Operators Manual

For The

6623A-600S

High Current Range Extender

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NOTICE

OM6623A-600S-A1-00
01 September 2021

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1. INTRODUCTION

1.1. SCOPE

This document describes the installation, operation, specifications, maintenance and calibration of the 6623A-600S High Current Range Extender especially designed for 9920/A DCC Resistance Bridges. Precautions associated with very high current connections and measurements are provided for purposes of user safety and measurement system reliability.

1.2. GENERAL DESCRIPTION

The Model 6623A-600S Current Range Extender is designed to extend the test current and measurement range of the Guildline Instruments 9920/A DCC Resistance Bridges.

The extender is essentially a direct current transformer with primary windings which produce an output current that varies directly with the input current. The windings provide transformation ratios of 10:1, 100:1, and 1,000:1 and allow for measurements to be performed above the 1 A capability of the DCC Resistance Bridge up to a maximum of 600 Amperes.

The 6623A-600S includes within the same chassis three current ranges. The 6623A-600S Extender is configured in a 5U chassis designed to operate at nominal power line voltage of 208 to 240 VAC.

The 6623A-600S design allows measurements to be made that reduce thermal and current offset effects with the inclusion of a bi-polar current source and all the control circuits necessary for control with the 66259 Extender Control Unit to be used with the 9920/A bridges.

No ancillary components such as external current sources or current reversing relays are needed for full utilization of the 6623A-600S current range extender.

1.3. OVERVIEW

The Model 6623A-600S Current Range Extender is a precision, fixed ratio, direct current transformer based on the principle of the direct current comparator. Figure 1-1 illustrates the instrument circuits in block diagram form with the connections to the 9920/A Bridge. Four precision programmable bi-polar current sources are incorporated into the extender such that measurements can be implemented through the 9920/A current comparator resistance bridge. The 6623A extender is connected to the 9920/A Bridge using the model 66259 Extender Control Unit as the interface and current controller.

No adjustments of the 6623A-600S are required for proper operation, but the 9920/A Bridge must be set up for use according to the configuration provided in this manual. The 66259 Extender Control Unit is generally configured at the factory for a specific range extender whenever a range extender is ordered. The control unit has calibration coefficients for the range extender current source such that accurate currents may be selected with the control unit over the full range of the extender. Refer to the Model 66259 manual for details on the operation of the extender control unit.

1.4. PRINCIPLE OF OPERATION

The Direct Current Comparator is a multiple winding toroidal transformer device shown in Figure 1-1 in which the primary and secondary windings carry direct currents and in which modulator and detector windings are used for the detection of DC flux in the core. When the primary and secondary ampere-turns are equal and opposite there is zero resultant DC flux in the core. This balance condition can be detected by the flux detector circuit. The DC output of the detector is proportional to ampere-turn imbalance. The presence of DC flux in the cores due to primary-secondary ampere-turns unbalance is indicated by the detector output both in magnitude and polarity.

A single current comparator toroidal transformer with associated servo and modulator circuits is utilized in the 6623A-600S. Ratios of 10:1, 100:1 and 1,000:1 are implemented with three primary windings on the current comparator transformer.

The peak detectors drive the respective servo circuits to provide correction currents which maintain ampere-turn balance in the cores at all times such that the ratio of input and output currents are exactly 10:1, 100:1, or 1,000:1 depending on which range of operation is selected. The 66259 Control Unit provides a front panel selected drive signal to the programmable current sources as to allow test currents of from +/-150 mA to +/- 600 A to be realized. The polarity is also manually controlled from the 66259 front panel. This current is directed to the specific primary windings of the toroidal transformers and the servo amplifier outputs drive a balancing current through the secondary windings. The secondary winding of the toroidal transformer is directed back to the 9920/A such that the bridge can also be balanced with the reduced current. The 9920/A Bridge, once properly balanced, can then determine the resistance ratio of the test resistor with that of the reference resistor used in the measurement. Refer to the 9920/A Technical Manual for a description of the bridge measurement technique.

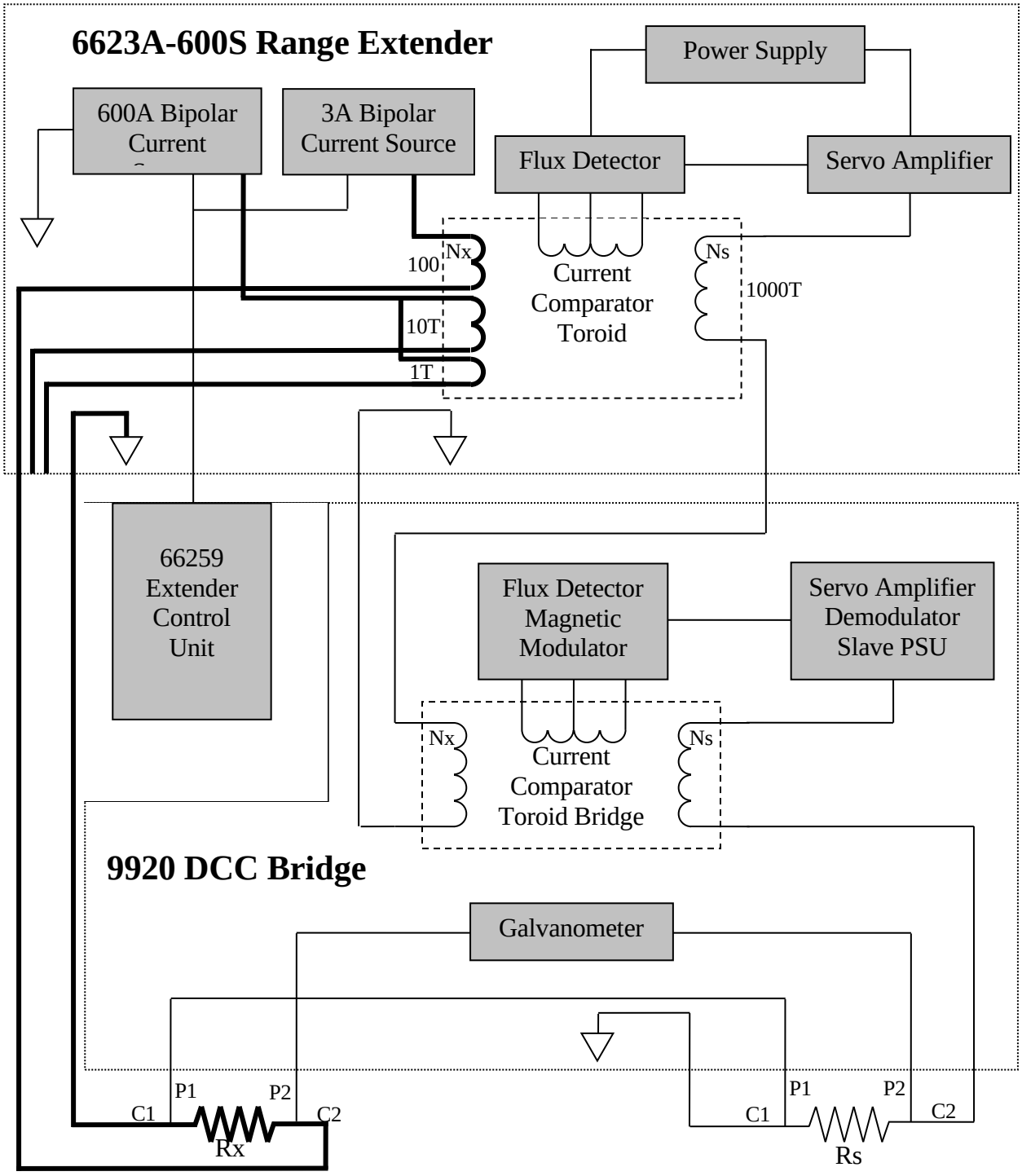


Figure 1-1 : Model 6623A-600S Block Diagram with 9920 Bridge

2. INSTALLATION

2.1. PRELIMINARIES

2.1.1. Unpacking

a. Remove the 6623A-600S Current Range Extender, the 66259 Extender Control Unit and the other items from the shipping container to a suitable location.

b. The following items are included with each new unit.

i. Operators Manual (OM6623A-600S)
ii. Four Spare 200A Fuses, (GPN 099-32200)
iii. Two Spare Fuses 30A Slow Blow, (GPN 099-30000)
iv. Two Spare Fuses 8A Slow Blow, Ceramic Tube (GPN 099-28001)
v. One SCW Lead, 1.5m (GPN 20236.03.02)
vi. One 20A, 1.5m red connection cable (GPN 996-00105)
vii. One 20A, 1.5m black connection cable (GPN 996-00104)
viii. One 30A, 1.5m red connection cable (GPN 31209-01-21)
ix. One 30A, 1.5m black connection cable (GPN 31209-02-21)
x. Two 300A, 1.5m red connection cable (GPN 30880-02-21)
xi. Two 300A, 1.5m black connection cable (GPN 30881-02-21)
xii. Model 66259 Extender Control Unit with cables and manual.
xiii. AC Line Cord, (GPN# 250-04030)

2.1.2. Power Voltage Selection

The 6623A-600S Current Range Extenders are shipped with fuses installed in the power entry module. The 6623A-600S is designed for universal use of AC power sources from nominal 208 Volts to 240 Volts in a frequency range of 50 Hz to 60 Hz. See Table 2-1 for the correct fuse selection if required.

Where the molded plug on the line cord supplied with the 6623A-600S does not match the local power outlet sockets, the plug can be removed and replaced with one that does fit the local service. The plug should be re-wired as follows:

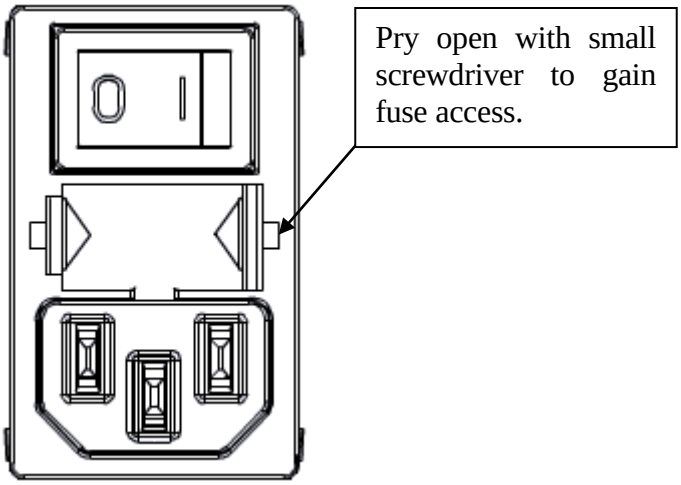
Brown wire	-	Line input
Blue wire	-	Neutral input
Green/Yellow wire	-	Ground (safety)

2.1.3. Fuse Selection or Replacement

Only fuses with specified current rating type should be used for replacement if necessary. See Table 2-1 below.

6623A-600S FUSES (TIME DELAY TYPE)		
208 V	220 V	240 V
8A, 250V, (T)	8A, 250V, (T)	8A, 250V, (T)

Table 2-1 : Fuse Ratings



Note: No external line voltage/frequency selection is required for power entry.

Figure 2-1 : Input Fuse Access

2.1.4. Setup and Power On

a. Verify that the power switches are off on each section.

b. Remove any excess packing materials from around the front and back panels that are provided for shipping purposes only. Select and install the correct line voltage fuse if necessary.

c. Connect the 6623A-600S extender to the 9920/A Bridge using the model 66259 Extender Control Unit and associated cables. Configure the 9920/A Bridge for 1:1 measurement mode with external current source as shown in Figure 2-2.

d. Connect the input power cord from the 6623A-600S and the 66259 Control Unit to the AC power outlet.

e. Turn on the power switch to the 9920/A Bridge.

f. Turn on the power switch to the 66259 and then to 6623A-600S. You should see the red and yellow "POWER" and "FAULT" indicators on the front panel light up. The fault indicator will remain on for about 6 seconds and then remain off unless a fault in the extender is detected. The red indicator will remain lighted as long as power is applied to the extender.

g. The system should now be ready to use as a 600 A current range extender.

Note 1: Do not cycle the power on the 6623A Range Extender with a shunt or load connected to one of the ranges on the back panel. Connect the load AFTER the 6623A is turned on. Disconnect the load BEFORE turning off the 6623A.

Note 2: It is essential that only one set of C1 and C2 current terminals be connected at any one time to a load (e.g. shunt). Only connect a load to one set of output current terminals.

Note 3: Do not connect or disconnect the load when the measurement is running.

Note 4: Make sure shunt current leads of sufficient size are connected to the correct C1 and C2 range terminals for a specific measurement current.

Note 5: Do not connect the current terminals of the test resistor through a scanner if test currents above 2 amperes will be selected.

Note 6: Warm up time of 45 minutes is recommended to meet full specifications.

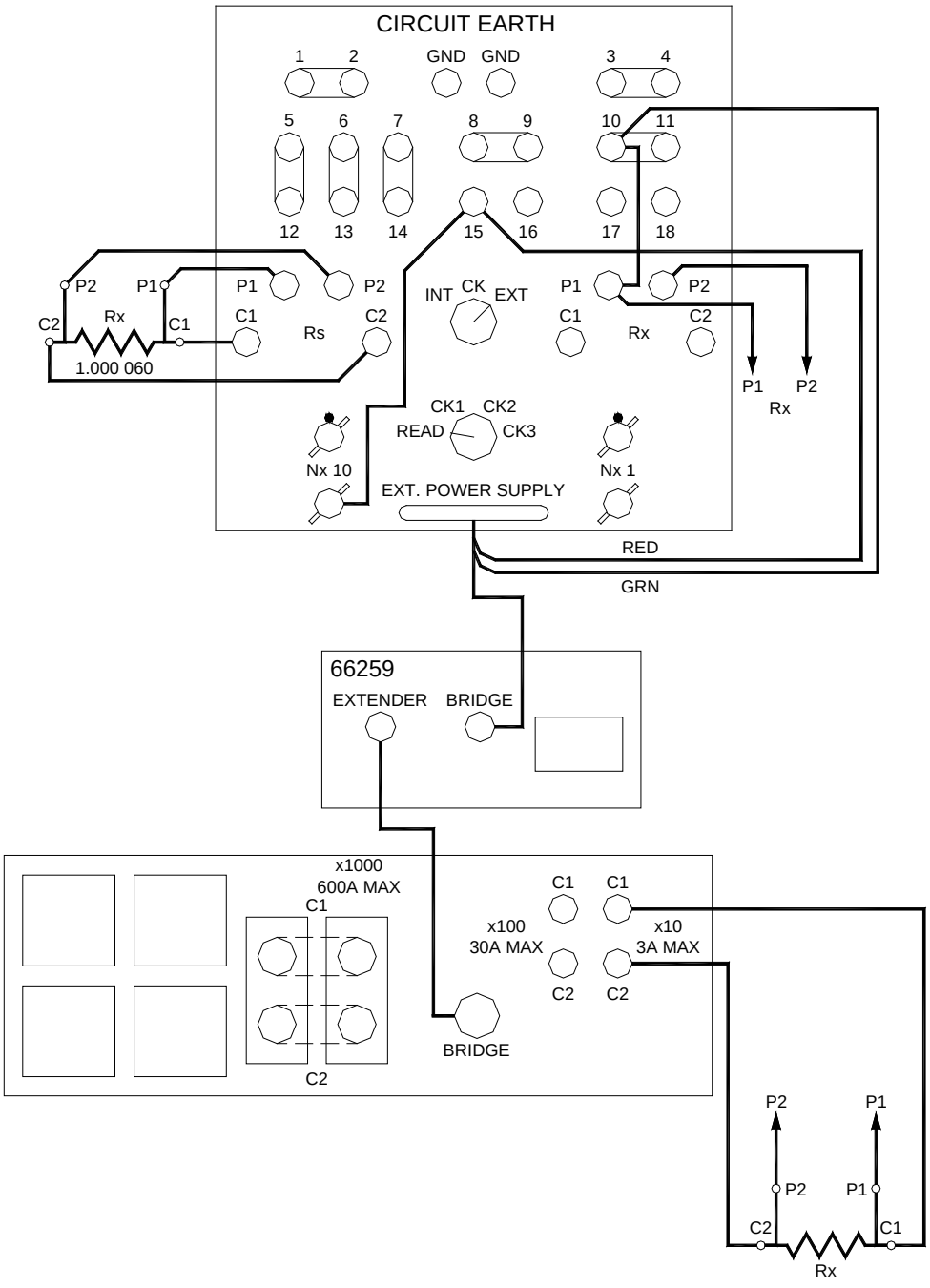


Figure 2-2 : 6623A-600S Connections with 9920

2.2. INCOMING INSPECTION

If no errors are displayed during power up then proceed to measure a 0.1 ohm resistor referenced to a 1 ohm standard. Using the measurement set up procedure below. For operation of the 9920/A Bridge refer to 9920/A Technical Manual.

Step 1) Connect a 1 ohm resistance standard to the Rs terminals and 0.1 ohm resistance standard to the Rx terminals of the 9920/A Bridge. Set up the 9920/A to measure a 0.1 ohm resistance using 1 A of current and the 1000:100 measurement mode with the internal current source.

Note that the 6623A-600A and the 66259 Control unit are not connected to the 9920/A at this point.

Step 2) Measure the value of the 0.1 ohm resistance using the normal procedure for a 1000:100 ratio using the internal 1 A supply as described in the 9920/A Technical Manual. Record the ohms value measured.

Step 3) Turn off the 9920/A and reconfigure the bridge with the 6623A-600S Range Extender and the 66259 Extender Control Unit as shown in Figure 2-2, except do not connect the Rx shunt leads to the back of the extender until after step 4.

Step 4) Turn on the 9920/A, the 66259 and then the 6623A-600S in sequence.

Note: Do not power on the 6623A-600S with a shunt resistor connected to the current output terminals on the back panel.

Step 5) Disconnect the leads connected to the Rx C1 and C2 terminals of the 9920/A and connect them to the C1 and C2 terminals of the x10-3A range on the back panel of the 6623A-600S.

Step 6) The deviation from nominal of the Rs Reference Standard Resistor may be set on the Rs Deviation dials of the 9920/A. Refer to the 9920/A Technical Manual for proper operation of the 9920/A and the 66259 Operators Manual for the proper operation of the Extender Control Unit.

Step 7) Set the 9920/A first 3 or 4 most significant Rx/Rs ratio dials to the 1.000 depending on the expected resistance value of the resistor to be measured.

Step 8) Using the Operators Manual for the Model 66259 Extender Control Unit initially select the ratio range being used, then the lowest positive current for the extender range selected and perform the tracking and comparator balance adjustments as required on the 9920/A using polarity reversal function on the Extender control Unit such that the test current of the 6623A-600S will be reversed when the polarity is selected. Note that the polarity reversal switch on the 9920/A will not be functional when the range extender is connected.

Note: **If the oscillator light on the 9920 should become extinguished at any time the current selection of the Model 66259 Extender Control unit must be disabled immediately.**
If the situation persists, the 9920/A must be powered off to avoid damage to the 9920/A circuits. See the 9920/A Technical Manual for further detail on how to remedy the problem.

Step 9) Slowly increase the test current to 1 A using the Model 66259 Extender Control Unit while reversing the polarity and making appropriate adjustments on the 9920/A front panel to maintain ampere-turn balance and galvanometer balance. Increase the galvanometer sensitivity as the balance is refined.

Step 10) Once satisfied with the final balance condition the Rx/Rs dials will indicate the ratio of the Rx resistance in relation to the Rs resistance after division by the range extender ratio.

Calculation of the Rx resistance: Rx = Rs x **(Rx / Rs dial reading) / Extender Ratio**

Example: Rs is nominal value of 1 ohm,
Rs/Rx dial reading is 1.000262
Extender Ratio used is: x 10

Rx = 1 x 1.000262 / 10 = 0.1000262 ohms

Step 11) Record the ohms value measured. Calculate the difference between the two measurement results. The difference should be less than +/- 0.00001 ohms depending on the stability of the resistors used in the test.

Note: This is not the 6623A-600S full rated accuracy but serves a functional test for the purposes of determining the instrument has been received in proper working order.

Note: It is recommended to keep the 6623A-600S powered off when the instrument is not in use for extended periods of time.

2.3. 6623A-600S FRONT PANEL

There are no controls on the front panel of the 6623A-600S.

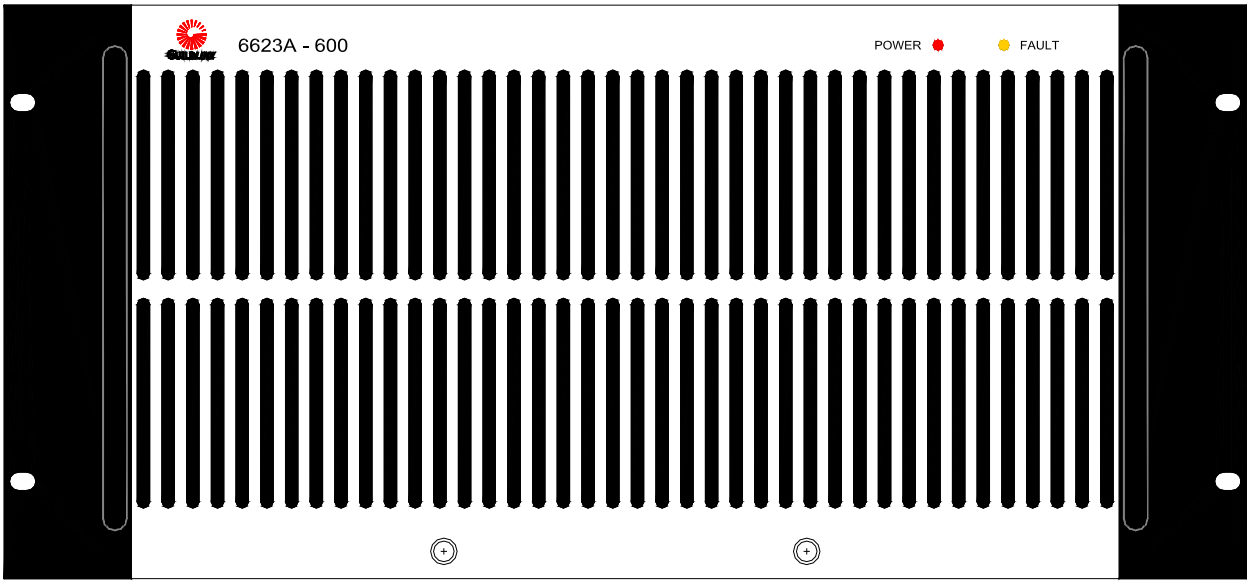


Figure 2-3 : 6623A-600S Front View

2.3.1. Power

The power-on indicator is lighted when the AC power is applied to the unit and the power switch on the rear panel is “ON”.

2.3.2. Fault

The fault indicator on is lighted when a fault condition has been detected in one of the current control circuits of one of the 150A internal current source boards.

Note that there are a set of yellow indicators behind the air outlet screen of the front panel. One or more may light when a fault in a particular 150A current source board is detected. This is a feature to allow identification of which board is at fault. If one board develops a fault the rest will continue to operate but the total available current will be reduced by a proportional amount.

2.4. 6623A-600S REAR PANEL CONNECTORS AND CONTROLS

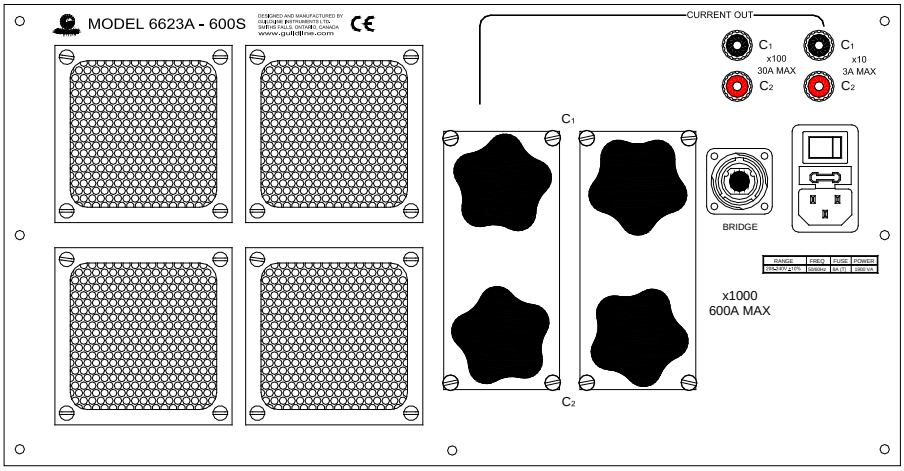


Figure 2-4 : 6623A-600S Rear View

2.4.1. Line Input Connector

The **Line Input Connectors** are a combination of a 3-prong AC standard male connector, an ON/OFF switch and a fused line input with access for fuse replacement. The line input connector accommodates nominal voltages of 208 to 240V. Appropriate time-delay fuses are provided as specified in section 2.1.3.

2.4.2. Resistor Under Test Output Terminals

The Test Resistor's current output terminals consist of three sets of two binding posts. These binding posts are labeled as C1 and C2 for each current range of x10-3A, x100-30A and x1000-600A maximum. These terminals are to be connected to the C1 and C2 terminals of the resistor under Test whenever the range extender is to be used. The potential terminals of the Test Resistor are always to be connected to the Rx P1 and P2 terminals of the 6622A Bridge.

Note: It is essential that only one set of C1 and C2 current range terminals be connected at any one time. Do not power on extender with a shunt connected.

Sets of 20 A, 30 A and 300 A leads are provided to allow for full 30 A and 600 A measurements with minimal temperature rise of the current leads. The leads can be doubled up to accommodate the higher currents to 600 A as there are two sets of terminals provided on the back panel for the x1000 range.
The x100-30A terminal output is protected from over-current with a 30A fuse internal to the instrument as a safety precaution.

2.4.3. Bridge Connector

The “BRIDGE” connector is a 7 pin circular connector which is used to connect the necessary signals to the model 66259 Extender Control Unit.

3. QUICK MEASUREMENT GUIDE

3.1. MEASUREMENT OPERATION GUIDE

This section contains information regarding the measurement of resistors in the range of 1μ ohm to 10 ohms. This guide is provided for manual control of the 6623A-600S.

3.1.1. Low Ohm Mode Resistance Measurement with the 6623A-600S

The 9920/A in its Low Ohm Mode with the 6623A-600S enables measurement of resistors below 10 ohms with test currents above 1 A.

Step 1) Connect the bridge, the extender control unit, the 6623A-600S range extender, the reference standard and the TEST resistor as shown in the Figure 2-2 connection diagram. Do not connect the load (e.g. shunt) until after the 6623A-600S is turned on. Use appropriate leads to carry the currents which are provided in the spare parts kit. See section 3.1.2 for test setup limits. Depending on the test current range the C1 and C2 terminals are to be attached to the appropriate range terminals on the back panel of the 6623A-600S after the unit is powered on.

Step 2) Turn on the 9920/A, the 66259 and then the 6623A-600S in sequence. **Do not power on 6623A extender with a shunt connected.**

Step 3) Make sure the selection of working standard resistor is appropriate and the appropriate C1 and C2 extender terminals are connected to the TEST resistor for the current range selected for the test. For measurement of low ohm resistors, usually a 1Ω reference is chosen unless the TEST resistor nominal value is higher than 0.01 ohms or high current requirements require the use of a 10Ω or 100Ω reference resistance. See Table 3-1 for recommended Low Ohms Test setups.

Step 4) The deviation from nominal of the Rs Reference Standard Resistor may be set on the Rs Deviation dials of the 9920/A at this time. Refer to the 9920/A Technical Manual for proper operation of the 9920/A and the 66259 Operators Manual for the proper operation of the Extender Control Unit.

Step 5) Set the 9920/A first 3 or 4 most significant Rx/Rs ratio dials to the appropriate value shown in Table 3:1, depending on the expected resistance value of the resistor to be measured.

Step 6) Using the Operators Manual for the Model 66259 Extender Control Unit initially select the ratio range being used, then the lowest positive current for the extender range selected and perform the tracking and comparator balance adjustments as required on the 9920/A using polarity reversal function on the Extender control Unit such that the test current of the 6623A-600S will be reversed when the polarity is selected. Note that the polarity reversal switch on the 9920/A will not be functional when the range extender is connected.

Note: If the oscillator light on the 9920 should become extinguished at any time the current selection of the Model 66259 Extender Control unit must be disabled immediately.
If the situation persists, the 9920/A must be powered off to avoid damage to the 9920/A circuits. See the 9920/A Technical Manual for further detail on how to remedy the problem.

Step 7) Slowly increase the test current to the desired magnitude using the Model 66259 Extender Control Unit while reversing the polarity and making appropriate adjustments on the 9920/A front panel to maintain ampere-turn balance and galvanometer balance. Increase the galvanometer sensitivity as the balance is refined.

Step 8) Once satisfied with the final balance condition, the Rx/Rs dials will indicate the ratio of the Rx resistance in relation to the Rs resistance after division by the range extender ratio.

Calculation of the Rx resistance: Rx = Rs x **(Rx/Rs dial reading) / Extender Ratio**

Example: Rs is nominal value of 1 ohm,
Rs/Rx dial reading is 1.000262
Extender Ratio used is: x 10

Rx = 1 x 1.000262 / 10 = 0.1000262 ohms

3.1.2. Recommended Test Setup Limits and Precautions for 6623A-600S

See Table 3-1 for the recommended test setups. Note that the current in the standard resistor is controlled by the resistance of the TEST resistor to be measured and the extender current such that the potentials across each resistance are equal and can be determined by the following formula:

Standard Resistor Current = Test Resistor Current x (Rx / Rs)

Also note that measurements made in Low Ohm mode should be made such that:

Rs $\geq$ Ext. Ratio x Rx

Other Checks and Precautions:

- Select the lowest ratio range of the extender that provides the current required for the test.
- Select current leads suitable to handle the test currents selected.
- Use the Table 3-1 to select the most suitable reference resistor value for the measurement.
- Verify that the bridge ratio will not exceed 1.111 as per the formula;
  Bridge Ratio = (Rx x Ext. Ratio) / Rs
- Verify that the reference resistor current will not exceed limits as per 3.1.2 above
- Ensure that all current lead connections are tight;

CAUTIONS:

1. **Loose High Current Connections Can Create Very High Temperatures and Arcing**
2. **It is essential that only one set of C1 and C2 current terminals be connected at any one time and the shunt current leads are connected to the correct C1 and C2 range terminals for a specific measurement current**
3. **Do not power on the 6623A Range Extender with a shunt connected to one of the ranges on the back panel**
4. **Do not connect the current terminals of the test resistor through a scanner if test currents above 2 amperes will be selected.**
5. **Ensure that cables used are rated for required currents and are well tightened down.**

Ref. (Ω)	U.U.T. (Ω)	Itest (A)	Rs Current (mA)	Extender Ratio/Range	9920/A Ratio Dial	Comment (1)
100	1	1	10	10:1 / 3A	0.10xx	Limit of 10 mW in Rs
1	0.1	1	100	10:1 / 3A	1.00xx	Limit of 10 mW in Rs
10	0.1	3	30	10:1 / 3A	0.10xx	Limit of x 10, 3A Range
1	0.05	2	100	10:1 / 3A	0.50xx	Limit of 10 mW in Rs
10	0.05	3	15	10:1 / 3A	0.05xx	Limit of x 10, 3A Range
1	0.01	3	30	10:1 / 3A	0.10xx	Limit of x 10, 3A Range
1	0.01	10	100	100:1 / 30A	1.00xx	Limit of 10 mW in Rs
10	0.01	30	30	100:1 / 30A	0.10xx	Limit of x 100/30A Range
1	0.005	20	100	100:1 / 30A	0.50xx	Limit of 10 mW in Rs
10	0.005	30	15	100:1 / 30A	0.05xx	Limit of x 100/30A Range
1	0.001	30	30	100:1 / 30A	0.10xx	Limit of x 100/30A Range
1	0.001	150	300	1000:1 / 600A	1.00xx	Limit of 10 mW in Rs
10	0.001	300	30	1000:1 / 600A	0.10xx	Limit of 100 W in U.U.T.
1	0.0005	600	300	1000:1 / 600A	0.50xx	Limit of x1000/600A Range
1	100u	600	60	1000:1 / 600A	0.10xx	Limit of x1000/600A Range
1	50u	600	30	1000:1 / 600A	0.05xx	Limit of x1000/600A Range
0.1	10u	600	60	1000:1 / 600A	0.1xx	Limit of x1000/600A Range
0.01	1u	600	60	1000:1 / 600A	0.1xx	Limit of x1000/600A Range

Table 3-1 : 6623A-600S Recommended Test Setups with 9920/A DCC Bridge

Note: If the oscillator light on the 9920/A should become extinguished at any time the current selection of the Model 66259 Extender Control unit must be disabled immediately.
If the situation persists, the 9920/A must be powered off to avoid damage to the 9920/A circuits. See the 9920/A Technical Manual for further detail on how to remedy the problem.

4. INSTRUMENT OPERATION

4.1. FRONT PANEL OPERATING PROCEDURE

The 9920/A Bridge and 6623A-600S Current Range Extender are manually operable only. The Model 9920/A Technical Manual describes the full detailed operating instructions for manual operation of the bridge.

Section 3 provides basic instructions as a quick guide to making measurements with the 6623A-600S.

Note: An Extender Profile is normally setup in the Model 66259 Extender Control Unit at the factory when being shipped with a particular Range Extender. Otherwise an extender profile must be created in the non-volatile memory of the 66259 Extender Control Unit. Provision is made in the extender profile for calibration coefficients in regard to test current accuracy. See the 66259 Operators Manual for details on setting up the profile and checking the profile as may be required.

5. VERIFICATION AND CALIBRATION

5.1. RATIO ACCURACY VERIFICATION

This procedure covers the ratio accuracy verification of the 6623A-600S Current Range Extender.

5.1.1. Purpose

The purpose of this procedure is to assure that the 6623A-600S Current Range Extender meets the manufacturer's specifications. It is recommended that these procedures be performed after any corrective maintenance activity, or if the operator perceives a problem with respect to ratio accuracy or test current accuracy.

It is recommended that all of these procedures be performed on an annual basis to verify performance of the 6623A-600S for its recertification.

The following procedure is to be used to verify the calibration of the Current Range Extender.

5.2. TEST EQUIPMENT REQUIRED

Test equipment of equivalent performance may be substituted from the list provided.

Description	Model
DC Comparator Bridge	Guildline 9920/A
DC Resistance Standard	Guildline 9330/1Ω
DC Current Shunt Standard	Guildline 9230A-30-0.1Ω
DC Current Shunt Standard	Guildline 9230A-100-0.01Ω
DC Current Shunt Standard	Guildline 9230A-300-0.001Ω
Temperature Controlled Oil Bath	Guildline 5010

Note: The 6623A is calibrated at the factory using a temperature controlled oil bath controlled to within ± 0.02 °C. If the ambient conditions in the laboratory are sufficiently controlled to within ± 0.5ºC the verification procedure below may be used without the oil bath with precautions that the environment around the standards is kept as stable as possible and the additional uncertainties due to temperature variations is taken into account.

5.3. PROCEDURE

5.3.1. PRELIMINARY MEASUREMENT OF THE 9230A-30-0.1Ω SHUNT

1. Place the 9330/1Ω Resistance Standard and the 9230A Current Shunt Standards in the 5010 Oil Bath and allow stabilizing in temperature at 25.00 °C.

2. Connect the 9330/1 Standard to the 9920/A Current Comparator Bridge Rs terminals and connect the 9230A-30-0.1Ω Current Shunt to the Rx terminals.

3. Setup the 9920/A for a 1000:100 ratio with the internal supply.

4. Measure the value of the 9230A-30-0.1Ω Shunt Resistance using a current of 1 A.

   Note that the 6623A-600A and the 66259 Control unit are not connected to the 9920/A at this point.

5. See the 9920/A Technical Manual for proper operation of the 9920/A DCC Comparator Bridge.

6. Record the result of the measurement.

5.3.2. VERIFICATION OF THE x10-3A RATIO OF THE 6623A-600S RANGE EXTENDER

1. Turn off the 9920/A and reconfigure the bridge with the 6623A-600S Range Extender and the 66259 Extender Control Unit as shown in Figure 2-2.

2. Turn on the 9920/A, the 66259 and then the 6623A-600S in sequence. **Do not power on extender with a shunt connected.**

3. Disconnect the leads connected to the Rx C1 and C2 terminals of the 9920/A and connect them to the C1 and C2 terminals of the x10-3A range on the back panel of the 6623A-600S.

4. The deviation from nominal of the Rs Reference Standard Resistor may be set on the Rs Deviation dials of the 9920. Refer to the 9920 Technical Manual for proper operation of the 9920 and the 66259 Operators Manual for the proper operation of the Extender Control Unit.

5. Set the 9920/A first 3 or 4 most significant Rx/Rs ratio dials to 1.00xx depending on the expected resistance value of the resistor to be measured.

6. Using the Operators Manual for the Model 66259 Extender Control Unit initially select the ratio range being used, then the lowest positive current for the extender range selected and perform the tracking and comparator balance adjustments as required on the 9920/A using polarity reversal function on the Extender control Unit such that the test current of the 6623A-600S will be reversed when the polarity is selected. Note that the polarity reversal switch on the 9920/A will not be functional when the range extender is connected.

Note: If the oscillator light on the 9920 should become extinguished at any time the current selection of the Model 66259 Extender Control unit must be disabled immediately.
If the situation persists, the 9920/A must be powered off to avoid damage to the 9920/A circuits. See the 9920/A Technical Manual for further detail on how to remedy the problem.

7. Slowly increase the test current to 1 A using the Model 66259 Extender Control Unit while reversing the polarity and making appropriate adjustments on the 9920/A front panel to maintain ampere-turn balance and galvanometer balance. Increase the galvanometer sensitivity as the balance is refined.

8. Once satisfied with the final balance condition the Rx/Rs dials will indicate the ratio of the Rx resistance in relation to the Rs resistance after division by the range extender ratio.

Calculation of the Rx resistance: Rx = Rs x **(Rx/Rs dial reading) / Extender Ratio**

Example: Rs is nominal value of 1 ohm,
Rs/Rx dial reading is 1.000262
Extender Ratio used is: x 10

Rx = 1 x 1.000262 / 10 = 0.1000262 ohms

9. Record the ohms value measured. Calculate the difference between this value and the value measured in 5.3.1.6. The difference should be less than +/- 1.0 ppm depending on the stability of the resistors used in the test.

5.3.3. VERIFICATION OF THE x100-30A RATIO OF THE 6623A-600S RANGE EXTENDER

1. Replace the 9230A-30-0.1Ω Shunt with the 9230A-100-0.01Ω Shunt.

2. Measure the ohm value of the 9230A-100-0.01Ω Shunt using the 6623A-600S Extender x10-3A range as in 5.3.2 but use a test current value of 3 A and an initial ratio dial setting of 0.10xx

3. Note that the resolution of the 9920/A will be limited to 1ppm but if care is taken the last dial may be interpolated to obtain a dial reading with an uncertainty of about 0.5ppm or the last dial Rs deviation setting may be used to determine the balance to 0.1ppm.

4. Record the result of the measurement.

5. Move the leads from the 6623A-600S Extender x10-3A range terminals to the x100-30A range terminals as shown in Figure 5-1.

6. Measure the ohm value of the 9230A-100-0.01Ω Shunt as above with an initial ratio dial setting of 1.00xx and a test current of 3 A.

7. Record the result of the measurement.

8. Compare the results of 5.3.3.4 and 5.3.3.7. The difference in the measurement value in 5.3.3.4 and the measurement value in 5.3.3.7 is to be less than ± 1.1 ppm of nominal value depending on the stability of the resistors used in the test.

9. Note that the verification of the test current magnitudes may be accomplished at this point by measurement of the voltage across the potential terminals of the shunt and calculating the test current value based on the measured resistance of the shunt.

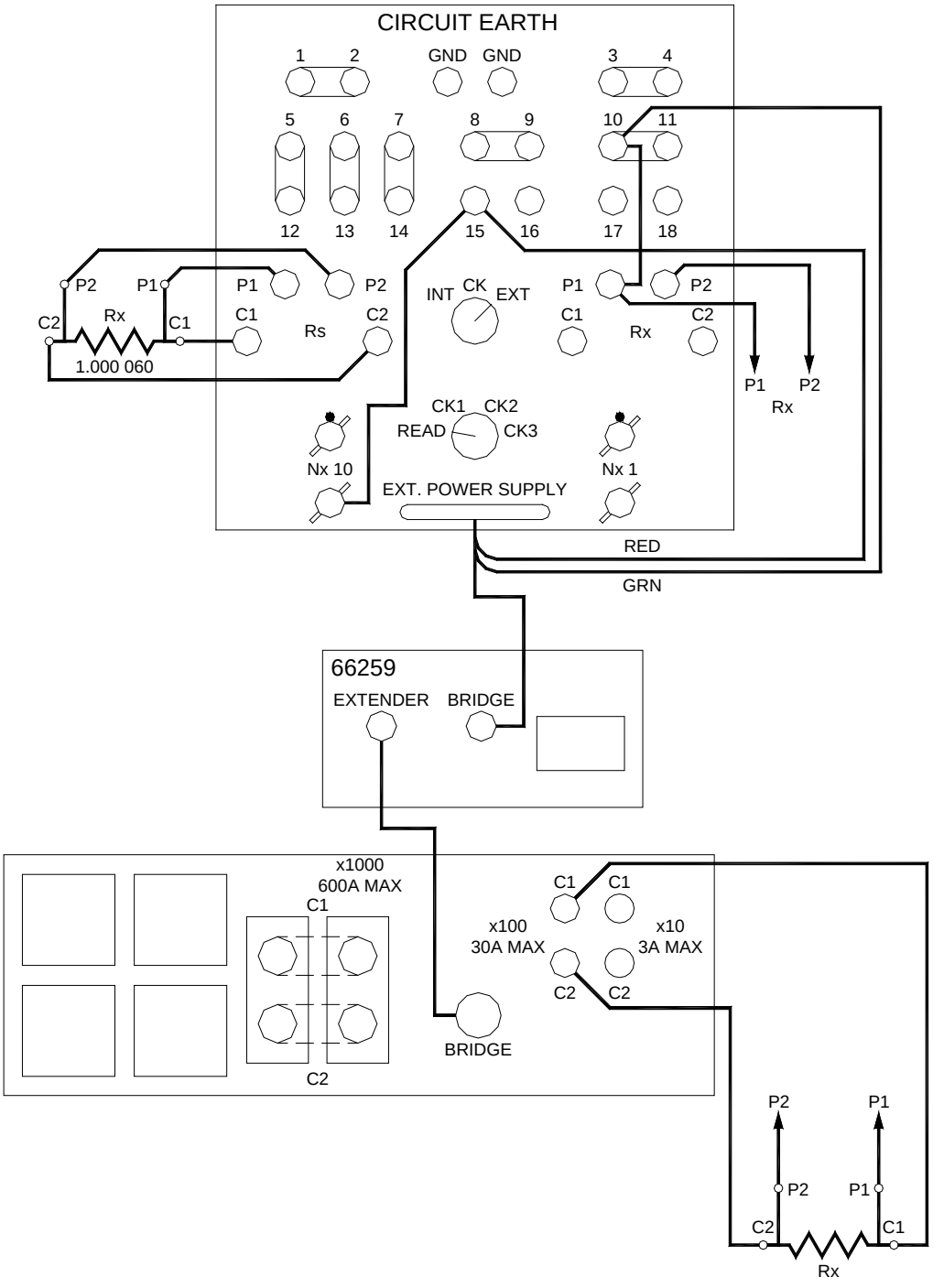


Figure 5-1 : Rear Panel Connections – 6623A-600S, x100-30A Range

5.3.4. VERIFICATION OF THE x1000-600A RATIO OF THE 6623A-600S RANGE EXTENDER

1. Replace the 9230A-100-0.01Ω Shunt with the 9230A-300-0.001Ω Shunt.

2. Measure the value of the 9230A-300-0.001Ω Shunt with the 6623A-600S Extender x100-30A range as in 5.3.3.6, but use a test current value of 30A and a ratio dial setting of 0.10xx.

3. Record the result of the measurement.

4. Move the leads from the 6623A Extender x100-30A range terminals to the x1000-600A range terminals as in Figure 5-2.

5. Measure the ohm value of the 9230A-300-0.001Ω Shunt as in 5.3.4.2 using a test current of 30 A and a ratio dial setting of 1.00xx.

6. Record the result of the measurement.

7. Compare the results of 5.3.4.3 and 5.3.4.6. The difference in the measurement values is to be less than ±1.2 ppm of nominal value depending on the stability of the resistors used in the test.

8. Note that the verification of the test current magnitude may be accomplished at this point by measurement of the voltage across the potential terminals of the shunt and calculating the test current value based on the measured resistance of the shunt.

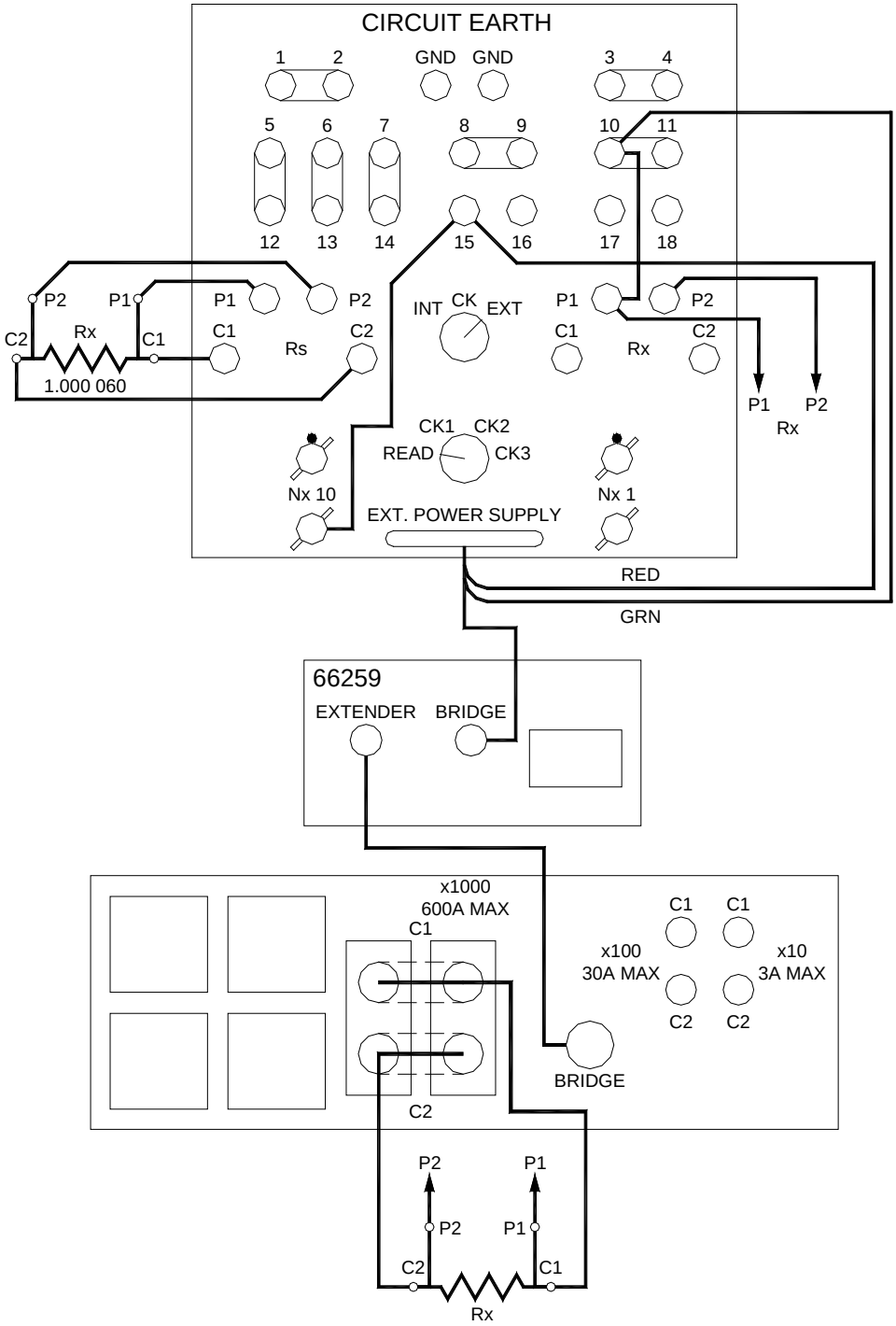


Figure 5-2 : Rear Panel Connections – 6623A-600S, x1000-600A Range

6. TROUBLESHOOTING AND MAINTENANCE

6.1. INTRODUCTION

This section covers troubleshooting, repair and verification of the 6623A Current Range Extender.

6.1.1. 9920/A Faults

Refer to the 9920/A Technical Manual for trouble shooting problems encountered with the bridge.

6.1.2. Model 6623A "Fault" Indicator

The Fault indicator on the front panel will light up whenever a fault condition is detected with the 600 A current sources of the range extender. This may be due to improper connections to the range extender, improper measurement setup or and actual circuit failure in the 6623A current source circuitry.

There are a set of yellow indicators behind the air outlet screen of the front panel. One or more may light when a fault in a particular 150A current source board is detected. This is a feature to allow identification of which board is at fault. If one board develops a fault the rest will continue to operate but the total available current will be reduced by a proportional amount.

6.1.3 Model 66259 Extender Control Unit Faults

Refer to the 66259 Operators Manual in regard to faults with the Extender Control Unit.

6.1.4. Maintenance

Preventive maintenance is limited to checking the instrument operation, test current accuracy.

The Service Manual available on request from Guildline Instruments Limited provides complete alignment and test information required if the 6623A-600S fails to meet performance specifications in section 5.

6.1.5. Connection Problems

Connection problems can be resolved by measuring the voltages on the potential terminals of the shunt resistance and that of the reference resistor and by observing the displayed test current on display of the 66259 Extender Control Unit.

6.1.6. Resolving Connection Problems

Attach a suitable DVM to the bridge front panel RxP1 and RxP2 terminals. When initiating the measurement, select a positive test current and observe that the RxP2 terminal voltage is positive with respect to the RxP1 terminal and is of a value equal to the test current times the shunt resistance value and agrees with the displayed value.

Also measure the voltage across the RsP1 and Rs P2 terminals, while the controller displayed current is still positive, and observe that the RsP2 terminal is also positive with respect to the RsP1 terminal and is approximately equal to that of the voltage on the shunt resistance.

If the polarity on bridge RxP terminals is not initially positive when the measurement is initiated with a positive current setting on the 66259, this indicates most likely an error has been made in connecting the current terminals of the shunt to the range extender C terminals or the potential terminals of the shunt to the bridge front panel RxP terminals. Check the connections.

Similarly if the polarity of the RsP terminals is not initially positive as well, there is most likely an error in the connections of the reference resistor to the bridge Rs terminals or an improper connection of the Extender Control Unit to the 9920/A.

7. APPENDICES

7.1. GENERAL SPECIFICATIONS

6623A-600S Current Range Extender General Specifications		
Operating Temperature to Full	+23 ± 4	°C
Specification	+73 ± 7	°F
Operating Temperature Maximum	+10 to +40	°C
Range <50% RH	+50 to +104	°F
Storage Temperature Maximum Range	-20 to +60	°C
	-4 to +140	°F
Operating Humidity	20 to 70	% RH
Storage Humidity	15 to 80	% RH
Power Requirements 600 A (Maximum):	1900	VA
Voltage Requirements	208 - 240 ±10%	VAC
Line Frequency	50 ±5% or 60 ±5%	Hz
Weight (Bench Unit)	(95/43.2)	lbs/kg
Weight (Rack Unit)	(76/34.5)	lbs/kg
Dimensions (Bench Unit)	D 747 , W 445 , H 254	mm
	D 29.4 , W 17.5 , H 10.0	in
Dimensions (Rack Unit)	D 739 , W 526 , H 222.3	mm
	D 29.1 , W 20.7 , H 8.75	in

Table 7-1 : General Specifications

NOTE: 1. The 6623A-600S Current Range Extender is always configured for 208 to 240 VAC 50/60 Hz operation at the point of shipment. No voltage selection is required in this range.

7.2. GENERAL SPECIFICATIONS (continued)

6623A-600S Current Range Extender General Specifications			
Resistance Range		0.1μ to 100	Ω
Transformation Ratios		10:1, 100:1, 1000:1	
Transformation Ratio Accuracies		±0.7, ±0.8, ±0.9	ppm
Linearity		±0.01	ppm of full scale ratio
Temperature Coefficient		±0.02	ppm/°C
Warm-up time to full rated accuracy		45	Minutes
Test Current Programmed through the 66259 Controller	3 A Range 30 A Range 450/600 A Range	±0.1 to ±3 ±3 to ±30 ±30 to ±600	A A A
	3 A Compliance 30 A Compliance 450/600 A Compliance	+/-8 +/-5 +/-1.3	V V V
	3 A Accuracy 30 A Accuracy 600 A Accuracy	±0.1 ±0.4 ±0.3 ±5 ±0.4 ±30	% + mA % + mA % + mA
	3 A Stability (10 Min.) 30 A Stability (10 Min.) 600 A Stability (10 Min.)	±0.01 ± 0.1 ±0.03 ± 2 ±0.06 ± 6	% + mA % + mA % + mA

Table 7-2 : General Specifications (continued)

7.3. RESISTANCE MEASUREMENT SPECIFICATION

The combined resistance measurement specification of the 6623A-600S with the 9920/A Bridge in Low Ohms mode of operation depends on the specific ratios utilized. For best operation the bridge ratio should be close to 1.0. Refer to the 9920/A Technical Manual for specific bridge performance specifications.