SECTION 1

GENERAL INFORMATION

1-1. INTRODUCTION

1-2. The Ballantine Model 1620A Transconductance Amplifier is a wide range DC-AC voltage to current converter. The 1620A converts a precision input voltage to a proportional output current. The instrument is intended for use as a precision current source for calibrating ammeters, current transformers and shunts. It may also be used as a high current power supply and as a power source in welding and bonding applications.

1-3. Dc input voltages provide the same polarity output current and output current is proportional to the input magnitude. For AC input voltages the output current has the same frequency and phase of the input voltage. Output current is proportional to the input voltage. The 1620A is DC coupled throughout and will faithfully convert into comparable output currents and input voltages of diverse waveshape, unbalanced symmetry and with dc offset potentials. The signals for the 1620A may be operated ± 100 volts with respect to the enclosure which must be earth grounded.

1-4. The 1620A incorporates seven switch selectable current ranges of:

100A	at	100 Siemens Transconductance
20A	at	10 Siemens Transconductance
2A	at	1 Siemens Transconductance
200m	at	100 milliSiemens Transconductance
20m	at	10 milliSiemens Transconductance
2m	at	1 milliSiemens Transconductance
200u	at	100 microSiemens Transconductance

All current ranges are rated ± dc, ac sinusoidal and ac rms with a crest factor equal to or less than 1.45.

1-5. Convenient front panel output connectors are provided to simplify testing of current ranges on conventional multimeters and ammeters. All currents to 2A are accessible from a single set of binding posts to avoid having to transfer connecting cables. The 20A RANGE and the 100A RANGE are each available on separate output connectors to purposely require switching of cables on these ranges where high current may damage low current ranges of the instrument being provided with the current input.

NOTE

Never connect more than one set of current output terminals at a time and be certain zero has been adjusted before using on each range. On high currents above 10A check zero after unit has been operated to warmup.

1-6. STANDBY and FRONT/REAR INPUT switching are provided along with complete optional remote IEEE-488 control of all RANGES, STANDBY, and FRONT/REAR INPUT. RANGE indicator lamps and REMOTE indication lamps are provided. Option 60 provides IEEE-488 bus operation.

1-7. OOVERCOMPLIANCE and INPUT OVERDRIVE voltage indicator lamps are provided on the front panel to show when the output voltage is excessive due to too high a load impedance for the current being supplied and when the input voltage is beyond the specified limits.

1-8. The Model 1620A is forced air ventilated with cold air drawn into the instrument and discharged from the instrument at its rear panel. Over-temperature output protection is provided.

1-9. The Model 1620A is housed in a rugged aluminum enclosure and is in conformance with RETMA 19 inch rack mount dimension. Rack mount hardware and slides are field installable. Option 15 provides slides and rack mount accessories.

1-10. The Model 1620A may be operated from conventional 100, 120, 220 and 240 volt ac mains with current capacity of 20 amperes.

1-11. SPECIFICATIONS

1-12. Table 1-1 lists the specifications for the Model 1620A.

TABLE 1-1.

PERFORMANCE SPECIFICATIONS

AC OPERATION

RANGES:			
0 to 100A rms	Transconductance:	100	Siemens
0 to 20A rms	Transconductance:	10	Siemens
0 to 2A rms	Transconductance:	1	Siemens
0 to 200m rms	Transconductance:	100	milliSiemens
0 to 20m rms	Transconductance:	10	milliSiemens
0 to 2m rms	Transconductance:	1	milliSiemens
0 to 200u rms	Transconductance:	100	microSiemens

Ratio of input voltage to output current. All ranges: 2 Volt input/full range current output except 100A RANGE which has 1 volt for 100A rms output current. AC rms is rated for sinusoidal inputs with a maximum crest factor of 1.45.

RESOLUTION:

(Referred to input voltage)
0.01% of range on the 2m to 20A RANGES.
10mA on the 100A RANGE.
1uA on the 200u RANGE.

COMPLIANCE VOLTAGE:

100A RANGE:	3 V rms sinusoidal (± 4.25 V peak) maximum to meet stated specifications.
20A RANGE:	4 V rms sinusoidal (± 5.6 V peak) maximum to meet stated specifications.
All other RANGES:	5.5 V rms sinusoidal (± 7.7 V peak) maximum to meet stated specifications.

OPEN CIRCUIT COMPLIANCE VOLTAGE:

Not greater that ± 15 V peak.

ACCURACY OF OUTPUT CURRENT:

Allowable deviation of range output current from input voltage:
± (0.15% of output current + 0.1% of range)

BANDWIDTH (SINUSOIDAL INPUT):

100A RANGE:	DC to 45 Hz to 100 Amps peak 45 Hz to 1 kHz to 100 Amps rms
20A RANGE:	DC to 1 kHz
2A RANGE:	DC to 5 kHz
All other RANGES:	DC to > 10 kHz

LOAD REGULATION/TRANSIENT RECOVERY TIME:

Any change in load on any range will have an output current settled within ± 0.01% of initial current in 5 seconds or less.

TOTAL HARMONIC DISTORTION:

< 0.1% of the fundamental at 100A rms and 1 kHz sinewave.

LOAD REQUIREMENTS:

The current output will supply resistive and capacitive loads as well as inductive loads to 2 millihenries at full specified currents and frequencies which permit operation within the rated compliance voltage.

TABLE 1-1. PERFORMANCE SPECIFICATIONS - Con'd

DC OPERATION

RANGES AND TRANSCONDUCTANCES:

0 to ± 100A at ± 100 Siemens
0 to ± 20A at ± 10 Siemens
0 to ± 2A at ± 1 Siemens
0 to ± 200m at ± 100 milliSiemens
0 to ± 20m at ± 10 milliSiemens
0 to ± 2m at ± 1 milliSiemens
0 to ± 200u at ± 100 microSiemens

RATIO OF INPUT VOLTAGE TO OUTPUT CURRENT:

All ranges ± 2 Volts input for ± full range current output;
except 100A RANGE which is ± 1 volt for ± 100A output current.

RESOLUTION:

(Referred to input voltage)

± 0.01% of range from ± 2m to ± 20A RANGES.

± 10mA on the ± 100A RANGE.

± 1uA on the ± 200u RANGE.

COMPLIANCE VOLTAGE:

± 4 volts maximum to meet stated specifications on the 20A and 100A RANGES.

± 7.5 volts maximum to meet stated specifications on all other RANGES.

OPEN CIRCUIT COMPLIANCE VOLTAGE:

Not greater than ± 15 V peak.

ACCURACY OF OUTPUT CURRENT:

Allowable deviation of output current from input voltage on 2A, 20A, 100A RANGES:

± (0.02% of output current + 0.02% of range).

On 200m to 200u RANGES:

± (0.12% of output current +.03% of range).

Option 04 provides ± (0.02% of output current +0.02% of range) on all ranges.

TRANSIENT RECOVERY:

0.01% of final output current value within 5 seconds of change in load or input voltage.

GENERAL

INPUT TERMINALS AND IMPEDANCE:

Gold plated universal binding posts.
95K Ohms input resistance.

OUTPUT TERMINALS:

Gold plated, universal binding posts on all ranges except 100A RANGE which uses Superior Model RS 100G high current female terminals.

REAR INPUT:

FRONT or REAR INPUT selectable by front panel switch.

TABLE 1-1. PERFORMANCE SPECIFICATIONS - Cont'd

GENERAL CONT'D

OFF GROUND OPERATION:

Instrument is capable of operating INPUT LO and OUTPUT LO to ± 100V dc with respect to CASE ground input. LO to CASE resistance: 0.5 Megohms.

ISOLATION:

Input voltage LO may be separated by ± 10 volts common mode voltage with respect to output current HI and LO terminals.

ENVIRONMENTAL CHARACTERISTICS:

Temperature:

Storage:	-40 to +75°C
Operation:	0 to 50°C (Full Accuracy)

Humidity:

Full Accuracy:	20% to 80% RH to 40°C; to 65% RH to 50°C
Usable:	10% to 100% RH without condensation

Altitude:

Storage:	0 to 50,000 feet
Operating:	0 to 10,000 feet

CONTROLS:

ON - OFF POWER Switch
STANDBY Switch - Disables output current drive
FRONT-REAR INPUT Switch - Selects front or rear panel input voltage terminals

PROTECTION:

Input Protection: to ± 15 volts and open or short circuit.

Output Protection: Open circuit or short circuit protection and output compliance voltage limited to ± 15 volts peak across current output terminals.

Sensitive components protected by high temperature cut out with STANDBY indicator.

Ventilation: Forced air ventilation is provided whenever interior temperature rises above 50°C.

Size:

Height:	267 mm (10½")
Width:	19" standard EIA rack mount configuration
Depth:	416 mm (16 3/8") behind panel 457 mm (18 inches) overall
Weight:	45.5 kg (100 lbs.) 68 kg (150 lbs.) shipping

POWER REQUIREMENTS:

100V or 120V or 220V or 240V ± 10%, Single phase, 50 to 60 Hz
2000 Volt Amperes fully protected with magnetic 20A circuit breaker.

ACCESSORIES PROVIDED:

P/N: 31-10338-0	100 Ampere plug connector; red
P/N: 31-10339-0	100 Ampere plug connector; white
P/N: 90-10296-5	Instruction Manual