# ELECTRIC RECEIVER FOR TYPE WM55 RECORDER AND TYPE WM53 INDICATOR
(ASSEMBLY AND COMPONENTS)

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One to four Electric Receivers may be mounted in a Type WM55 Recorder, or Type WM53 Indicator (maximum of two indicating in WM53). Each Receiver comprises the receiving portion of one electrical measuring or calculating circuit, and contains:

1. a wiring board assembly,
2. an amplifier, plugged into the wiring board;
3. a motor driven slidewire disc and cam assembly, which positions a drive arm

The drive arm may be used to operate recording, indicating, integrating, and control devices.

Instruction Section covers Receiver parts and accessories that are standard for most circuits.

- 1) Receiver Case
- 2) Motor driven slidewire disc and cam
- 3) Accessories
  - a) Retransmitting slidewire
  - b) Retransmitting movable core transformer
  - c) Alarm contacts

Cross References, page 2, for listing of Instruction Sections covering circuit variations, Receivers, and the Type WM55 Recorder.

**Bailey Babcock & Wilcox**
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FIGURE 1 - Type WM55 Recorder with Four Electric Receivers
INSTALLATION

An Electric Receiver can be mounted in the Type WM55 Recorder in any of the four component positions A, B, C, or D as shown in Figure 1. In a Type WM55 Indicator, indicating Receivers can be mounted in positions A and B. Integrators or retransmitting auxiliaries in C and D. Each unit is secured to the rear of the Recorder by four captive mounting screws, which are accessible when the amplifier cover is removed. These screws are shown in Figure 3.

An adjustable link transmits the motion of the Receiver drive arm to its corresponding pen yoke. The Receiver requires a different link for each Recorder Case position. Each link is stamped with the letter of the position for which it is intended.

The method for connecting and disconnecting adjustable links is illustrated under ‘Installation of Additional Components’ in Instruction Section E12-3.

To install the Receiver in the Recorder refer to the Instruction Section covering the specific Receiver (see Cross References on page 2).

Wiring

The power supply connections to the Recorder are described in Instruction Section E12-3.

Connections to the Receivers are made in the central wiring channel on the rear of the Recorder (Figure 3).

Note that the polarized Receiver power plugs are inserted in the power socket assembly in the center of the Recorder wiring channel. 7 8 inch and 1 1/8 inch holes are provided at the top and bottom of the wiring channel for external measuring circuit and auxiliary circuit cables, and the Recorder power supply.

Connect measuring circuit leads as shown in the Instruction Section covering the Receiver’s specific circuit application.

If the Receiver is equipped with accessories, such as alarm contacts, retransmitting slide wire, or retransmitting movable core transformer, make external connections to the auxiliary circuit terminals as shown in Figure 2 (This illustration does not apply to Class G Receivers for Factory Mutual Approval. See Cross References on page 2).

FIGURE 2 - Auxiliary Circuit External Connections (Contact Positions at 0% Ch)
Wiring Board

Each circuit class has a separate wiring board assembly. General component locations and connections are shown in Figure 3.

Motor Driven Slidewire Disc and Cam

The slidewire disc and cam are shown removed from the Receiver in Figure 4. The disc and cam shaft is driven by an ac induction type reversing motor with an internal gear reduction housing mounted within the Receiver. Figure 7 shows two styles of reversing motors, either of which may be mounted in any standard receiver for the Type WM55 Recorder.

The slidewire disc is mounted on a disc hub which, in turn, is mounted on the disc and cam shaft. Shaft motion is transmitted to the disc through a spring key. Any backlash in the reduction gearing is eliminated by the backlash spring, which engages with the disc hub to put a small counterclockwise torque on the disc.

The molded slidewire disc is secured to the hub by the disc clamp whose mounting screws are accessible through the larger holes of the pen drive arm.

The desired relation between slidewire motion and recording pen travel is obtained by shaping the pen drive cam during factory.
calibration. The cam is attached to the disc hub and is located in proper relation with the slide wire disc by means of a dowel sleeve. This cam actuates the pen drive arm. The drive arm support is shown in Figure 5. Note that the drive arm support pin must be in the lever assembly notch marked with the letter of the Recorder Case position occupied by the Receiver. To change the pin to a different notch, remove the support screw, reposition the support, and replace the screw.

The slidewire disc is arranged to support either one flat tapered slidewire or one or two round slidewires.

**ADJUSTMENT AND CALIBRATION**

Electric Receivers are furnished precalibrated by the Bailey Meter Company. When the Receivers are factory mounted in Type WM55 Recorders, the pens are calibrated as well. Calibration of the recording pen is necessary when the Receiver's position in the Recorder Case is changed, when a Receiver is added to a previously furnished Recorder, after parts replacement, etc.

**Recording Pen Calibration (Refer to Figure 4)**

1. With Recorder power switch OFF, manually rotate slidewire disc against zero travel limit stop.

2. If pen does not read zero chart, make a fine adjustment of adjustable link between Receiver drive arm and pen yoke (Figure 1), to position the pen exactly at zero. (Linkage adjustments are described under Adjustment and Calibration in Instruction Section E12.3.)

 NOTE For units with thermocouple or signal failure protection, pen is calibrated with 2% offset.

3. Turn Recorder power switch ON and energize transmitter. Make zero adjustment at transmitter, if necessary, to bring pen reading back to zero.

4. Using the calibration data furnished on the Specification Sheets in the front of this Instruction Book, check other points within chart range. Readings should be within the accuracy guaranteed for the instrument.

5. The length of the Receiver drive arm is set at the factory and should not be changed.

**Travel Limit Stops**

These stops, consisting of eccentric screws mounted on the slidewire disc, engage a boss on the Receiver case (Figure 4). They permit travel of the slide wire contact to the extremes of the wound portion of the slidewire. The zero stop is adjusted during factory calibration, and should not be changed.

**Slidewire Contact**

The slidewire contact should engage the slide wire lightly over its entire travel, with a pressure of 30±5 grams. This pressure assures proper electrical contact and minimum slidewire wear. Make certain that slidewire contact pressure is correct.

Never allow the contact to spring back onto the slidewire, for it will nick the slidewire windings, and cause rapid contact wear and premature failure.

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**FIGURE 5 Drive Arm Support**

**FIGURE 6 Rear View of Slidewire E**
MAINTENANCE

Receiver Disassembly

1. Removing Receiver from Recorder Case
   a. Disconnect adjustable link from Receiver drive arm (Figure 1)
   b. On back of Recorder, remove (1) the central wiring channel cover and (2) the wiring cover plate that is directly above the Receiver
   c. Pull Receiver power plug (Figure 3)
   d. Remove numbered designation strip(s) from Receiver terminal block(s), and disconnect leads to the Receiver from the terminal block
   e. Remove terminal block(s) from their support, to free the fanning strip(s), which should be left on the Receiver leads
   f. Remove amplifier cover from rear of Receiver and loosen the four retained Receiver mounting screws (Figure 3)
   g. Carefully withdraw Receiver from the Recorder Case, tipping slightly so that Receiver drive arm will not strike the case

2. Removing Motor from Receiver
   a. Pull Receiver power plug (Figure 3)
   b. Turn slidewire disc until it hits 100% travel limit stop (follower at low point of cam)
   c. Loosen four amplifier mounting screws and carefully unplug amplifier from wiring board
   d. Remove four (or five) motor leads from wiring board (Figure 3)
   e. Loosen three retained screws on motor mounting plate, and remove motor with mounting plate.

3. Removing Slidewire Disc (see Figure 4)
   a. Rotate slidewire disc counterclockwise against the stop
   b. Remove cam(s) by taking out cam mounting screws (dowel sleeve remains attached to the slidewire disc)
   c. Remove set screw from end of disc and cam shaft, and take out spring key (tension exerted on disc hub by backlash spring should turn disc and hub assembly counterclockwise a gainst stop as soon as spring key is removed)
   d. Take out two screws securing disc clamp to hub, and remove disc from disc hub.
   e. Turn disc hub counterclockwise until all backlash spring tension is removed. Slip disc hub off shaft, taking care that backlash spring is not pulled with it. (Backlash spring should be left in its mounting unless absolutely necessary to remove it for inspection or renewal.)
   f. Do not attempt to remove slidewire from molded disc. Always handle this assembly with care, in order not to damage the windings.

Receiver Reassembly

1. Place disc hub on shaft so that one of its rear notches engages backlash spring

2. Wind slidewire lead wires counterclockwise around narrow part of hub for two turns, and place disc on the hub. (When positioning disc, hold slidewire contact away from slidewire, and then carefully let it down on the wire)

3. Place disc clamp in position and insert disc clamp screws. Turn screws only partway into the disc hub, so that disc can still be turned with respect to the hub.

4. Rotate disc and hub one complete turn, from zero to maximum travel limit stop, to check that slidewire leads allow full, free travel of disc.

5. Fasten spring key in position with spring key set screw.

6. While holding the disc motionless, rotate key, disc clamp, and disc hub two turns clockwise, to set proper tension on backlash spring.

7. Tighten disc clamp screws just enough to keep backlash spring from unwinding, yet still allowing disc to be turned with respect to the disc hub.

8. Rotate disc with respect to hub so that position of dowel sleeve (on the disc) with
respect to cam screw holes (on the hub) approx
imately corresponds to positions of the dowel
and cam screw holes on the pen drive arm (look
at etched side of cam)

9 Place pen drive cam in position and in-
stall two cam screws

10 Tighten disc clamp screws (accessible
through holes in the cam)

11 Manually, rotate slidewire disc and
check contact position on slidewire, action of
backlash spring, motion of follower on pen
drive cam, and operation of the travel limit
stops

To replace the motor in the Receiver, and
to remount the Receiver in the Recorder Case,
follow disassembly instructions in reverse
order When positioning motor in the Receiver,
be sure pinion gear engages drive gear prop-
erly Do not force fit The two dowels on in-
side of Receiver case should fit snugly into
dowel holes on motor mounting plate before the
three mounting screws are tightened

After Receiver has been mounted in Recorder
Case, check reading of recording pen when
slidewire is against its minimum stop

Slidewire

Maintenance of slidewire is limited to re-
moval and replacement If slidewire or con-
tact becomes dirty wipe assembly with clean
cloth

Motors

If the action of the motor becomes sticky,
as indicated by a stepping chart record, some
exercising of the motor is recommended This
should always be done after new oil has been
added to the gearbox For Receiver applica-
tions where the measured variable changes
slowly or not at all over long periods of time,
the motor should be exercised through full
range in both directions about once each week
This may be done by turning off the Recorder
or Indicator power supply and turning the slide-
wire by hand

Failure of the motor to respond to a change
in variable may be from causes other than
frozen motor bearings Failure of the amplifier
or some other part of the circuit may be the
reason for lack of response Electrical power
to the motor is indicated on an unbalance of
measuring circuit by voltage across the motor
capacitor (read at the motor test jacks of the
Amplifier Unit by means of an ac voltmeter).
The circuit can be unbalanced in the case of
Class Q resistance thermometer circuits by
shorting or opening the measuring element at
the Receiver terminal board, and in a similar
manner on other applications A large unbalance
of this type will produce a voltage of around 90
to 150 volts between these terminals, and will
indicate that electrical torque is being develop-
ed If the motor does not respond, the bearings
obviously are frozen, and the following pro-
cedure should be followed to restore operation

NOTE The following procedure does not apply
to oil sealed motors If bearings are frozen in
oil sealed motors, the entire motor assembly
must be replaced

If the motor is completely stuck or frozen
and will not break loose, proceed as follows

1 Remove motor assembly from Receiver
case as outlined under "Receiver Disassembly"

2 Remove four screws from motor assem-
bly (Drive pinion need not be removed on
Holtzer-Cabot motors) Allow motor mounting
plate to hang loose on shaft Bodine motors
only Drive out groove pin holding pinion gear to
shaft and remove pinion gear See Figure 7

3 Break seals between gearcase, motor
proper, and bearing plates by placing a knife
blade in external grooves and striking blade
lightly with a mallet

4 Break seal at A, Figure 7, to remove
gearcase (In Bodine motors, then remove in-
ergear from gearcase )

5. Clean all residual oil out of gearcase by
flushing with kerosene

6 Break seals at B and C, Figure 7, to
remove rotor and bearings (If rear bearing
cannot readily be removed from Holtzer-Cabot
motors, loosen setscrew that bears on rotor
endplay adjustment screw, remove rotor end-
play adjustment screw and, if necessary, drive
bearing out of bearing plate with a large diam-
eter wooden dowel )

7 Clean all residual grease from bearings
with naptha Repack bearings with Beacon 325
grease (available from the Bailey Meter Company
in 2 oz containers Part No 199113A1) Use
just enough grease to fill wells in bearings
Bodine motors only: Place 1 to 1-1/2 teaspoons of Lubriplate 907 grease in gear case.

8. Reassemble motor. Do not force any parts into place, they should fit together easily. Tighten four screws evenly to prevent gears from binding.

9. Lubricate motor as described under "Motor Lubrication".

10. Bench test motor, as shown in Figure 8. (In Holtzer-Cabot motors if rotor end play adjustment screw was removed, reset its position by running motor and turning screw in until motor stalls, and then backing screw out one-half turn. Tighten setscrew.) Starting voltages are shown in Figure 8. Also check motor operation in opposite direction by reversing connections to red and white leads. If time permits, operate motor for about 24 hours and check for excessive noise and/or erratic operation.

11. Replace motor in Receiver case as outlined under "Receiver Reassembly".

Motor Lubrication

The special lubricants used in these motors are suitable for ambient temperatures of not more than 120°F.

STANDARD MOTORS - HOLTZER-CABOT MOTORS MUST BE FILLED WITH LUBRICANT PRIOR TO PLACING IN SERVICE. These motors are emptied of lubricant prior to shipment, and must be refilled. Special lubricant and container is included for this purpose ("LUBSAC", Pt. No. 199287-1). To lubricate Holtzer-Cabot motor remove screws from oil fill hole and overflow hole (Figure 7), insert plastic tube on LubSac into filler hole and squeeze lubricant from LubSac. Fill until lubricant runs out of overflow hole.

BODINE MOTORS are shipped full of lubricant sufficient for 3 months operation. To lubricate Bodine motors, remove yellow screw from oil fill hole and insert 20 drops of oil (LUBSAC", Pt. No. 199287-1). Replace screw, exercise motor by hand, and place in service.

NOTE: Lubricate both Bodine and Holtzer-Cabot motors every three months.

Lubrication requirements for each motor assembly are given under "Motor Specifications" on page 10.
MOTOR SPECIFICATIONS

TUBE TYPE AMPLIFIERS

Motor Assembly Pt. No. 666329-1

Holtzer Cabot Motor (4 Leads)
Type - ac induction RPM Output -- 20
Model -- RBC-2405 Torque -- 40 oz. in.
Volts -- 115 Watts 9
Cycles -- 60 Capacitor 0.75 mfd
Control Winding Balance Voltage
20-40 volts ac
Control Winding Unbalance Voltage
(Running) -- 110-130 volts ac
*Power Winding Voltage -- 185-200 volts ac
Winding Resistance at 75F --
Control 800 ohms
Power 800 ohms
\(\Delta\) Lubrication - Gearcase. Sohulf P48 oil
Bearings: Beacon 325 grease

Bodine Motor (4 Leads)
Type - ac induction RPM Output -- 20
Model -- KLI 24RM or 21.7
Volts -- 115 Torque -- 46.5 oz. in.
Cycles -- 60 Watts 9.5
Capacitor -- 0.75 mfd
Control Winding Balance Voltage --
25-45 volts ac
Control Winding Unbalance Voltage --
(Running) -- 150-170 volts ac
*Power Winding Voltage -- 195-210 volts ac
Winding Resistance at 75F --
Control 580 ohms
Power 580 ohms
\(\Delta\) Lubrication - Gearcase Lubriplate
907 grease and, or oil
Bearings: Beacon 325 grease

\(\Delta\) Add lubricant to motor before startup

SOLID STATE AMPLIFIER

Motor Assembly Pt. No. 6618667-1

Bodine Motor (5 Leads)
Type - ac induction RPM Output -- 18
Model KLI 24RM Torque -- 50 oz. in.
Volts -- 115 Watts 9
Cycles -- 60 Capacitor -- 0.6 mfd
Control Winding Unbalance Voltage -- 20v ac
*Power Winding Voltage -- 185-200 volts ac
Lubrication - Gearcase. Sohulf P48 oil
Bearings: Beacon 325 grease

Holtzer-Cabot Motor (5 Leads)
Type - ac induction RPM Output -- 20
Model RBC-2405 Torque -- 50 oz. in.
Volts -- 118 Watts -- 9
Cycles -- 60 Capacitor -- 0.6 mfd
Control Winding Unbalance Voltage -- 20v ac
*Power Winding Voltage -- 185-200 volts ac
\(\Delta\) Lubrication - Gearcase Sohulf P48 oil
Bearings: Beacon 325 grease

* Can be read at motor terminals on wiring board when motor is run with amplifier removed. This arrangement requires that an eleven lead (Pt. No. 666755 1) or twelve lead (Pt. No. 666755 2) cable be connected between the amplifier plug and the socket on the wiring board.
ACCESSORIES

**Alarm Contacts**

When high or low limit alarm contacts are furnished with the Receiver, one or two alarm contact cams are attached to the rims of the slidewire disc. Cams and contacts are shown in Figure 4.

Factory settings are as follows:

- One contact furnished: 50% of full chart.
- Two contacts furnished: 25% and 75% of full chart.

To change factory settings:

1. Turn Recorder power switch OFF.
2. Check calibration of recording pen as outlined under "Adjustment and Calibration".
3. Set rear contact cam:
   - Loosen hex nut on front of slidewire disc until rear cam can be rotated. (Do not loosen two screws holding front cam.)
   - Rotate slidewire disc until recording pen indicates desired alarmpoint. While holding slidewire disc in place, rotate alarm contact cam on disc to contact-operating position and retighten hex nut to lock rear cam in place.
4. If two contacts are furnished, set front alarm contact as follows:
   - Loosen two contact cam clamping screws on front of slidewire disc until front cam can be rotated. (Do not loosen hex nut which clamps rear cam.)

b. Rotate slidewire disc until recording pen indicates desired alarmpoint. While holding slidewire disc in place, rotate front cam on disc to contact-operating position. Retighten two contact cam clamping screws.

**Retransmitting Slidewire**

When the Receiver is equipped with two round slidewires, the slidewire closer to the pen drive arm is the retransmitting slidewire. Adjustment procedures are the same as those given for the measuring slidewire.

**Retransmitting Movable Core Transformer**

Figure 10 shows a Receiver equipped with a retransmitting movable core transformer. The core is positioned by a follower arm that rides on the core cam mounted in front of the pen drive cam.

This arrangement also is used in Class B circuits, where the Receiver measuring element is a movable core transformer rather than a slidewire. However, the transformer functions as a part of the measuring circuit rather than as a retransmitter, and there is no measuring slidewire on the slidewire disc.

An eccentric (see Figure 10) is provided to zero the coil position. The coil can be shifted a total of 1/8 inch along its axis. To make the adjustment, loosen the coil support screws (Allen heads), turn the eccentric until coil out put is at the required value for the pen reading, and retighten the support screws.

The movable core transformer is described in Instruction Sections covering the Class J and Class B Telemeter Receivers (see Cross References).

![Front View of Slidewire Disc](image)

![Receiver with Retransmitting Movable Core Transformer](image)
REPLACEMENT PARTS

Parts Drawing E12 105 (Figure 11) shows parts that are common to Electric Receivers of all circuit classes. Refer to Instruction Sections on specific circuits for additional parts drawings that apply to each class of Receiver (See "Cross References").

Although Figure 11 normally will apply to the Receivers furnished, there may be individual differences in basic Receiver assemblies because of:

a. Design changes made since the printing of this Instruction Section.

b. Special design of the Receiver furnished to make it suitable for a non-standard application.

Therefore, when ordering parts, assure correct replacements by specifying on the order:

1. Complete Class identification and code number of the Receiver for which parts are desired. The code number is shown on a label below the Receiver nameplate.

2. The Parts Drawing on which each part is illustrated. (The Parts Drawing Number is given in the Figure title.)

Parts Drawings for Recorders, including pen assemblies, are shown in Instruction Section E12 3. Type KM55 or WM55 Recorder and KM53 or WM53 Indicator.

FIGURE 11 Parts Drawing E12 105, Electric Receivers in Type WM55 Recorder