

K101-0914 Armature Comparator

(Can be factory set for 110, 208, or 220 Volts, 1PH, 50 or 60 Hz)

New updated version of the Armature Analyzer
Simpler Operation
Faster Operation
Better Test Results
Wider Application
Only 1 connection (outlet) is necessary.

Shipping Container: 24"W x 48"L x 32"H

Pallet: 36" x 48"

Shipping Weight: 150 lbs.

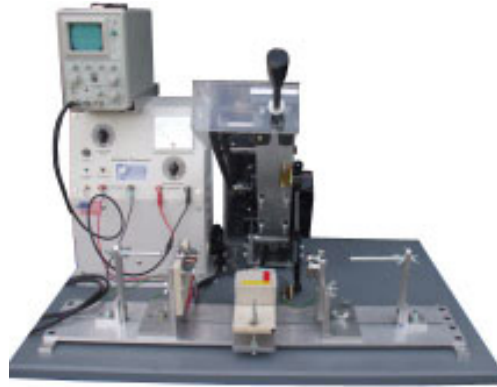
For Parts and Service Contact:

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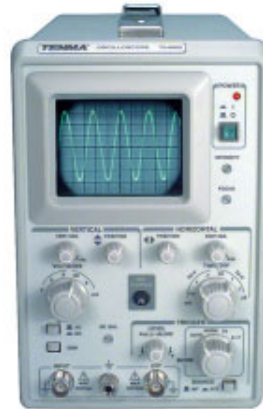
E-mail: vensel7@comcast.net
Website: venselenterprises.com

Check List

A. Basic Armature Analyzer



B. Oscilloscope & Manual:



C. Operation Manual

D. Level



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BASIC THEORY

The Armature Comparator is designed to test armatures by comparing them to an OEM or known good armature. By comparing to the "Known Good Armature", you can check torque as well find shorts, bad connections, opens, and leakage to ground. The Oscilloscope allows you to find out what is wrong with the armature i.e.: shorts, opens, bad connections and leakage to ground. The Analog Meter allows you to set the electronic circuits and to read torque after the machine is set. The Analog Meter will also read the approximate resistance of the leakage to ground in ohms.

There are two types of windings used in automotive armatures, LAP & Wave. The Armature Comparator will locate faults in both types of windings. Lap Windings are wound using parallel windings. The individual coils are connected to the commutator bars which are adjacent or close to each other. The Wave Windings use a series of windings and the individual coils are connected to the commutator bars which are approximately two pole pitches apart. What this means to you is that you will be able to locate problems in an armature before it is put in a unit and read the armature torque.

TORQUE.....Why look for it? Because an armature will loose torque if any or all of the following conditions exist.

- Non-OEM lamination steel
- Small wire size or lower grade copper used in the hairpins
- Laminations being burned to hot, before being rewound
- Not enough laminations
- Improper twist of the hairpins during winding or rewinding, (improper commutation).
- Relocation of the hairpins when the commutator is replaced, (changing commutation).

It has been found that most low strength (Torque) armatures have a combination of the above deficiencies in them.

THEORY OF OPERATION

This Armature Comparator is designed to allow you to compare an OEM or "Known Good Armature" to any other like armature or to test an armature you have nothing to compare to. This is accomplished by inducing a high frequency signal into the laminations and hairpins and picking up the results on brushes off of the commutator. This signal is analyzed and conditioned and the results of Torque and Leakage to Ground are displayed on the Analog Meter and the faults i.e.: opens, bad connections and shorts are displayed on the Oscilloscope. Redesigned for more accuracy than all previous models.

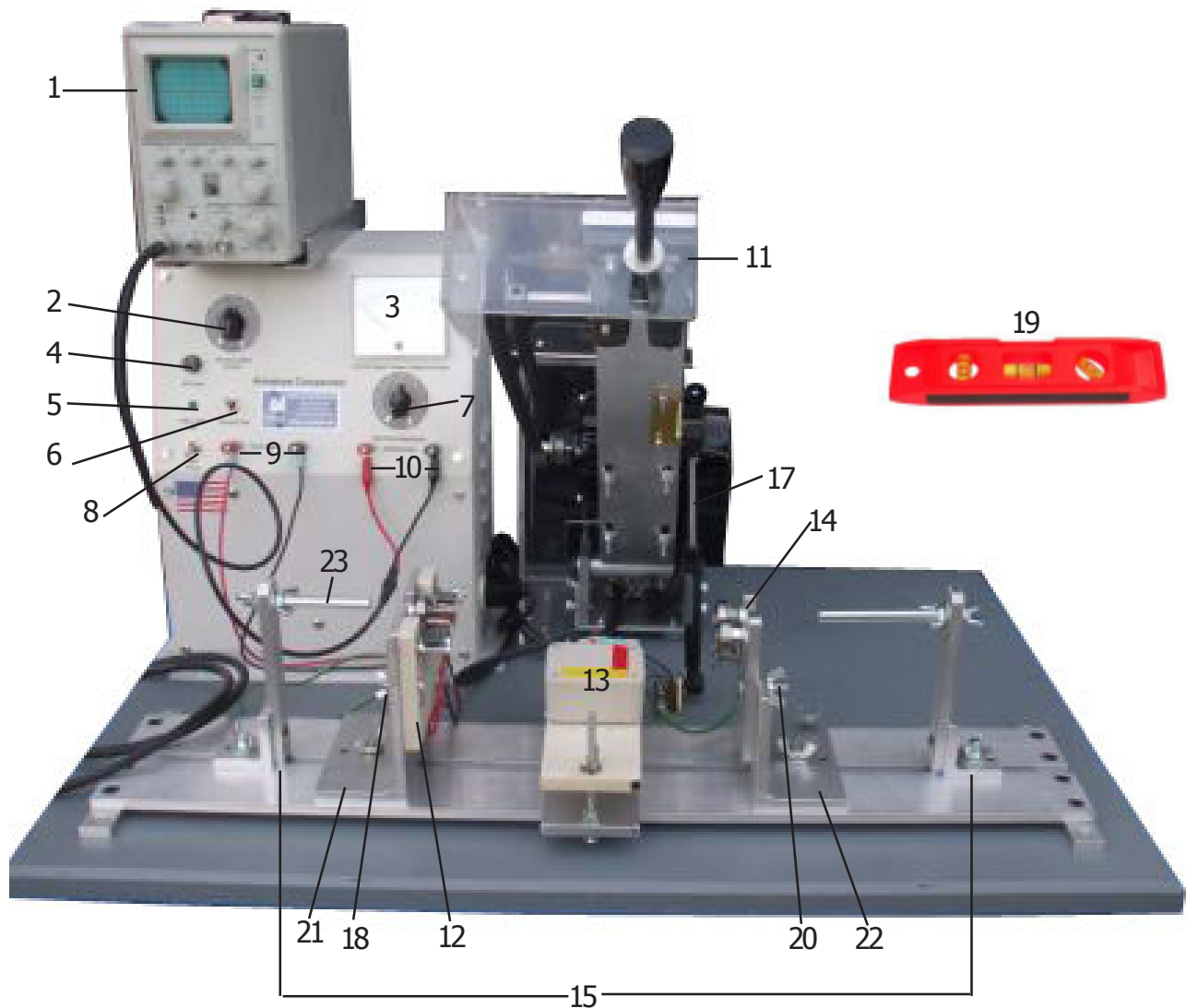
Definition of Terms:

Shorts: Copper to Copper contact, hairpin to hairpin or commutator.

Leakage to Ground: Resistance from Copper to Steel, Hairpins or Commutators to Laminations or Shaft.

Opens: A hairpin if out of the slot in the commutator (no contact)

Bad Connections: Connections between the commutator and hairpin



1. **Oscilloscope**
2. **Armature Speed Control Adjustment**
3. **Analog Meter**
4. **AC Power Fuse**
5. **Pilot Light**
6. **Momentary Leakage to Ground Switch**
7. **Set Adjustment Only for Initial Set Up**
8. **AC Power On/Off Switch**
9. **Brush Assembly Test Lead Jacks**
10. **Oscilloscope Test Leads Jack**
11. **Rotating & RPM Control System**
12. **Brush Plate Assembly-Adj Up/Down & Back & Forth**
13. **Transmitter Block-Height Adjustable & Spring Loaded**
14. **Ground Brush & Bearing Assembly**
15. **Armature Location Adjusters-stops adjustable**
17. **Return Shock**
18. **Adjusting Point-brush holder up & down**
19. **Level**
20. **Height Adjustment-for (14) Ground Brush & Brg Assy**
21. **Mounting Bracket-left hand, moves back & forth**
22. **Mounting Bracket-right hand, moves back & forth**
23. **Holding Shaft For Commutator End-to hold down commutator on brushes**

Special Notes:

Scope Patterns:

If the scope pattern is not consistent in height, sand the commutator while the armature is rotating with 40 grit sand paper. This will insure proper brush contact with the commutator.

If the scope patter snakes or waves, (goes up and down across the screen), this will not affect the test results. This is normally seen in lamination stacks that do not have any slots in them.

Transmitter Block:

The transmitter block location is critical to the accuracy of the analyzer readings. Make sure the transmitter block is located per instructions.

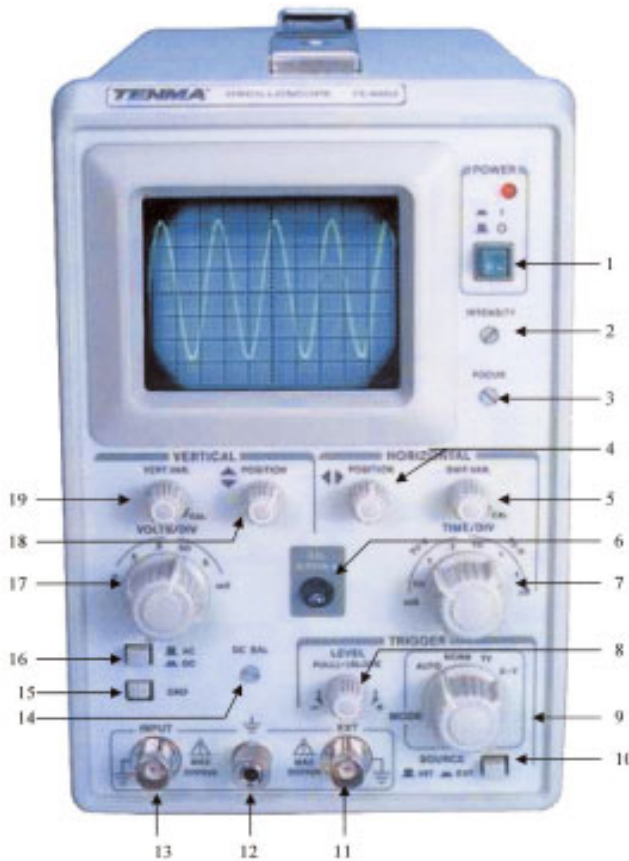
TESTER COMPONENT FUNCTIONS

- Oscilloscope** - Indicates the problems that exist in the armature under test. Only #17 & #7 should need to be used in normal operation.
Shorts -Copper to copper contact with resistance below 0.1 ohm. Not found with a growler.
Opens -An open connections between a hair pin and the commutator
Bad Connections - A bad connection between the hairpins and the commutator with a resistance below 0.56 ohms.
Grounds - Leakage to ground will be indicated on the oscilloscope and analog meter.
- Armature Speed Control** - Adjust the rotating RPM of the armature to compensate for the different lamination and commutator OD's and the number of commutator bars. This also allows you to get a much better pattern on the oscilloscope. For better evaluation of the problems in the armature, make sure you keep a record of these settings per armature in the Set Point Log in this manual.
- Analog Meter-4 Functions** -
 - Allows you to set the machine circuits to a specific armature for continuous testing.
 - Indicates the torque of the armature under test compared to your standard.
 - Leakage to Ground..an indication of excessive leakage to ground from the hair pins or commutator to the laminations or shaft using the Momentary Ground Switch.
 - Display the best possible signal from the armature to the control panel by adjusting the brush holder assembly (12) up and down.

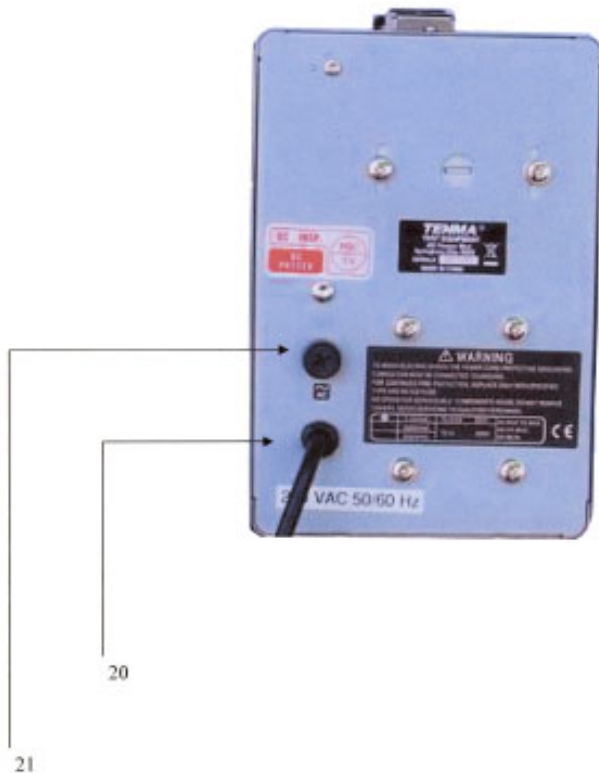
Special Note: For the best results we recommend using the M151-GFA AC Ground Fault Analyzer. This type of test will not be incorporated into this tester due to the high risk for damage from the high voltage used to analyze electronic circuits.
- AC Power Fuse**-provides protection for all circuits in the control box. (5 Amp)
- Pilot Light**-indicates there is AC power to the control panel.
- Momentary Leakage to Ground Switch**-controls the reading on the analog meter. This test can be per formed before the armature is rotated. Press down for the test.
- Set Only Adjustment Potentiometer**-adjusts the analog meter for different armature commutator and lamination sizes. Once you are confident with this setting, log the setting in the Test Setting Log in this manual for future reference. Log like armatures in commutator OD, number of bars/lamination OD and length.
- AC Power Switch**-turns the AC power on to the control panel, motor and oscilloscope.
- Brush Assembly Test Leads Jack, Red & Black**-the pin connections (pin) should be inside the hole in the back of the plug not in the hole in the front of the jacks.
- Oscilloscope Test Leads, Red & Black**-the connections (pin) should be inside the hole in the back of the plug not in the hole in the front of the jacks.
- Rotating & RPM Control System**-this consists of the Motor Speed Control and the Belt Spinning Device. They will give you various speeds for different commutators, number of bars and laminations and commutator OD's. This produces much more accuracy in the scope pattern and the analog meter readings of torque and armature potential fault. The motor ON/OFF Switch is controlled by the location of the Belt Rotating Device. Lowering the Belt Rotating Device will automatically will turn on the motor and released it will automatically turn the motor off. The air shock will raise the assembly after the downward pressure is released by letting go of the handle.
- Brush Plate Assembly**-picks up the output signal from the armature and sends it to the Control Box. Brush Spring Tension must be at or above 10 oz. to insure a consistent scope reading. It is adjustable up & down for calibration and set point.
- Transmitter Block**-induces a signal into the laminations and hair pins that is analyzed by the Control Box and displayed on the Analog Meter & Scope.

Special Note: The block must always be set with a clearance of 0.029" (74mm) between the top of the block and the armature lamination. This is the thickness of a hacksaw blade with the teeth ground off. There are two strips of tape on the Transmitter Block, one yellow and one red. These are to be positioned in the center of the hair pins on the drive end of the armature. Each color represents a different length lamination stack and will help in positioning the armature to get consistent test results.
- Ground Brush Assembly**-completes the ground circuit through the bearings for the leakage to ground test. Adjustable Up & Down.
- Mechanical Armature Location Adjusters**-insure the repetitive armature location over the transmitter block during multiple like armature tests. Adjusts Up & Down and Back & Forth. Special Note: The bar that contacts the armature shaft on the left side (comm end) is machined to fit over the top of the shaft as well as contacting the end of the shaft. Applying holding force against the brush springs.
- Motor Assembly (17) Return Shock**-lifts up the rotating and RPM Control (11).
- Return Shock**-raises (11) RPM Control back to it's at rest position
- Adjustment Point**-adjusts the height of the Brush Plate Assembly (12) using Level (19).
- Level**-used for initial leveling of complete tester and for leveling (12) Brush Plate Assembly using (18) Height Adjustment.
- Height Adjustment**-adjusts the height of (14) Ground Brush Bracket using (19) Level. A set screw is used for Standard Home Position.
- Mounting Bracket LH**-moves left and right and holds (12) Brush Assembly that moves up and down.
- Mounting Bracket RH**-moves left and right and holds (14) Ground Brush Assembly that moves up and down using (20) Wing Nut.
- Holding Shaft**-holds commutator shaft end tight on brushes

OSCILLOSCOPE FUNCTIONS & SETTINGS



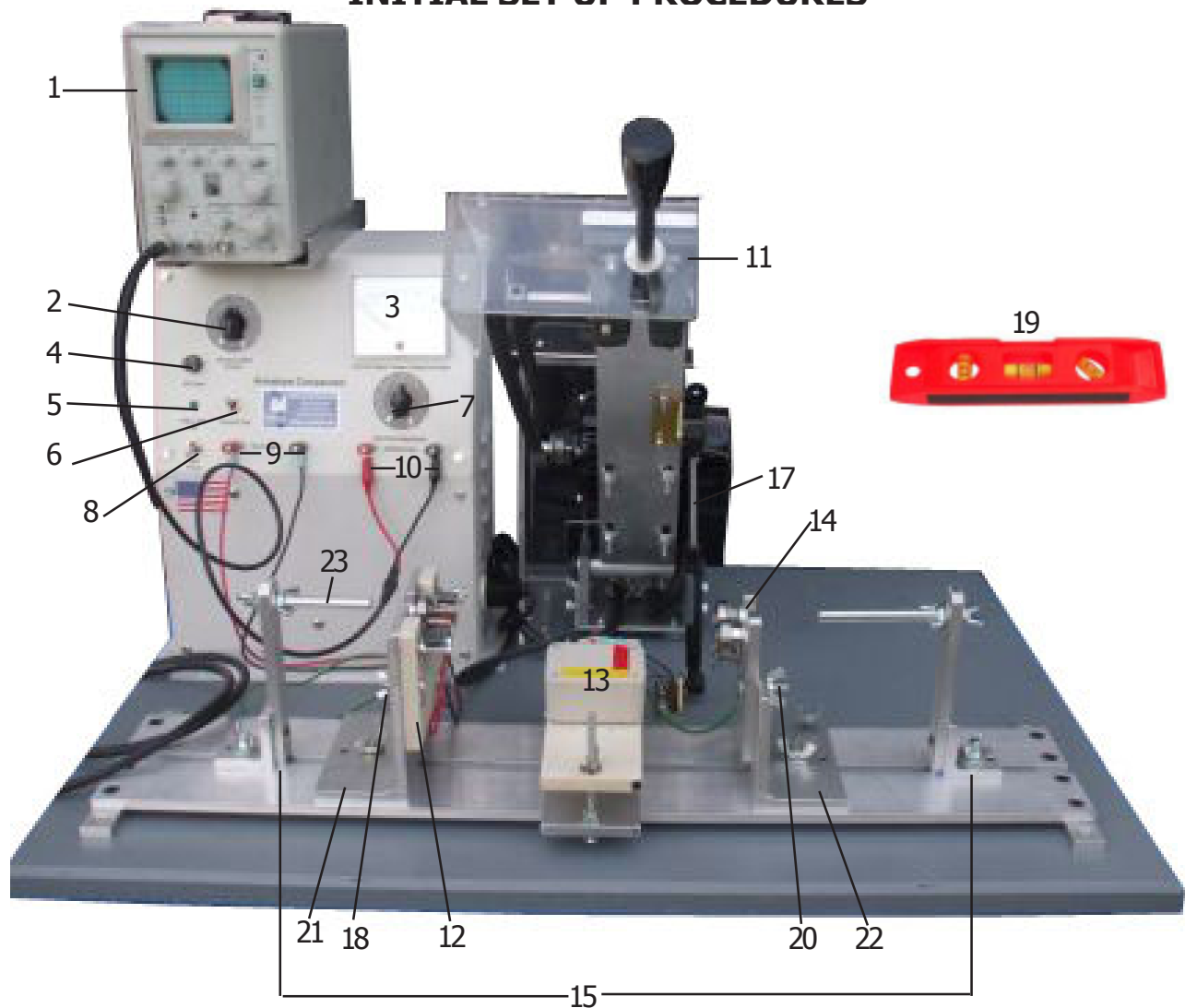
1. **On/Off Switch:** Push up for on and down for off. Turn off when not in use for longer screen life.
2. **Intensity:** Adjusts the brightness of the display. Rotate clockwise for a brighter display. This was factory set and should not need adjusting.
3. **Focus:** Adjust the focus of the pattern. This is factory set and should not need adjusting.
4. **Position:** Moves the pattern left and right.
5. **SWP VAR:** Speed the pattern travels across the screen.
6. **CAL.:** Provides a lead connection point for calibration. Not used in normal operation. Refer to the scope manual for use.
7. **Time/DIV.:** Selects the horizontal sweep rate. Should be set at 1.
8. **Level:** Not used
9. **Trigger:** Controls the trigger mode. Should be set to Automatic.
10. **Source:** Selects the source of the trigger signal. Should be set at INT.
11. **EXT.:** Not used.
12. **GND.:** Not used.
13. **Input:** Test lead connections to control box.
14. **DC Bal.:** Not used.
15. **GND.:** Locates the center of the trace on the screen, then is adjusted to #18.
16. **AC/DC:** Selects the input coupling mode. Keep set at AC.
17. **Volt/DIV.:** Varies the vertical deflection height of the input voltage. Keep set at 50.
18. **Position:** Moves the display up and down.
19. **Vert. Var.:** Sync ionizes frequency with RPM control.
20. **Cord:** AC Power Cord
21. **Fuse:** Protection for the AC power circuits in the scope.



Notes:

1. Adjustments #7, #9 & #17 are factory set. Only make adjustment if necessary. You should only need to adjust the Voltage Set Timer. Refer to the scope manufacturers manual for in depth adjustment information. #5 & #19 should be the only adjustments that need to be made in normal operation.
2. There is an In-line Fuse in the Red Scope Lead for additional protection. (3/4 Amp).

INITIAL SET UP PROCEDURES



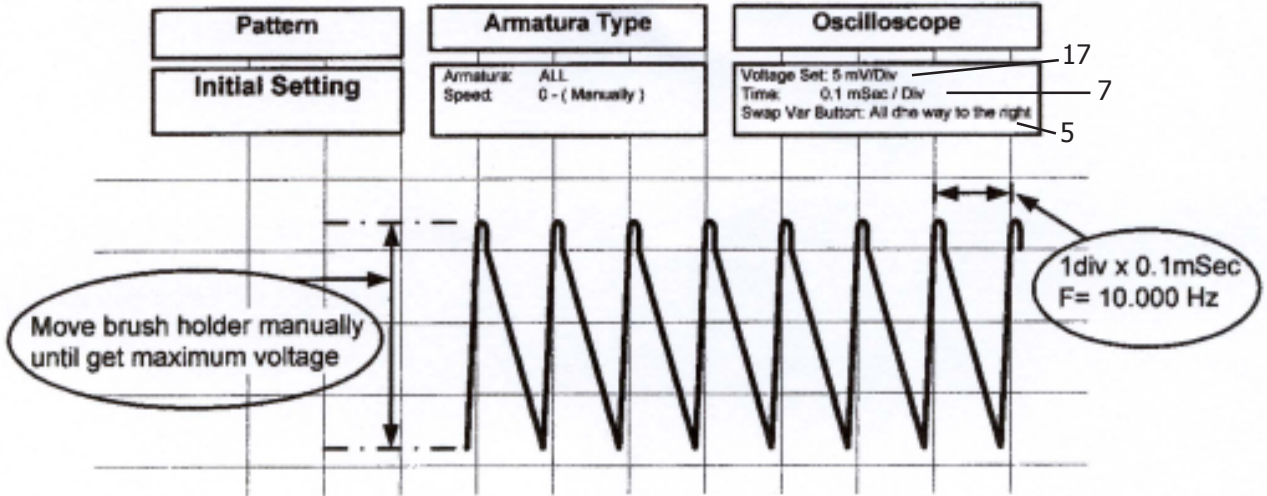
- 1 Read complete instructions first.
- 2 Find a known good armature, an OEM that has never been rewound or had the commutator changed, or an armature that has passed your final load test. **DO NOT USE A NEW IMPORTED ARMATURE.**
- 3 Connect AC power to shop power.
- 4 Mount the scope tray and scope (1) on top of the control Box, plug the scope into the receptacle on the side of the control box, turn and leave on. This allows the scope to come on automatically whenever the tester power switch (8) is activated.
- 5 Lower the transmitter block (13) to clear lamination stock and brush plate assembly (12) to clear contact with the commutator.
- 6 Set the known good armature on the bearings (21/22) with the commutator over the brushes. Insure the drive belt is centered over the middle of the lamination stack and rotating & RPM control system (11). Also align the red or yellow strip on the transmitter block (13). The red strip is for long lamination stacks like 10 & 40 MT and the yellow strip is for small lamination stacks like the PMGR style.
- 7 Level the armature using level (19) and the height adjustment (20) on the drive end. The commutator end bearing block is a fixed height.
- 8 Bring the shafts resting on brackets (15) into light contact with the end of the armature shaft, making sure the shaft holding rod (23) is position where it will hold down the top of the armature during rotation. This shaft should be kept slightly lubricated to prevent excess wear.
- 9 Adjust the height of the transmitter (13) to about the thickness of a hacksaw blade, 0.29 or 74mm from the lamination stack to the top of the transmitters (13) using the wing nut on the front of the transmitter block.
- 10 Tighten the wing nuts on the transmitter block (13), armature location adjusters (15), left side mounting bracket (21) right side mounting bracket (22) and height bearing lock for drive end (20).
- 11 Rotate the armature by hand to insure free movement.
- 12 **THESE ADJUSTMENTS MUST BE REDONE FOR EACH DIFFERENT TYPE OF ARMATURE!**

FINAL SET UP PROCEDURES

There are two ways to set the machine to a specific size armature. In both methods the movable brush plate assembly (12) and the wing nuts (18) are used. The first way is by using the scope (1) and the second way is by using the analog meter (3). Both methods will produce the same test results, so you can use whichever method you prefer. These methods are different from the older style Armature Analyzers and generator much better test results, especially on smaller armatures.

Method #1 using the scope:

Reset these settings on the scope, **making sure to go back to the old setting after doing this set up.** Put scope settings at: (17) volt/DIV to 5mv, (7) time/DIV to 10us, (5) rotate all the way the right CCW.

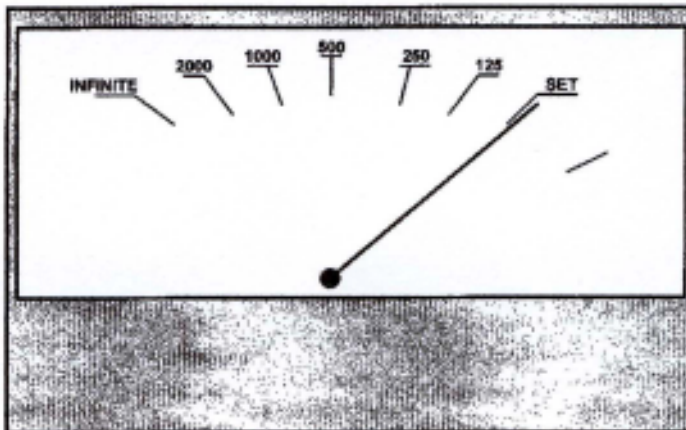


Turn on AC power (8), using a known good armature as stated in #2 of Initial Set Up Procedure, set up the scope. This set up is done without rotating the armature. If you do not get a reading on the scope rotate the armature slightly as the brushes may be set on the mica and not on the commutator bar. Once you have a reading, use the set adjustment pot (7) and raise or lower the brush plate assembly (12) up slowly and observe the height of the scope pattern. When you have the highest possible pattern tighten wing nut (18), locking the brush holder in place and continue with production testing procedure.

Note: By setting the scope with the highest possible test pattern, you will get the strongest possible signal strength and the best test results.

Method #1 using the scope:

Move brush holder manually until get maximum reading



Follow steps 1 through 12 in the Initial Set Up Procedures then using the analog meter (3), which is controlled by the set adjustment pot (7), (the meter can be at any point on the scale to begin with), raise or lower the brush plate assembly (12) adjusting until you get the highest possible reading on the analog meter (3). When you have the highest possible reading tighten the wing nut (18).

Now you are ready for the set point adjustment.

Rotation Armature Testing:

Place the good armature in the preset brackets on the lower RPM control assembly (11) contacting the belt with the lamination stack.

Rotate the armature and use the set pot (7)...continue rotating until the analog meter (3) reads set.

Observe the reading on the scope (1). You are looking for a series of M's across the screen.

Make sure you log all the final setting in the Set Point Log in this manual.

No changes should be made until you go to a different type of armature.

Production Testing:

With the armature rotating, observe the reading on the scope (1) and the set point meter (3) and compare these readings to the charts in this manual for the test evaluation of each armature.

Ground Testing:

There is a ground test on this tester as well. To perform this test, press down on the leakage to ground switch (6) and observe the reading on the analog meter (3). This reading should be 2000 to infinity. We recommend using the M151-GFA Ground Fault Analyzer for the best results in finding leakage to ground.

Manual Rotation for Fault Location:

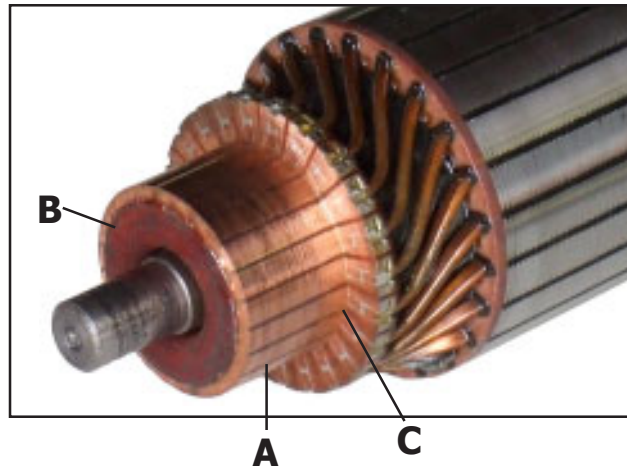
Rotating the armature slowly by hand, bar to bar will find the location of the faults, (these will be under the brushes). You will also be able to find shorts, leakage to ground, bad connections and opens using the same procedure. If the motor is running, there is a separate set of scope pattern identification charts. You will see the first scope pattern as you get closer to the fault. The fault will be under the brushes at the highest spike or peak on the scope pattern.

Remember: After the machine is set for a specific armature, the analog meter (3) indicates two things, Armature Torque and Leakage to Ground using the Momentary Switch (6). The Oscilloscope (1) indicates all faults in the armature. Refer to the Scope Pattern Identification Chart on page 10 for sample patterns that identify Shorts, Opens, Bad Connections & Leakage to Ground.

Here is an easy way to see how the transmitter works in relation to its location to the armature. After the set up is complete, loosen the Transmitter Block and move it left and right with the motor running. Observe the Set Point Meter while the armature is spinning. This will show you how important the correct Transmitter Block Location is.

Testing An Armature Without an OEM or "Known Good Armature":

- 1 Mount the armature as stated on the previous page.
- 2 Turn Set Pot (7) counter clockwise to zero.
- 3 Turn RPM Pot (2) counter clockwise to zero.
- 4 Lower Arm (11) to rotate armature.
- 5 If possible, use Set Pot Log to get the Set Number from an armature with like specifications, commutator bars, OD, Lamination OD, and Lamination length.
- 6 This will get you close enough for a setting or just do Step 7.
- 7 Now slowly rotate Motor RPM Pot (2) clockwise to try to get a good scope pattern on the Oscilloscope (1).
- 8 If you cannot get a good pattern height of approximately one increment, the scope pattern indicates what is wrong with the armature. Refer to the Pattern ID Chart.
- 9 You cannot read torque with this type of armature evaluation.

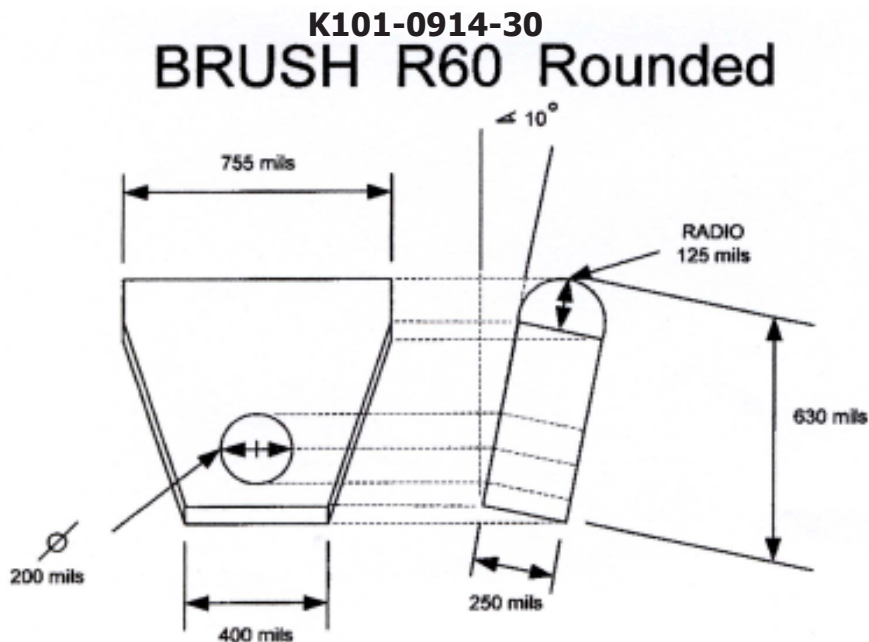


Common Problem Areas:

Many times you will get a bad or odd pattern or a combination of patterns. If you get one of these patterns while you are spinning the armature, sand the flat portion on the commutator (A) with a coarse grit (100 Grit or coarser) sand paper. This should clean up the pattern. The other locations on the commutator that could cause a bad pattern are (B) where the copper bars contact the back and (C) where the riser meets the flat part. These bad patterns can be caused by copper dust or chips made when turning the commutator or from sanding. Use sand paper or a wire brush on these areas should eliminate these scope patterns, if they are not a major fault.

914 Brushes

There is a new designed brush used on this tester. The shape is designed to cover a much wider range of commutator bar widths. The shape of this brush is important in the test readings. You do not want to contact more than one commutator bar at a time with a brush. They need to be reshaped or replaced if they are hitting more than one commutator bar at a time. These are a standard R60, 10MT brush reshaped to perform this contact function.



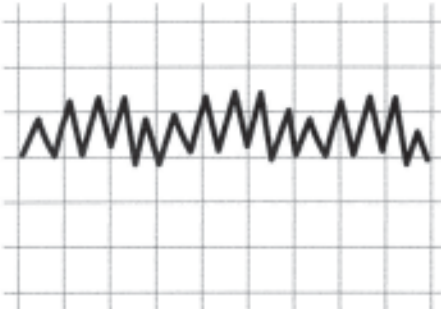
Armature Comparator
Fault Patterns Rotate by Motor

8/03/2007

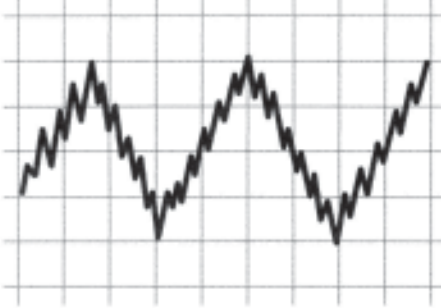
For Fault Identification

H.T. Armature-Lg Brush Holder (18)

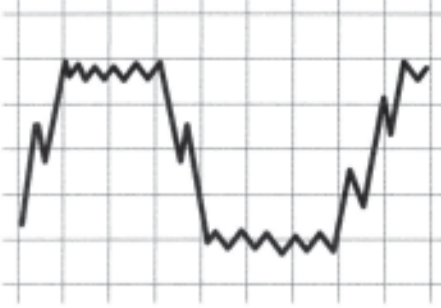
GOOD



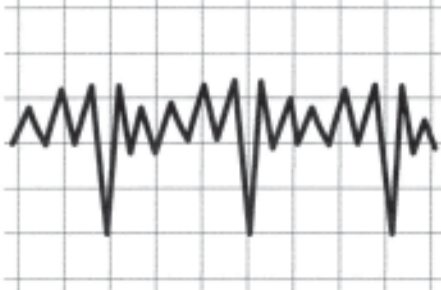
SHORT



OPEN

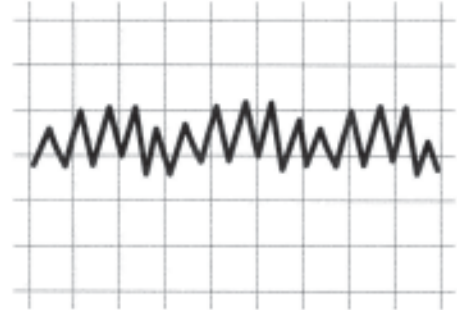


GROUND

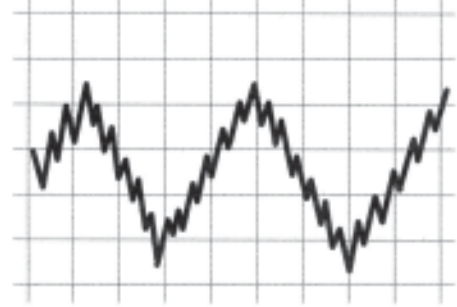


P.G.M. Armature-Sm BH (12)

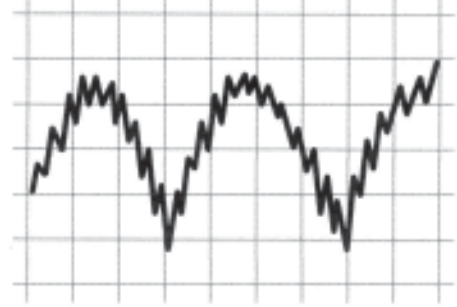
GOOD



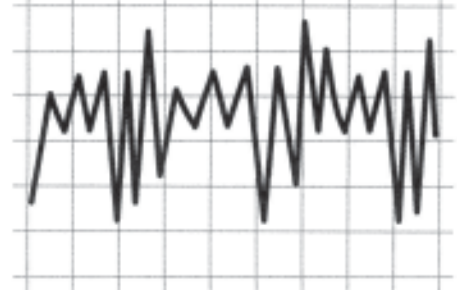
SHORT



OPEN



GROUND



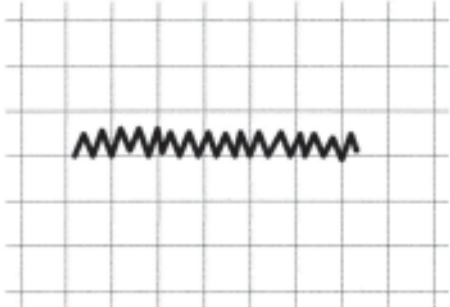
Armature Comparator
Fault Patterns Rotate by Hand

8/3/2007

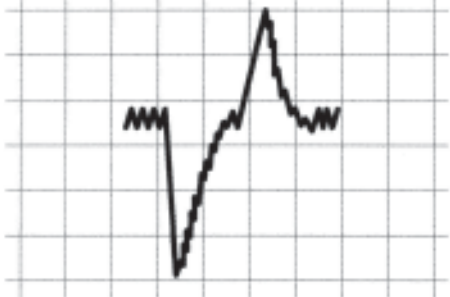
For Fault Identification

H.T. Armature-Lg Brush Holder (18)

GOOD



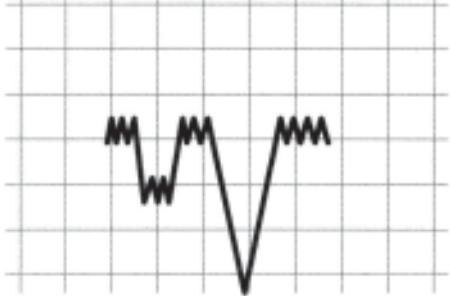
SHORT



OPEN

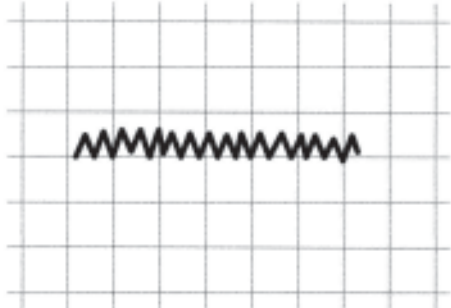


GROUND

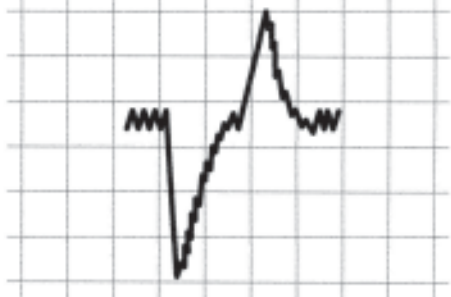


P.G.M. Armature-Sm BH (12)

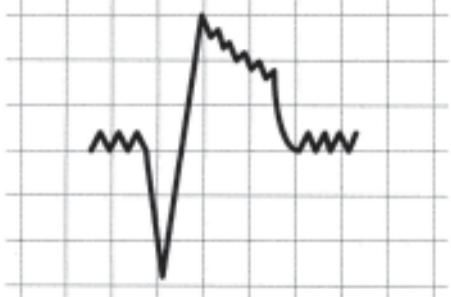
GOOD



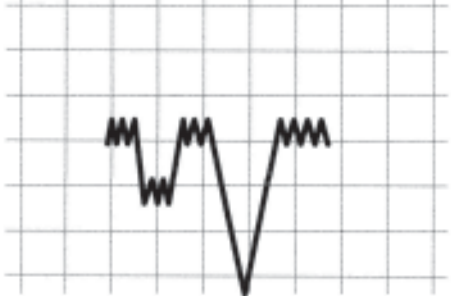
SHORT



OPEN



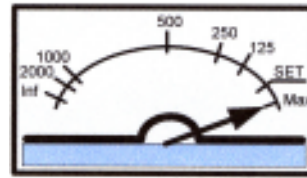
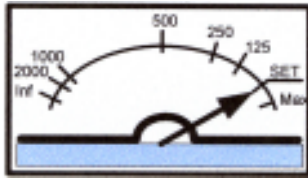
GROUND



METER READINGS AND THEIR MEANINGS

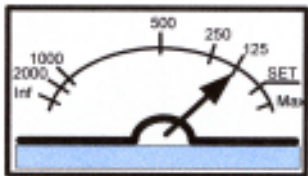
Torque Reading:

Ideal based on your set armature torque, good free run amps:



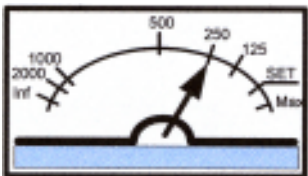
You may see this.
It is slightly stronger than SET.

Less Torque and higher free run amps:



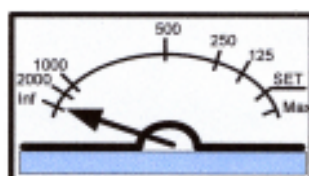
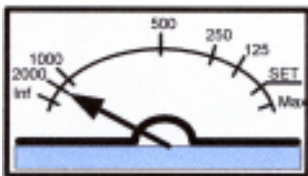
Even less torque and higher free run amps:

Note: We recommend not using over 250 based on your in house specifications.



Ground Reading:

Ground Test Good using Swtich (6), 2000 to Infinity:



Moisture in the armture will read approximately 1000:



PARTS LIST

Ground Brush	K101-0914-001-3
Brush Spring-All-(Tension should be at or above 10oz)	K101-0914-002
Brush Holder-All	K101-0914-003
Belt	K101-0914-004
Analog Meter	K101-0914-005
Test Lead for Oscilloscope	K101-0914-006
Oscilloscope	K101-0914-007
Transmitter Block-(Must be calibrated with control box)	K101-0914-008
Set Potentiometer	K101-0914-009
Brushholder Assembly Complete	K101-0914-010-1
Bearings-All (Each)	K101-0914-012
AC Power Switch	K101-0914-013
Ground Test Switch	K101-0914-014
Transformer	K101-0914-015
Motor Return Gas Shock	K101-0914-016
Motor Switch	K101-0914-017
Motor	K101-0914-018
Motor Speed Control Unit	K101-0914-019
Pillow Block-Each	K101-0914-020
Motor Pulley	K101-0914-021
Belt Drive Pulley	K101-0914-022
PC Board-Supply	K101-0914-023-2
Safety Cover-Motor	K101-0914-025
Safety Cover-Pillow Block	K101-0914-026
PC Board-Control	K101-0914-027
Brush Holder Assembly-Universal	K101-0914-28
Conversion Mounting Kit-update old style 914's including illustrations	K101-0914-29
Contact-Rounded	K101-0914-30

For Replacement Parts Contact Us At:

Vensel Enterprises
3710 Riverside Drive
Crystal Lake, IL 60014
800-662-6099
815-459-0355
FAX: 815-459-0442
Email: vensel7@comcast.net
Website: venselenterprises.com

WARRANTY

The K101-0914 is warranted by KAR Industries against defects in workmanship or materials under normal use for 1 year from the date of purchase. All electrical parts are warranted for 1 year after the date of purchase. The motor is warranted by the motor manufacturer for 1 year. All parts and repair under warranty must be shipped prepaid to Kar Industries in Miami Florida. The warranty does not apply to damage resulting from accidents, shipping, misuse or alternation.

TERMS & POLICIES

All prices are outright, no exchange. All prices are F.O.B. Miami, Florida.
In states or countries where sales tax or dues are applicable, the customer will assume all responsibility for these fees.
Prices are subject to change without notice.

For information and parts contact:



Vensel Enterprises
3710 Riverside Drive
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Website: venselenterprises.com