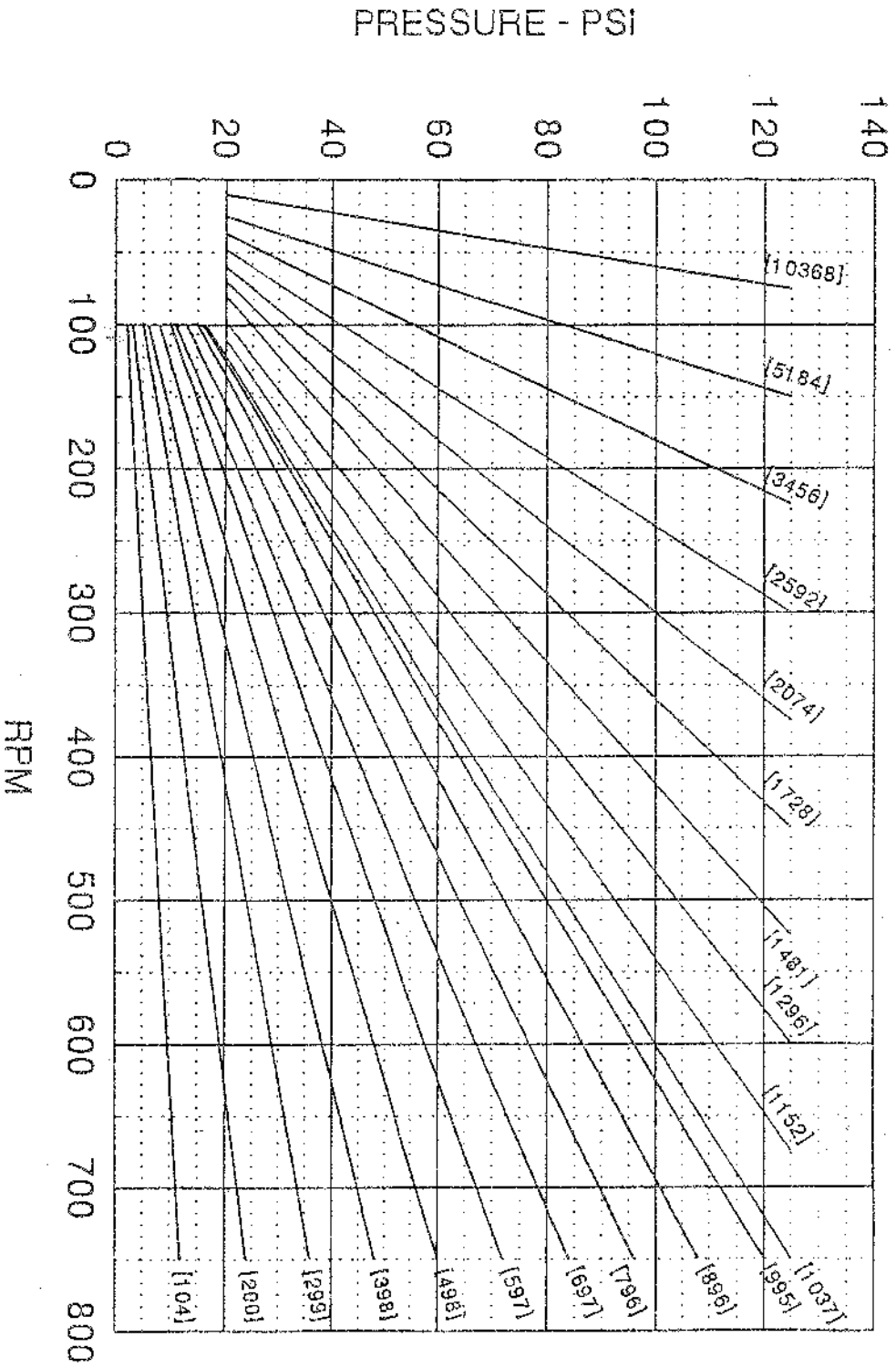


ROBERT PUMP COMPANY

COMMERCE, GEORGIA

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[99U]



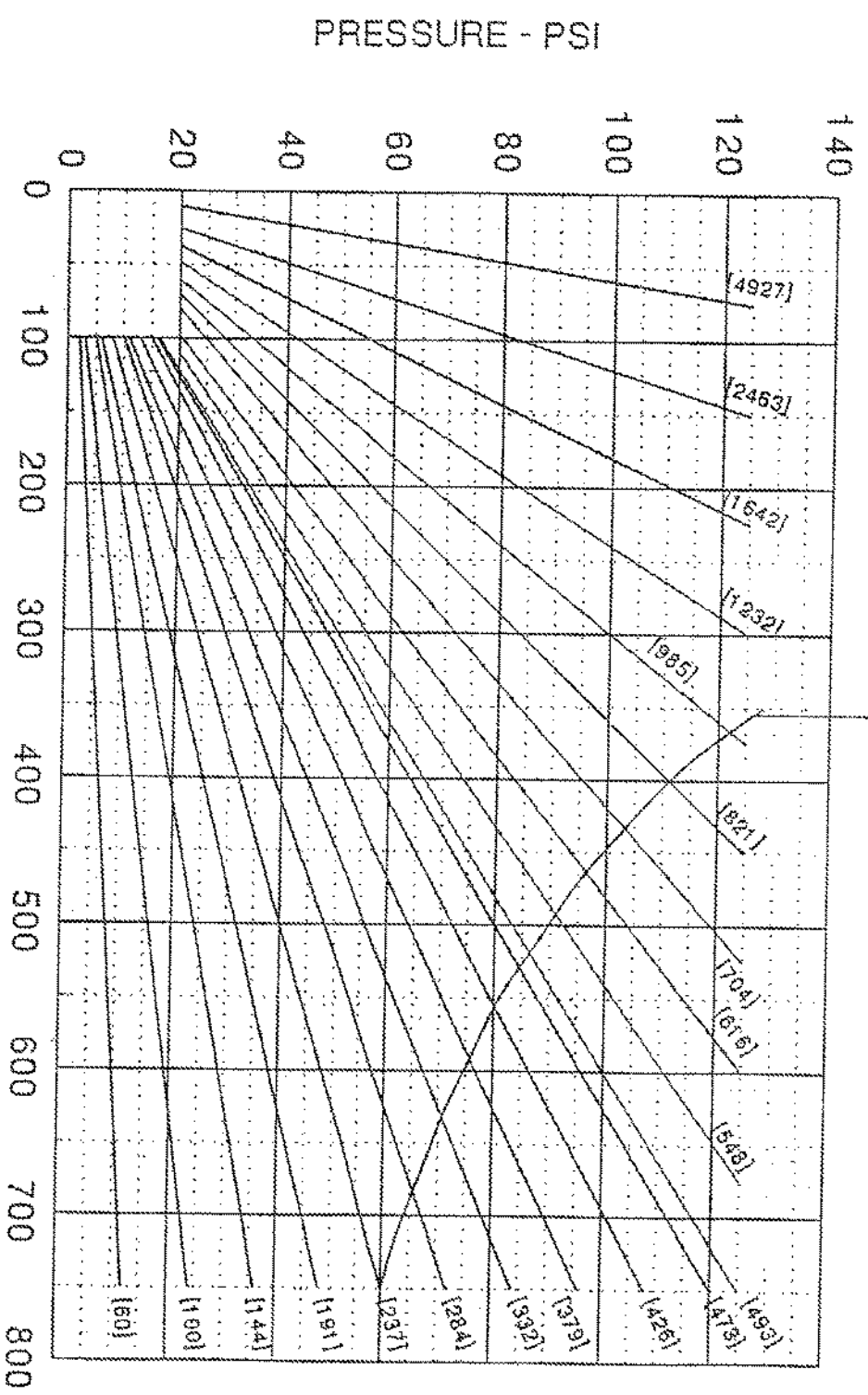
ROBER PUMP COMPANY

COMMERCE, GEORGIA

[SSU]

PV LIMIT CURVE

3622,3722,4622,4722
(BRONZE BEARINGS)

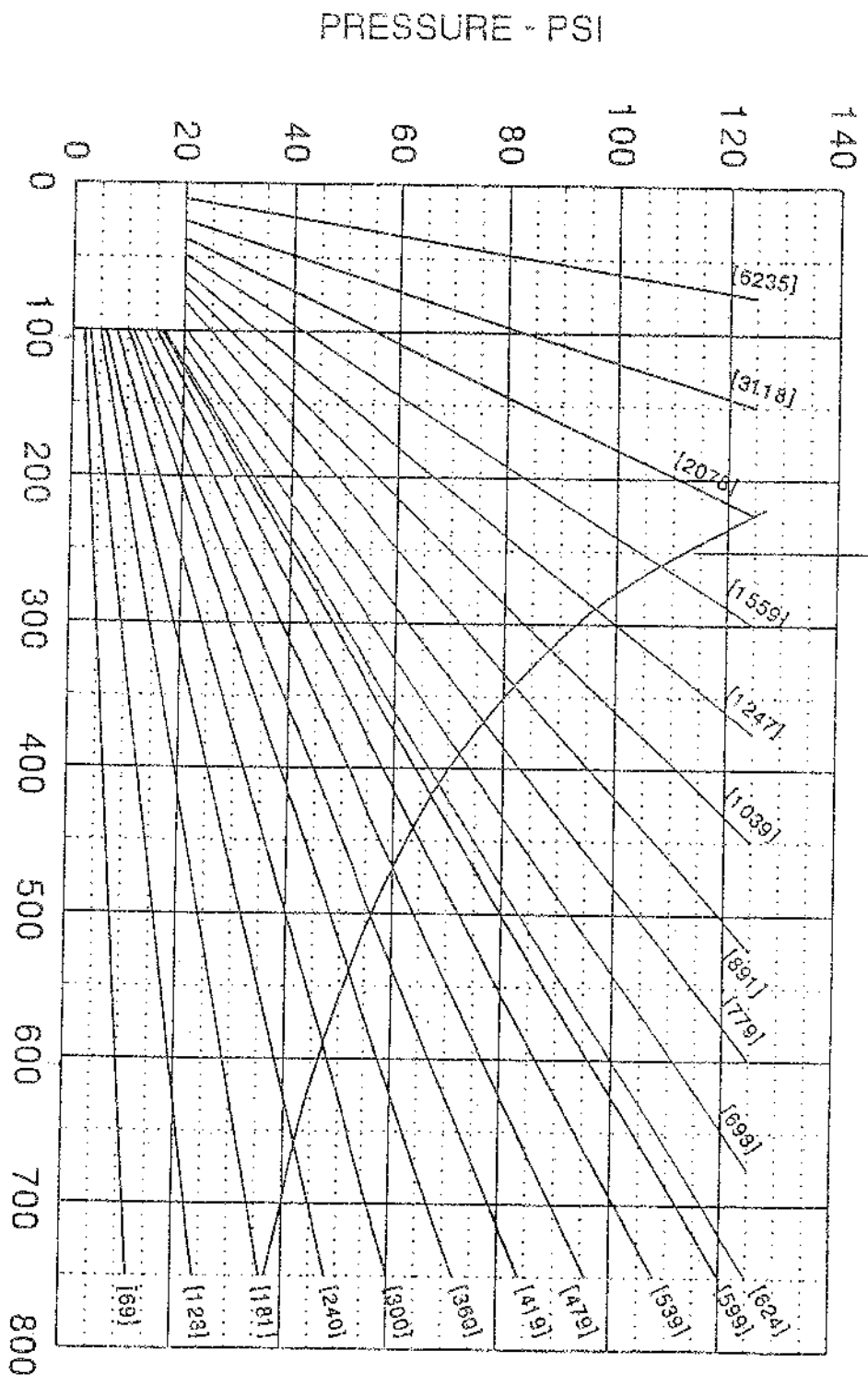


ROPER PUMP COMPANY
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COMMERCE, GEORGIA

3622,3722,4622,4722
 (IRON BEARINGS)

ISSUE
 PV LIMIT CURVE



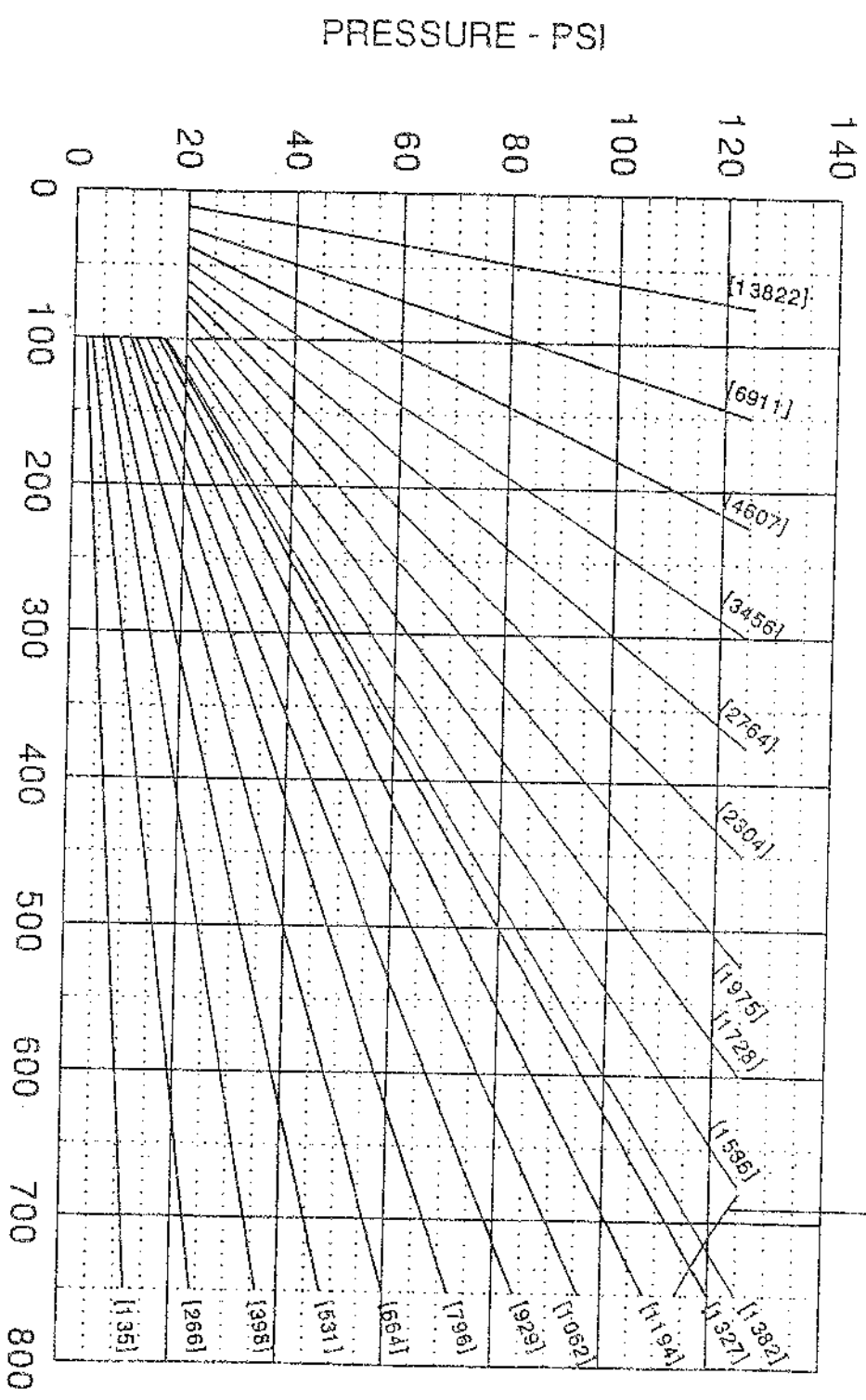
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COMMERCE, GEORGIA

[ISSU]

3622,3722,4622,4722
(CARBON BEARINGS)

PV LIMIT CURVE



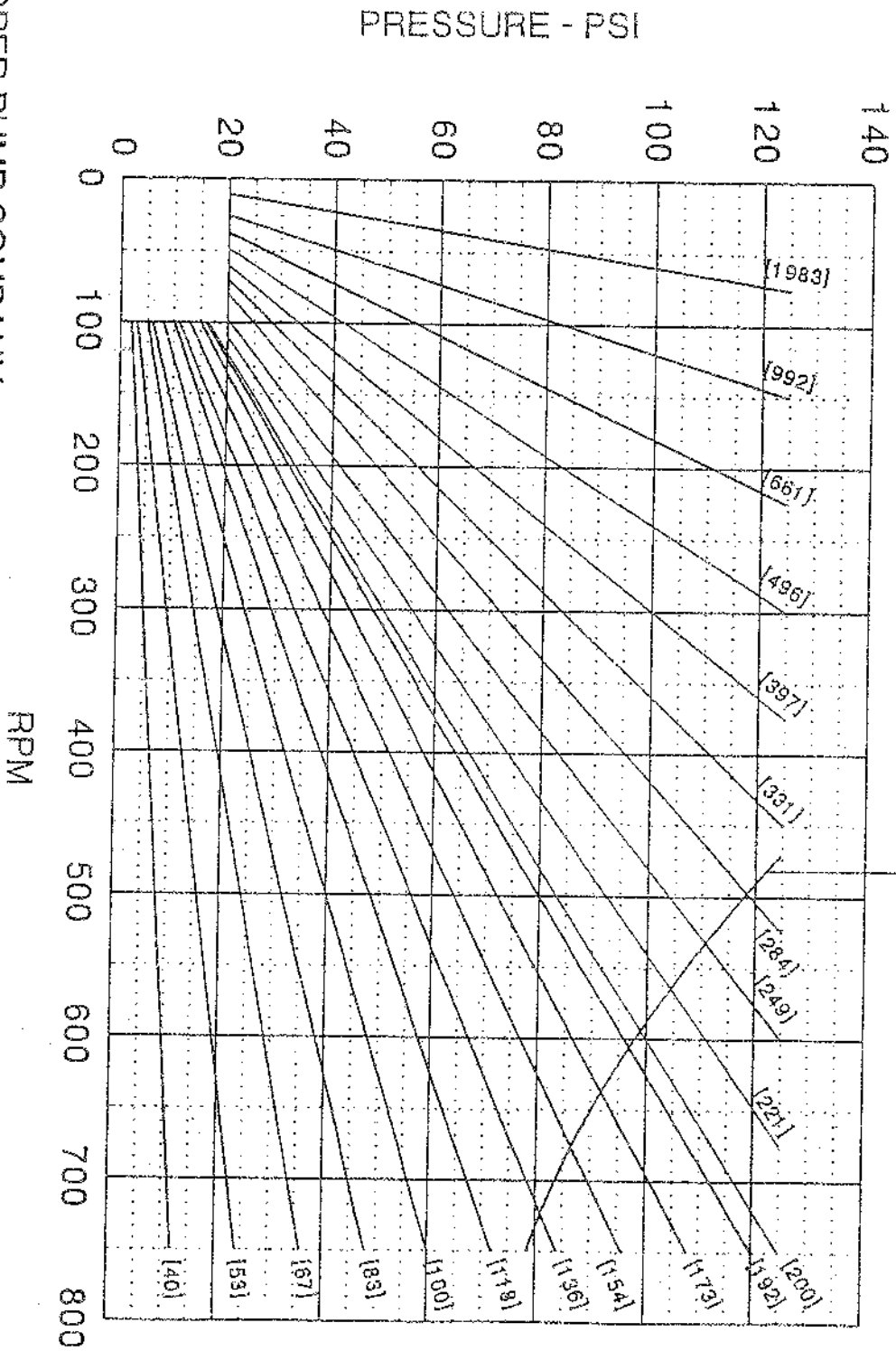
ROPER PUMP COMPANY
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COMMERCE, GEORGIA

3635,3735
(BRONZE BEARINGS)

[SSU]

PV LIMIT CURVE



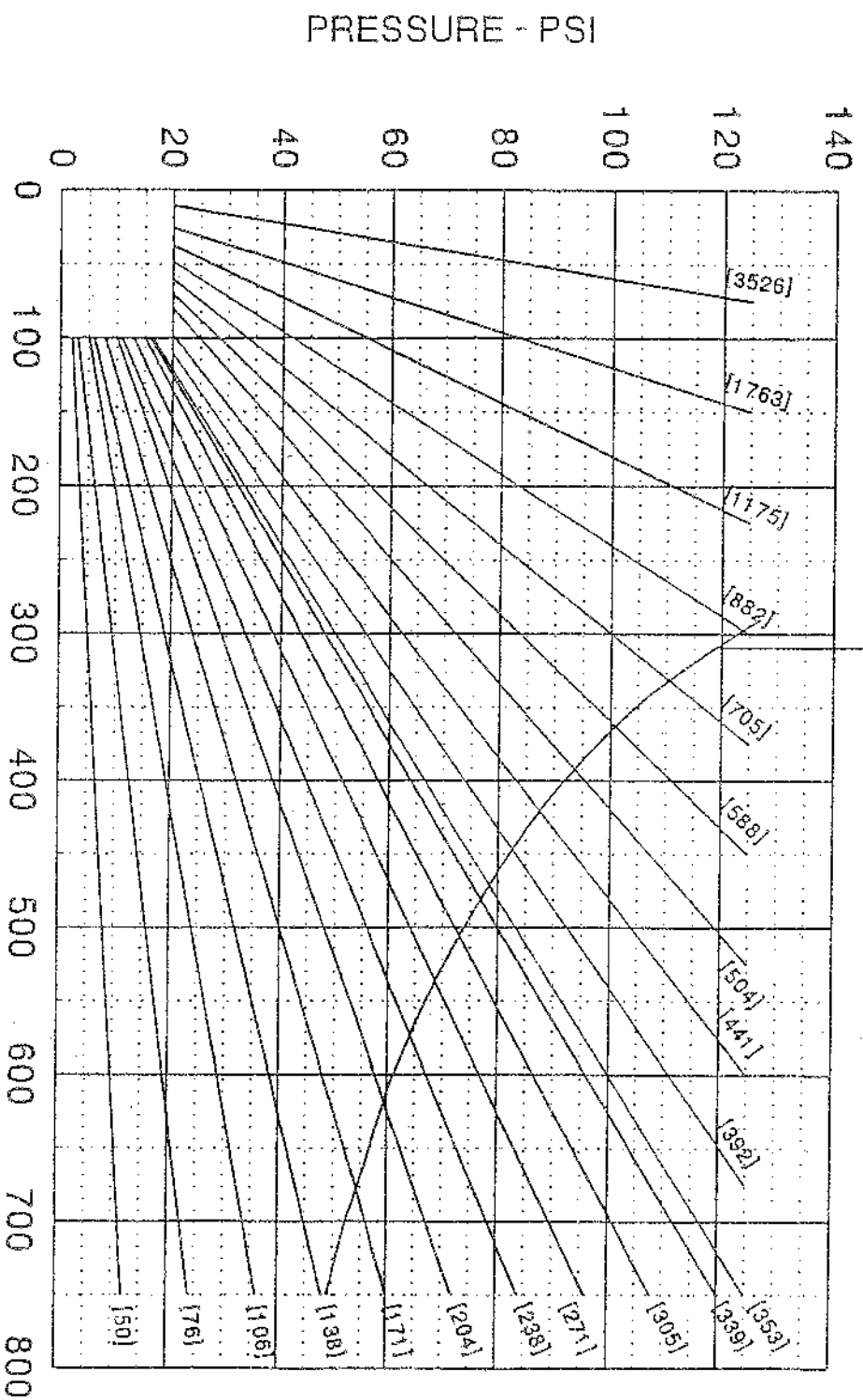
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COMMERCE, GEORGIA

3635,3735 (IRON BEARINGS)

[SSU]

PV LIMIT CURVE

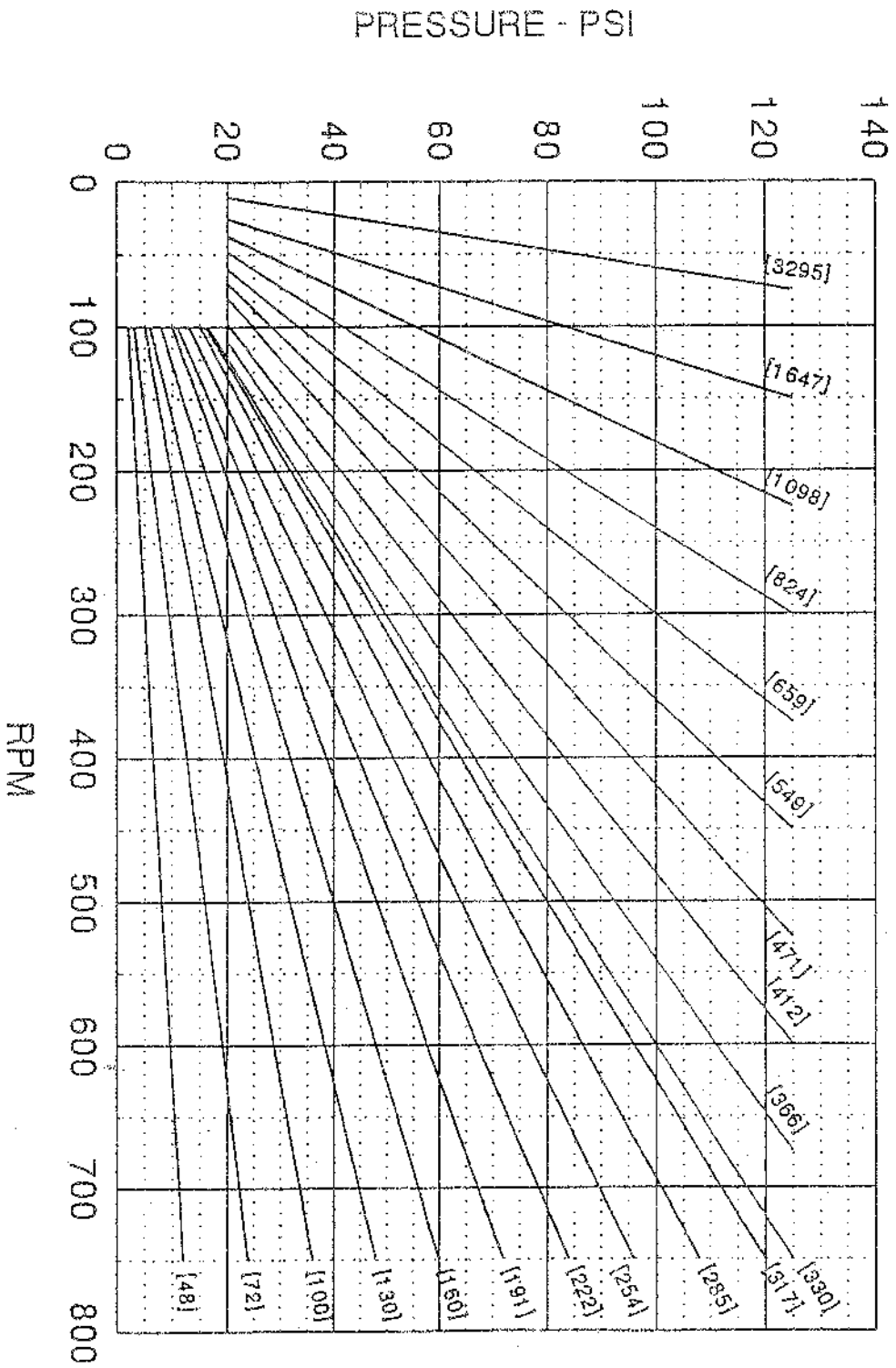


ROPER PUMP COMPANY
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COMMERCE, GEORGIA

3635,3735
(CARBON BEARINGS)

[ISSU]



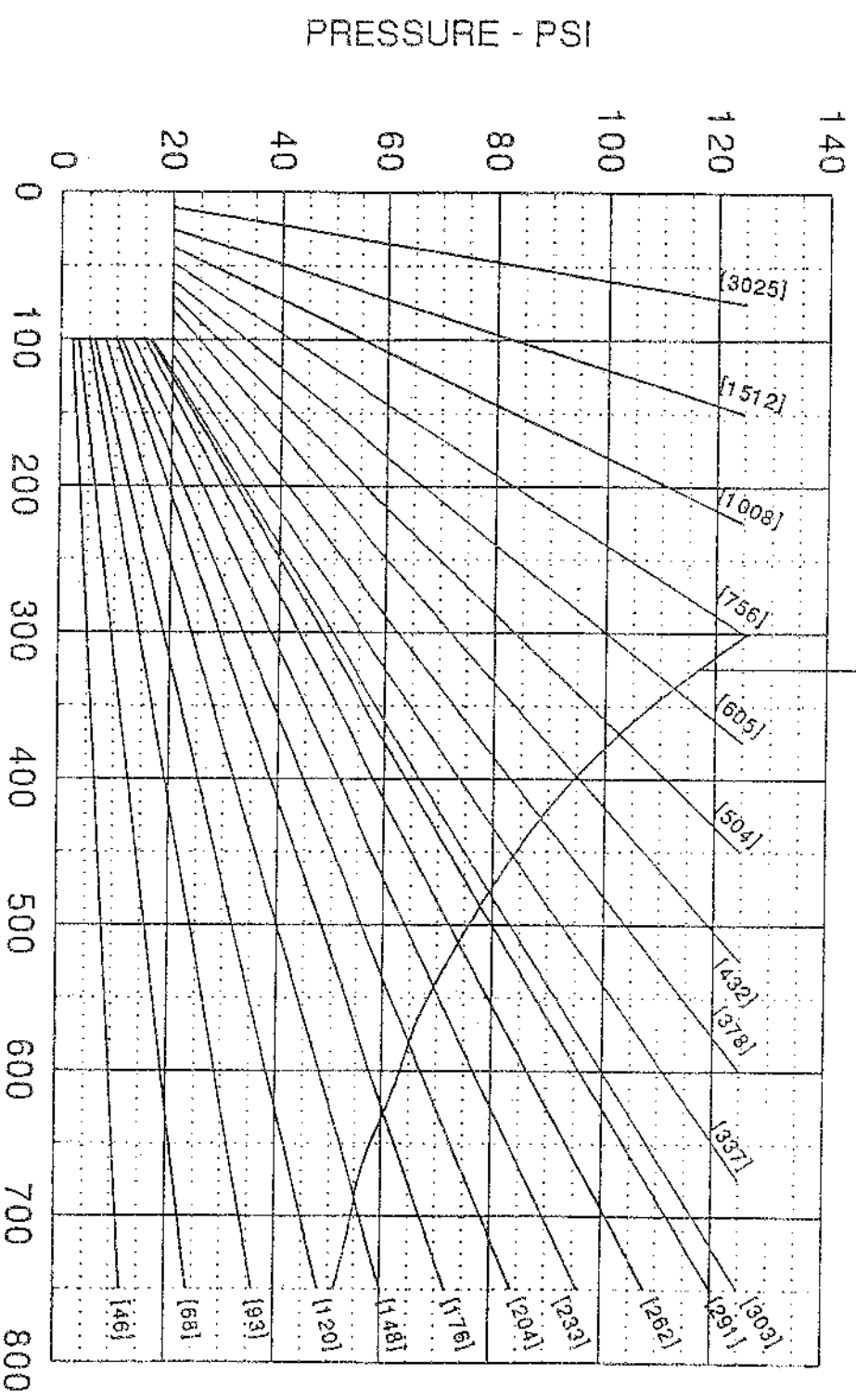
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COMMERCE, GEORGIA

3648,3748 (BRONZE BEARINGS)

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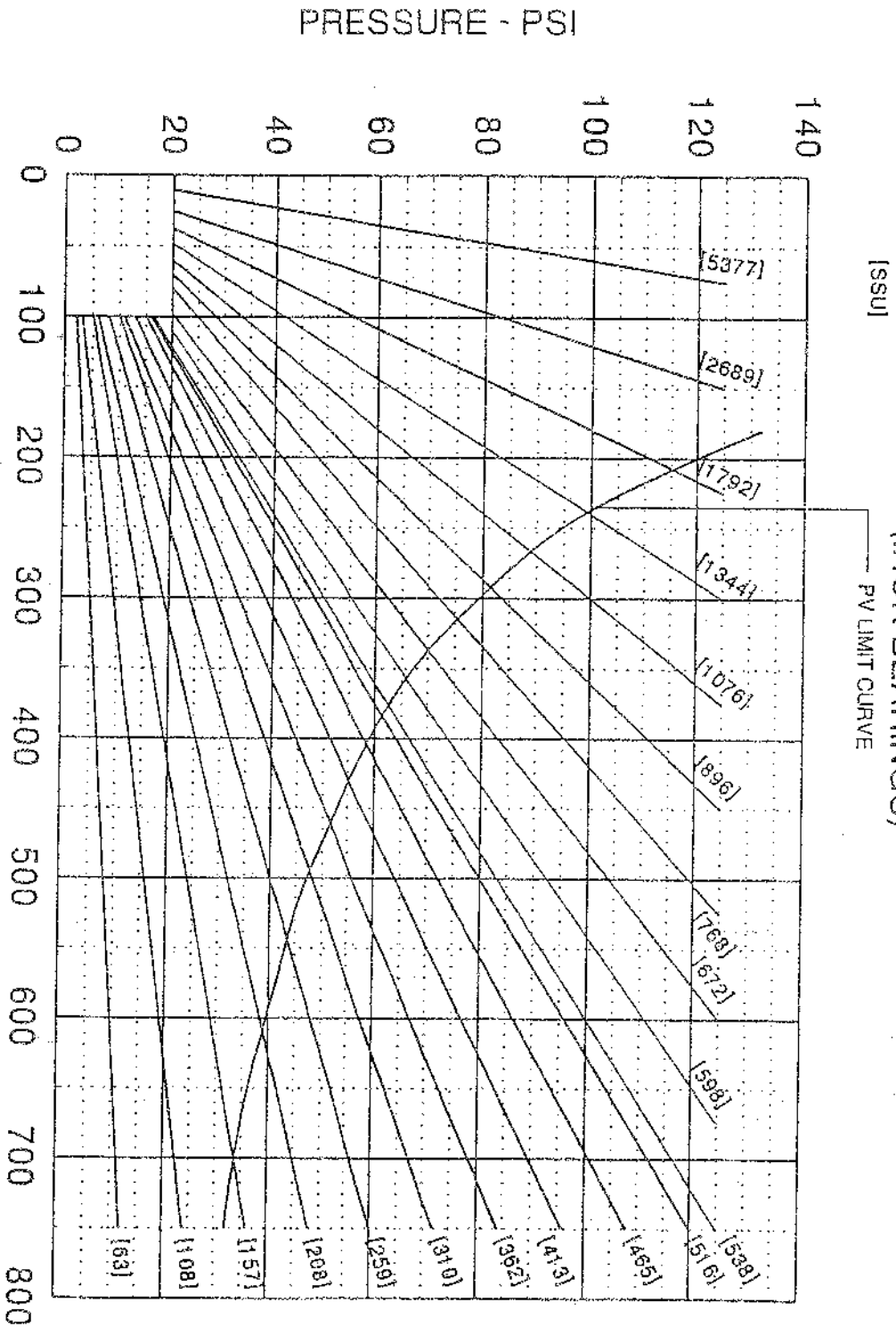
PV LIMIT CURVE



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COMMERCE, GEORGIA

3648,3748
(IRON BEARINGS)



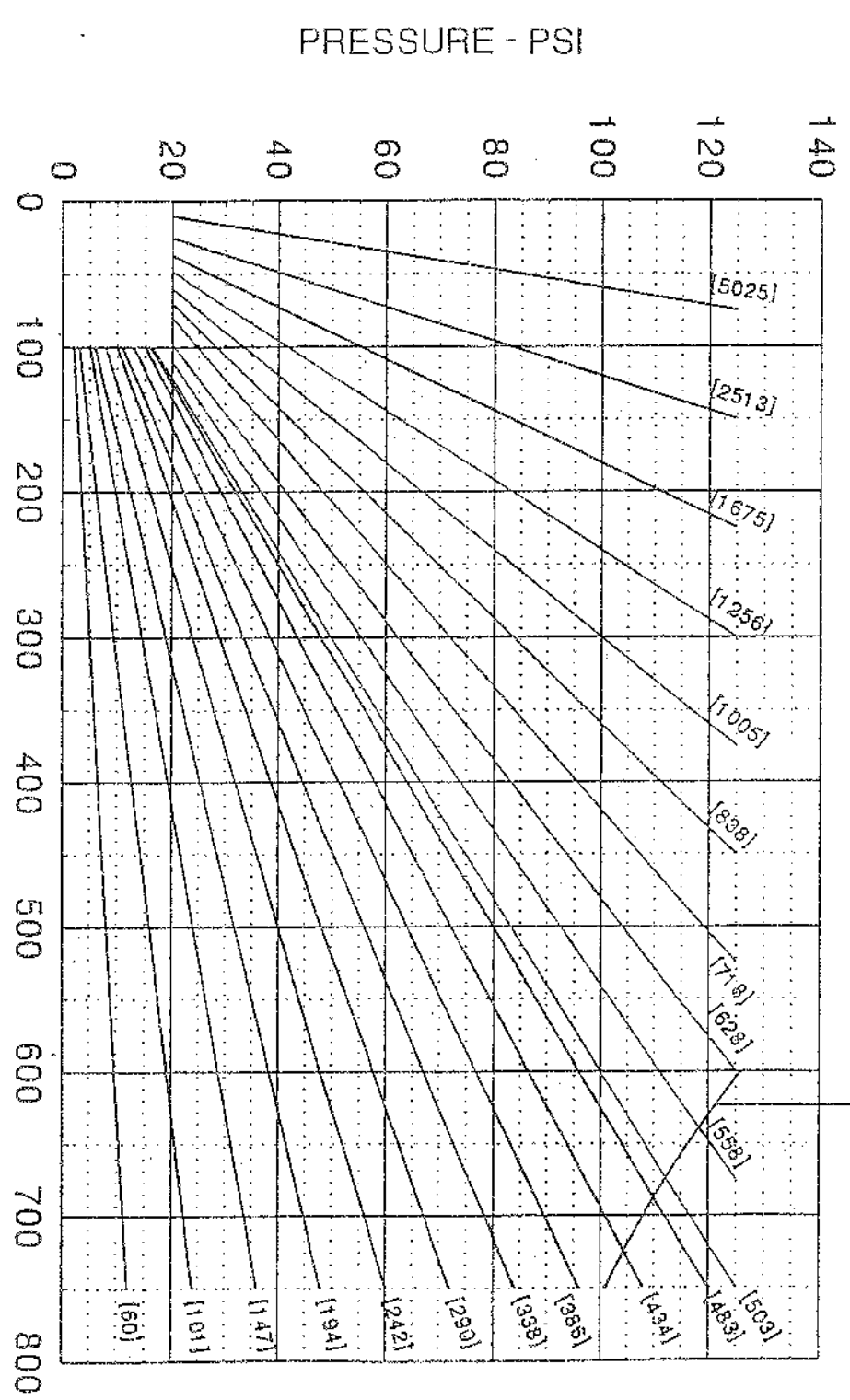
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COMMERCE, GEORGIA

3648,3748
(CARBON BEARINGS)

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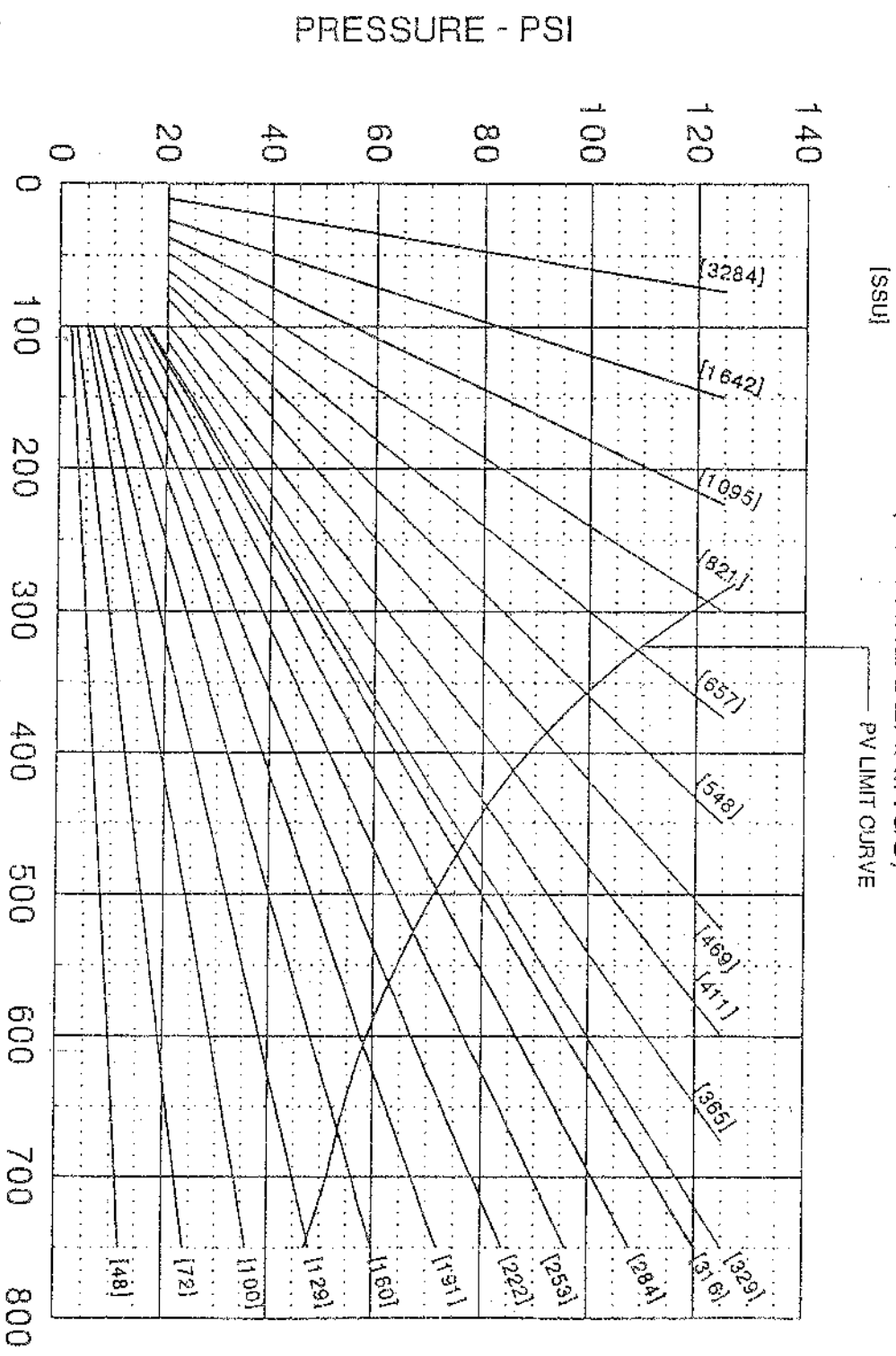
PV LIMIT CURVE



PROPER PUMP COMPANY
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COMMERCE, GEORGIA

3658,3758,4658,4758
 (BRONZE BEARINGS)

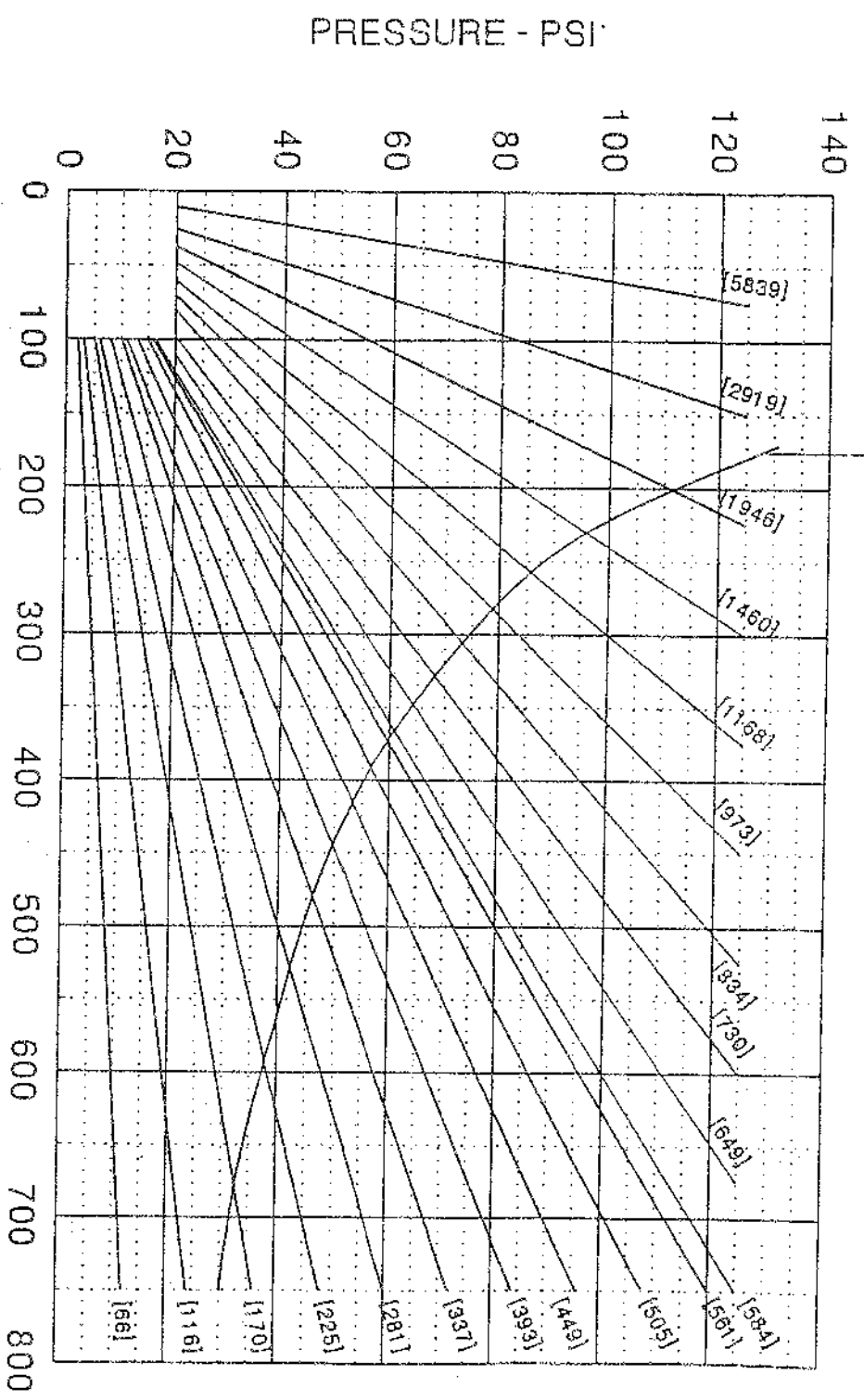


ROPER PUMP COMPANY
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COMMERCE, GEORGIA

3658,3758,4658,4758
(IRON BEARINGS)

[SSU] PV LIMIT CURVE



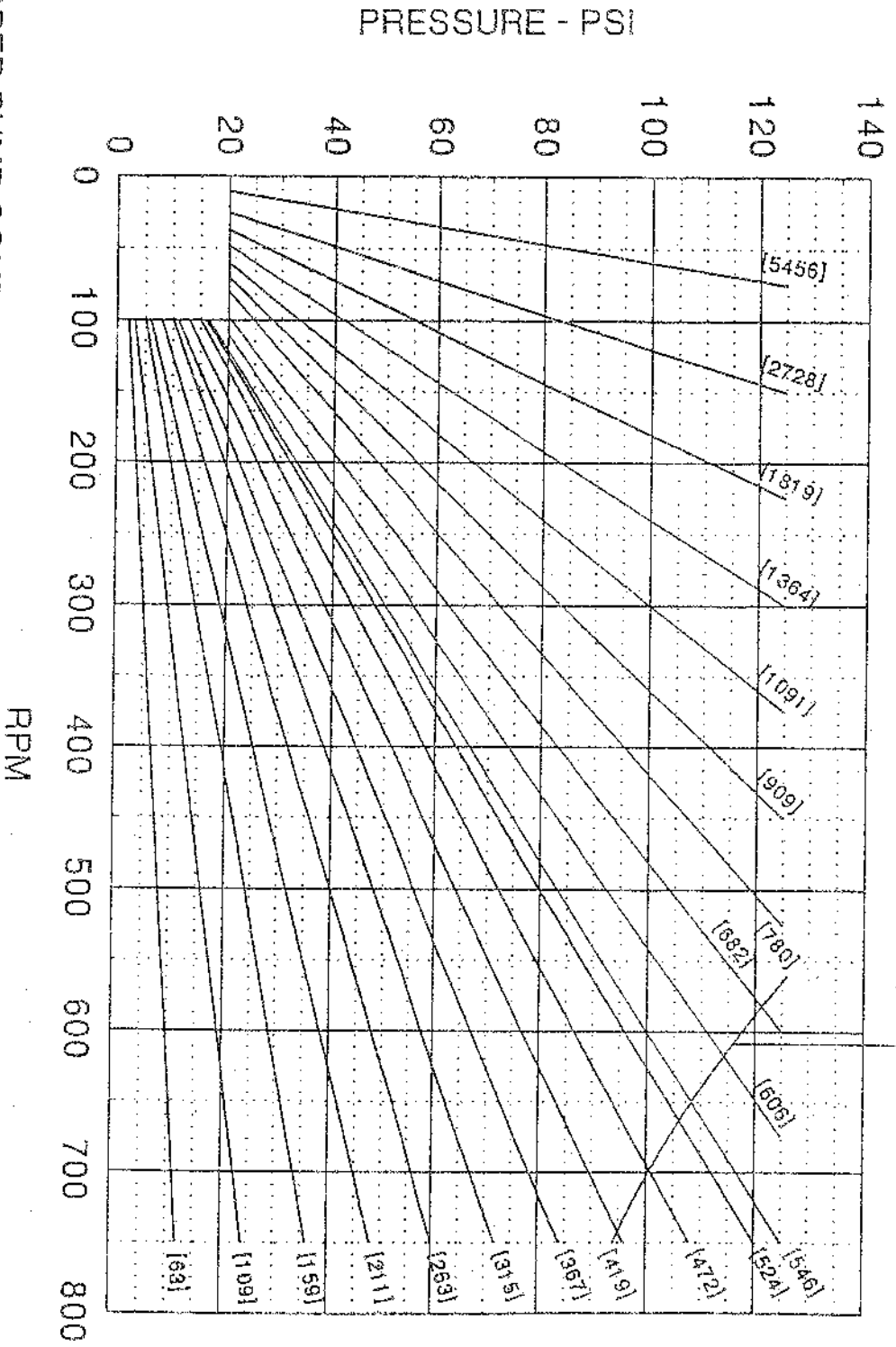
ROPER PUMP COMPANY
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COMMERCE, GEORGIA

3658, 3758, 4658, 4758
(CARBON BEARINGS)

[SSU]

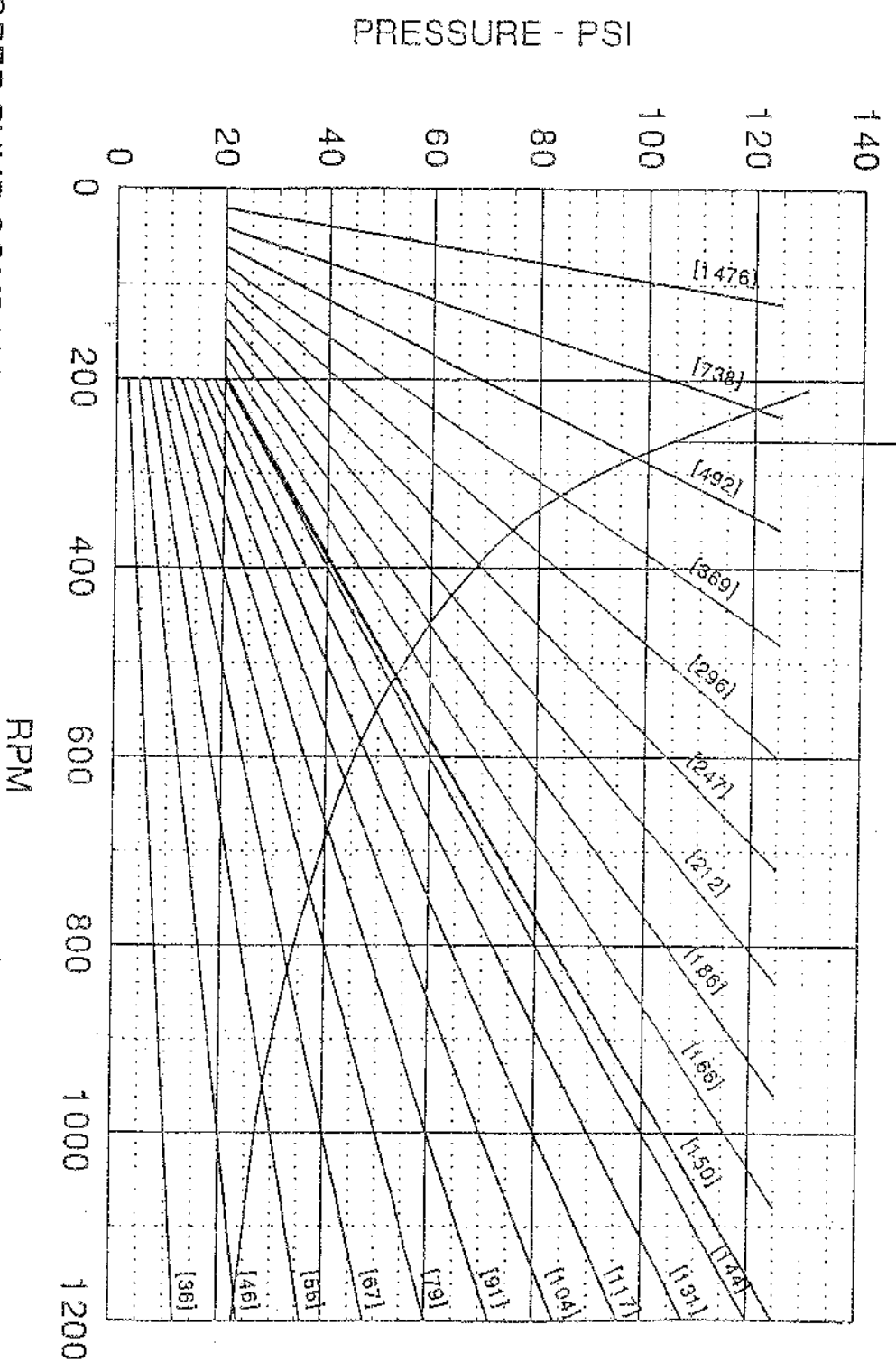
PV LIMIT CURVE



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COMMERCE, GEORGIA

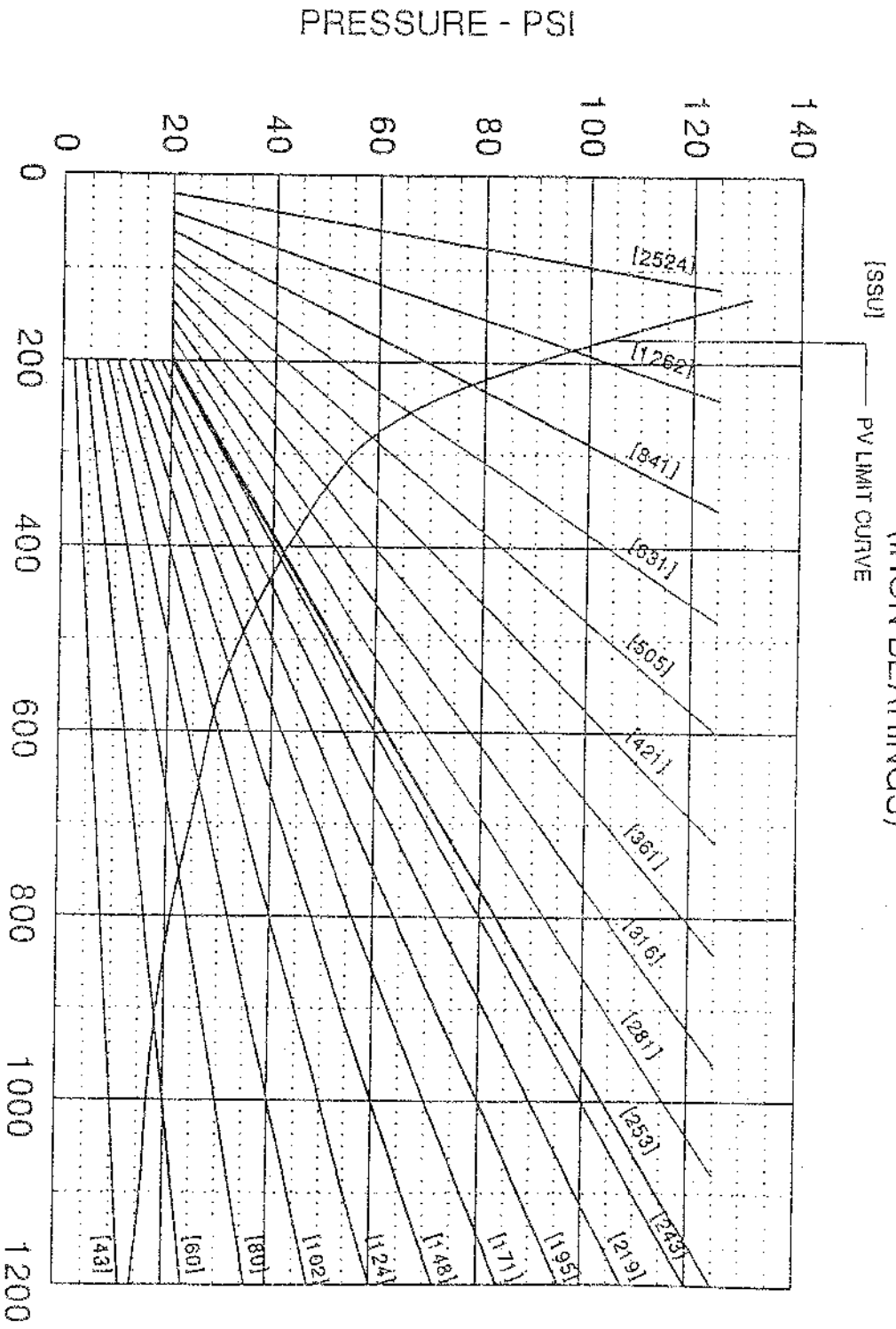
4668
 (BRONZE BEARINGS)
 PV LIMIT CURVE
 [SSU]



PROPER PUMP COMPANY
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COMMERCE, GEORGIA

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(IRON BEARINGS)

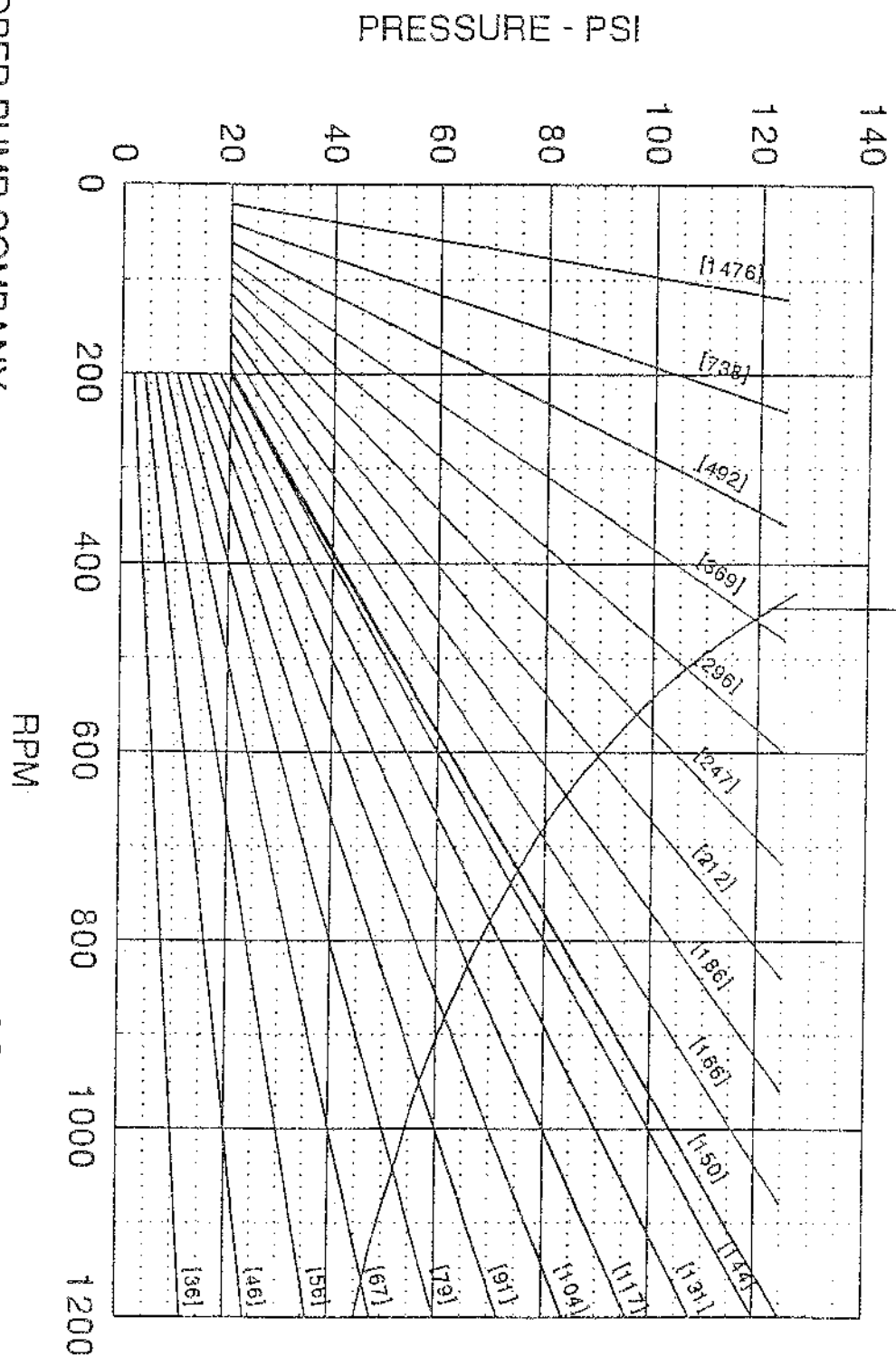


ROPER PUMP COMPANY
ISSUED: 1966

COMMERCE, GEORGIA

4668 (CARBON BEARINGS)

[SSU] PV LIMIT CURVE

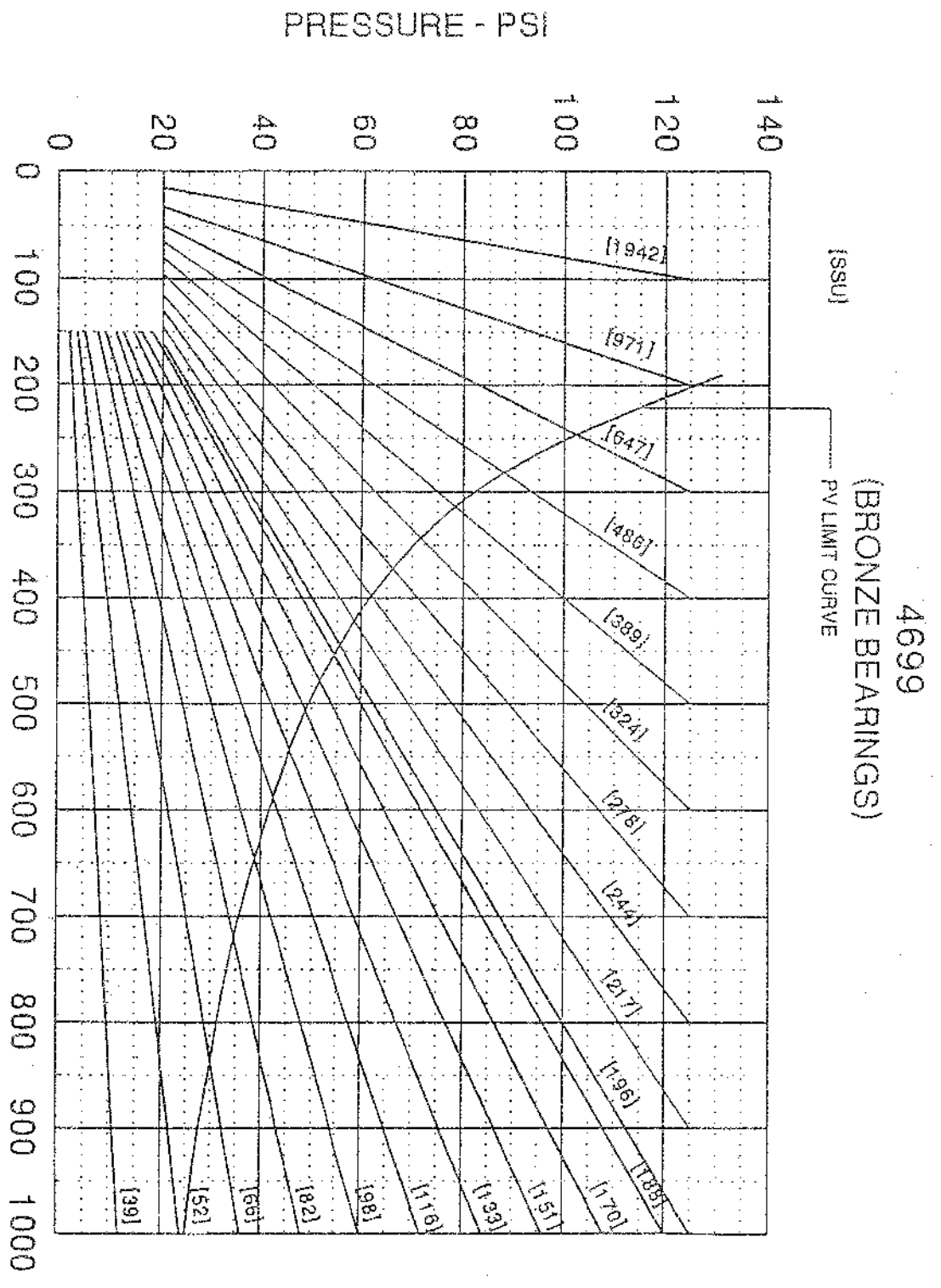


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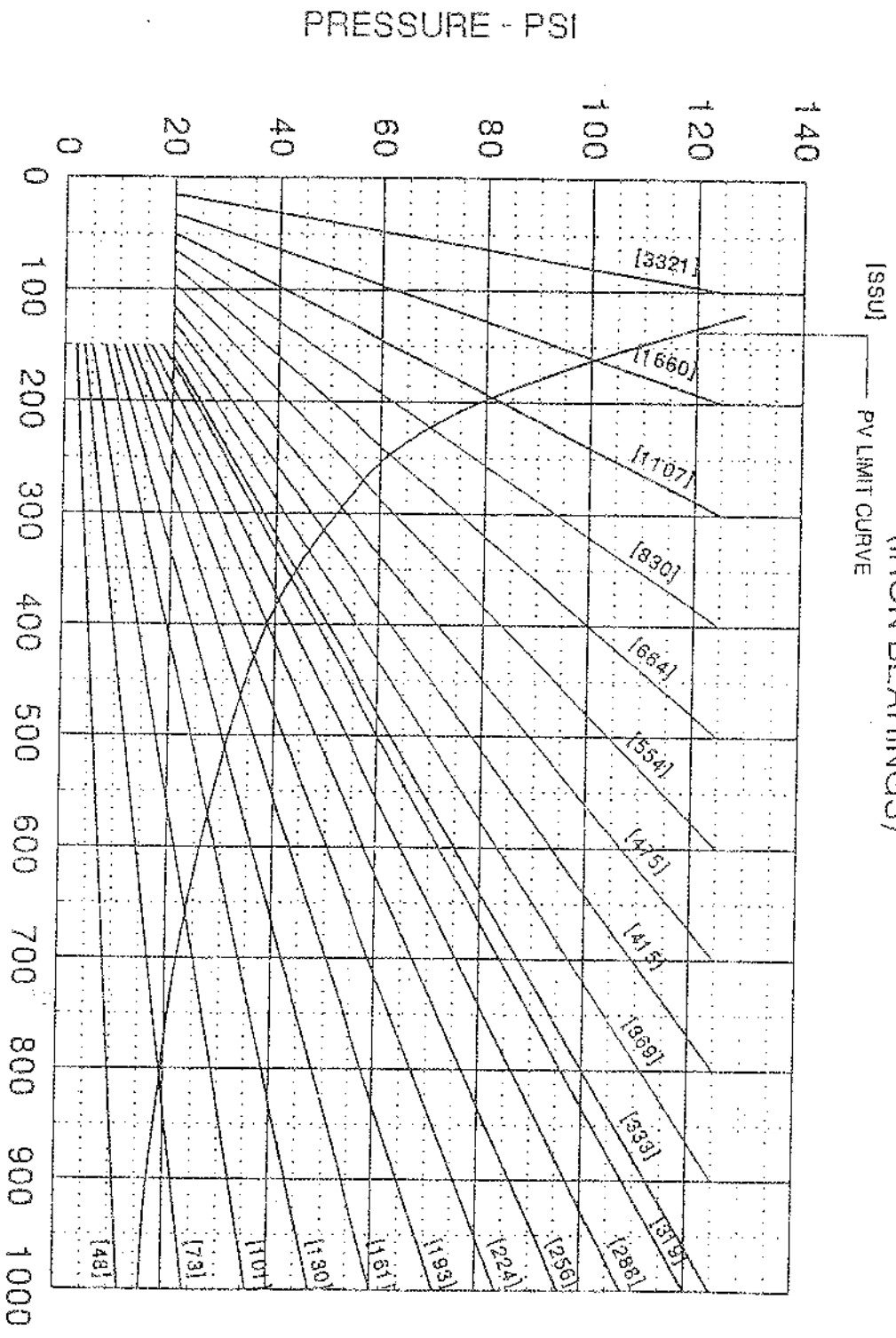
COMMERCE, GEORGIA

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ISSUED 1/96

COMMERCE, GEORGIA



4699
(IRON BEARINGS)



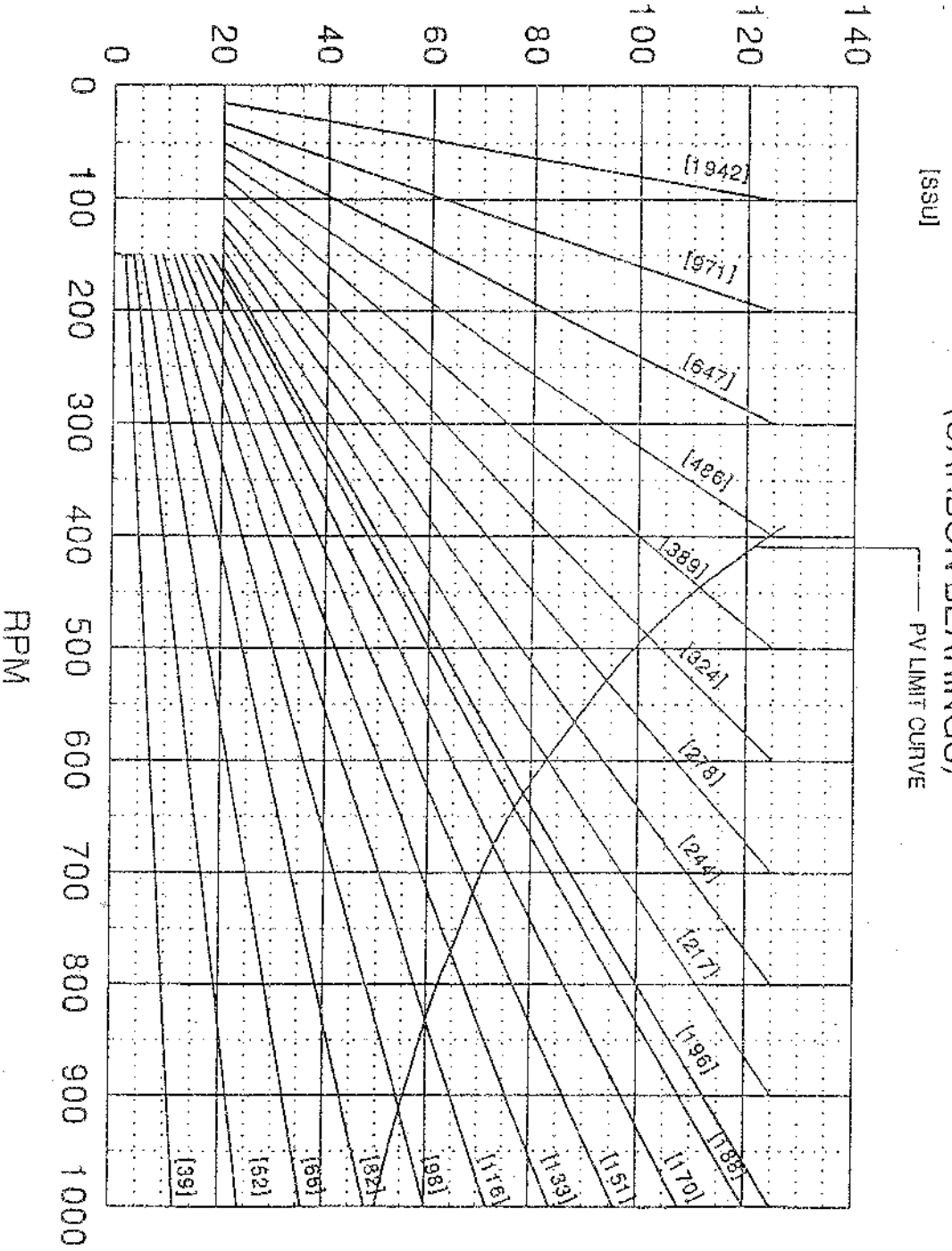
ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

PRESSURE - PSI

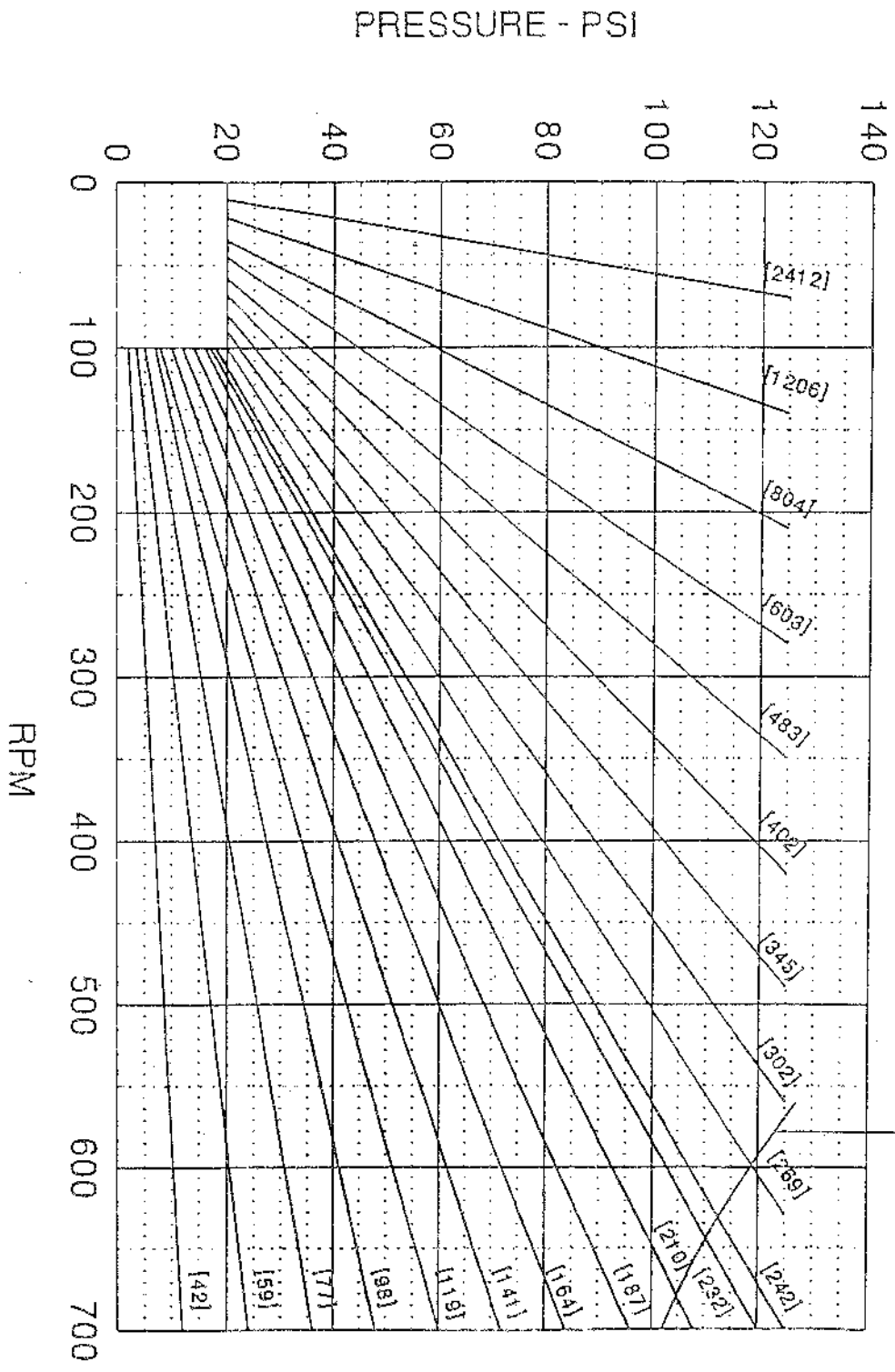


RPM

4717 ARV (BRONZE BEARINGS)

[35U]

PV LIMIT CURVE



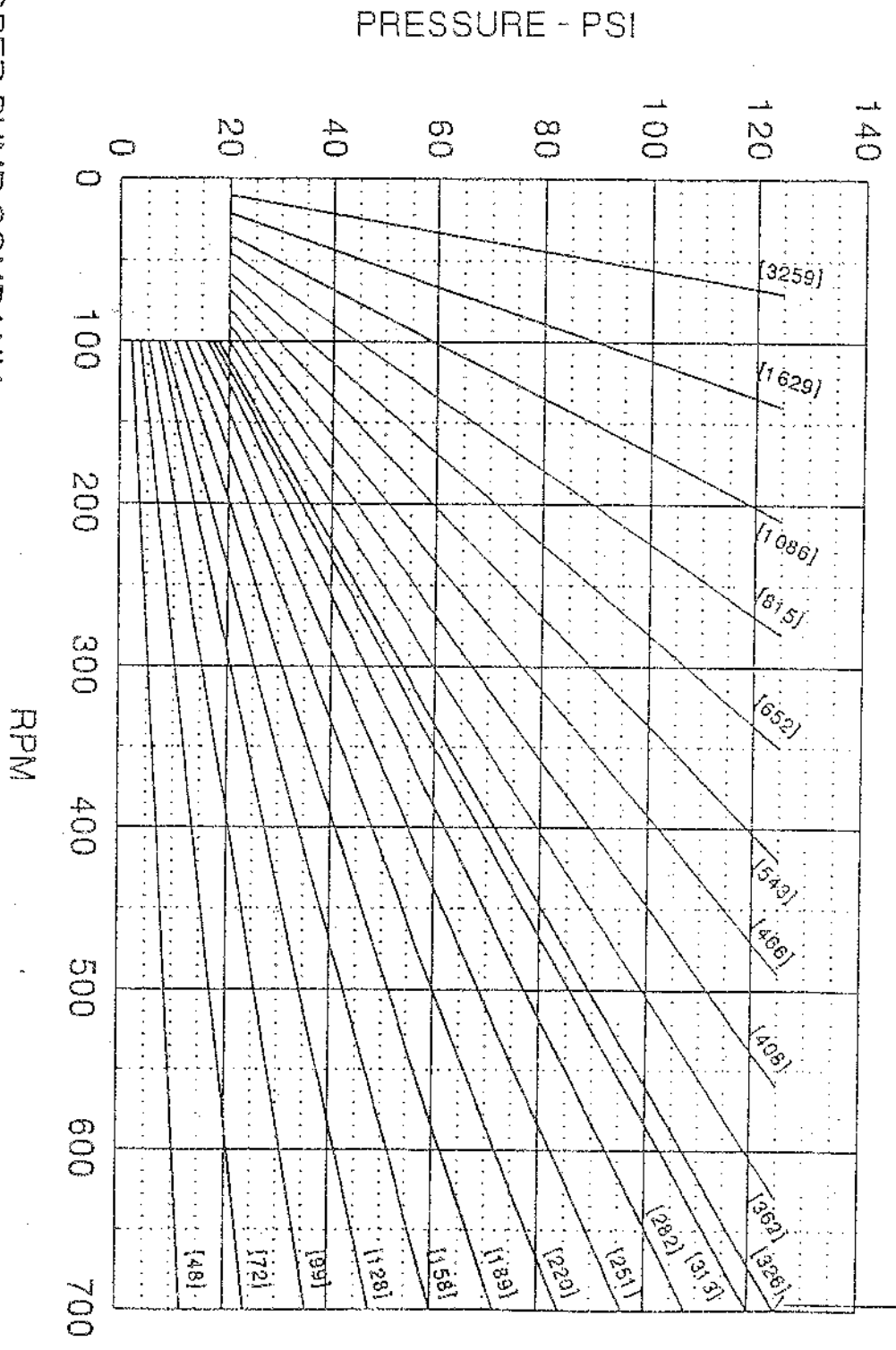
ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

4717 ARV
(CARBON BEARINGS)

[SSU]

PV LIMIT CURVE

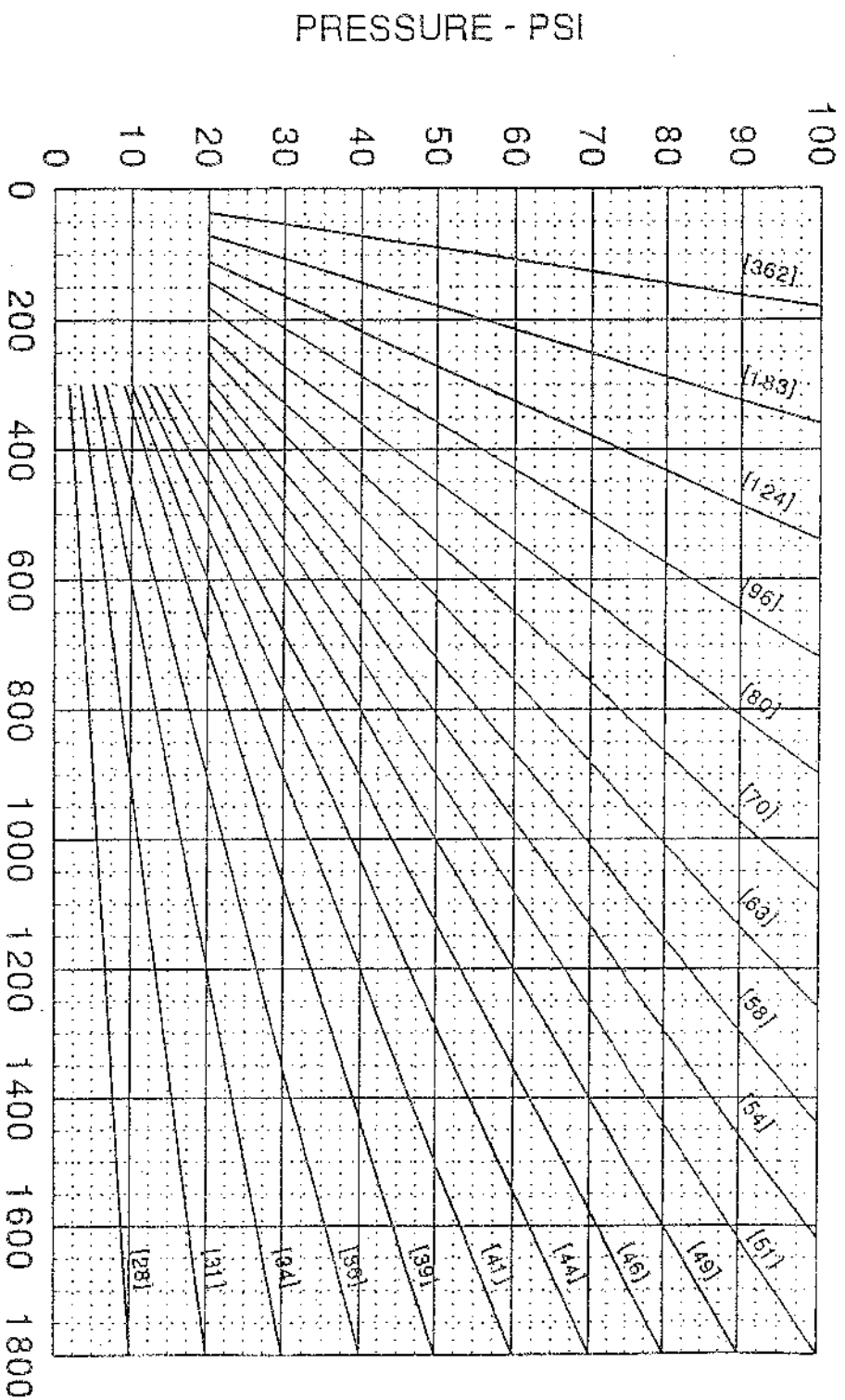


ROPER PUMP COMPANY
ISSUED: 1/96

COMMERCE, GEORGIA

26016
(CARBON BEARINGS)

[SSU]

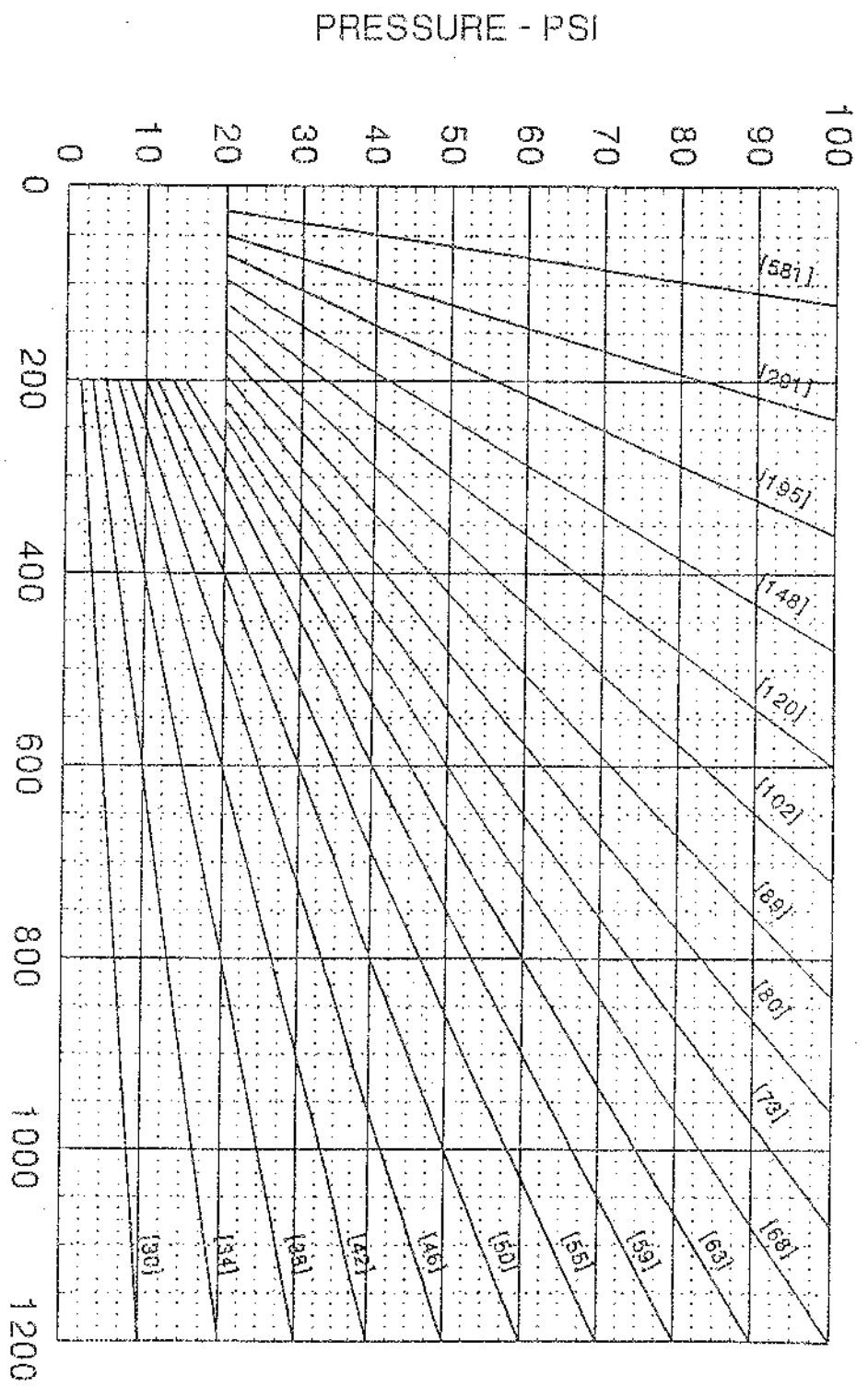


ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

(ISSU)

26024 (CARBON BEARINGS)



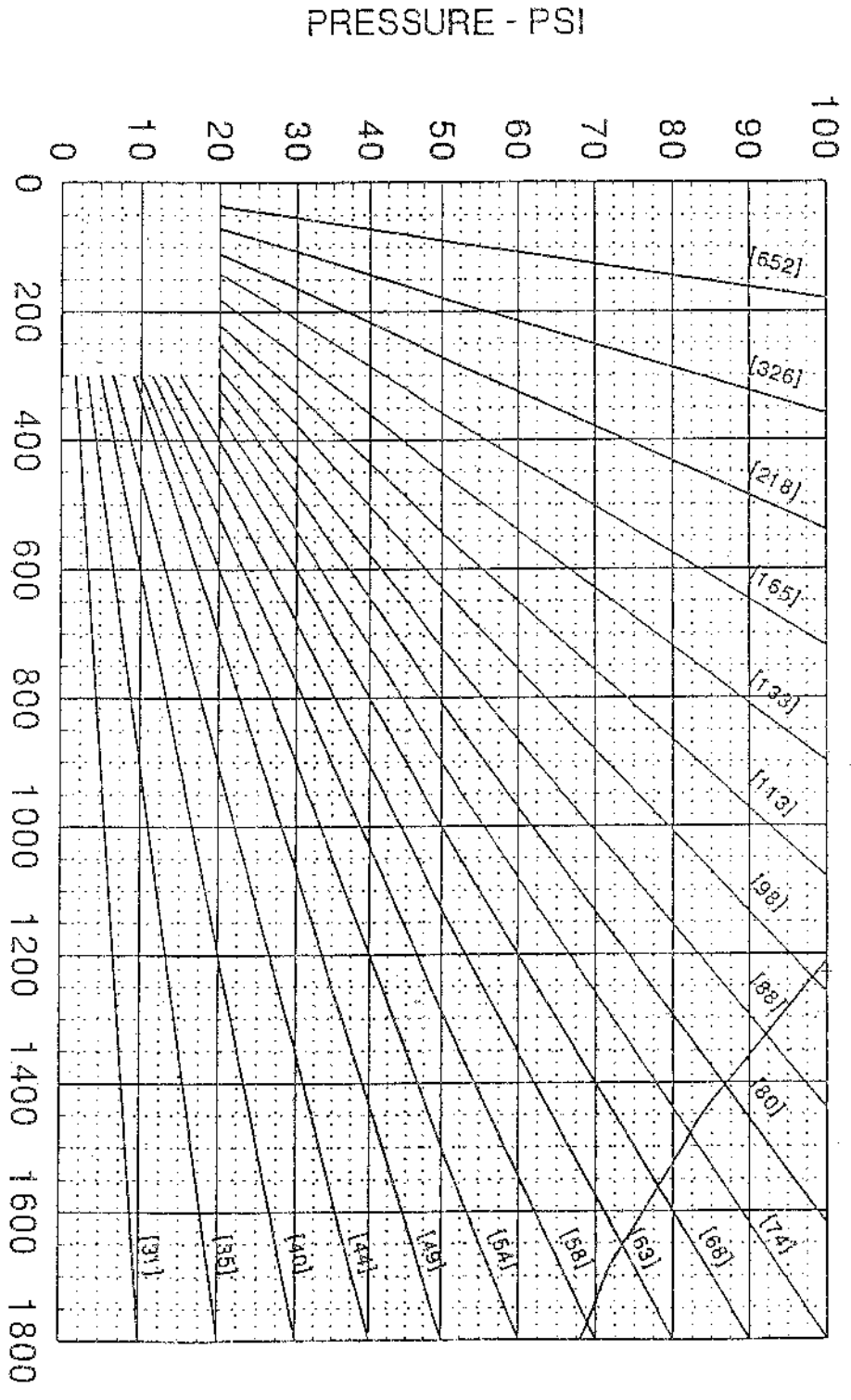
ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

26032 (CARBON BEARINGS)

[352]

PV LIMIT CURVE



PRESSURE - PSI

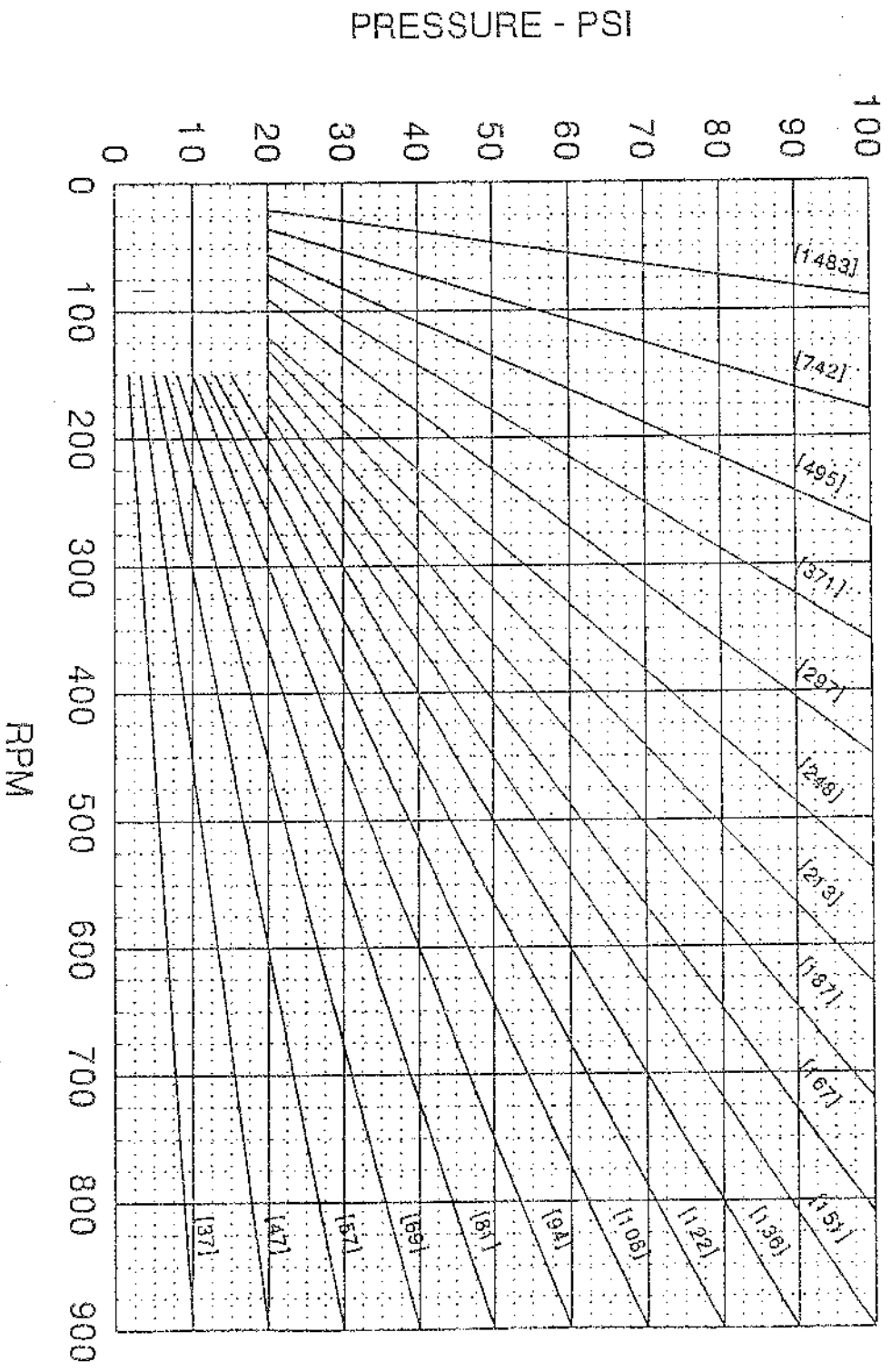
RPM

ROPER PUMP COMPANY
ISSUED: 7/56

COMMERCE, GEORGIA

26064
(CARBON BEARINGS)

[35u]



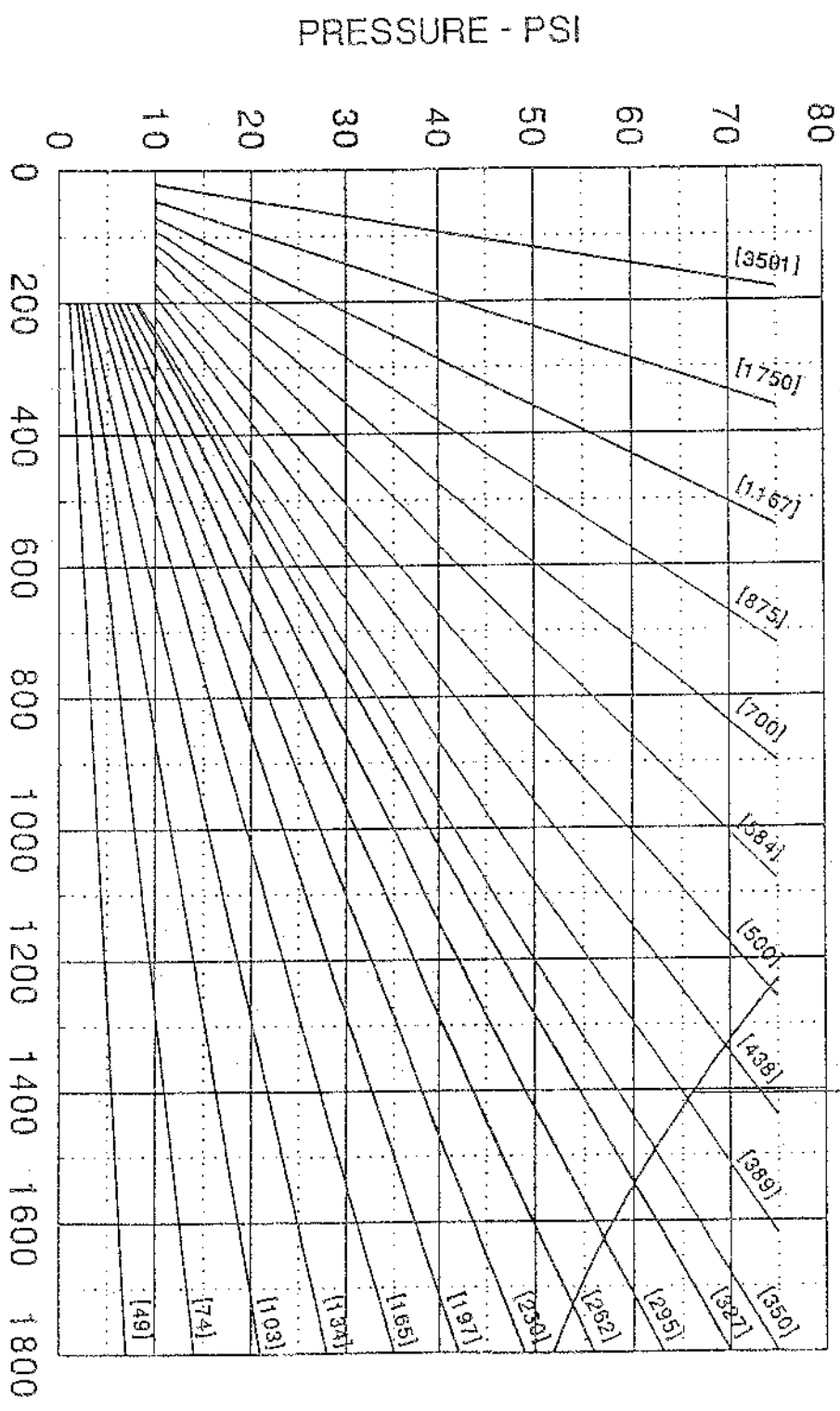
ROPER PUMP COMPANY
ISSUED 1/66

COMMERCE, GEORGIA

2835
(BRONZE BEARINGS)

[ISSU]

PV LIMIT CURVE

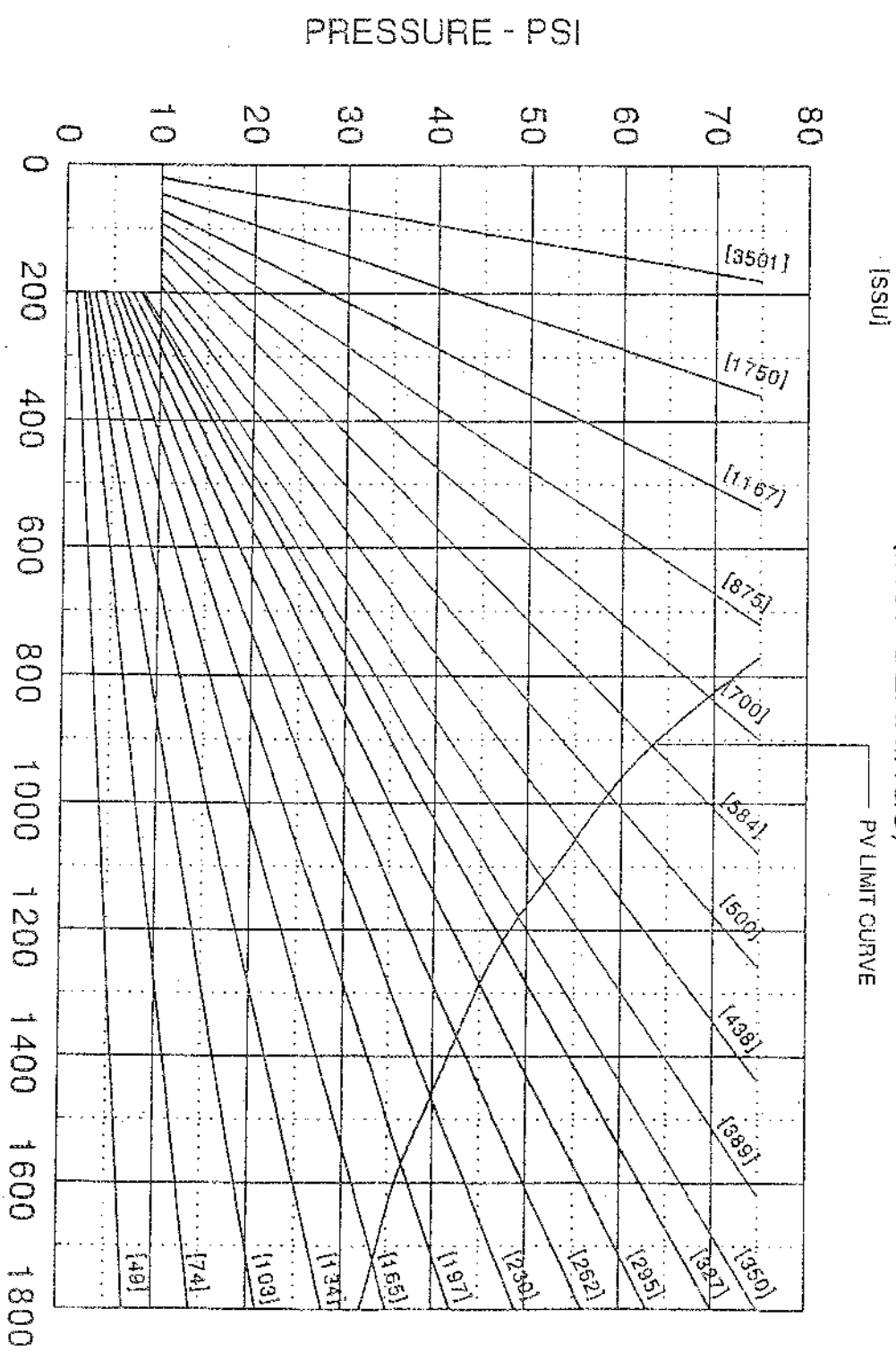


ROPER PUMP COMPANY
ISSUED 1/96

RPM

COMMERCE, GEORGIA

2835
(IRON BEARINGS)

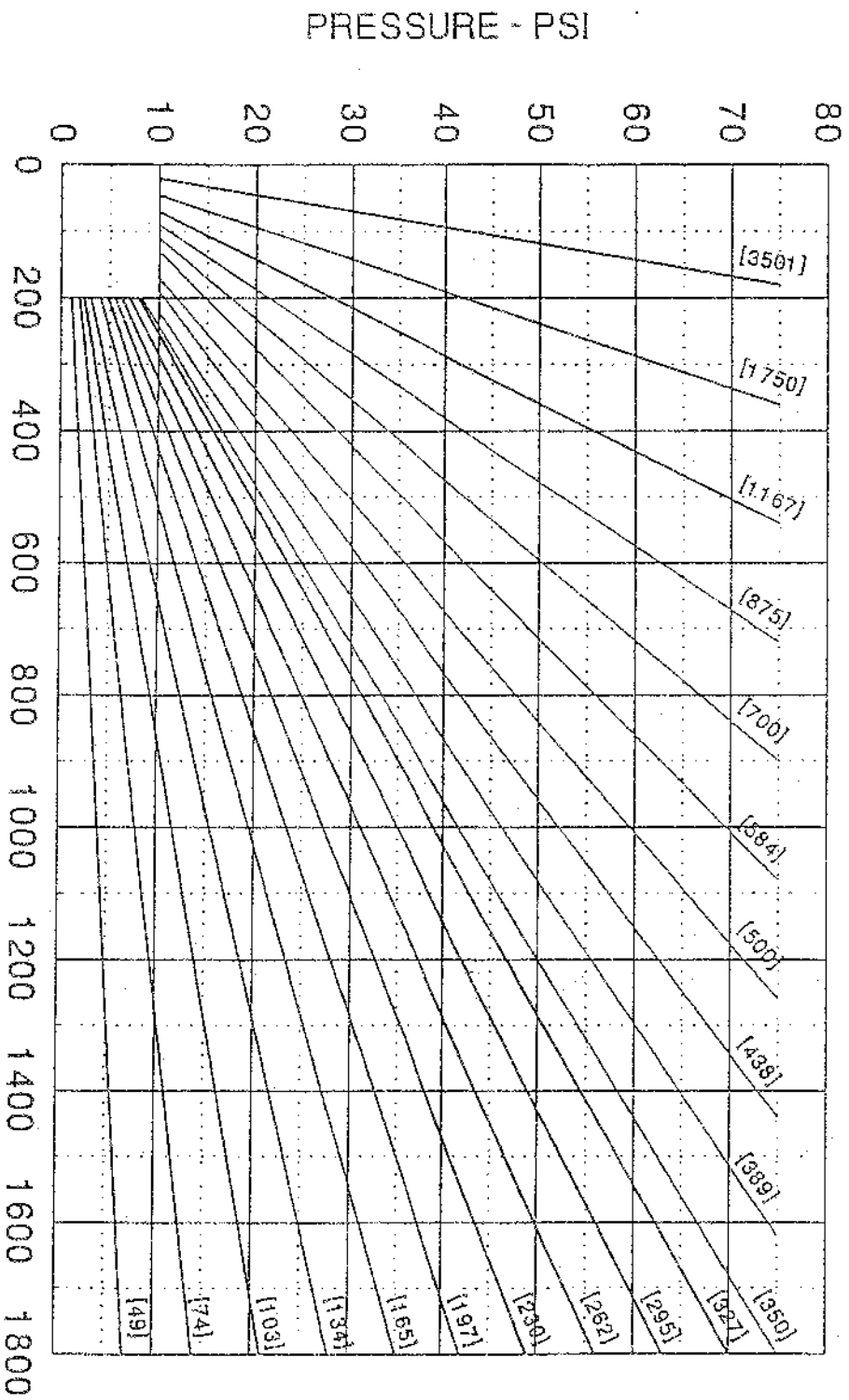


ROPER PUMP COMPANY
ISSUED 1/56

COMMERCE, GEORGIA

[SSU]

2835 (CARBON BEARINGS)



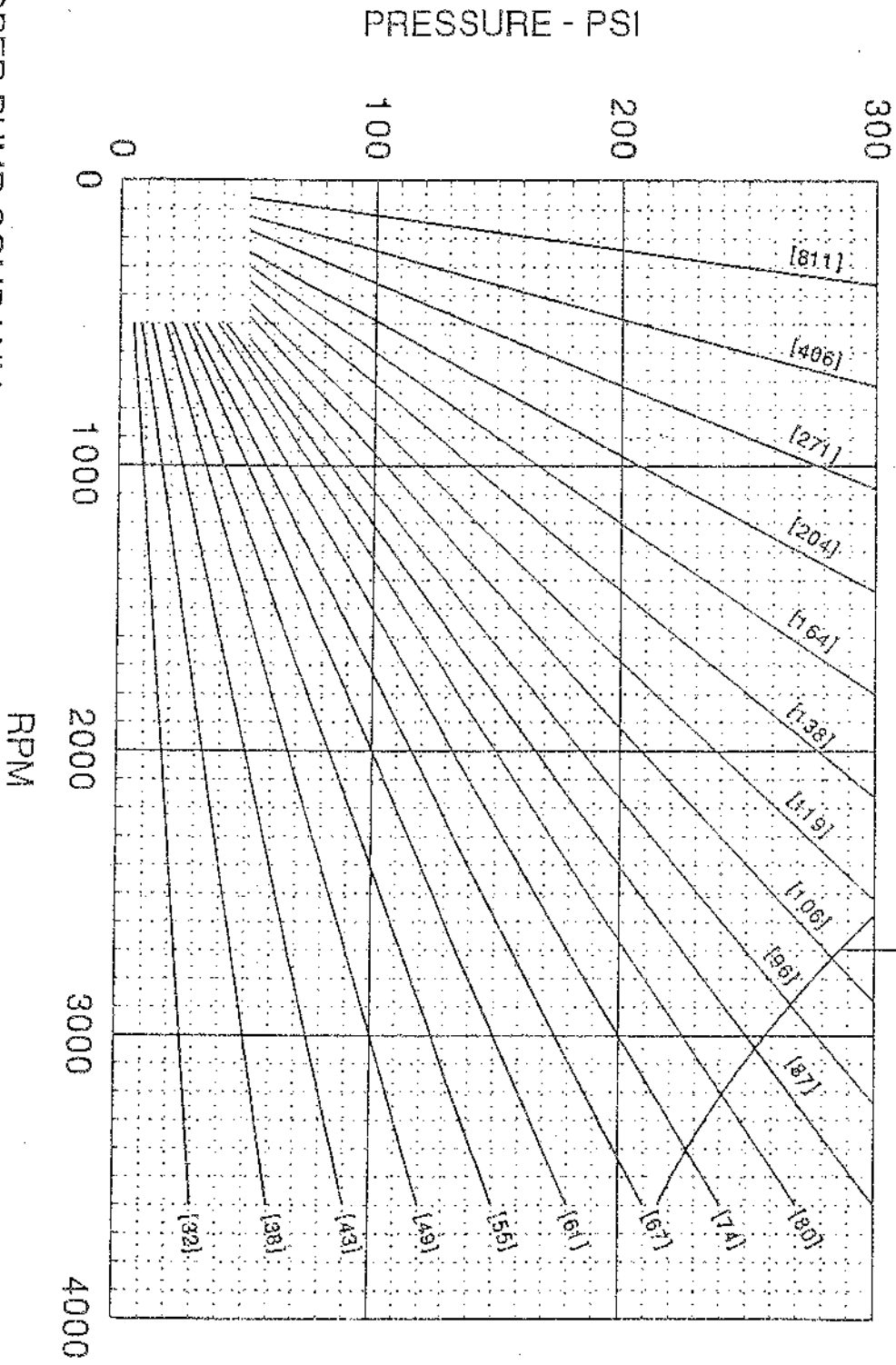
ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

RPM

PRESSURE - PSI

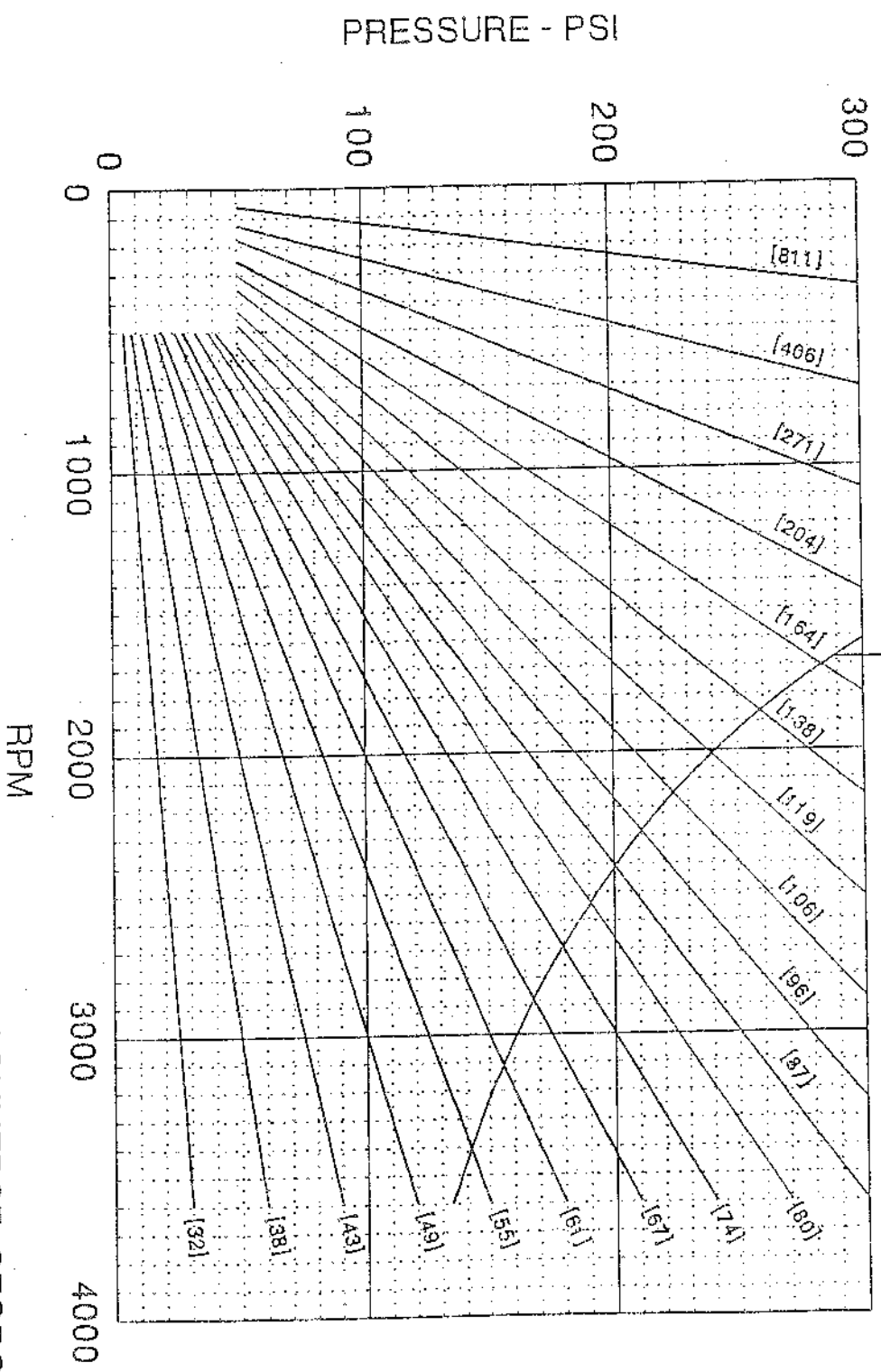
A005
 (BRONZE BEARINGS)
 PV LIMIT CURVE
 [SSU]



ROPER PUMP COMPANY
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COMMERCE, GEORGIA

A005
 (IRON BEARINGS)
 PV LIMIT CURVE
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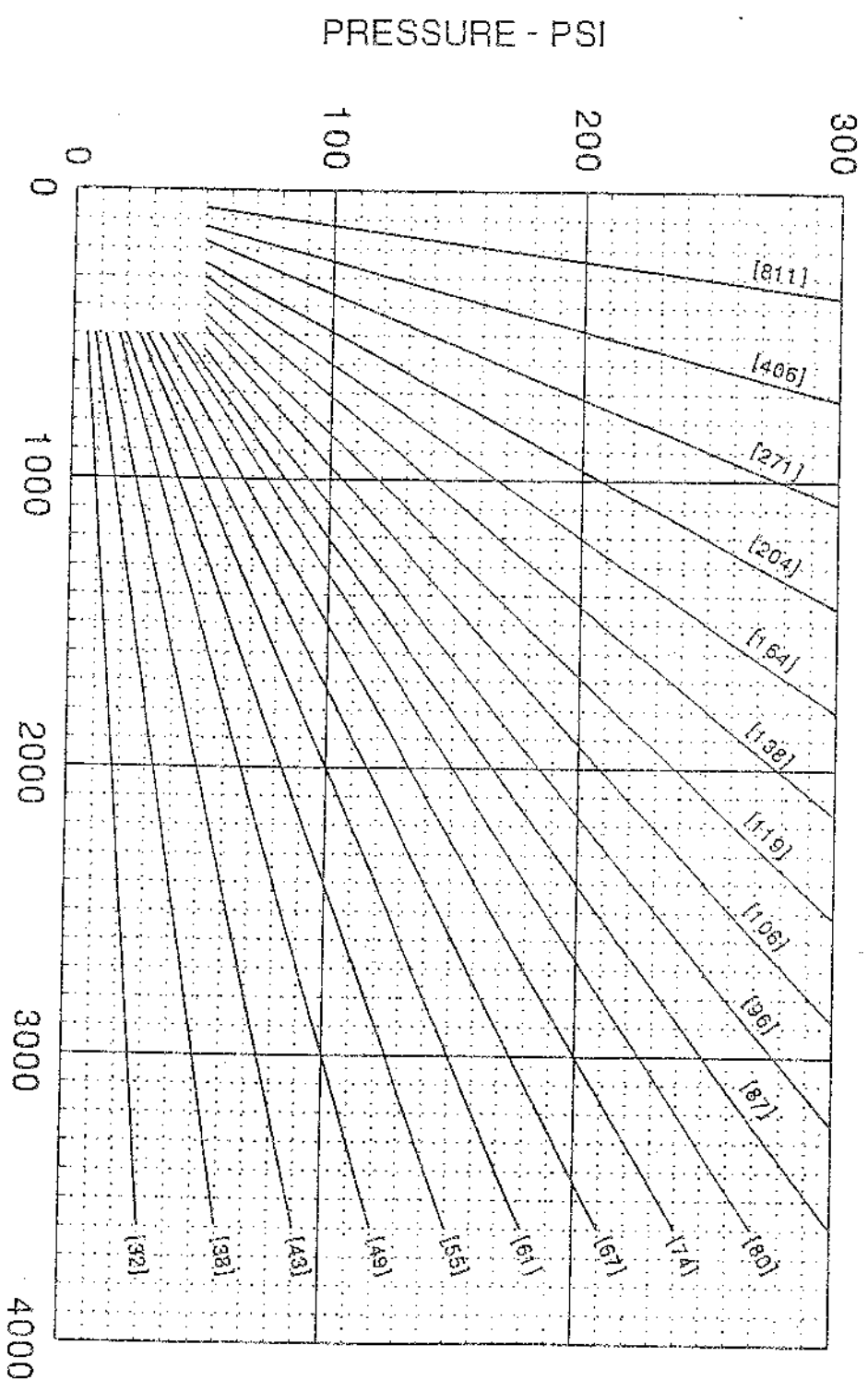


ROPER PUMP COMPANY
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ISSUJ

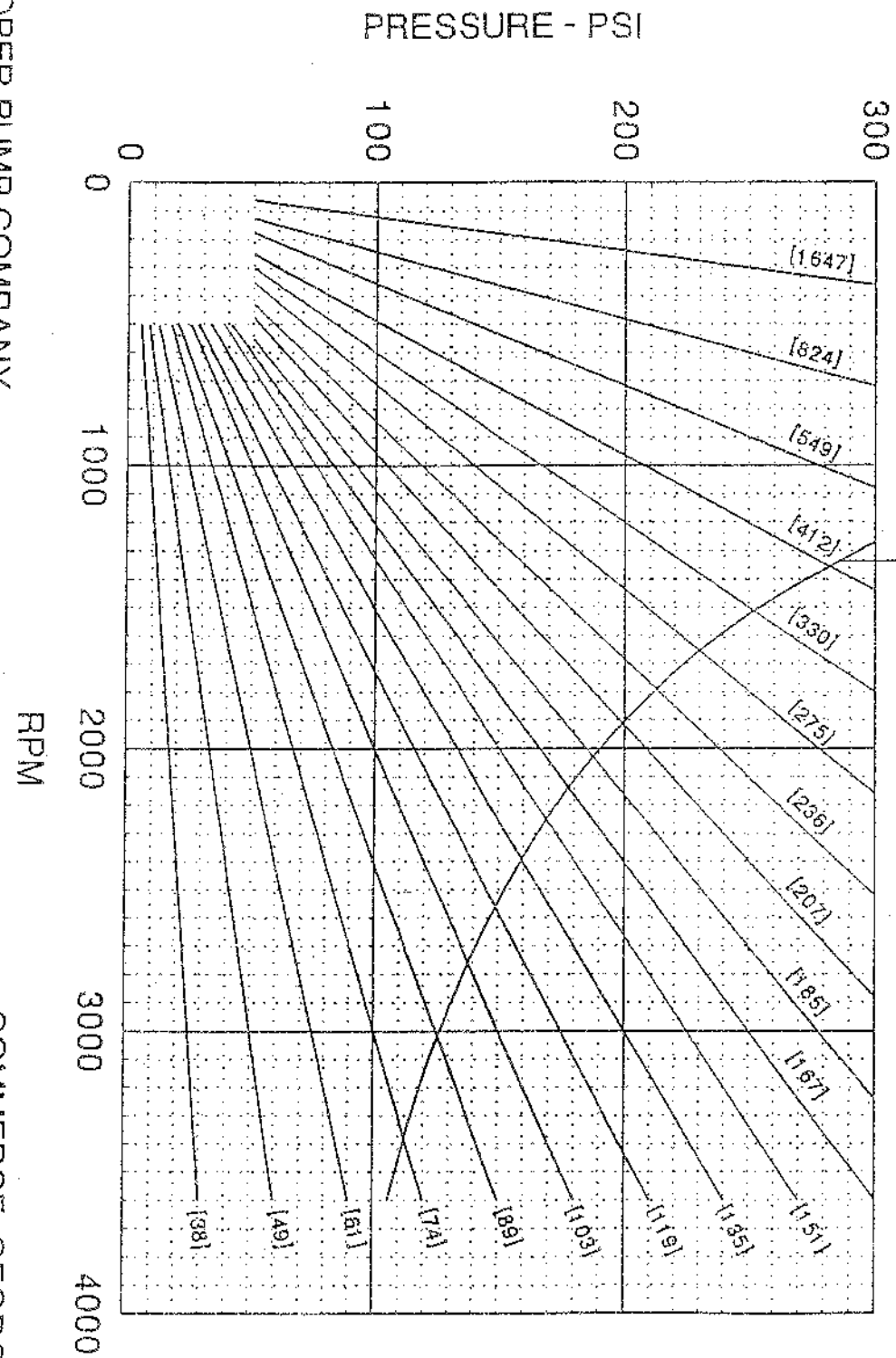
A005
(CARBON BEARINGS)



ROPER PUMP COMPANY
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A01
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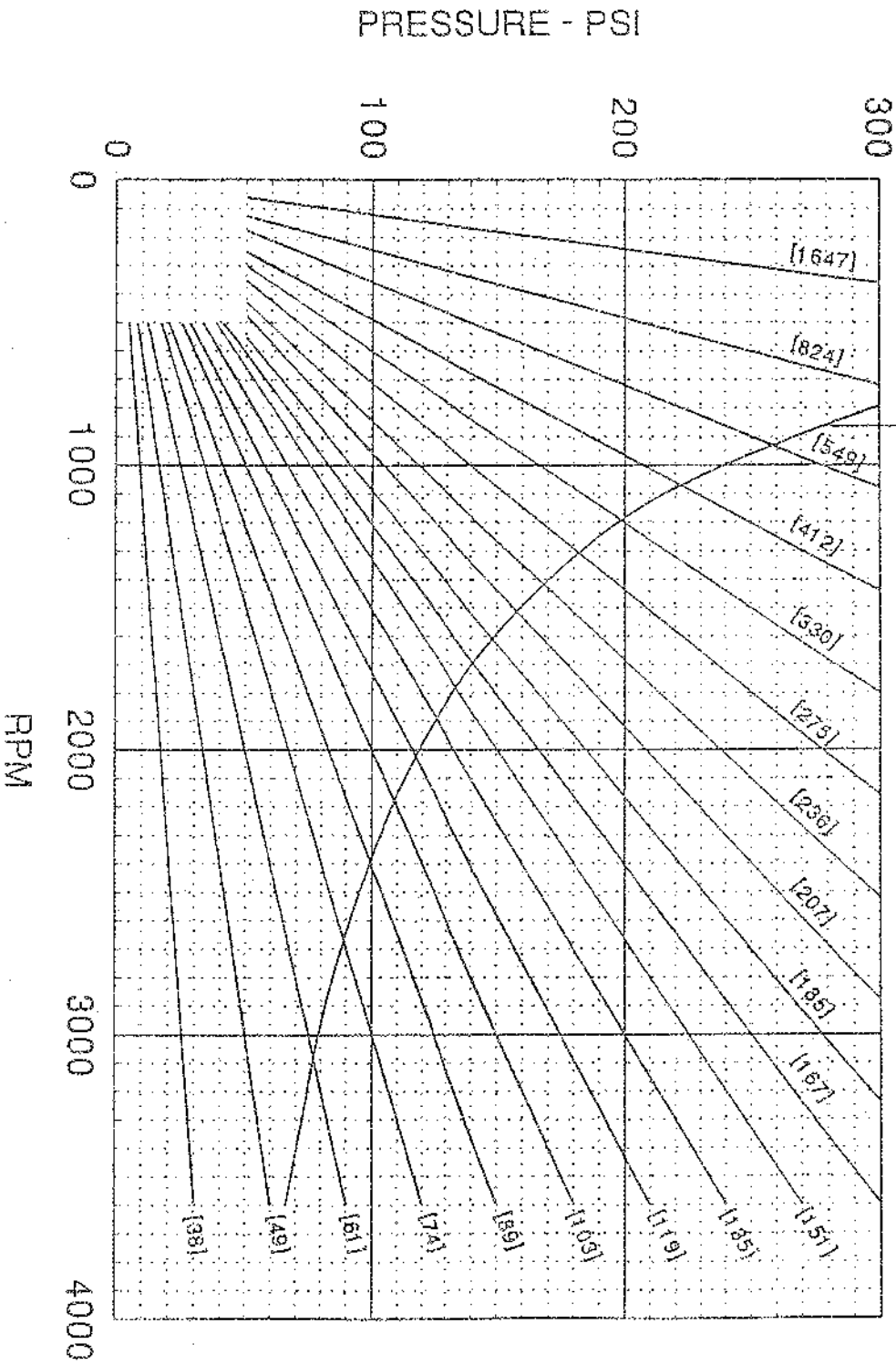
ROPER PUMP COMPANY
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COMMERCE, GEORGIA

A01
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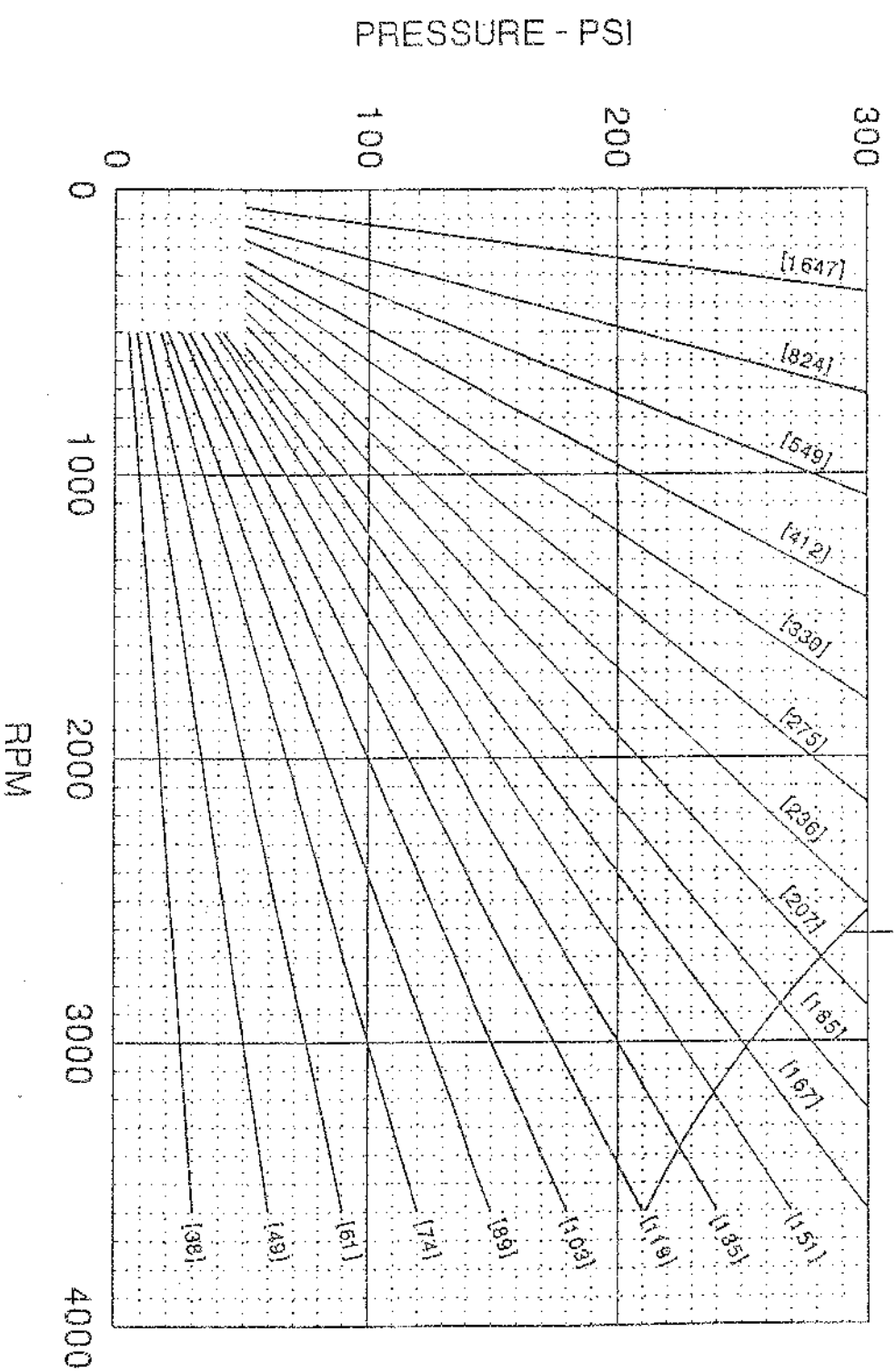
PV LIMIT CURVE



ROPER PUMP COMPANY
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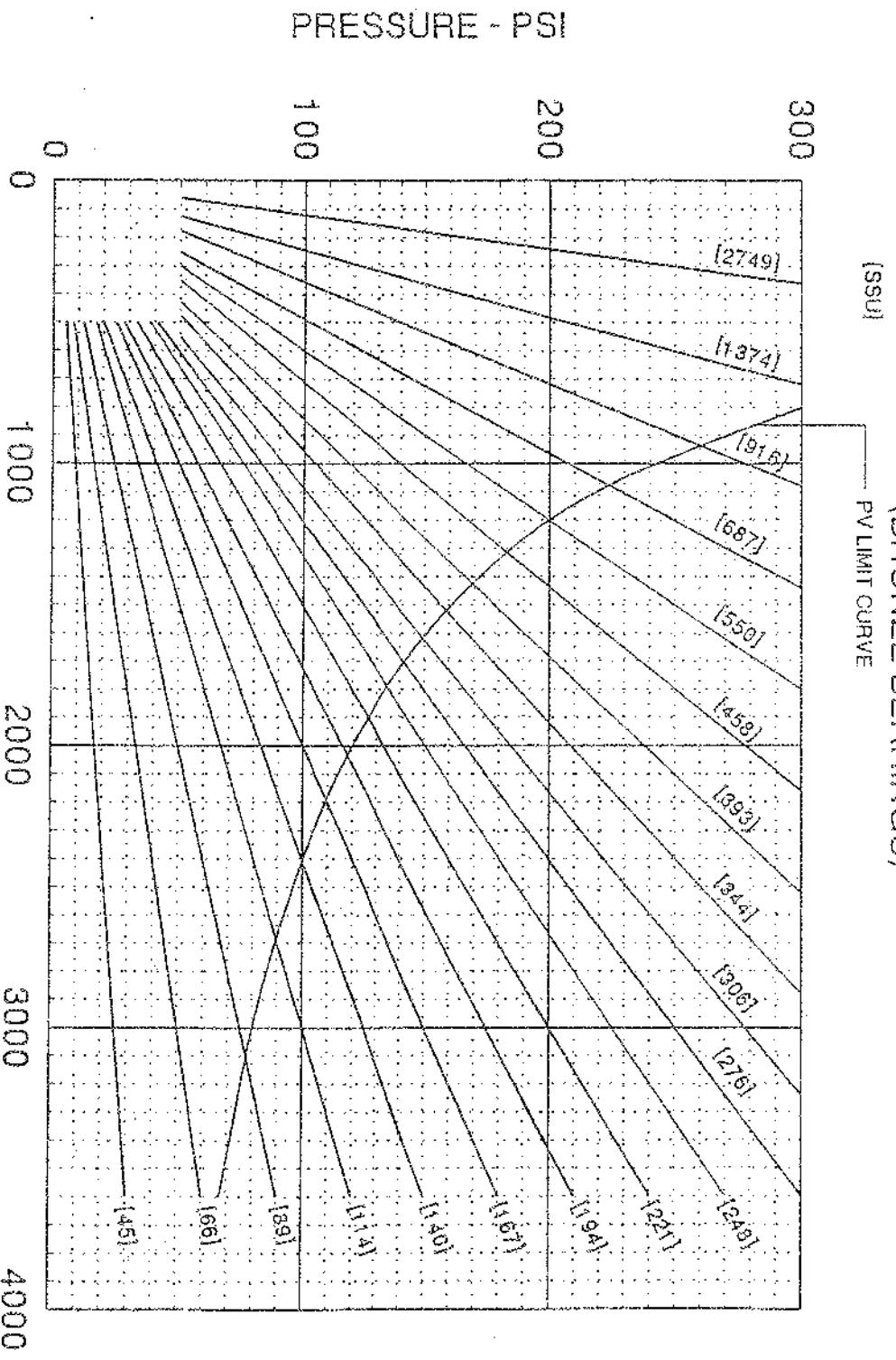
COMMERCE, GEORGIA

A01
(CARBON BEARINGS)
PV LIMIT CURVE



ROPER PUMP COMPANY
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COMMERCE, GEORGIA

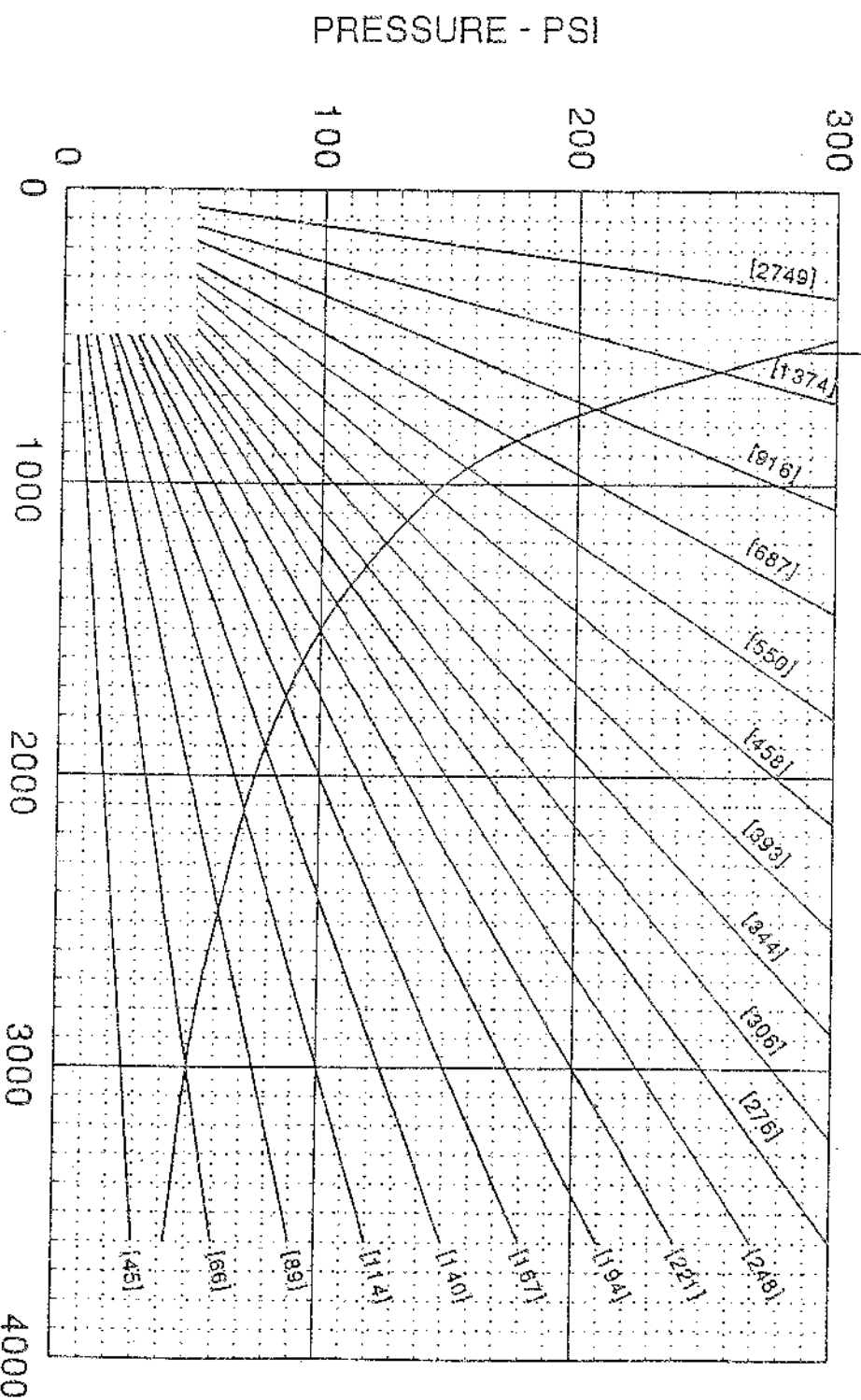
A02
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ROPER PUMP COMPANY
ISSUED: 7/98

COMMERCE, GEORGIA

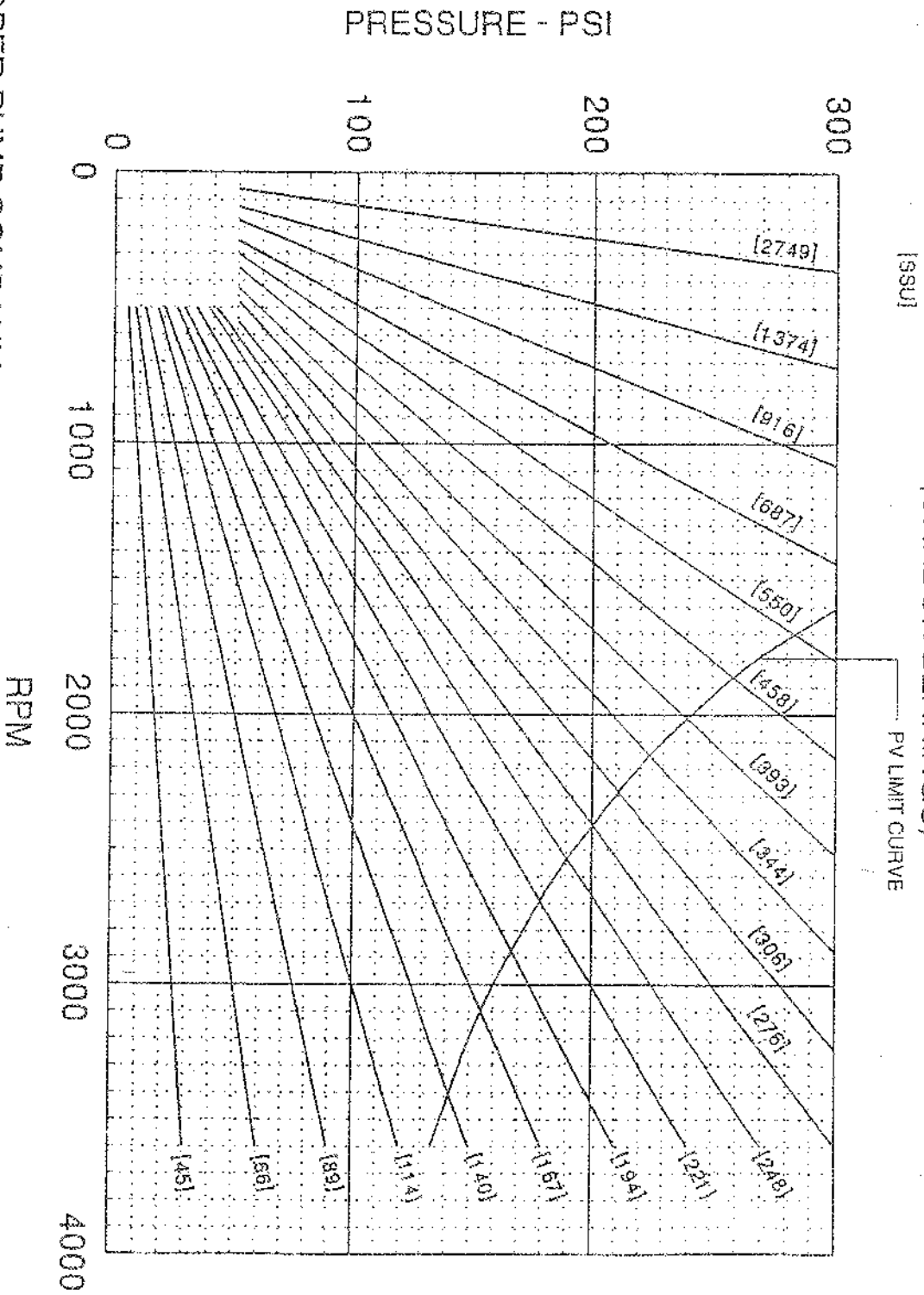
A02
(IRON BEARINGS)
PV LIMIT CURVE
(SSU)



ROPER PUMP COMPANY
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COMMERCE, GEORGIA

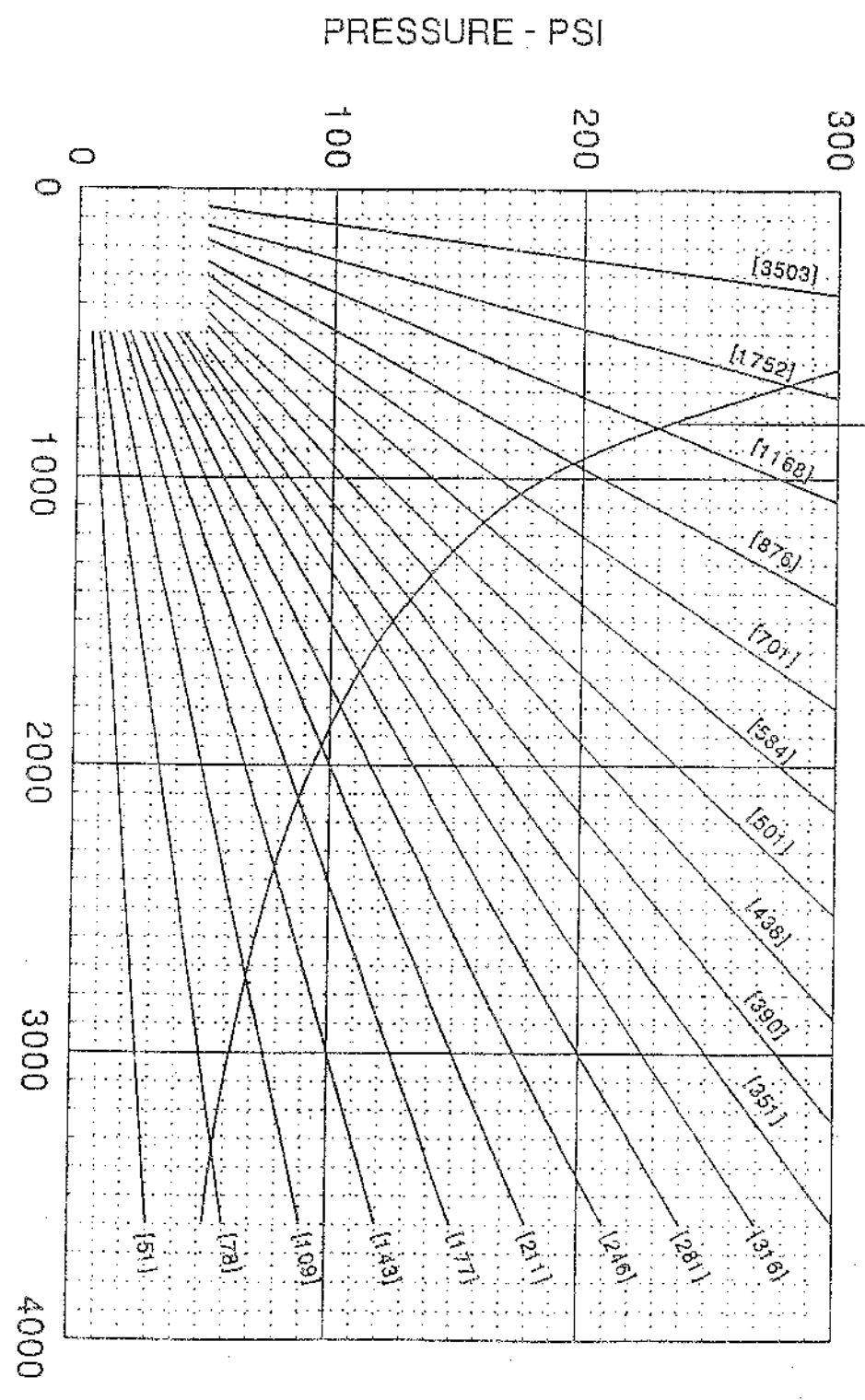
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COMMERCE, GEORGIA

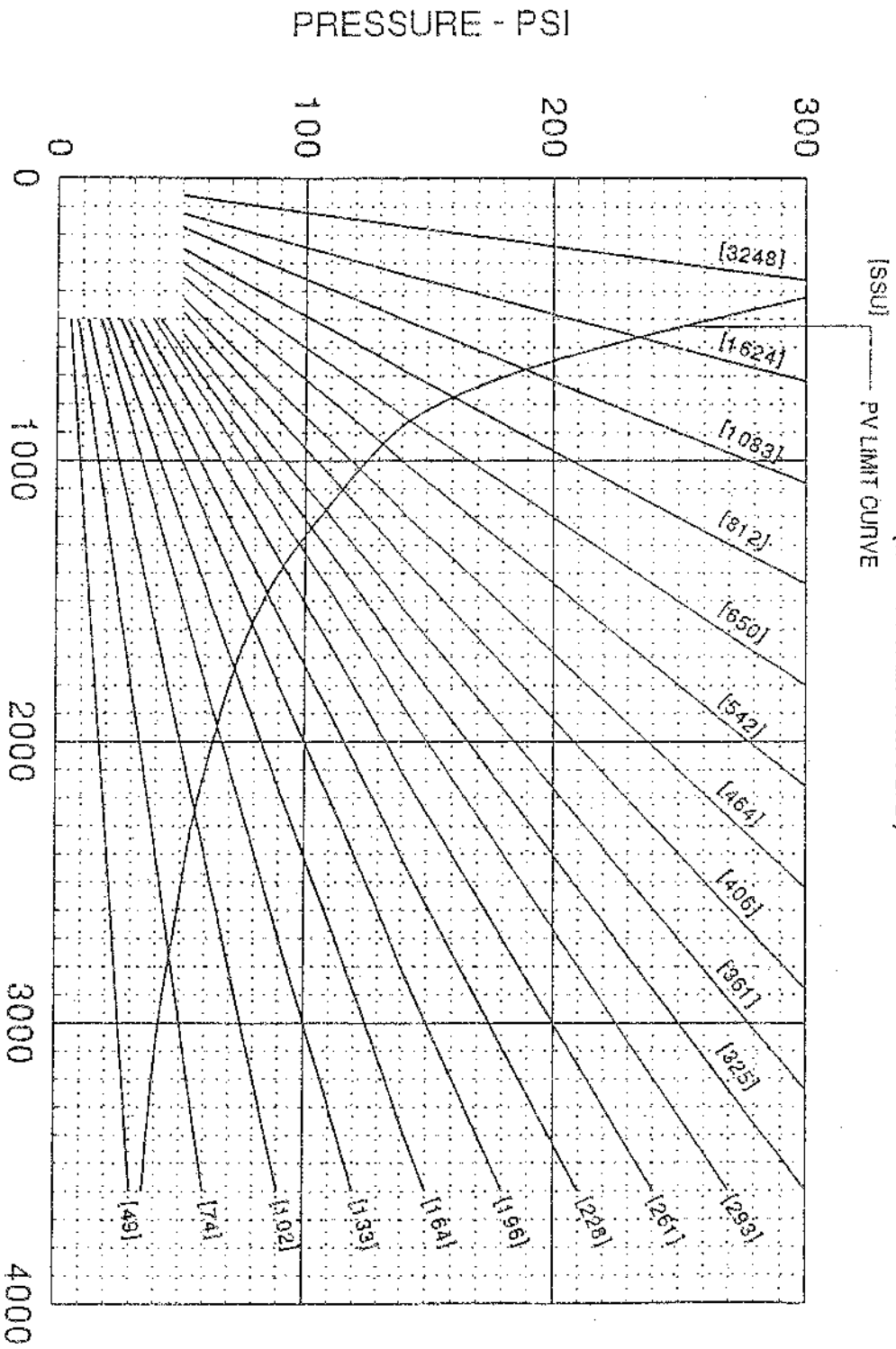
A03
 (BRONZE BEARINGS)
 PV LIMIT CURVE
 [SSU]



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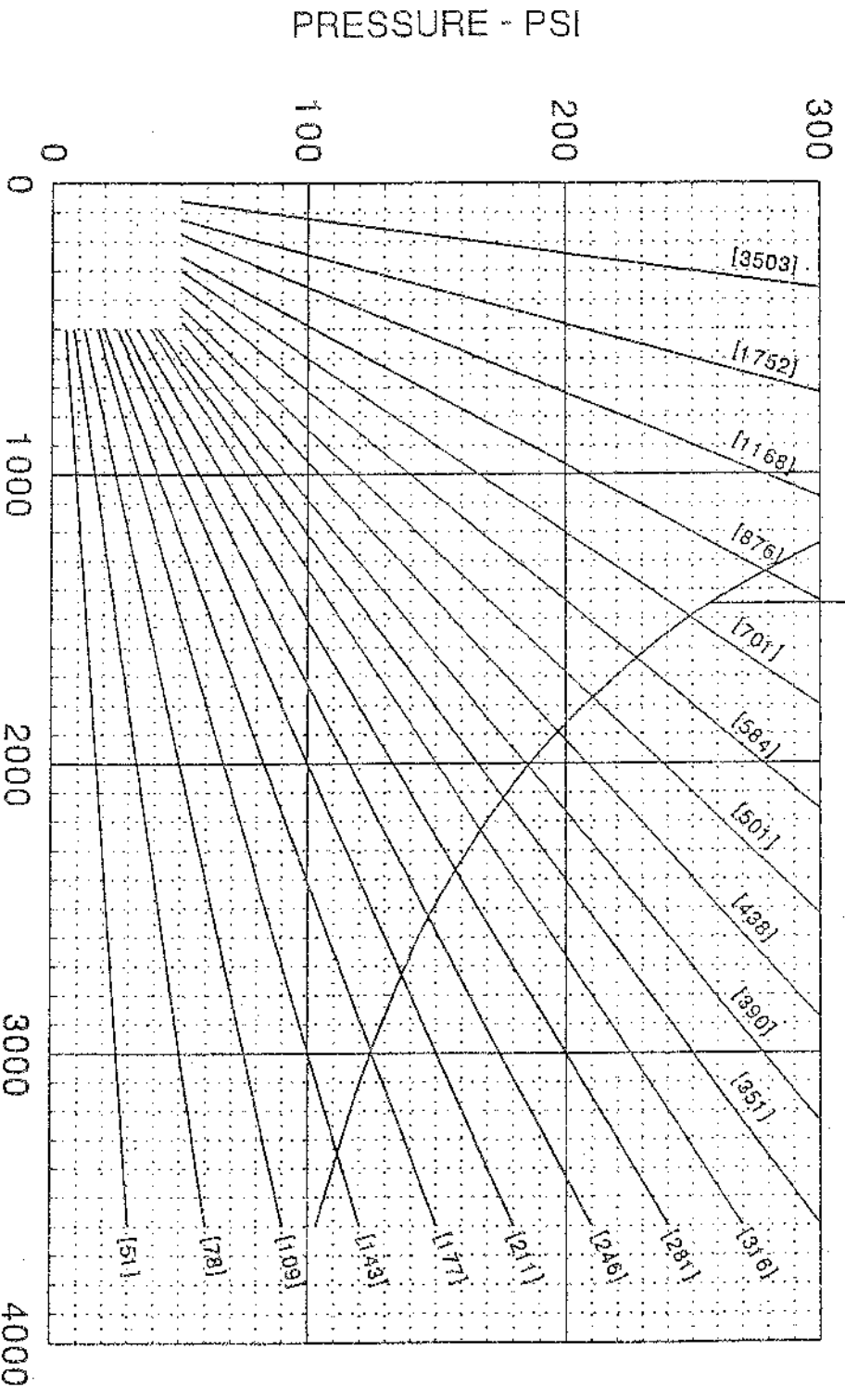
A03
(IRON BEARINGS)



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COMMERCE, GEORGIA

A03
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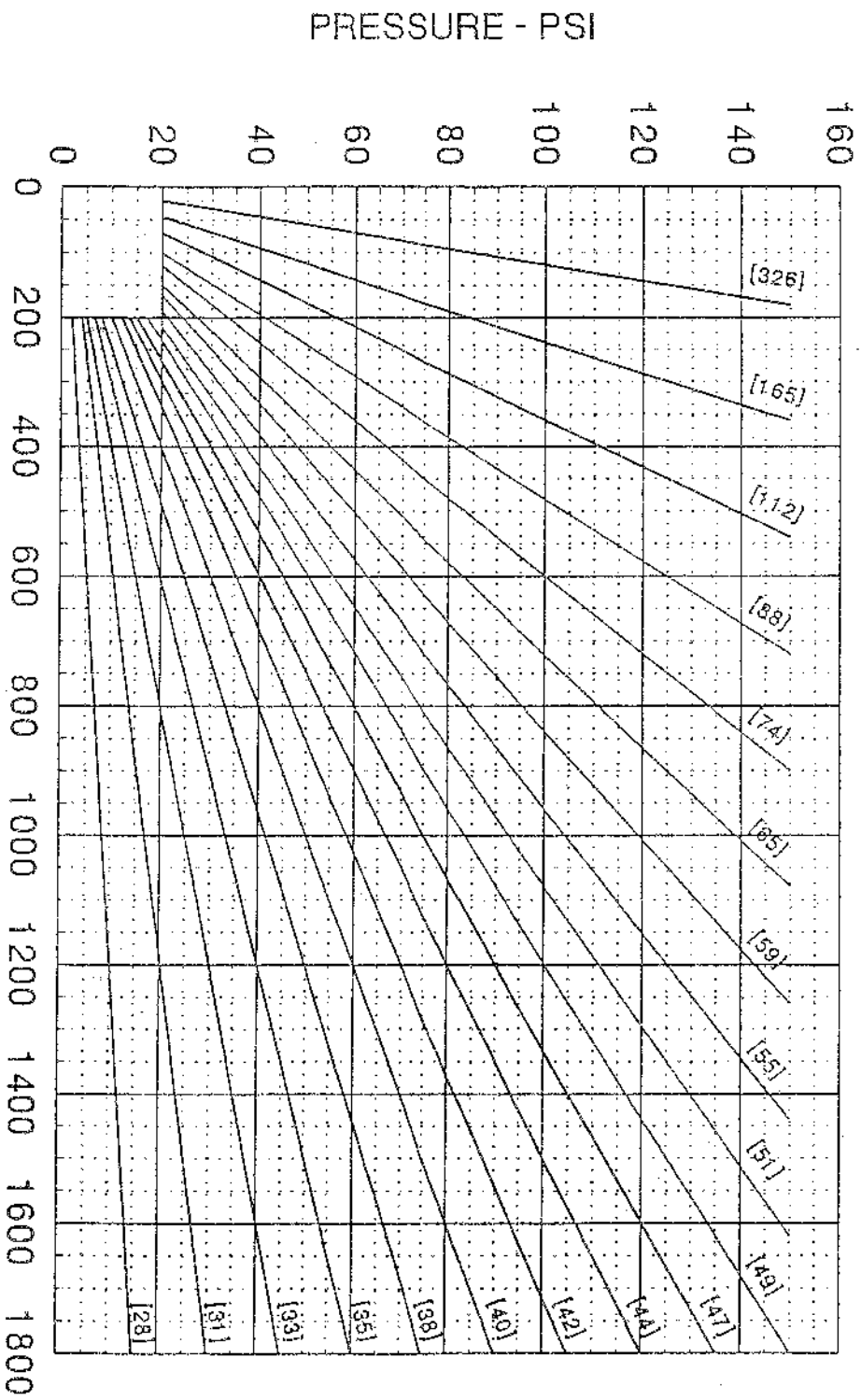


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[SSU]

A06 (BRONZE BEARINGS)



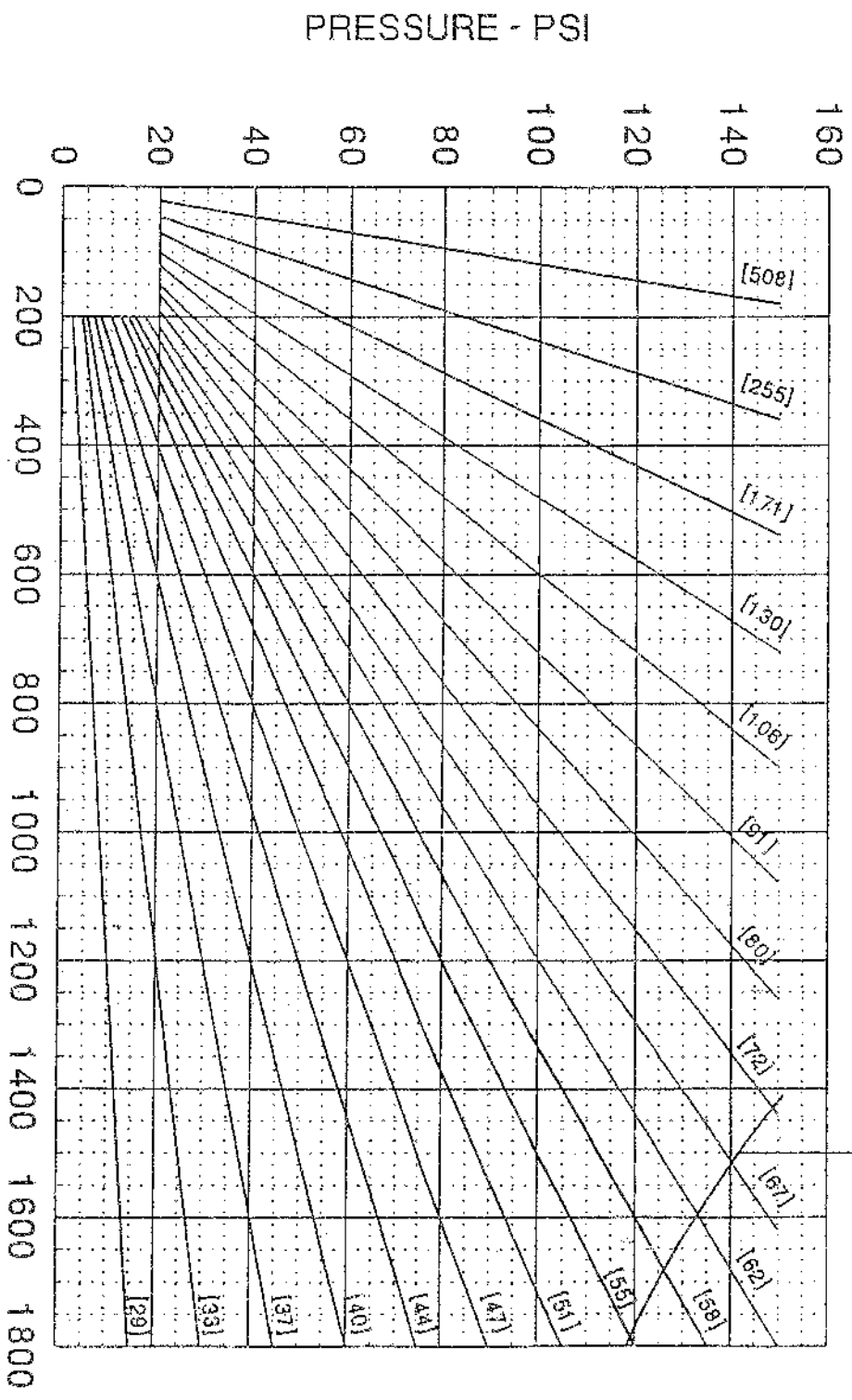
ROPER PUMP COMPANY
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COMMERCE, GEORGIA

A06 (IRON BEARINGS)

[SSU]

PV LIMIT CURVE

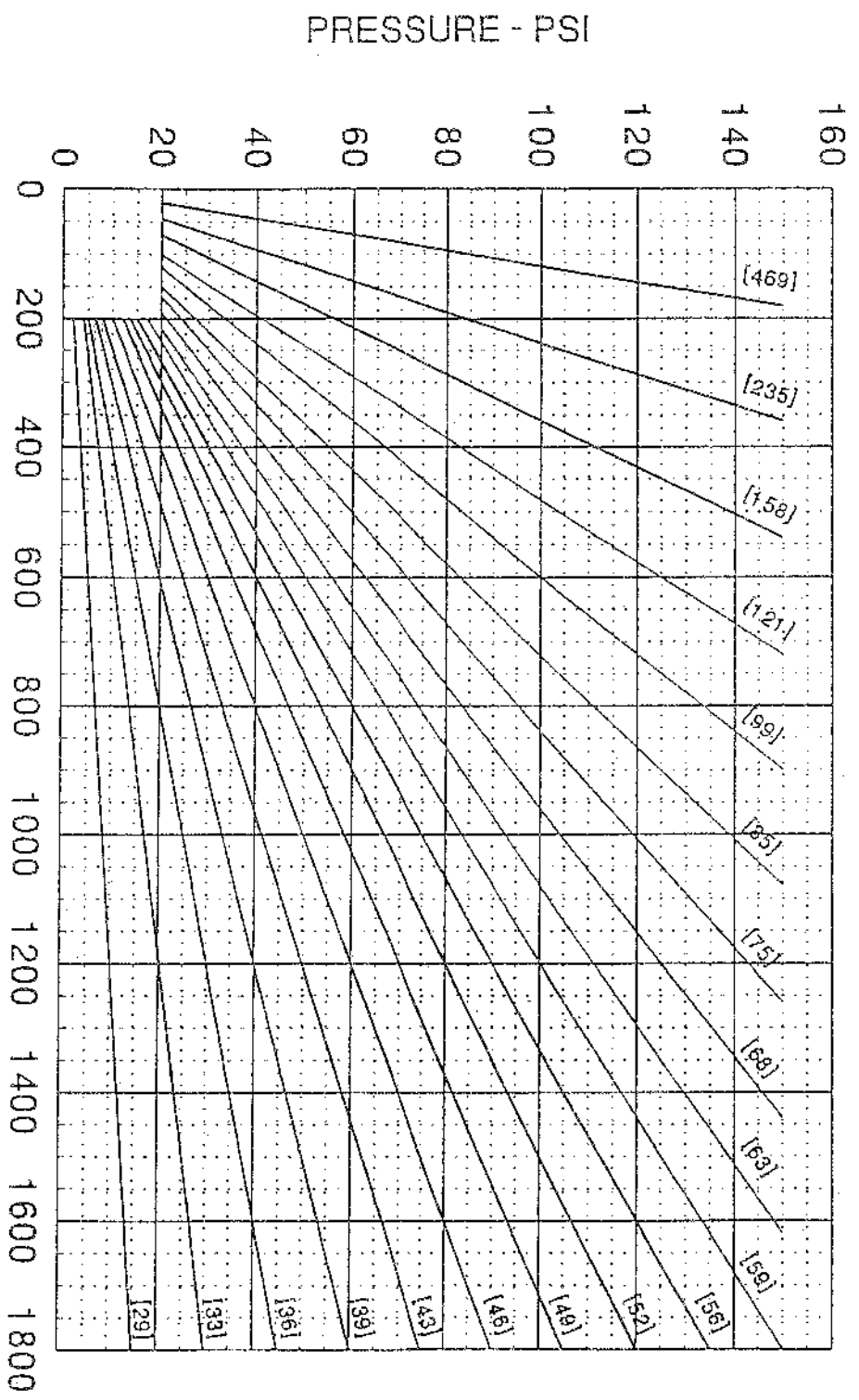


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A06
(CARBON BEARINGS)

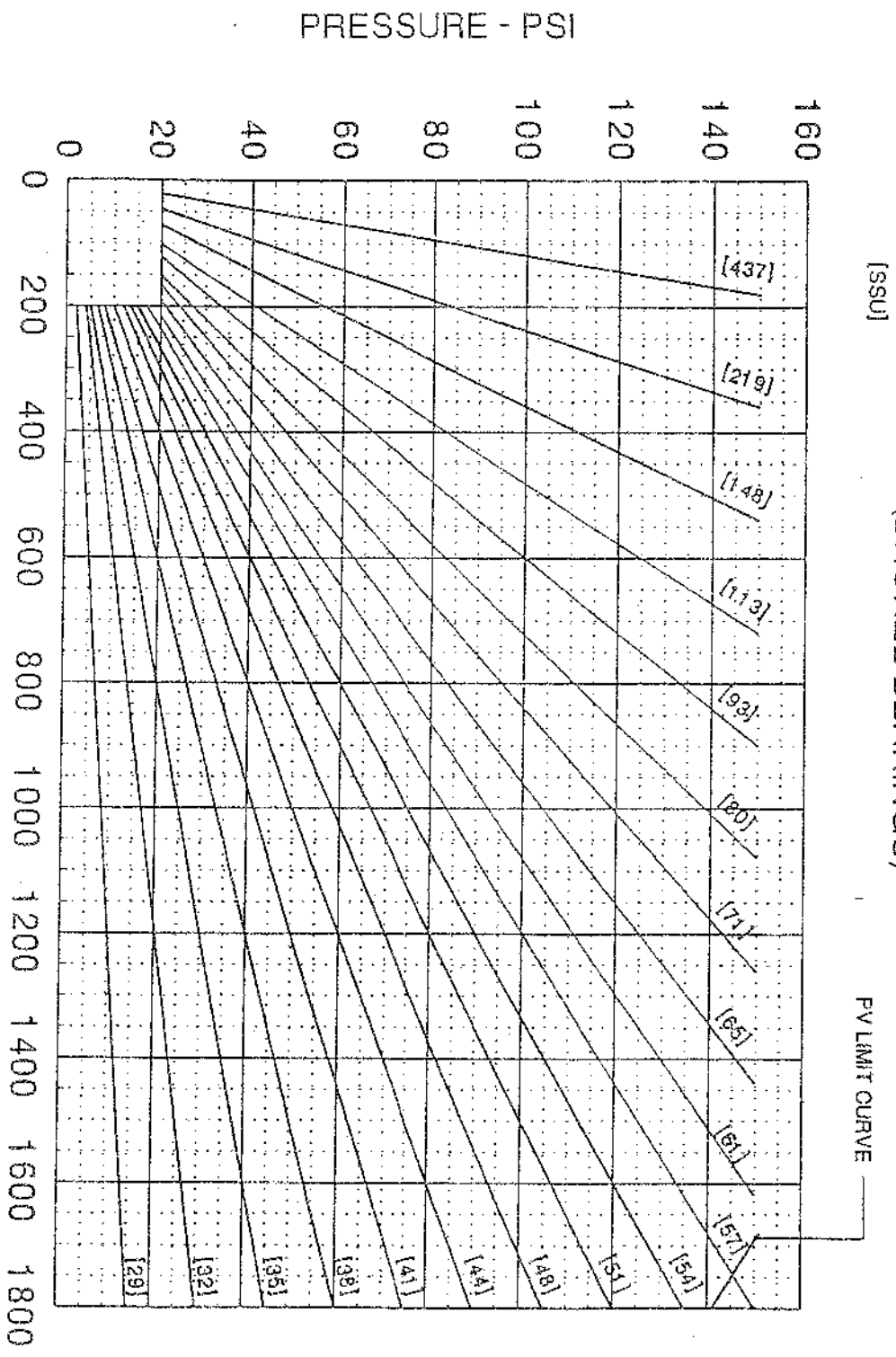
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ROPER PUMP COMPANY
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COMMERCE, GEORGIA

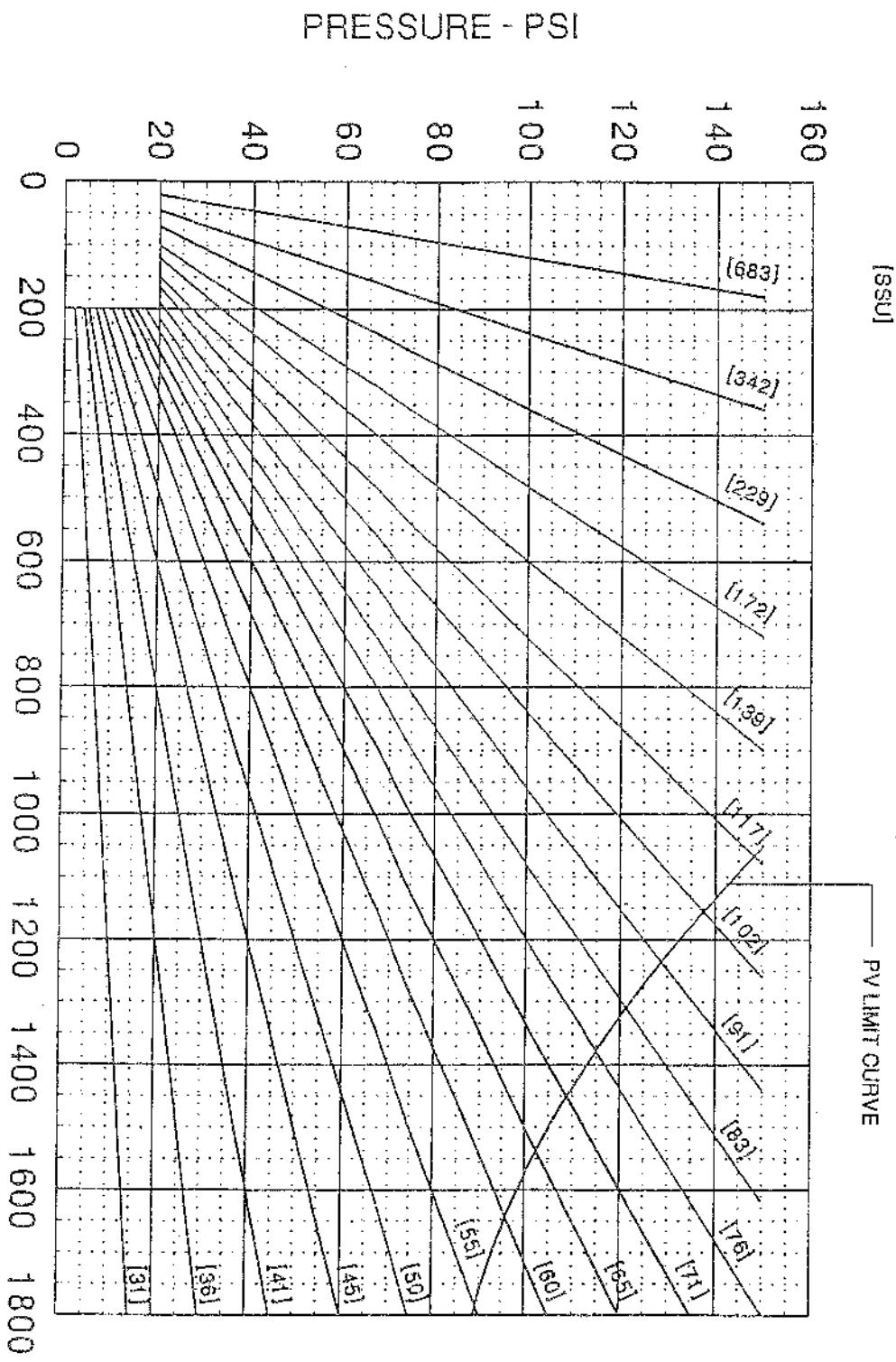
A08 (BRONZE BEARINGS)



ROPER PUMP COMPANY
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COMMERCE, GEORGIA

A08
(IRON BEARINGS)

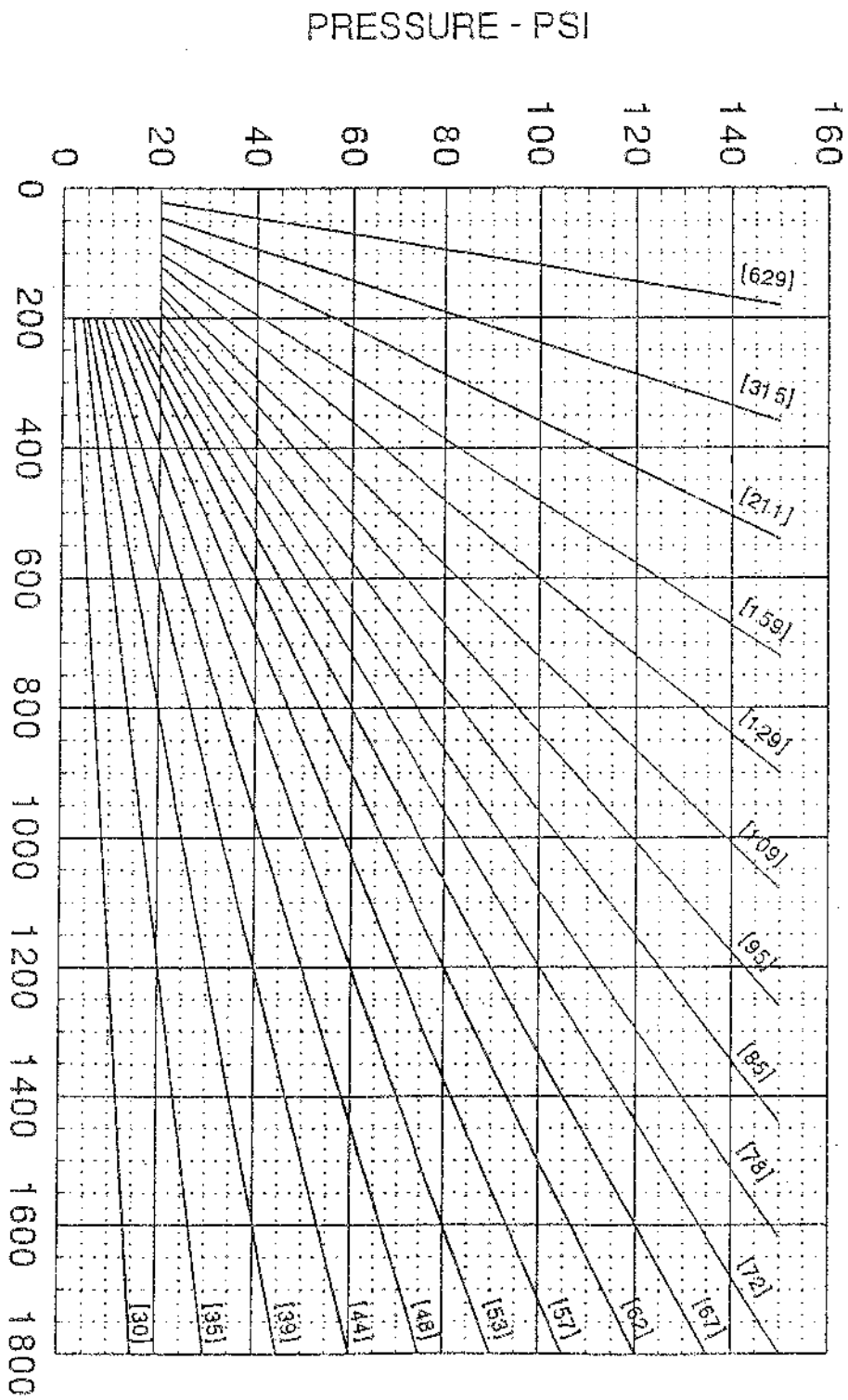


ROPER PUMP COMPANY
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COMMERCE, GEORGIA

[ISSU]

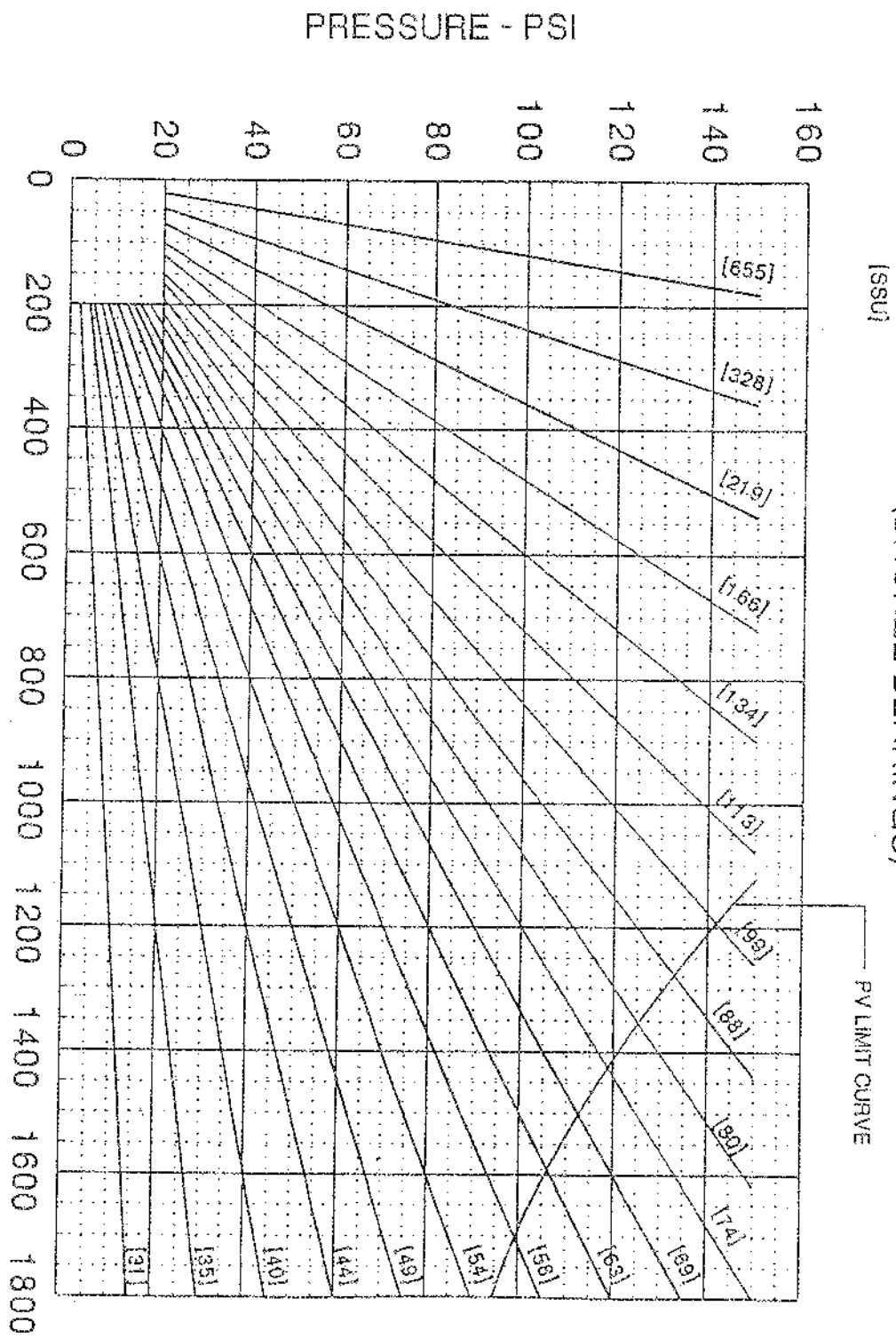
A08 (CARBON BEARINGS)



ROPER PUMP COMPANY
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COMMERCE, GEORGIA

A12
(BRONZE BEARINGS)



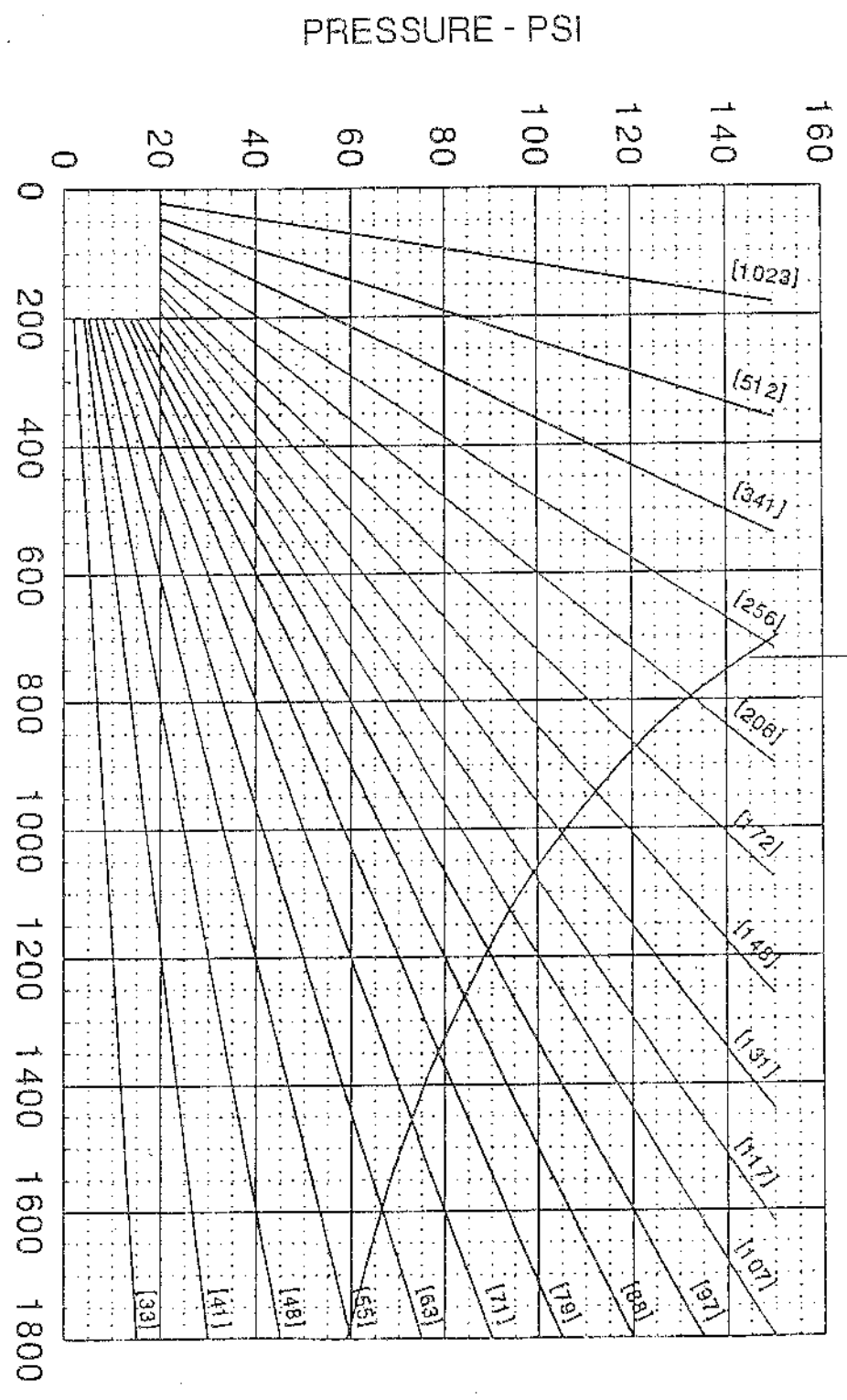
ROPER PUMP COMPANY
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COMMERCE, GEORGIA

A12 (IRON BEARINGS)

[SSU]

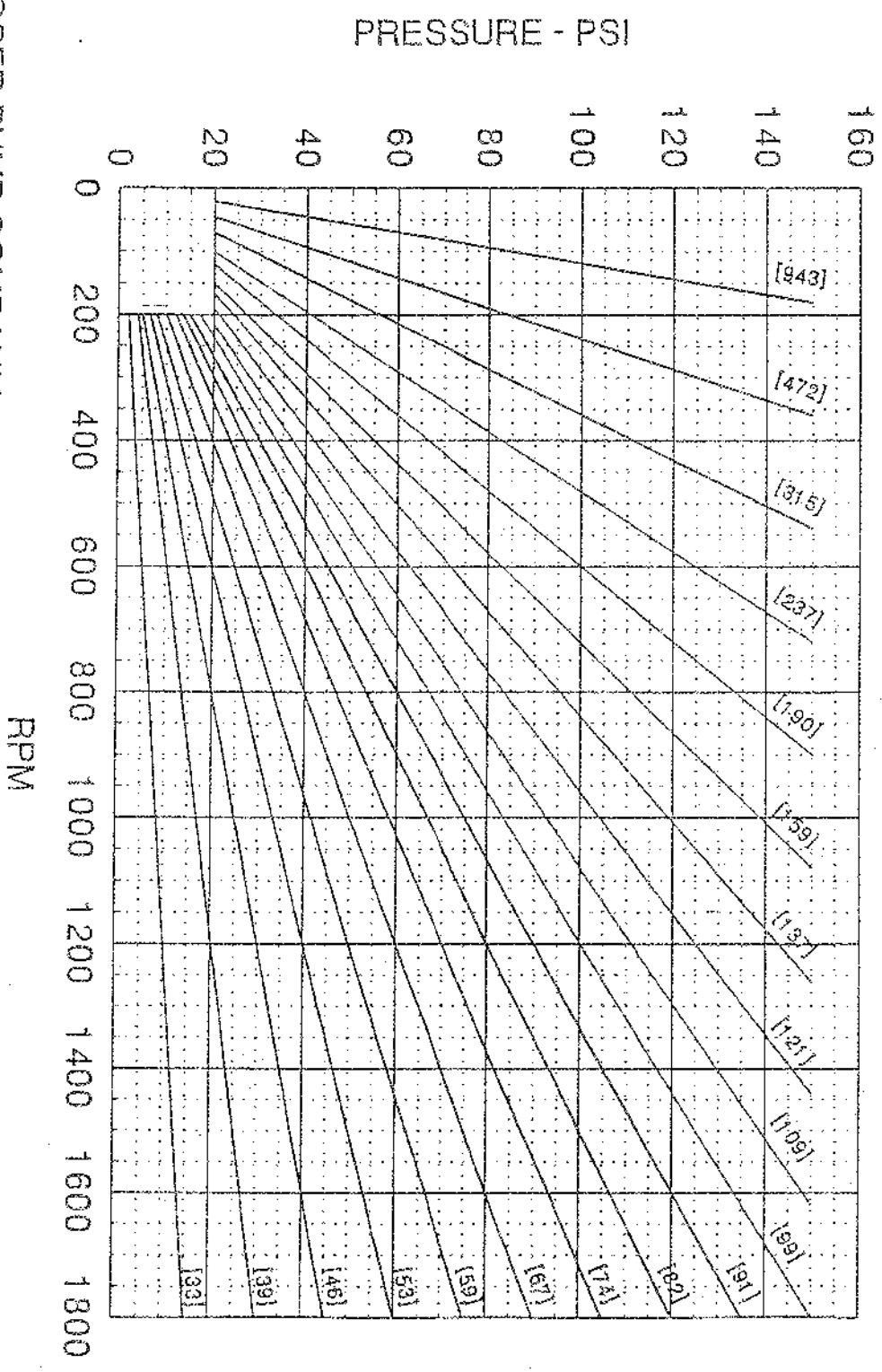
PV LIMIT CURVE



ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

ISSUJ
A12
(CARBON BEARINGS)



ROPER PUMP COMPANY
ISSUED 1/95

COMMERCE, GEORGIA

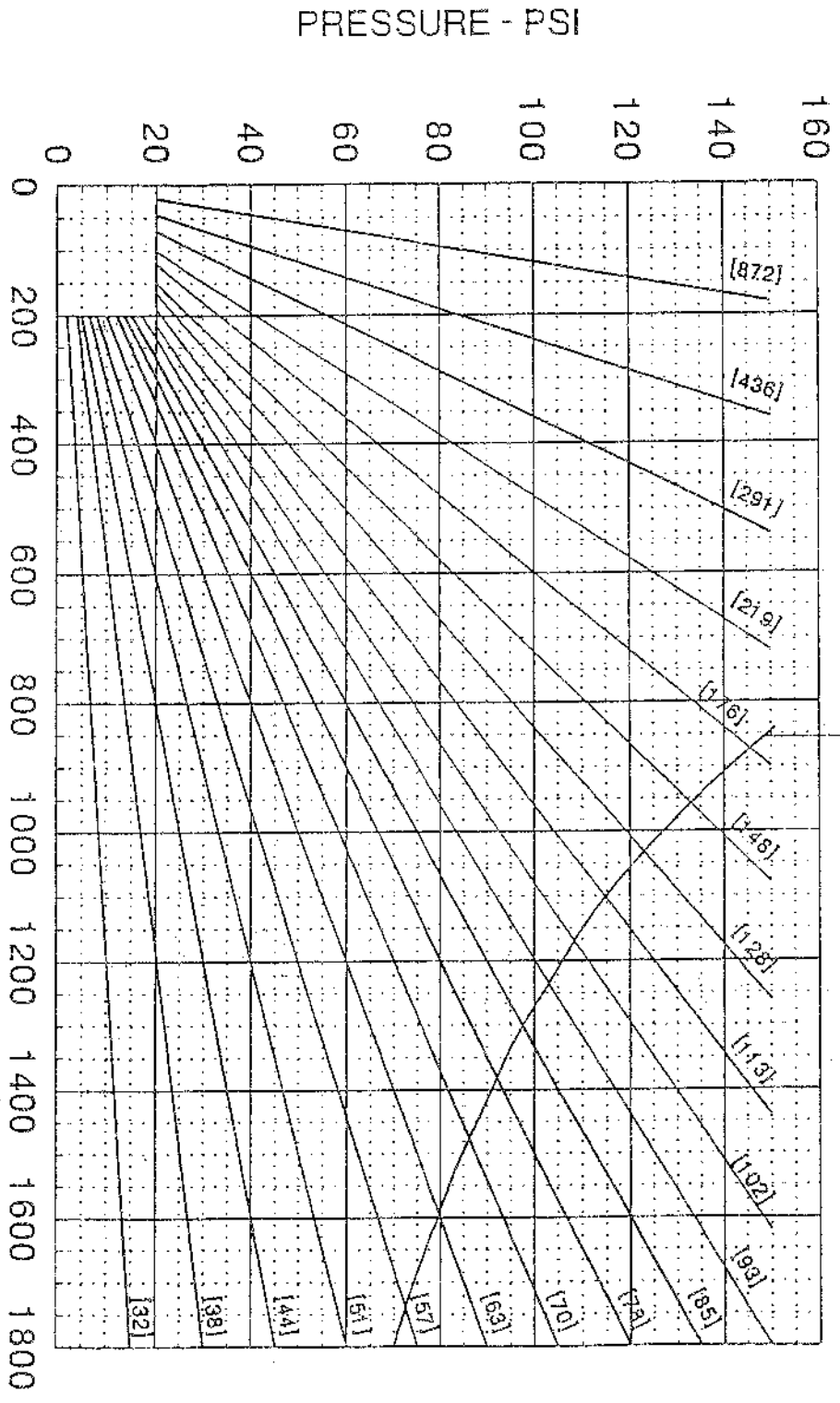
RPM

PRESSURE - PSI

A16 (BRONZE BEARINGS)

[SSU]

PV LIMIT CURVE

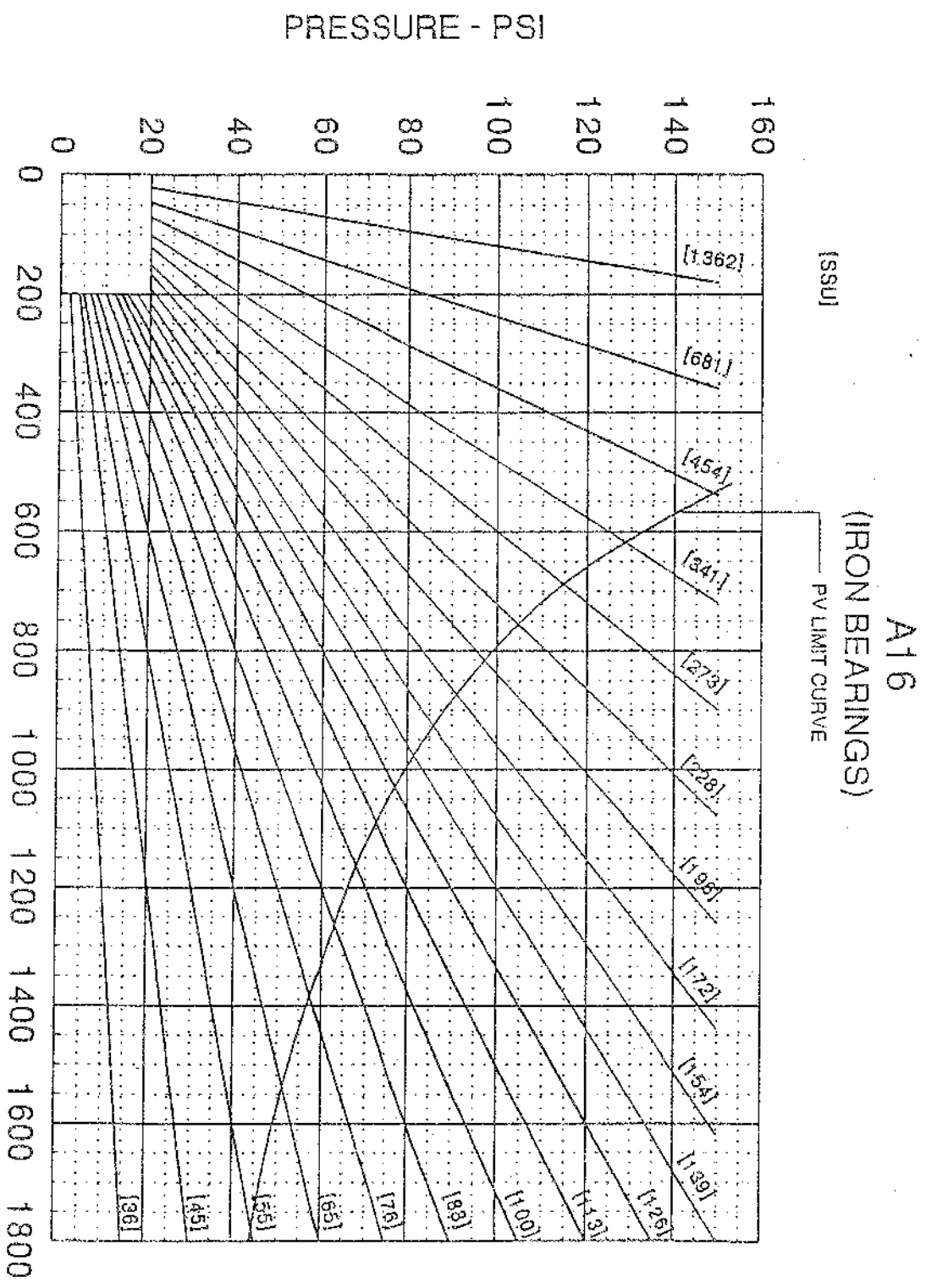


ROPER PUMP COMPANY
ISSUED: 1/96

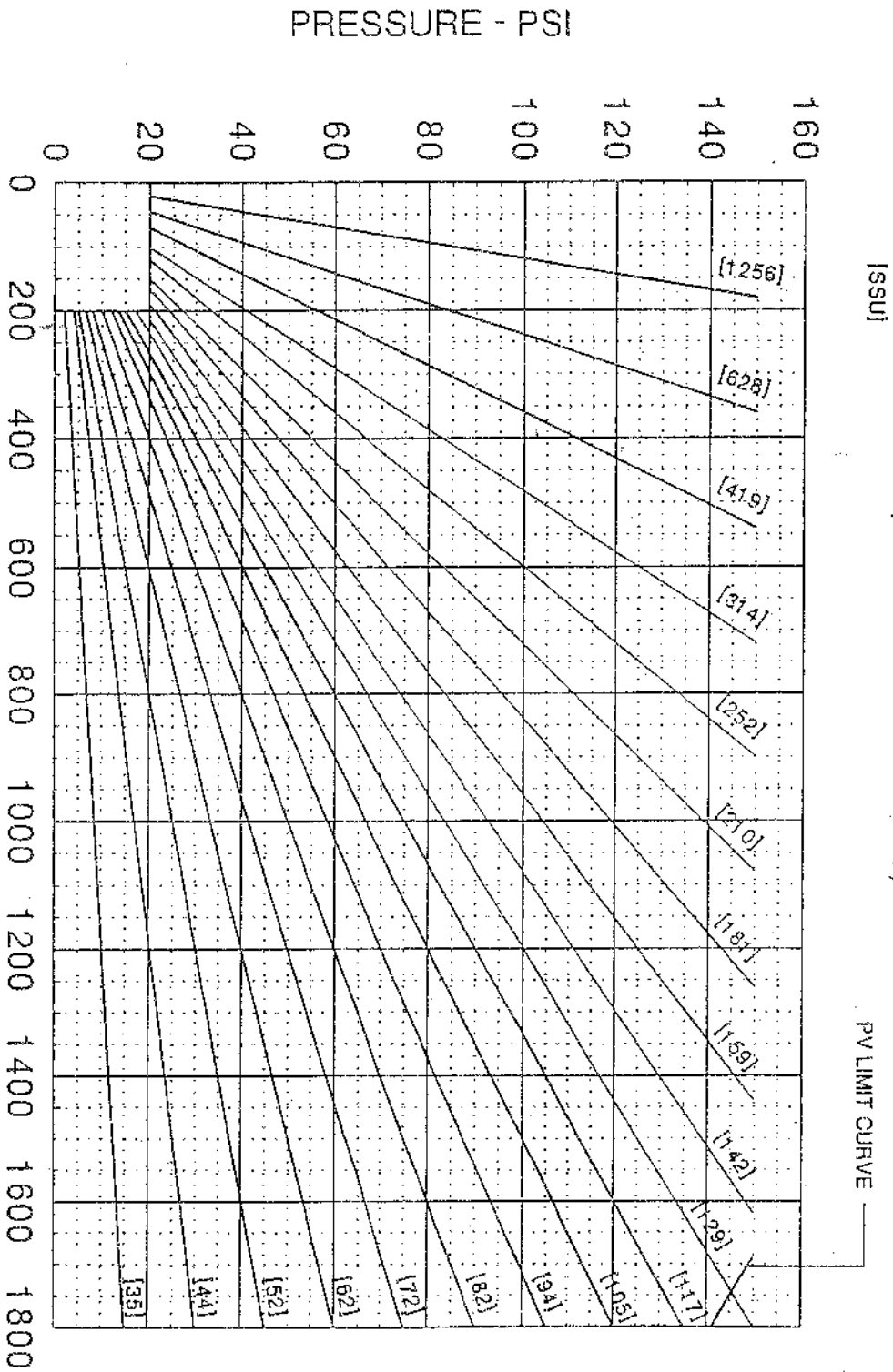
COMMERCE, GEORGIA

ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA



A16 (CARBON BEARINGS)



ROPER PUMP COMPANY

ISSUED 1/96

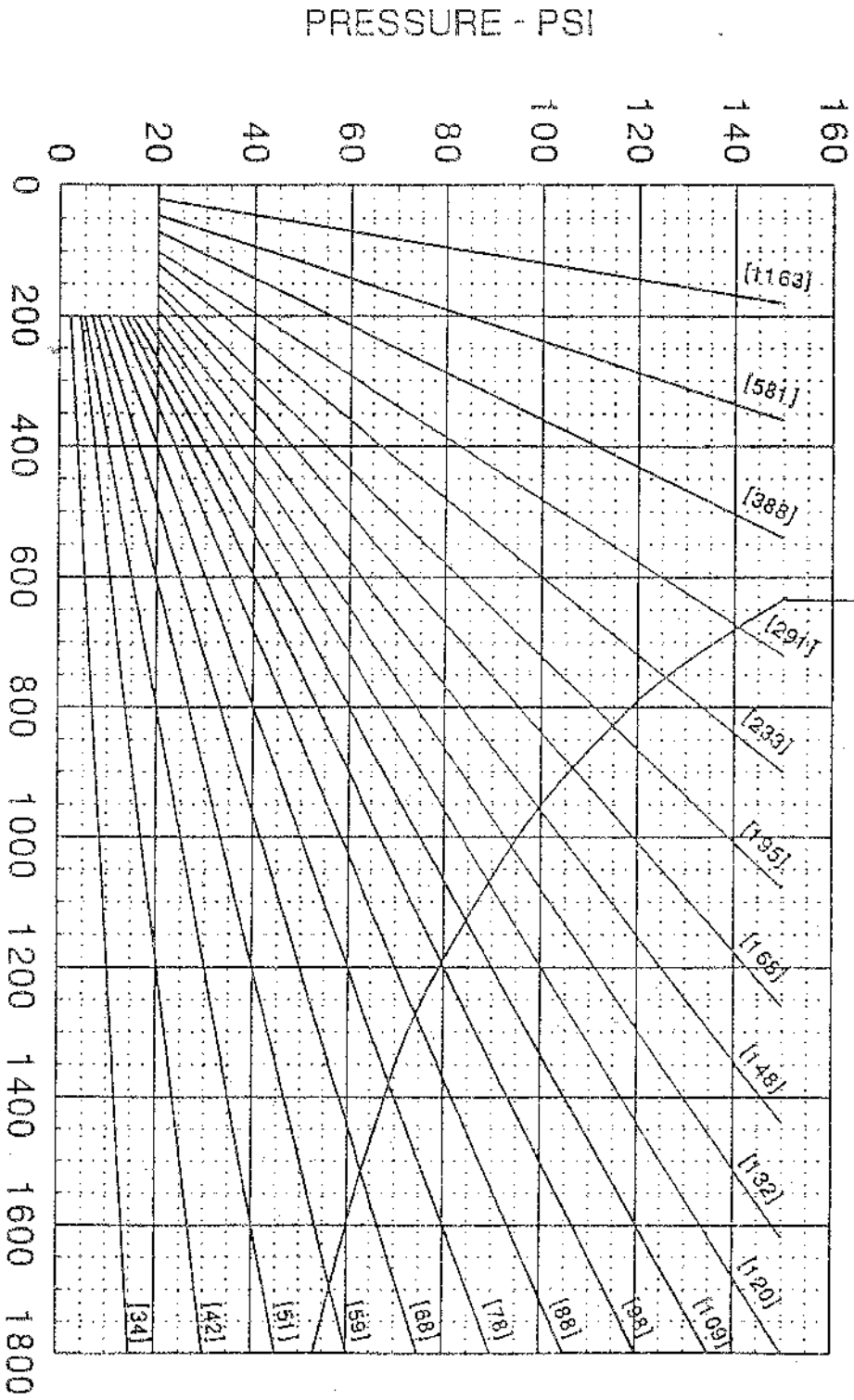
COMMERCE, GEORGIA

A21

(BRONZE BEARINGS)

[SSU]

PV LIMIT CURVE



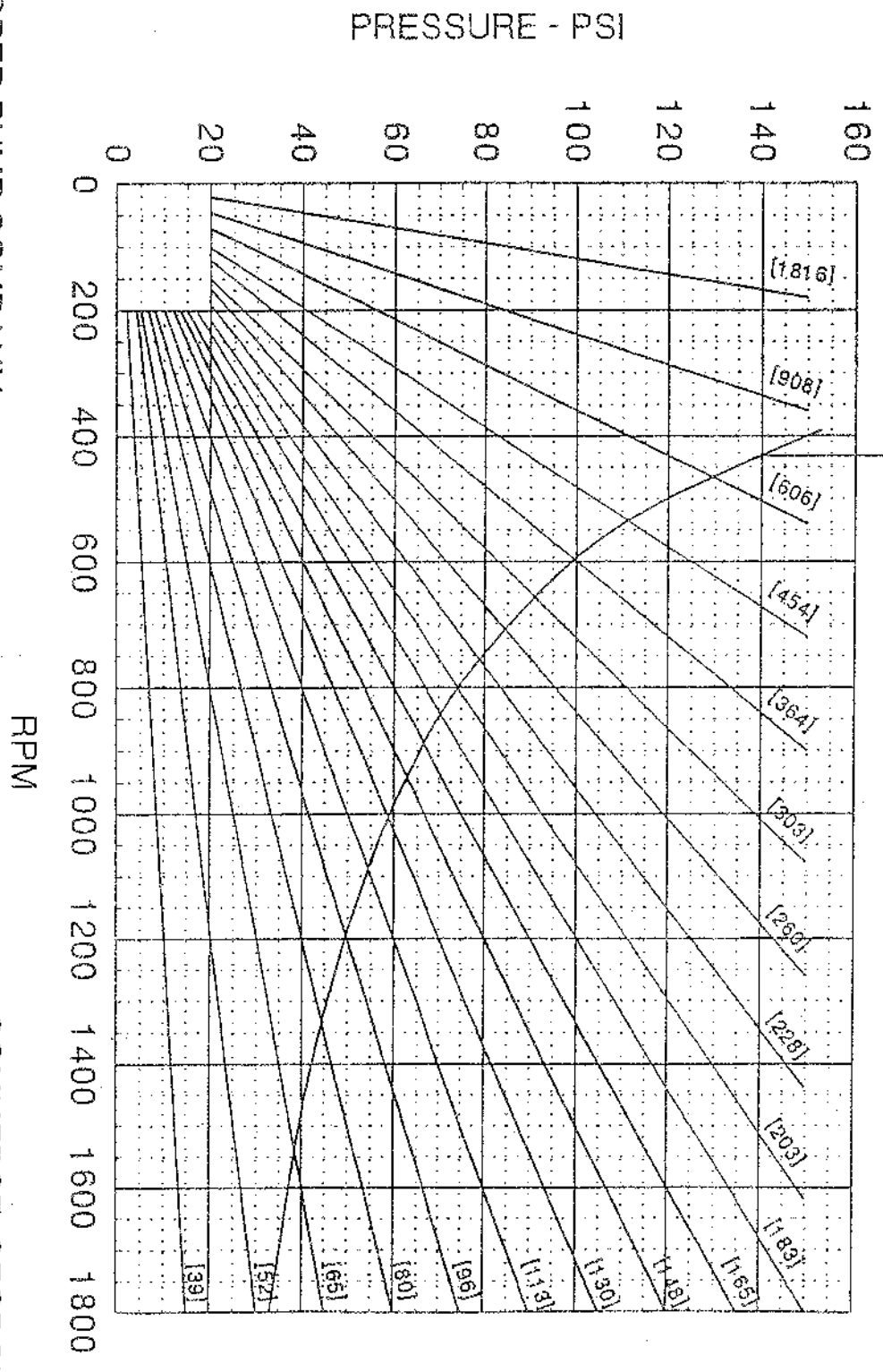
ROPER PUMP COMPANY

ISSUED 01/98

RPM

COMMERCE, GEORGIA

A21
 (IRON BEARINGS)
 PV LIMIT CURVE
 [ISSU]



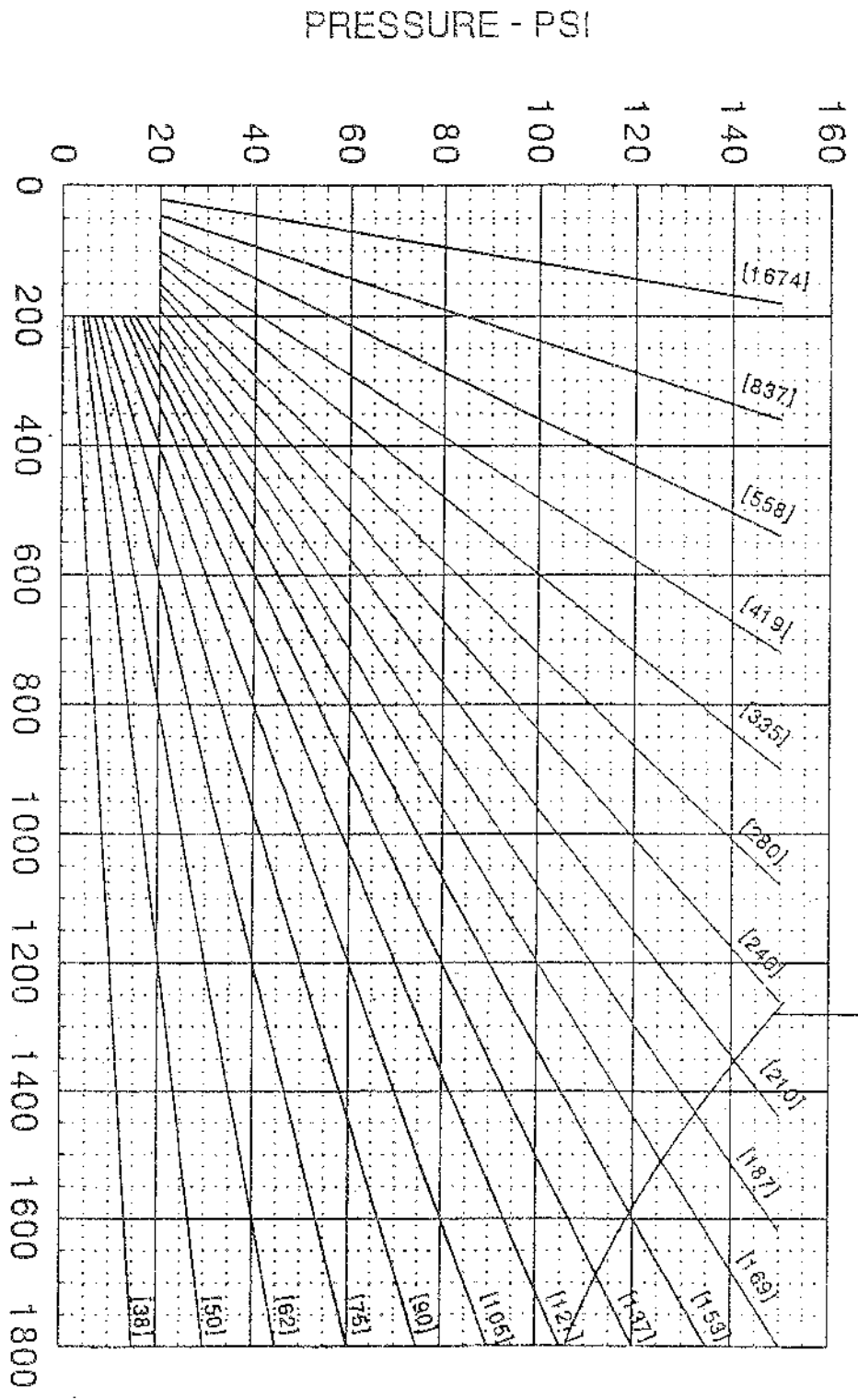
ROPER PUMP COMPANY
 ISSUED 1/96

COMMERCE, GEORGIA

A21 (CARBON BEARINGS)

ISSUJ

PV LIMIT CURVE



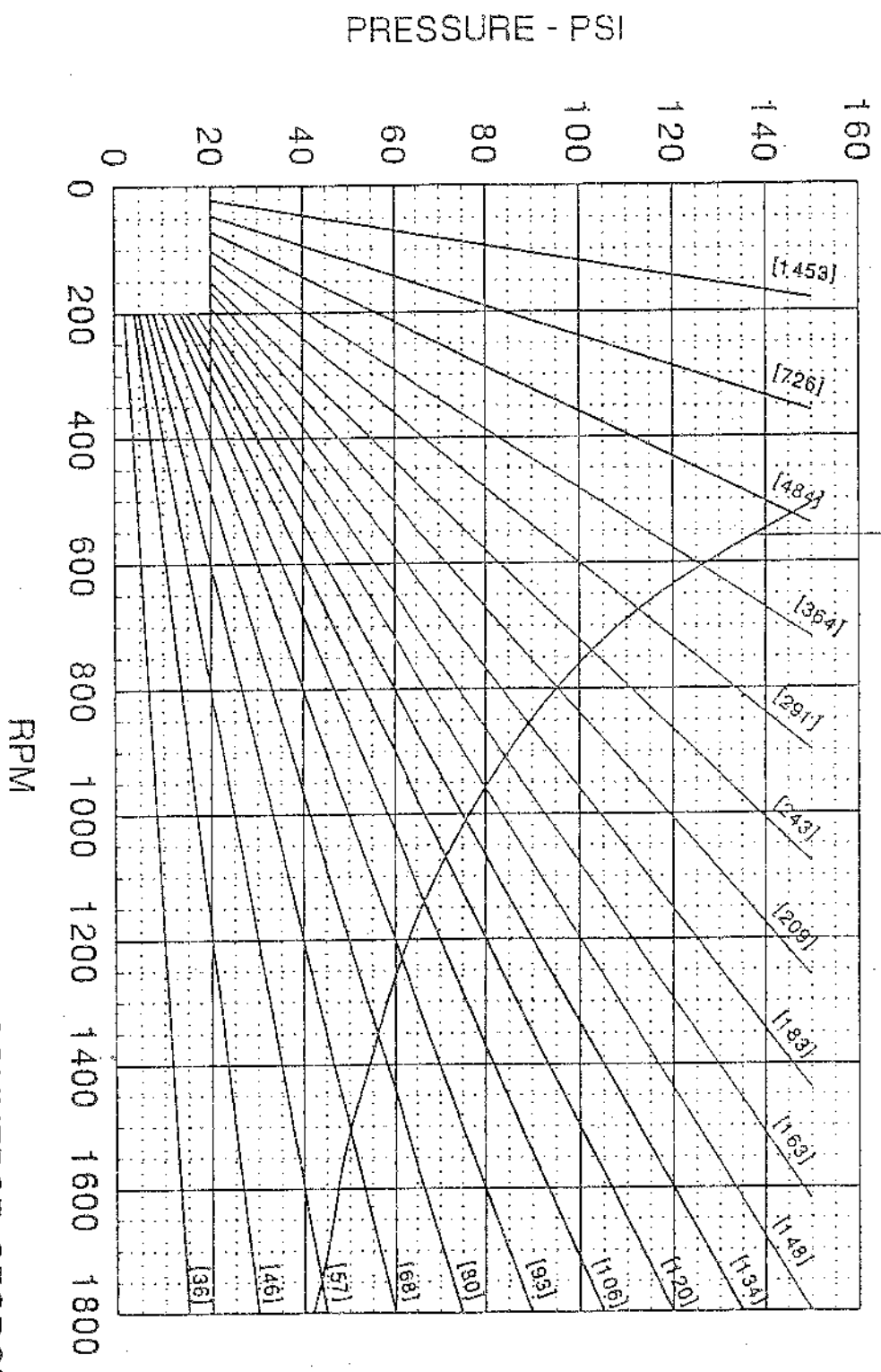
ROPER PUMP COMPANY
ISSUED 1/56

COMMERCE, GEORGIA

A27

(BRONZE BEARINGS)

ISSUI PV LIMIT CURVE

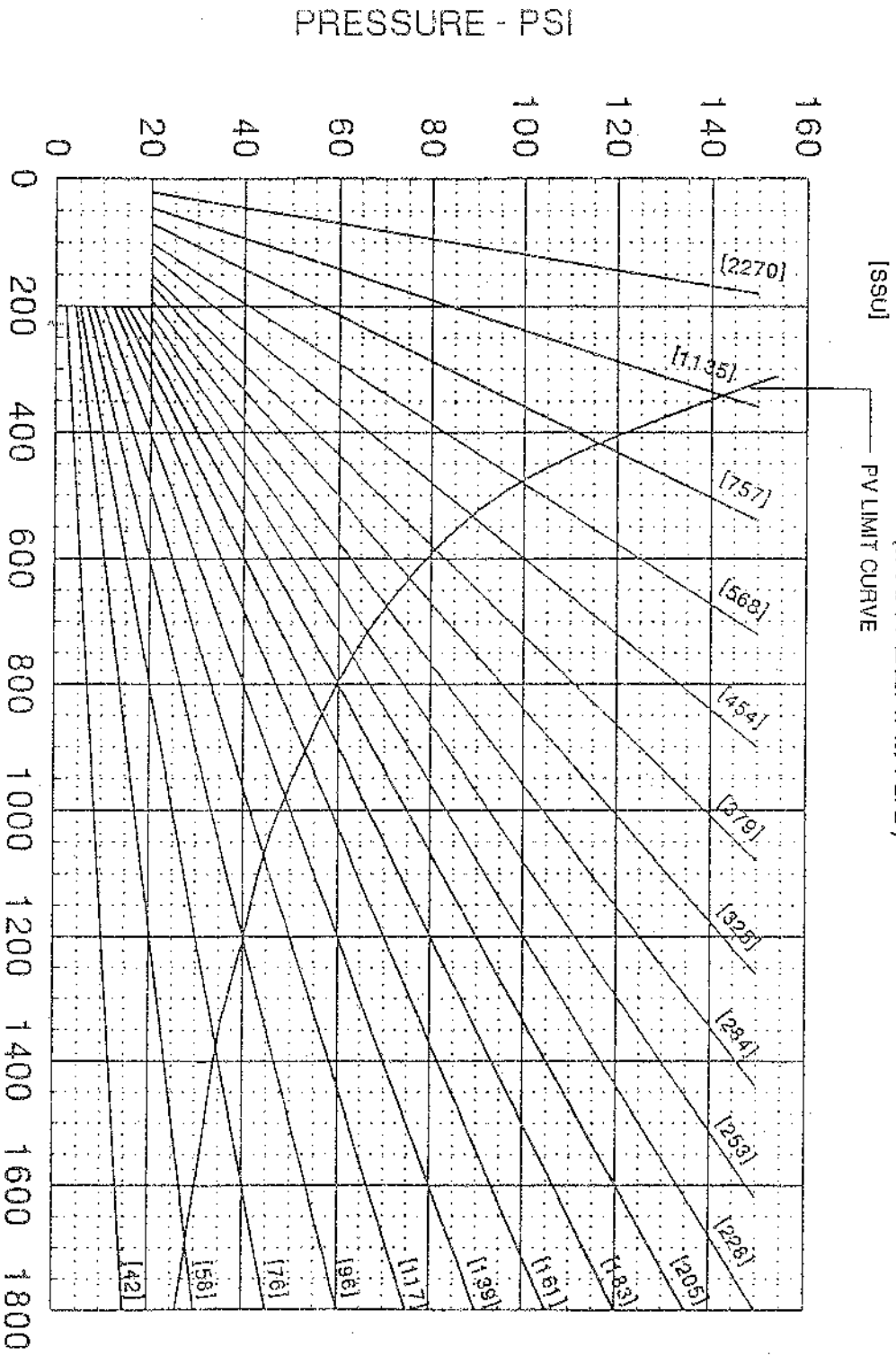


ROPER PUMP COMPANY

ISSUED: 1/98

COMMERCE, GEORGIA

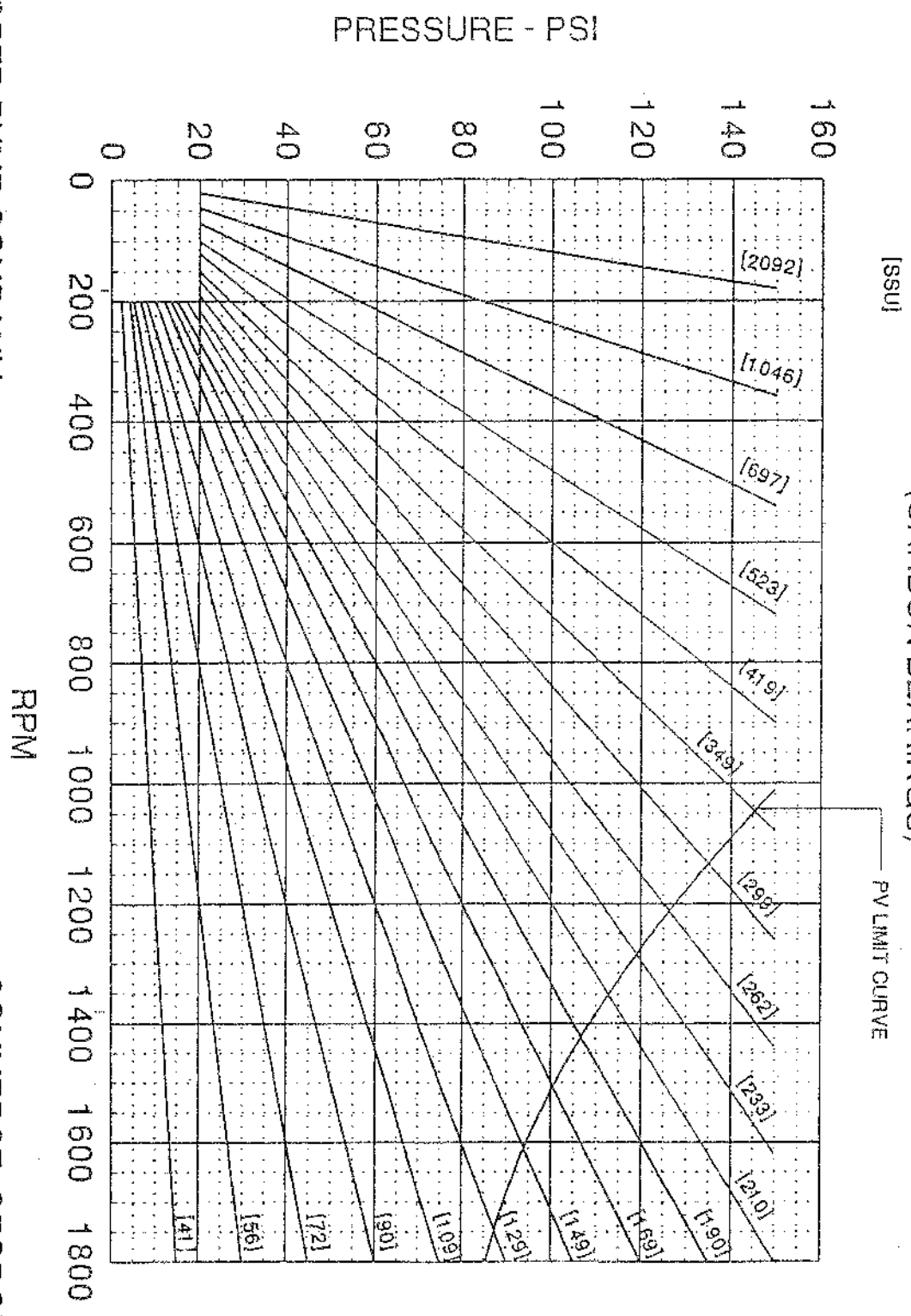
A27
(IRON BEARINGS)



ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

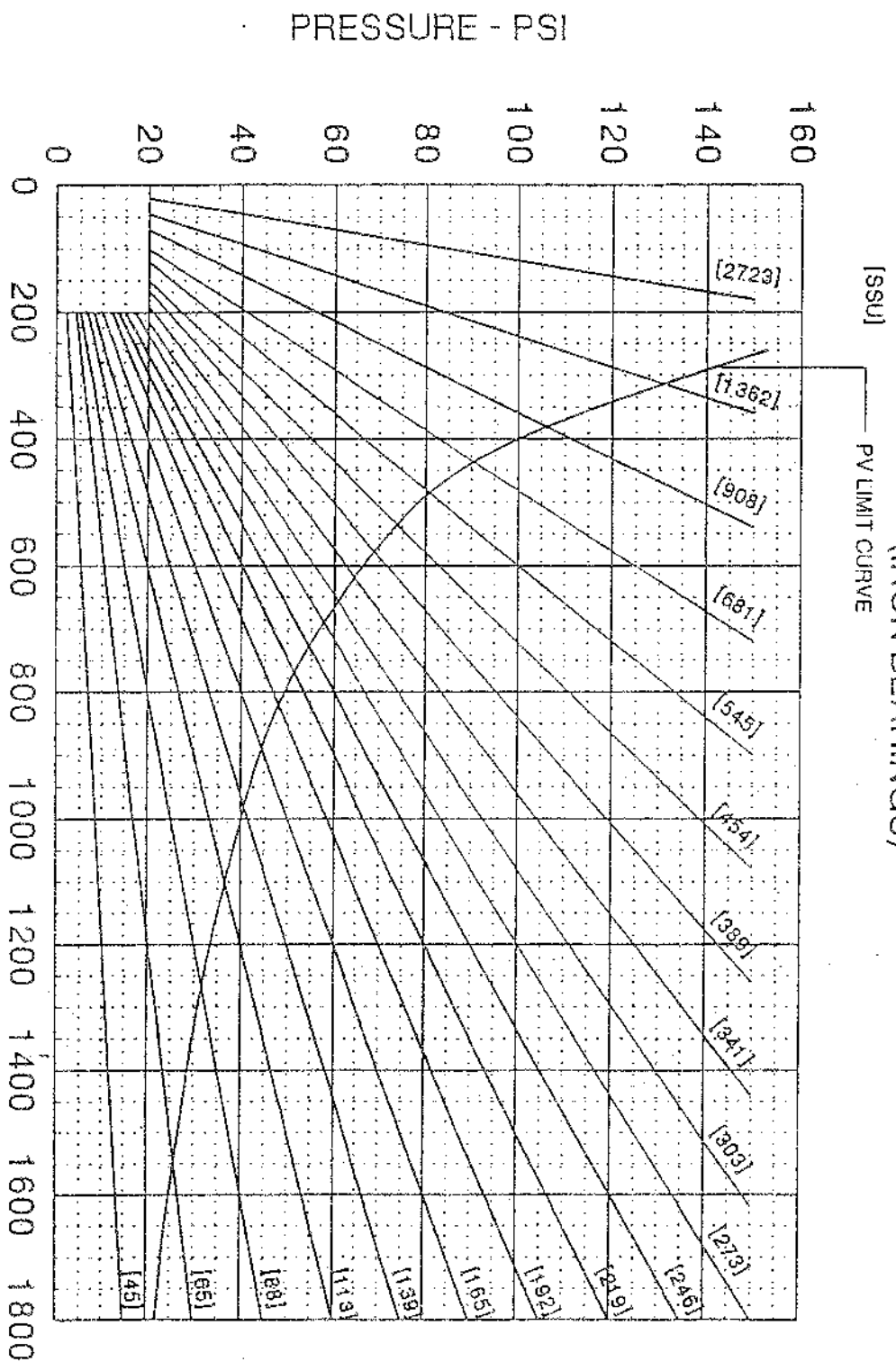
A27 (CARBON BEARINGS)



ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

A32 (IRON BEARINGS)



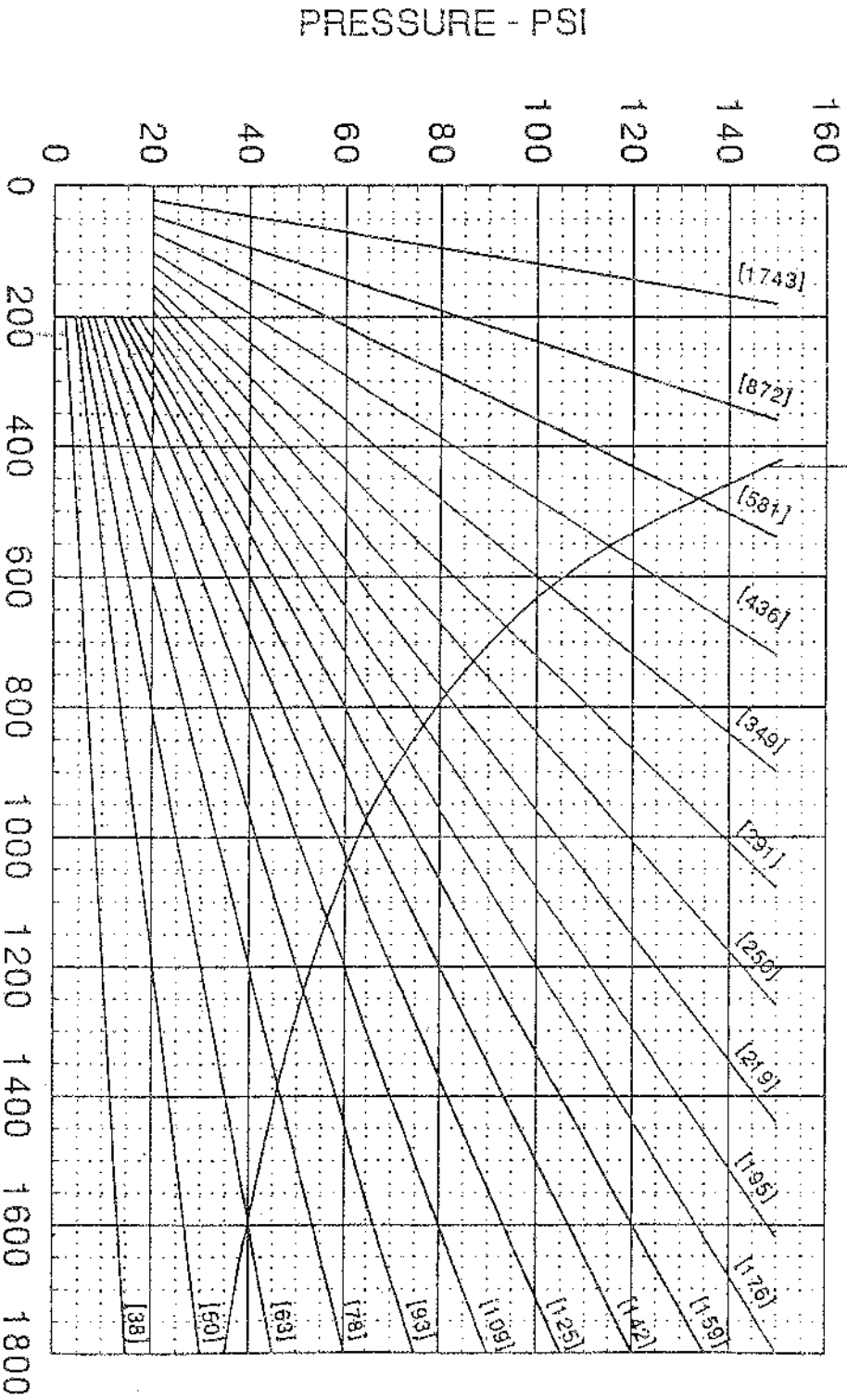
ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

A32

(BRONZE BEARINGS)

[650] PV LIMIT CURVE



PRESSURE - PSI

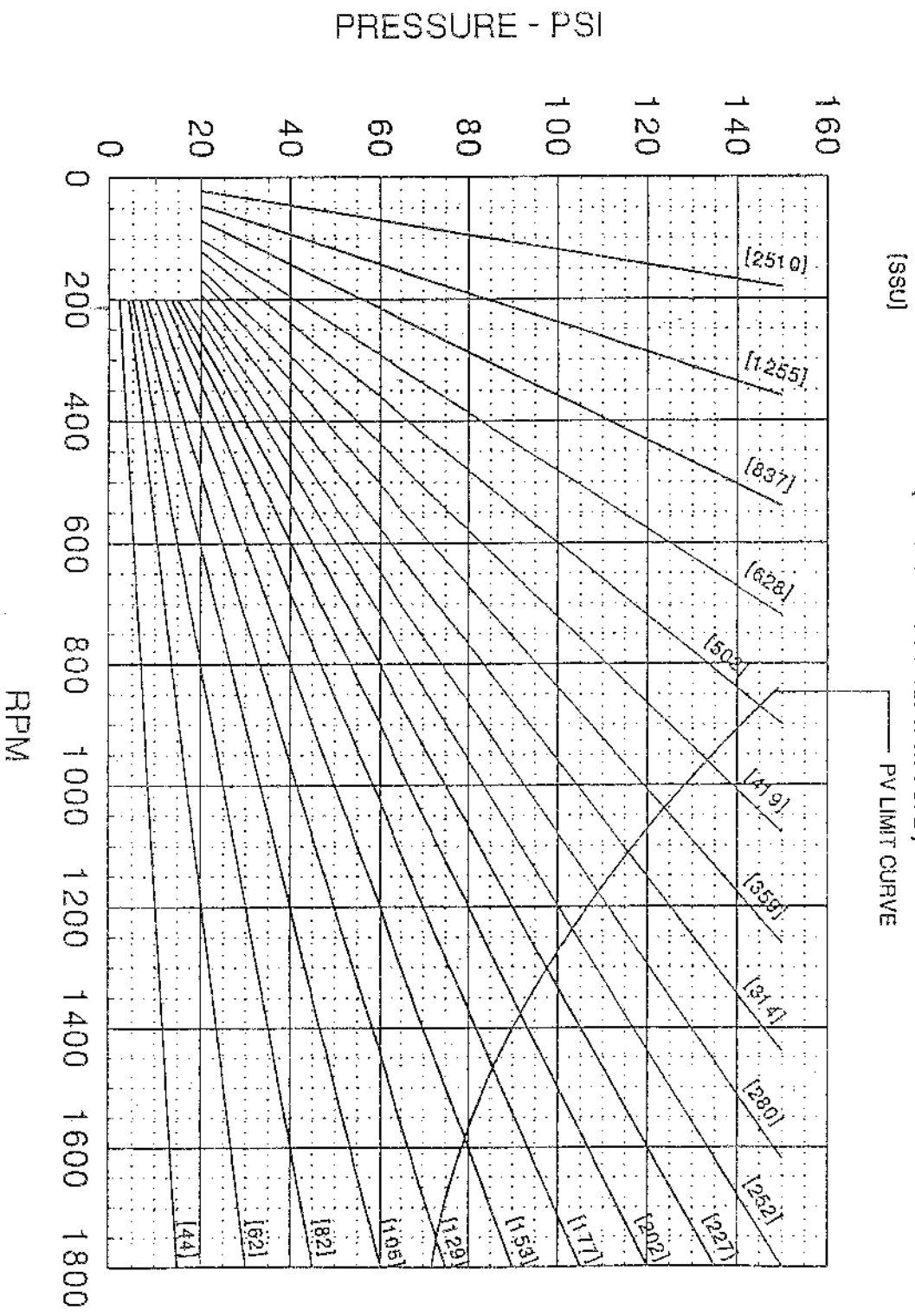
RPM

ROPER PUMP COMPANY

ISSUED: 1/96

COMMERCE, GEORGIA

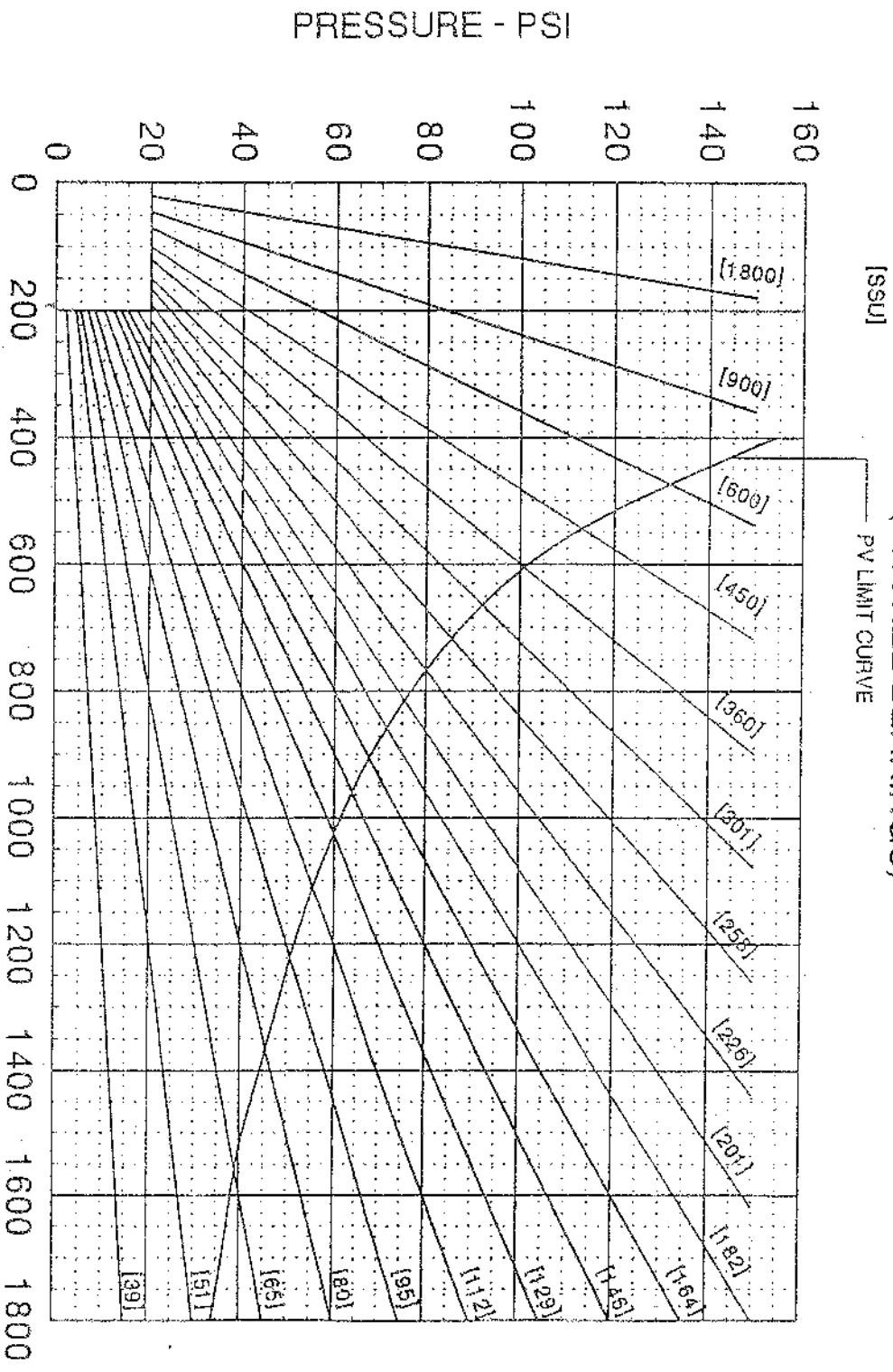
A32
(CARBON BEARINGS)



ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

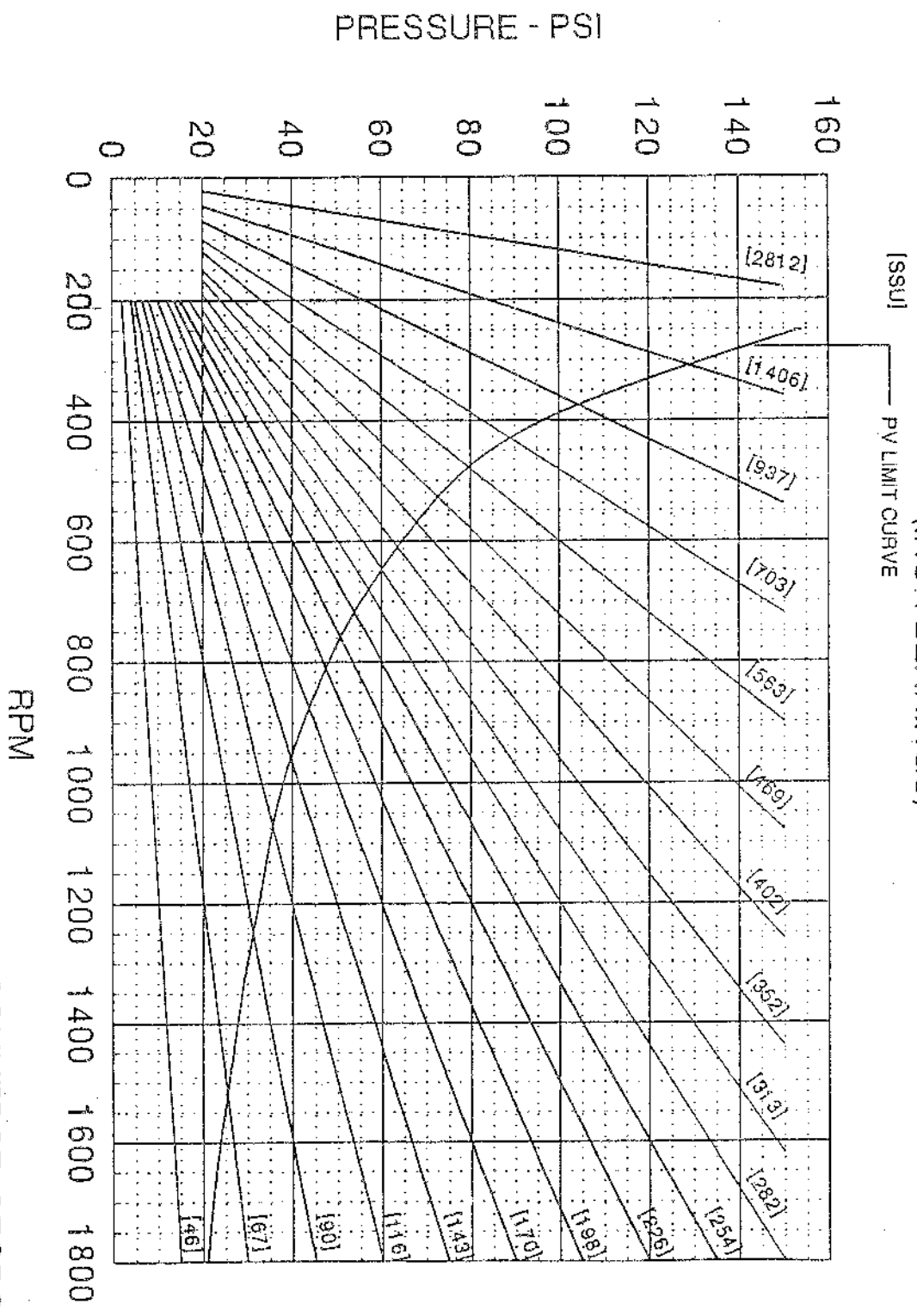
A40 (BRONZE BEARINGS)



ROPER PUMP COMPANY
ISSUED: 1/96

COMMERCE, GEORGIA

A40
(IRON BEARINGS)



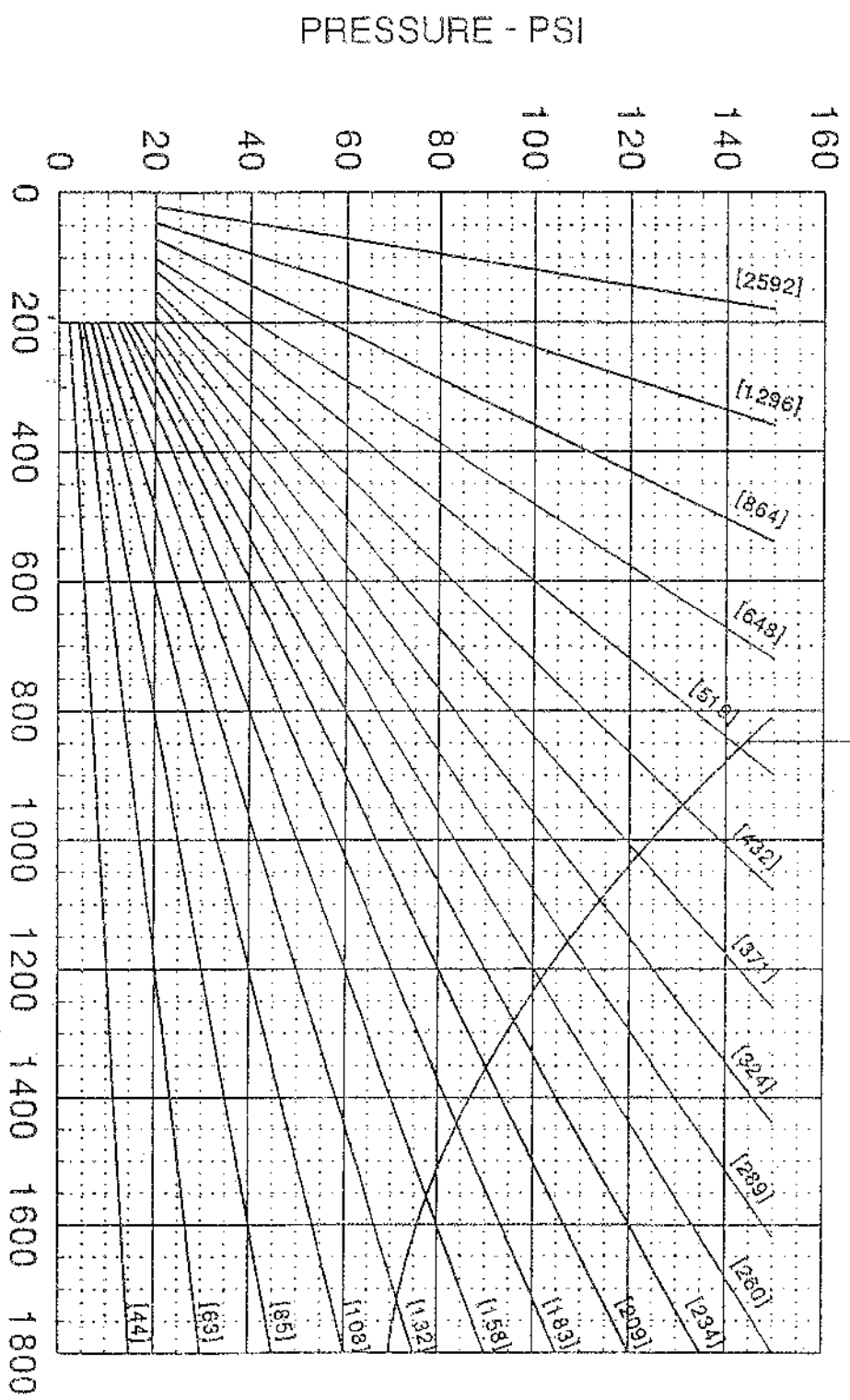
ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

A40 (CARBON BEARINGS)

ISSUE

PV LIMIT CURVE



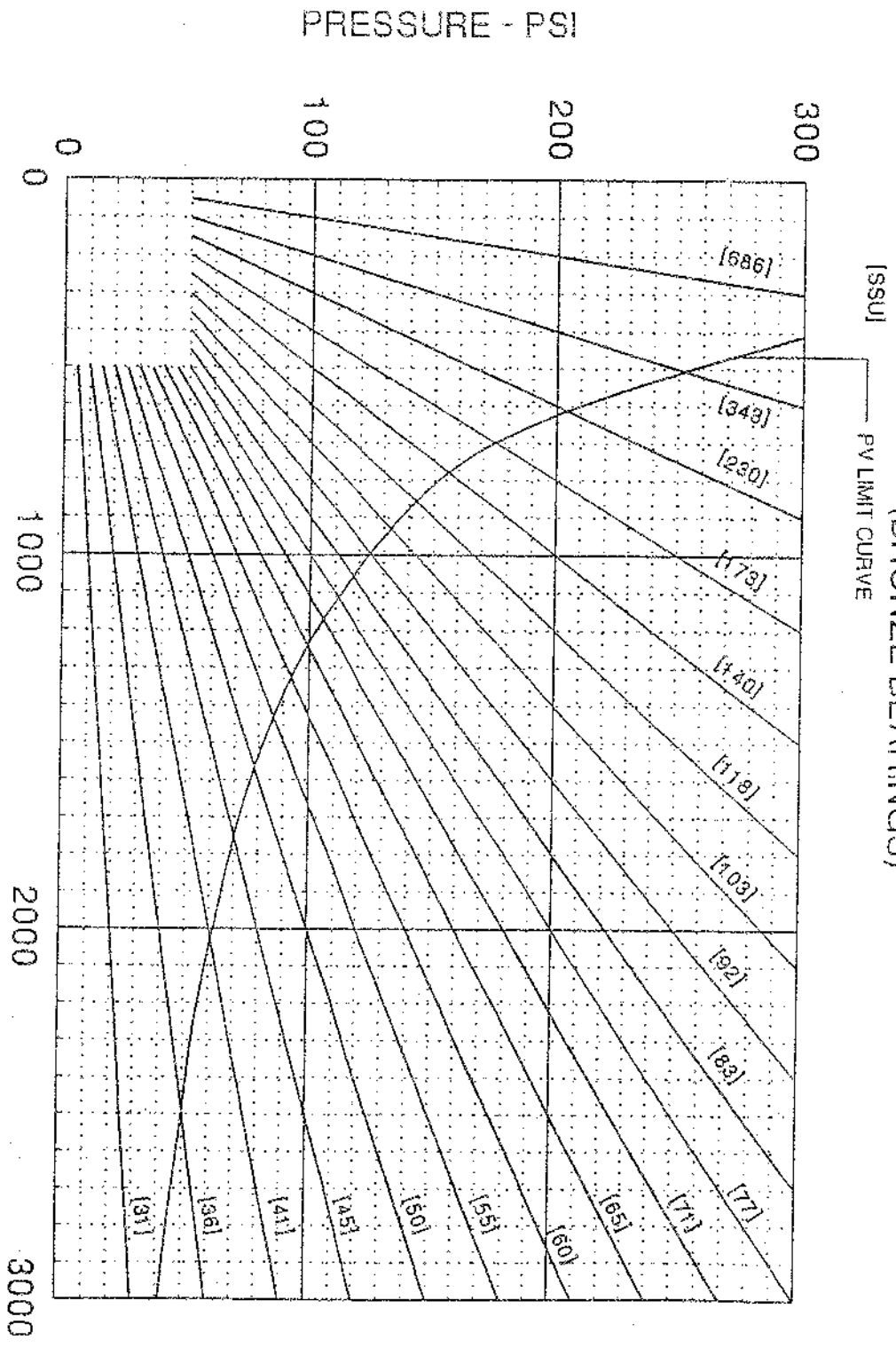
ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

RPM

PRESSURE - PSI

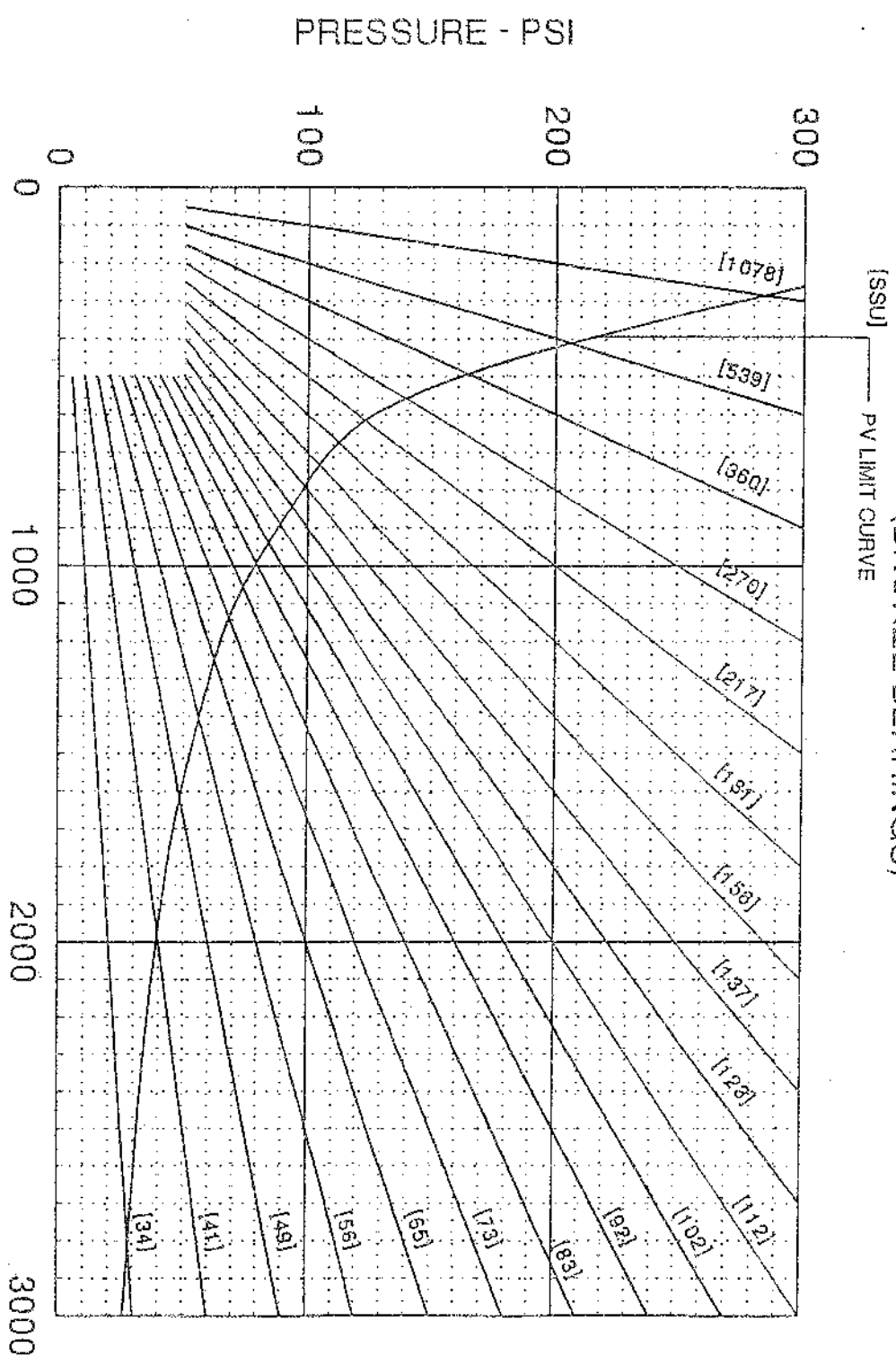
AE19
(BRONZE BEARINGS)



ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

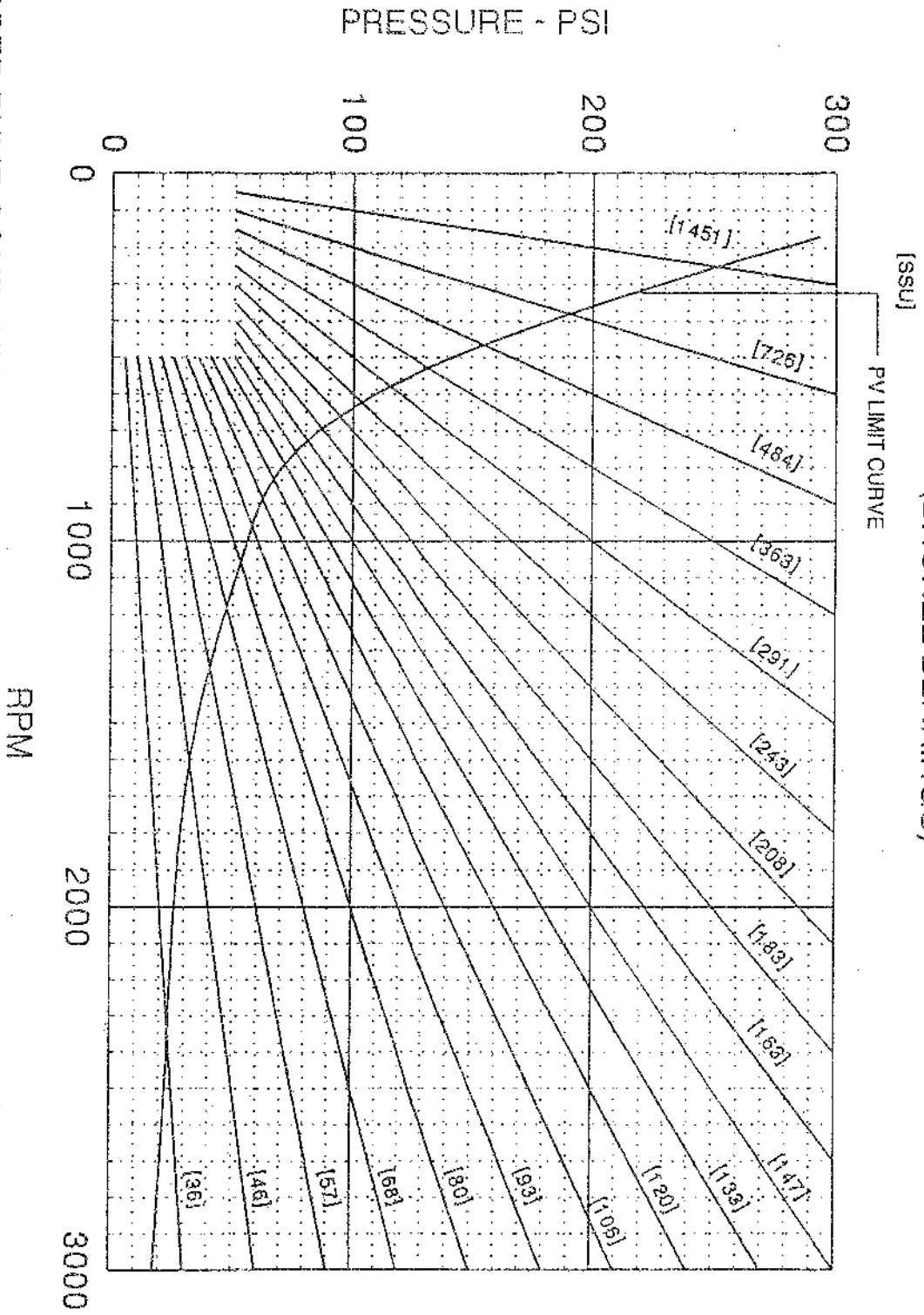
AE29
(BRONZE BEARINGS)



ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

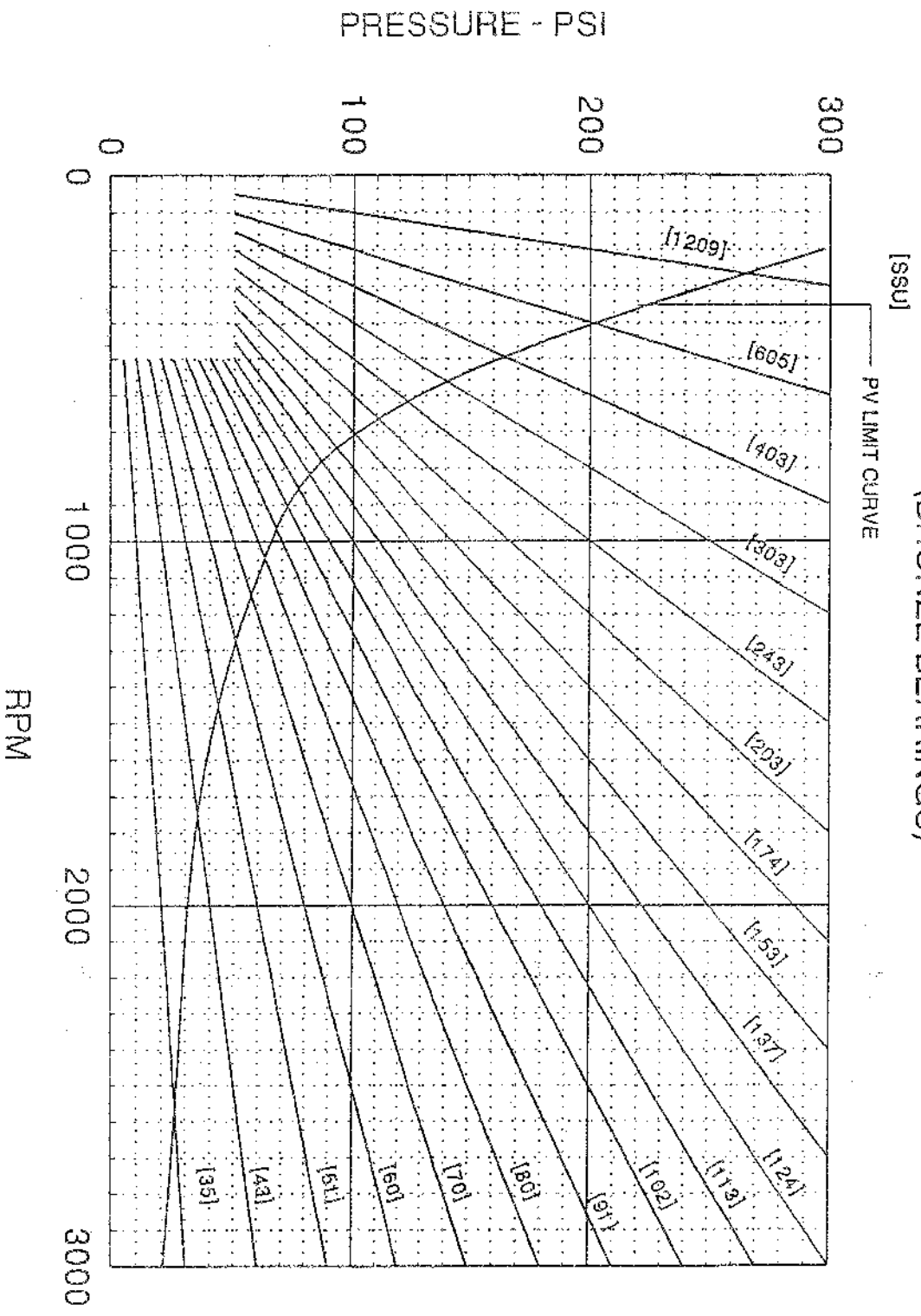
AE54
(BRONZE BEARINGS)



ROPER PUMP COMPANY
ISSUED 1/95

COMMERCE, GEORGIA

AE75 (BRONZE BEARINGS)

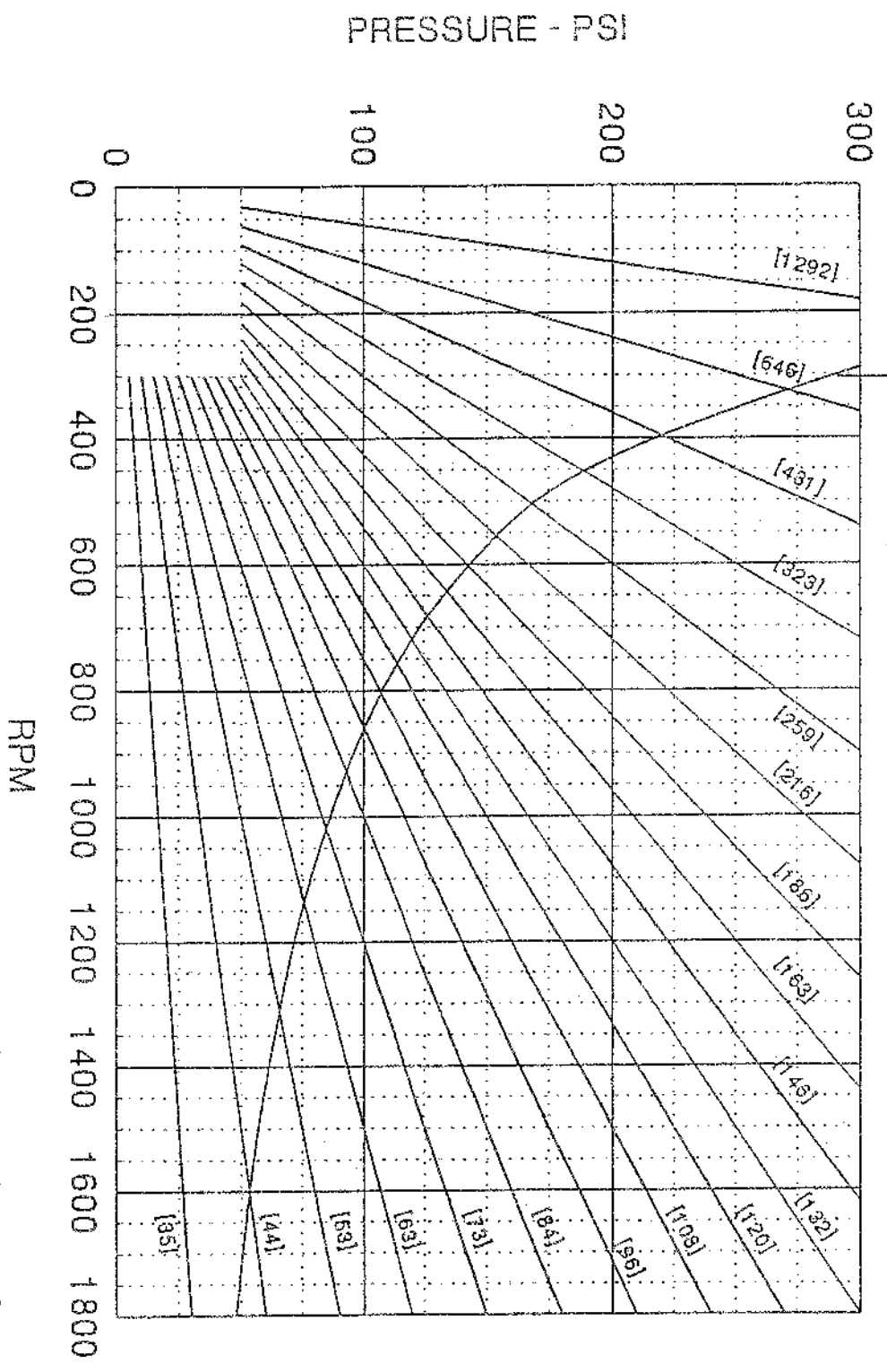


ROPER PUMP COMPANY
ISSUED: 1/96

COMMERCE, GEORGIA

F35 TYPE 27 (BRONZE BEARINGS)

[ISSU] — PV LIMIT CURVE

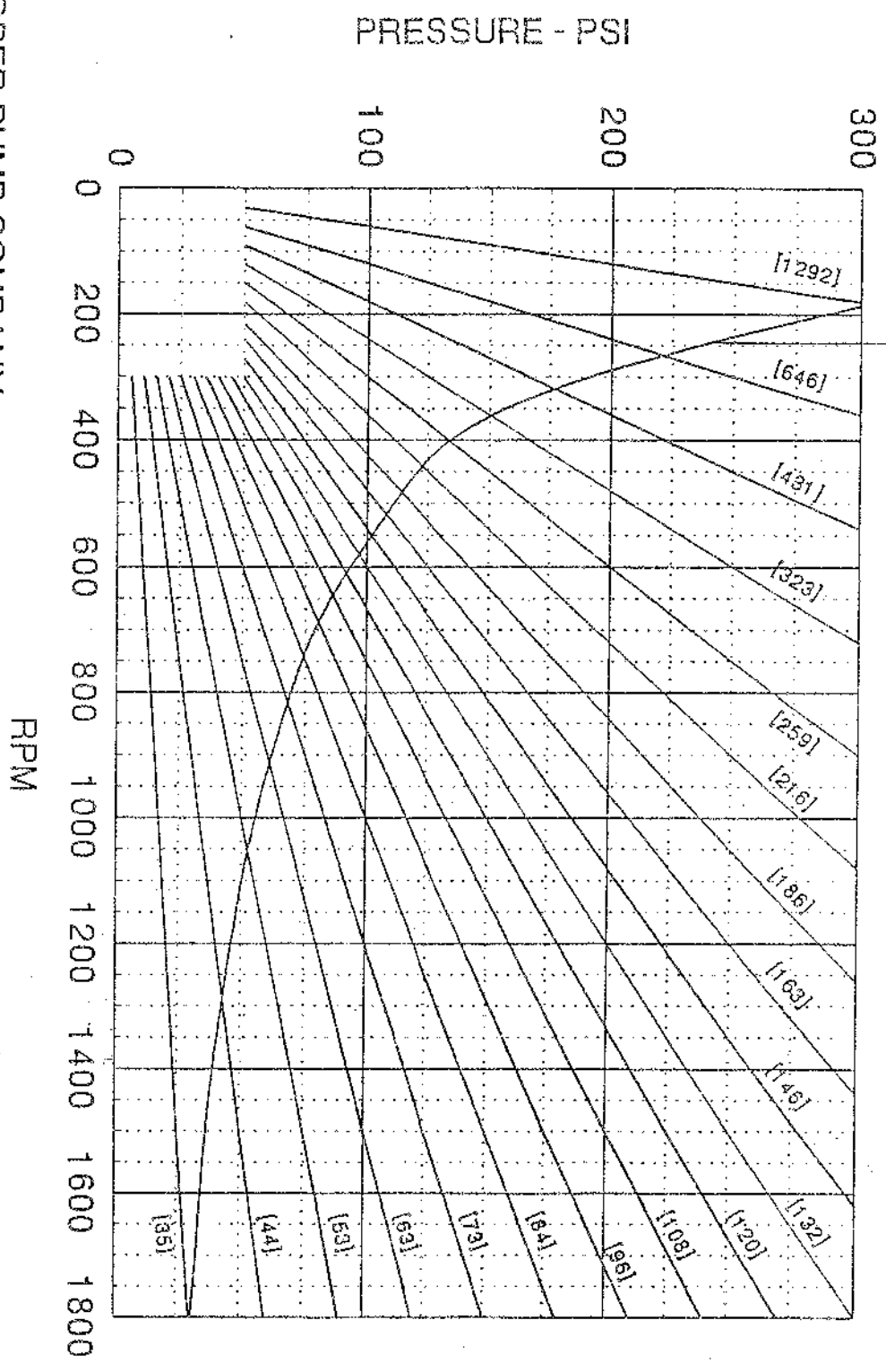


ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

F35 TYPE 27 (IRON BEARINGS)

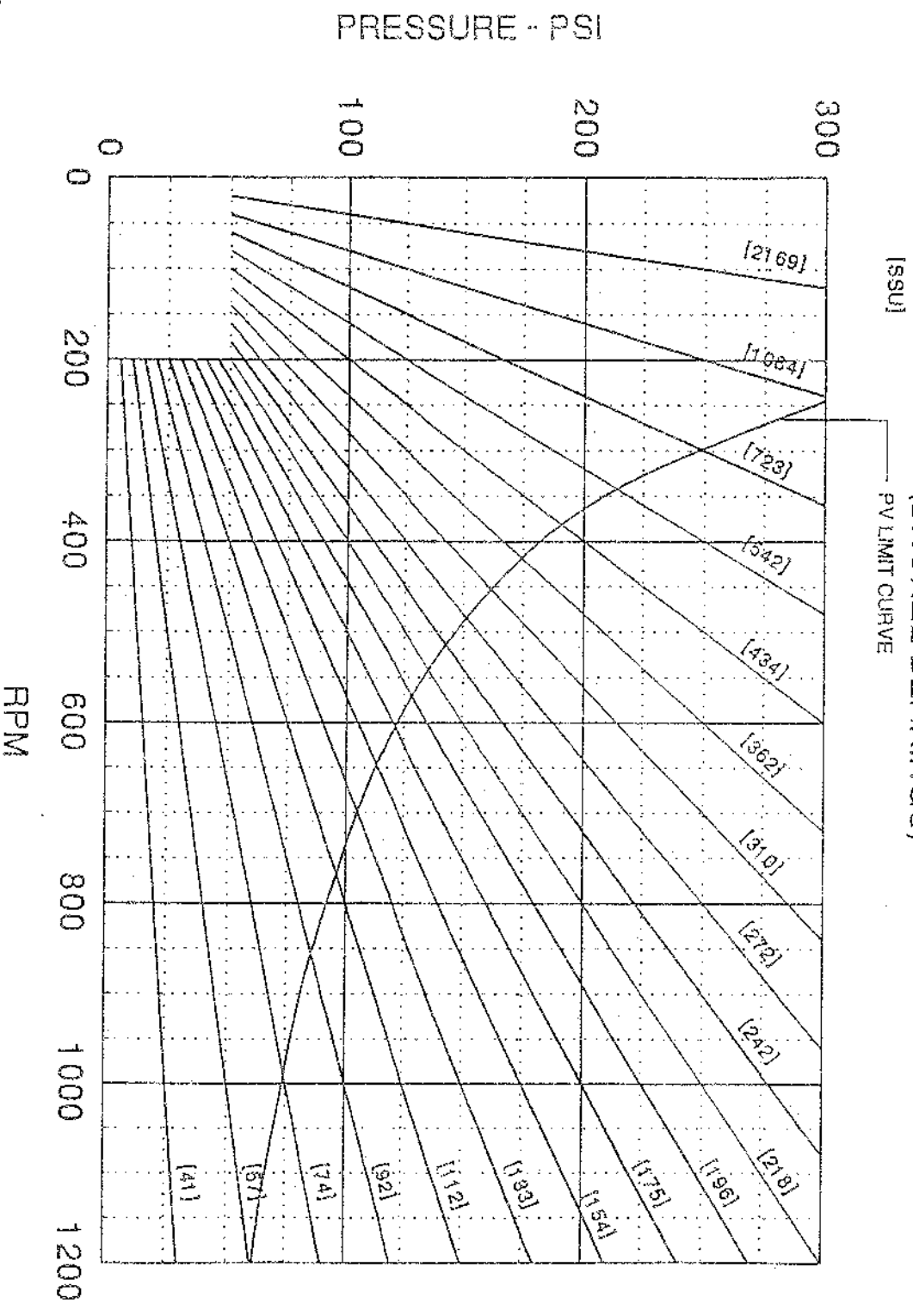
(ISSU) — PV LIMIT CURVE



ROPER PUMP COMPANY
ISSUE 01/96

COMMERCE, GEORGIA

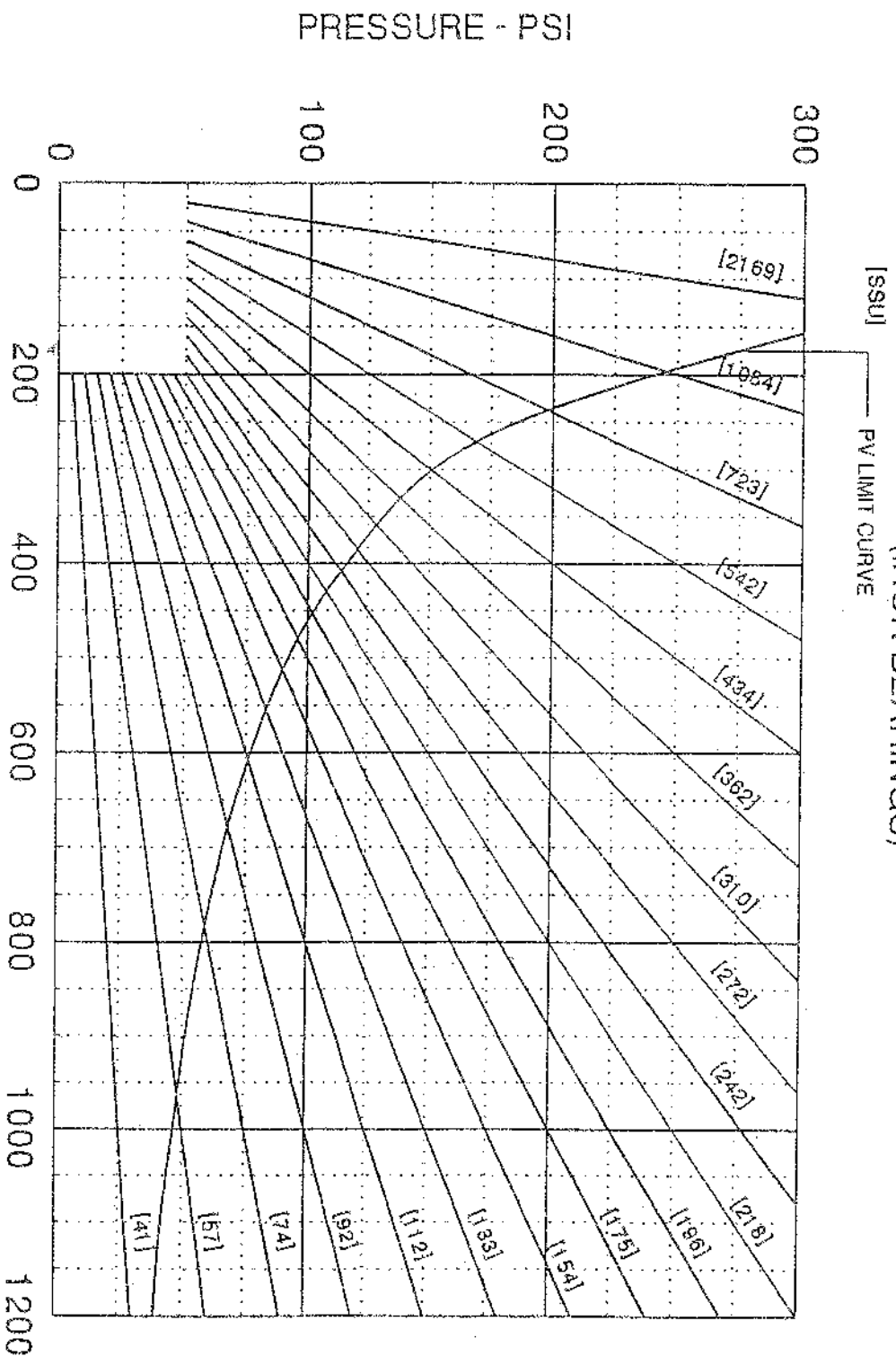
F50 TYPE 27
(BRONZE BEARINGS)



ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

F50 TYPE 27 (IRON BEARINGS)



PRESSURE - PSI

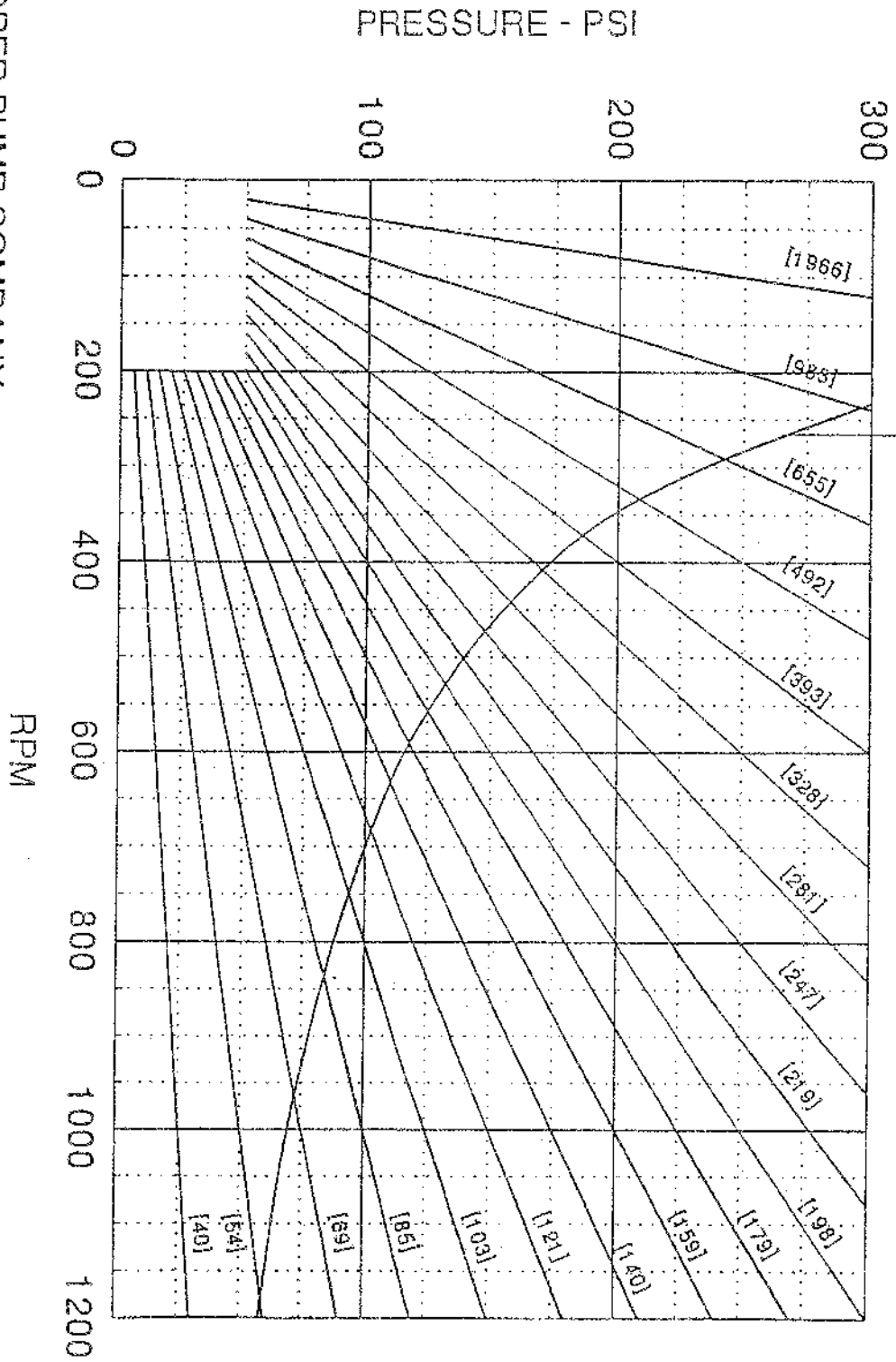
RPM

ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

F75 TYPE 27
(BRONZE BEARINGS)

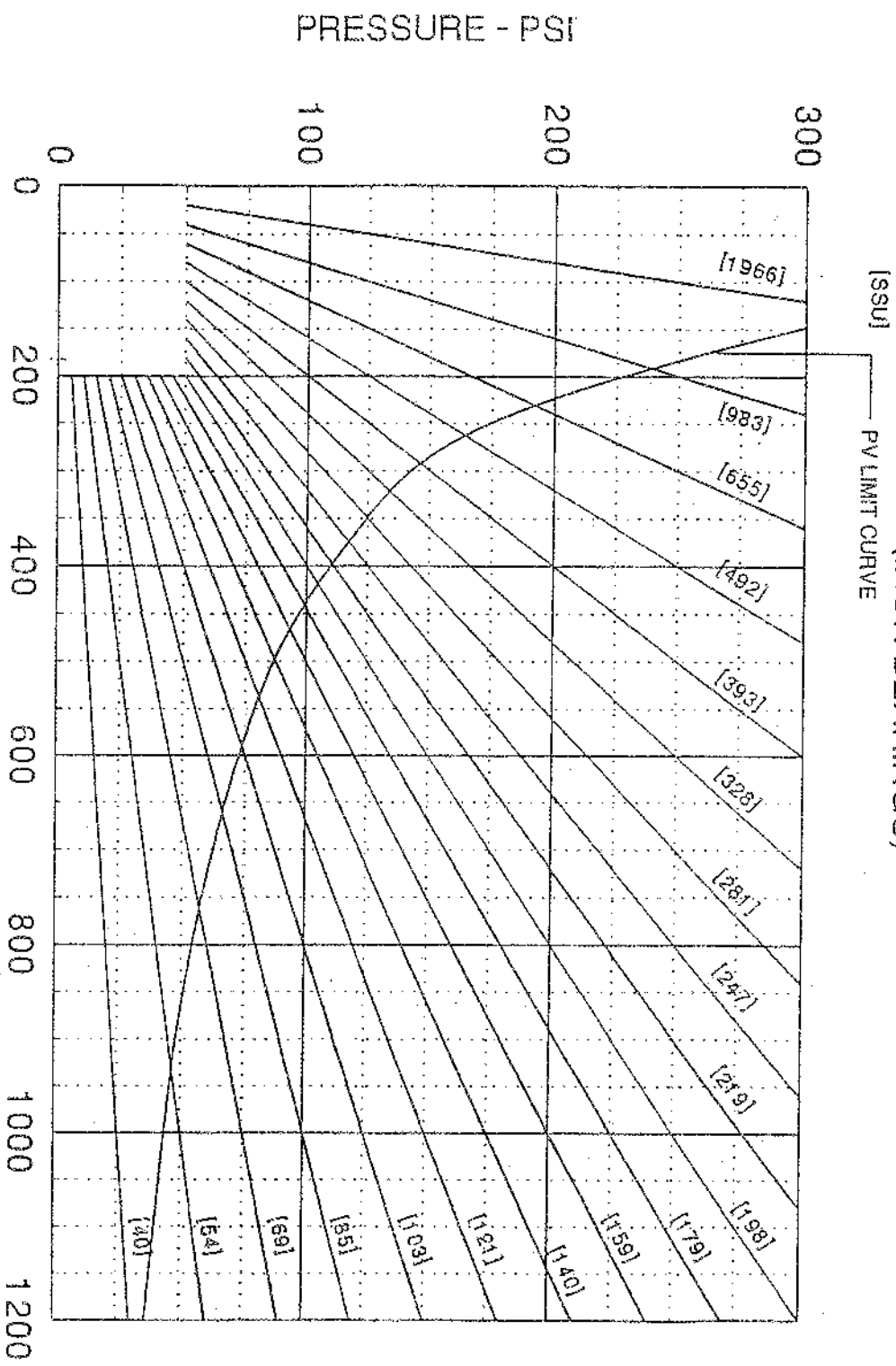
[1966] PV LIMIT CURVE



ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

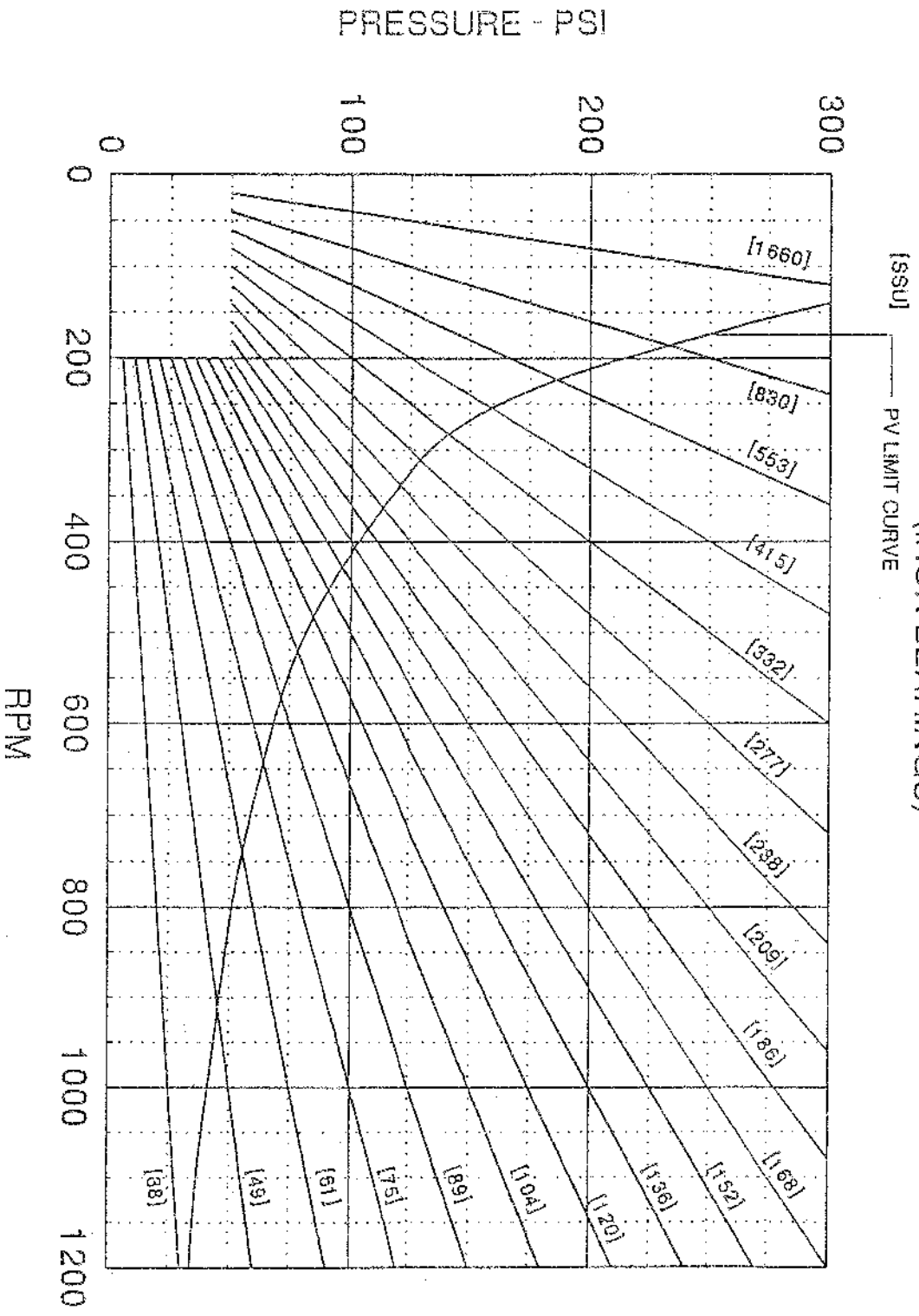
F75 TYPE 27 (IRON BEARINGS)



ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

F100 TYPE 27
(IRON BEARINGS)

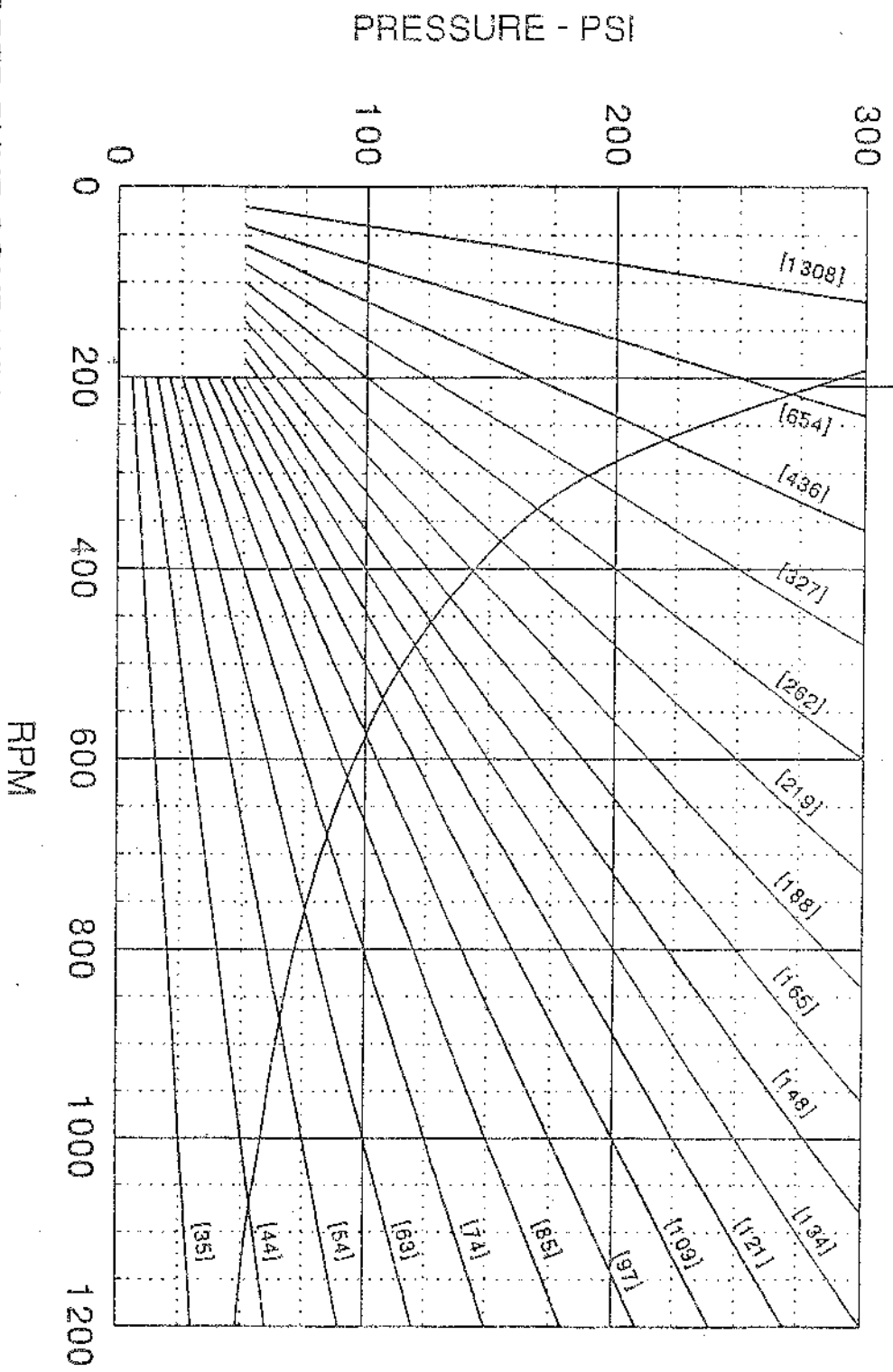


ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

F150 TYPE 27 (BRONZE BEARINGS)

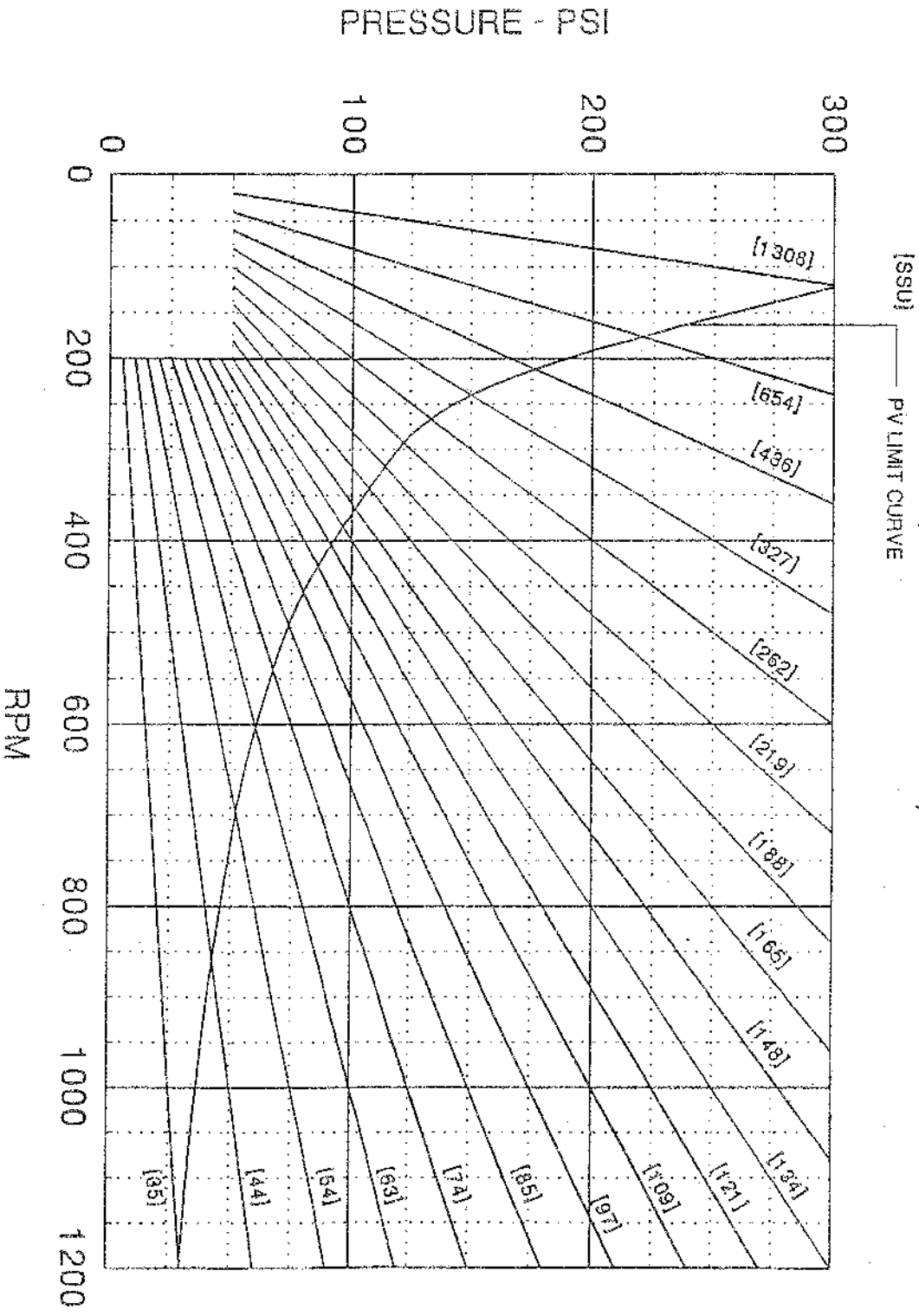
[SSU] PV LIMIT CURVE



ROPER PUMP COMPANY
ISSUED: 1/96

COMMERCE, GEORGIA

F150 TYPE 27
(IRON BEARINGS)

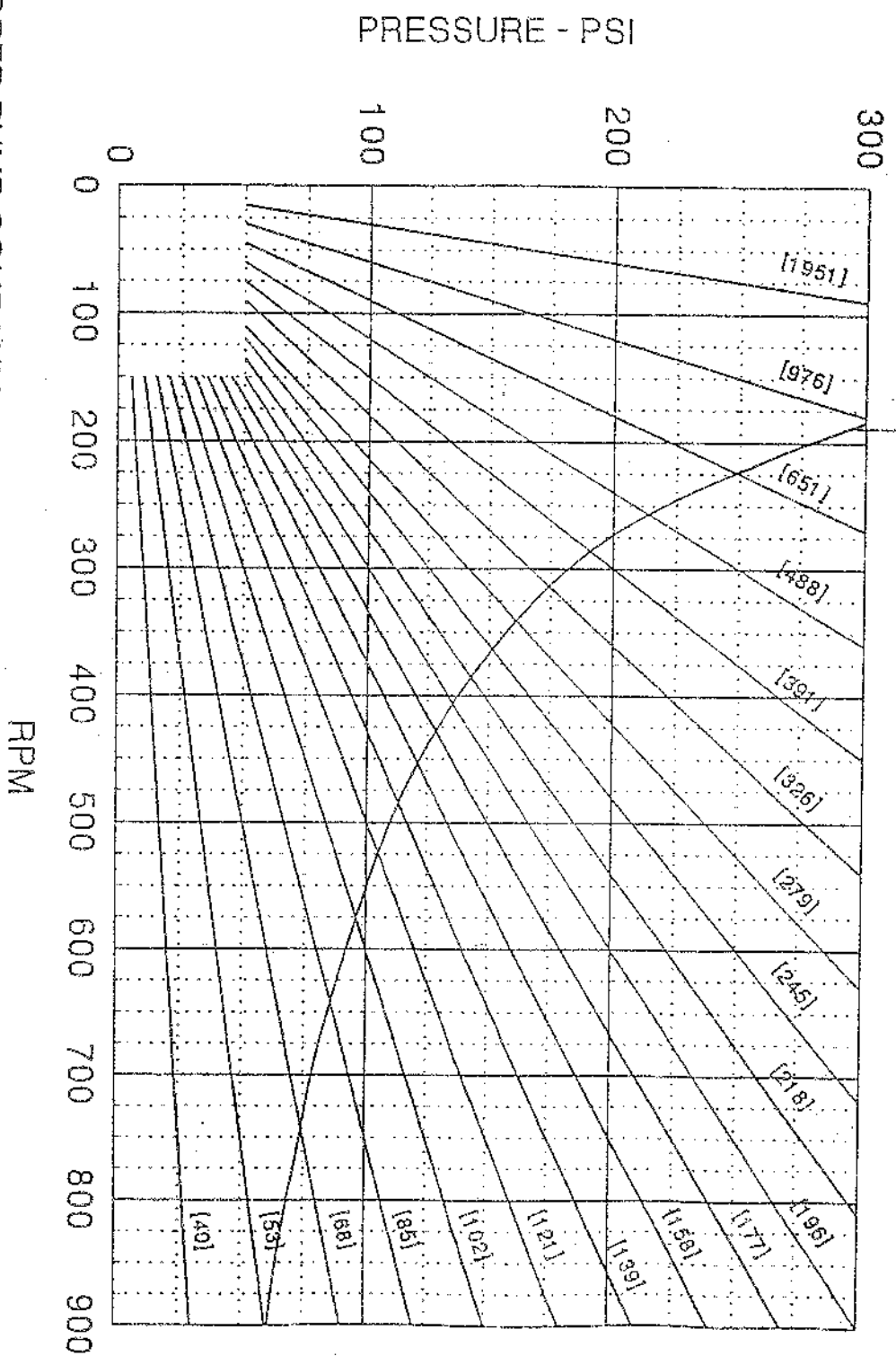


ROPER PUMP COMPANY
ISSUED 1/96

COMMERCE, GEORGIA

F200 TYPE 27 (BRONZE BEARINGS)

[SSU] PV LIMIT CURVE

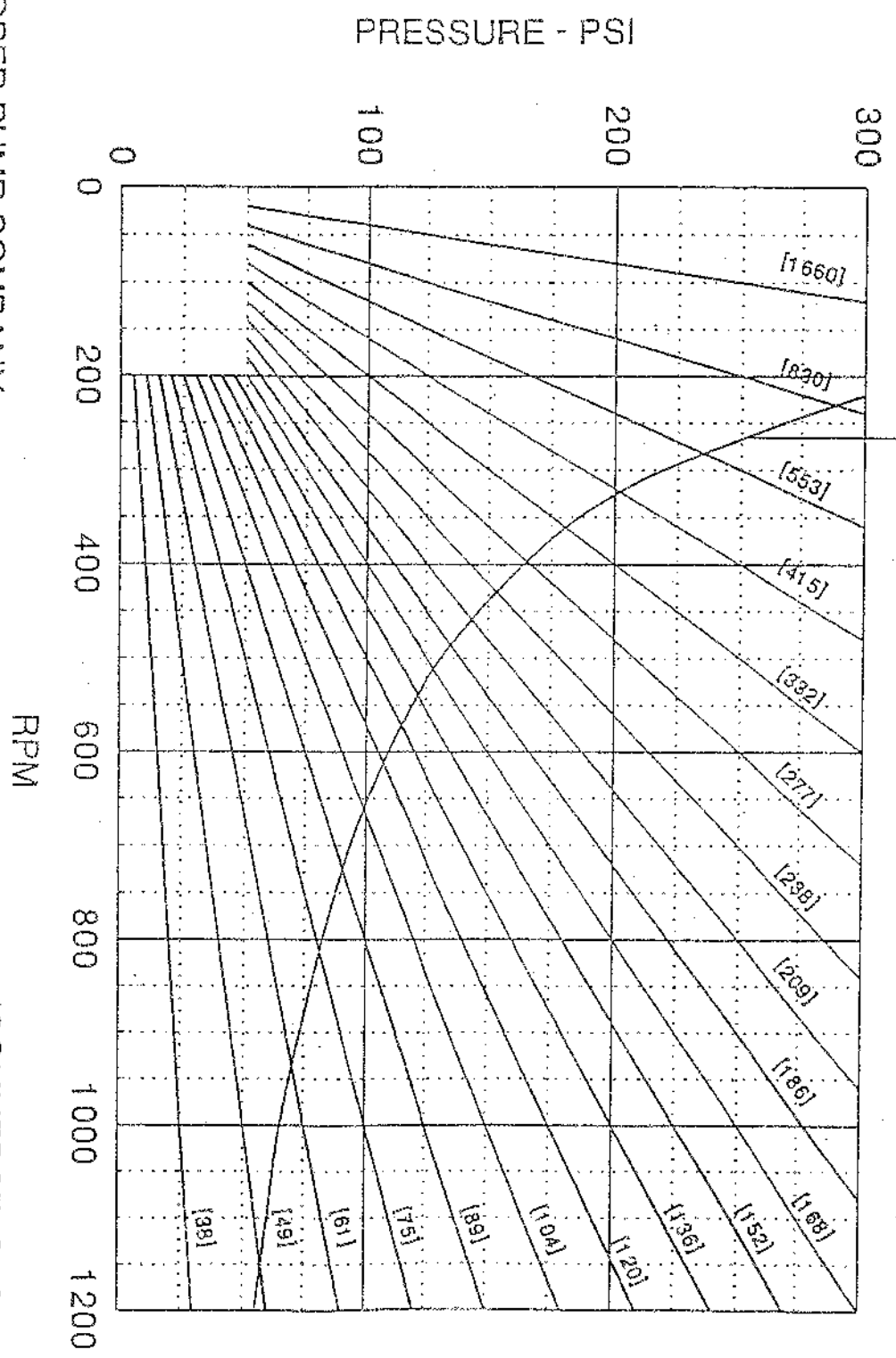


ROPER PUMP COMPANY
ISSUED: 1/96

COMMERCE, GEORGIA

F100 TYPE 27
(BRONZE BEARINGS)

[55U] PV LIMIT CURVE

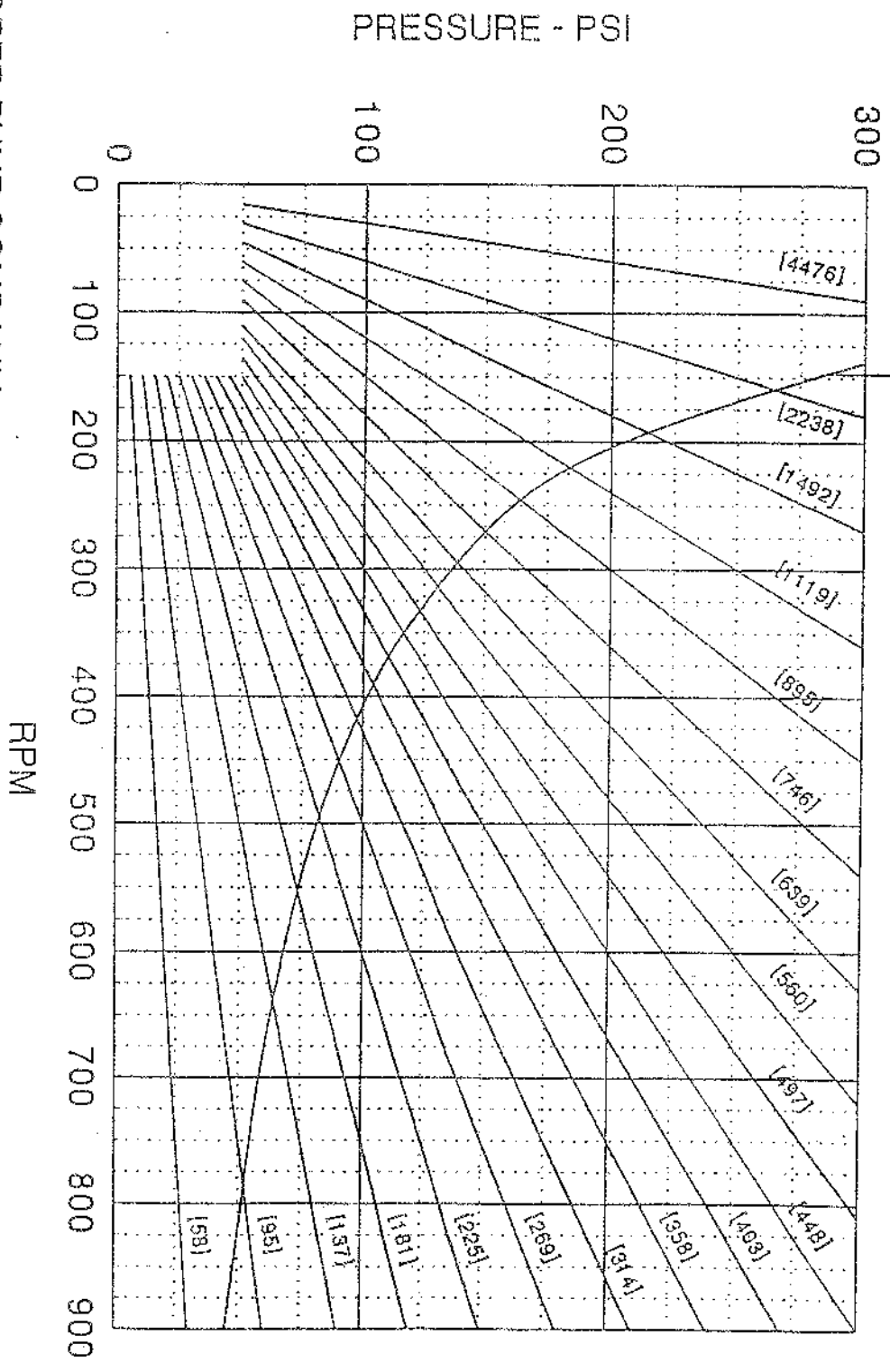


ROPER PUMP COMPANY
ISSUED 1/95

COMMERCE, GEORGIA

F300 TYPE 27 (BRONZE BEARINGS)

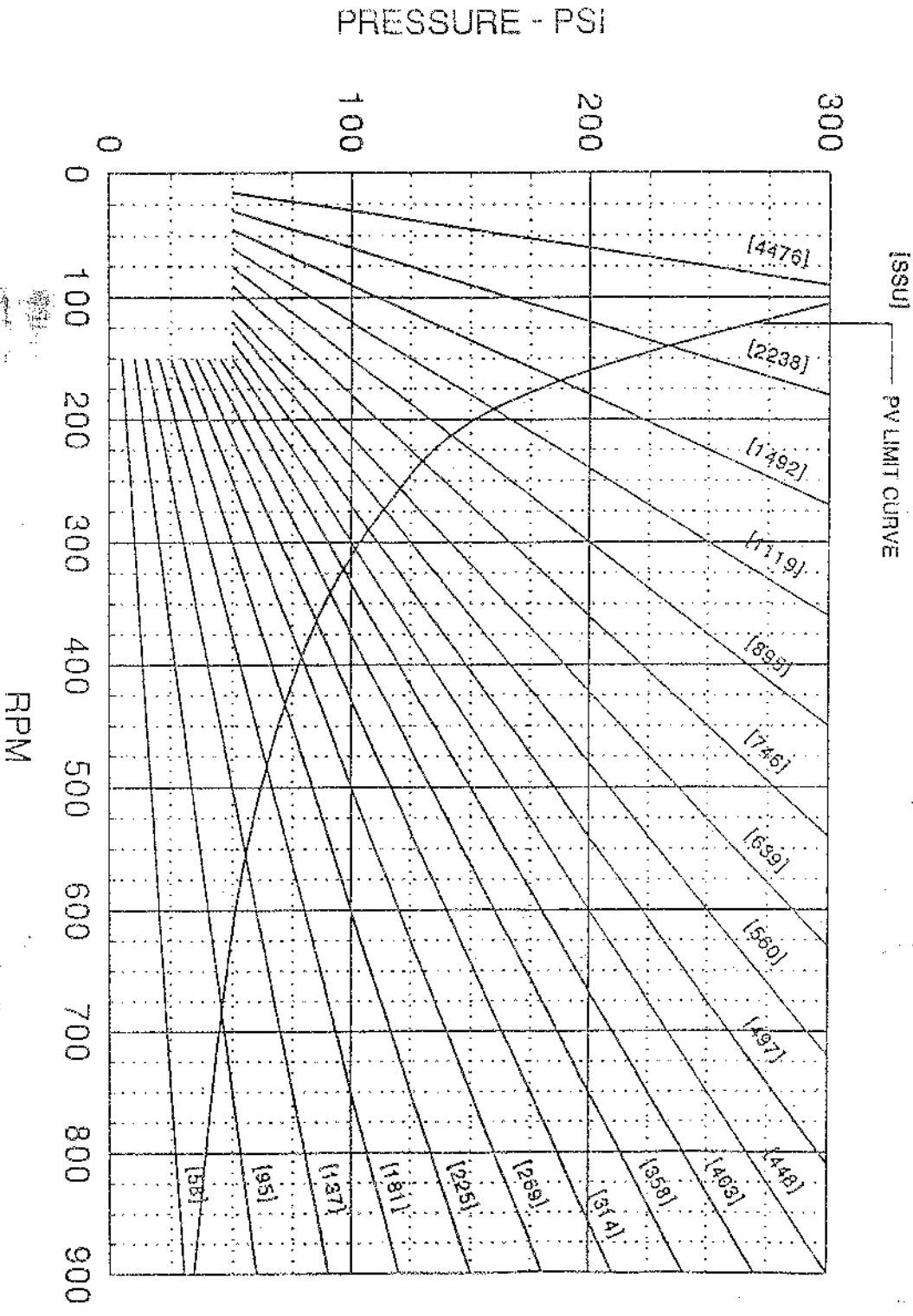
[SSU] — PV LIMIT CURVE



ROPER PUMP COMPANY
ISSUED 1/58

COMMERCE, GEORGIA

F300 TYPE 27
(IRON BEARINGS)



ROPER PUMP COMPANY
ISSUED 1/66

COMMERCE, GEORGIA

