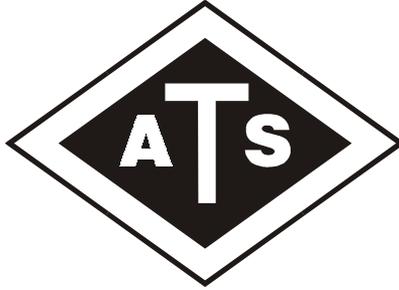


**TIME-RITE MODEL B**  
Instruction Manual



**PISTON POSITION INDICATOR**

Revised May 1999

**AIRCRAFT TOOL SUPPLY  
COMPANY**

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# DESCRIPTION

## DESCRIPTION

Time-Rite is an instrument designed for precision timing of aircraft engines by direct measurement of piston travel.

The features of Time-Rite design — a moveable slide pointer, and an adjustable calibrated scale — eliminate the need for finding top dead center, and compensate for the variables involved in accurate piston positioning.

Calibrated scales are available for most type engines, and scale calibrations are obtained in cooperation with, and are approved by the engine manufacturers.

Because of the difference in spark plug locations and piston dome shapes, different pivot arms are available to adapt Time-Rite to all aircraft engines. All arms are easily interchanged, as described in the section under "Pivot Arms."

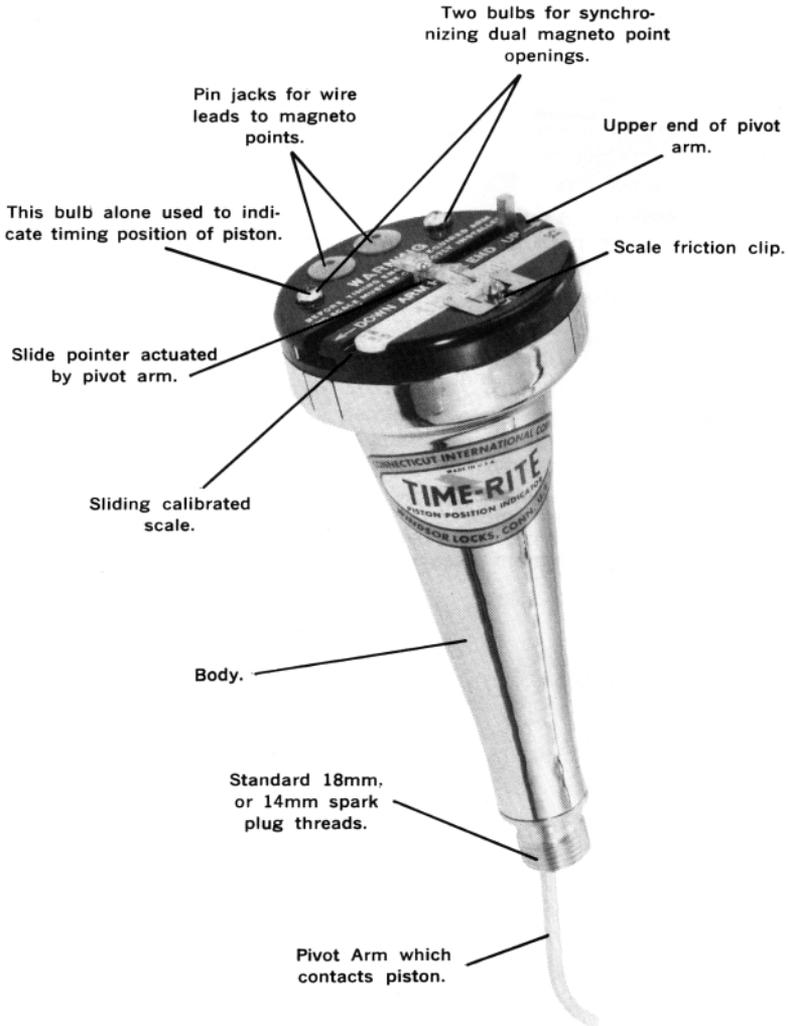


The Model B uses two indicator lights, one shows piston position while the pair is used for synchronizing dual magneto point openings. This is the most versatile model.

Bodies for Model B can be provided with spark plug thread adapters for either 14mm or 18mm plug threads.

# DESCRIPTION

## MODEL B TIME-RITE ILLUSTRATION



# HOW TO USE TIME-RITE

## FINDING EXHAUST VALVE CLOSING POSITION

Check the “after top center” position of the piston relative to the closing of the exhaust valve as follows. Move the slide pointer up against the arm. Turn the crankshaft through top center to the point where the exhaust valve closes. Align the zero degree position of the scale with the slide pointer which was left at the highest point of piston travel. Then, push the slide pointer until it contacts the pivot arm and read its position on the scale, this reading is the “after top center” position of the piston at the time the exhaust valve closes.

## TOP DEAD CENTER

Older methods of engine timing require the use of top dead center indicators, propeller shaft pointers, protractors of timing disks; none of which are necessary when the engine is timed with Time-Rite. It is not necessary to find the top-dead-center when the Time-Rite is used as explained under “Scale Calibrations.”

However, Time-Rite may be used as a top dead center indicator, and the following method is recommended. The ordinary top dead center indicator has a very short range, which requires finding the TDC by measurement of the flat spot. Many errors in this method are due to working with piston positions too close to the top of the stroke where small piston movements correspond to relatively large crankshaft movements. A more accurate method is to locate a piston position 20-25 degrees to either side of the top of the stroke.

Set the slide pointer at any convenient degree position on the scale, and with a pointer on the crankshaft (not on a propeller shaft driven through reduction gears) turn the engine shaft in the direction of rotation until the bulb lights. Mark this position against the crankshaft pointer. Turn the engine shaft so that the piston goes through the top center position and reset the slide pointer. Turn the engine shaft backward until the bulb again lights. Mark this position against the crankshaft pointer. Halfway between these marks is the true top-center.

# HOW TO USE TIME-RITE

## STEP 1

Be sure that the required arm and scale are correctly installed. The scale is correctly installed with the zero degree at the bottom. The Hook or Bent End direction (up or down) is determined in relation to the cap when the scale is on the right. In certain engines, the Time-Rite is installed with the scale to the left of the cap, but the direction of the arm is still determined with the scale to the right.



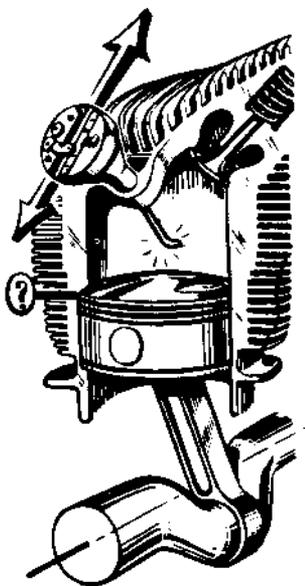
Screw Time-Rite tightly into the front spark plug bushing of No. 1 cylinder after making sure that the piston is on the compression stroke and not too near the top. The Time-Rite cannot be readily installed with the piston at the top of the stroke. Remove all spark plug gaskets.

NOTE: In some engines when using a hooked pivot arm, it may not be possible to screw Time-Rite into the spark plug bushing because the pivot arm hits either the cylinder wall or head.

Now, simply hold the cap so that it will not rotate and screw the body into the bushing.

## STEP 2

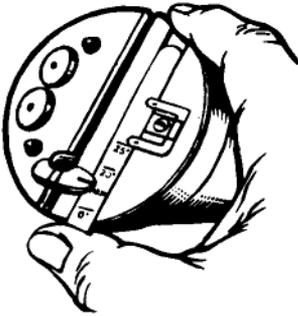
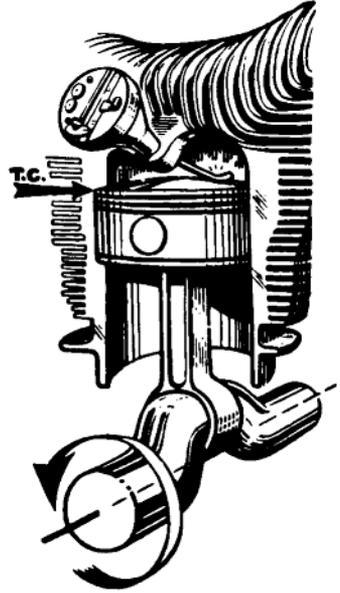
Turn cap so the slot is parallel with the vertical axis of the cylinder. The scale should be to the right of the slot when Time-Rite is installed in radial engines as illustrated. Refer to the section of this manual on "Opposed and Inverted Engines."



# HOW TO USE TIME-RITE

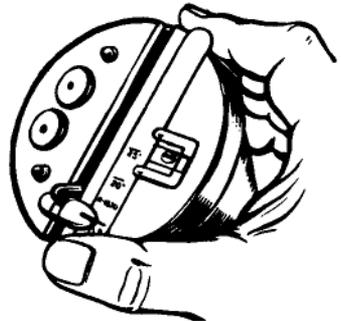
## STEP 3

Slide the pointer to a position near the center of the cap. Turn the engine in the direction of rotation so that the piston goes through the top center position. This will leave the slide pointer at the highest point of piston travel. This operation replaces finding top dead center, necessary with all other methods of engine timing.



## STEP 4

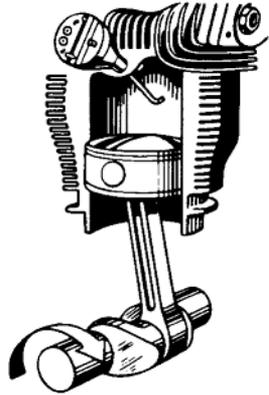
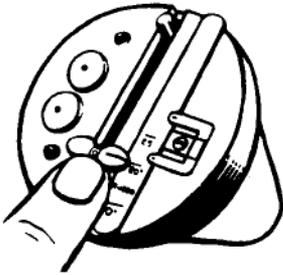
Set the zero degree position of the scale opposite the slide pointer reference mark. Be sure that the correct scale is used for the engine being timed.



# HOW TO USE TIME-RITE

## STEP 5

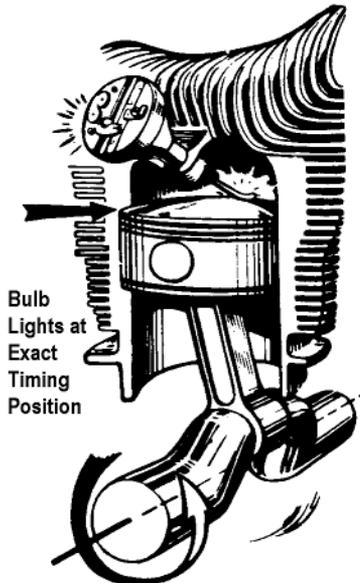
Turn the engine back through the top center position so that the piston has reached some point before the desired timing position. Set the scale pointer opposite the desired timing position on the scale. Do not move the scale.



## STEP 6

Turn the engine in the direction of rotation until the pivot arm just touches the slide pointer which will cause the bulb to light indicating that the piston is at exact timing position.

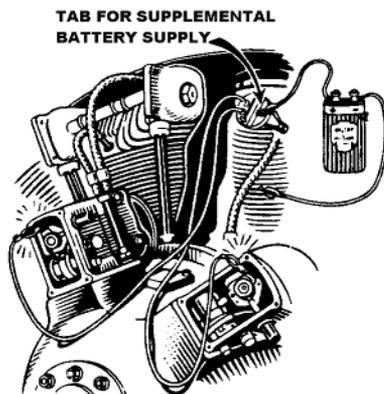
NOTE: If the battery is dead, then you must accomplish this final step by pushing the slide pointer up beyond the desired timing position, and allow the pivot arm to push the slide pointer down to the selected timing position. This method may be used after first accomplishing Steps 3 and 4.



# HOW TO USE TIME-RITE

## STEP 7

Although Time-Rite is primarily a piston position indicator, it can also be used for checking magneto breaker point opening and synchronization.



When using Time-Rite for this purpose, it is important to disconnect or insulate the primary coil leads, as is done with any other similar direct current circuit checks on magneto operated ignition systems. The individual magneto manufacturer's recommendation on insulation or disconnection of the primary coil leads should be followed. This is not necessary on battery operated ignition systems.

After finding the desired timing position of the piston as previously described, move the slide pointer down and away from the pivot arm to disconnect the bulb circuit through the arm and the slide. Insert the phone tips into the jacks and attach the alligator clips to the proper connections on the magneto for checking operation of the usual manner so that the breaker points are just opening. The lights will be lit when the breaker points are closed, and will go out when the points open.

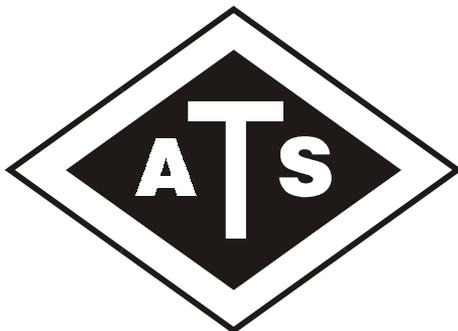
To check the setting, turn the crankshaft back, then turn it in the direction of rotation until the lights go off, indicating the points have opened. Push the slide pointer until it contacts the pivot arm and then note its position on the scale. The position of the slide pointer should align exactly with the degree mark to which the engine is timed, then the magnetos are properly timed.

## HOW TO USE TIME-RITE

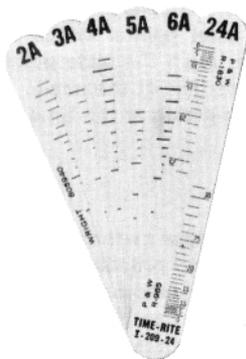
NOTE: Scale should not have been moved once it was properly referenced.

Because it may take some time to complete these operations, it has been found desirable to provide a supplemental battery so as not to interrupt the work in the event the small battery runs down. The supplemental battery may be used in parallel with the small battery by connecting the "plus" terminal to the screw on the scale friction spring and ground the "minus" terminal to any convenient place on the engine.

As an alternate method, the Time-Rite may be used in conjunction with a magneto synchronizer. Use Time-Rite to accurately determine the timing position, following steps 1 through 6. The slide pointer should then be moved away from the pivot arm to disconnect the bulb circuit. The magneto points may now be synchronized and set at the position using the magneto synchronizer. To check the point opening, turn the engine shaft in the normal direction of rotation until the synchronizer shows the points have just opened. Move the Time-Rite slide pointer until it just touches the pivot arm causing the bulb to light. Read the degree position on the scale. If the synchronizing and point opening are correct, the Time-Rite pointer will be on the desired timing position.



# MAINTENANCE



## SCALE CALIBRATIONS

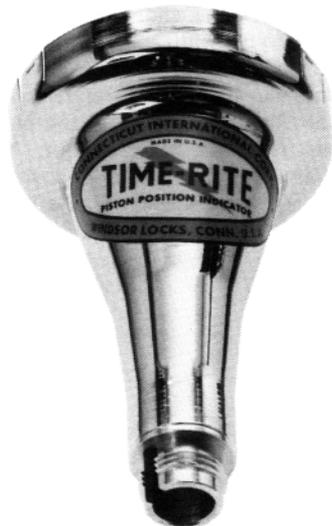
All scales are calibrated and checked under the engine manufacturer's supervision and are guaranteed accurate. Piston-dwell is a constant factor for all engines of the same model, and is equidistant either side of top dead center. A scale once correctly calibrated is accurate on all engines of that particular model. The piston dwell or flat spot is accurately considered in the calibration of the scale. All piston positions on the scale are referenced from the top of the stroke and represent true crankshaft positions relative to true top dead center.

## DISASSEMBLY AND MAINTENANCE

Time-Rite may be easily disassembled by slipping the cap out of the body. A slight turning movement while separating will simplify the operation. If a hooked pivot arm is installed, be sure that the hook passes through the slot provided in the spark plug thread adapter. It may be reassembled by snapping the cap into the body until the body stops at the cap shoulder, and the spring tabs grip into the groove in the cap.

If the cap ever gets too loose, the spring tabs on the body can be bent slightly to obtain a firmer grip.

The battery is easily replaced by slipping it out of its place in the cap. Dead batteries should not be allowed to remain in the instrument, as they tend to produce corrosion and may cause damage.



## MAINTENANCE

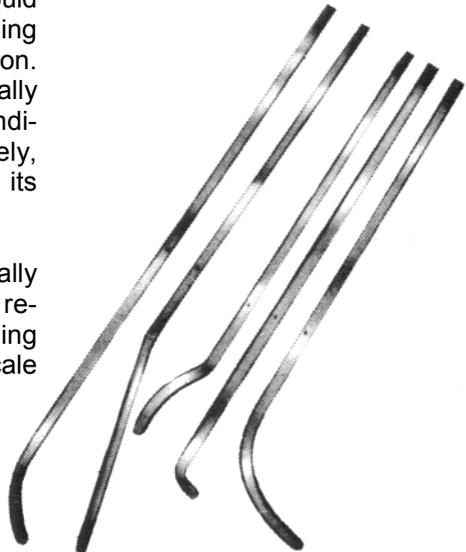
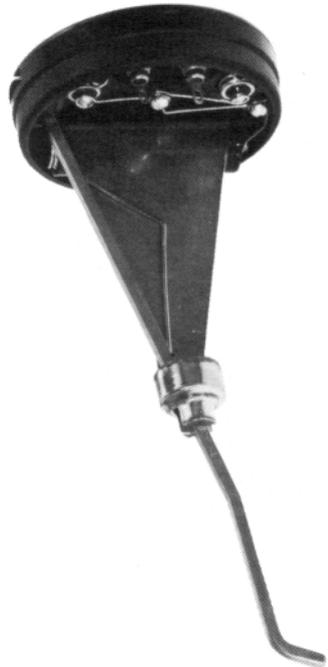
A bulb may be removed by rotating the spring which bears on its base.

If the electric circuit malfunctions, each connection can be easily checked by tracing the wiring. Pivot arms may be be interchanged by lifting the pivot arm retainer and return the pivot spring out of the hole in the pivot arm. Hook or Bent End direction of the Pivot Arm is determined in relation to the cap when the scale is on the right.

Scales are inserted in the scale depression of the cap. If the scale is not snug, bend the arms of the scale friction cap slightly. Be sure the correct side of the scale is used and that the zero degree mark is at the bottom.

The slide pointer should always be kept in good working order. It should be removed occasionally for cleaning or regulation of the spring friction. The spring can be manually manipulated so to produce a condition where the slide will move freely, but retain sufficient friction to hold its place in the T slot.

It may be desirable to occasionally adjust the friction spring which retains the calibrated scale by bending it slightly so that it will hold the scale firmly.

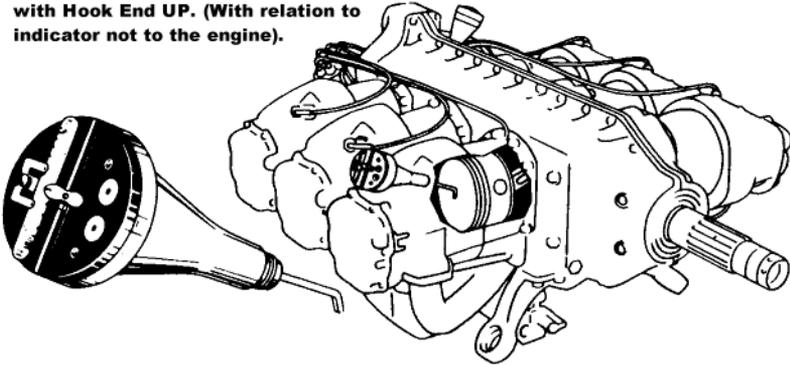


# SPECIAL INSTRUCTIONS

## OPPOSED AND INVERTED ENGINES

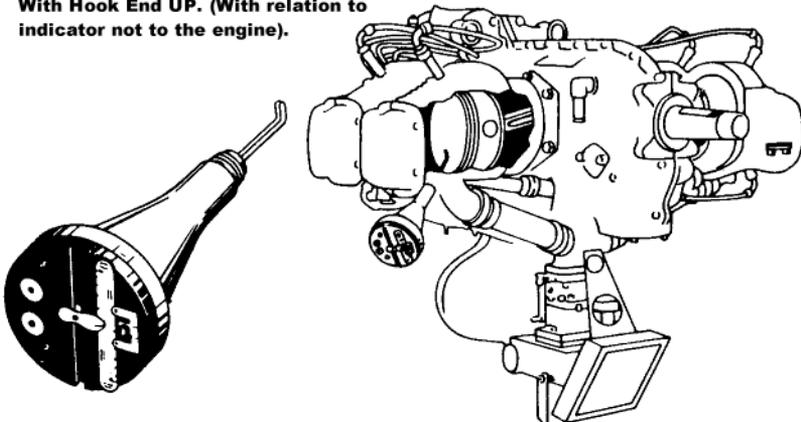
When used in the top spark plug hole of horizontal or flat opposed engines such as Franklin, Continental, or Lycoming, Time-Rite is correctly installed with the calibrated scale to the LEFT. When installed in the bottom plug hole, note that scale will be to the RIGHT. The diagrams on the following pages illustrate these positions as well as the correct position when installed in inverted engines. Note: Hook or Bent End direction of the Pivot Arm is determined in relation to the cap when the scale is to the RIGHT.

**Pivot Arm "A" installed in indicator with Hook End UP. (With relation to indicator not to the engine).**



**Time-Rite installed in top spark plug hole of typical opposed engine**

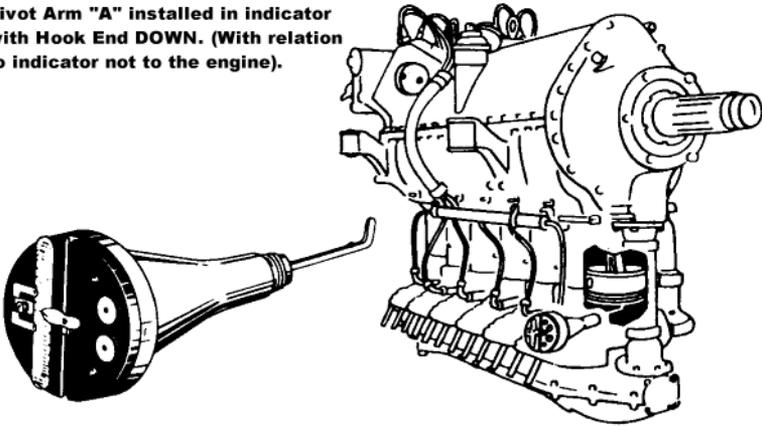
**Pivot Arm "A" installed in indicator With Hook End UP. (With relation to indicator not to the engine).**



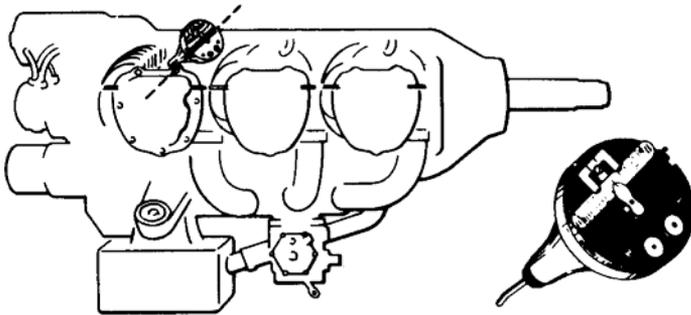
**Time-Rite installed in bottom spark plug hole of typical opposed engine**

# SPECIAL INSTRUCTIONS

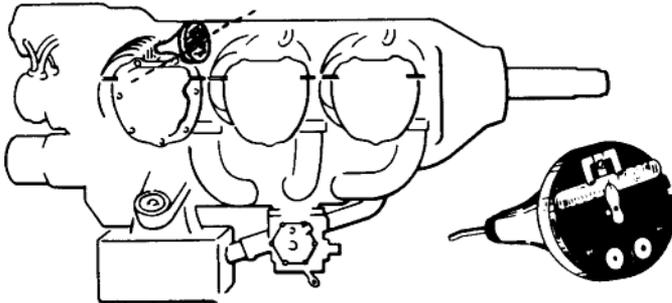
**Pivot Arm "A" installed in indicator with Hook End DOWN. (With relation to indicator not to the engine).**



**Time-Rite installed in Ranger 6-440 (inverted) engine**



**Continental E-165; E-185; E-225 and O-470-A, -E, -J, -11, and -15 (with cyl. #532452, 536727, 538348, and 538610)**



**Continental E-165; E-185; E-225 and O-470-A, -E, -G, -H, -J, -11, and -15 (with new cyl. #536727, 538348, and 538610)**

# SPECIAL INSTRUCTIONS

## CONTINENTAL ENGINES

E-165, E-185, E-225 and 0-470-A, -E, -J, -11 and -15 engines with cylinder #532452 are timed with the -D arm (hook end up) and a -10 scale. The cylinder number is located on the top of the cylinder casting between the rocker box cover stud bosses. After screwing the indicator in tightly turn the cap so that the "T" slot is in line with the rocker box screw and the scale is to the left.

E-165, E-185, E-225 and 0-470-A, -E, -J, -11 and -15 engines equipped with cylinders #536727, 538348, 538610 are timed with the -E arm (hook end down) and the -13 scale. After screwing the indicator in tightly turn the cap so that the "T" slot is in line between the rocker box screws and the scale is to the left.

The side of the -13 scale is imprinted with the following notation: "Continental E Series Engines" is applicable to the series of engines covered above. It should be noted that these engines may have mixed cylinders (both old and new style cylinders) so the cylinder number should always be checked to find the correct arm and scale to be used.

Continental 0-470-B and -13 engines may be timed with the opposite side of the -13 scale imprinted with the following notation "Continental 0-470-Series."

NOTE: In using the Time-Rite on engines equipped with cylinder #536727, 538348, 538610 there may be interference between the largest OD of the Time-Rite and the rocker box cover stud boss. It is permissible to file enough of this boss away so that the Time-Rite will seat on the spark plug hole seat. If necessary to file the rocker box stud boss, it should be done with care and no more material should be removed than is necessary. A dab of zinc chromate paint or alodine on the exposed surface is desirable.

On O-470 -B, -G, -H, -K, -L, -M, -N, -P, -130, IO-470-C, -D, -E, -F, GSO-526-A, and FSO-526-A engines, interference may be encountered between the tapered portion of the Time-Rite body and the cooling fins of the intake section of the cylinder head. This interference can be eliminated, without detriment to the engine, by filing off, with a smooth file, sufficient material from the fin to allow the Time-Rite to seat itself on the spark plug hole seat. The amount of material removed should not exceed 1/4 of an inch on the first fin and progressively reduced through the next six fins. Care should be taken to blend the radii and coat the exposed metal with alodine.

On engine 0-470-B, -G, -H, -K, -L, -M, -N, -P, -13 and IO-470-C, -D, -E, F align the "T" slot in the Time-Rite Cap two-thirds of the way between the first and second studs from right to left.

The Continental GSO-526-A engine is timed both BTC and ATC depending on the magneto being used. The FSO-526-A is timed ATC. Be sure to use the correct side of the scale for the particular timing position desired.

## ALLISON V-1710

Use Pivot Arm "-H" with the bent end pointing down, and Calibrated Scale "-12." This arm and scale calibration is applicable to all models of Allison engines for ignition timing. Valve opening and closing may also be checked on all models

# SPECIAL INSTRUCTIONS

except certain early models having a 6.65:1 compression ratio. It is recommended that Time-Rite be installed in the outside spark plug hole of #6 cylinder (left front bank)

## FRANKLIN ENGINES (Aircooled Motors, Inc.)

Whenever possible, it is recommended that you install the Time-Rite in the top spark plug hole. On 0-425 series, it is necessary to install the Time-Rite using the method as described in the "Note" accompanying step 1.

## ROLLS ROYCE PACKARD V-1650

Use Pivot Arm I-205-J with bent end pointing down, and Calibrated Scale I-209-15. Install in the outside cylinder A-6, left front bank. 14MM Body Assembly required.

## LYCOMING ENGINES

0-360-AIA, 0-340-AIA, 0-235, 0-290, 0-435, and GSO-580. On these engines, interference with rocker box flanges prevents the use of Time-Rite in top spark plug holes. Therefore, install Time-Rite in the bottom spark plug holes of #1 cylinder or in any other cylinder, if necessary. The scale will be to the right when Indicator is correctly installed

## PRATT & WHITNEY ENGINES (Wasp Major R-4360 Engines)

The Model G-18 Time-Rite should be used for all Wasp Major Engines except the R-4360 High Ignition Systems. These systems may be timed with either Model B or Model C-18. Complete instructions for the Model G-18 indicator kit assembly are contained in a separate instruction book furnished with the G-18 indicator kit assembly. The Model D-18 (with Pivot Arm I-205-AX and Scale I-209-16) should be used exactly as the Model B Time-Rite using the cylinder chart below.

Engine Model	Cylinder	Timing Mark on Scale
R-4360-41	D-1, D-2, D-3	20 BTC
	D-6, D-7, D-4	22 BTC
	D-5	

## RANGER

Time-Rite may be installed in either #1 or #6 cylinder

## WRIGHT ENGINES

R-3350. Time-Rite may be used for all timing operations on R-3350 engines. Its use is advocated to correctly time fuel injector units, thus insuring fuel injection to all cylinders at the proper position of piston travel. For full details, the engine manufacturer should be consulted. On R-3350-26W engines Time-Rite should be installed in the front spark plug hole. The interference between the Time-Rite and the intake pipe does not allow its use in the rear plug hole.

R-975, R-760 - Use scale I-209-4. Use Pivot Arm "C" with the Hook-End Down.

# ENGINES-SCALES-ARMS

ENGINE MANUFACTURER	ENGINE MODEL	TIME RITE	SCALE	ARM	U/D *
ALLISON	V-1710-143, -145	B18	12	H	Dn.
CONTINENTAL	A-SERIES	B18	5B	D	Up
	C-75, C-85, C-115, C-125	B18	5A	C	Up
	C-90, C-145, 0-300-A thru D, 0-200 A thru F	B18	10B	C	Up
	E-165, E-185, 1, 3, 8, 9, 11; E-225-4, 8 (with 532452 Cylinders); IO-470-J, 0470-A, E, J, 11, 15 (with 532452 Cylinders)	B18	10A	D	Up
	E-165, E-185, 1, 3, 8, 9, 11, E-225-4, 8; O-470-A, E, J, 11, 15 (with 536727, 538348, 528610 Cylinders)	B18	13A	E	Dn.
	FSO-526-A (ATC), GSO-526-A (ATC)	B18	20A	X	
	G10-300, GO-300-A, B, C, E	B18	21A	U	Up
	GSO-526-A (BTC)	B18	20B	A	Dn.
	IO-470-C, G; O-470-B, G, H, M, N, P, 2, 13	B18	13B	E	Dn.
	IO-470-D, E, F, H, K, L, M, N, R	B18	17	S	Up
	O-470-G, H	B18	21B	T	Up
	O-470-K, L	B18	17A	S	Up
	R-9A, R-760, R-975-C1, C2, C3	B18	4A	C	Dn.
	W670	B18	4B	C	Dn.
FRANKLIN	4A4; 6A4-150, 165; 6V4-178; 0-335-3, 4	B14	7B	A	Dn.
	6A8-125	B14	7A	E	Dn.
	6A4-200, 6V4-200, O-335-2, 5, 5A, 5B, 6, 6B, YO-335-5	B14	8B	G	Dn.
	6A6-245, 6A8, 6V6-245, O-425-1, 5, 9	B14	8A	R	Dn.
JACOBS	L4, R755A	B18	6B	C	Dn.
LYCOMING	D2, O-145-B, C	B18	9A	C	Up
	O-235, O-290-11, O320, A, C, E; O435-17, 23, O-480-1, A1, A6, GO-435, VO-435, GO-480-A1, A6, B, B6, D, F, F6, GO-580, GSO-480-A1A6, B1A6, B1B6, GSO-580, IGSO-480-A, A1, A6, B6, 10-320A TVO-435, TVO-435-B1A	B18	9B	E	Dn.
	O-340-A, O-290-D2B, O-290-D2C	B18	18B	V	Dn.
	GO-480C, C1B6, C2D6; G2D6; GO-480-C1D6; GO-480-C2C6	B18	19	E	Dn.
	IMO-360-A, O-360-A, A1A, VO-360, MO-360, IGO-540, 0540-A, A1A; VO-540, IGSO-540, HIO-360B, 0-340-A1A	B18	18A	D	Dn.
	R-680 (5:5:1)	B18	3A	C	Dn.

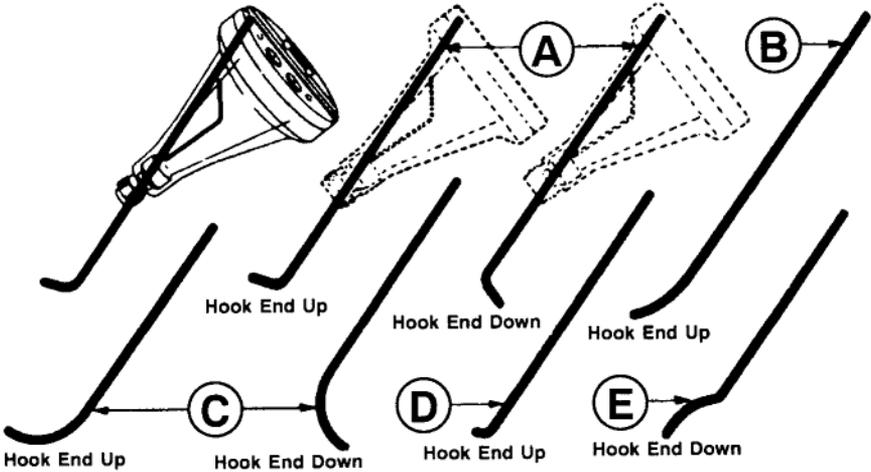
\*Direction of Hook End of Arm.

# ENGINES-SCALES-ARMS

ENGINE MANUFACTURER	ENGINE MODEL	TIME RITE	SCALE	ARM	U/D *
LYCOMING	IO-540	B18	9A	T	Up
	IMO-360-B	B18	19	E	Up
	IO-320-B1A, B, C; 0-320-B, D; GO-480-B1B; B1DB, D1A; 0-235-C1, O-290D, O2B, 0-435A, GO-435-C2, C2A, C2B, D1; GSO-590C, GSO-580D, 0-540-B2B5	B18	9A	E	Dn.
	O-360A1D, O-360C, O-540D, E, F, IO-540-D4A5, IO-360A, B, D, IO-360-A1B6	B18	29A	U	Up
	VO-360A, VO-360B, IVO-360A, HO-360A, HO-360B, HIO-360B, IO-540C, IO-540D, IO-540J, HO-360, IGSO-540-A1A	B18	18A	D	Up
	IO-720, IO-360-A1A	B18	18A	V	Up
	0-360B, 0-540B	B18	19	R	Up
	O-290-D-2	B18	18A	E	Dn.
	0-290D, 0-435A	B18	13A	V	Dn.
PRATT & WHITNEY	R-985, R-1830	B18	24A	A	Up
	R-2000 R-2800	B18	24B	A	Up
	R-1340-H1, R-2180	B18	23A	A	Dn.
	R-4360	B18	23B	A	Up
RANGER	6-440-C	B18	3B	A	Dn.
ROLLS-ROYCE	V-1650, 23, 25	B14	15	J	Dn.
	GIPSY QUEEN 30 MK.2 & 70 MK.2	B14	25A	C	Dn.
	GIPSY MAJOR 140	B14	28A	D	Up
	GIPSY MAJOR 10 MK.2	B14	25B	R	Dn.
WARNER	125, 145, 165, 185	B18	6A	C	Dn.
WRIGHT	R-1300-1A, 2A, 3, 4, C7BA (805941)	B18	11A	K	Up
	R-3350-75 (80594) 749C188D1 (805941)	B18	11B	G	Up
	R-1820-54, 72 WA, 60, 62, 62A, 74W, 76, 76A, 76B, 76C, 76D, 80, 80A, 82, 82A, 84, 84A, C, D, 86, 86A, 97, 101, 103, 103A, C9GB, C9GC, C9HD, C9HE (805940)	B18	2B	B	Up
	R-2600-8, 13, 20, 29, C1488, R-3350-8, 13, 23A, 24W, 24WA, 35, 35A, 57M, 57AM, 83; 745C18BA-3 (805940)	B18	2A	B	Up
	R-3350-26W, 26WA, 26WB, 30W, 30WA, 30WB, 32W, 34, 77, 85, 89, 91 (805942), 861C18CA-2, 956C18CA, 927TC18DA-1, 2, 3, 4; 975C18CB-1, 988TC18EA-1, 2, 3	B18	14B	M	Up
	R-760, R-975	B18	4A	C	Dn.
	R-3350TC18	B18	14A	MA	Dn.

\*Direction of Hook End of Arm.

# PIVOT ARMS & SCALES



**Typical pivot arm positions with relation to indicator...  
not with relation to its installation in engine.**

## PIVOT ARMS & SCALES

Each pivot arm is lettered (A, B, C, etc.). The following pages illustrate these arms which are readily changed by lifting the pivot arm retainer and return spring from the hole in the pivot arm.

The arm illustrations in the back of this book are to scale, and should be used to compare the actual in case where it is suspected that the arm has been bent.

Each indicator kit is equipped only with scales and pivot arms as initially ordered. Extra scales and pivot arms for additional engines are available.

Each scale is numbered, and each side is lettered (2A, 2B). Refer to the following pages for the correct scale to use for the engine being timed.

# PIVOT ARMS



"A" & "AX"



"B"



"C"

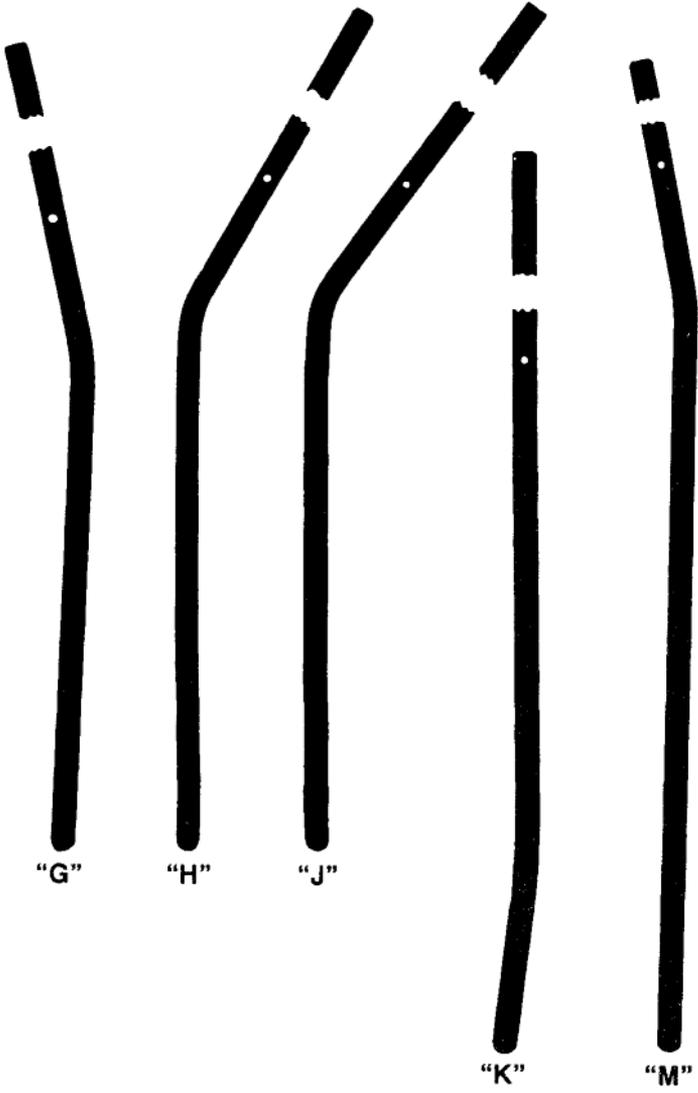


"D"



"E"

# PIVOT ARMS



# PIVOT ARMS



"MA"

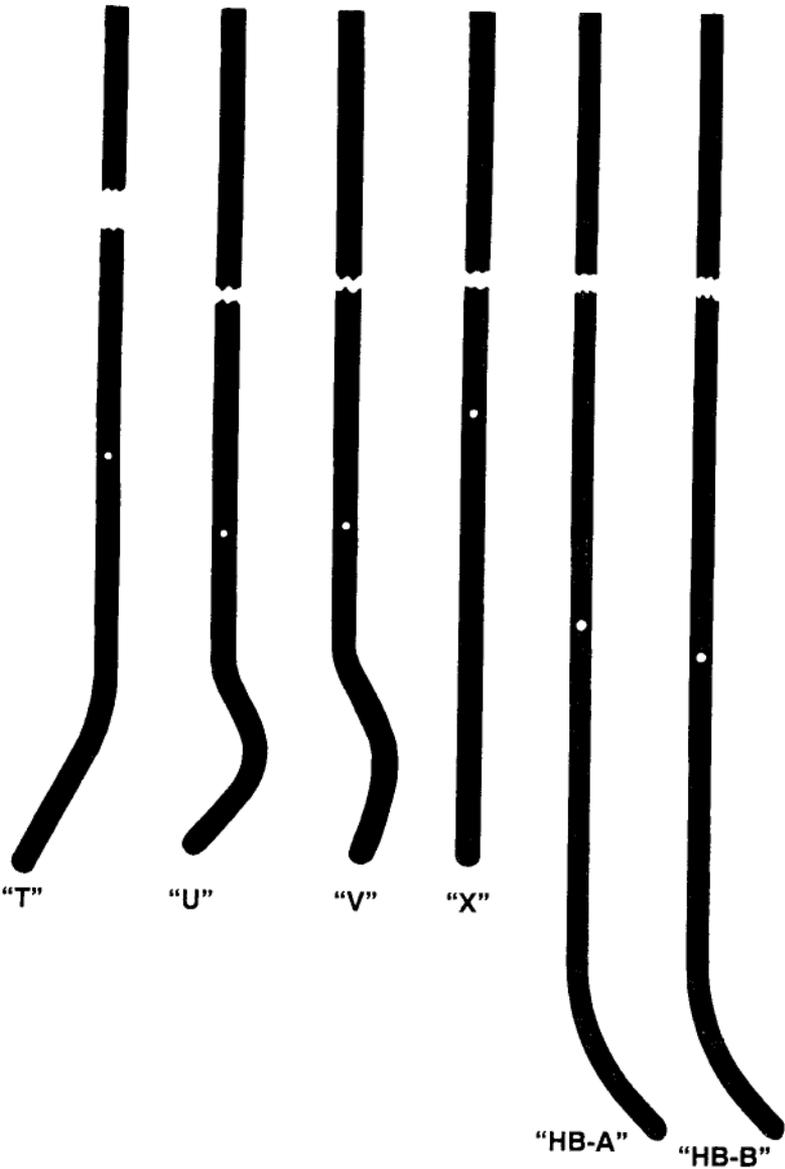


"R"



"S"

# PIVOT ARMS



## **WARRANTY AND SERVICE POLICY**

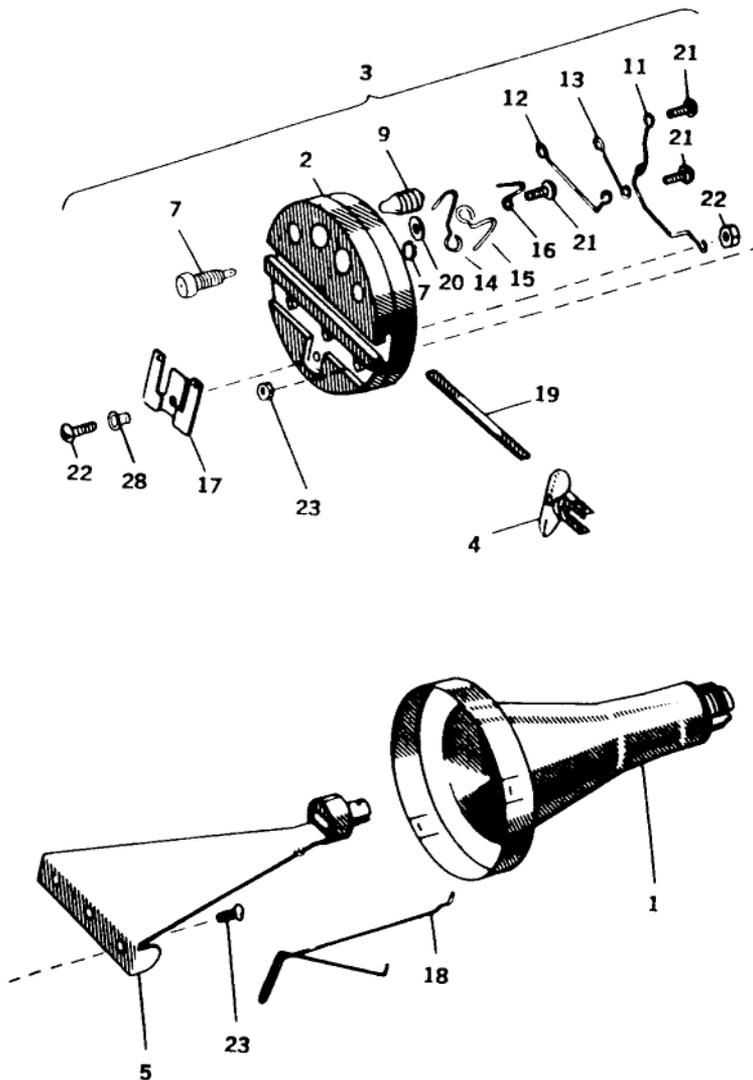
We are dedicated to bring you the best possible product available. When used according to instructions, the efficiency of the Time-Rite and its freedom from defects in material and workmanship are guaranteed for one full year.

If for any reason you find you are having a problem with one of our Time-Rite products please feel free to give our customer service representative a call. We will at that time resolve your problem in the most efficient possible manner. We take pride in our products and our customers are our first priority.

# PARTS LIST

Ref. No.	Description	Part No.
1	Body Assembly 18mm thread standard specify if 14mm is desired.	I-201
2	Cap Only	I-202
3	Cap Assembly Complete	I-296
4	Slide Pointer Assembly	I-203A
5	Pivot Plate Assembly	I-204
6	Pivot Arm (see Table for different arms)	
7	Jack	10047-341
8	AA Battery	Size AA
9	#112 Penlight Bulb	10047-340
10	Scales (see Table for different scales)	
11	Battery Connector	I-210-1A
12	Connector	I-210-1B
13	Bulb Connector	I-210-2
14	Bulb Jack (left)	I-210-3L
15	Bulb Jack (right)	I-210-3R
16	Insert to Bulb	I-210-4
17	Scale Friction	I-210-5
18	Pivot Arm Retainer & Return	I-210-6
19	Contact Strip	I-210-7
20	Contact Washer	10030-55
21	Spring Fastening Screws	10000-159
22	Scale Friction Screw & Nut	10000-167
23	Plate Screws & Nuts	10000-165
24	Magneto Lead Set	I-214
25	Supplemental Battery Leads	I-215
26	Supplemental Battery	I-216
27	Carrying Case	I-358
28	Eyelet	10047-347

# PARTS LIST



Replacement parts should be ordered in accordance with the parts list



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- Clecos Pliers
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