OPERATION & MAINTENANCE MANUAL

BT 700K FLAMELESS HEAT

AEROTECH

HERMAN NELSON

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WARRANTY

MULTITEK NORTH AMERICA LLC
LIMITED WARRANTY TO ORIGINAL PURCHASER

Multitek hereby warrants to the original purchaser its products from defects in material and workmanship for a period of one year (365 days) or 1000 hours whichever occurs first from the date of delivery to the original purchaser. For units and accessories in dealer's stock, warranty start date shall be no later than one year (365 days) from the date of shipment from Multitek or 100 hours whichever occurs first for a period of one year (365 days) or 1000 hours whichever occurs first. This warranty does not apply to items such as parts, components and other accessories not manufactured by Multitek; such items are covered by individual warranties of the manufacturers of such equipment, terms of which may vary.

Within the warranty time period, Multitek will, at its sole and exclusive option, and at no charge to the purchaser, either repair, replace f.o.b. its factory, or allow credit at the then current dealer net price for any part manufactured by Multitek that shall be proved to be defective in workmanship or material, provided that, upon receipt of written request from Multitek, all parts claimed defective be properly identified and returned to the factory within thirty (30) days of such request with all charges prepaid. No repairs shall be made, ,however, without prior written consent and approval of an authorized agent of Multitek. Multitek will not accept any charges prepaid. No repairs shall be made, however, without prior written consent and approval of an authorized agent of Multitek. Multitek will not accept any charges for labor and/or parts incidental to the removal and remounting of parts repaired or replaced under this warranty.

This warranty covers only new equipment in the original owner's possession which, after shipment from Multitek, has not been manufactured or altered in any manner whatsoever without the written consent of Multitek. The express warranty herein furthermore shall not apply to any equipment defect caused, either directly or indirectly, or in part, by the neglect, misuse, abuse or operation of said equipment under conditions other than those specified by Multitek. Request for warranty will be accepted on service parts that fail due to defects and workmanship within 90 days from date of purchase.

THE EXPRESS WARRANTY SET FORTH HEREIN IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING SPECIFICALLY, BUT NOT EXCLUSIVELY, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS OR PARTICULAR PURPOSE SET FORTH IN THE UNIFORM COMMERCIAL CODE. ANY AND ALL SUCH WARRANTIES, TO THE EXTENT PERMITTED BY LAW, ARE HEREBY EXPRESSLY DISCLAIMED AND EXCLUDED, ANY LIMITED WARRANTIES WHICH ARE NOT EXCLUDED HEREBY DUE TO OPERATION OF LAW ARE SPECIFICALLY LIMITED IN DURATION TO THE PERIOD OF THE EXPRESS WARRANTY PROVIDED HEREIN.

THE REMEDIES SET FORTH HEREIN ARE SOLE AND EXCLUSIVE REMEDIES OF THE ORIGINAL PURCHASER HEREUNDER, AND MULTITEK SHALL NOT BE LIABLE FOR ANY FURTHER LOSS, DAMAGES OR EXPENSES, INCLUDING INCIDENTAL OR CONSEQUENTIAL DAMAGES, ARISING DIRECTLY, INDIRECTLY OR IN PART FROM THE USE, INSTALLATION, MAINTENANCE AND SERVICING OR ITS PRODUCTS.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation on the duration of any implied warranties not excluded hereby due to operation of law may not apply to you. Some states do not allow the exclusion or limitation of warranty gives you specifically legal rights, and you may also have other rights which vary from state to state.

The warranty registration form must be returned to Multitek to validate the warranty.

To make a claim under this Limited Warranty, contact your dealer in writing at the address below.

Provide as to said claim the following information:

(a) Your name, address and telephone number.

(b) A description of the product which is the subject of the claim, including:

(1) Model name and year; and

(2) Serial number.

(c) Date of purchase of product.

(d) Name and address of the dealer from whom said product was purchased.

(e) Nature of the product failure.

For further information regarding this Limited Warranty, contact Multitek at the address stated below.

MULTITEK NORTH AMERICA LLC. PO BOX 170 375 PROGRESS ST PRENTICE WI 54556

JOHN DEERE NEW OFF-HIGHWAY ENGINE WARRANTY

Warranty Duration

Unless otherwise provided in writing, John Deere* makes the following warranty to the first retail purchaser and each subsequent purchaser (if purchase is made prior to expiration of applicable warranty) of each John Deere new off-highway engine marketed as part of a product manufactured by a company other than John Deere or its affiliates and on each John Deere engine used in an off-highway re-power application.

- 12 months, unlimited hours of use, or
- 24 months and prior to the accumulation of 2000 hours of use

Note: In the absence of a functional hour meter, hours of use will be determined on the basis of 12 hours of use per calendar day.

Warranty Coverage

This warranty applies to the engine and to integral components and accessories sold by John Deere, and delivered to the first retail purchaser on or after 1 January 2007.

All John Deere-warranted parts and components of John Deere engines which, as delivered to the purchaser, are defective in materials and/or workmanship will be repaired or replaced, as John Deere elects, without charge for parts or engine repair labor, including reasonable costs of labor to remove and reinstall non-engine parts or components of the equipment in which the engine is installed, and, when required, reasonable costs of labor for engine removal and re-installation, if such defect appears within the warranty period as measured from the date of delivery to the first retail purchaser.

Emissions Warranties

Emissions warranties appear in the operation and maintenance instructions furnished with the engine/machine.

Obtaining Warranty Service

Warranty service must be requested of the nearest authorized John Deere engine service outlet before the expiration of the warranty. An authorized service outlet is a John Deere engine distributor, a John Deere engine service dealer, or a John Deere equipment dealer selling and servicing equipment with an engine of the type covered bye this warranty.

Authorized service outlets will use only new or re-manufactured parts or components furnished or approved by John Deere.

Authorized service locations and the name of the John Deere division or subsidiary making this warranty are listed in the *Parts and Service Directory for John Deere Engines*.

At the time of requesting warranty service, the purchaser must be prepared to present evidence of the engine's delivery date.

John Deere reimburses authorized service outlets for limited travel expenses incurred in making warranty service repairs in non-John Deere applications when travel is actually performed. The limit, as of the date of publication of this statement, is US$400.00 (US$500.00 if engine is marine) or equivalent. If distances and travel times are greater than reimbursed by John Deere, the service outlet will charge the purchaser for the difference.

* "John Deere" means John Deere Power Systems with respect to users in the United States, John Deere Limited with respect to users in Canada, and Deere & Company or its subsidiary responsible for marketing John Deere equipment in other countries where the user is located. DF2369E (4-07)

Purchaser's Responsibilities

The cost of normal maintenance and depreciation.

Consequences of negligence, misuse, or accident involving the engine, or improper application, instillation, or storage of the engine.

Consequences of service performed by someone other than a party authorized to perform warranty service, if such service, in John Deere's judgment, has adversely affected the performance or reliability of the engine.

Consequences of any modification or alteration of the engine not approved by John Deere, including but not limited to, tampering with fuel and air delivery systems.

The effects of cooling system neglect as manifested in cylinder liner or block cavitation ("pitting", "erosion", "electrolysis").

Any premium for overtime labor requested by the purchaser.

Costs of transporting the engine or the equipment in which it is installed to and from the location at which the warranty service is performed, if such costs are in excess of the maximum amount payable to the service location were the warranty service performed at the engine's location.

Costs incurred in gaining access to the engine; i.e., overcoming physical barriers such as walls, fences, floors, decks or similar structures impending access to the engine, rental or canes or similar, or construction of ramps or lifts or protective structures for engine removal and re-installation.

Incidental travel costs including tolls, meals, lodging, and similar.

Service outlet costs incurred in solving or attempting to solve non-warrantable problems.

Services performed by a party other than an authorized John Deere engine service dealer, unless required by law.

Charges by dealers for initial engine start-up and inspection, deemed unnecessary by John Deere when operation and maintenance instructions supplied with the engine are followed.

Costs of interpretation or translation services.

No Representations or Implied Warranty

Where permitted by law, neither John Deere nor any company affiliated with it makes any guaranties, warranties, conditions,representations or promises, express or implied, oral or written, as to the nonoccurence of any defect or the quality or performance of its engines other than those set forth herein, and DOES NOT MAKE ANY IMPLIED WARRANTY OR CONDITIONS OF MERCHANTABILITY OR FITNESS otherwise provided for in the Uniform Commercial Code or required by and Sale of Goods Act or any other statue. This exclusion includes fundamental terms. In no event will a John Deere engine distributor or engine service dealer, John Deere equipment dealer, John Deere or any company affiliated with John Deere be liable for incidental or consequential damages or injuries including, but not limited to, loss of profits, loss of crops, rental or substituted equipment or other commercial loss, damage to the equipment in which the engine is installed or for damage suffered by purchaser as a result of fundamental breaches of contract or breach of fundamental terms, unless such damages or injuries are caused by the gross negligence or intentional acts of the foregoing parties.

Remedy Limitation

The remedies set forth in this warranty are the purchaser's exclusive remedies in connection with the performance of, or any breach of guaranty, condition, or warranty in respect of new John Deere engines. In the event the above warranty fails to correct purchaser's performance problems caused by defects in workmanship and/or materials, purchasers exclusive remedy shall be limited to payment by John Deere of actual damages in an amount not to exceed the cost of the engine.

No Seller's Warranty

No person or entity, other than John Deere, who sells the engine or product in which the engine has been installed makes any guaranty or warranty of its own on any engine warranted by John Deere unless it delivers to the purchaser a separate written guaranty certificate specifically guaranteeing the engine, in which case John Deere shall have no obligation to the purchaser. Neither original equipment manufacturers, engine or equipment distributors, engine or equipment dealers, nor any other person or entity, has any authority to make any representation or promise on behalf of John Deere or to modify the terms of limitation of this warranty in any way.

Additional Information

For additional information concerning the John Deere New Off-Highway Engine Warranty, see booklet Engine Owner's Warranty - Worldwide. DF2369E (4-07)

PRE-DELIVERY INSPECTION CHECKLIST

- Confirm unit has a serial number, model number and vehicle identification number attached in the front lower left side of the unit.
- Confirm operator's packet has been delivered with the unit.
- All the safety decals have been identified an are in a functional state.
- Identify all external features and their function. Insure that all openings are now clear before starting unit.
- Check all fluid levels are at their proper levels.
- Confirm unit initial startup and pump is operational.
- Review all startup and shutdown procedures to ensure proper steps are taken.
- Review basic personal safety and unit safety procedures.
- Review warranty information provided with operators manuals.
- Verification that unit was delivered, basic features and safety were discussed.
- Register your unit.

PRE-OPERATIONAL CHECKLIST

- Check engine oil. Add if require per specifications named in engine operators manual.
- Check coolant level while engine is still cold. Coolant should not exceed the bottom of the filler neck. If required add to the radiator and check coolant system for leaks.
- Check fuel filter for water or debris. Drain filters as needed.
- If the air cleaner is fitted with an automatic dust unloaded valve, squeeze valve to clear away any dust.
- If air intake is equipped with an air intake restriction indicator gauge, check to see if service is needed.
- Inspect all engine compartments while engine not in operation. Look for oil, coolant leaks, worn fan and accessory drive belts, loose connections and trash build-up. Remove trash buildup and have repairs made as needed.
- Inspect radiator for leaks or debris. Have service done prior to use of unit.
- Check air intake hoses and connections for loose connections and cracks. Have service done prior to use of unit.
- Check all belts for cracks or damage. Have service done prior to use of unit.
- Check engine mounts for any broke or cracked mounts. Have service done prior to use of unit.
- Check for fire extinguisher and perform an inspection.

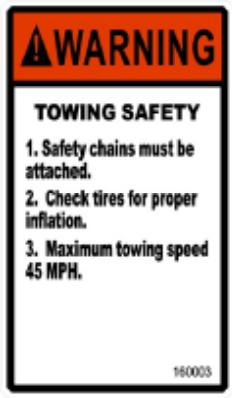
WARNING!

DOORS MUST BE CLOSED WHILE IN OPERATION.

Located on both sides of unit below the doors, failure to adhere to warning could result in serious personal injury or overheating of engine.

Located above the emergency shut off button on the right side of the unit. If shut down is not done properly it will cause damage to the unit

Located on the right side of the unit on the air outlet assembly. Use caution when working near this label. Personal injury will occur if contact is made.



Towing instructions located on the air louver at the front of the unit. Do not disregard warning as damage to the unit or personal injury may occur.

GENERAL OPERATOR SAFETY INSTRUCTIONS

TO ENSURE A SAFE WORKING ENVIRONMENT THE FOLLOWING ARE SAFETY GUIDELINES WHILE THE EQUIPMENT IS IN OPERATION. FAILURE TO MAINTAIN THESE GUIDELINES CAN RESULT IN GREAT BODILY HARM, POTENTIAL DEATH AND OR DAMAGE TO THE UNIT.

1. Stop engine and put the key in your pocket when adjusting any part of the machine, unless the procedure is approved by Multitek.
2. Make sure machine is operating on a level operating surface.
3. Do not operate in a small or confined area as this unit produces carbon monoxide
4. Store fuel away from flammable materials
5. Keep all observers at a safe distance from work areas.
6. Keep all children and minors away from equipment while in operation.
7. Do not wear baggy or loose clothing around machinery. Parts are moving at a high rate of rotation and loose articles may become entangled in the drive components or engine.
8. Long hair should be tied back securely due to the potential of becoming entangled in the drive components and engine causing serious bodily harm.
9. Wear personal protective equipment (PPE) approved by CSA or ANSI. Examples of needed PPE for this piece of equipment would be hearing protection, eye protection, and gloves as the unit is very hot while in operation.
10. If operation of the unit is not normal follow the shut down instructions immediately. Emergency shutdown procedures can be found in section 3.6 in this manual.
11. Keep hands, feet and clothing away from power-driven parts and be aware of coworkers' locations. Failure to avoid moving or extremely hot surfaces could result in serious bodily harm if not death.
12. Do not operate unit while intoxicated or under the influence of any drugs or alcohol.
13. Do not smoke near the unit or while refilling the unit with fuel.
14. Do not place unit or refill unit by or near an open flame. If you need to see into th unit use a flashlight or alternate light source with no flame.
15. Make sure all safety guards are in place and in proper working order. Do not operate unit without guards in place, to do so may result in serious bodily harm, death or damage to the unit.
16. A carbon monoxide detector is highly recommended while using this unit to heat an enclosed area.

WARNING

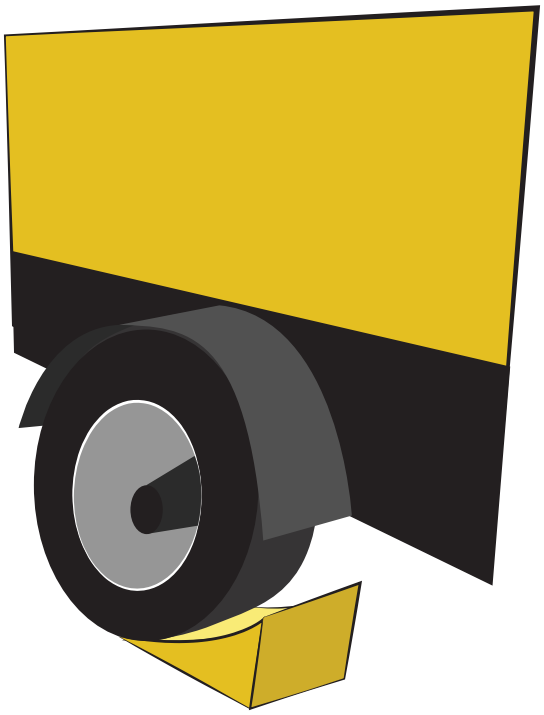
All guidelines put forth must be adhered to. If any guideline is ignored the potential for serious bodily harm, death or damage to the unit is very likely. When this unit is in operation it has many fast moving parts and becomes very hot. Extreme caution should be taken.

SERVICE TIRES SAFELY

Failure to follow proper procedures when mounting a tire on a wheel or rim can produce an explosion that may result in serious injury or death. Do not attempt to mount a tire unless you have the proper equipment and experience to perform the job. Have it done by a qualified tire repair service.

When sealing tire bends on rims, never exceed 80 psi or maximum inflation pressures specified by the tire manufacturer for mounting tires. Inflation beyond this maximum pressure may break the bead, or even the rim, with dangerous explosive force. If both beads are not seated when the maximum recommended pressure is reached, deflate, reposition tire, re-lubricate the bead and re-inflate. A tire should be enclosed in a cage in case of accidental explosion. Please follow manufacturer's recommended tire pressure.

(Such information is also available from the Rubber Manufacturers Associations and from tire manufacturers).

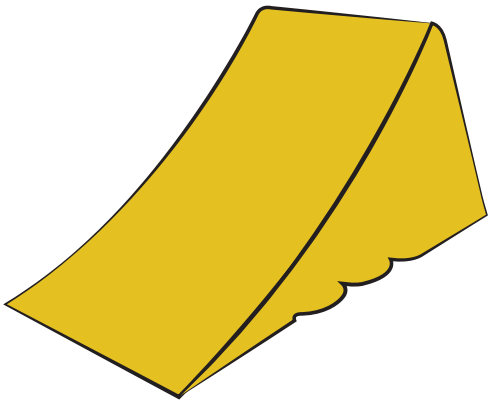


NOTE

Always block heater when adjusting brakes or changing tires.

IMPORTANT!

Always block or chock wheels when heater is parked.



AVOID HIGH-PRESSURE FLUIDS

WARNING!

Escaping fluid under pressure can penetrate the skin, causing serious injury. Relieve pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks.

If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene may result.

DO NOT TAMPER WITH ANY PRESSURE SETTINGS

If the machine is not performing to your expectations, please contact our Service Department to correct any problem you may have. Call Toll-Free at 1-800-243-5438. Should it become necessary to loosen or remove any hydraulic fitting, please follow this procedure:

1. Shut off the engine to stop the hydraulic pump.
- Back and forth several times.

Hydraulic power is excellent, but it can be as dangerous as electricity or fire if not properly contained or controlled.

An operator must be conditioned to think about mechanical failures and broken metal components as being a hazard to the safety of others and himself while working. Sometimes not enough attention is paid to the condition of the hoses, pumps, valves, etc., because they do not appear to be doing much.

Do not neglect frayed, kinked, cracked, or otherwise damaged hydraulic components. Just because it isn't leaking doesn't prove that it will not fail.

Very high pressure must be developed within hydraulic system components in order to perform the tasks demanded of them. Rupture of a pressurized component will allow the trapped oil to be released suddenly with all possible deadly force.

Because of the various types of hydraulic hoses and how they are used, installation or environmental stress can be blamed for many failures. The most frequent problems are:

Twisting the hose during hose installation - When a hose is twisted during installation, structural damage may occur (especially if they are twisted to the point that kinks develop). Some of the braiding may break or separate at the kink, causing a weak point and possibly a hose rupture. A hose may look fine on the outside but may be damaged internally. Make sure hoses are not distorted when fittings are tightened.

****Installing the hose with sharp bends in it -*** Sharp bends can cause hoses to rupture on the outside radius of the bend. You can correct the problem by properly routing the hose or installing shields to prevent bending over sharp corners.

**** Excessive heat or cold -*** unless hoses are specifically designed for high heat usage, some become brittle and hard from extremely high temperature operation. The inner liner in many hoses will start to harden when exposed to temperatures above 200°F (93°C).

Extreme heat build-up can be the result of many factors, such as:

-Faulty or improperly adjusted valves
-High pressure leaks
-Low fluid levels
-Dirt build-up on lines, hoses, reservoir or cooler

When replacing any heat-damaged hose, determine whether the system is exceeding recommended temperature levels. If it is, correct the overheating problem before installing the new hose.

Cold temperatures can also cause hose failure. Flexing of very cold lines can crack both the inner linings and outer covers.

****External damage or aging of hoses -*** Hoses can be damaged by abrasive rubbing, corrosion, heat from being too close to high temperature sources, and prolonged exposure to sunlight and age. Constant exposure to extreme conditions will eventually deteriorate any hose.

Take special care in the installation and routing of hoses to protect them from external damage.

When hoses begin to deteriorate, replace them. Replacement prior to failure can save costly down-time or repairs and may mean a safer operation for people on or around the job site.

HYDRAULIC SYSTEM CONTAMINATION CONTROL

Contamination control not only helps maximize machine performance, it has a significant effect on component life. Implement the following practices to guard against the effects of contamination:

DURING OPERATION:

-Fix leaks immediately. If oil is leaking out, particles are getting in.
-Replace work seals immediately
-Control operating temperature by keeping the oil tank fully and properly maintaining the oil cooler and relief valves.

DIMENSIONS/INPUTS/OUTPUTS	700 KCA WITH TRAILER VALUE	700 KCA SKID TYPE VALUE
Overall Length	12’2”/3708.4mm	
Overall Width	4’2”/1270.0mm	
Overall Height	7’5”/2032.0mm	
Shipping Length	700 KCA SHIPS FULLY ASSEMBLED SAME DIMENSIONS AS OVERALL	
Shipping Weight		
Shipping Height		
Weight with LRF	5700lbs./2585.4765kg	
Ground Clearance	7.5”/190.5mm	
Heat Input		
Heat Output		
Fuel Consumption at Full Load		
Operating Temperature		
Low Range Fluid (LRF)heat transfer fluid	Mobil 1 Synthetic ATF	Mobil 1 Synthetic ATF
LRF Capacity	15 GAL/56.7812L.	15GAL/56.7812L.
Tires	225/75/R15LRD-235/80/16 LRE	N/A
Tire Pressure	65 PSI / 450 KPA - 80 PSI	N/A
Trailer Hitch	2 5/16”/58.7375mm	N/A
Internal Pump		
Fuel Tank	100 GAL / 150 GAL	100 GAL / 150 GAL
Fuel Type		
Engine Specs	5030HF285	5030HF285

(See John Deere operator’s manual for additional information)

MAINTENANCE LOG

Model Number ***Vin #***

Engine Model ***Engine Serial #***

Date	*Hours*	*Describe Service Performed*	*Notes*

NOTES

OPERATION & MAINTENANCE MANUAL

MODEL IC$_3$D USER MANUAL

AEROTECH

HERMAN NELSON

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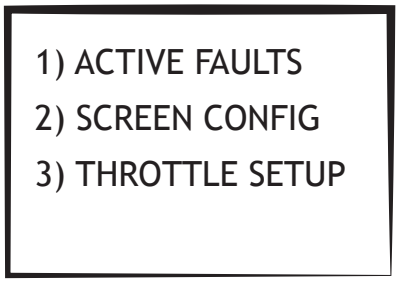
CONNECTOR/ PIN NO.	DESCRIPTION
1	GROUND
2	UNSWITCHED BATTERY (+)
3	SWITCHED BATTERY (+)
4	CAN1-HIGH
5	CAN1-LOW
6 UNUSED	INPUT VTD
7 UNUSED	INPUT VTD
8 UNUSED	SWITCHED GND
9 UNUSED	FREQUENCY INPUT
10 FUEL LEVEL*	INPUT RTD
11 UNUSED	INPUT SWITCHED BATTERY
12 UNUSED	INPUT SWITCHED BATTERY
13 UNUSED	INPUT VTD
14 UNUSED	OUTPUT (BATTERY -)
15 UNUSED	OUTPUT (BATTERY +)
16 UNUSED	OUTPUT (BATTERY +)

*Input may not be used in all configurations.

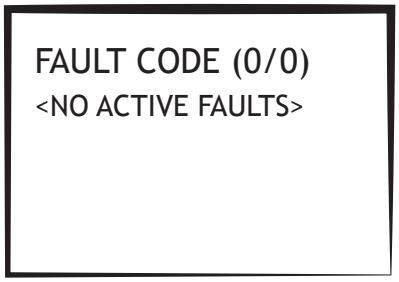


MAIN MENU

Up/Down Button: Scroll the main menu

Enter Button: Make selection of highlighted item

Access: Press and release menu button while at the operation screen

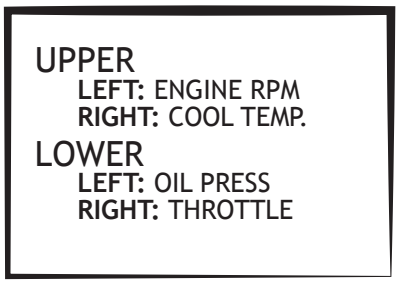


ACTIVE FAULTS

Up/Down Button: Scroll the active fault list

Exit Button: Return to main menu

Access: Main Menu...Active faults



SCREEN CONFIG

Upper Left: Used to set the displayed data in the upper left of the operation screen

Upper Right: Used to set the displayed data in the upper right of the operation screen

Lower Left: Used to set the displayed data in the lower left of the operation screen

Lower Right: Used to set the displayed data in the lower right of the operation screen

Up/Down Button: Scroll the screen

Enter Button: Change highlighted parameter

Access: Main Menu...Screen Config

TYPE: RAMP
LOW IDLE: 800 RPM
HIGH IDLE: 2400 RPM

THROTTLE SETUP

Type: The active throttle mode. In auto mode the controller will automatically control the engine RPM and adjust to attain the temperature set point specific in auto config. When off the rabbit turtle throttle switch on the instrument panel becomes active and is used to manually control the engine RPM. Use the enter key to toggle this value.

Low Idle: The minimum speed when the engine is in automatic mode. Select using the enter key and adjust with the up and down arrows

High Idle: The maximum speed when the engine is in automatic mode. Select using the enter key and adjust with the up and down arrows.

Warm Up Time: The duration of the engine warm-up period in automatic mode. Select using the enter key and adjust with the up and down arrows.

Ramp Up Time: The time it takes to ramp up to full speed in automatic mode. Select using the enter key and adjust with the up and down arrows.

Ramp Down Time: The time it takes to ramp down to low idle in automatic mode. Select using the enter key and adjust with the up and down arrows.

Cool Down Time: The time the engine will run at low idle in automatic mode before allowing the engine to resume full speed operation unless manually overridden. Select using the enter key and adjust with the up and down arrows.

Up/Down Button: Scroll the selected item/Adjust item value

Enter Button: Make selection of highlighted item/Toggle value

Access: Main menu...Throttle setup

OPERATING MODES

RAMP MODE
When the throttle mode is set to RAMP the controller will adjust the engine rpm between low and high idle with the up and down arrows on the controller. The up and down arrows only adjust the RPM when the controller is on the main operation screen and displaying engine data.

MAIN CONTROL
When the throttle is configured to be OFF the engine will be controlled using the rabbit/turtle throttle switch that is found on the instrument panel.

PLEASE READ ALL OPERATORS MANUALS

FOR ADDITIONAL STORAGE INFORMATION

STORAGE INFORMATION

1.) Turn key onto the off position and remove. Engage the emergency stop button.

2.) Complete pre-operational checklist and make sure all services needed are completed.

3.) Complete all maintenance per suggested maintenance schedule.

4.) Disconnect battery and store in a cool dry place. Charge battery monthly to maintain battery's life and integrity.

5.) Secure doors and vents in a closed position.

6.) Make sure all openings are covered or in a closed position.

7.) Reference engine manual for additional storage requirements/preparation.

8.) Touch up any damaged areas with paint or sealant to prevent rust from occurring.

9.) Drain any excess fluids if necessary.

10.) Store unit in a covered location to protect unit from the elements.

GENERAL MAINTENANCE

		LUBRICATION AND MAINTENANCE SERVICE INTERVALS			
ITEM	DAILY	EVERY 2 WEEKS	500HRS/12 MONTHS	2000HRS/24 MONTHS	AS REQUIRED
Check engine oil and coolant levels	✓	✓			
Check fuel filter/water bowl	✓	✓			
Check air cleaner dust unloaded valve and restriction indicator gauge	✓	✓			
Visual walk around inspection	✓	✓			
Operate engine at rated speed and 50%-70% load a minimum of 30 min.		✓			
Service fire extinguisher			✓		
Check engine mounts			✓		
Service batteries			✓		
Change engine oil and replace oil filter			✓		
Check crankcase vent system			✓		
Check air intake hoses connections and system			✓		
Replace fuel filter elements			✓		
Check automatic belt tensioner and belt wear			✓		
Check engine electrical ground connection			✓		
Check cooling system			✓		
Coolant solution analysis-add SCA's as required			✓		
Pressure test cooling system			✓		
Check engine speeds			✓		
Check crankshaft vibration damper				✓	
Flush and refill cooling system				✓	
Test thermostats				✓	
Check and adjust engine valve clearance				✓	
Add coolant					✓
Replace air cleaner elements					✓
Replace fan and alternator belts					✓
Check fuses					✓
Bleed fuel system					✓

MAINTENANCE LOG

Model Number ***Vin #***

Engine Model ***Engine Serial #***

Date	*Hours*	*Describe Service Performed*	*Notes*

MEMBER

X MAINTENANCE - fans have few moving parts and seldom need more than inspection, cleaning wheels and lubrication.

INSPECTIONS depend upon the fan environment. Time intervals between inspections become obvious. Then set up and maintain a consistent schedule.

CLEAN FAN WHEELS assure good wheel balance and increased bearing life. Grease and dust buildup is the major cause of excessive vibration and fan failure.

LUBRICATION: Bearings and lubricated on factory assembled fans.

1. **Grease Type Ball or Roller Bearings -** Some smaller ball bearings are permanently lubricated. Periodically, grease should be added to other bearings. Add grease slowly until a slight bead forms at the seals. **AVOID OVER-PACKING! TOO MUCH GREASE WILL CAUSE OVERHEATING.** Inspection every two months should be adequate unless service is heavy and speed is high.
   WARNING: DO NOT LUBRICATE WHILE FAN IS IN OPERATION AND MOVING.
2. Oil Type Bearings - Select an oil that will have these viscosities at operating temperatures.
   a. Ball Bearings: 13 Centistokes (70 Saybolt Sec.)
   b. Spherical Roller Bearings: 20 Centistokes (100 Saybolt Sec.)
   NOTE: Oil type Ball Bearings and spherical Roller Bearings...add oil threw cups and only after the fan has stopped for a least five minutes. Do not overfill.
   c. Sleeve Type Bearings Fill with oil to the top of the center circle the oil gauge; level should not drop below bottom of circle. **DO NOT OVER-LUBRICATE!** This causes overheating, bearing failure. A weekly check of oil level and contamination is desirable, but seldom needs oil more than once a month. Change oil after first 120 hours, then after each 1,000 hours, normally (depending upon dirt in environment). **BE SURE OIL LUBRICATORS ARE LEVEL** especially with extended piping.
   NOTE: A slight rise in temperature is normal after re-lubrication until bearing chamber is stabilized.

C.**STORAGE ON JOB SITE** (plus shutdowns).

☐ **SHORT TERM** (less than 30 days)
- ☐ Store in clean, dry location
- ☐ Cover equipment fro protection from moisture and dust.
- ☐ Keep covered when moving to prevent condensation.

☐ **LONG TERM STORAGE** (over 60 days). Same as short term storage PLUS...
- ☐ Suspend silica gel bags in outlets and inlets.
- ☐ Fill bearings to capacity for protection.
- ☐ Coat machined surfaces with grease.
- ☐ Cover inlets and outlets with lids.
- ☐ Enclose entire fan with plastic or tarp.

D.**MAINTENANCE DURING STORAGE** (long and short term periods)

☐ **TURN SHAFT EVERY TWO WEEKS.** This prevents a permanent "set" of bearings. This false brinelling causes vibration to be transmitted threw the bearing and eventual failure.

☐ **RUN FAN FOR 15 MINUTES EVERY TWO WEEKS** if possible.
- ☐ Remove silica bags before starting
- ☐ Be sure that bearings are lubricated and aligned
- ☐ Replace silica bags after operating fan.

Dirt Exposure	Bearing Moisture Exposure	Bearing Operating Temperature	Greasing Interval (1)	Use Grease Equivalent to these
Slight	None	32˚F to 120˚F 120˚F to 160˚F 160˚F to 200˚F	6 months 2-4 months 1-2 months	High quality NLGI No.2 multi-purpose ball bearing greases are generally satis-factory. Consultation with the reputable lubricant supplier is recommended.
Moderate to Heavy		32˚F to 160˚F 160˚F to 200˚F	1-4 weeks 1 week	
Slight to Heavy	Direct water splash or exposure to outdoor environment	32˚F to 200˚F	Daily to 1 week or as determined by inspection of instillation	Mobil Oil Co., Mobiluz EP2 Shell Oil Co., Alvania EP2 Texaco Inc., RB2
Slight	None	-60˚F to 32˚F	Determined by inspection of instillation	Esso, Beacon 325 • Shell Oil Col, Aeroshell 7A Texaco Inc., Low Temp EP
		Above 200˚F		Special lubrication may be required

(1)Frequency of re-greasing will vary, depending on the hours of operation, temperature and surrounding conditions.

SLEEVE BEARINGS - OIL VISCOSITY		
Room Temp at Startup	Speed	Oil Required
Below -10˚F	All	Consult
-10˚F to 32˚F	All	SAE 10
32˚F to 70˚F	Low	SAE 20
	High	SAE 10
Above 70˚F	Low	SAE 30
	High	SAE 10 (light loads)
	High	SAE 20 (heavy loads)

Oil film in liner should not exceed 180˚F. Only use high quality petroleum oils, straight mineral type with rust and oxidation inhibitor and anti-foam agent. Approximate viscosity below.

SAE 10 = 183 SUS at 100˚F; 46 SUS at 210˚F
SAE 20 = 348 SUS at 100˚F; 57 SUS at 210˚F
SAE 30 = 489 SUS at 100˚F; 65 SUS at 210˚F

GREASE LUBRICATION

Dirt Exposure	Bearing Moisture Exposure	Bearing Operating Temperature	Greasing Interval (1)	Use Grease Equivalent to these
Slight	None	32°F to 120°F 120°F to 160°F 160°F to 200°F	6 months 2-4 months 1-2 months	High quality NLGI No.2 multi-purpose ball bearing greases are generally satis-factory. Consultation with the reputable lubricant supplier is recommended.
Moderate to Heavy		32°F to 160°F 160°F to 200°F	1-4 weeks 1 week	
Slight to Heavy	Direct water splash or exposure to outdoor environment	32°F to 200°F	Daily to 1 week or as determined by inspection of instillation	Mobil Oil Co., Mobiluz EP2 Shell Oil Co., Alvania EP2 Texaco Inc., RB2
Slight	None	-60°F to 32°F	Determined by inspection of instillation	Esso, Beacon 325 • Shell Oil Col, Aeroshell 7A Texaco Inc., Low Temp EP
		Above 200°F		Special lubrication may be required

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SAE 20 = 348 SUS at 100°F; 57 SUS at 210°F
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Warranty of Sellers' Products

Warranty of Sellers' Products - Except where a different express written warranty has been issued with respect to a particular product, no warranty of any kind, express or implied is extended by the seller to any person or persons other than its direct buyers. To direct Buyers, the seller warrants only that it will finish by freight a replacement for or at its option repair, any product of its manufacturer or part or portion thereof, proved to its' satisfaction to be defective in material or workmanship under normal use and service within one year from the date of shipment.

The seller shall have no responsibility for the performance of any product sold by it under conditions varying materially from those under which such product is usually tested under existing industry standards, not for any damage to the product from abrasion, erosion, corrosion, deterioration or the like due to abnormal temperatures or the influence of foreign matter or energy, nor the design or operation of any system of which any such product for any particular application. The seller shall not be liable for any cost or expense including, without limitation, labor expense, in so connection with the removal or replacement of alleged defective equipment or any part of portion thereof not for incidental or consequential damages of any kind, not under any circumstances for any damage beyond the price of the good sold. Any freight allowances to connection with a replacement will be on the same terms as were applicable to the original sale, except that a replacement for a product or part or portion thereof which is proved to the seller satisfaction to be defective in material or workmanship as provided herein above,, will in any event be furnished with freight (but not local cartage) allowed, inside the continental US (excluding Alaska and Hawaii) to the 1st destination.

Other warranties-the foregoing warranty is in lew of all other warranties of any kind, express or implied and of all other obligations or liabilities, on the part of the seller. The seller neither assumes, nor does it authorize any other person to assume on its behalf, any liability in connection with the sale of its products.

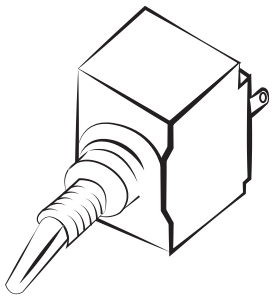
Consult your local representative or factory for additional information.

2.0 OPERATING THE WEBASTO TSL 17

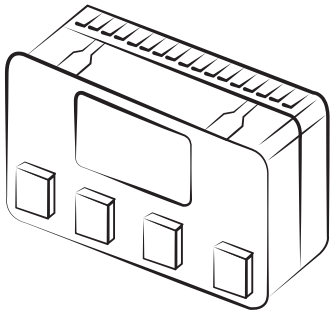
Before switching on the TSL 17, set vehicle heating system to the “heat position and open any shut off valves. Depending on the type of control installed in the dashboard of the vehicle, the TSL 17 can be operated by the following methods.

2.1 SWITCHING ON

USING A SWITCH:



USING THE OPTIONAL DIGITAL TIMER:



USING THE SWITCH:

When the switch is used for turning “ON” the TSL 17, the operation indicator (toggle) lights up. Shortly thereafter, the heater begins operation and delivers heated coolant to the engine.

The TSL 17 will cycle on and off until:
The toggle switch is switched “OFF”.
The vehicle battery voltage drops below 9.6V or the TSL 17 runs out of fuel.

2.2 Switching Off

Manually: When heating is no longer required, switch the TSL 17 heater off by means of the toggle switch or by pressing the “instant heat” button on the optional timer.

The indicator light turns off, combustion is extinguished followed by an after run cycle of approximately 90 seconds.

Startup Sequence:
The coolant circulating pump, ceramic igniter and combustion air fan start operation and after approximately 60 seconds combustion starts (audible combustion sound). After the coolant temperature has reached the set point of 170˚F (77˚C) the TSL 17 will automatically adjust its heat output to a lower operating range (part-load heat output). If the temperature of the coolant continues to rise and climb over 174˚F (79˚C) at the heater outlet, the heater will cycle off.
When the temperature falls below 149˚F (65˚C) the heater will restart and repeat the heating cycle.

NOTE

If heaters being switched on while the engine is warm only the circulating pump will run, coolant temperature must fall below 86˚F (30˚C) before heater starts.

MAINTENANCE OF THE HEATER

Annual Maintenance

The TSL 17 heater requires a minimum of maintenance to keep in good operating condition. The following maintenance procedures should be performed annually before each heating season:

NOTE

For major repair and spare parts return to your authorized Webasto Thermo-systems Specialist.

Enclosure Box and Heater
- Clean the heater and enclosure box from any accumulated debris or dust with compressed air.
- Inspect all components for wear and damage.

Electrical System
- Check wiring harnesses for damage, repair or replace if damaged
- Check the condition of the batteries and the connections.
- Load test the batteries and replace if necessary.

NOTE

The heater will not function properly with weak batteries.

Combustion Air System
- Check for obstructions at air intake port.
- Check air intake tube carefully for restrictions and damage. Repair or replace if damaged.

Exhaust System
- Check the exhaust system carefully for restrictions or corrosion. Replace damaged parts.

Fuel System
- Change fuel filter if equipped. Inspect fuel line for damage, restrictions, routing or loose connections. Repair or replace if damaged.

Coolant System
- Inspect all coolant lines and clamps for leakage, restrictions or damage. Repair or replace.
- Inspect coolant circulation pump or leakage. Repair or replace if damaged.

Operational Test
- Run your heating system for at least 15 minutes.
- Check water and fuel connections for leakage. Re-tighten hose clamps if necessary.

OPERATION & MAINTENANCE MANUAL

BT 700K FLAMELESS HEAT

AEROTECH

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