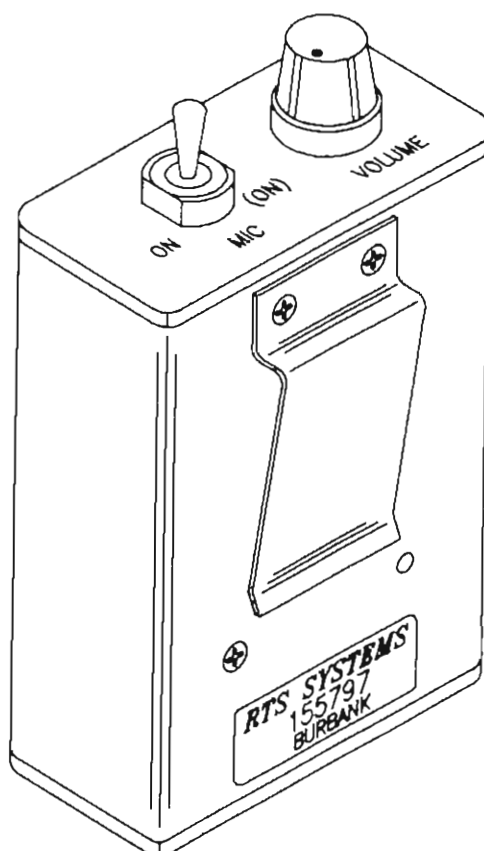


# USER MANUAL

**MODEL BP317**

## Portable Belt Pack User Station



**RTS**™

## PROPRIETARY NOTICE

The RTS product information and design disclosed herein were originated by and are the property of Telex Communications, Inc. Telex reserves all patent, proprietary design, manufacturing, reproduction, use and sales rights thereto, and to any article disclosed therein, except to the extent rights are expressly granted to others.

## COPYRIGHT NOTICE

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## PATENT NOTICE

This equipment contains and uses a design embodied in United States Patent No. 4,358,644: "A Bilateral Current Source for a Multi-terminal Intercom". This design employs a two-wire to four-wire converter.

## UNPACKING AND INSPECTION

Immediately upon receipt of the equipment, inspect the shipping container and the contents carefully for any discrepancies or damage. Should there be any, notify the freight company and the dealer at once.

## WARRANTY INFORMATION

RTS products are warranted by Telex Communications, Inc. to be free from defects in materials and workmanship for a period of three years from the date of sale.

The sole obligation of Telex during the warranty period is to provide, without charge, parts and labor necessary to remedy covered defects appearing in products returned prepaid to Telex. This warranty does not cover any defect, malfunction or failure caused beyond the control of Telex, including unreasonable or negligent operation, abuse, accident, failure to follow instructions in the Service Manual or the User Manual, defective or improper associated equipment, attempts at modification and repair not authorized by Telex, and shipping damage. Products with their serial numbers removed or effaced are not covered by this warranty.

To obtain warranty service, follow the procedures entitled "Procedure For Returns" and "Shipping to Manufacturer for Repair or Adjustment".

This warranty is the sole and exclusive express warranty given with respect to RTS products. It is the responsibility of the user to determine before purchase that this product is suitable for the user's intended purpose.

**ANY AND ALL IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY ARE LIMITED TO THE DURATION OF THIS EXPRESS LIMITED WARRANTY.**

NEITHER TELEX NOR THE DEALER WHO SELLS RTS PRODUCTS IS LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND.

## CUSTOMER SUPPORT

Technical questions should be directed to:

Customer Service Department  
RTS/Telex,  
2550 Hollywood Way, Suite 207  
Burbank, CA 91505 U.S.A.  
Telephone: (818) 566-6700  
Fax: (818) 843-7953

## RETURN SHIPPING INSTRUCTIONS

### PROCEDURE FOR RETURNS

If a repair is necessary, contact the dealer where this unit was purchased.

If repair through the dealer is not possible, obtain a RETURN AUTHORIZATION from:

Customer Service Department  
Telex Communications, Inc.  
Telephone: (800) 828-6107  
Fax: (800) 323-0498

### DO NOT RETURN ANY EQUIPMENT DIRECTLY TO THE FACTORY WITHOUT FIRST OBTAINING A RETURN AUTHORIZATION.

Be prepared to provide the company name, address, phone number, a person to contact regarding the repair, the type and quantity of equipment, a description of the problem and the serial number(s).

### SHIPPING TO MANUFACTURER FOR REPAIR OR ADJUSTMENT

All shipments of RTS products should be made via United Parcel Service or the best available shipper, prepaid. The equipment should be shipped in the original packing carton; if that is not available, use any suitable container that is rigid and of adequate size. If a substitute container is used, the equipment should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material. All shipments must be sent to the following address and must include the Return Authorization.

Factory Service Department  
Telex Communications, Incorporated  
West 1st Street  
Blue Earth, MN 56013 U.S.A.

Upon completion of any repair the equipment will be returned via United Parcel Service or specified shipper collect.

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## SECTION 1: DESCRIPTION & SPECIFICATIONS

### 1.1 DESCRIPTION

The Model BP317 is a portable, single-channel, intercom user station. This user station is designed to be used in a full duplex, conference line intercom system.

#### Conference Line Intercom System

A conference line intercom system allows a group of people to talk and listen on a single channel. On this channel, all users can listen when one or more other users are talking (conferencing). Up to 75 users can share the same conference line (or conference bus).

#### Full Duplex Operation

Full duplex operation allows two way conversation at the same time, that is, one user can interrupt a second user while the second user is still talking.

The BP317 with a headset, in effect, interfaces a human user to the intercom system. The user talks and listens using the headset (or a handset). The headset connects to the BP317 via a four conductor cable and connector. The BP317 connects to the system using a three conductor "microphone" type cable. The BP317 contains two controls to help the user interface well to the intercom system: the volume control, and the microphone switch.

#### Volume Control

The volume control on the BP317 has a wide range to compensate for: user hearing differences, ambient noise variation, variations in headset / handset sensitivity, and variations in talker voices. The volume control in the BP317 reduces distortion by driving the headphone amplifier only as much as needed.

#### Microphone Switch

In normal system operation, one or more users talk and the rest listen. A microphone switch on each station allows the talker's microphone to be enabled and allows the listeners to keep their microphones disabled. In this condition, speech intelligibility is enhanced since background noise from other microphones is not present.

The microphone switch has three positions:

- (1) center "OFF",
- (2) momentary "ON", and
- (3) latched "ON".

The momentary position allows quick bursts of communication, especially useful in a high noise environment. The latched position allows "hands free" operation, when the user needs to have two way conversation while performing another activity.

#### Model BP317 Connections, Inputs & Outputs

Unmodified BP317 user stations have two connectors:

1. An XLR4 type female connector for a dynamic microphone headset or handset.
2. An XLR-3 type female connector to tie the station to the communications line.

#### Power Requirements

The BP317 requires from + 15 to +35 volts DC, but is operable at reduced performance from + 12 to +14.9 volts. Power is carried to the unit from a system power supply using two different methods: (1) the TW or two wire method, or (2) the three wire or Series 17 method.

#### Optional Features

User-installed options include: carbon microphone headset connection, two-wire line operation, and two-channel line operation.

The BP317 works with both the TW Intercom System and the Series 17 Intercom System. Further information about the TW Intercom System and the Series 17 Intercom System is found in Appendix A.

## 1.2 BP317 SPECIFICATIONS

### Input DC Voltage

18 to 35 volts DC (12 to 17 volts, reduced performance)

### DC Current

Quiescent 20 milliamperes

Operating, 10 dB  
below clipping 25  
ohm headphones 35 milliamperes

### Impedance Across Line

10,000 ohms, minimum

### Environmental

#### Temperature

Operating 0°C to 60°C

Storage -40°C to 85°C

#### Humidity

Operating &  
Storage 5% to 95% non-condensing

### Noise Contribution

One unit -75 dBu

Ten units -67 dBu

### Microphone Preamplifier

Input Impedance 470 ohms/dynamic mic

Source Impedance 200 ohms, nominal

Maximum Input  
Level 150 millivolts

Frequency Response  
(-54 dBu input) 100 hertz to 10 kilohertz  $\pm 3$  dB

Limiter Range 30 dB

Carbon Mic (User Option)  
Excitation Current 10 milliamperes, nominal

### Current Source

Transfer Ratio 3.3 milliamperes / volt  
= 3.3 millisiemens

Output  $\pm 5$  milliamperes into 200 ohms  
=  $\pm 1$  volt peak, nominal

### Headphone Amplifier

Voltage Gain 34 dB

Output Voltage 8 volts peak-to-peak into 25 ohms

Output Power 1/2 watt peak into 25 ohms

Frequency Response  
150 hertz to 8 kilohertz  $\pm 3$  dB

Headphone Impedance Range  
25 to 600 ohms (500 to 2000 with reduced levels)

**NOTE: DO NOT USE HEADPHONES WITH  
IMPEDANCES LESS THAN 25 OHMS.**

Sidetone Adjustment Range  
-20 dB to full on

### Connections

#### Headset Connector

Dynamic Microphone XLR type 4-pin female

#### Line Connections

Input XLR type 3-pin female

### Mechanical

#### Dimensions

5.20 H x 3.00 W x 1.50\* D, inches  
132 H x 76 W x 38 D, millimeters

#### Weight

1.1 pounds, 0.5 kilograms

#### Finish

Clear, anodized aluminum / or textured grey paint

\* Depth with belt clip: 1.87 inches / 47.5 mm

### SPECIFICATION NOTES:

0 dBu = 0.775 volts rms.

0 dBm = 1 milliwatt  
= 0.775 volts rms into 600 ohm load  
(0 dBu, open circuit)

**Note:** All products and specifications subject to  
change without notice.

## SECTION 2: INSTALLATION

Follow the directions: "To Install the BP317", below.

### 2.1 Type Of System, Powering Method And Power Supplier(ies)

The BP317 can be installed in a (1) three wire system, (2) two wire system, or (3) special two wire system.

- (1) In a three wire system ("Series 17" type), the power is separate from the audio and is supplied by a central power supply.
- (2) In a two wire system ("TW" type), the power and audio may share the same wire. The power is supplied centrally by a special "TW" type power supply.
- (3) In a special two wire system (Local Power), each BP317 is locally powered, and the BP317s in the system are interconnected using two wire cable.

In (1) above, the power supply is a regulated supply, 24 volts DC to 32 volts DC. Up to 57 BP317s can be operated from a 2 ampere supply.

In case (2) above, the number of BP317s that can be powered by various "TW" power supplies are as follows: PS8 power supply: 12; PS15: 28; PS31: 42.

In (3) above, a local power supply needs to provide 18 to 24 volts DC at 100 milliamperes peak.

In (1) and (3) above, the two wires carrying the audio require one system termination consisting of a 200 ohm resistor and a 100 microfarad / 50 volt capacitor in series. This combination is connected across the two wires. If the capacitor is polarized, its negative terminal is connected to the system circuit common.

#### To Install the BP317:

1. Determine the type of system in which the BP317 is to be installed. Determine the powering method and power supply(ies).
2. Determine the mounting of the BP317: Portable or Permanent.
3. Read "Choosing Headsets or Handsets" (Section 2.3).
4. Determine the cabling requirements.
5. Create a system block diagram and equipment list (if not already available), then install the system.
6. Verify correct system operation by using the checkout procedure in Section 2.6.
7. Update the system block diagram, equipment list and any other documentation to reflect the "as installed" configuration. If the system block diagram was originally created by RTS Systems, send a copy of the "as installed" system block diagram to RTS Systems. This diagram will be used to update the original documentation, and for future service support.

### 2.2 Type Of Mounting

- (1) One type of mounting for the BP317 is portable, when it is worn on clothing or an equipment belt. The BP317 has a belt clip.
- (2) Another type of mounting for the BP317 is permanent or semi-permanent, either a "desk mount" (sitting on a desk) or fastened to furniture. Avoid placing the BP317 on a metal or grounded metal surface. Contact between the Model BP317 and metal surfaces may cause unwanted noises on the intercom line.

### 2.3 Choosing Headsets

Introduction. Headset choice depends on operating environment, operating requirements, and personal taste.

Operating Environment. Table 2-1 shows typical operating environments and the amount of background noise present.

A very quiet operating environment may require that sound does not leak from the headphones, meaning the headphones should have good "acoustic isolation".

A very noisy/loud environment usually requires headphones that prevent outside sound from leaking in (again, good acoustic isolation), headphones that can produce a loud, clear sound, and noise cancelling microphones, as well.

Understanding speech in a noisy environment requires that the wanted sound from the headphones is as loud or louder than the unwanted sound leaking into the headphones from the noisy environment.

**Loudness.** In general, the loudness of a headphone depends upon its ability to absorb power at a given voltage (impedance) and the efficiency of its design. Practically, the impedance has a larger effect with present day headsets.

**Impedance.** Low impedance headphones are louder, causing the BP317 to draw more current from the power supply. High impedance headphones are not as loud, drawing less current from the power supply. The BP317 design range of impedances for the headphone part of the headset is 25 ohms to 600 ohms. Headphones up to 2000 ohms will function but at reduced levels. In a double muff headset such as the Beyer DT109 sold by RTS Systems, there are 50 ohm headphones connected in parallel resulting in an impedance of 25 ohms.

**Efficiency.** The BP317 produces the loudest sound in low impedance headphones such as the DT109. In this headphone, one milliwatt of electrical power produces 94 dB SPL (Sound Pressure Level).

**Practical Loudness.** The BP317 can produce an SPL of 111 dB in each ear of a DT109 or DT108 headset. Low impedance headsets such as the DT108 and DT109 headsets, cause the BP317 to require more power from the power supply. With DT109 headsets, BP317 peak current is 75 milliamperes. With 600 headphones, BP317 peak current is 30 milliamperes. (Quiescent BP317 current is 20 milliamperes.

#### Headphone Sound Isolation

The ability of headphones to shut out unwanted environmental noise varies from none (0 dB isolation) to about 1/8th as loud (30 dB isolation). The degree of isolation depends both on the design of the headset and the frequency content of the environmental noise. Lightweight, "open" headsets such as the RTS Systems LH267 (single muff) and LH268 (double muff), have almost no (0 dB) isolation. The trade-off is that the LH267/LH268 are very comfortable and can be worn for long periods (8 to 12 hours) without physical discomfort from the earmuffs or headband. The LH267/LH268 are low impedance and can be turned up loud.

Because there is no isolation, care must be taken that the sound signals from the LH267/LH268 are not unintentionally leaked into microphones.

The DT108/DT109 headsets have an isolation ranging from 10 dB to 20 dB.

At least four companies: Telex, Setcom, David Clark, and Carter Engineering sell headsets intended for heavy industrial, aerospace, and military markets. These headsets can provide acoustic isolation figures of 20dB to 40dB. Generally speaking, these headsets are heavier and less comfortable to wear.

#### Isolation, Headset Microphones.

In high noise environments, the headset microphone should be a noise cancelling type.

**Comfort.** In general, the comfort of headsets depends upon their weight, padding and design.

## **2.4. Cabling Requirements**

### **2.4.1 Wire Size**

It may be necessary to overcome power losses by increasing conductor size over long runs (more than one kilometer). Normal conductor size is #22 AWG (16 ohm/1000 ft.). The maximum allowable loop resistance is determined by the power supply voltage, the loop current and the user station minimum operating voltage. The maximum loop resistance equals the difference of the power supply voltage and the minimum operating voltage divided by the maximum loop current (power required by the user station(s)).

**Example:** A BP317 headset station (with 25 ohm headphones) uses 35 milliamperes at 10 dB below clipping. The power supply voltage is 26 volts DC and the user station minimum operating voltage is 18 volts DC (for bridging impedance). Then the maximum allowable loop resistance =  $(26-18) \text{ volts} / .035 \text{ amperes} = 228 \text{ ohms}$ .

This corresponds to an operating distance of 2192 meters (7,125 feet) for a #22 AWG wire pair using a single user station with 25 ohm headphones. Data for these calculations can be found in the specifications in section 1 and in standard electrical wire tables.

### **2.4.2 Grounding**

System circuit ground should not be directly connected to "earth" or "chassis" ground (where directly means a connection an ohmmeter would show). Each user station is bypassed to its own chassis via a 0.1 microfarad capacitor, establishing a radio frequency (RF) ground to reduce radio frequency interference from radio transmitters.

In order to prevent a buildup of voltage across the system capacitance, the power supply has a bleeder resistor to chassis ground (22 kilohms). If the system has no RTS power supply, a bleeder resistor should be supplied at a central point in the system.

The basic benefit of not "earth" grounding the RTS System circuit return is that it permits continued operation during an accidental system ground fault. This accidental grounding can happen as the result of a pinched wire or a scraped cable that has been pulled across a sharp edge. A single accidental ground can be tolerated by the system until the fault can be cleared and (with luck) before a second ground fault can cause noise or overload or bring the system down.

Another benefit of not "earth" grounding the circuit return is that it prevents the introduction of noise through "earth" currents from other equipment. If the RTS circuit ground conducts these currents, it is likely that they will be heard as interfering noise on the communication line.

#### 2.4.3 Signal

The number of conductors required to interconnect user stations is:

<u>Number of Conductors</u>	<u>Number of Channels</u>
2	1
3	2

Two channel "TW" applications, or single channel, three wire applications may use either standard microphone cable (for convenience) or two-twisted-pair cable (considerably less expensive than microphone cable). Standard wire size for the system is #22 gauge wire for interconnection. For permanent installations it is recommended that each channel should have individually shielded twisted pair of at least #22 gauge wire; such as Belden #8723 for 2 channels. This will reduce interference and help maintain a low crosstalk figure between channels. In general, shielded cable will reduce interference. Unshielded cable can often be successfully used.

The audio signal line level is maintained between -10 dBu and 0 dBu (between 0.24 and 0.77 volts rms). These levels are low enough to prevent crosstalk into other equipment (such as TV cameras) yet high enough to reduce external interference to the TW System.

- The 200 ohm line impedance is high enough to allow communication over line lengths of 1.6 kilometers (one mile) and low enough to permit an adequate speech bandwidth with 3.2 kilometers of accumulated cable. In most systems the 200 ohm impedance gives a high fidelity bandwidth with low losses.

When using equipment in rain or conditions of excessive moisture, always protect the equipment with plastic covers and make sure all cable connectors are lifted out of mud, snow or moisture and protected with plastic. Water mud and snow in connectors can cause considerable hum.

#### 2.5 Mechanical

The BP317 user station is either clipped to a user's clothing for portable operation, or mounted on a structure, camera or vehicle.

For permanent installation, temporarily remove the electronics from the case. Drill, deburr and fasten the case as necessary, then reinstall the electronics. See Section 5 for instructions on how to remove the electronics from the case.

An installation drawing for headset user station BP317 is included at the end of this section. These drawings provide mechanical information useful for permanent and other type installations. This information includes overall dimensions, fastener hole locations, console cutout dimensions and weights.

Space allowances for control access, cabling and servicing must be determined on a case by case basis by the installer. It is recommended that space be provided for: cabling service loops, reaching XLR type connector locks, local power option power supplies and headset connectors and cables.

If the headset connector is remotod, allow space between this cable and interfering sources such as video/TV monitors, power supplies and equipment with internal power supplies.

#### 2.6 System Check

Using three beltpacks with three headsets and three persons, verify all persons can intercommunicate throughout the system. Verify that with all microphone switches off and volume controls midway, only a barely audible hiss is heard. The other two persons should sound equally loud and clear to the third person.



## 2.7 Standard User Station Connections

Dynamic Microphone headset connector:

XLR-4-31 type (female 4-pin) receptacle (J102)

Input level

-55 dBu, nominal

Output level to headphone

10 volts peak-to-peak, open circuit.

Pin 1 - Microphone low

Pin 2 - Microphone high

Pin 3 - Headphone low

Pin 4 - Headphone high

Do not common pins 1 and 3.

Line input connector: J101)

XLR-3-31 receptacle (for single-channel)

Pin 1 - Common (low side of line)

Pin 2 - Power

Pin 3 - Channel

XLR-3-31 receptacle (for two-channel)

Pin 1 - Common (low side of line)

Pin 2 - Channel 1 (+DC)

Pin 3 - Channel 2 (Audio)

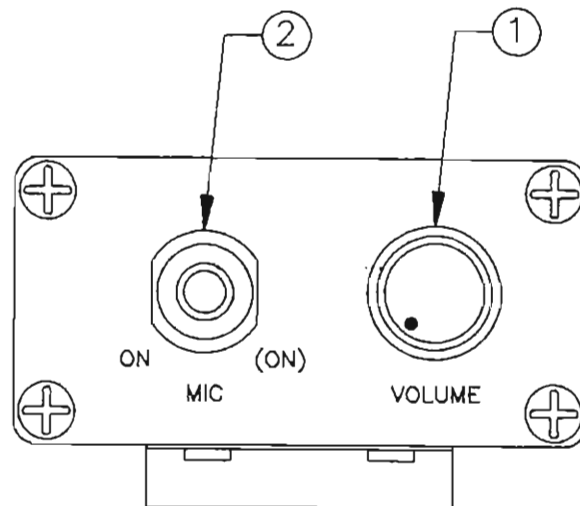
\* For operation on channel 2 only or both channels if so modified. May also be operated on channel 1 by connecting using line cable with just two wires (common and TW channel 1) then tying pins 2 and 3 together at connector.

**Table 2-1**  
**Typical Operating Environments,**  
**Environmental Noise, Sound Pressure Level,**  
**at 10 meters distance**

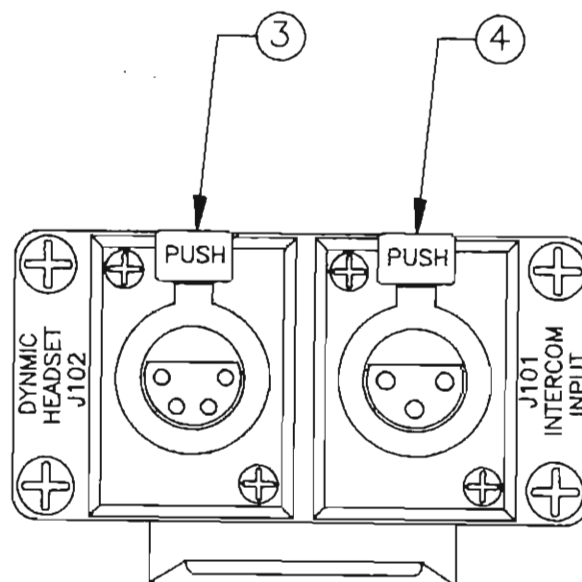
<u>Source</u>	<u>SPL</u>
Aircraft R	120 dB to 160 dB
Orchestra, 75 piece, (Peaks) or Pipe Organ, (Peaks)	140 dB
Rock Concert	110 dB to 140 dB
Piano, Peaks	120 dB
Blaring Radio	110 dB
Centrifugal Ventilating Fan	110 dB
Auto on Highway	100 dB
Vaneaxial Ventilating Fan	90 dB
Voice, Shouting	90 dB
Factory	75 dB
Voice, Conversational	70 dB
Residence	45 dB
Television Studio	25 dB to 35 dB
Voice, Whisper	30 dB

**Table 2-2**  
**Typical Operating Environments,**  
**Sound Pressure Level, at Ear**

<u>Source</u>	<u>SPL</u>
Maximum Allowable Impulse Exposure	140 dB
LH267 + BP317 10 dB below Clipping	114 dB
DT109 + BP317 10 dB below Clipping	111 dB
LH268 + BP317 10 dB below Clipping	110 dB
Setcom Series 5 + BP317 10 dB below Clipping	99 dB
Headphones with 20 dB Acoustic Isolation at 130 dB Rock Concert (Mouth Closed)	110 dB
Headphones with 40 dB Acoustic Isolation at 140 dB Rock Concert (Mouth Closed)	100 dB



**Figure 3-1A**  
**Front Panel, Model BP317 Portable Belt Pack User Station**



**Figure 3-1B**  
**Rear Panel, Model BP317 Portable Belt Pack User Station**

## SECTION 3: OPERATION

### 3.1 Operating Controls And Connections

Table 3-1 below lists the Model BP317 user station controls and connectors. The reference numbers in Table 3-1 correspond to the circled numbers in Figure 3-1.

**Table 3-1**

<u>Ref. No.</u>	<u>Name</u>	<u>Description</u>
<i>Front Panel</i>		
1	<b>VOLUME control</b>	Sets the sound listening level in the user station headset headphones.
2	<b>MIC ON toggle</b>	This three-position toggle switch allows the user to choose from two different MIC-ON positions: latching or momentary. The center toggle position is MIC-OFF. The user station microphone may be turned on or off without affecting the user station listen function. This switch must be on when using a microphone switch on the headset.
<i>Rear Panel</i>		
3	<b>DYNAMIC microphone HEADSET connector</b>	This 4-pin female XLR type connector is for plugging in a dynamic microphone type headset. A wide range of headset types may be used.
4	<b>INTERCOM INPUT ("line") connector</b>	This 3-pin female XLR type connector connects the user station to the TW System or Series 17 line.

### 3.2 Operation

To communicate directly with another station or stations:

- 1) Turn the volume control all the way counterclockwise (to the left) before plugging in the headset.
- 2) Set the MIC ON/OFF toggle switch to one of the "ON" positions, either momentary or latching. If using a headset, this switch must be on before the microphone switch on the headset can be used.
- 3) Set the listening level in the headset using the Volume control.
- 4) Speak into the microphone.

## DIAGRAMS

RTS Systems  
Document  
Number

Size

Title

Page

OD 5435		Outline Drawing, Belt Pack, Model BP317 . . . . .	13
AS6608		Servicing Assembly Diagram, CC-62 P.C. Assy for Model BP317 Portable Belt Pack User Station . . . . .	14
SD5435		Schematic Diagram, Model BP317 Portable Belt Pack User Station, Sheet 1 of 1 . . . . .	15

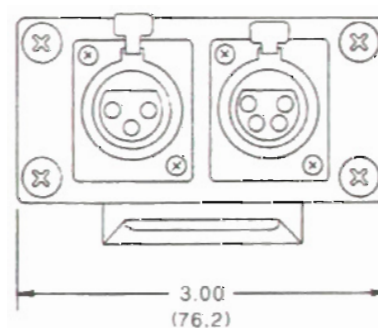
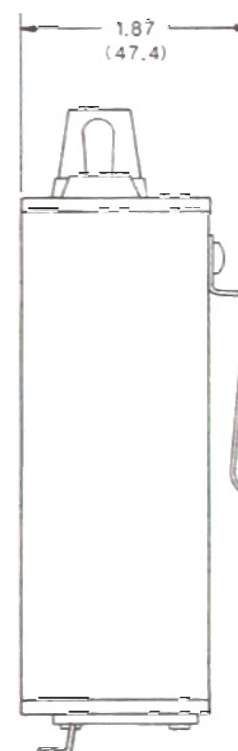
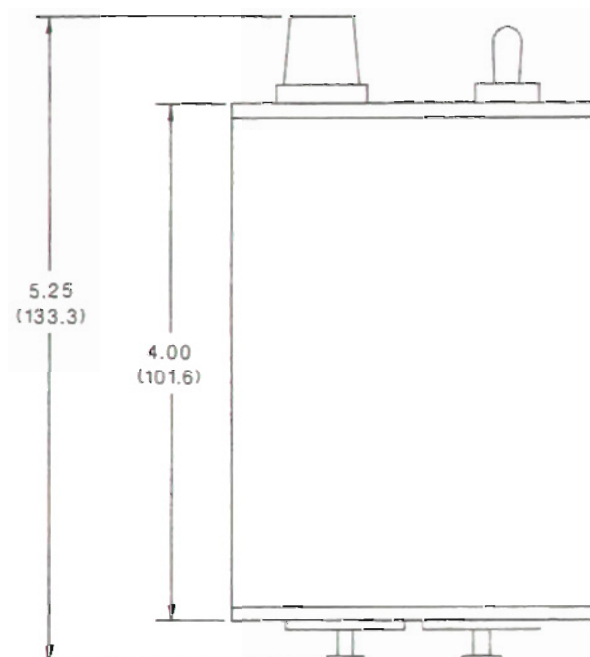
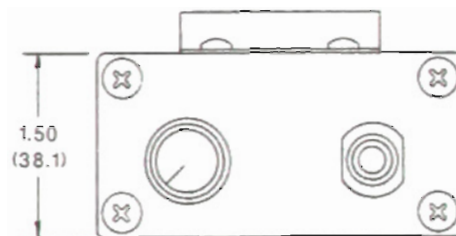
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3

2

1

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	REVISED TO SHOW BELT CLIP	6-22-88	



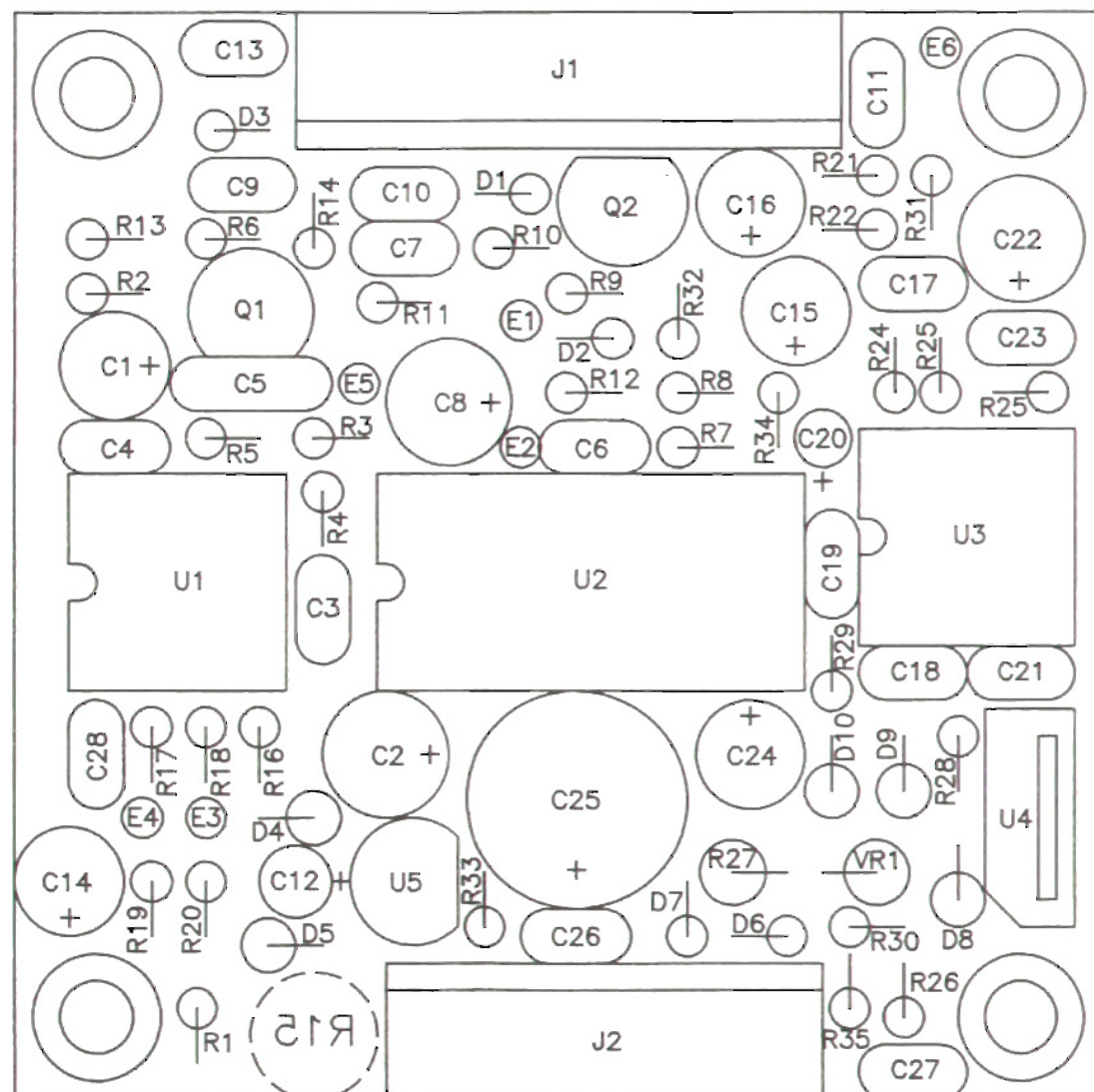
WEIGHT : 1.0 LBS (.45Kg)

ALL DIMENSIONS : INCHES (MM)

UNLESS OTHERWISE SPECIFIED REMOVE ALL BURRS & BREAK SHARP EDGES HOLE TOLERANCES PER ANSI B94.11-1987 R1812 DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES 1/16 .005 .001 90°		CONTRACT NO.		IRIS SYSTEMS BURBANK, CALIFORNIA	
DRAWN R NEILSON 3-23-88		APPROVALS		DATE	
CHECKED GM 6-22-88		ISSUED		SIZE FSCM NO. DWG. NO. REV.	
NEXT ASSY USED ON		DO NOT SCALE DRAWING		C 60572 OD 5435 A	
APPLICATION		SCALE 1/1		SHEET 1 OF 1	

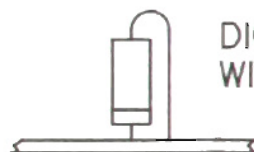
OD 5435  
Outline Drawing,  
Belt Pack, Model BP317

TOP VIEW



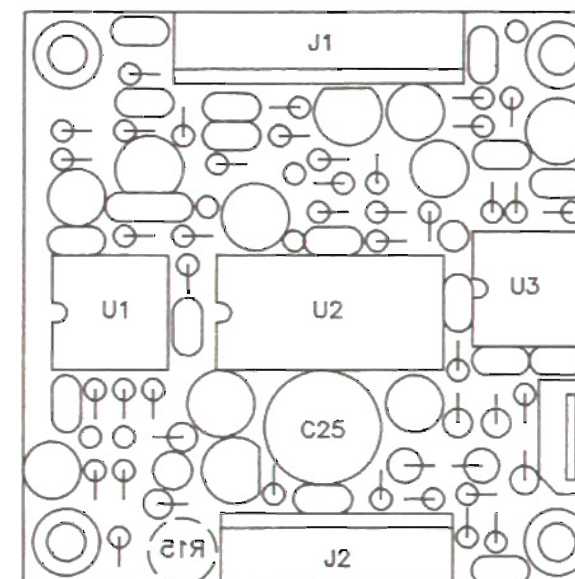
AS6608

Servicing Assembly Diagram,  
CC-62 P.C. Assy for  
Model BP317 Portable  
Belt Pack User Station



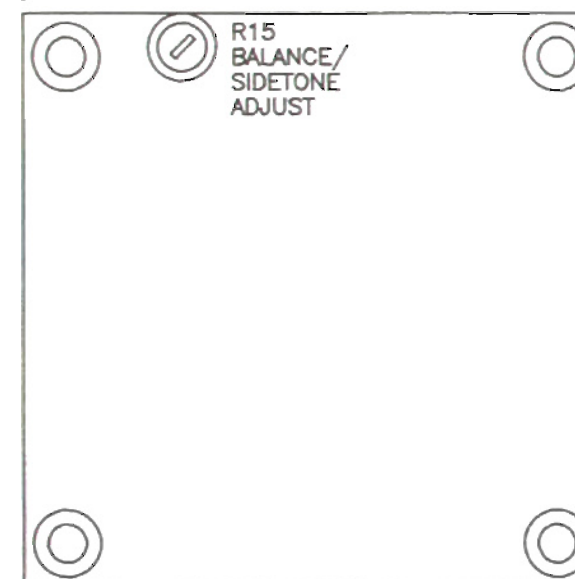
DIODES ARE INSTALLED  
WITH CATHODES DOWN

TOP VIEW



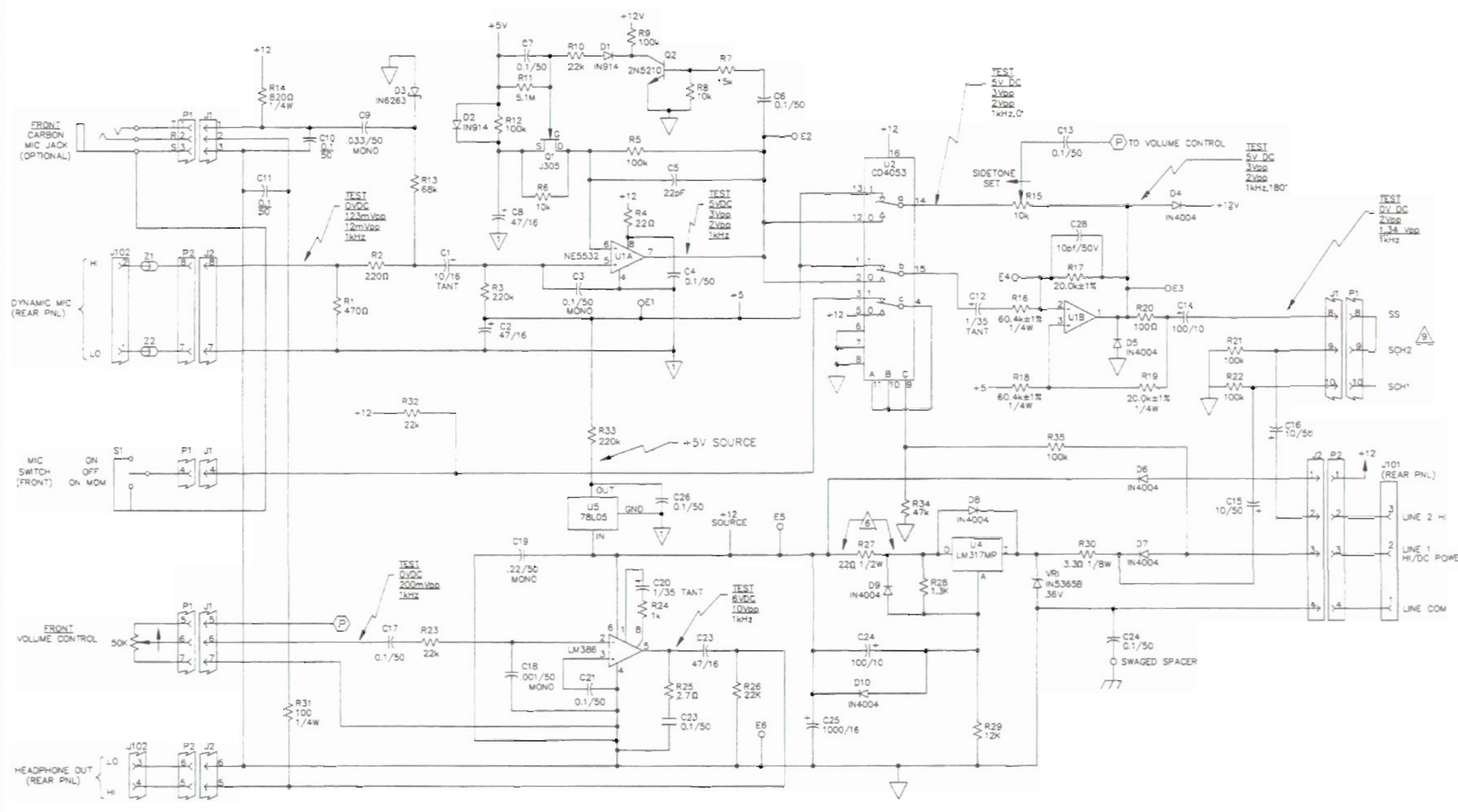
PARTS ON TOP SIDE  
OMITTED FOR CLARITY

SIDE VIEW



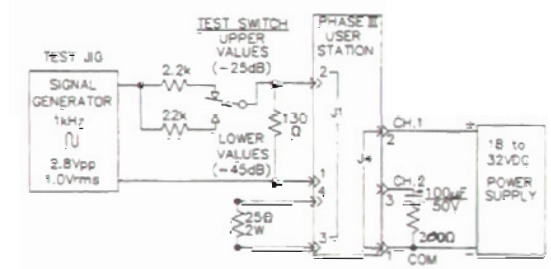
BOTTOM VIEW





**SD 5435**  
Schematic Diagram,  
Model BP317 Portable  
Belt Pack User Station,

- 9 STANDARD UNITS ARE SET TO THREE WIRE OPERATION, CHANNEL 2.
- 8 TEST JIG AND TEST SETUP FOR VOLTAGE READINGS SET CHANNEL SELECT FOR CHANNEL 2.



TEST FREQUENCIES: 100 Hz, 1kHz AND 10kHz ( $\pm 3\text{dB}$ )  
SET LIMITER POT WITH TEST SWITCH IN -25dB POSITION,  
AND FREQUENCY AT 1kHz. VOLUME POT AT MIN.

7. ALL TEST VOLTAGES AND CURRENTS:  $\pm 10\%$
6. QUIESCENT CURRENT: 20 mA / DYNAMIC CURRENT: 20 TO 40 mA ADDITIONAL
5. CURRENT LIMITER: R27, D10, U4. CURRENT LIMIT IS  $V/R_{27}$   
 $V_T = [V_{IN} (OUT-ADJ) + V_{D10}] = 1.25V + 0.65V = 1.9V$ .  $I(22\Omega) = 86\text{mA}$
4. ALL 0.1 MONOLITHIC CERAMIC CAPACITORS RATED AT 50 VOLTS.
3. ALL 0.1 CAPACITORS ARE MONOLITHIC CERAMIC TYPE.
2. ALL CAPACITANCE SHOWN MICROFARADS/VOLTS.
1. ALL RESISTORS ARE 1/8 WATT, CARBON FILM,  $\pm 5\%$
- NOTES: UNLESS OTHERWISE SPECIFIED

