

INSTRUCTION MANUAL

FOR

MODEL 304B

LEVEL-TEK

Robertshaw

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INSTRUCTION MANUAL NUMBER

909GF259A

P-2394

SECTION I - DESCRIPTION

1.1 GENERAL

The Robertshaw Model 304B Level-Tek is a capacitance sensing ON-OFF control instrument used for detecting or controlling product level changes in vessels or containers. Control action is provided by means of relay contact closure.

The Model 304B is designed for mounting directly on a Robertshaw probe assembly installed within the vessel or container. The probe assembly senses the change in product or material level as a function of capacitance change between the probe and the vessel wall.

1.2 MODEL IDENTIFICATION

Identify instrument models in accordance with the description and variations listed in each table. Dashes are used in the model number only in those spaces as indicated in the following example.

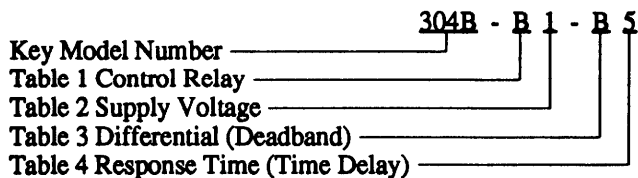


TABLE A KEY MODEL NUMBER

Key Model No.	Description
304B	Capacitance-actuated On-Off Control. CSA Certified, enclosure meets Explosion-proof Class I, Division 1 Groups C & D, Class II, Division 1 Groups E, F & G, and Enclosure 5. Also, meets NEMA 4 requirements. Does not include probe. Intrinsically safe probe input.

Table 1 - Control Relay

Desig.	Description
B	DPDT Dust-tight

Table 2 - Supply Voltage

Desig.	Description
1	26.5 VDC ± 10%
2	120 VAC ± 10%, 50/60 Hz
3	240 VAC ± 10%, 50/60 Hz

Table 3 - Differential (Deadband)

Desig.	Description
B	Adjustable deadband. Differential adjustable from 0.2 to 200 pf.

Table 4 - Response Time (Time Delay)

Desig.	Description
5	Adjustable time delay from 0.5 to 20 seconds.

SECTION II - SPECIFICATIONS

2.1 ENVIRONMENTAL

Operating Temperature Limits-40°F to +160°F
 (-40°C to +71°C)

Storage Temperature Limits-55°F to +225°F
 (-48°C to +107°C)

Vibration Limits2 g's to 100 Hz

Enclosure ClassificationDesigned of NEMA 4 requirements. CSA Certified Explosion-proof, Class I, Div. 1, Groups C & D, Class II, Div. 1, Groups E, F, & G and Dust-tight Enclosure 5. CSA Certified Intrinsically safe probe input circuit for Class I, Div. 1, Groups C & D and Class II, Div. 1, Groups E, F & G when used with Models 702, 728, 729, 736, 738, 739, 740, and 741 probes.

Operating Humidity Range0% to 95% RH

2.2 ELECTRICAL

Supply Voltage26.5 VDC ± 10%, 120 VAC ± 10%,
 240 VAC ± 10%

Supply Power5 VA 3 Watt Max. @ 120/240 VAC
 80ma Max. @ 26.5 VDC

Output RelayElectromechanical Relay
 Form: DPDT plug in
 Rating: 5A at 28 VDC, 120 VDC
 Noninductive 2.2A at 240 VAC,
 Noninductive

2.3 PERFORMANCE

Zero Adjustment (Control Point) Range15 to 225 pf

Sensitivity (Deadband) Adjustable0.2 pf to 200 pf

Response Time (Time Delay) Adjustable0.5 to 20.0 seconds

SECTION III - INSTALLATION

3.1 PROBE MOUNTING

Robertshaw probes are provided in a variety of sizes and types for specific applications involving liquids interface detection where the product is electrically conductive. Bare-type probes can be used on nonconductive materials only.

3.1.1 Horizontal

Horizontally mounted rod-type probes must be installed in a vessel at the desired point of level detection. Horizontally mounted probes provide the closest control (smallest dead-band) in that a small level change at or near the probe will produce a large capacitance change.

On applications involving viscous liquids or materials that have a tendency to "cling" or "build up", it is recommended that the probe be mounted on a slight downward angle to permit draining of the material from the probe. When installing the probe in a nozzle, recess, or open end well, a sheathed probe should be used, with the sheath length equal to the nozzle, recess, or well length.

3.1.2 Vertical

Vertically mounted rod-type probes should be installed in either the top or bottom of the vessel with the mid-point on the probe corresponding to approximately the desired level detection point. Vertically installed probes allow a variation in the level detection point up and down the length of the probe by means of the instrument zero adjustment.

3.2 INSTRUMENT MOUNTING

The Model 304B Level-Tek is designed for mounting directly on the installed probe assembly, (See Figure 1) and may be mounted or orientated in any position.

NOTE

Prior to installing the instrument to the probe, the probe electrical connection pin (included with the instrument) should be installed in the end of the probe so as to make connection with the instrument chassis when installed.

3.3 ELECTRICAL CONNECTIONS

The instrument chassis assembly may be removed from the housing for wiring installation by loosening the three chassis mounting screws (captive screws) and withdrawing chassis straight out. Care should be exercised in reinstalling the chassis to engage the probe connection pin in the chassis receptacle.

All electrical connections should be made in accordance with Figure 2. See Specifications Section II for control relay contact ratings.

SECTION IV - OPERATION

4.1 SELECTING THE OPERATIONAL MODE

The Model 304B Level-Tek is designed with field-changeable operational mode provisions to allow for fail-safe relay contact closure upon loss of electrical power.

Applications for high level detection should utilize the High Level Fail Safe (HLFS) mode which is defined as an increase in capacitance or level to cause the control relay to become de-energized. Loss of electrical power or other failures would cause the control relay to become de-energized indicating a high level or unsafe condition.

Applications for low detection should utilize the Low Level Fail Safe (LLFS) mode which is defined as a decrease in capacitance or level to cause the control relay to become de-energized. Loss of electrical power or other failures would cause the control relay to become de-energized indicating a low level or unsafe condition.

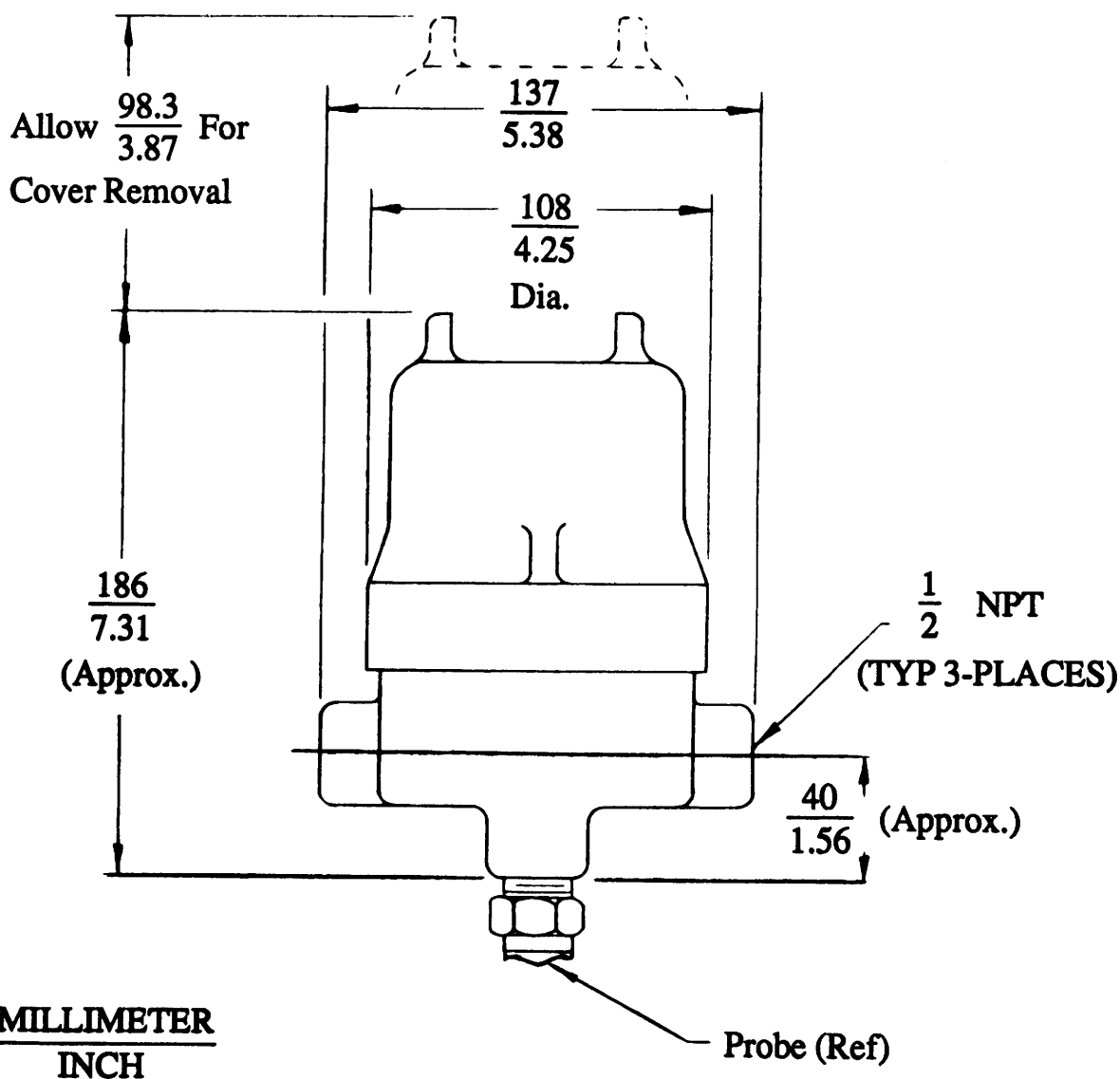
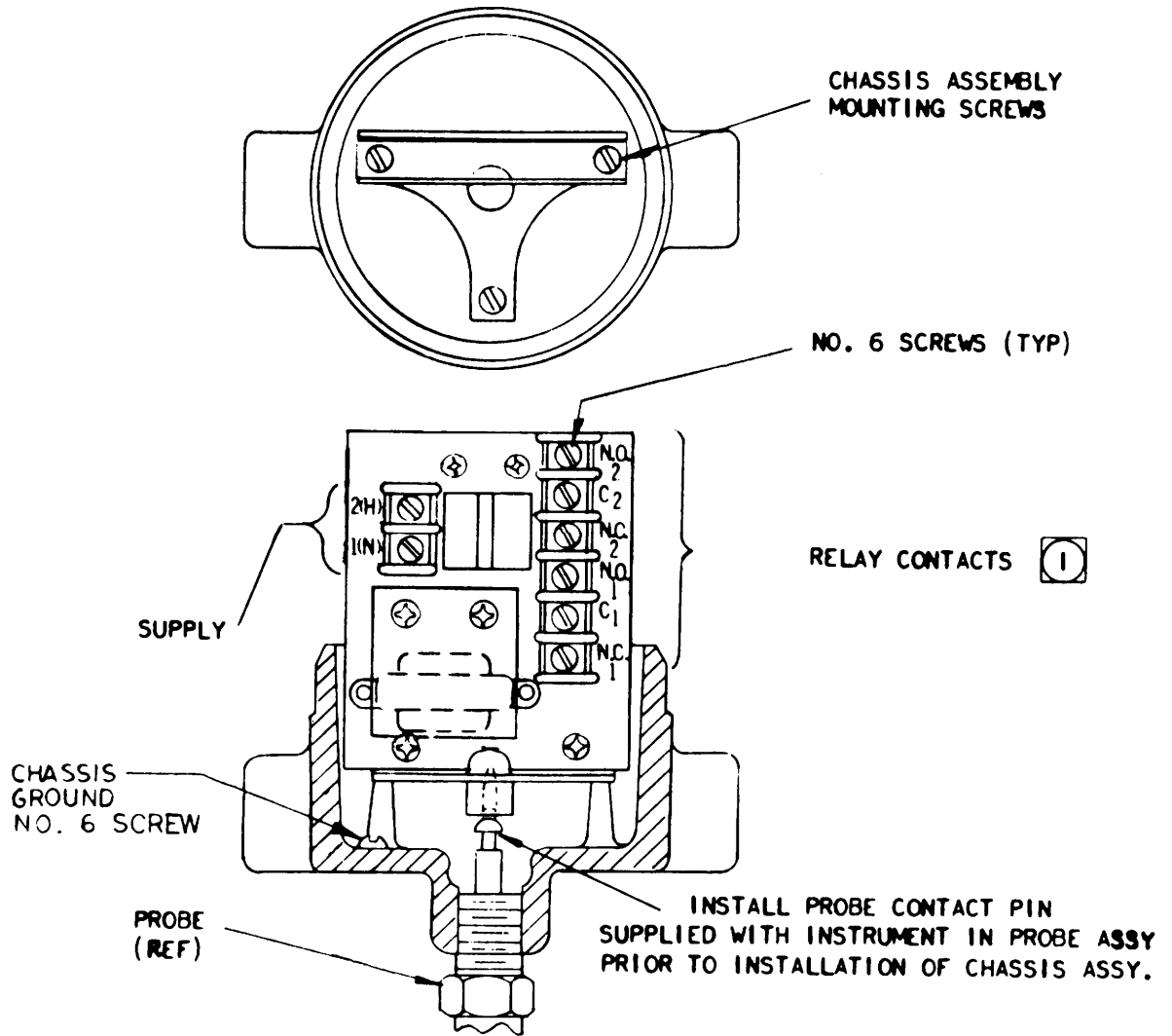


Figure 1. Probe Mounting Dimensions.



ELECTRICAL

Supply Voltage See Rating Plate	
TERMINAL	
1 2	120 VAC 50/60 Hz
1 2	240 VAC 50/60 Hz
1 - 2 +	26.5 VDC

CONNECTIONS

☐ Relay Contacts			
TERMINAL			
N.C. 1	NORMALLY CLOSED	NO. 1	☐
C 1	COMMON	NO. 1	
N.O. 1	NORMALLY OPEN	NO. 1	
N.C. 2	NORMALLY CLOSED	NO. 2	
C. 2	COMMON	NO. 2	
N.O. 2	NORMALLY OPEN	NO. 2	

☐ Control relay contact designations are shown with relay in the de-energized condition. The relay is normally energized and becomes de-energized when level or process reached the control point.

Figure 2. Electrical Connections.

4.2 CHANGING THE OPERATIONAL MODE

The operational mode may be changed by relocating the shorting bar links on the chassis assembly. (See Figure 3). The supply voltage to the instrument should be momentarily disconnected when making this change.

4.3 CALIBRATION ADJUSTMENTS

All the adjustments for calibrating the Model 304B Level-Tek are located on the top of the chassis assembly and consist of the following: (See Figure 3).

NOTE

A Solid State Light (DSI) is included on the Circuit Board Assembly to facilitate initial calibration. The light is "ON" when the Control Relay is energized.

4.3.1 Zero Adjustment (Control Point)

The ZERO adjustment is a multi-turn potentiometer (approximately 20 turns) that varies the control point through a range of approximately 15 to 225 pf of terminal capacitance. Clockwise rotation of the ZERO adjustment increases the control point capacitance.

4.3.2 Differential Adjustment (Deadband)

The DIFF adjustment is a multi-turn potentiometer (approximately 20 turns) that varies the ON-to-OFF differential (or deadband) over a range of approximately 0.2 pf to 200 pf. Clockwise rotation of the DIFF adjustment increases the differential or deadband of the instrument.

4.3.3 Response Time Adjustment (Time Delay)

The RESPONSE TIME adjustment is a multi-turn potentiometer (approximately 20 turns) that varies the instrument response time to a change in capacitance or level. Clockwise rotation of the adjustment potentiometer increases the response time through a range of approximately 0.5 to 20 seconds.

The adjustable response time provides a delay to alarm or de-energize the control relay and no delay to reset the relay. To de-energize the control relay, level in the vessel must exceed the control point setting (either high or low) for a period of time as dictated by the RESPONSE TIME adjustment setting. Each rotation of the RESPONSE TIME adjustment, from the full counterclockwise position, increases the response time approximately 1.0 seconds.

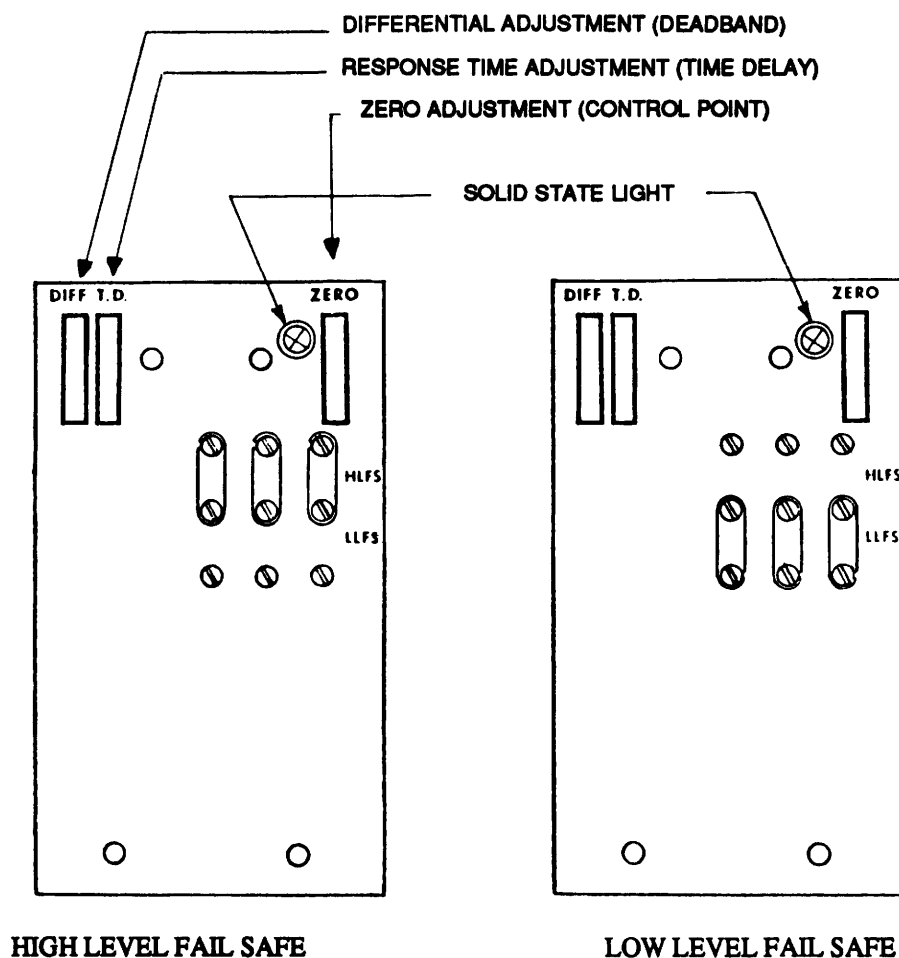


Figure 3. Calibration and Operational Mode Adjustments.

SECTION V - CALIBRATION

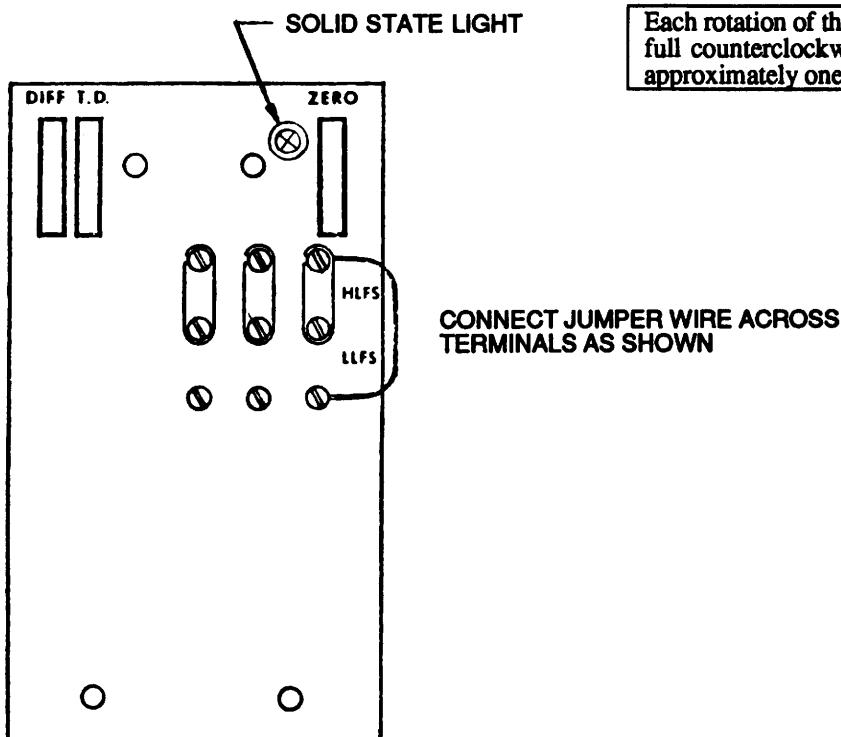
5.1 CALIBRATION PROCEDURE

5.1.1 High Level Fail-Safe

NOTE

To facilitate initial calibration, connect a jumper wire as shown in Figure 4 to disable the response time.

- Allow the material in the vessel to increase to the desired high level control point on the vertically mounted probe.
- Rotate the DIFF adjustment and the ZERO adjustment to the full counterclockwise position (approximately 20 turns).
- Rotate the ZERO adjustment clockwise until the control relay becomes energized. (Solid State Light is ON).
- Slowly rotate the ZERO adjustment counterclockwise until the control relay becomes de-energized. (Solid State Light is OFF).
- If minimum differential (deadband) is desired, calibration is now complete. If an increased differential (deadband) is desired, proceed to Step "f".
- Rotate the DIFF adjustment fully clockwise (approximately 20 turns).
- Allow the level of material in the vessel to decrease to the desired low level control point on the vertically mounted probe.
- Rotate the DIFF adjustment slowly counterclockwise until the control relay becomes energized. (Solid State Light is ON).
- Remove the jumper wire previously connected. The adjustable response time may be set by rotating the adjustment fully counterclockwise (approximately 20 turns) and then clockwise to the desired response time setting.



NOTE

Each rotation of the RESPONSE TIME adjustment from the full counterclockwise position increases the response time approximately one second.

5.1.2 Low Level Fail-Safe

NOTE

To facilitate initial calibration, connect a jumper wire as shown in Figure 4 to disable the response time.

- Allow the level of material in the vessel to increase to the desired high level control point on the vertically mounted probe.
- Rotate the DIFF adjustment and the ZERO adjustment to the full counterclockwise position (approximately 20 turns).
- Rotate the ZERO adjustment clockwise until the control relay becomes de-energized. (Solid State Light is OFF).
- Slowly rotate the ZERO adjustment counterclockwise until the control relay becomes energized. (Solid State Light is ON).
- If minimum differential (deadband) is desired, calibration is now complete. If an increased differential (deadband) is desired, proceed to Step "f".
- Rotate the DIFF adjustment fully clockwise (approximately 20 turns).
- Allow the level of material in the vessel to decrease to the desired low level control point on the vertically mounted probe.
- Rotate the DIFF adjustment slowly counterclockwise until the control relay becomes de-energized. (Solid State Light is OFF).
- Remove the jumper wire previously connected. The adjustable response time may be set by rotating the adjustment fully counterclockwise (approximately 20 turns) and then clockwise to the desired response time setting.

NOTE

Each rotation of the RESPONSE TIME adjustment from the full counterclockwise position increases the response time approximately one second.

Figure 4. Method of Disabling Response Time.

SECTION VI - MAINTENANCE

A Technical Service Maintenance Manual, Number 909 GF 260, can be purchased from:

ROBERTSHAW
2318 Kingston Pike
P.O. Box 400
Knoxville, TN 37901-0400

SECTION VII - SPARE PARTS**MODEL 304B CIRCUIT BOARD ASSEMBLIES**

PART NO.	DESCRIPTION
044 KB 524-80	PCA304B-B1-B5 26.5 VDC \pm 10%, Supply Voltage
044 KB 524-85	PCA 304B-B2-B5 120 VAC \pm 50/60 Hz Supply Voltage
044 KB 524-90	EXTENDED DELIVERY PCA 304B-B3-B5 240 VAC \pm 50/60 Hz Supply Voltage

304B POWERSUPPLY AND RF CONTROL PRINTED CIRCUIT BOARD SUB-ASSEMBLIES

PART NO.	DESCRIPTION
044 KB 527-01	Power Supply PCA 304B-B1-XX, 26.5 VDC
044 KB 527-02	Power Supply PCA 304B-B2-XX, 120 VAC
044 KB 525-10	RF Control PCA 304B-XX-B5
044 KB 527-03	EXTENDED DELIVERY Power Supply PCA 304B-B3-XX, 240 VAC
250 KB 051-02	Relay



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