



## 2007 Sundance DCU-706 Software Specification

2 versions of software and hardware are required for 2007 production.

### **Sundance DCU-6560-131, SD-880 Series, PN 6560-131**

2007 Features include:

- Zone 3(1), RGBW, 4-O/Ps, Exterior
- Zone 2, RGB, 4-O/Ps, Top Side and waterfeature lights
- Zone 1(3), RGB, 2-O/Ps, Interior, underwater lighting
- 3 Button Auxiliary control panel functionality
- Single AC ON/OFF mode from the main control panel, to SW AC I/P
- Photocell enabled
- Temp probe and RF output enabled
- Music feature, not implemented

### **Jacuzzi DCU-2560-131, Jac-J300/J400 and SD-780 series, PN 6560-132/2560-131**

The feature list includes all of the above features with 2 changes,

- 2 Button Auxiliary control panel functionality
- No SW AC input control, constant 12vAC power only, all operations are handled from the AUX panel.

### **Software Features to implement and Basic Operational Guidelines:**

The original software design is based on the 2005/2006 version of the DCU-6600 Atmel processor software application. Basic operational features are very similar.

Bryan Huff has supplied a chart for the modes of operation he would like to see included for both a Jacuzzi and Sundance version of the code.

Basic Mode changes for the Standard 8 Modes are listed as per Bryan Huff's Excel SpreadSheet chart, which will be included later in this document. (Implemented from 4th draft), 5th draft rcvd Nov 14/06, not implemented.

There are 5 hidden modes on both the Jacuzzi and Sundance DCU.

Standard Modes are all available with the use of the AUX Mode button only, both versions.

Hidden Modes will be available, if the lights are already ON, with a "Push and Hold" of the AUX button for 3 seconds, this will get you the first hidden mode, an additional Mode button press (short duration) will move to the next hidden mode and so on. A 5th push of the Mode Btn will get back to the standard modes of operation at the beginning of the sequence.

A standard 2 Hr timeout is on all standard and hidden modes.

(\*\* Question: can we make one of the hidden modes disregard the timeout for showroom operation\*\*)

New Features Controls added for this DCU

## **The Photocell feature and Default Mode**

The Exterior Zone 3(1) will operate on photocell control.

ON during the night, OFF during the day, Exterior Zone3(1) only.

When no photocell is installed the exterior lights and iPOD white lights will be ON all the time.

If the Photocell Pins are shorted (jumpered) the lights will never be on, always OFF

The "default" colour mode will be initiated whenever the DCU is not in operation, so not turned on from the AUX panel or the SW AC input.

To set/store the default colour mode:

With the interior lighting turned OFF (all lights off except the exterior on photocell control)

Simply "Push and Hold" the Mode button for 3 seconds. Upon release of the button, a new mode will be selected, "Push and Hold" again for another 3 seconds to select the next default mode. Each "Push and Hold" button press will cycle through the STD mode list.

Once a default mode is selected it will be remembered until the DCU power (tub power) is removed.

Intensity of the default mode is not controlled.

(\*\* How to set the intensity of the default mode, if you press the intensity button while default mode is enabled, then you are asking the lights to turn ON \*\*)

## **Temperature Probe and RF LCD Status Monitor**

The DCU contains an RF transmitter, operating at 433.92MHz, it has a periodic transmission of temperature data for a separate battery operated wireless LCD Status monitor.

The intention is that the Status monitor can sit in a consumer's kitchen and have relatively up to date information (approx. 15 minute intervals) on the status of the hot tub temperature in the backyard. This should aid in the ability to determine if a circuit breaker has popped or a tub is shut-down, especially during the critical cold winter months, where a freeze up would cause major disasters.

The DCU transmits an updated temperature every 11 seconds.

## **"Unique ID"**

Each DCU will have a Unique ID so it can transmit its code and not interfere with a neighbours LCD unit. There are 65,560 different combinations 0xFFFF, with 0xDEAD being a test case.

## **"Offset"**

Each DCU has a delay upon startup based on the unique ID, this should enable tubs in the neighbourhood, that start at the same time, possibly after a power blackout, a chance to receive a clear transmission and not have 2 tubs broadcast at the same time. (16 variations, 1 second each)

The LCD Status monitor will need to "Bond" to the unique ID of its respective DCU.

An LCD need not be "Bonded" or "Married" after the batteries have been removed and replaced.

The DCU code must be able to be told to send the "Bond" command, while the LCD Status monitor is in a "listening" for a "Bond" code, and cannot pickup a random transmission from a different tub.

To send the "Bond" command from a DCU, it must be available during any operation status (lights on or off, 2 hr timeout On or off, AC On or Off for Sundance)

"Press and Hold" the Intensity button for 3-seconds (There is only 1 on Jacuzzi so it must be that one)

(\*\* confirm the pin number of the intensity control \*\*)

(\*\* I would like to make ALL lights flash twice during this operation to show the Marry Me command has been sent.\*\*) )

The DCU, as long as it is powered, regardless of it's lighting status (ON or OFF), will send a periodic transmission of its temperature. (approx every 11 seconds, for a 0.11mS 4680 baud, packet)

The actual baud rate and transmission scheme is as follows:

All packets with a 1 start bit, 0 stop bits and odd parity

11 bits/byte, 55 byte packet

(1) Sync byte and type of transmission (Bond or Temp)

(2) ID, with LSB first and inverted for Linx modules

(1) Temp packet in Celsius only now, as of v1.39

(1) CHKSM

## Temperature Probe Input

The first specification for the Temperature probe to be used was the US Sensor Corp Probe.

Sundance Part # 6600-144, now changed to the GE version DC95H303W, as per Tony S.

The DCU is to be made to read the values of this probe with a provided R/T temperature curve chart.

The DCU hardware is currently set to have the Resistive thermocouple to operate from the +5v line to the IC analog input pin, with a 18K resistor used to linearalize the termocouple for the intended range. When a thermocouple is not installed the pin will be pulled to GND.

The LCD Status Display should read Hi(C) or Hi(F) when no probe is installed or cable is broken.

**Upper and Lower Limits** were originally set from Sundance for 85F-115F (30C-46C). Above and below that limit we can display Hi and Lo if need be. As of Nov 14/06, set to 55F-115F.

## "Data Transmission", (4680 Baud, 8,0,1)

Data is transmitted approx every 11 seconds.

Initial data time is offset based on the inuque ID of the DCU, so all transmissions will not be happening at the same time after a power failure.

Consists of: Sync Byte and command type(1), Unique ID Word (2), Temp (1), CHKSM(1).

## "Bond" transmisstion: (4680 Baud, 8,0,1)

Sent after a 3 second intensity button push

transmission packct is sent for 4 minutes upon regular 11 second intervals

Consists of: Sync Byte and command type(1), Unique ID Word (2), Temp (1), CHKSM(1).

NOTE\*: If a temperature probe is not installed to the DCU, the LCD will display HiF or HiC.



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### **The Music Option** (not operational for the 2007 production year)

The music option will have to have some hardware additions (space available on the PCB already) for a stereo or mono music input.

In the future this will allow the lighting to functionally "beat" with the music. Either on a simple Low frequency beat (drums, base etc) or on a 3 frequency spectrum of Highs, mediums and lows for different colours to different beats.

### Revision Notes and History

Notes and Changes	Date	Initials	Rev #
Initial Document creation	Sep 26/06	RL	1.0
Operation software updates	Oct 17/06	RL	1.1
Show operation changes	Oct 20/06	RL	1.2
Nov – Production code changes	Nov 15/06	RL	1.3
Nov – FCC changes for packet information	Nov 22/06	RL	1.4



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### LCD Status Monitor Basic Software Specification and Operation

LCD code operation:

Batteries are inserted, waits for a 20 minute period for new "Bond" command  
Flashes green if it already has a unique ID number in memory.

Displays -- (2 dashes). Once the unit receives an update or the "Bond" command, it will display the current temperature.

Wakes up listens for signal:

rcvs signal  
checks timing value  
displays temp value  
changes status to flash green (which is the same as previous?)

if no signal is rcvd after 34 seconds, go to sleep wait for 15 minutes, lsiten for signal for 34 seconds.

Change status LED to flash RED if it misses 2 updates (30 minutes)

Change the display to remove the temperature reading and display -- , after 2 additional losses of signal (total time 1Hr)

Continues to flash Red with no display, until a return of the signal or the battery dies.

If the signal returns (ie: after power failure),  
changes status LED to flash green  
Displays Temp

Test condition:

A new LCD unit that is not "Bonded" to a unique ID will always recognize and display a temperature from a unique ID of 0xDEAD for test purposes.

## LCD Status Monitor Point Form Installation and Operation Notes

- Remove unit from packaging
- Remove 2 screws from back cover
- Monitor is factory set to indicate degrees in Fahrenheit, for Celsius display, move the small black jumper (located on a 3-pin header below the battery housing) from the left two pins to the right two pins.
- Insert 3 x "AAA" batteries (Alkaline or Lithium recommended)
- Replace the cover and screws
- First time installing batteries:
  - Set the Status Monitor on or near the hot tub
  - Within 15 minutes of installing the batteries, on the hot tub lighting controls, press and hold the light intensity button (*waterfall intensity* on SD 880 series) for 10 seconds to 'bond' the receiver.
  - Within 1 minute of bonding, the display will update with a temperature indication and the LED indicator will start flashing green every 15-30 seconds.
- Future battery changes – simply replace ALL 3 BATTERIES and allow the unit time to receive several updates (30 minutes to 1 hour)
- If unit does not appear to update properly (after 1 Hr)
  - Ensure the tub is powered properly.
  - Move the unit closer to the tub to ensure it receives an update.
  - It is recommended to wait for 1Hr to ensure reception of several updates.
- Effective range is approx 150 ft in clear line of sight. Each obstacle (ie. wall, fence, window, pet, family member) will decrease this range. Range can also be affected by battery condition.
- If the unit indicates 'Hi' with no temperature units displayed, it is indicating a problem with the thermocouple connection to the Lighting Controller.
- You may reverse the stand included on the back of the unit to make it a desk top unit.
  - Squeeze the arms at the top of the stand together to release it from the housing.
  - Reverse the stand and re-install the arms, forming a tripod stand.



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### 1. FCC Information to Users @ FCC 15.21 & 15.105

#### For Class B Unintentional Radiators:

*This equipment has been tested and found to comply with the limits for a Class B digital devices, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of more of the following measures:*

- *Reorient or relocate the receiving antenna*
- *Increase the separation between the equipment and receiver*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

### 2. Warning to Users @ FCC 15.21 & 15.105

**Warning:** *Changes or modifications not expressly approved by Rosstech Signals Inc. could void the user's authority to operate the equipment*