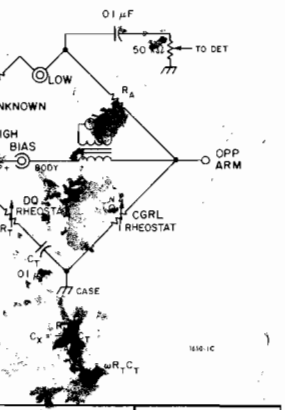
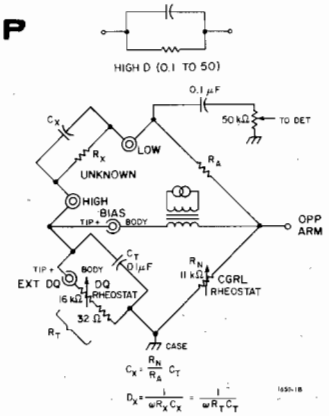
C_S



	pF	nF			μF		
MULT	100	1	10	100	1	10	100
$R_A\Omega$	1M	100k	10k	1k	100	10	1

a. Turn GENERATOR switch to BAT CHECK position. If the meter pointer is not in the BAT sector, replace the batteries.
b. Turn GENERATOR switch to AC EXTERNAL or AC INTERNAL 1 kHz.
c. Turn PARAMETER switch to C_S.
d. Connect the unknown so that most stray capacitance is between the LOW terminal and the 1650-B case.
e. Turn ORTHONULL® switch to OUT.
f. Turn OSC LEVEL clockwise. The panel control affects only the internal oscillator.
g. Turn DQ dial near 0.05 on the LOW D scale.
h. Turn CGRL dial near 11.
i. Adjust DET SENS for about 6 divisions deflection.
j. Turn MULTIPLIER switch for minimum meter reading.
k. Alternately adjust, first the CGRL dial, then the DQ dial for the best null, increasing the DET SENS as needed.
l. ORTHONULL® is not used on this bridge unless the DQ dial reading times f(kHz) approaches or exceeds 1.
m. If the DQ dial goes into the uncalibrated portion, the unknown should be measured as C_P.
n. The series capacitance of the unknown equals the product of the CGRL-dial reading and the MULTIPLIER-switch setting.
o. The D equals the reading on the DQ dial times f (kHz).
p. Turn GENERATOR switch to OFF.

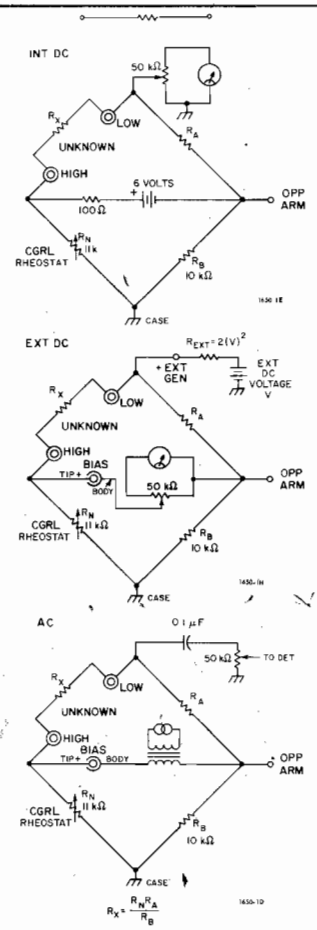
C_P



	pF	nF			μF		
MULT	100	1	10	100	1	10	100
$R_A\Omega$	1M	100k	10k	1k	100	10	1

a. Turn GENERATOR switch to BAT CHECK position. If the meter pointer is not in the BAT sector, replace the batteries.
b. Turn GENERATOR switch to AC EXTERNAL or AC INTERNAL 1 kHz.
c. Turn PARAMETER switch to C_P. Large electrolytics should be measured at a low frequency (120 Hz) for greater accuracy.
d. Connect the unknown so that most stray capacitance is between the LOW terminal and the 1650-B case.
e. Turn ORTHONULL® switch to OUT.
f. Turn OSC LEVEL clockwise. The panel control affects only the internal oscillator.
g. Turn DQ dial near 0.2 on the HIGH D scale.
h. Turn CGRL dial near 11.
i. Adjust DET SENS for about 6 divisions deflection.
j. Turn MULTIPLIER switch for minimum meter reading.
k. Alternately adjust, first the DQ dial, then the CGRL dial for the best null, increasing the DET SENS as needed.
l. ORTHONULL® switch should be set to IN if the DQ dial reading times 1/f (kHz) approaches or exceeds 1.
m. If the DQ dial reaches the stop at 0.1, the unknown should be measured as C_S.
n. The parallel capacitance of the unknown equals the product of the CGRL-dial reading and the MULTIPLIER-switch setting.
o. The D equals the reading on the DQ dial times 1/f (kHz).
p. Turn GENERATOR switch OFF.

R

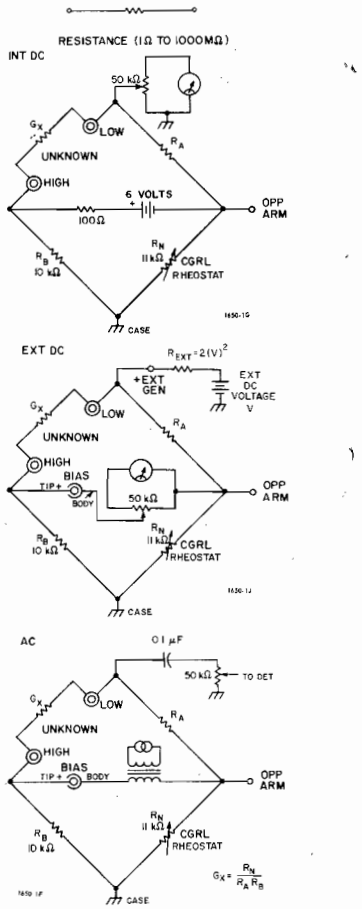


	mΩ	Ω			kΩ		
MULT	100	1	10	100	1	10	100
$R_A\Omega$	1	10	100	1k	10k	100k	1M

a. Check mechanical zero of meter.
b. Turn GENERATOR switch to the BAT CHECK position. If the meter pointer is not in the BAT sector, replace the batteries.
c. Turn GENERATOR switch to the desired generator source. The OSC LEVEL control affects only the internal oscillator.
d. Turn ORTHONULL® switch to OUT and PARAMETER switch to R.
e. Turn CGRL dial near 11.
f. Adjust DET SENS control for about 6 divisions deflection.
g. Turn MULTIPLIER switch for minimum reading to the left of center if making a dc measurement. Null as usual if making an ac measurement. (DQ rheostat not in the circuit.)
h. Adjust CGRL dial for best ac null, or zero the pointer if using dc. If ac null is not sharp, a reactive balance may be necessary, see instruction manual.
i. The unknown resistance is the CGRL-dial reading multiplied by the MULTIPLIER switch setting.
j. Turn GENERATOR switch to OFF.

OPERATING INSTRUCTIONS

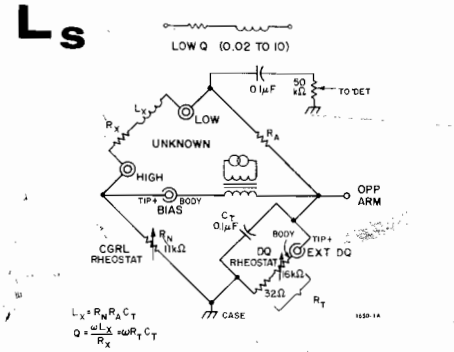
G



	mΩ	μΩ			mΩ		
MULT	100	1	10	100	1	10	100
$R_A\Omega$	1M	100k	10k	1k	100	10	1

a. Check mechanical zero of meter.
b. Turn GENERATOR switch to the BAT CHECK position. If the meter pointer is not in the BAT sector, replace the batteries.
c. Turn GENERATOR switch to the desired generator source. The OSC LEVEL control affects only the internal oscillator.
d. Turn ORTHONULL® switch to OUT and PARAMETER switch to G.
e. Turn CGRL dial near 11.
f. Adjust DET SENS control for about 6 divisions deflection.
g. Turn MULTIPLIER switch for minimum reading to the left of center if making a dc measurement. Null as usual if making an ac measurement. (DQ rheostat not in the circuit.)
h. Adjust CGRL dial for best ac null, or zero the pointer if using dc, If ac null is not sharp, a reactive balance may be necessary, see instruction manual.
i. The unknown conductance is the CGRL-dial reading multiplied by the MULTIPLIER switch setting.
j. Turn GENERATOR switch to OFF.

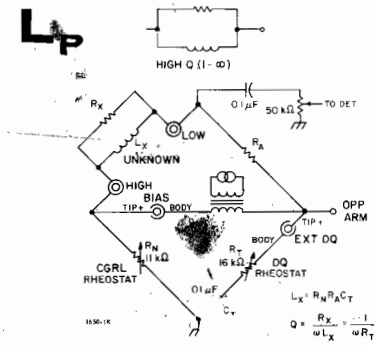
L_S



	μH	mH			H		
MULT	100	1	10	100	1	10	100
$R_A\Omega$	1	10	100	1k	10k	100k	1M

a. Turn GENERATOR switch to BAT CHECK. If the meter pointer isn't in the BAT sector, replace the batteries.
b. Turn GENERATOR switch to AC EXTERNAL or AC INTERNAL 1 kHz. Air core rf chokes should be measured at a high frequency (10 kHz) to get a reasonable Q.
c. Turn PARAMETER switch to L_S.
d. Connect unknown so that most stray capacitance is between the LOW terminal and the 1650-B case.
e. Turn ORTHONULL® switch to OUT.
f. Turn OSC LEVEL clockwise. The panel control affects only the internal oscillator. Use full output except for nonlinear unknowns. Iron core inductors are often nonlinear.
g. Turn DQ dial near 4 on the LOW Q scale.
h. Turn CGRL dial near 11.
i. Adjust DET SENS for about 6 divisions deflection.
j. Turn MULTIPLIER switch for minimum meter reading.
k. Alternately adjust the CGRL and DQ dials for the best null, DQ dial first, increasing the DET SENS as needed. Null means bring the pointer as near to the center of the meter as possible. Usually it won't be possible to center the pointer.
l. ORTHONULL® should be switched IN if the DQ-dial reading times f (kHz) approaches or is less than 1.
m. If a sharp null cannot be obtained and the Q dial is near 10, switch to L_P.
n. The series inductance of the unknown equals the product of the CGRL-dial reading and the MULTIPLIER-switch setting.
o. The Q of the unknown equals the Q-dial reading times f (kHz).
p. Turn GENERATOR switch OFF.

L_P



	μH	m..			H		
MULT	100	1	10	100	1	10	100
$R_A\Omega$	1	10	100	1k	10k	100k	1M

a. Turn GENERATOR switch to BAT CHECK. If the meter pointer isn't in the BAT sector, replace the batteries.
b. Turn GENERATOR switch to AC EXTERNAL or AC INTERNAL 1 kHz.
c. Turn PARAMETER switch to L_P.
d. Connect unknown so that most stray capacitance is between the LOW terminal and the 1650-B case.
e. Turn ORTHONULL® switch to OUT.
f. Turn OSC LEVEL clockwise. The panel control affects only the internal oscillator. Use full output except for nonlinear unknowns. Iron core inductors are often nonlinear.
g. Turn DQ dial near 5 on the HIGH Q scale.
h. Turn CGRL dial near 11.
i. Adjust DET SENS for about 6 divisions deflection.
j. Turn MULTIPLIER switch for minimum meter reading.
k. Alternately adjust the CGRL and DQ dials for the best null, CGRL first, increasing the DET SENS as needed. Null means bring the pointer as near to the center of the meter as possible. Usually it won't be possible to center the pointer.
l. ORTHONULL® is not used on this bridge unless the DQ dial reading times 1/f (kHz) approaches 1 or less.
m. If a sharp null cannot be obtained, the unknown is too lossy and must be measured as L_S, or the unknown is not inductive.
n. The parallel inductance of the unknown equals the product of the CGRL-dial reading and the MULTIPLIER-switch setting.
o. The Q of the unknown equals the dial reading times 1/f (kHz).
p. Turn GENERATOR switch to OFF.