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Same as 1995

VERITEST 1.4 ←

INSTRUCTION MANUAL

QUALITY CONTROL CONSULTANTS – SMALL PARTS SORTING

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*Effective 15 April 1995

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* Effective 15 April 1995

The Engineered Inspection Services' Veritest is an extremely versatile instrument which offers high-speed nondestructive separation capabilities based on eddy current technology. The machine is easily set up and operated.

APPLICATION

The Veritest is designed to sort or separate magnetic or non-magnetic parts into either two or three groups, dependent on the initial set-up of the inspection. These groups can be differences in metallic grades, hardness, case depth, grain size, or plating thickness as well as variations in processing, geometry, or chemistry. Because the equipment is both frequency and phase selective, the important variable which needs to be inspected can be detected in most cases despite the presence of other inconsequential variables.

When accompanied by suitable mechanical handling systems, the Veritest is an ideal component of an automated inspection line because of its inherent stability and high speed capabilities.

UNIQUE FEATURES

1. Infinitely variable phase and frequency selection is provided to maximize separation capabilities, enabling:
   a. A better separation in phase of signals indicating defects and those which may simply indicate variations within the good parts
   b. An arbitrary choice of depth of frequency penetration so that the proper area of the part can be inspected for the defect being sought
2. The broad frequency range (from 100 Hz to 20 KHz) allows application to both magnetic and non-magnetic materials.
3. The unit is highly sensitive at all frequencies, with a relatively low inherent noise level.

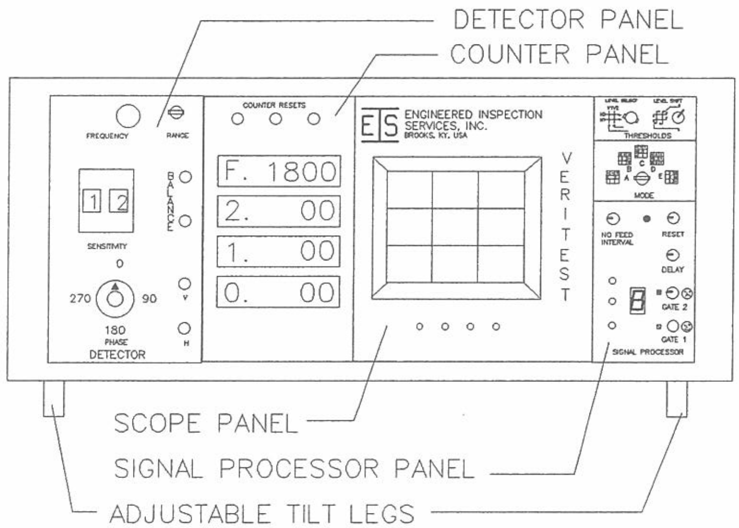
4. A simple polar presentation is provided on the rectangular scope to illustrate the relation between amplitude and phase. The threshold levels on the screen are independently adjustable to allow for tighter sorts which may be required for specific defects. Threshold level adjustments are located in the upper right corner of the S P M section.
5. Due to a judicious selection of integrated circuit components, the Veritest is completely stable, unaffected by normal environmental temperature changes.
6. Five modes of operation are available, with three-way separation available in all modes. Mode A provides separations based on amplitude (vertical) variations in part signals. Modes B, C, and T provide separations based on a combination of both phase (horizontal) and amplitude signal variations. Mode P provides separations based solely on phase differences between signals.
7. Inspection speeds up to 100 pieces per second are theoretically obtainable, with feed-through rates up to 2000 feet per minute. However, typical screw separations of up to 10 per second are more practical due to the problems encountered activating gates at higher speeds.
8. The unit has an automatic switch-off capability for jam-ups of parts feed drives. It is also available with monitors to control the bowl and hopper operation.

EQUIPMENT DESCRIPTION

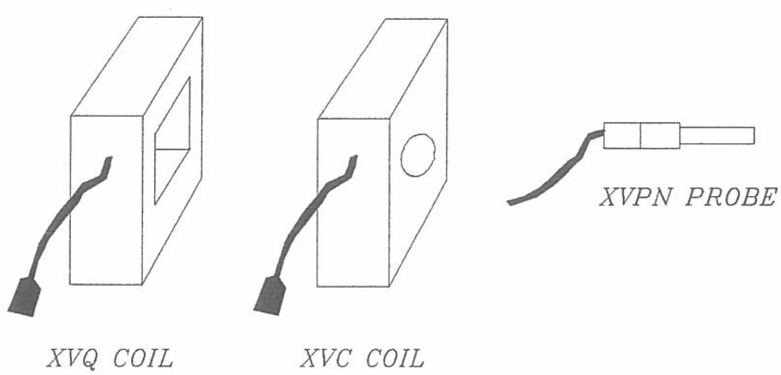
The Veritest is packaged in a conventional 19" rack mount cabinet. The chassis is 7" high so that the total dimensions are 19½" wide, 7½" high, and 17" deep. Total weight is approximately 50 lbs. The Veritest can also be conveniently packaged with other E I S inspection equipment as an auxiliary unit.

Current requirements: 115V/230V, 50-60 Hz cycle, single phase, 2 amps minimum required.

The equipment contains one chassis with four sub units: the detector module, the counter module, the scope module, and the signal processor module. A pair of test coils plugs into the back of the unit via an extension cable. Operation of an E I S parts diverter or other automated sorting device is accomplished by 48V DC pulses which drive control solenoids.



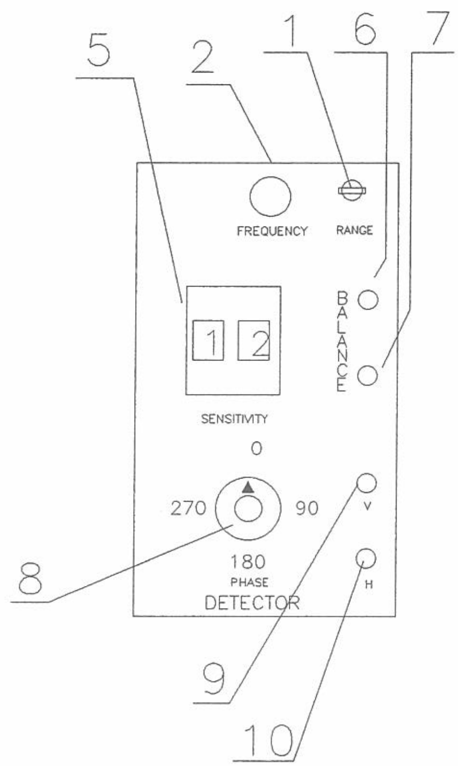
SENSORS: Coils are available in sizes from ¼" through 6" i.d. in roughly ¼" increments (circular or rectangular configurations); special sizes can be manufactured. Probes of any specified o.d. are also available.



CONTROLS AND CONNECTORS FOR TESTING PURPOSES

A. Front Panel

1. Detector Module



ALL NUMBERS IN MANUAL IN PARENTHESES ( ) REFER TO NUMBERS IN VERITEST ILLUSTRATIONS THROUGHOUT MANUAL

a. Frequency controls: A fine control (2) plus a range switch or multiplier (1) provide maximum control for frequency selection.

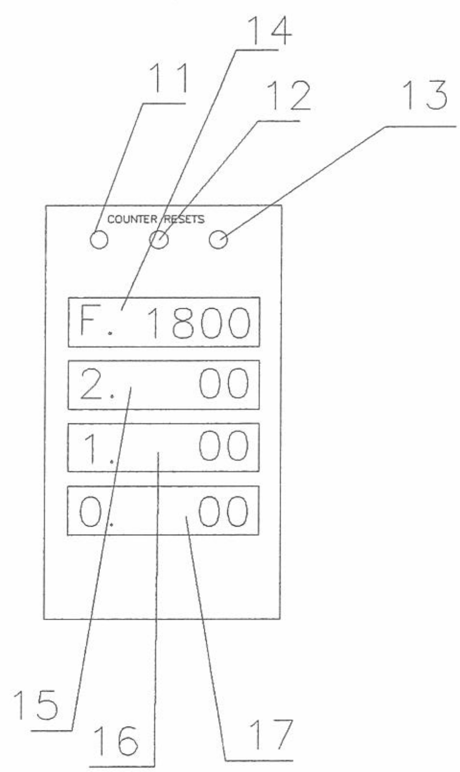
b. Sensitivity: 2 ten position thumbwheel switches (5) allow adjustment of system gain in one and ten db steps from 0 to 99 db to obtain the proper sensitivity for the best possible sort.

c. Balance controls: These controls (6 and 7) adjust balance in the test coils in order for the inspection to be reliable. The spot on the screen serves as a visual indicator. Perfect balance puts the spot to the center of the screen.

d. Phase: This dial (8) is calibrated in degrees. It varies the deflection angle of the part signal on the screen continuously over a 360° range.

e. Position controls: V (9) and H (10) position controls place the spot in the center of the screen at 0 sensitivity. This gives the operator a visual aid to assist in the initial set-up of the unit.

2. Counter Module

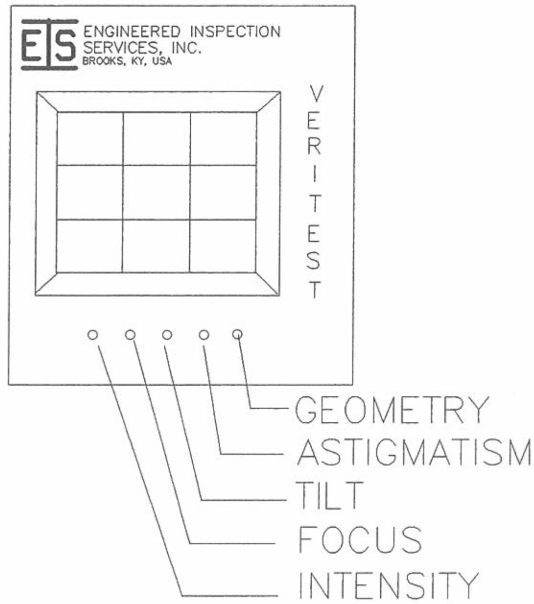


a. Frequency display: This number (14) shows the test frequency in Hz being used for inspection.

b. Parts counters: These numbers (15-17) count tested rejects or good parts.

c. Counter resets: These buttons (11-13) reset the counts to zero.

3. Scope Module



No external controls

The controls listed below are internal controls accessible from this panel. They are listed from left to right if one is facing the unit. These controls are infrequently adjusted and should only be done so by qualified personnel. **There are possibly lethal voltages inside the unit!**

Intensity:	Controls the brightness of the spot on the screen.
Focus:	Focuses the spot on the screen.
Tilt:	Some units have a fifth hole in the front for tilt control (see illustration)
Astigmatism:	Controls the roundness of the spot on the screen.
Geometry:	Controls the vertical linearity of the sweep.

4. Signal Processor Module

a. Gate duration levels 1 and 2 (28-29): These knobs control the amount of time the gates stay open after a part leaves the test coil. The duration should be set for a sufficient time to allow one part to clear the diverter gate without allowing the following part to pass through before the gate closes.

b. Delay (26): This knob controls the amount of time before a gate is opened after a part leaves the coil.

c. No feed interval (23): This knob controls the amount of time before the feed drive system is turned off when no parts are passing through the test coil.

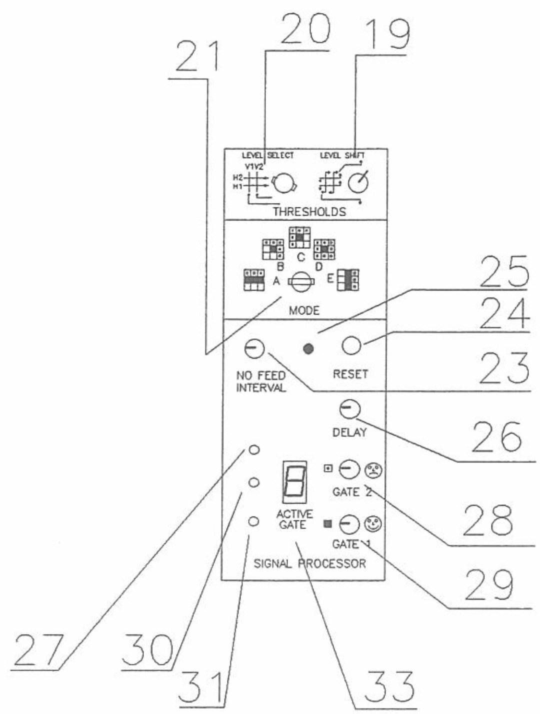
d. Reset (24): This button resets the system after a parts jam-up. The button should be depressed and held until a part passes through the coil.

e. Mode switch (21): This switch selects the mode which will be used to perform the inspection. The selection is based on the dispersion of the signals of the parts being tested. These modes are explained fully later in the manual.

f. Threshold level selector (20): This switch is used to select the threshold (line) which the operator desires to move in order to establish new boundaries.

g. Threshold switch (19): This is a momentary toggle switch used to facilitate actual movement of the threshold line chosen in f above. By pressing the switch up or down, the threshold will move either vertically or horizontally.

h. 3-5 switch: This internal switch selects 3 or 5 way separation. In 5 position any signal whose level passes the upper limit of the display takes precedence over any other condition.



i. Levels 0 (31) and 3 (30) gate duration as well as levels 0 and 3 gate delay operate the same as levels 1 and 2 described in 4a and 4b above. These are adjusted by screwdriver from the S P M and are for special applications only.

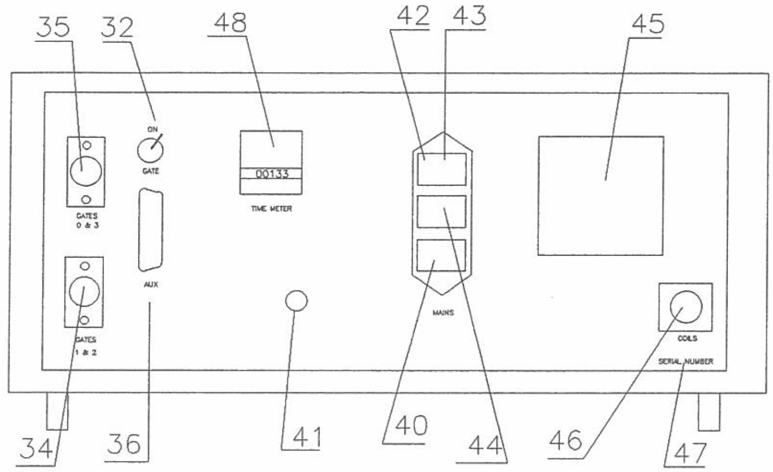
j. Active gate indicator (33): This 7-segment LED indicates the gate level activated. An internal switch can select either real-time operation or a last gate activated latch. In real time the LED continuously changes to display the gate which is activating. In last gate activated mode the LED shows a constant display of the last gate operated and changes only when another gate is activated.

B. Rear Connector Panel (RCP):

a. 4 pin audio connector: 50VDC gate switched outputs (34, 35)

b. 15 pin din connector: auxiliary outputs for counters and bowl control (36)

c. Input connector: for power cord (40)



d. Gate output fuse: .5 amp (41)

e. Mains input fuse: 2.5 amps (42)

f. Mains input fuse: 2.5 amps (43)

g. Mains switch: main energization for the unit (44)

h. MS connector: connector for the coil cable (46)

i. Elapsed time meter: clocks actual machine usage (48)

j. Gate output switch: turns off power to gates (32)

PRINCIPLES OF OPERATION

The two test coils are energized by either a high or low frequency current, depending on the position of the frequency selectors. This power is applied to a primary coil in each coil assembly, and the secondary coil in each assembly is connected to the other in such a way that the secondary voltages cancel each other. The resultant signal input to the amplifier is nearly zero when the coils are close to balance.

Under this condition, the spot remains on the screen even if the sensitivity is set at a fairly high value. Each coil assembly then acts as a transformer with the material to be tested as its core. The secondary windings oppose each other to produce a low output if the material in each coil is similar. This low residual output may now be reduced by the balancing controls so that the spot is in the center of the screen or very close to it, indicating a perfectly balanced system at the particular sensitivity used.

Any material suitable for testing by this equipment (i.e. all metals) will, when inserted in the coils, affect their output voltage by virtue of variations in their electrical or magnetic characteristics. For instance, two pieces of brass of similar shape but of different resistive values will produce different output voltages across their respective secondaries due to the differences in electrical losses within each piece. When the voltage of one coil is subtracted from that of the other, there remains an uncancelled "difference" voltage which causes the spot to deviate from the center of the screen (or balance indication). Thus, the balance controls must be used to re-center the dot and cancel out this "difference".

On the other hand, if the material is magnetic, the voltages induced are dependent on both the effective magnetic permeability and the resistance losses due to the circulating currents.

To be able to perform a satisfactory separation involving chemical analysis, the size of the pieces to be tested must be uniform; and their placement in relation to the coils must be accurately reproducible. Frequently it will be necessary to use jigs to handle the parts in order to obtain this positional accuracy, particularly on "close" separations involving small pieces.

The choices available for testing will now be described and suggestions given as to their best utilization. It should be kept in mind that these suggestions are offered as a general guide. Experimentation in connection with a given particular problem may indicate a more suitable method than one suggested here.

FREQUENCY

The choice of using a particular frequency will depend upon several factors. For magnetic material, it will depend upon whether an inspection should include the whole body or just the outer skin (case depth determination). If penetration is desired (for instance, to sort a mix in material or a lack of heat treat), a low frequency should be used. If the case depth is under investigation or you wish to sort plated from unplated parts, a higher frequency is helpful in confining inspection to the surface.

For non-magnetic materials such as aluminum, brass, or copper, either of the frequency spectrums may be used in general unless sensitivity is a factor. If this is the case, the range from 10 KHz to 20 KHz will give the greatest sensitivity to variations in these materials (particularly true with small samples).

Minor magnetic characteristics are present in the so-called "non-magnetic stainless" group. Depending on whether it is desirable to suppress these characteristics with high frequencies or to make use of them by means of lower frequencies, either end of the frequency range may be advantageous. Different frequencies should be tried on these alloys to determine which gives the best test results.

A practical factor which may influence the selection of frequency is the presence of a strong 50/60 Hz field produced by a large motor or transformer in the vicinity of the test coils. In this case, even though the coils have been wound in such a way as to minimize the effects of external fields when they are placed in parallel, the operator may be forced to test with a higher frequency to eliminate the interference caused by using a testing frequency close to that of the interfering source.

The best approach may be to use low frequencies from 100 Hz - 6 KHz (1800 - 3000 Hz is the most common) for all definitely magnetic material and high frequencies (above 10 KHz) for all non-magnetic material, including stainless steels. In any case, this should be verified by trial on your specific parts. For example, the highest frequency range will be useful where the thickness of an anodized coating is to be inspected.

There are two basic advantages to using a continuously variable testing frequency instead of a few fixed frequencies:

1) As mentioned before, it gives an arbitrary choice of depth of penetration.
2) It enables a better separation in phase of desired indications.

PHASE

For all sorts, the phase control (8) must be adjusted so that the part signal originates from the bottom of the screen while the part is entering the test coil.

SENSITIVITY

The sensitivity control (5) is a dual decade thumbwheel switch, with each position providing a 1 db change in sensitivity. This control (5) utilizes a logarithmic scale, which means that every change of 6 db doubles the sensitivity over the previous setting. The sensitivity should be set so as to discern sufficient differences between the good and bad parts to allow a separation. A note of caution, however: **no two parts are exactly the same.** Therefore, too much sensitivity will increase the difference in good part signals to a degree where the sort may become impossible.

COILS AND HANDLING

The coils are molded in either a black or brown molding compound, depending on whether they are standard or high frequency models. The position of these coils with respect to one another and to other metals in the area is important because nearby magnetic materials or stray AC fields can cause interference in the test. The effects of these interferences become greatly magnified when the Veritest is operated at high sensitivities. Therefore, when operating at high sensitivities, the coils should be kept well away from the indicator cabinet and any other magnetic material (particularly any that might be moved during the course of the test). To determine unwanted effects, carefully balance the coils at maximum sensitivity with nothing in them and then move one of them with respect to the other, to the indicator cabinet, etc., re-balancing when necessary.

The coils themselves can also have an effect on each other. They are constructed in a manner that tends to cancel out stray magnetic AC fields if they are placed edge against edge with the faces parallel. They should also be in the same plane with the cables entering the coils at corresponding edges, both to the front or both to the rear. When the coils are in this position, the action of the fields between them is minimized. If, however, the direction of cable entry is reversed on one coil, the effect of a stray field upon the coils is greatly increased. While interaction between the coils may be eliminated by separating them widely, the nulling effect on a stray field may be lost.

At times it may prove more convenient to carry the test coil to the material, rather than the reverse, as when testing long lengths of bar stock. When operating in this manner, it is recommended that the test coil and reference coil be placed well away from the indicator unit and from each other so that interaction among them is minimized. Balancing will, of course, be done at approximate locations at which the test coil will be used. Only careful experimentation will determine what liberties may be taken with the above precautions.

The test coils consist of two similar coils, one for holding a balancing (or reference) specimen and the other for testing. Coils are available in standard sizes, ranging from ¼" to 6" i.d. For maximum sensitivity, a pair should be selected whose inside diameter most closely matches the specimen's largest outside diameter, taking into consideration the method being used to convey the part through the coil. The equipment is sensitive to the position of the specimens, particularly short pieces, in the coils. The usual practice is to insert specially-designed jigs through the coil to ensure that each piece is in the same position while it is inspected. These jigs or liners should be non-metallic, non-conductive, and be made preferably out of a smooth synthetic material like plastic to ensure long wear. They may reduce the i.d. of the test coils but provide a better fit for the specimen.

The shape of the jig depends upon the size and shape of the part which is to be inserted into the coil. Since a circular coil opening may not be suitable for certain shapes insofar as maintaining positioning accuracy, the contour of the coil opening may be modified as required by means of a sleeve or guide.

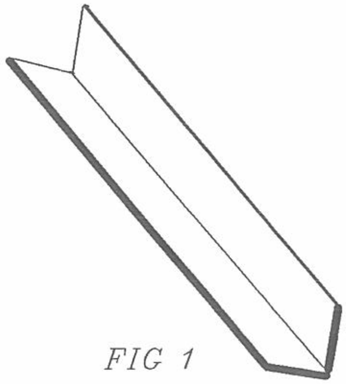


FIG 1

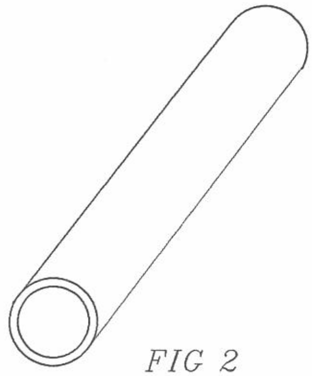


FIG 2

For use with circular coils

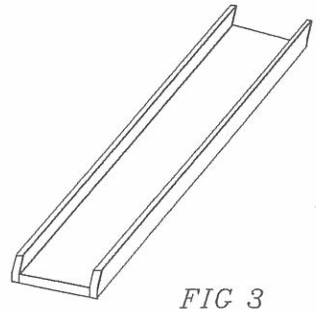


FIG 3

For use with rectangular coils

Some of the most common types of jigs used for this purpose are shown in Figures 1, 2, and 3. The parts which would probably be used with the jigs shown are:

Figure 1: screws, special shapes, ball bearings
Figure 2: rods, bolts, screws, etc.
Figure 3: strips (flats), nuts

In all methods of testing with this comparator, it is essential to keep available two samples, one good and one bad, which should be periodically inserted in the system to determine if the equipment is still operating in the manner in which it was originally set up. It is always possible that an adjustment may have been unknowingly altered or that the reference coil or the piece in it may have been disturbed. Therefore, **IT SHOULD BE MADE A WELL-ESTABLISHED POLICY TO INSERT KNOWN GOOD AND BAD SAMPLES IN THE TEST COIL AT REGULAR INTERVALS TO CHECK THE OPERATION OF THE EQUIPMENT**, particularly when using high sensitivity. If a discrepancy is noted, re-testing of the last batch of parts inspected may be necessary.

<u>**The Reference Coil**</u>

This name refers to the coil which provides all or part of the cancelling (reference) voltage. This coil holds the reference specimen against which the parts being tested will be compared. The contents of this coil cannot be moved once a set-up has been arrived at and the test has begun. It may be beneficial to anchor the part in the coil by means of some type of putty to eliminate dislodging of the part if the coil is disturbed.

The Test Coil

This name refers to the coil into which the pieces being tested are inserted. Its output voltage is compared to that of the reference coil as each piece goes through.

Remarks

The coils bear no designation as to which is the "Test coil" and which the "Reference coil" since they are built identically and are interchangeable. The only effect produced by an interchange of the coils is the reversal of the signal deflections on the oscilloscope. An advantage of not identifying the coils is that after continued long use the "Test coil" may become somewhat worn, and it may be preferable to equalize this wear by alternating the coils. However, this must never be done while any one test is in progress. **ONCE A TEST HAS BEGUN, THE COILS CANNOT BE INTERCHANGED!**

S P M MODULE

The Engineered Inspection Services' Signal Processor Module (S P M) is the heart of the Veritest. This interface module was designed to give a three- or five-way sorting capability for comparator applications such as sorts for mixes in screw machine products, bearing materials, etc.

In addition to giving a five-way sort capability with five modes of operation for processing the vertical and horizontal oscilloscope information, the S P M also provides a missing part signal which can be used to control the parts feed system. Figure 4 illustrates the standard oscilloscope, which is arranged with variable thresholds of approximately 1% steps from 0 to 100% of full scale vertical deflection.

The S P M accepts not only the V (vertical) input information from part signals but also the H (horizontal) information. It processes these inputs, either singly or combined, to operate two separate reject gates, allowing separations of up to three different parameters. This is accomplished by "remembering" the highest signal position of each signal generated by the tested pieces as they pass through the test coil. This "remembered" signal is then transferred to the output gate circuitry, and the system resets when the tested part leaves the coil.

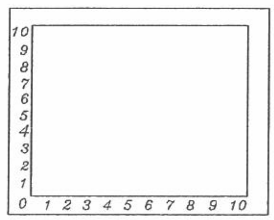


FIG 4

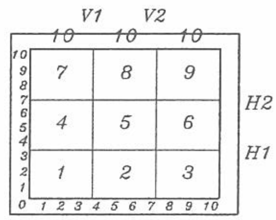


FIG 5

To accomplish this, the S P M divides the Veritest oscilloscope into nine separate and distinct squares as illustrated in Figure 5 via four electronically-displayed threshold lines. These levels have been set arbitrarily at 35% and 70% of full scale deflection of a V signal from the bottom of the scope and 35% and 70% of full scale deflection of the H signals from the left-hand side of the scope. The reset pulse level, as well as level three, is an internal adjustment set to the lower and upper limits of the oscilloscope.

The threshold levels can be changed via the controls in the top section of the S P M panel. The V1 position controls the first (from the left edge of the screen) vertical threshold line on the screen while V2 controls the second. The H1 position controls the bottom horizontal threshold line while H2 controls the top line. The toggle switch will move the threshold line indicated by the position at which the switch is set.

Attention needs to be paid by the operator while moving the threshold lines as they can occasionally jump off the screen. By paying attention to the level select icon and remembering that V1 is always on the left and H1 is always on the bottom, this problem can be avoided. If either the V1 and V2 lines or the H1 and H2 lines are reversed, the proper gates will not activate in the mode you have chosen for inspection. If an operator reverses the lines in the middle of an inspection run, the good parts will very likely become contaminated by rejects.

For many dimensional sorts such as length or diameter, the signal variations between the parts principally show up as amplitude changes. As illustrated in Figure 6, such a three-way separation may be: 1) too short, 2) good, 3) too long. The zero signals could be plating bits or contaminants. To obtain these amplitude variations, sufficient sensitivity is used to give three separate groupings for the parts as illustrated. The horizontal threshold lines may be adjusted if necessary so that the different part signals cross separate threshold levels, thereby activating different gates. The signals as shown in Figure 6 would activate the gates as illustrated in Figure 7.

Amplitude variations

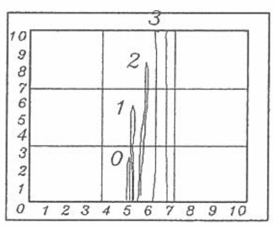


FIG 6

Mode A gate operation

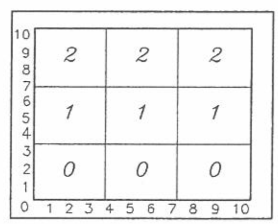


FIG 7

If the internal 3-5 switch were set in position three for this sort, part numbers two and three would activate the same gate. However, in all modes of operation, position five of this switch places an upper limit on signals, giving all signals which cross the upper edge of the scope tube an out of test range consideration. This signal often indicates a double feed of parts. These parts are rejected down the middle gate along with smaller bits and pieces. We recommend that this switch be set to the five position for all sorts.

Certain other sorting applications do not give just amplitude variations but also have some phase (horizontal) displacement between the signals. Figures 8, 10, and 12 illustrate such conditions. To properly handle these types of indications, Modes B, C & T have been incorporated into the S P M and function as illustrated in Figure 9 for Mode B, Figure 11 for Mode C, and Figure 12A for Mode

T (Target). While the signal area for gate one is the same in all three modes, you can see that the other two gate areas are different.

In all three modes the center box is normally targeted as the acceptable area, and all other signals are rejected. Both horizontal and vertical threshold lines may need to be adjusted so that part signals fall in the appropriate areas. These three modes offer the most stringent inspection of products and are especially useful when inspecting part quality immediately prior to packaging.

Phase & amplitude variations

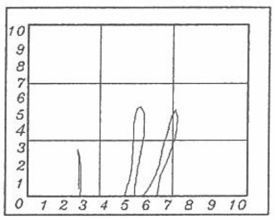


FIG 8

Mode B gate operation

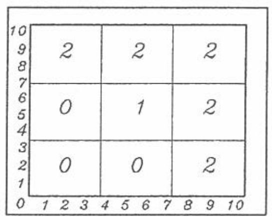


FIG 9

Phase & amplitude variations

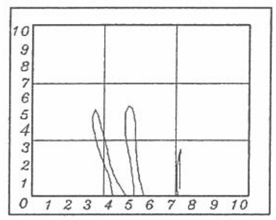


FIG 10

Mode C gate operation

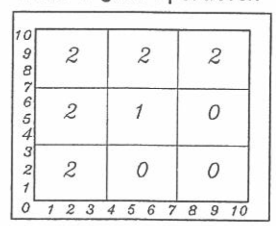


FIG 11

In all modes of operation the illustration legend is:

0 = no gate operation

1 = gate #1 operation

2 = gate #2 operation

3 = no gate operation

Another type of signal grouping, such as that found in hardness variations, may appear only as phase changes (horizontal displacement differences) as illustrated in Figure 13. These signals, as illustrated, can have the same amplitude (vertical height). To separate these indications, Mode P has been added and functions as shown in Figure 14. The vertical threshold lines are then adjusted so that the different part signals fall between different lines.

Phase & amplitude variations

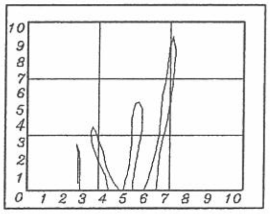


FIG 12

Mode T gate operation

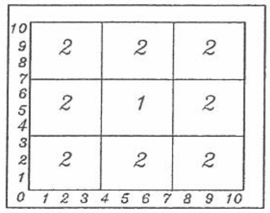


FIG 12A

Phase variations

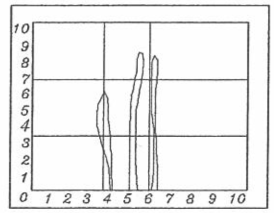


FIG 13

Mode P gate operation

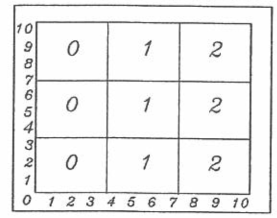


FIG 14

In all modes of operation the thickness of a threshold line is all that is necessary between different part signals to differentiate between parts and to activate separate gates.

Priority encoding is used in all modes as follows:

Mode A: Gate 2 takes priority over 0 and 1
Gate 3 takes priority over 0, 1, and 2*

Modes B, C & T: Gate 2 takes priority over 0 and 1
Gate 3 takes priority over 0, 1, and 2*

Mode P is encoded as follows:

Signals traversing from
0 to 1: Gate 0
0 to 2: Gate 2
1 to 0: Gate 0
1 to 2: Gate 2
2 to 0: Gate 2
2 to 1: Gate 2

Level 3 takes priority over all other levels*

*For level 3 to take priority over all other gates, the 3-5 switch must be in position 5.

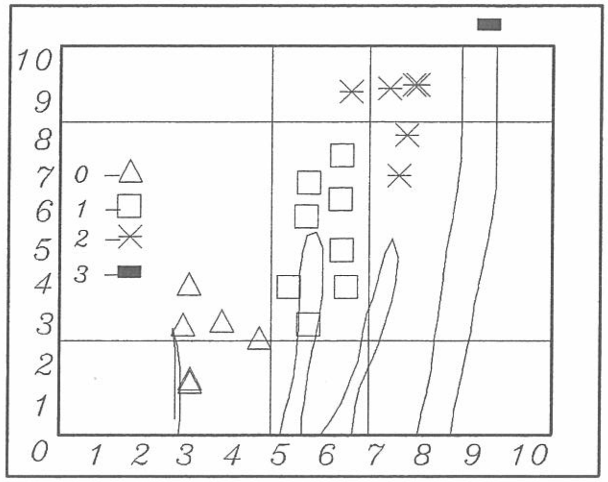


FIG 15

Figure 15 illustrates a typical application of a two-way mix. Both phase and amplitude variations are displayed, each having a wide dispersion pattern. One can see that by adjusting the various threshold levels (19 and 20) and using Mode B, one can group the parts. Mixed in are numerous parts both smaller and larger than the two of interest. These are readily sorted with a G-3 (three-way) gate. The 0 and 3 dispersion groups default through the middle (no gate) chute.

The missing part signal (jam-up indicator) (25) is available as both a normally on and a normally off 13.5VDC CMOS signal output. A time adjust (23), along with indicator (25) and reset switch (24), is located on the S P M front panel.

INSTALLATION

The indicator cabinet should preferably be set up on a convenient table (if an equipment stand was not purchased) in such a way that the oscilloscope is easily visible and the controls accessible to the operator. If the coils are to be used on a table which you supply, the table should be free of metal. If this is not possible, the coils should be secured in place several feet away from the indicator cabinet, parallel to each other and almost side by side.

After a suitable location has been chosen, preliminary set-up consists of connecting the coil connector to its appropriate socket located on the rear connector panel and connecting the gate output from its socket to the automatic sorting device used. These connectors must be well tightened because they not only prevent the plugs from being pulled out but also ensure a good electrical contact. **CAUTION: DO NOT CONNECT THE GATE CABLE TO THE VERITEST WHILE THE UNIT IS ON!** This can cause a circuit card to be blown.

VERITEST SET-UP

1. Read this instruction booklet to thoroughly familiarize yourself with the Veritest and its functions.

2. Connect the desired set of coils to their respective connector. Normal coils (black) go from 100 Hz to 8 KHz while high frequency coils (brown) go from 8 KHz to 20 KHz.

   Select one of these coils as the reference coil (see page 14). The other coil then becomes the test coil (see page 15). Verify that both coils have the same serial number as they are manufactured in matched sets.

3. Turn off the gate switch (32) located on the R C P.

4. Set the test frequency (1 and 2). Refer to pages 10 and 11 for details.

5. Set the sensitivity (5) to zero.

6. With the V (9) and H (10) controls, position the dot in the approximate center of the oscilloscope. Exact positioning is not critical.

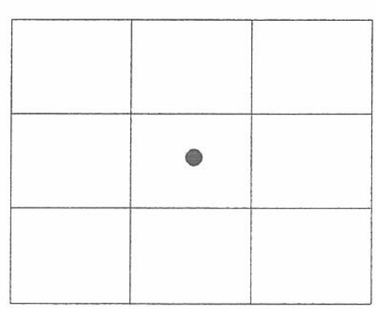


FIG 16

7. Set the sensitivity (5) to 30 db or more.

8. While turning the phase control (8), check for movement of the spot. The optimal setting is achieved when there is minimal movement of the spot. If a circle is scribed as in Figure 17, the coils are not balanced.

9. With the balance controls (6 and 7), move the dot to the center of the circle scribed. See Figure 18.

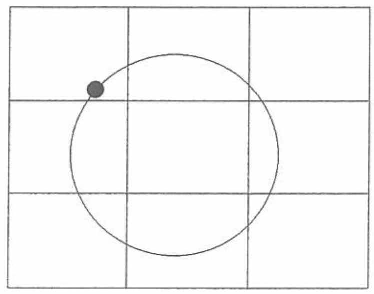


FIG 17

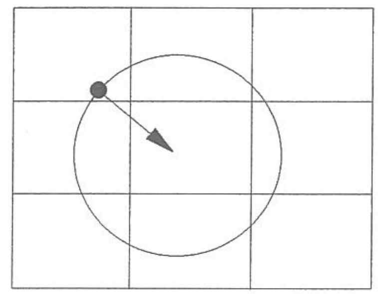


FIG 18

10. Place a good part in the "Reference coil". The spot will move away from the center of the scope. If not, increase the sensitivity and repeat. Move the piece into the reference coil until the spot has reached its maximum position (Figure 19) and begins to reverse direction. At this point, you are finished with the reference coil. Move it away from the test area so that it will not be disturbed.

REFERENCE COIL

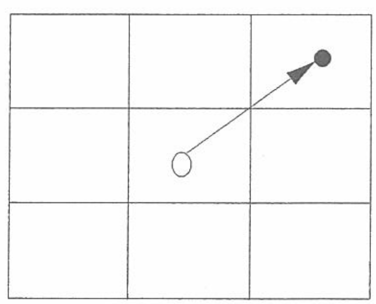


FIG 19

TEST COIL

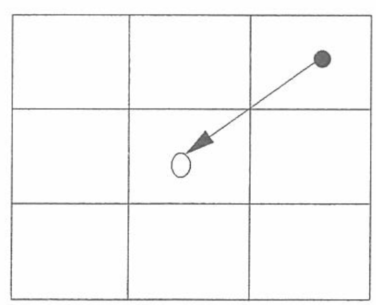
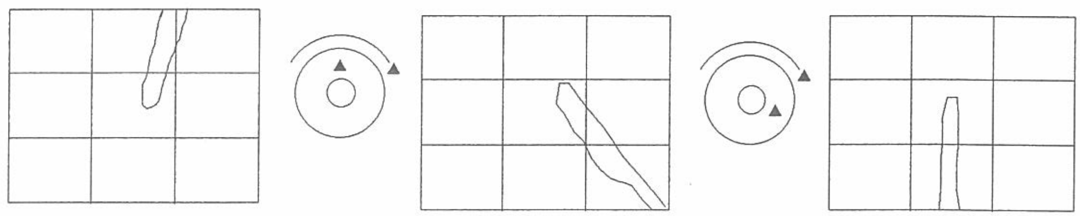


FIG 20

11. Into the "Test coil" place another good part. This part will cause the spot to move back towards the scope balance center (Figure 20). Again, leave the part at its maximum point and verify with the phase control (8) that it is at the center of balance. If not, re-balance with the balance controls (6 and 7) without moving the good parts centered in each coil.

12. While moving the piece in and out of the coil, turn the phase control (8) so that the part signal comes onto the scope from the bottom. See Figure 21. This is important as the direction of the part signal activates the appropriate gating circuitry. Try to get the signal as near vertical as possible to simplify the sort.



Phase Adjustment
FIG 21

13. Place a bad part in the test coil. Observe the amplitude and phase information of the piece signal as compared to that of the good part. If there is little or no difference between the signals of the good parts and those of the bad, the sensitivity must be increased. You should have just enough sensitivity to obtain sufficient differences between the signals of the good parts and those of the bad parts to enable a sort to be accomplished.

    * As no two parts are the same -- not even all good ones -- too much sensitivity will not only amplify the differences between the good and the bad parts but also the differences between the good parts. Therefore, only as much sensitivity as is necessary to establish a sort should be used.

14. If there is still not a sufficient difference between the signals of the good and bad parts, you may need to vary the frequency as it may not be set correctly for the defect which you are seeking. Refer to pages 10 and 11 of the manual.

    * Remember that either frequency or sensitivity changes require re-centering of a good part in the coil. A re-balance of the system may be necessary, and the phase control may need to be adjusted to re-orient the dot movement to bring it up from the bottom of the oscilloscope.

Note: If during set-up the optimal point for balance is not at the approximate scope center or if, in your judgment, the part signals are not falling where you desire for the sort, you can utilize the V and H controls on the detector panel to move all signals vertically or horizontally to give the response desired. Remember: when these controls are used, all signals will be moved the same distance. It is best to adjust sensitivity and frequency first before attempting to use this method.

DO NOT CONFUSE THE V & H CONTROLS and their functions with THE BALANCE CONTROLS and their functions. The V & H controls only move the spot vertically and horizontally. The balance controls govern the system zeroing and can move the spot in any linear direction 90 degrees.

15. Once sufficient signal differences have been achieved between the good and bad parts, the vertical and horizontal threshold levels may need to be moved (controls 19 and 20) so that the good and bad pieces fall into different test blocks as displayed in Figures 22 and 23. All it takes is the width of one line between signals to activate separate gates.

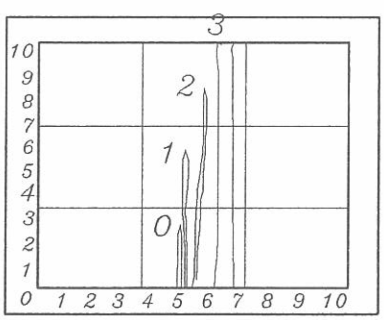


FIG 22

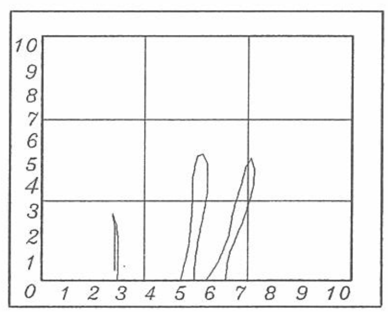


FIG 23

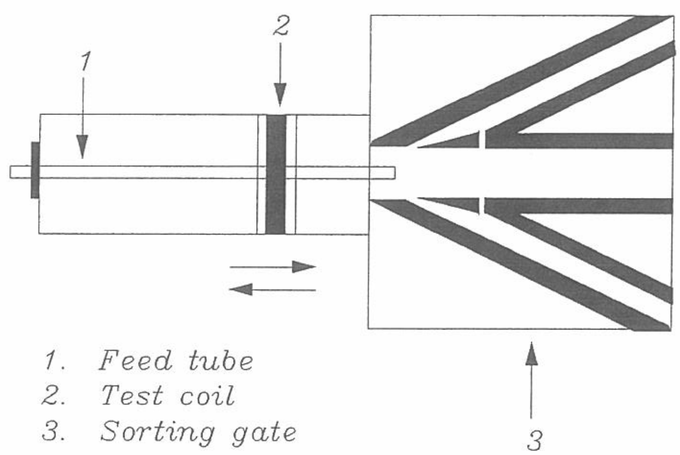
16. **It is important to note at this time that part signals must leave the oscilloscope screen for the system to operate properly.** Before actual sorting begins, this fact needs to be verified. If the signals do not leave the screen, the gates will not activate correctly. It may be necessary to increase the sensitivity or adjust part signals with the V control to achieve this.

17. Choose the appropriate mode of operation as per the S P M panel description, beginning page 15. The choice should be based on test piece criteria: amplitude only differences, phase only differences, or phase and amplitude differences.

18. By passing parts through the test coil and observing the active gate display (33) on the S P M panel, you can ascertain which gates will activate during actual operation. Some vertical (V, 9) positioning or adjustment of a threshold level (19 and 20) may be necessary as static and dynamic operation can differ somewhat.

19. Energize the gate output switch (32). Pass the sample pieces through the gate again to verify proper operation.

20. Proper set-up of the gate and test coil is as follows:



1. *Feed tube*
2. *Test coil*
3. *Sorting gate*

FIG 24

Move the test coil close enough to ensure that the gate can open in time to accept a part but not so far away as to make excessive gate duration (length of time the gate is open) necessary. Use just enough duration to assure piece capture.

21. On turn-key systems the feed system is controlled by the unit through use of the auxiliary output (36) via a master control panel. To engage the system, depress the reset button (24) on the S P M panel, force a part through the coil, or press the reset on the master control panel.

22. If you wish to utilize the automatic shutdown feature in the event of a parts jam or lack of parts, set the "no part" interval control (23) fully clockwise. Depress the reset switch as above or pass a piece through the test coil. This will energize the feed system.

23. Decrease the "no part" interval (23) CCW until the feed system de-energizes. Increase the interval (23) and reset (24) the system. Use just enough interval to keep the feed system energized for the desired part feed rate. Too small an interval will interrupt the system operation constantly; too large an interval can result in a serious overflow of parts or a severe jam of the feed system.

24. Begin sorting!

NORMAL

MODE P			MODE T			MODE C			MODE B			MODE A		
0	0	0	2	2	2	2	2	2	0	0	2	0	1	2
1	1	1	2	1	2	0	1	2	0	1	2	0	1	2
2	2	2	2	2	2	0	0	2	2	2	2	0	1	2

H1 & H2 REVERSED

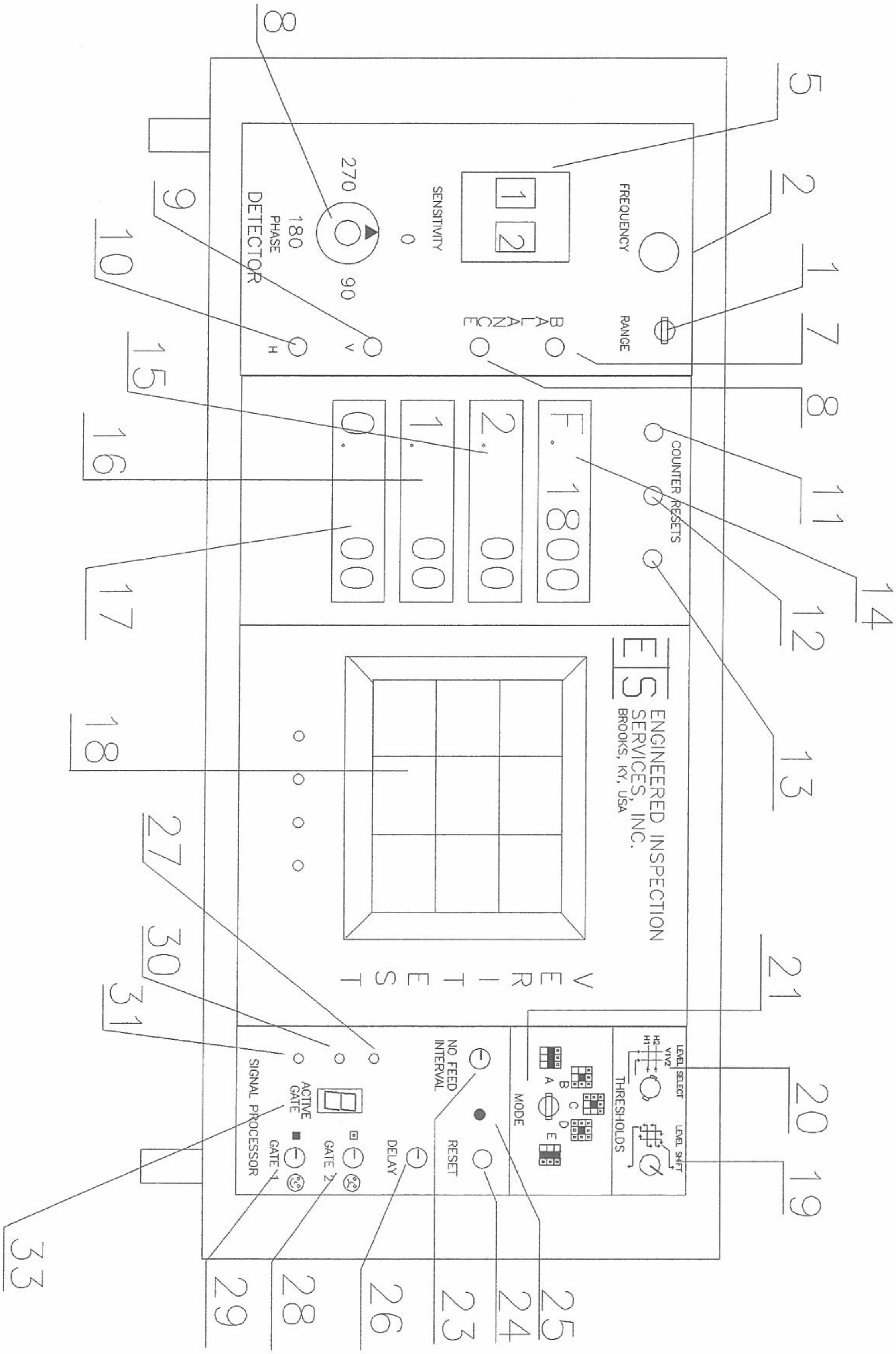
MODE P			MODE T			MODE C			MODE B			MODE A		
0	0	0	2	2	2	2	2	2	0	2	2	0	1&2	2
1	1	1	2	1	2	0	1&2	2	0	1&2	2	0	1&2	2
2	2	2	2	2	2	0	2	2	2	2	2	0	1&2	2

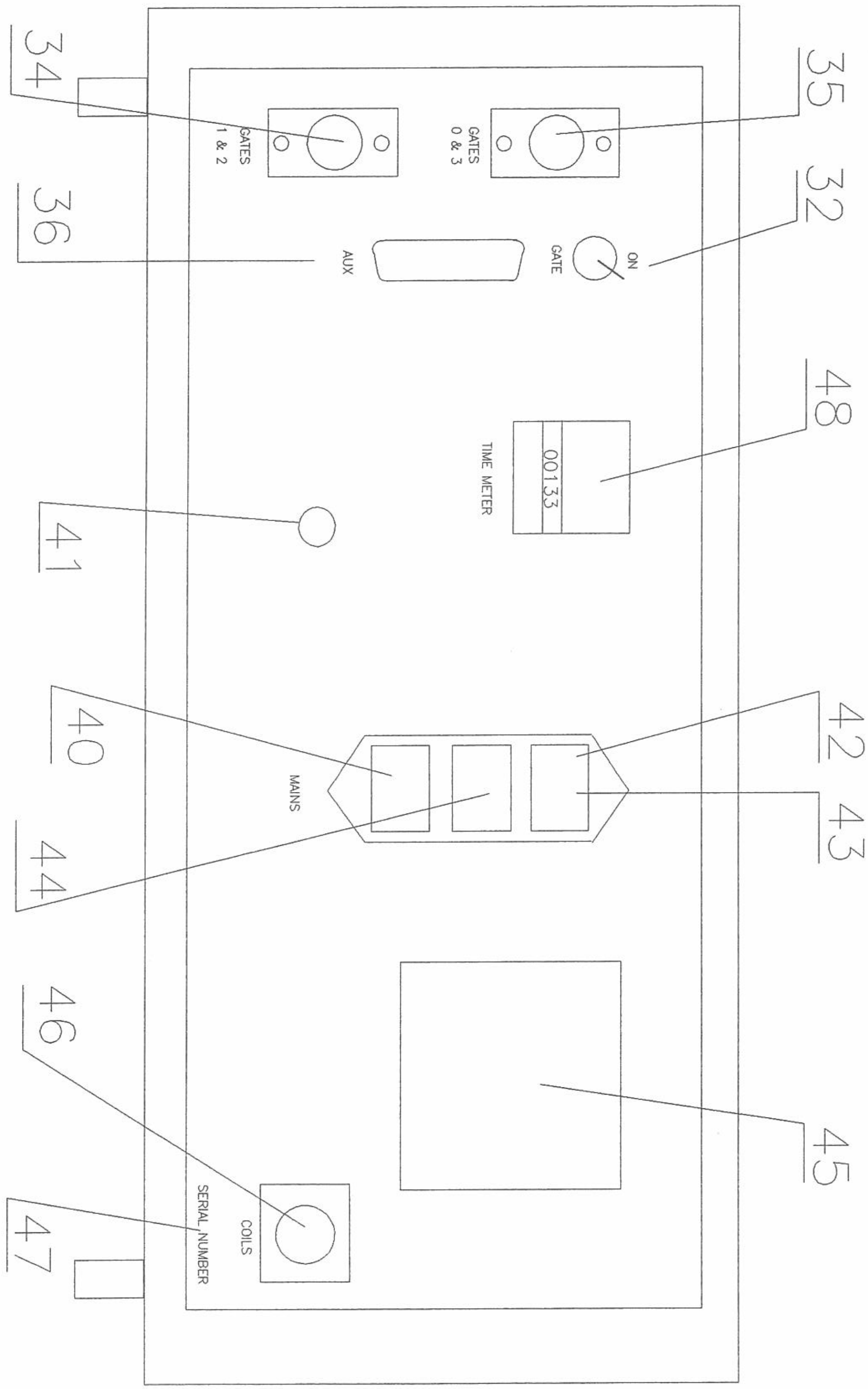
V1 & V2 REVERSED

MODE P			MODE T			MODE C			MODE B			MODE A		
2	2	2	2	2	2	2	2	2	0	0	2	0	1	2
0	0	0	2	2	2	2	2	2	2	2	2	0	1	2
0	0	0	2	2	2	0	0	2	2	2	2	0	1	2

VI & V2 REVERSED H1 & H2 REVERSED

MODE P			MODE T			MODE C			MODE B			MODE A		
0	0	0	2	2	2	2	2	2	0	2	2	0	1&2	2
2	2	2	2	2	2	2	2	2	2	2	2	0	1&2	2
2	2	2	2	2	2	0	2	2	2	2	2	0	1&2	2


FREQUENCY
RANGE
SENSITIVITY
BALANCE
PHASE
DETECTOR
COUNTER RESETS
ENGINEERED INSPECTION
SERVICES, INC.
BROOKS, KY, USA
VERITEST
THRESHOLDS
LEVEL SELECT
LEVEL SHIFT
MODE
NO FEED INTERVAL
RESET
DELAY
GATE 2
GATE 1
ACTIVE GATE
SIGNAL PROCESSOR


34
35
GATES 1 & 2
GATES 0 & 3
36
32
AUX
GATE
ON
48
TIME METER
00133
41
40
42
MAINS
44
43
46
45
47
COILS
SERIAL NUMBER

VERITEST FRONT PANEL CONTROLS

1. Frequency range switch
2. Fine frequency adjust
5. Sensitivity adjust
6. Balance control
7. Balance control
8. Phase control
9. Vertical positioning control
10. Horizontal positioning control
11. 0 counter reset
12. 1 counter reset
13. 2 counter reset
14. Frequency display
15. Counter #2 display
16. Counter #1 display
17. Counter #0 display
18. Oscilloscope
19. Level adjust joystick
20. Threshold level adjust selector
21. Mode selector switch
23. No feed interval adjust
24. No feed reset button
25. No feed indicator light
26. 1-2 gate delay adjust
27. 0-3 gate delay adjust
28. Gate 2 duration switch
29. Gate 1 duration switch
30. Gate 3 duration switch
31. Gate 0 duration switch
33. Active gate display

VERITEST REAR CONNECTOR PANEL CONTROLS

32. Gate activation switch
34. 1-2 gate output connector
35. 0-3 gate output connector
36. Auxiliary output connector
40. Mains input connector
41. Gate fuse
42. Mains power fuse
43. Mains power fuse
44. Mains power on switch
45. Ventilation filter
46. Coil connector
47. Serial number
48. Elapsed time meter

MAINTENANCE

A. Veritest chassis

Maintenance of the Veritest is principally of a preventive nature.

1. The ventilation filter must be regularly cleaned by either:
   a) replacing the filter screen or
   b) washing the filter in a mild, soapy solution, followed by a thorough rinsing and drying

* The frequency of filter maintenance is highly dependent on the overall environmental conditions in the area. Harsher environments mandate more frequent cleaning.

2. A monthly overall check of machine functions should be performed in all modes of operation. This can be accomplished at zero sensitivity (5) by simulating a test condition with alternate use of V (9) and H (10) controls and with observation of the system in operation. Reference pages 15-19.
3. Annual calibration of the Veritest by qualified service personnel is strongly advised. This will decrease costly down time and emergency service costs.

B. Coils and Probes

No maintenance is required other than rigid routine handling criteria as follows:

a) Do not pick up coils or probes by the cables.
b) Keep cable connectors clean.

C. G-3 Gate Assembly

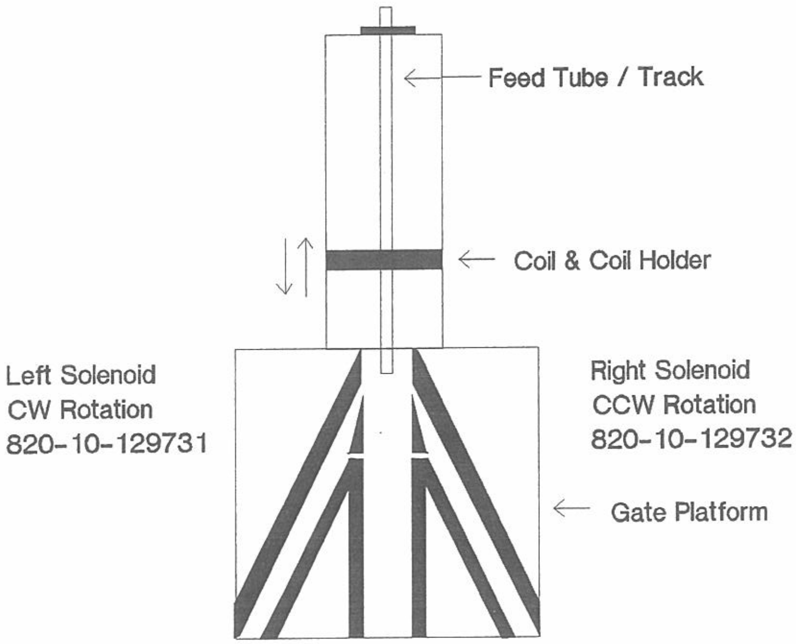
Referring to the following G-3 gate illustration, the only maintenance is replacement of the solenoid or flipper arrangement. They are consumable items and will have to be changed from time to time. On high speed applications and those applications involving large parts, the flipper attach fitting may also occasionally fail.

Occasionally pieces of dirt or plating will fall through the hole for the flipper attach fitting into the area under the gate table top. Sometimes this can cause shorts or improper operation of the gates. This area should be inspected periodically and any foreign material removed.

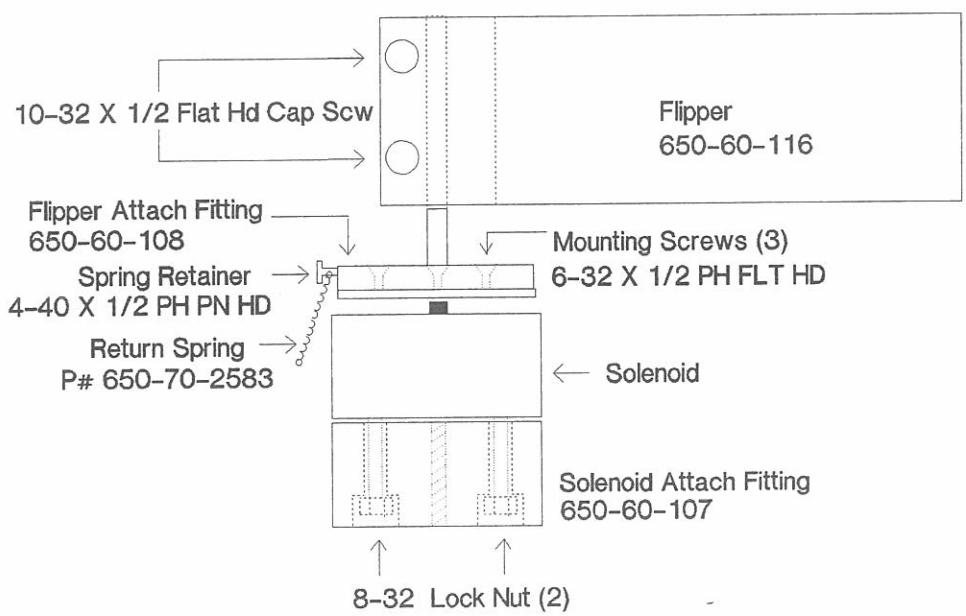
To replace a solenoid:

1. Remove the flipper by loosening the socket cap screws and lifting off each flipper.
2. Remove the top plate of the gate assembly by removing the four M6 retaining bolts.
3. Remove the three 6-32 x 1/2 phillips flat head screws on the flipper attach fitting.
4. Remove the two bolts from the solenoid attach fitting. (Access to these is from the underside of the gate support.)
5. Cut the wires from the socket, leaving enough wire to allow the use of wire nuts. Soldering to the connector is not necessary.
6. Remove the two 8-32 lock nuts on the solenoid from the back of the solenoid attach fitting.
7. Re-assemble all the items in reverse order.

SORTING GATE PART BREAKDOWN



Top View



Exploded Side View