



OPERATOR'S GUIDE

Model 9100

Universal Calibration System

OPERATOR'S GUIDE

for

THE Model 9100 UNIVERSAL CALIBRATION SYSTEM

(for operating, performance and maintenance details
refer to the User's Handbook)

850299

Issue 3 (Aug 1995)

For any assistance contact your nearest Wavetek Sales and Service Center. Addresses can be found at the back of the User's Handbook.

Due to our policy of continuously updating our products, this handbook may contain minor differences in specification, components and circuit design to the instrument actually supplied. Amendment sheets precisely matched to your instrument serial number are available on request.

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DANGER
HIGH VOLTAGE



**THIS INSTRUMENT IS CAPABLE
OF DELIVERING
A LETHAL ELECTRIC SHOCK !**



Model 9100: I+, I-, Hi, Lo, sHi and
sLo Terminals;
Model 9105: H (Red), sH (Red), sL
(Black), LI- (Black) and
I+20 (Yellow) Leads;
carry the Full Output Voltage

THIS CAN KILL !



**Avoid damage to your
instrument**

For **Maximum Output Voltages**
and **Maximum Currents**, Refer to:
User's Handbook Volume 2 Section 7.

Unless **you** are **sure** that it is **safe** to do so,

DO NOT TOUCH ANY of the following:

**Model 9100: I+ I- Hi Lo sHi or sLo
leads and terminals**

Model 9105: H sH sL LI- or I+20 leads

DANGER

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1 About the Operator's Guide

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Section 3 of the *User's Handbook* for the Model 9100 should be used to gain practice at manipulating front-panel controls.

For an introduction to 'Procedure Mode', refer to *Section 5* of the *User's Handbook*. For the use of other modes refer to *Section 3* of the *User's Handbook*.

Section 4 of the *User's Handbook* shows, in a general way, the 'Manual Mode' facilities of the 9100 for calibration of a manually-operated measuring instrument. It is divided into sub-sections each dealing with 'Functions' (DC Voltage, AC Voltage etc.). Each sub-section carries a specimen procedure for calibrating that function in a 'general' UUT. This 'Operator's Guide' repeats these procedures in a more convenient form.

This Guide is divided into the following Sections:

2	Interconnections	4.2-1
3	DC Voltage	4.3-1
4	AC Voltage	4.4-1
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2 Interconnections

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Section 4, sub-section 4.2 of the User's Handbook gives details of the Model 9105 Leadset and Workmat, used for connecting the 9100 to the UUT. This Section repeats the User's Handbook information appropriate to operational interconnections.

2.1 External Leads — Specification Degradation

The 9100 Accuracy Specification is delivered at the front panel terminals.

Degradation of the specification at the UUT can occur if care is not taken to select the correct type, length and terminations for the external leads. This applies particularly to the outputs of HF AC Voltage at milliamp levels and HF AC Current. In addition, for accurate thermocouple simulation, extension leads of the correct materials must be used to avoid forming spurious junctions.

2.2 Model 9105 Lead Set

4.2.3

The design of the Model 9105 optimizes the connections between 9100 and UUT, in order to minimize the specification degradation for the outputs of all functions. In addition, it provides a convenient screened work mat which permits easy connection to the UUT using leads of defined short length, which are also provided.

It is highly recommended that the 9105 Lead Set be used for all hand-held UUTs.

2.3 Connection Accessories

Two accessories are available to connect with the 9100/9105 for specific purposes:

- For thermocouple software compensation, an external module can be plugged into a 15-way D-type socket, either on the 9100 front panel or on the connection unit beneath the 9105.
- A pair of coils is available (Option 200) to permit clamp ammeters to be calibrated at high currents.

4.14.4

4.5.6

Fig 2.1 overleaf

2.4 Work Mat Facilities

Layout and Connections

The layout of the 9105 Work Mat is shown in *Fig 2.1*. The connecting leads would not all be connected at the same time, but the relevant connections for each Function (ACV, DCI, thermocouple simulation etc.) are given with the procedures for individual functions in the *corresponding Sections*.

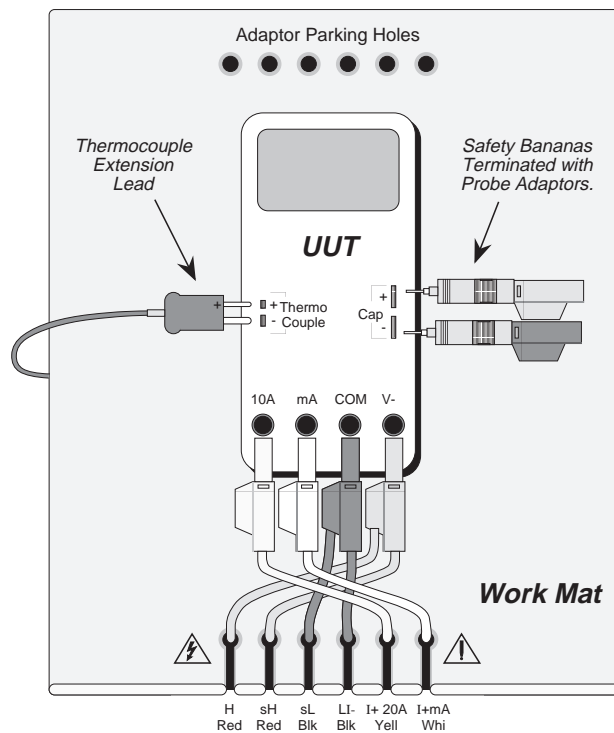


Fig. 2.1 Layout of 9105 Work Mat

3 DC Voltage Calibration

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3.1 Interconnections

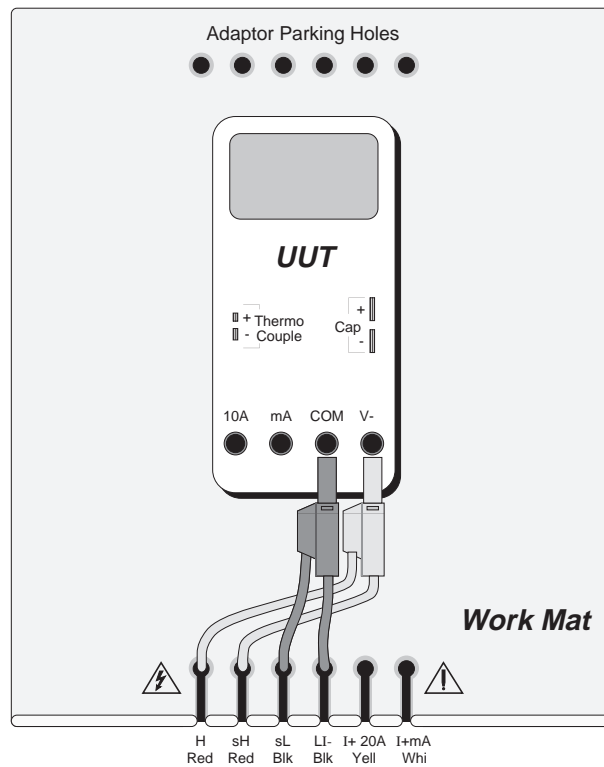


Fig. 3.1 Connections for DC Voltage Calibration

3 DC Voltage Calibration (Contd)	User's H'b'k Page Ref
3.2 The 9100 as a Fixed Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook</i> ; paras 3.3.1. Familiarity with editing screen values is also assumed (<i>Section 3</i>).	3-4 3-1
3.2.1 9100 and UUT Setup	
1. Connections	
Connect the 9100 to the UUT as in <i>Fig. 3.1</i> , and ensure that both instruments are powered ON and warmed up.	
2. UUT Select DC Voltage function.	
3. 9100	
Ensure that the 9100 is in DC Voltage Function with Output OFF. If in any other function, press the 'V' key on the right of the front panel.	4.3-2
3.2.2 Sequence of Operations	
Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100	
Use the front panel controls to set the 9100 Output voltage to the UUT cal point value, entering High Voltage State if the cal point has been assigned to that state.	3-8 to 21 4.3-7 <i>Fig. 4.3.1</i>
2. UUT Select the correct range for the cal point.	
3. 9100	
a. Set Output ON .	
b. Note the UUT reading.	
4. UUT	
a. If a UUT calibration adjustment is provided, adjust the UUT reading to be equal to that on the 9100 screen, as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
b. If no adjustment is provided on the UUT, record the UUT reading at the calibration point as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
5. 9100 Set Output OFF .	

3 DC Voltage Calibration (Contd)

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3.3 The 9100 as an Adjustable Source

The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the *User's Handbook*; paras 3.3.1. Familiarity with editing screen values is also assumed (*Section 3*).

3-4
3-1

3.3.1 9100 and UUT Setup

1. Connections

Connect the 9100 to the UUT as in *Fig. 3.1*, and ensure that both instruments are powered ON and warmed up.

2. UUT Select DC Voltage function.

3. 9100

Ensure that the 9100 is in DC Voltage Function with Output OFF. If in any other function, press the 'V' key on the right of the front panel.

4.3-2

3.3.2 Sequence of Operations

Refer to the table of UUT calibration points in the *Manufacturer's Calibration Guide* for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.

1. 9100

Use the front panel controls to set the 9100 Output voltage to the UUT cal point value, entering High Voltage State if the cal point has been assigned to that state.

3-8 to 21

4.3-7
Fig. 4.3.1

2. UUT Select the correct range for the cal point.

3. 9100

- a. Set Output **ON**.
- b. Slew the DC Voltage Output reading until the UUT reading is equal to the calibration point value.

4. UUT

Record the 9100 screen output value as detailed in the *UUT Manufacturer's Calibration Guide*.

5. 9100 Set Output **OFF**.

4 AC Voltage Calibration

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4.1 Interconnections

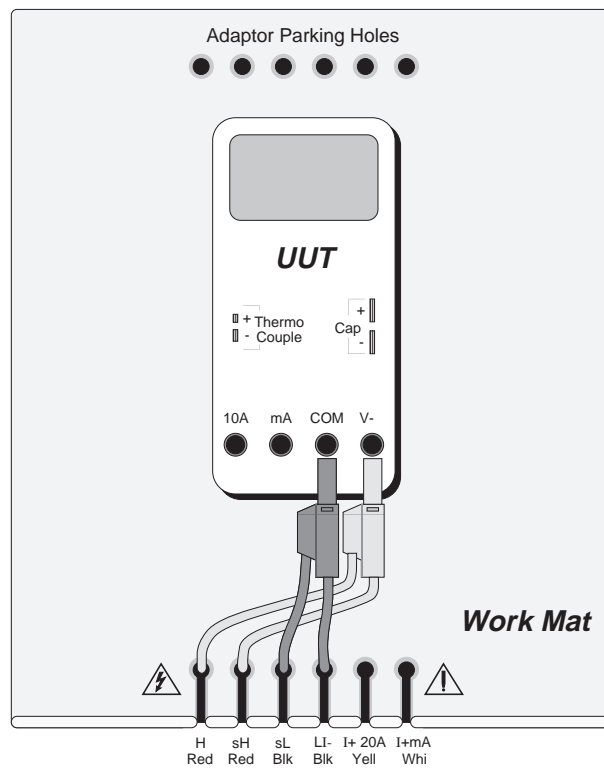


Fig. 4.1 Connections for AC Voltage Calibration

4 AC Voltage Calibration (Contd)	User's H'b'k Page Ref
4.2 Using the 9100 as a Fixed Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook</i> ; paras 3.3.1. Familiarity with editing screen values is also assumed (Section 3).	3-4 3-1
4.2.1 9100 and UUT Setup	
1. Connections	
Connect the 9100 to the UUT as shown in Fig. 4.1, and ensure that both instruments are powered ON and warmed up.	
2. UUT Select AC Voltage function.	
3. 9100	
Ensure that the 9100 is in AC Voltage Function with Output OFF. If in any other function, press the 'V' key on the right of the front panel, then press the V screen key.	4.4-2
4.2.2 Sequence of Operations	4.4-4 to 6
Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100	
a. Use the front panel controls to set the 9100 Output to the UUT cal point frequency and voltage, entering High Voltage State if the cal point has been assigned to that state.	3-8 to 21 4.4-11
b. Select required waveform and phase-shift.	Fig. 4.4.1
2. UUT Select the correct range for the cal point.	
3. 9100	
a. Set Output ON .	
b. Note the UUT reading.	
4. UUT	
a. If a UUT calibration adjustment is provided, adjust the UUT reading to be equal to that on the 9100 screen, as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
b. If no adjustment is provided on the UUT, record the UUT reading at the calibration point as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
5. 9100 Set Output OFF .	

4 AC Voltage Calibration (Contd)

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4.3 The 9100 as an Adjustable Source

The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the *User's Handbook*; paras 3.3.1. Familiarity with editing screen values is also assumed (*Section 3*).

3-4
3-1

4.3.1 9100 and UUT Setup

1. Connections

Connect the 9100 to the UUT as shown in *Fig. 4.1*, and ensure that both instruments are powered ON and warmed up.

2. UUT Select AC Voltage function.

3. 9100

Ensure that the 9100 is in AC Voltage Function with Output OFF. If in any other function, press the 'V' key on the right of the front panel, then press the V screen key.

4.4-2

4.3.2 Sequence of Operations

Refer to the table of UUT calibration points in the *Manufacturer's Calibration Guide* for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.

4.4-4 to 6

1. 9100

a. Use the front panel controls to set the 9100 Output to the UUT cal point frequency and voltage, entering High Voltage State if the cal point has been assigned to that state.

3-8 to 21
4.4-11
Fig. 4.4.1

b. Select required waveform and phase-shift.

2. UUT Select the correct range for the cal point.

3. 9100

a. Set Output ON.

b. Slew the AC Voltage Output reading until the UUT reading is equal to the calibration point value.

4. UUT

Record the 9100 screen output value as detailed in the *UUT Manufacturer's Calibration Guide*.

5. 9100 Set Output OFF.

5 DC Current Calibration

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5.1 Interconnections

The general connection schemes for UUT calibration of DC Current Function are illustrated in *Figs. 5.1, 5.2 and 5.3.*

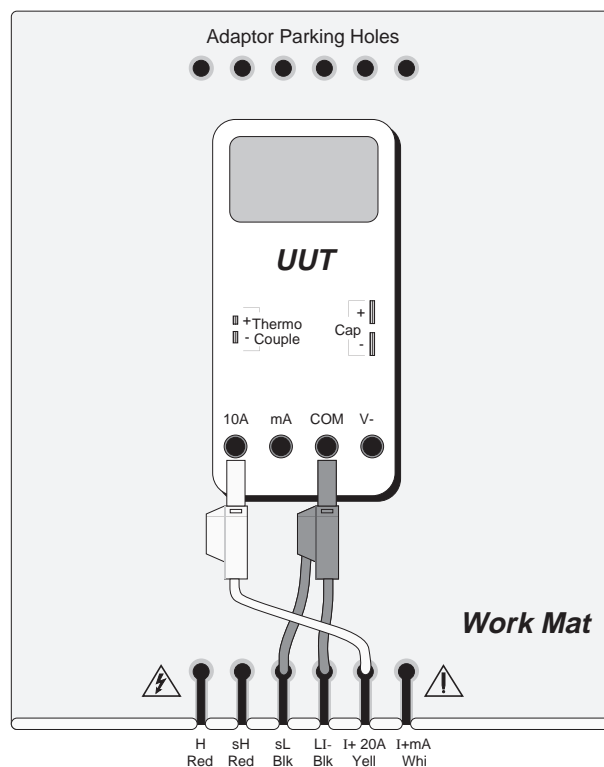


Fig. 5.1
Connections for DCI 'NORMAL OUTPUT'
UUT Calibration

5 DC Current Calibration (Contd.)

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5.1 Interconnections (Contd.)

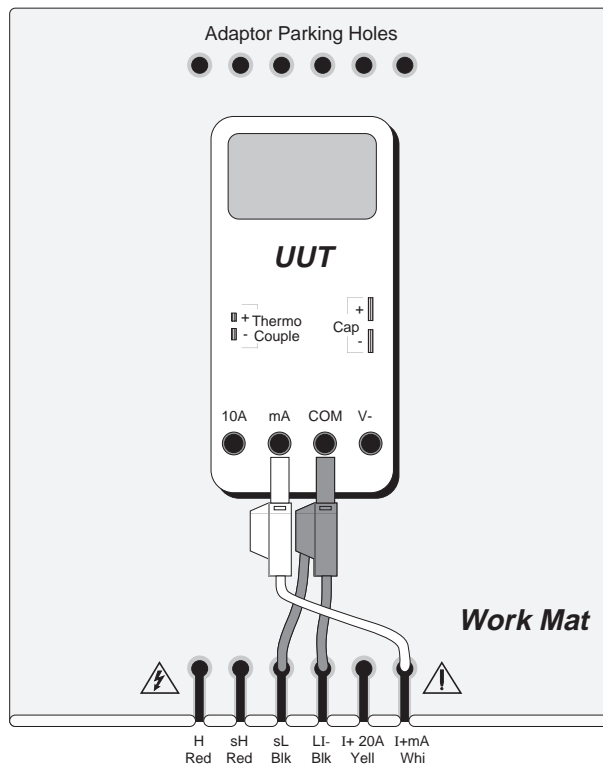


Fig. 5.2
Connections for DCI 'AUX OUTPUT' UUT Calibration

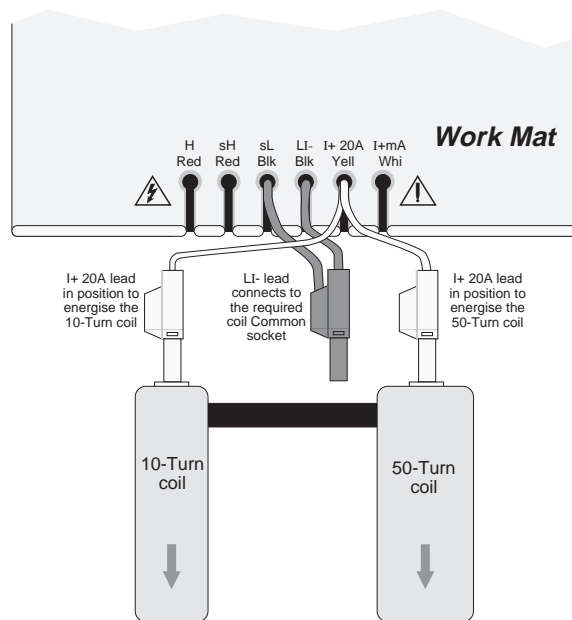


Fig. 5.3
Connections for DC High Current UUT Calibration
Using the 10-Turn or 50-Turn Current Coils

5 DC Current Calibration (Contd.)

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5.1 Interconnections (Contd.)

Notes about positioning the current sensing clamp in the center air space of the coils:

The two coils on the assembly have been optimally designed to reduce the effects of stray magnetic fields at the pick-up position for sensor clamps. The design gives characteristics which would normally be associated with central air spaces of much larger area, more closely simulating single-conductor pick-ups.

However, there are several types of clamp meter; some having different requirements for placing the clamp around the pick-up conductor. Manufacturers normally give instructions for aligning the clamp or meter with respect to the conductor. When the meter is clamped to any conductor, errors may arise whose magnitude is similar to the uncertainty of the meter if precautions are not observed, so the manufacturer's instructions should be strictly followed when using the 9100 to calibrate the clamp meter.

To obtain consistent results, in the absence of manufacturer's instructions, the following guidelines should be observed:

- *Fig 5.4.* With the coils located on a non-magnetic surface (not the work mat, as it has a steel core), place the clamp in position so that it surrounds the vertical arm of the coil. Keep the clamp mid-way up the vertical arm, and away from the corners.
- *Fig 5.5.* Place the vertical arm of the coil, as far as is possible, in the center of the air space of the clamp. Align the center axis of the meter along the plane of the coil itself.
- During later normal measurements using the clamp meter, place the clamp in the same position with respect to the pick-up conductor as it was when being calibrated.

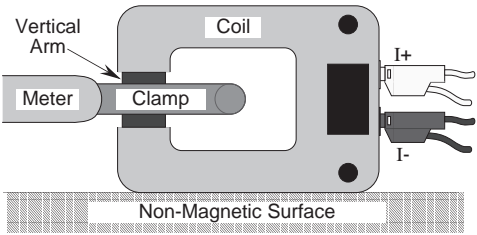


Fig. 5.4 Position of Clamp

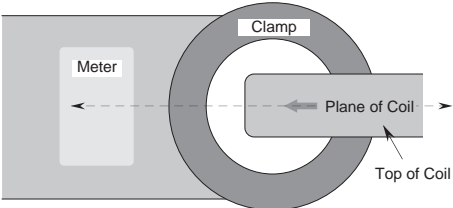


Fig. 5.5 Position of Coil

5 DC Current Calibration (Contd)	User's H'b'k Page Ref
5.2 The 9100 as a Fixed Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook</i> ; paras 3.3.1. Familiarity with editing screen values is also assumed (Section 3).	3-4 3-1
5.2.1 9100 and UUT Setup	
1. Connections	
Connect the 9100 to the UUT as in Fig. 5.1, 5.2 or 5.3/4/5, and ensure that both instruments are powered ON and warmed up.	
2. UUT Select DC Current function.	
3. 9100	
Ensure that the 9100 is in DC Current Function with Output OFF. If in any other function, press the 'A' key on the right of the front panel.	4.5-2
5.2.2 Sequence of Operations	
Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100	3-8 to 21
Use the front panel controls to set the 9100 Output current to the UUT cal point value, and select the form of output (SELECT OUTPUT key). Reconnect (Fig 5.1, Fig 5.2, or Fig 5.3/4/5) as required.	
2. UUT Select the correct range for the cal point.	
3. 9100	
a. Set Output ON .	
b. Note the UUT reading.	
4. UUT	
a. If a UUT calibration adjustment is provided, adjust the UUT reading to be equal to that on the 9100 screen, as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
b. If no adjustment is provided on the UUT, record the UUT reading at the calibration point as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
5. 9100 Set Output OFF .	

5 DC Current Calibration *(Contd)*

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5.3 The 9100 as an Adjustable Source

The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the *User's Handbook; paras 3.3.1*. Familiarity with editing screen values is also assumed (*Section 3*).

3-4
3-1

5.3.1 9100 and UUT Setup

1. Connections

Connect the 9100 to the UUT as in *Fig. 5.1, 5.2 or 5.3/4/5*, and ensure that both instruments are powered ON and warmed up.

2. UUT Select DC Current function.

3. 9100

Ensure that the 9100 is in DC Current Function with Output OFF. If in any other function, press the 'A' key on the right of the front panel.

4.5-2

5.3.2 Sequence of Operations

Refer to the table of UUT calibration points in the *Manufacturer's Calibration Guide* for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.

1. 9100

Use the front panel controls to set the 9100 Output current to the UUT cal point value, and select the form of output (SELECT OUTPUT key). Reconnect (*Fig 5.1, Fig 5.2, or Fig 5.3/4/5*) as required.

3-8 to 21

2. UUT Select the correct range for the cal point.

3. 9100

- a. Set Output ON.
- b. Slew the DC Current Output reading until the UUT reading is equal to the calibration point value.

4. UUT

Record the 9100 screen output value as detailed in the *UUT Manufacturer's Calibration Guide*.

5. 9100 Set Output OFF.

6 AC Current Calibration

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6.1 Interconnections

The general connection schemes for UUT calibration of AC Current Function are illustrated in *Figs. 6.1, 6.2 and 6.3.*

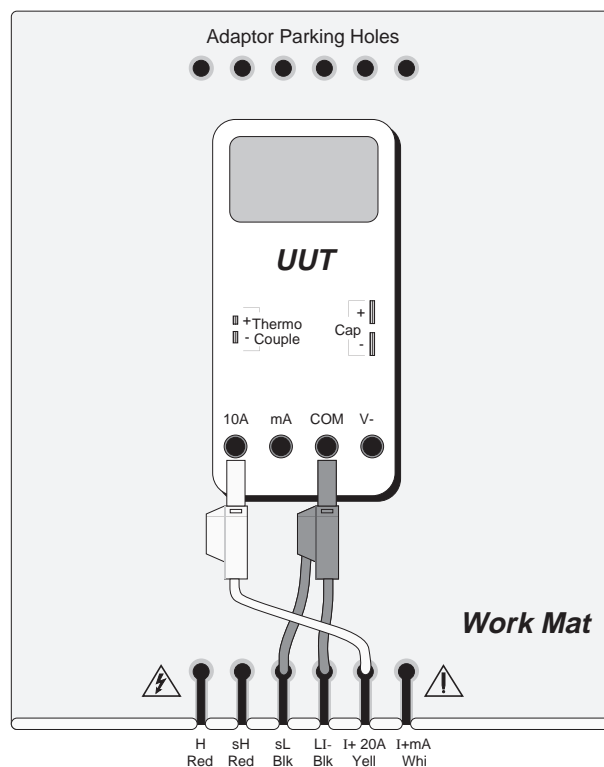


Fig. 6.1
Connections for ACI 'NORMAL OUTPUT'
UUT Calibration

6 AC Current Calibration (Contd.)

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6.1 Interconnections (Contd.)

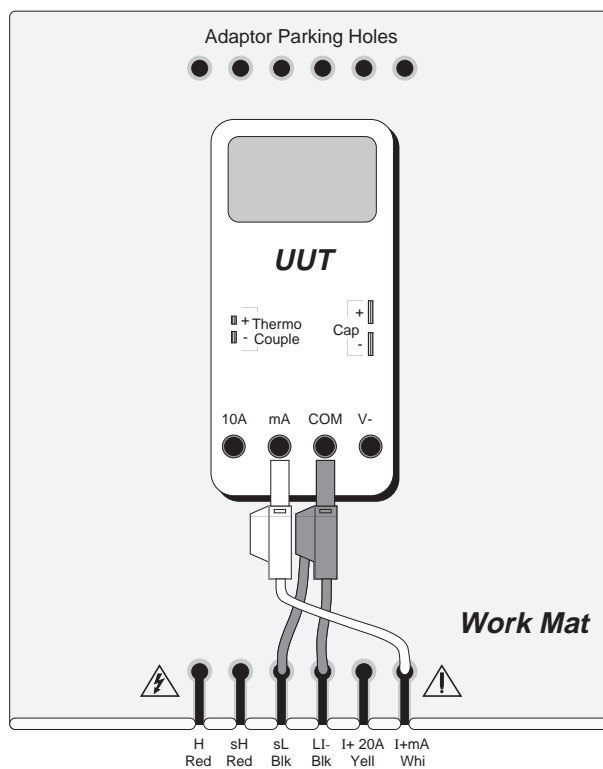


Fig. 6.2
Connections for ACI 'AUX OUTPUT' UUT Calibration

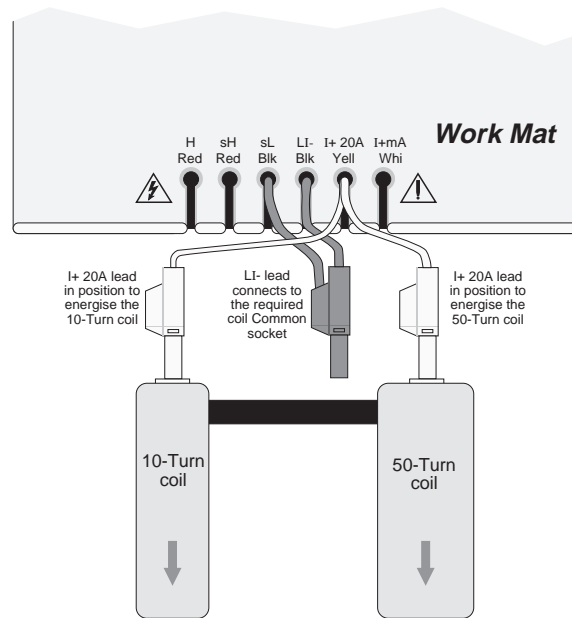


Fig. 6.3
Connections for AC High Current UUT Calibration
Using the 10-Turn or 50-Turn Current Coils

6 AC Current Calibration (Contd.)

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6.1 Interconnections (Contd.)

Notes about positioning the current sensing clamp in the center air space of the coils:

The two coils on the assembly have been optimally designed to reduce the effects of stray magnetic fields at the pick-up position for sensor clamps. The design gives characteristics which would normally be associated with central air spaces of much larger area, more closely simulating single-conductor pick-ups.

However, there are several types of clamp meter; some having different requirements for placing the clamp around the pick-up conductor. Manufacturers normally give instructions for aligning the clamp or meter with respect to the conductor. When the meter is clamped to any conductor, errors may arise whose magnitude is similar to the uncertainty of the meter if precautions are not observed, so the manufacturer's instructions should be strictly followed when using the 9100 to calibrate the clamp meter.

To obtain consistent results, in the absence of manufacturer's instructions, the following guidelines should be observed:

- *Fig 6.4.* With the coils located on a non-magnetic surface (not the work mat, as it has a steel core), place the clamp in position so that it surrounds the vertical arm of the coil. Keep the clamp mid-way up the vertical arm, and away from the corners.
- *Fig 6.5.* Place the vertical arm of the coil, as far as is possible, in the center of the air space of the clamp. Align the center axis of the meter along the plane of the coil itself.
- During later normal measurements using the clamp meter, place the clamp in the same position with respect to the pick-up conductor as it was when being calibrated.

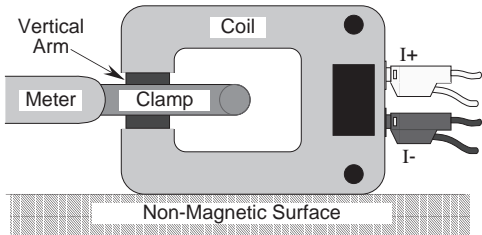


Fig. 6.4 Position of Clamp

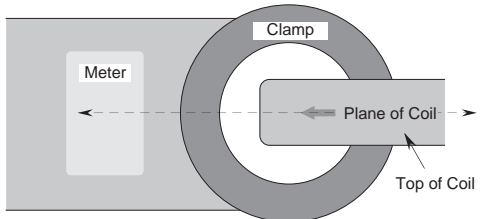


Fig. 6.5 Position of Coil

6 AC Current Calibration (Contd)	User's H'b'k Page Ref
6.2 Using the 9100 as a Fixed Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook</i> ; paras 3.3.1. Familiarity with editing screen values is also assumed (<i>Section 3</i>).	3-4 3-1
6.2.1 9100 and UUT Setup	
1. Connections	
Connect the 9100 to the UUT as shown in <i>Fig. 6.1, 6.2 or 6.3/4/5</i> , and ensure that both instruments are powered ON and warmed up.	
2. UUT Select AC Current function.	
3. 9100	
Ensure that the 9100 is in AC Current Function with Output OFF. If in any other function, press the 'A' key on the right of the front panel, then press the A screen key.	4.6-2
6.2.2 Sequence of Operations	
Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100	
<ul style="list-style-type: none"> a. Use the front panel controls to set the 9100 Output to the UUT cal point frequency, current and output form (SELECT OUTPUT key). Reconnect (<i>Fig 6.1, Fig 6.2, or Fig 6.3/4/5</i>) as required. b. Select required waveform and phase-shift. 	3-8 to 21
2. UUT Select the correct range for the cal point.	
3. 9100	
<ul style="list-style-type: none"> a. Set Output ON. b. Note the UUT reading. 	
4. UUT	
<ul style="list-style-type: none"> a. If a UUT calibration adjustment is provided, adjust the UUT reading to be equal to that on the 9100 screen, as detailed in the <i>UUT Manufacturer's Calibration Guide</i>. b. If no adjustment is provided on the UUT, record the UUT reading at the calibration point as detailed in the <i>UUT Manufacturer's Calibration Guide</i>. 	
5. 9100 Set Output OFF .	

6 AC Current Calibration (Contd)

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6.3 The 9100 as an Adjustable Source

The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the *User's Handbook; paras 3.3.1*. Familiarity with editing screen values is also assumed (*Section 3*).

3-4
3-1

6.3.1 9100 and UUT Setup

1. Connections

Connect the 9100 to the UUT as shown in *Fig. 6.1, 6.2 or 6.3/4/5*, and ensure that both instruments are powered ON and warmed up.

2. UUT Select AC Current function.

3. 9100

Ensure that the 9100 is in AC Current Function with Output OFF. If in any other function, press the 'A' key on the right of the front panel, then press the **A** screen key.

4.6-2

6.3.2 Sequence of Operations

Refer to the table of UUT calibration points in the *Manufacturer's Calibration Guide* for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.

1. 9100

a. Use the front panel controls to set the 9100 Output to the UUT cal point frequency, current and output form (SELECT OUTPUT key). Reconnect (*Fig 6.1, Fig 6.2, or Fig 6.3/4/5*) as required.

b. Select required waveform and phase-shift.

2. UUT Select the correct range for the cal point.

3. 9100

a. Set Output **ON**.

b. Slew the AC Current Output reading until the UUT reading is equal to the calibration point value.

4. UUT

Record the 9100 screen output value as detailed in the *UUT Manufacturer's Calibration Guide*.

5. 9100 Set Output **OFF**.

3-8 to 21

7 Resistance Calibration

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7.1 Interconnections

The general connection scheme for UUT calibration is illustrated in *Fig. 7.1*. The use of either 4-wire remote sensing at the UUT terminals, or 2-wire local sensing at the 9100 terminals, is served by the same connections from the 9105 at the work mat. Selection of 2/4-wire is carried out on the 9100 front panel.

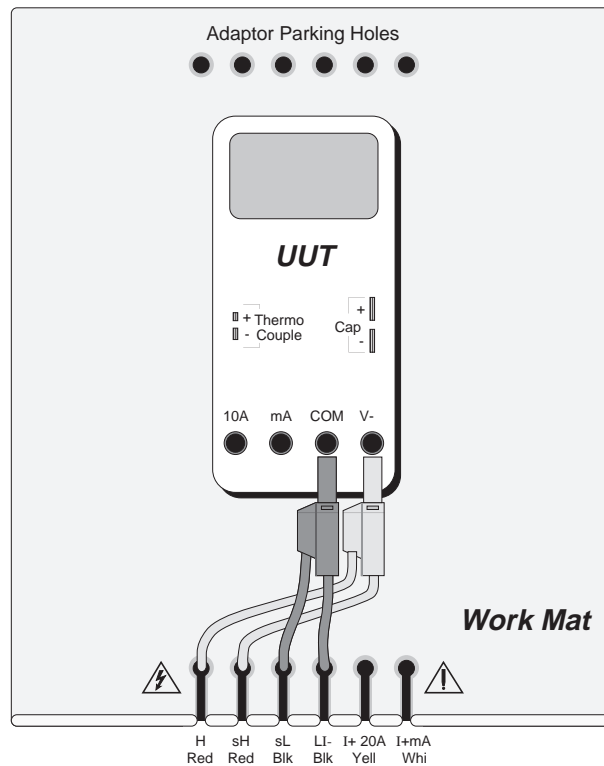


Fig. 7.1: Interconnections for 2-Wire or 4-Wire UUT Resistance Calibration

7 Resistance Calibration (Contd)	User's H'b'k Page Ref
7.2 The 9100 as a Fixed Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook</i> ; paras 3.3.1. Familiarity with editing screen values is also assumed (Section 3).	3-4 3-1
7.2.1 9100 and UUT Setup	
1. Connections	
Connect the 9100 to the UUT as in Fig. 7.1, and ensure that both instruments are powered ON and warmed up.	
2. UUT Select Resistance function.	
3. 9100	
Ensure that the 9100 is in Resistance Function with Output OFF. If in any other function, press the ' Ω ' key on the right of the front panel.	4.7-2
7.2.2 Sequence of Operations	
Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100	
Use the front panel controls to set the 9100 Output resistance to the UUT cal point value, selecting 2-Wire or 4-Wire and 'UUTi' Current Span as required.	3-8 to 21 4.7-9/10 4.7-11
2. UUT Select the correct range for the cal point.	
3. 9100	
a. Set Output ON .	
b. Note the UUT reading.	
4. UUT	
a. If a UUT calibration adjustment is provided, adjust the UUT reading to be equal to that on the 9100 screen, as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
b. If no adjustment is provided on the UUT, record the UUT reading at the calibration point as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
5. 9100 Set Output OFF .	

7 Resistance Calibration (Contd)

User's H'b'k
Page Ref

7.3 The 9100 as an Adjustable Source

The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the *User's Handbook*; paras 3.3.1. Familiarity with editing screen values is also assumed (Section 3).

3-4
3-1

7.3.1 9100 and UUT Setup

1. Connections

Connect the 9100 to the UUT as in *Fig. 7.1*, and ensure that both instruments are powered ON and warmed up.

2. UUT Select Resistance function.

3. 9100

Ensure that the 9100 is in Resistance Function with Output OFF. If in any other function, press the ' Ω ' key on the right of the front panel.

4.7-2

7.3.2 Sequence of Operations

Refer to the table of UUT calibration points in the *Manufacturer's Calibration Guide* for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.

1. 9100

Use the front panel controls to set the 9100 Output resistance to the UUT cal point value, selecting 2-Wire or 4-Wire and 'UUTi' Current Span as required.

3-8 to 21

4.7-9/10
4.7-11

2. UUT Select the correct range for the cal point.

3. 9100

- a. Set Output **ON**.
- b. Slew the Resistance Output reading until the UUT reading is equal to the calibration point value.

4. UUT

Record the 9100 screen output value as detailed in the *UUT Manufacturer's Calibration Guide*.

5. 9100 Set Output **OFF**.

8 Conductance Calibration

User's H'b'k
Page Ref

8.1 Interconnections

The general connection scheme for UUT calibration is illustrated in *Fig. 8.1*. The use of either 4-wire remote sensing at the UUT terminals, or 2-wire local sensing at the 9100 terminals, is served by the same connections from the 9105 at the work mat. Selection of 2/4-wire is carried out on the 9100 front panel.

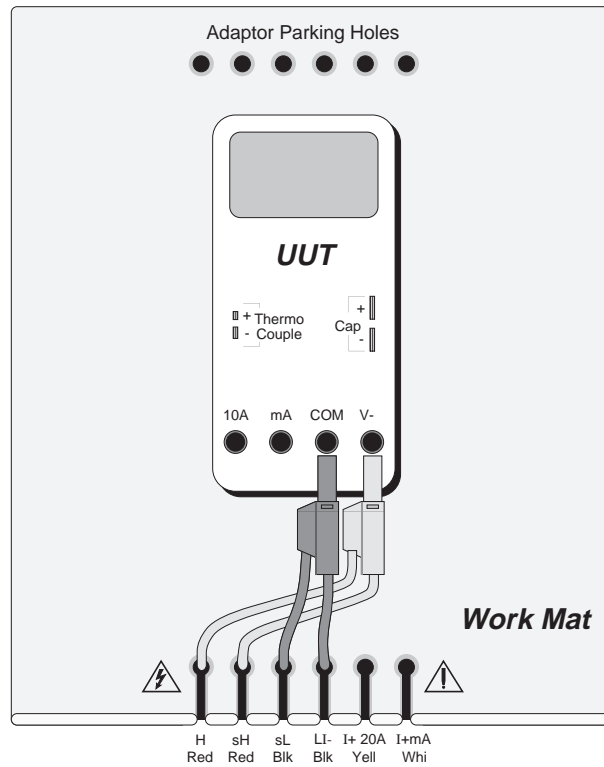


Fig. 8.1
Connections for 4-Wire & 2-Wire Conductance Calibration

8 Conductance Calibration (Contd)	User's H'b'k Page Ref
8.2 The 9100 as a Fixed Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook</i> ; paras 3.3.1. Familiarity with editing screen values is also assumed (Section 3).	3-4 3-1
8.2.1 9100 and UUT Setup	
1. Connections	
Connect the 9100 to the UUT as in Fig. 8.1, and ensure that both instruments are powered ON and warmed up.	
2. UUT Select Conductance function.	
3. 9100	
Ensure that the 9100 is in Conductance Function with Output OFF. If in any other function, press the 'Ω' key on the right of the front panel, then press the screen key on the bottom row.	4.8-2
8.2.2 Sequence of Operations	
Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100	
Use the front panel controls to set the 9100 Output conductance to the UUT cal point value, selecting 2-Wire or 4-Wire and 'UUT' Current Span as required.	3-8 to 21 4.8-8/10 4.8-11
2. UUT Select the correct range for the cal point.	
3. 9100	
a. Set Output ON.	
b. Note the UUT reading.	
4. UUT	
a. If a UUT calibration adjustment is provided, adjust the UUT reading to be equal to that on the 9100 screen, as detailed in the <i>UUT Manufacturer's Calibration Guide</i>.	
b. If no adjustment is provided on the UUT, record the UUT reading at the calibration point as detailed in the <i>UUT Manufacturer's Calibration Guide</i>.	
5. 9100 Set Output OFF.	

8

Conductance Calibration (Contd)

User's H'b'k
Page Ref

8.3 The 9100 as an Adjustable Source

The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the *User's Handbook*; paras 3.3.1. Familiarity with editing screen values is also assumed (Section 3).

3-4
3-1

8.3.1 9100 and UUT Setup

1. Connections

Connect the 9100 to the UUT as in *Fig. 8.1*, and ensure that both instruments are powered ON and warmed up.

2. UUT Select Conductance function.

3. 9100

Ensure that the 9100 is in Conductance Function with Output OFF. If in any other function, press the 'Ω' key on the right of the front panel, then press the screen key on the bottom row.

4.8-2

8.3.2 Sequence of Operations

Refer to the table of UUT calibration points in the *Manufacturer's Calibration Guide* for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.

1. 9100

Use the front panel controls to set the 9100 Output conductance to the UUT cal point value, selecting 2-Wire or 4-Wire and 'UUT' Current Span as required.

3-8 to 21

4.8-8/10
4.8-11

2. UUT Select the correct range for the cal point.

3. 9100

a. Set Output ON.

b. Slew the Conductance Output reading until the UUT reading is equal to the calibration point value.

4. UUT

Record the 9100 screen output value as detailed in the *UUT Manufacturer's Calibration Guide*.

5. 9100 Set Output OFF.

9 Frequency Calibration

User's H'b'k
Page Ref

9.1 Interconnections

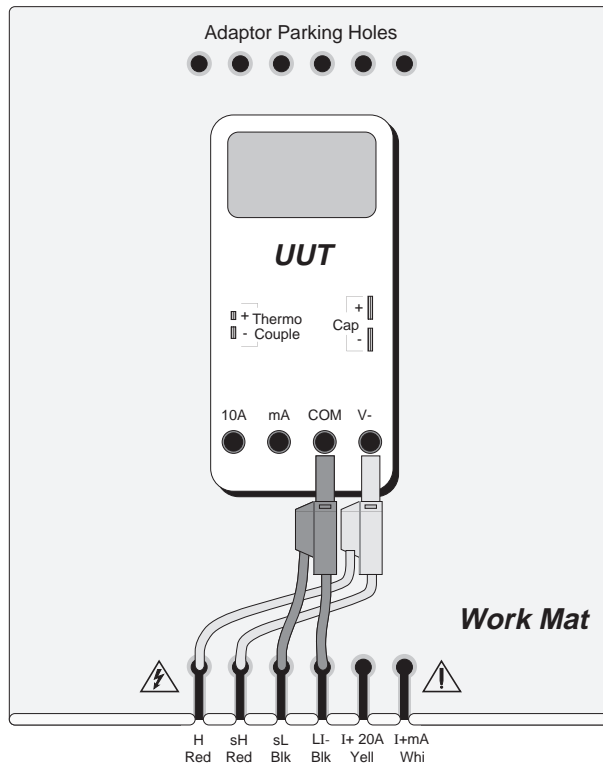


Fig. 9.1 Connections for Frequency Calibration

9 Frequency Calibration (Contd)	<i>User's H'b'k Page Ref</i>
9.2 Using the 9100 as a Fixed Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook; paras 3.3.1</i> . Familiarity with editing screen values is also assumed (<i>Section 3</i>).	3-4 3-1
9.2.1 9100 and UUT Setup	
1. Connections Connect the 9100 to the UUT as shown in <i>Fig. 9.1</i> , and ensure that both instruments are powered ON and warmed up.	
2. UUT Select Frequency function.	
3. 9100 Ensure that the 9100 is in Frequency Function with Output OFF. If in any other function, press the 'Hz' key on the right of the front panel, or the Hz screen key at the left of the bottom row.	4.9-2
9.2.2 Sequence of Operations	
Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100 Use the front panel controls to set the 9100 Output to the UUT cal point parameters: Frequency High signal level voltage Low signal level voltage	3-8 to 21
2. UUT Select the correct range for the cal point.	
3. 9100 a. Set Output ON. b. Note the UUT reading or response.	
4. UUT a. If a UUT calibration adjustment is provided, adjust the UUT reading or response to be appropriate to the settings on the 9100 screen, as detailed in the <i>UUT Manufacturer's Calibration Guide</i> . b. If no adjustment is provided on the UUT, record the UUT reading or response at the calibration point as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
5. 9100 Set Output OFF.	

9 Frequency Calibration <i>(Contd)</i>	<i>User's H'b'k Page Ref</i>
9.3 The 9100 as an Adjustable Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook; paras 3.3.1</i> . Familiarity with editing screen values is also assumed (<i>Section 3</i>).	3-4 3-1
9.3.1 9100 and UUT Setup	
1. Connections	
Connect the 9100 to the UUT as shown in <i>Fig. 9.1</i> , and ensure that both instruments are powered ON and warmed up.	
2. UUT Select Frequency function.	
3. 9100	
Ensure that the 9100 is in Frequency Function with Output OFF. If in any other function, press the 'Hz' key on the right of the front panel, or the Hz screen key at the left of the bottom row.	4.9-2
9.3.2 Sequence of Operations	
Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100	
Use the front panel controls to set the 9100 Output to the UUT cal point parameters:	3-8 to 21
Frequency	
High signal level voltage	
Low signal level voltage	
2. UUT Select the correct range for the cal point.	
3. 9100	
a. Set Output ON .	
b. Slew the Frequency Output reading until the UUT reading or response is appropriate to the 9100 settings.	
4. UUT	
Record the 9100 screen output values as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
5. 9100 Set Output OFF .	

10 Mark/Period Calibration

User's H'b'k
Page Ref

10.1 Interconnections

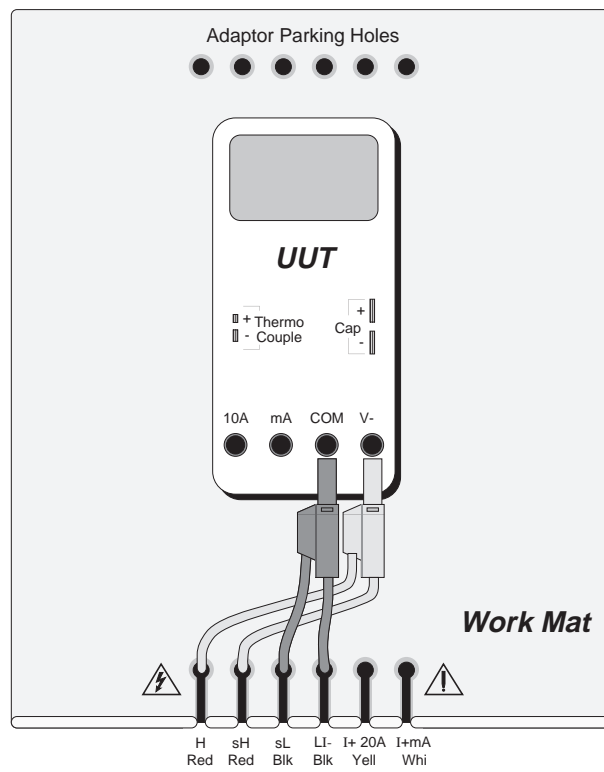


Fig. 10.1 Connections for Mark/Period Calibration

10 Mark/Period Calibration (Contd)	User's H'b'k Page Ref
10.2 Using the 9100 as a Fixed Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook</i> ; paras 3.3.1. Familiarity with editing screen values is also assumed (Section 3).	3-4 3-1
10.2.1 9100 and UUT Setup	
1. Connections Connect the 9100 to the UUT as shown in Fig. 10.1, and ensure that both instruments are powered ON and warmed up.	
2. UUT Select Mark/Period function.	
3. 9100 Ensure that the 9100 is in Mark/Period Function with Output OFF. If in any other function, press the 'Hz' key on the right of the front panel, then the screen key on the bottom row.	4.10-2
10.2.2 Sequence of Operations	
Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100 Use the front panel controls to set the 9100 Output to the UUT cal point parameters: Mark time interval Period time interval High signal level voltage Low signal level voltage	3-8 to 21
2. UUT Select the correct range for the cal point.	
3. 9100 a. Set Output ON. b. Note the UUT reading or response.	
4. UUT a. If a UUT calibration adjustment is provided, adjust the UUT reading or response to be appropriate to the settings on the 9100 screen, as detailed in the <i>UUT Manufacturer's Calibration Guide</i> . b. If no adjustment is provided on the UUT, record the UUT reading or response at the calibration point as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
5. 9100 Set Output OFF.	

10 Mark/Period Calibration (Contd)

User's H'b'k
Page Ref

10.3 The 9100 as an Adjustable Source

The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the *User's Handbook*; paras 3.3.1. Familiarity with editing screen values is also assumed (*Section 3*).

3-4
3-1

10.3.1 9100 and UUT Setup

1. Connections

Connect the 9100 to the UUT as shown in *Fig. 10.1*, and ensure that both instruments are powered ON and warmed up.

2. UUT Select Mark/Period function.

3. 9100

Ensure that the 9100 is in Mark/Period Function with Output OFF. If in any other function, press the 'Hz' key on the right of the front panel, then the screen key on the bottom row.

4.10-2

10.3.2 Sequence of Operations

Refer to the table of UUT calibration points in the *Manufacturer's Calibration Guide* for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.

1. 9100

Use the front panel controls to set the 9100 Output to the UUT cal point parameters:

- Mark time interval
- Period time interval
- High signal level voltage
- Low signal level voltage

3-8 to 21

2. UUT Select the correct range for the cal point.

3. 9100

- a. Set Output **ON**.
- b. Slew the required Output parameter until the UUT reading or response is appropriate to the 9100 settings.

4. UUT

Record the 9100 screen output values as detailed in the *UUT Manufacturer's Calibration Guide*.

5. 9100 Set Output **OFF**.

11 % Duty Calibration

User's H'b'k
Page Ref

11.1 Interconnections

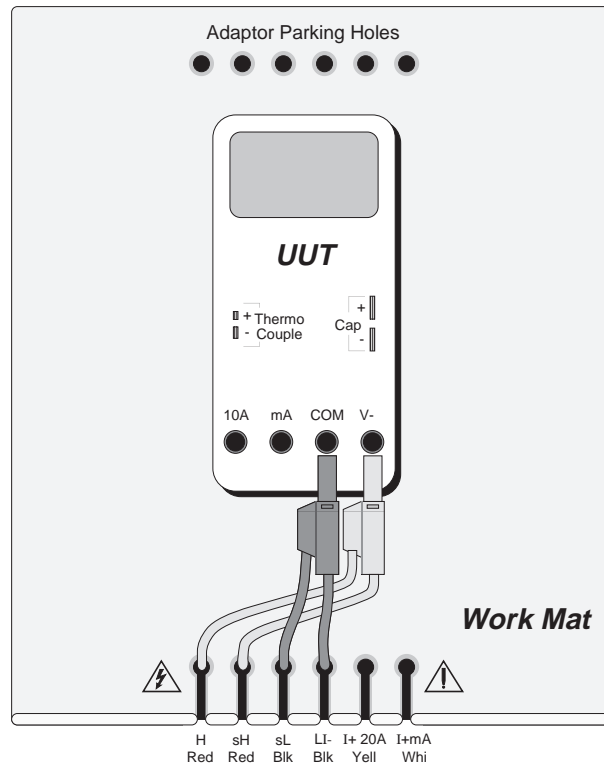


Fig. 11.1 Connections for % Duty Calibration

11 % Duty Calibration (Contd)	User's H'b'k Page Ref
11.2 Using the 9100 as a Fixed Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook</i> ; paras 3.3.1. Familiarity with editing screen values is also assumed (Section 3).	3-4 3-1
11.2.1 9100 and UUT Setup	
1. Connections Connect the 9100 to the UUT as shown in Fig. 11.1, and ensure that both instruments are powered ON and warmed up.	
2. UUT Select % Duty function.	
3. 9100 Ensure that the 9100 is in % Duty Function with Output OFF. If in any other function, press the 'Hz' key on the right of the front panel, then the screen key on the bottom row.	4.11-2
11.2.2 Sequence of Operations	
Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100 Use the front panel controls to set the 9100 Output to the UUT cal point parameters: % Duty Period High signal level voltage Low signal level voltage	3-8 to 21
2. UUT Select the correct range for the cal point.	
3. 9100 a. Set Output ON. b. Note the UUT reading or response.	
4. UUT a. If a UUT calibration adjustment is provided, adjust the UUT reading or response to be appropriate to the settings on the 9100 screen, as detailed in the <i>UUT Manufacturer's Calibration Guide</i> . b. If no adjustment is provided on the UUT, record the UUT reading or response at the calibration point as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
5. 9100 Set Output OFF.	

11 % Duty Calibration (Contd)

User's H'b'k
Page Ref

11.3 The 9100 as an Adjustable Source

The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the *User's Handbook*; paras 3.3.1. Familiarity with editing screen values is also assumed (*Section 3*).

3-4
3-1

11.3.1 9100 and UUT Setup

1. Connections

Connect the 9100 to the UUT as shown in *Fig. 11.1*, and ensure that both instruments are powered ON and warmed up.

2. UUT Select % Duty function.

3. 9100

Ensure that the 9100 is in % Duty Function with Output OFF. If in any other function, press the 'Hz' key on the right of the front panel, then the screen key on the bottom row.

4.11-2

11.3.2 Sequence of Operations

Refer to the table of UUT calibration points in the *Manufacturer's Calibration Guide* for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.

1. 9100

Use the front panel controls to set the 9100 Output to the UUT cal point parameters:

- % Duty
- Period
- High signal level voltage
- Low signal level voltage

3-8 to 21

2. UUT Select the correct range for the cal point.

3. 9100

- a. Set Output **ON**.
- b. Slew the required Output parameter until the UUT reading or response is appropriate to the 9100 settings.

4. UUT

Record the 9100 screen output values as detailed in the *UUT Manufacturer's Calibration Guide*.

5. 9100 Set Output **OFF**.

12 Auxiliary Calibration

User's H'b'k
Page Ref

12.1 Auxiliary Functions

12.1.1 Function Grouping and Selection

Three function groups are accessed using the 'Aux' key on the right of the front panel. Two are sub-divided into individual functions as shown in the table below, which also gives their selection symbols and Section numbers in this guide:

Function	Symbol on Aux Screen	Sub-Function	Symbol on Sub-Screen	Section
Capacitance		---	---	13
Temperature:	°C	Thermo-couple	THERMO COUPLE TYPE	14
		RTD	RTD	15
Logic:		Pulses		16
		Levels	1/∅	17

12.1.2 Calibration Procedures

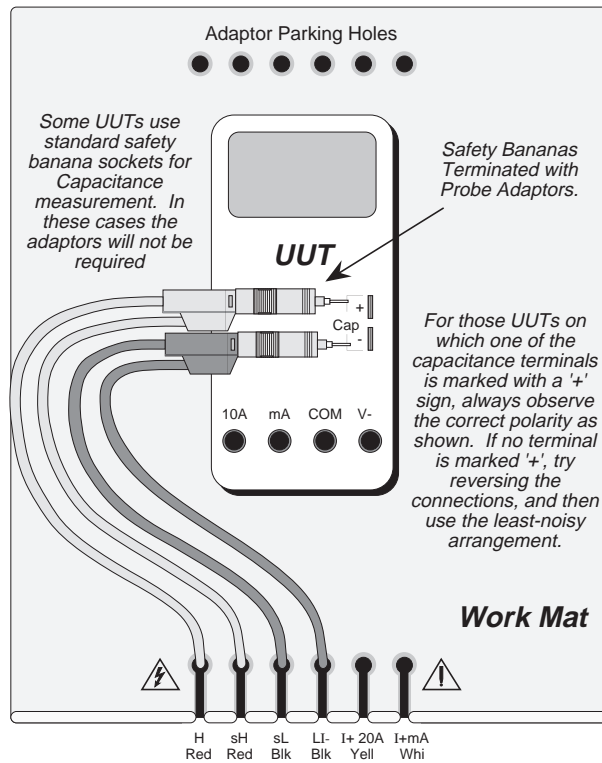
The instructions for calibrating UUTs in the above functions are contained in their sections as shown in the table.

13 Capacitance Calibration

User's H'b'k
Page Ref

13.1 Interconnections

The general connection scheme for UUT calibration is illustrated in *Fig. 13.1*. The use of either 4-wire remote sensing at the UUT terminals, or 2-wire local sensing at the 9100 terminals, is served by the same connections from the 9105 at the work mat. Selection of 2/4-wire is carried out on the 9100 front panel.



**Fig. 13.1 Connections for
4-Wire or 2-Wire Capacitance UUT Calibration**
(Leads which are not shown are not connected)

13 Capacitance Calibration (Contd)	User's H'b'k Page Ref
13.2 The 9100 as a Fixed Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook</i> ; paras 3.3.1. Familiarity with editing screen values is also assumed (Section 3).	3-4 3-1
13.2.1 9100 and UUT Setup	
1. Connections	
Connect the 9100 to the UUT as in Fig. 13.1, and ensure that both instruments are powered ON and warmed up.	
2. UUT Select Capacitance function.	
3. 9100	
Ensure that the 9100 is in Capacitance Function with Output OFF. If in any other function, press the 'Aux' key on the right of the front panel, then press the screen key on the bottom row.	4.13-2
13.2.2 Sequence of Operations	
Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100	
Use the front panel controls to set the 9100 Output capacitance to the UUT cal point value, selecting 2-Wire or 4-Wire and 'UUT' Current Span as required.	3-8 to 21 4.13-9/10 4.13-11
2. UUT Select the correct range for the cal point.	
3. 9100	
a. Set Output ON .	
b. Note the UUT reading.	
4. UUT	
a. If a UUT calibration adjustment is provided, adjust the UUT reading to be equal to that on the 9100 screen, as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
b. If no adjustment is provided on the UUT, record the UUT reading at the calibration point as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
5. 9100 Set Output OFF .	

13 Capacitance Calibration (Contd)

User's H'b'k
Page Ref

13.3 The 9100 as an Adjustable Source

The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the *User's Handbook*; paras 3.3.1. Familiarity with editing screen values is also assumed (*Section 3*).

3-4
3-1

13.3.1 9100 and UUT Setup

1. Connections

Connect the 9100 to the UUT as in *Fig. 13.1*, and ensure that both instruments are powered ON and warmed up.

2. UUT Select Capacitance function.

3. 9100

Ensure that the 9100 is in Capacitance Function with Output OFF. If in any other function, press the 'Aux' key on the right of the front panel, then press the screen key on the bottom row.

4.13-2

13.3.2 Sequence of Operations

Refer to the table of UUT calibration points in the *Manufacturer's Calibration Guide* for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.

1. 9100

Use the front panel controls to set the 9100 Output capacitance to the UUT cal point value, selecting 2-Wire or 4-Wire and 'UUT' Current Span as required.

3-8 to 21

4.13-9/10
4.13-11

2. UUT Select the correct range for the cal point.

3. 9100

a. Set Output ON.

b. Slew the Capacitance Output reading until the UUT reading is equal to the calibration point value.

4. UUT

Record the 9100 screen output value as detailed in the *UUT Manufacturer's Calibration Guide*.

5. 9100 Set Output OFF.

14 Thermocouple Temperature Calibration

User's H'b'k
Page Ref

14.1 Interconnections

The general connection scheme for UUT calibration is illustrated in Fig. 14.1. Always use the correct extension cable from the Thermocouple socket on the 9105 to the UUT Thermocouple input. Observe the correct polarity, otherwise spurious junctions may be set up.

N.B. Always ensure that the CJC pod fitted to the leadset connection block (or 9100 front panel) is the same unit that was calibrated together with the 9100 unit in use.

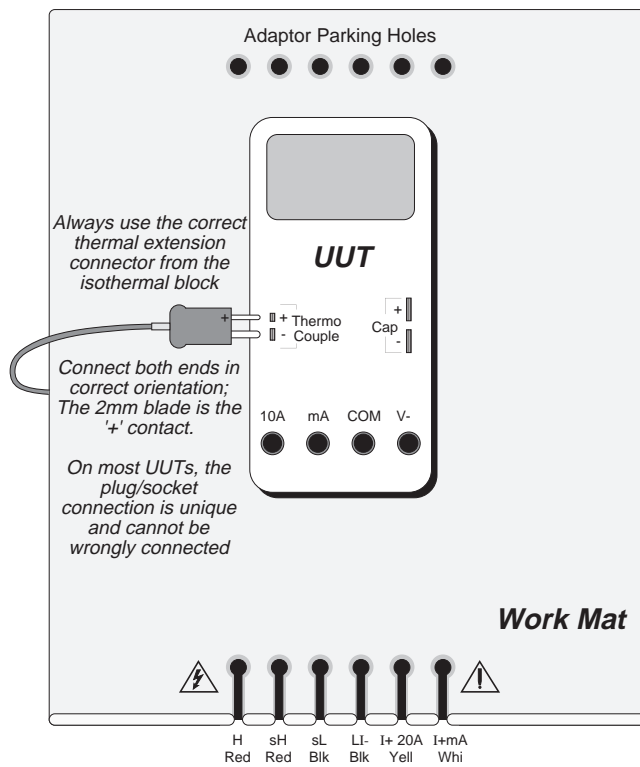


Fig. 14.1
Connections for Thermocouple Temperature Calibration

14 Thermocouple Temperature Calibration (Contd)	User's H'b'k Page Ref
14.2 The 9100 as a Fixed Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook; paras 3.3.1</i> . Familiarity with editing screen values is also assumed (<i>Section 3</i>).	3-4 3-1
14.2.1 9100 and UUT Setup	
1. Connections Connect the 9100 to the UUT as in <i>Fig. 14.1</i> , and ensure that both instruments are powered ON and warmed up.	
2. UUT Select Thermocouple Temperature function.	
3. 9100 Ensure that the 9100 is in Thermocouple Temperature Function with Output OFF. If in any other function, press the 'Aux' key on the right of the front panel, then press the °C screen key on the bottom row.	4.14-2
14.2.2 Sequence of Operations	
Refer to the table of UUT calibration points in the <i>UUT Calibration Guide</i> . Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100	
a. Ensure that the correct parameters (thermocouple type, temperature scale, and unit of temperature) are selected.	4.14-4
b. Set the 9100 Output temperature to the UUT cal point value, using front-panel controls.	3-8 to 21
2. UUT Select the correct range for the cal point.	
3. 9100	
a. Set Output ON .	
b. Note the UUT reading.	
4. UUT	
a. If a UUT calibration adjustment is provided, adjust the UUT reading to be equal to that on the 9100 screen, as detailed in the UUT's Calibration Guide.	
b. If no adjustment is provided on the UUT, record the UUT reading at the calibration point as detailed in the UUT's Calibration Guide.	
5. 9100 Set Output OFF .	

14 Thermocouple Temperature Calibration *(Contd)*

User's H'b'k
Page Ref

14.3 The 9100 as an Adjustable Source

The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the *User's Handbook*; paras 3.3.1. Familiarity with editing screen values is also assumed (*Section 3*).

3-4
3-1

14.3.1 9100 and UUT Setup

1. Connections

Connect the 9100 to the UUT as in *Fig. 14.1*, and ensure that both instruments are powered ON and warmed up.

2. UUT Select Thermocouple Temperature function.

3. 9100

Ensure that the 9100 is in Thermocouple Temperature Function with Output OFF. If in any other function, press the '**Aux**' key on the right of the front panel, then press the °C screen key on the bottom row.

4.14-2

14.3.2 Sequence of Operations

Refer to the table of UUT calibration points in the *UUT Calibration Guide*. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (**1**) to (**5**) at each stage.

1. 9100

a. Ensure that the correct parameters (thermocouple type, temperature scale, and unit of temperature) are selected.

4.14-4

b. Set the 9100 Output temperature to the UUT cal point value, using front-panel controls.

3-8 to 21

2. UUT Select the correct range for the cal point.

3. 9100

a. Set Output **ON**.

b. Slew the Output Temperature reading until the UUT reading is equal to the calibration point value.

4. UUT

Record the 9100 screen output value as detailed in the UUT's Calibration Guide.

5. 9100 Set Output **OFF**.

15 RTD Temperature Calibration

User's H'b'k
Page Ref

15.1 Interconnections

The general connection scheme for UUT calibration is illustrated in *Fig. 15.1*. The use of either 4-wire remote sensing at the UUT terminals, or 2-wire local sensing at the 9100 terminals, is served by the same connections from the 9105 at the work mat. Selection of 2/4-wire is carried out on the 9100 front panel.

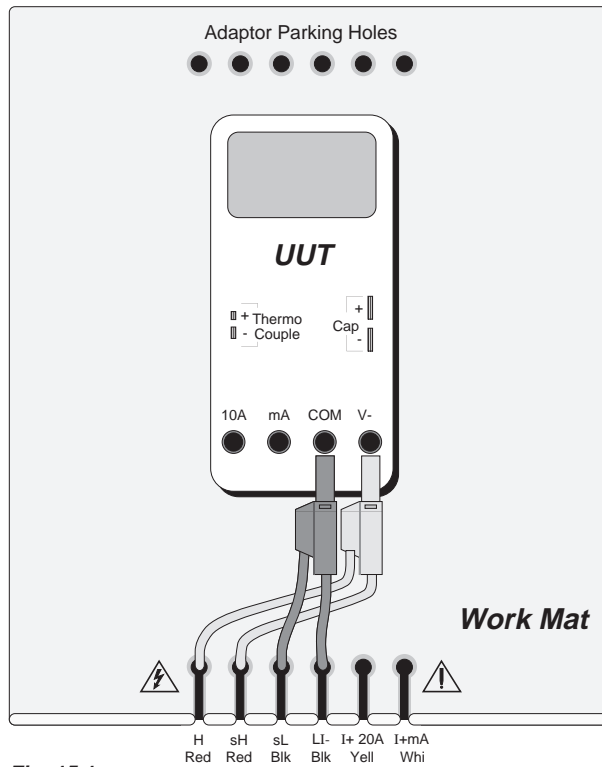


Fig. 15.1
Connections for RTD Temperature Calibration

15 RTD Temperature Calibration (Contd)	User's H'b'k Page Ref
15.2 The 9100 as a Fixed Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook</i> ; paras 3.3.1. Familiarity with editing screen values is also assumed (Section 3).	3-4 3-1
15.2.1 9100 and UUT Setup	
1. Connections Connect the 9100 to the UUT as in Fig. 15.1, and ensure that both instruments are powered ON and warmed up.	
2. UUT Select the RTD Temperature function.	
3. 9100 Ensure that the 9100 is in RTD Temperature Function with Output OFF. If in any other function, press the 'Aux' key on the right of the front panel, then press the °C screen key on the bottom row. Finally press the RTD screen key on the bottom row.	4.15-2
15.2.2 Sequence of Operations	
Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100	
a. Ensure that the correct parameters (RTD type, temperature scale, and unit of temperature) are selected.	4.15-4
b. Use the front panel controls to set the 9100 Output temperature to the UUT cal point value, selecting 2-Wire or 4-Wire and 'UUT' Current Span as required.	3-8 to 21
2. UUT Select the correct range for the cal point.	
3. 9100 Set Output ON and note the UUT reading.	
4. UUT	
a. If a UUT calibration adjustment is provided, adjust the UUT reading to be equal to that on the 9100 screen, as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
b. If no adjustment is provided on the UUT, record the UUT reading at the calibration point as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
5. 9100 Set Output OFF .	

15 RTD Temperature Calibration (Contd)

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15.3 The 9100 as an Adjustable Source

The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the *User's Handbook*; paras 3.3.1. Familiarity with editing screen values is also assumed (*Section 3*).

3-4
3-1

15.3.1 9100 and UUT Setup

1. Connections

Connect the 9100 to the UUT as in *Fig. 15.1*, and ensure that both instruments are powered ON and warmed up.

2. **UUT** Select the RTD Temperature function.

3. 9100

Ensure that the 9100 is in RTD Temperature Function with Output OFF. If in any other function, press the '**Aux**' key on the right of the front panel, then press the °C screen key on the bottom row. Finally press the **RTD** screen key on the bottom row.

4.15-2

15.3.2 Sequence of Operations

Refer to the table of UUT calibration points in the *Manufacturer's Calibration Guide* for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.

1. 9100

a. Ensure that the correct parameters (RTD type, temperature scale, and unit of temperature) are selected.

4.15-4

b. Use the front panel controls to set the 9100 Output temperature to the UUT cal point value, selecting 2-Wire or 4-Wire and 'UUT' Current Span as required.

3-8 to 21

2. **UUT** Select the correct range for the cal point.

3. 9100

a. Set Output **ON** and note the UUT reading.
b. Slew the Output Temperature reading until the UUT reading is equal to the calibration point value.

4. UUT

Record the 9100 screen output value as detailed in the *UUT Manufacturer's Calibration Guide*.

5. **9100** Set Output **OFF**.

16 Logic Pulses Calibration

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16.1 Interconnections

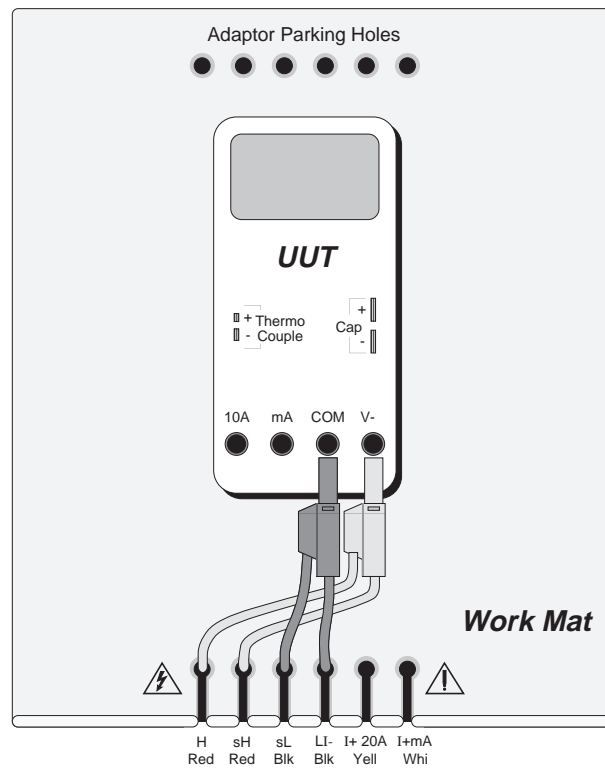


Fig. 16.1 Connections for Logic Pulses Calibration

16 Logic Pulses Calibration (Contd)	User's H'b'k Page Ref
16.2 Using the 9100 as a Fixed Source The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook; paras 3.3.1</i> . Familiarity with editing screen values is also assumed (<i>Section 3</i>).	3-4 3-1
16.2.1 9100 and UUT Setup	
1. Connections Connect the 9100 to the UUT as shown in <i>Fig. 16.1</i> , and ensure that both instruments are powered ON and warmed up.	
2. UUT Select Logic Pulses function.	
3. 9100 Ensure that the 9100 is in Logic Pulses Function with Output OFF. If in any other function, press the 'Aux' key on the right of the front panel, then the LOGIC screen key on the bottom row.	4.16-2
16.2.2 Sequence of Operations Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100 Use the front panel controls to set the 9100 Output to the UUT cal point parameters: Pulse Width and Repetition Interval Logic signal type: TTL, CMOS or ECL	3-8 to 21
2. UUT Select the correct range or response for the cal point.	
3. 9100 a. Set Output ON . b. Note the UUT reading or response.	
4. UUT a. If a UUT calibration adjustment is provided, adjust the UUT reading or response to be appropriate to the settings on the 9100 screen, as detailed in the <i>UUT Manufacturer's Calibration Guide</i> . b. If no adjustment is provided on the UUT, record the UUT reading or response at the calibration point as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
5. 9100 Set Output OFF .	

16

Logic Pulses Calibration

(Contd)

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16.3 The 9100 as an Adjustable Source

The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the *User's Handbook*; paras 3.3.1. Familiarity with editing screen values is also assumed (Section 3).

3-4
3-1

16.3.1 9100 and UUT Setup

1. Connections

Connect the 9100 to the UUT as shown in Fig. 16.1, and ensure that both instruments are powered ON and warmed up.

2. **UUT** Select Logic Pulses function.

3. 9100

Ensure that the 9100 is in Logic Pulses Function with Output OFF. If in any other function, press the 'Aux' key on the right of the front panel, then the **LOGIC** screen key on the bottom row.

4.16-2

16.3.2 Sequence of Operations

Refer to the table of UUT calibration points in the *Manufacturer's Calibration Guide* for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.

1. 9100

Use the front panel controls to set the 9100 Output to the UUT cal point parameters:
Pulse Width and Repetition Interval
Logic signal type: TTL, CMOS or ECL

3-8 to 21

2. **UUT** Select the correct range or response for the cal point.

3. 9100

- a. Set Output **ON**.
- b. Slew appropriate Output parameters until the UUT reading or response is as required for the cal point.

4. UUT

Record the 9100 screen output parameter values as detailed in the *UUT Manufacturer's Calibration Guide*.

5. **9100** Set Output **OFF**.

17 Logic Levels Calibration

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17.1 Interconnections

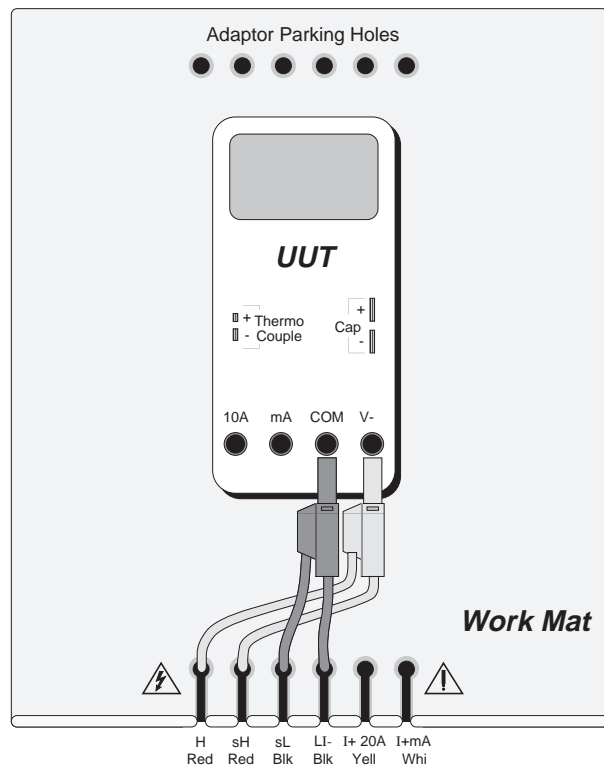


Fig. 17.1 Connections for Logic Levels Calibration

17 Logic Levels Calibration (Contd)	User's H'b'k Page Ref
17.4 The 9100 as a Fixed Source	
The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the <i>User's Handbook; paras 3.3.1</i> . Familiarity with editing screen values is also assumed (<i>Section 3</i>).	3-4 3-1
17.4.1 9100 and UUT Setup	
1. Connections Connect the 9100 to the UUT as shown in <i>Fig. 17.1</i> , and ensure that both instruments are powered ON and warmed up.	
2. UUT Select Logic Levels function.	
3. 9100 Ensure that the 9100 is in Logic Levels Function with Output OFF. If in any other function, press the 'Aux' key on the right of the front panel, then the LOGIC screen key on the bottom row. Finally press the 1/0 screen key on the bottom row.	4.17-2
17.4.2 Sequence of Operations	
Refer to the table of UUT calibration points in the <i>Manufacturer's Calibration Guide</i> for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.	
1. 9100 Use the front panel controls to set the 9100 Output to the UUT cal point parameters: Logic type: TTL, CMOS or ECL Voltage Level ('H' or 'L' screen keys can be used)	3-8 to 21
2. UUT Select the correct range or response for the cal point.	
3. 9100 a. Set Output ON . b. Note the UUT reading or response.	
4. UUT a. If a UUT calibration adjustment is provided, adjust the UUT reading or response to be appropriate to the settings on the 9100 screen, as in the <i>UUT Manufacturer's Calibration Guide</i> . b. If no UUT adjustment is provided, record the UUT reading or response at the calibration point as detailed in the <i>UUT Manufacturer's Calibration Guide</i> .	
5. 9100 Set Output OFF .	

17

Logic Levels Calibration

(Contd)

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17.5 The 9100 as an Adjustable Source

The following procedure assumes that the instrument is in Manual Mode. In case of difficulty, read the *User's Handbook*; paras 3.3.1. Familiarity with editing screen values is also assumed (Section 3).

3-4
3-1

17.5.1 9100 and UUT Setup

1. Connections

Connect the 9100 to the UUT as shown in Fig. 17.1, and ensure that both instruments are powered ON and warmed up.

2. UUT Select Logic Levels function.

3. 9100

Ensure that the 9100 is in Logic Levels Function with Output OFF. If in any other function, press the 'Aux' key on the right of the front panel, then the **LOGIC** screen key on the bottom row. Finally press the **1/0** screen key on the bottom row.

4.17-2

17.5.2 Sequence of Operations

Refer to the table of UUT calibration points in the *Manufacturer's Calibration Guide* for the UUT. Follow the sequence of calibration stages as directed by the guide, and carry out the following operations (1) to (5) at each stage.

1. 9100

Use the front panel controls to set the 9100 Output to the UUT cal point parameters:
Logic type: TTL, CMOS or ECL
Voltage Level ('H' or 'L' screen keys can be used if required)

3-8 to 21

2. UUT Select the correct range or response for the cal point.

3. 9100

- a. Set Output **ON**.
- b. Slew appropriate Output parameters until the UUT reading or response is as required for the cal point.

4. UUT

Record the 9100 screen output parameter values as detailed in the *UUT Manufacturer's Calibration Guide*.

5. 9100 Set Output **OFF**.

18 Error Messages

18.1 Error Messages

While using the Model 9100 in its manual operating mode it is possible that error messages will be displayed on the screen. Some of these messages simply inform the operator that the adjustments he/she has made to the Model 9100's front-panel controls would result in an invalid instrument condition — for example, the requested AC output voltage and frequency would exceed the Model 9100's volt-hertz profile specification — while others warn of possible failures within the instrument. The action which must be taken when each of these messages appears depends on the type of message displayed.

The Model 9100's error messages are therefore broken down into different types as follows:-

Type A Fatal System Errors

This type of error occurs when the Model 9100's microprocessor detects illegal conditions in the calibrator's analog circuits or in its own hardware and software operating environment. When this type of error occurs, a hardware 'watchdog' circuit activates the microprocessor's reset line to restart the Model 9100, and the appropriate fatal error message is continuously displayed.

Action required:

Press the **RESUME** screen softkey or power the Model 9100 off and then on. If the error message recurs, note it and contact your local Wavetek Service Center.

Type B General Operating Errors

These errors warn the user that he/she has requested an operating condition which is beyond the normal operating limits of the Model 9100.

Action required:

Adjust the requested operating conditions until they lie within the Model 9100's specified limits and proceed.

18 Error Messages

Type C Overload Errors

Overload errors occur when the Model 9100 detects over-current, over-voltage, over-temperature or over-compliance conditions in its analog output circuits.

Action required:

Remove the source of the overload, and in the case of over-temperature conditions wait for the Model 9100 to cool down. If the overload condition persists, contact your local Wavetek Service Center.

Type D Calibration Errors

Although most of these errors occur during calibration of the Model 9100, they may also occur when the Model 9100 interrogates its calibration stores during normal operation.

Action required:

Error messages indicating a password failure or incorrect cal switch position can be overcome by rectifying the condition before proceeding. If the error message indicates a corrupt calibration store, recalibrate the Model 9100. If the failure message persists, contact your local Wavetek Service Center.

Type E Cold Junction Compensation Errors

These errors occur when the thermistor which senses the temperature of the Model 9100's terminals indicates an obvious temperature error.

Action required:

Contact your local Wavetek Service Center.

Type F Configuration Errors

These errors only occur when you are configuring the Model 9100 using the **CONFIG** screen menus.

Action required:

Correct the configuration data which has caused the error and proceed.

18 Error Messages

18.2 Wavetek Service Center Support

If you are unable to overcome the cause of error messages displayed on your Model 9100 or you believe that the unit has developed a fault, you can obtain product support from your nearest Wavetek Service Center. However, before you do so please take the time to document as much information as possible about the nature of the error message or fault. As a minimum, this should include the mode of operation in which the Model 9100 was being used when the error message/fault occurred, the function and range selected at the time, and the error message which was displayed. You should also run the Model 9100's **Full Selftest** routines (see *Section 8.3* of the *Model 9100 Multifunction Meter Calibration System User's Handbook — Volume 2*) and report any error messages which appear during these tests. Note that you can obtain a print out of the selftest results by connecting a printer to the Model 9100's parallel printer port and selecting the **PRINT** option at the end of selftest.

The more information you can provide, the easier it will be for Wavetek's engineers to diagnose and rectify the fault.

18 Error Messages

18.3 Alphabetic List of Error Messages

Error Message	Error Type
A	
Amplitude outside limits	D
A valid Cold Junction temperature is required	D
B	
Bottom of range	B
C	
Cal is password protected	D
Cal switch not enabled	D
Cannot change: delta Φ still selected	B
Cannot change: Φ ref out still selected	B
Cap meas no 1st reading	
<i>The first of the two measurements required for capacitance calibration is missing</i>	D
Cap meas no 2nd reading	
<i>The second of the two measurements required for capacitance calibration is missing</i>	D
Cap meas outside limits	D
Century entry is not a valid number	
<i>The first two digits of the year entered are not 19 or 20</i>	F
Changing current setting ↓ gives best UUT performance	
<i>UUT sense current high. Internal circuits saturated.</i>	B
Cold junction measurement invalid. Default = 25°C	E
Confirm with ON	B
Corrupt +ve zero (DAC)	D
Corrupt -ve zero (DAC)	D
Corrupt cal factors	D
Corrupt cold junc diff factor	E
Corrupt composite DAC zero	D

18 Error Messages

Error Message	Error Type
Corrupt factors:- substitution <i>A nominal correction factor has been substituted for invalid data in the non-volatile memory</i>	D
Corrupt LFAC correction <i>The low frequency AC correction factor is corrupted</i>	D
Corrupt lookup table <i>The required value in the DAC characterization look-up table is corrupted</i>	D
Corrupt main DAC gain	D
Corrupt offset DAC factor	D
Corrupt polarity gain (DAC)	D
Corrupt res. ref. factor	D
Corrupt selfcal factor	D
Corrupt trim DAC gain	D
Corrupt Vmax. Vmin	D
D	
DAC Default Charactn. Failed <i>An attempt to load the DAC characterization look-up table with default values has failed</i>	A
Day entry is not a valid day	F
Day entry is not a valid number	F
Day separator is incorrect	F
Deviation too big	B
Deviation too small	B
Down range required	B
Duty too big	B
Duty too small	B
E	
Entry contains illegal characters	B
Entry does not give a valid time setting	F

18 Error Messages

Error Message	Error Type
F	
Failed -----	D
Failed to clear Flash RAM	A
Failed to save (cjc) factor	D
Failed to save (R-eqV) factor	D
Failed to save configuration	F
Flash RAM protected by switch	A
Frequency outside limits	D
Frequency too big	B
Frequency too small	B
Freq too big: 1kHz max when delta Φ active	B
Freq too big: 1kHz max when Φ ref out active	B
G	
Gain request limited <i>Requested gain setting is beyond the maximum capability of the DAC. The maximum value has been set.</i>	D
H	
High volt lvl below low volt lvl <i>The voltage specified for the high level of a pulse waveform is below that specified for its low level</i>	B
High volt lvl equals low volt lvl <i>The voltage specified for the high level of a pulse waveform is the same as that specified for its low level</i>	B
Hours entry is not a valid number	F
I	
Illegal duty/width combination	B
Illegal offset	B
Illegal rep/width combination	B
Incorrect or missing workmat. Cold junction default = 25°C	E
Invalid CJC measurement - default to 25°C	E
Invalid junction measurement	E

18 Error Messages

Error Message	Error Type
L	
Level too big	B
Level too small	B
Limits: Gain of 1 zero	D
Limits: R-eqV	D
Low volt lvl above high volt lvl <i>The voltage specified for the low level of a pulse waveform is above that specified for its high level</i>	B
M	
Maximum value	B
Measurement command flushed <i>The required internal A/D converter reading is not available</i>	A
Minimum value	B
Minutes entry is not a valid number	F
Month entry is not a valid month	F
Month entry is not a valid number	F
Month separator is incorrect	F
MULTIPLE analogue fail flags <i>More than one analogue failure has been detected</i>	C
N	
No A/D ready bit after 160ms <i>The internal A/D converter has not produced a reading within the required time period</i>	A
No more failures to view <i>There are no more self-test failures to be reported</i>	B
No more ranges	B
Nominal Resistance too big	B
Nominal Resistance too small	B
Number too big	B

18 Error Messages

Error Message	Error Type
O	
OPERATING SYSTEM ERROR	A
Over compliance	C
Over temperature	C
Overload of HV power supply	C
Overload of output clamp	C
Overload of power amp	C
P	
Password incorrect	D
Period too big	B
Period too small	B
Phase angle too big	B
Phase angle too small	B
Printer is not responding	B
Printer out of paper	B
Priority OFF received	
<i>A request to turn the output ON has been overridden by a request to turn it OFF</i>	B
R	
Reached lower boundary	B
Reached upper boundary	B

18 Error Messages

Error Message	Error Type
S	
Safety Voltage must be in the range 10.000 V - 110.000 V	F
Search Procedure - NO Test point	B
Search Procedure - Function ID Expected	B
Syntax error	B
T	
Target too big	B
Target too small	B
Temperature must be within the range 00.00 - 50.00	D
Temperature table: no entry found	E
Temperature too big	B
Temperature too small	B
Thermal limit:- reduced output	B
Thermocouple adaptor required. Cold junction default = 25°C	E
Top of range	B

18 Error Messages

U

UNDEFINED FATAL ERROR	
<i>The firmware detected an unspecified fatal error</i>	A
UNEXPECTED case in switch statement	A
UNEXPECTED compliance flag	
<i>An output compliance error occurred while the output circuit was inactive</i>	A
UNEXPECTED HV power supply flag	
<i>A high voltage output error occurred while the high voltage circuit was inactive</i>	A
UNEXPECTED multiple fail flags	A
UNEXPECTED over temperature flag	
<i>An over-temperature error occurred while the temperature measurement circuit was inactive</i>	A
UNEXPECTED Output clamp overload	A
UNEXPECTED Power amp overload	
<i>A power amplifier overload error occurred while the power amplifier was inactive</i>	A
Unknown keycode	
<i>The keyboard encoder has produced an unrecognised code</i>	B
Up range required	B
Using default DAC factors	D
UUT sense current is high. Internal circuits saturated.	
Change current setting ↑	B
UUT sense current is high. Internal circuits saturated.	
Output outside specification	B
UUT sense current is low.	
Output outside specification	B

V

Entered value is outside of the allowed range	B
---	---

W

Width too big	B
Width too small	B

Y

Year entry is not a valid number	F
Year separator is incorrect	F

