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EM34-3 & EM34-3XL

OPERATING INSTRUCTIONS

OCTOBER 1991

NOTE TO EM34-3 USERS

CAUTION

1. If your system is non-rechargeable, use only alkaline batteries. If it is rechargeable, it is safe to use alkaline batteries, however, do not attempt to recharge them.

   One of the most common problems with the instrument is the contamination of the connector and battery contacts. To clean connector contacts on the cables, receiver and transmitter use contact cleaning aerosol (eg. WD40), which is available in most electronic components stores. To clean battery contacts use fine sand paper (#400 or higher) and wipe several times over the contacts. Ensure that the spring action of the battery holders is maintained. Bend holder slightly if necessary. Keep protective cap over connectors when cables not in use.

EM34-3XL

2. The EM34-3 is more susceptible to power line and atmospheric noise at 40m coil separation than at the 10m and 20m separation. For those who frequently survey with the 40m separation in noisy environments, **Geonics** offers an alternative system, the EM34-3XL. With 10 times the signal to noise capability at 40m separation and 4 times greater signal to noise at 10m and 20m separations. The XL system offers improved performance under noisy conditions. The EM34-3XL is available as either a new system or your current EM34-3 can be modified to an XL system. The XL coil has a diameter of approximately 1.0 m and is 1.5 kg heavier than the standard EM34-3 coil.

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EM34-3 & EM34-3XL OPERATING INSTRUCTIONS

The following is the set-up and operating procedure for the EM34-3 Terrain Conductivity Meter.

1. INITIAL SET-UP

At the beginning of the survey select an area free of "cultural interference" and man-made conductors such as buried pipes, buildings, power lines and steel reinforced concrete, etc.

1.1 Having determined the coil separation to be used for the survey, lay the instrument out on the ground accordingly. Connect the reference cable (10, 20 or 40 meters) - one end to the 8-pin connector on the transmitter (Tx) coil and the other end to the **"REFERENCE"** connector on the receiver console. See attached sketch for proper use of thimbles and snaps on the cable.

1.2 Connect the transmitter console to the transmitter coil using the appropriate short cable.

1.3 Put the **"LEVEL"** switch on the transmitter console to the **"NORMAL"** position. (See Section 6).

1.4 Set the receiver and transmitter coils to the selected coil separation with red circles on the coils both facing in the same direction.

1.5 Set transmitter **"SEPARATION"** switch to selected value and turn on transmitter (**"POWER/ON"** switch to **"ON"** position).

1.6 Check to see that Battery Monitor Meter indicator is in the black area of the scale. If not, batteries are low or are not making proper contact to the battery clips. During the transmitter battery check transmitter coil has to be far from metal objects including concrete floor.

1.7 Check condition of receiver battery by rotating receiver **"SEPARATION"** switch to **"BATT"** position with **"POWER/ON"** switch in **"POWER"** (off) position (see Section 5.2).

1.8 Set receiver **"SEPARATION"** switch to selected value.

2. ELECTRONIC NULLING

To remove any offsets in the output (DC) circuitry.

2.1 Leave equipment set up and transmitter on as in Section 1.

2.2 Prior to turning receiver on, insure that meters read zero. If they do not, adjust mechanical meter zero control located on the meters.

2.3 Turn on receiver (**"POWER/ON"** switch to **"ON"** position).

2.4 With receiver coil disconnected depress **"NULL"** push button switch. Both meter needles should go to zero.

2.5 If either needle is not at zero reading, release the lock on the appropriate **"NULL"** control potentiometer. Keeping the **"NULL"** switch depressed adjust the **"NULL"** control to zero the meter.

2.6 Lock the **"NULL"** control.

2.7 Connect the receiver coil to the receiver console **"COIL"** connector via the appropriate short cable.

3. RECEIVER COMPENSATION AND GAIN CHECK

3.1 Maintaining the receiver and transmitter coils in the same plane adjust the coil separation to obtain zero reading (centre of green area) on the **"SEPARATION"** meter. (Insure that red circles on coils face in the same direction). The coil separation should now measure the selected value and allow from 2-4 meters of slack reference cable between the thimbles which attach to the console leather cases.

3.2 With the **"SENSITIVITY RANGE"** switch set to the 300 mS/m position move the receiver coil toward the transmitter until the **"SEPARATION"** meter deflects to full scale mark.

3.3 Measure the distance that the receiver coil has moved. This distance should be 10.4% of intercoil spacing.

4. TAKING A READING

The instrument is now operational, reading apparent terrain conductivity directly in mS/m in either the horizontal or vertical dipole mode.

4.1 At each measurement station the transmitter operator positions himself and remains stationary. The receiver operator should position the receiver coil such that the **"SEPARATION"** meter is in the green area.

4.2 The **"SENSITIVITY RANGE"** switch should be set such that the **"CONDUCTIVITY"** needle is in the upper 70% of the scale. The meter reading should then be recorded in mS/m. (The **"SENSITIVITY RANGE"** switch setting indicates full scale meter reading).

NOTE: In order to minimize reading errors particularly on the most sensitive settings it is necessary to keep the receiver and transmitter consoles separated from their respective coils by 0.7 - 1.0 meter.

5. PERIODIC DAILY CHECKS

5.1 Nulling: To make sure that any possible drift is kept under control, we suggest that you repeat the electronic nulling procedure (steps 2.1 to 2.6) at least once per day during the survey.

5.2 Receiver Battery Check: The receiver battery test is done simply by switching the **"SEPARATION"** switch to **"BATT"** position and power switch to **"POWER"** position. The meters will indicate the condition of the two sets of receiver batteries. If the indicator is below the markings check that the battery contacts are clean and rigid. Replace contacts and/or batteries if required.

With new batteries, meter reading should be on the upper limit of the scale.

For instruments with rechargeable batteries refer to section 5.5.

5.3 EM34-3 Transmitter Batteries: With the Tx coil connected and the **"LEVEL"** switch in the **"HIGH"** position, needle of the Battery Monitor Meter should be in the black area of the scale. Keeping the transmitter batteries warm in cold weather will improve battery lifetime.

5.4 EM34-3XL Transmitter Batteries: With the Tx coil connected and the **"LEVEL"** switch in the **"NORMAL"** position, needle of the Battery Monitor Meter should be in the black area of the scale. This procedure is valid for 10 m, 20 m of High Power or Normal Power operation and 40 m - Normal Power operation. For 40 m High Power operation **"LEVEL"** switch has to be in **"HIGH"** position. Keeping the transmitter batteries warm in cold weather will improve battery lifetime.

5.5 The receiver and transmitter **"CHARGER"** connectors are used for charging of the optional rechargeable set of batteries. Do not try to charge non-rechargeable batteries normally supplied with the instrument.

6. TRANSMITTER OUTPUT POWER

As mentioned earlier, transmitter output power should be kept at the **"NORMAL"** level for increased battery life. Under very noisy conditions (power line or spherics) the transmitter power should be increased by switching the **"LEVEL"** switch to **"HIGH"** position.

7. INSTRUMENT CALIBRATION

Prior to leaving the factory, the instrument is calibrated to read correctly, but due to its high sensitivity, fine adjustment of the instrument in the field may be helpful, particularly in regions of low conductivity and where the conductivity values are known to a good degree of confidence.

NOTE: As a precautionary measure the readings and exact location should be recorded prior to making any adjustments so that if the correction is found to be unsatisfactory the original settings can be recovered without returning the instrument to the factory.

7.1 Having decided what the new reading should be, the instrument **"zero"** can be adjusted by controls inside the receiver console. To gain access to these controls remove the receiver chassis from its metal cover by removing the two side screws and battery lid.

7.2 The **"zero"** adjustment potentiometers are located on printed circuit board No. 5 - one potentiometer for each coil separation.

10 meters - R15
20 meters - R14
40 meters - R13

7.3 The appropriate potentiometer should then be adjusted to give the desired meter reading.

NOTE: Each control should be adjusted only with the corresponding coil separation.

7.4 After adjusting any of the **"zero"** controls check the Electronic Null (Section 2).
Re-Null if necessary and repeat **"zero"** adjustment.

8. MISCELLANEOUS

8.1 The switch **"METER-REV"** is used to reverse the meter deflection. This switch is operated when the meter deflects negatively as may occur when traversing vertical dikes. In such a case push the switch to reverse needle deflection from left to right.

8.2 The switch marked **"HD/VD"** is used to give information to the optional external data logger about orientation of the coils; **"HD"** position for horizontal dipole (coils in the vertical coplanar mode) and **"VD"** position for vertical dipole (coils in the horizontal coplanar mode).

8.3 The **"RECORD"** push button activates recording of data on the digital logger.

8.4 The **"RECORDER"** connector is the output connector for the digital data logger. Refer to DL55 Section in this manual.

Multiple coil separation surveys

8.5 It is possible to use one cable for multiple coil spacing surveys, however, a simple calibration procedure is required. For a 10m and 20m coil separation set up procedure is as follows:

1. Set up the instrument with the 10m cable, take and note a reading.

2. Without moving the coils, carefully remove the 10m cable and replace it with the 20m cable.

3. Take another reading at 10m separation with the 20m cable and note the reading. It will likely be different from the reading with the 10m cable. Do not forget to adjust **"SEPARATION"** on receiver.

4. The difference between the two readings is now your calibration constant to be either added to or subtracted from all your 10m readings. 20m reading are taken normally.

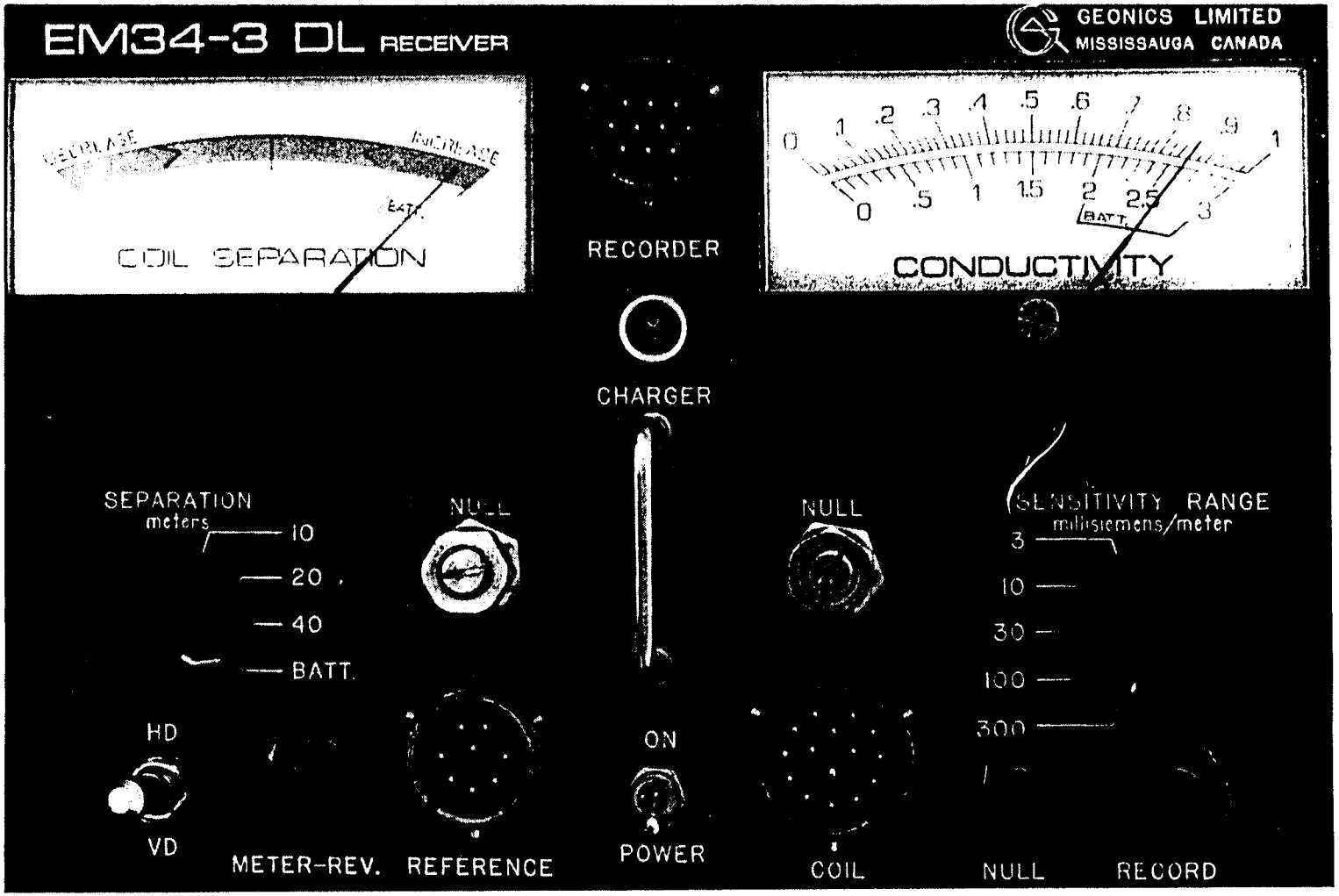
5. The procedure is the same for 20m and 40m separations.

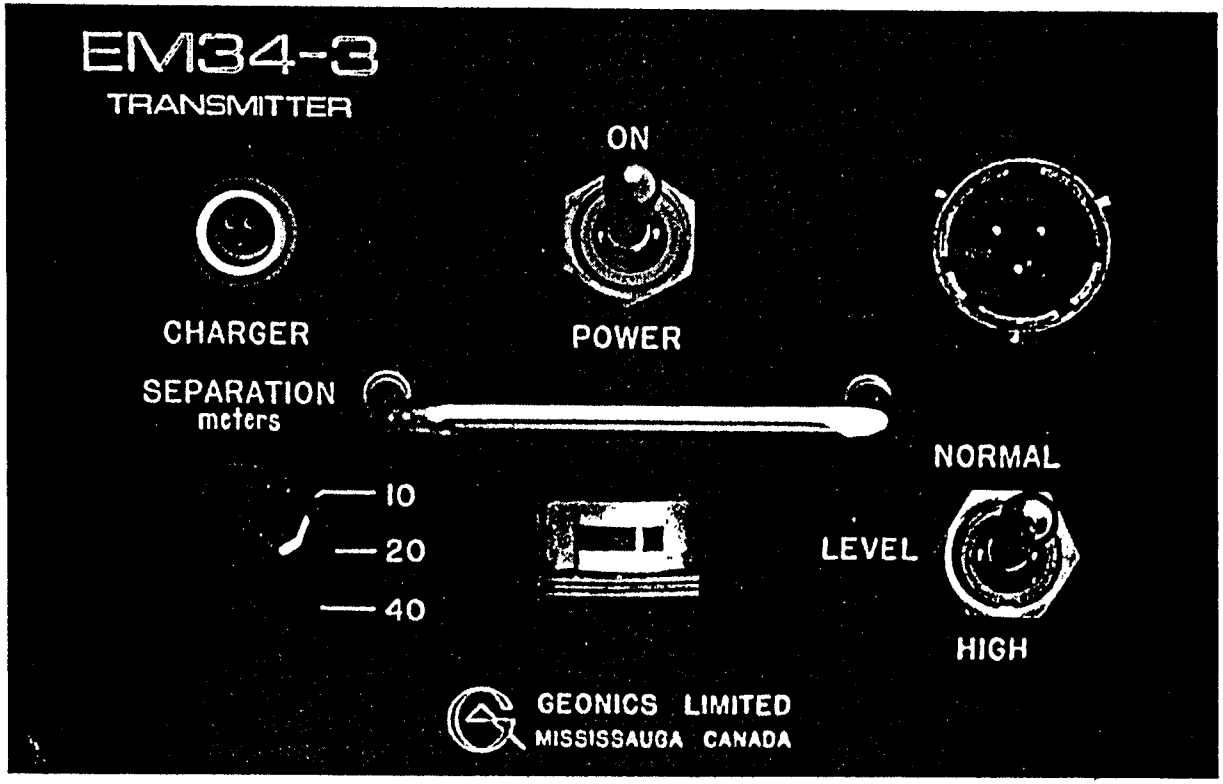
EM34-3 & EM34-3XL INSTRUMENT SPECIFICATIONS

Measured Quantity	Apparent conductivity of the ground, milli Siemens/meter (mS/m)
Range of Conductivity	0-3, 10, 30, 100, 300 mS/meter
Instrument Noise Level	Less than 0.2 mS/meter
Measurement Accuracy	±5% at 20 mS/meter
Measurement Precision	±2% of full scale deflection
Primary Field Source	Self-contained dipole transmitter
Sensor	Self-contained dipole receiver
Intercoil spacing	10 meters, 20 meters or 40 meters
Operating Frequencies	6.4 kHz at 10 meter spacing 1.6 kHz at 20 meter spacing 0.4 kHz at 40 meter spacing
Operating Temperature Range	-40°C to +50°C
Power Supply	Transmitter: 8 disposale "D" cells Life: 20 hrs continuous duty-"NORMAL" Life: 7 hrs continuous duty-"HIGH" Receiver: 8 disposable "C" cells Life: 20 hrs continuous
Recorder Connector	Output connector for interface with digital data logger DL55
Reference Cable	Lightweight 2 wire shielded cable
Optional	Rechargeable Battery supply with dual transmitter/receiver battery charger 115/220 volts

Weights & Dimensions			
Receiver Console	3.1	kg	19.5 x 13.5 x 26 cm
Receiver Coil	5.6	kg	63 cm
Transmitter Console	3.0	kg	15 x 8 x 26 cm
Transmitter Coil (EM34-3)	7.2	kg	63 cm
Transmitter Coil (EM34-3XL)	8.5	kg	100 cm
Shipping Weight & Dimensions (EM34-3)	37.5	kg	75 x 75 x 20 cm
Shipping Weight & Dimensions (EM34-3XL)	51.0	kg	106 x 106 x 20 cm

August 1990


EM34-3 DL RECEIVER
GEONICS LIMITED
MISSISSAUGA CANADA
COIL SEPARATION
BATT.
RECORDER
CONDUCTIVITY
0 1 .2 .3 .4 .5 .6 .7 .8 .9 1
0 .5 1 1.5 2 2.5 3
BATT.
CHARGER
SEPARATION
meters
10
20
40
BATT.
NULL
NULL
SENSITIVITY RANGE
millisiemens/meter
3
10
30
100
300
HD
VD
METER-REV.
REFERENCE
ON
POWER
COIL
NULL
RECORD


EM34-3
TRANSMITTER
ON
CHARGER
POWER
SEPARATION
meters
10
20
40
NORMAL
LEVEL
HIGH
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MISSISSAUGA CANADA