NPN & PNP
Version

U2
LM7809CT
LINE   VREG
VOLTAGE
COMMON
C1 330nF   C2 100nF
VCC
LED1
V1 -12V
GND   GND
PR7   R2 560Ω 1%
I: --
I(p-...
GND

H3 3
H4 3
Remove H3 & H4 to set
The restance so that the reference
voltage is correct

R16 56Ω 1%
R19 5KΩ Key=A W202   35.2 %
R18 10Ω Key=B W100   43.3 %
V: -- V(p-...
PR1
R17 56Ω 1%
I: -- I(p-...
PR4
Ref1
GND

VEE_5v
VCC_5v
S2
Key = Space

PR2
V: -- V(p-...

R24 10KΩ 1%
These two pots
set the relationship
of gain between
the 100mV input and
the 1mA Emitter
current.
Remove H5 and H6
to check the Resistance

Inverting Amplifier
Gain = - R24 / R25

TP1
R25 10kΩ 1%
U12A
LM324N
VEE
VCC

H5 5
R23 20KΩ Key=C W203   45 %
R27 2KΩ Key=D W202   50 %
H6 6

R26 10KΩ 1%
Inverting Amplifier
Gain =
- R26 / (R27 + R23)

U12B
LM324N
VEE
VCC
GND

VEE_5v
VCC_5v
S1
Key = Space

This Op Amp
is just a buffer
used to measure the
VB Voltage

VCC
U4B
LM324N
VEE
R20 10kΩ 1%

With the reference
Transistor in place
Check their is 600mV
Dropped across the
emitter resistors
measure TP6 to GND
Then set your DMM
to Relitive and begin
Test other transistors

To mesure
the Vbe of the
transistor
probe
TP4 to TP6

XMM1   XMM4
GND

XSC1
Ext Trig
B   A

VEE   U5 LM7905CT   VEE_5v
LINE   VREG
VOLTAGE
COMMON
C7 330nF   C8 100nF
GND

The input voltage
at this Op Amp U3C
needs to be lower
the input at U3D

VCC
U3C
LM324N
VEE

R7 20kΩ 0.5%
R11 10kΩ 0.5%
R12 10kΩ

R9 20kΩ 0.5%

VEE
U3A
LM324N
VCC

VCC
U3B
LM324N
VEE
This Op Amp
is just a buffer
to the output of U3A

R14 10kΩ 1%

This Op Amp
Takes the input voltage from
the voltage divider & gain
adjustment from U12B and then
it adjusts the output of this op amp
until the voltage accross R15 is equaly
to that

V: -- V(p-...
PR3

VCC
U12C   TP7
LM324N
VEE

TP8   60.7 %

PR5   R15 20KΩ Key=E W203
TP3   H1 1

Transistor
Under
Test
Take out the
Transistor and
H1, H2 to
measure the
Resistance

Q1 2N5551

This Op Amp
is just a buffer
used to measure the
VE Voltage

VCC
U4A
LM324N
VEE
R21 10kΩ 1%   TP6

Emitter Current Check
To do this.
Measure the Voltage from
TP6 to TP5.if it reads 10mv
this is equivalent to a emitter
current of 1mA
(For more accurate readings
subsitute the 10mV above
for the recorded value of R3.)

XMM2
TP5
TP4

U14 LM7805CT   VCC_5v
LINE
VOLTAGE
VREG
COMMON
C4 330nF   C6 100nF
GND

VCC

R10 10kΩ 0.5%

VEE
U3D
LM324N
VCC

R8 20kΩ 0.5%
R13 10kΩ 0.5%

PR9
V: -- V(p-...
GND

The input voltage
at this Op Amp U3D
needs to be higher
the input at U3C

PR10   Ref1
V: -- V(p-...

U1 LM7909CT   VEE
LINE   VREG
VOLTAGE
COMMON
C3 330nF   C5 100nF
V2 -12V
GND   GND

Op Amp's U3C, U3D and U3A
Work together to calculate the
difference in voltage between the
Input of U3C and input of U3D.
The difference in Voltage is Outputed
at U3A.

This Op Amp
is just a buffer
used to measure the
Voltage Prior to the VB Resistor
So that the current going through
it can be calculated

VCC
U4C
LM324N
VEE
R4 10kΩ 1%

Note
Record the value of
R3 on Assembly

R3 10Ω 0.5%
H2 2

R5 2KΩ Key=F W202   29.3 %
R6 10Ω Key=G W100   65 %
I: -- I(p-...
PR6
R1 10Ω 1%

To check the emmiter
resistance
remove the Transistor, H1 & H2
Then measure ohms
From TP3 to GND
Calculation Example:
0.6v at TP3
Ie = 1mA
Therefore Re Needs to be 600 ohms
measure TP3 to GND.

GND

This Op Amp
is just a buffer
used to measure the
Current through the
1 Ohm Resistor

VCC
U4D
LM324N
VEE
R22 10kΩ 1%

Base Current
Check. This value needs
to be divided by R15
to get correct current value
Eg. 85mV / 10K = 8.5uA
Measure TP2 to TP4

XMM3
TP2