

5.10 Installation Check List

DATE _____
 UNIT # _____

510	Gin Heading	0	_____	_____	
511	Windspeed Shadow	0	_____	_____	
512	Wrap Factor	100	_____	_____	**
513	Wrap Offset	0	_____	_____	**
514	Altitude	0	_____	_____	
515	Start Date	YYMMDD	_____	_____	

* Reset these parameters when changing controller board.

** Reset these parameters when changing I/O board.

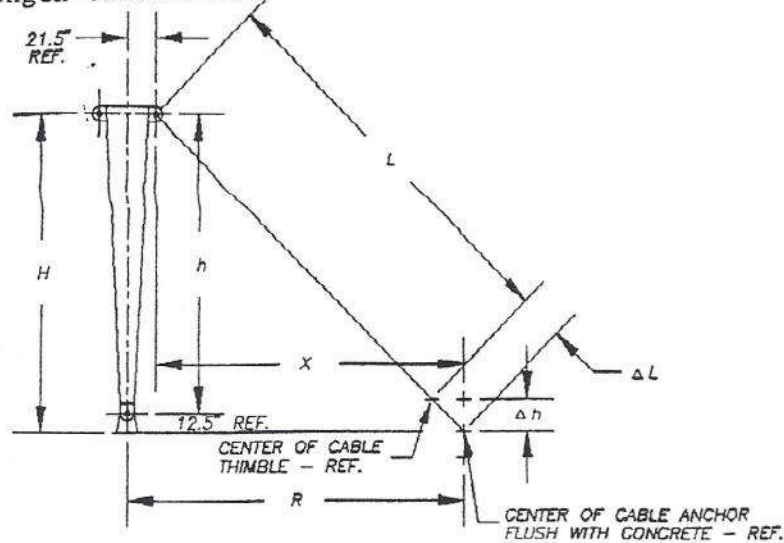
CARTER WIND TURBINES, INC.

Check all items listed: 1) after 1st 50,000 kWhr. generated; 2) after 1st three months of operation; and 3) every 6 months thereafter - except as needed or noted. Date the top of each column every time a unit is lowered and initial each square if item is checked. If maintenance must be performed other than routine check, put number in square and fill out maintenance report.

Normal Maintenance Intervals (300KW) Unit # 17 Gearbox # _____
 Generator # _____ Blade #'s 1048 & 1045 Date Installed _____

	3/18/91	2-22-95	6-21-95	1-9-96					
Check transmission magnetic plug (2 places)	LA	OK	OK	OK					
Grease yaw bearings (1 place), front generator bearing and input shaft seal	LA	OK	OK	OK					
Check blades for pitch up and return	LA	OK	OK	OK					
Check snubber dead band (1/2" max)	blade #1048 3/16	OK	OK	OK					
	blade #1045 1/8	OK	OK	OK					
Clean snubber magnet surfaces	LA	OK	OK	OK					
Check torque on hub bolts, leading edge arm bolts, and all blade overspeed bolts									
Check elastomeric bushings	LA	OK	OK	OK					
Check input shaft slip ring and brushes	LA	OK	OK	OK					
Check brake caliper float	LA	OK	OK	OK					
Check brake pad wear and self adjustment	LA	OK	OK	OK					
Check brake motor operation & power off delay (10-30 sec)	LA	OK	OK	OK					
Check brake motor solenoid gap	LA	OK	OK	OK					
Check yaw travel with clutch slipping (20" to 25" O.K. with blade hub & blades parallel to tower)	LA	OK	OK	OK					
Check yaw gearbox leakage & oil level if necessary	LA	OK	OK	OK					
Check yaw flag operation	LA	OK	OK	OK					
Check out of balance operation	LA	OK	OK	OK					
Check main gearbox leakage & oil level if necessary	LA	OK	OK	OK					
Change oil filter & take oil sample once per year	LA	OK	OK	OK					
Change transmission oil & filter after 50,000 kWhr's or if oil sample dictates (Mobil SHC 629(UK) or 632(US) 16 qts.)	LA								
Check guy cables, turnbuckles and anchors	LA	OK	OK	OK					
Check turnbuckle jam nuts	LA	OK	OK	OK					
Check guy wire tension - note space between threaded studs after tightened	LA	OK	OK	OK					
Check all pins & 1/2 inch bolt keepers	LA	OK	OK	OK					
Clean blades (if efficiency is below 85%)		OK	OK	OK					
Grease pulley blocks and winch	LA	OK	OK	OK					
Check pulley cable for frays and kinks	LA	OK	OK	OK					
Check blade track	LA	OK	OK	OK					
Check for a kWhr meter disk oscillation of more than ±1/4" per rotor blade revolution (between 0 & 10 kW)		OK	OK	OK					
Check capacitor contactor operation		OK	OK	OK					
Check current flow thru generator heaters (≈ .9 amps if both heaters are working									
Check blade pitch up in winds over 25 mph - both blades pitched & stayed pitched up		OK	OK	OK					
Check lightning arrestors	LA	OK	OK	OK					
Turn power off to controller & check that 3 V battery supply to components stays up									

Cable Length Calculations



$$L'' = (H^2 + X^2)^{1/2} - \Delta L'' \quad \text{WHERE:}$$

$$H'' = h'' + 12.5'' \pm \Delta h \quad (+ \text{ IF BASE PAD IS HIGHER THAN ANCHOR PAD, } - \text{ IF BASE PAD IS LOWER THAN ANCHOR PAD})$$

Δh = ELEVATION OF CONCRETE CABLE ANCHOR PAD RELATIVE TO CONCRETE BASE PAD.

$$X'' = R'' - 21.5''$$

$\Delta L''$ SIDES = 78.5"
 $\Delta L''$ AFT = 71.5"
 $\Delta L''$ FORE = 92"
] = GIVEN DISTANCE BETWEEN CENTER OF CABLE THIMBLE & CENTER OF CABLE ANCHOR FLUSH WITH TOP OF CONCRETE - REF. LENGTH OF TURNBUCKLE, ANCHOR PAD, TRIANGLE PLATES, GIN POLE FLANGES AS CASE MAY BE.

		UNIT NUMBER			
EXAMPLE					
h	121' 0.5"				
Δh_{S1}	0				
Δh_{S2}	0				
Δh_A	-0' 6.6"				
Δh_F	0' 5.5"				
RS_1	64' 0"				
RS_2	64' 0"				
RA	64' 0"				
RF	64' 0"				
ΔLS_1	0' 78.5"				
ΔLS_2	0' 78.5"				
ΔLA	0' 71.5"				
ΔLF	0' 92.0"				
LS_1^*	130' 5-3/4"				
LS_2^*	130' 5-3/4"				
LA^*	130' 6-3/4"				
LF^*	129' 9-1/4"				

* ROUND OFF DECIMAL ANSWER TO NEAREST 1/4 INCH FRACTION

5.13 Pulley Block Mounting Procedure/Check List

WARNING: DO NOT ATTEMPT TO RAISE OR LOWER UNIT WITH LOWER PULLEY BLOCK MOUNTED TO WINCH. PERSONAL INJURY AND LOSS OF ENTIRE WIND TURBINE COULD RESULT.

NOTE: USE TWO PEOPLE TO PERFORM THIS OPERATION.

1. _____ With pulley blocks mounted to winch, back winch onto mounting pad and unhook from truck.
2. _____ Manually position winch under gin pole vang, swing pulley blocks upward, and align upper pulley block with hole in vang.
3. _____ Insert pin and install locking bolt, nut, & washer.
4. _____ Connect winch power cord and control box.
5. _____ Apply caulking around studs on winch mounting pad if necessary.
6. _____ Position winch and lower onto mounting studs, unwinding cable as necessary.
7. _____ Install winch mounting nuts and washers. Torque to 300'#.
8. _____ Detach lower pulley block from winch by removing locking nut, washer, bolt, and then mounting pin.
9. _____ Swing lower pulley block out and align with hole in triangle plate.
10. _____ Insert pin and reinstall locking bolt, nut, & washer.
11. _____ Remove winch tongue if winch is to be left in place for an extended period of time.
12. _____ Double check all preceding steps before continuing.
13. _____ Increase tension on cable enough to remove upper turnbuckle pin.
14. _____ Remove upper turnbuckle pin and lower turnbuckle to the ground.

Turbine is now ready to be lowered. Use reverse procedure to dismount pulley blocks and move winch.

5.14 COP Watchdog Test and Set Procedures

NOTE: COP Watchdog must be in place on all units!

To find out if COP Watchdog is set:

1. Do a manual stop before test.
2. Make sure jumper at OS2 is off.
3. Remove jumper at OS4.
4. Push reset button.
5. Put jumper back on OS4.
6. Operate keypad.
 - A.) If display responds normally, COP is set.
 - B.) If display is frozen and does not seem to work, COP is not set.

To set the COP Watchdog:

1. Make sure unit is in manual stop mode before setting COP.
2. Make sure jumper at OS2 is off.
3. Remove jumper at OS4.
4. Push reset button.
5. Put jumper back on OS2 to short the two pins.
6. Use jumper from OS10 to short pins at OS8.
7. Push reset button.
8. Use jumper from OS2 to short pins at OS7.
9. Put jumper back on OS4.
10. Push reset button.
11. Remove jumper from OS4.
12. Put jumper from OS7 back on single pin of OS2.
13. Put jumper from OS8 back on B-C of OS10.
14. Go to step 2 of COP Test Procedure.

5.15 SPI Test Procedures

The following checks can be made to insure that the SPI interface PCB is operating properly. It can also be used to check out or test a new replacement board.

- 1 Enter; 12 Flag Angle, - 0° (-8°) check flag when unit lowered.
- 2 Enter; 21 Wrap Angle, (0°- 9°) in house.
- 3 Enter; 15, temp, abt 35 deg C
Enter; 16, temp, abt 32 deg C
Enter; 17, temp, will be the ambient.
- 4 Disconnect P1 to insure RPM & RPM fail light comes on with RPM sensor failure on display.

- Reset 8 *

- 5 Anemometer check - watch light on SPI WSPEED & read display.

- 6 Test emergency brake 3 *

NOTE: if not operating Q5 is normally the problem.

"Field Test of Emergency Brake"

- Enter; 402, Enter, Alter, 9, Enter.
- push reset button on HSCII
- Enter; 6, watch for BR=1, BS=0 on display window.
- Enter; Hold 5, watch for BR=1, BS=1

- 7 To get out of Manual.

- push reset (HSC11) - 0, Enter, brings the display back to normal.
- clear, 8 *
- 1 *, bump test
- Voltage, checks
 - P7 pin 1, gnd
 - D9, cathode -- > 8 Volts is OK
 - D10, cathode -- > 21 Volts is OK
 - VR2, -- same as D9 cathode, right lead should read +5V on output

- 8 Procedure completed.

5.16 I/O Testing Procedures

The following checks can be made to insure that the I/O interface PCB is operating properly. It can also be used to check out or test a new replacement board.

1 - Enter; 8 *. This should reset the system and display "Blades Available."

1.1 Check voltages at connector P7 coming from the HSC11 PCB. Pin 1 is ground.

Voltage readings and connections as follows:

<u>Neg. lead</u>	<u>Pos lead</u>	<u>Voltage (approx.)</u>
Pin 1	Pin 2	11V
Pin 1	Pin 3	9V
Pin 1	Pin 4	5V

Voltage checks from the I/O PCB to the SPI PCB as follows:

<u>Neg. lead</u>	<u>Pos lead</u>	<u>Voltage (approx.)</u>
Neg side of C11	Top of D9	13V
Neg side of C11	Top of D10	16V
Neg side of C11	Right lead of VR2	5V

2 Check

- enter; 21 hold, (wrap), 9 to -19 is ok without fluctuation.
- enter; 12, (flag angle), looking for 0 degrees.
- enter; 15, temp, abt 35 deg C
- enter; 16, temp, abt 32 deg C
- enter; 17, temp, will be the ambient.

3 Manual Mode.

- Enter; 402, Alter, 9.
- Push reset button on HSC11 PCB. Why are you doing this? To operate from HSC11 to the I/O to the individual functions.
- Enter; 6, brake.
- Enter; 5, hold. Brake, wait for brake to return.
- Enter; 1, bump.
- Enter yaw; *
- Enter yaw; 9 *

5.16 I/O Testing Procedures

- 4 Button Mode on I/O PCB. Press the following push buttons and observe their operation.
 - Brake.
 - Dump.
 - Yaw.
 - Yaw. Yaw D together.
 - Press buttons for lights.
- 5 Push reset on HSC11 to get out of manual mode.
- 6 Procedure completed.

5.17 Troubleshooting and Replacing the HSC11 Printed Circuit Board (PCB)

The following procedures have been developed to give a technician some instructions in the replacement of the HSC11 PCB after determining that the HSC11 PCB needs to be replaced.

It is suggested you read all of the following procedures before beginning with the removal of the suspected faulty board.

- Voltage checks. The HSC11 PCB produces voltages that are sent to the I/O PCB. These voltages are checked as follows.

* Carefully remove connector P7 of the I/O PCB. Using a DMM, connect the ground lead to pin 4, with your positive lead check pins 1, 2, and 3. The voltages should read approximately -10 volts, +10 volts and +5 volts respectively.

- NOTE: Before you remove the HSC11 PCB and disconnect power to the board, insure that you have written down the 500 series parameters. If you do not have the parameters, you will have to refer to the detail procedures for a total system reset.

Replacing HSC11

- Reset System. a more detailed procedure can be found in the CWTI manual.

NOTE: Turn off the YAW Breakers on the front panel or the unit will yaw for 20 sec.

- enter; 402, alter, 222.
- enter; 401, alter, 43086 (set key).
- Push the reset button on HSC11 PCB.

- enter; 11, check line voltage. If voltage is not 480 volts, use 501 parameters to correct/adjust the line voltage. Jumper OS2, located on the HSC11 PCB, must now be connected.

- enter; 8 *, Wait for Blades Available on the display.

- enter; 21 hold, (wrap), 9 to -19 is ok without fluctuation.

- enter; 12, (flag angle), looking for 0 degrees.

- enter; 15, temp, abt 35 deg C

- enter; 16, temp, abt 32 deg C

- enter; 17, temp, will be the ambient.

5.17 Troubleshooting and Replacing the HSC11 Printed Circuit Board (PCB)

- enter; 8 *, reset

- Turn the YAW circuit breaker back on.

- enter; 3 *, for manual stop for brake release right away.

If it takes 20 sec, than emergency release brake is not working and Q5, 2N2709, SPI PCB, normally corrects the problem.

- enter; 8 *, reset

- enter; 1 *, for Bumping the Nacel in slow gear.

enter; 2 *, for Bumping the Nacel in fast gear.

NOTE: R29 must be installed in order for fast bumping.

Currently, R29 has been disconnected.

Continue testing by entering into the Manual Mode.

- enter; 402, Alter, 9 in that order.

- Push the reset button on the HSC11 PCB.

- check the following

	<u>Function</u>	<u>Press</u>
to insure operation:	Brake	6

Dump Brake 5 and hold it down for 4

seconds

Yaw *

Yaw Dir 9

SCR Bump 1 or 2

- Push the reset button on the HSC11

- enter; 8 *.

- Blades Avialable should now be displayed.

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DRAWINGS/SCHEMATICS

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