



# DLP-RFS-LOCATOR

RANGING AND LOCATING DEMONSTRATION – ONE MASTER, MANY TARGETS

## OVERVIEW

In this demonstration system, there is a single Master transceiver and up to 50 Targets. The hardware for the Master is hand-held and battery powered.



**DLP-RFS-LOCATOR - Master Version 3.0**

A “Learn” Mode is initiated whereby the Master requests 16-bit IDs from all Targets within range of the Master using LORA Mode with spreading factor of 12, and stores the IDs to non-volatile memory. Once all of the Target IDs have been learned and stored, a “Search” Mode can be initiated whereby a specific “Active” Target is selected by the user from the stored IDs, and the direction to that Target transceiver is determined using a directional antenna and RSSI values received by the Master from the Target. The Master then uses the “Ranging” feature of the Semtech SX1280 transceiver chip to determine the distance to the selected Target transceiver.

All data is presented on an LCD display during Learn, Search and Ranging operations. During the Search process, an audible tone is also used to indicate the direction to the Active Target.

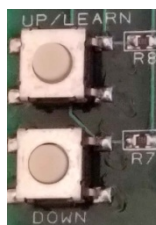
## LEARN MODE

The system is set up and ready for this demonstration once all Target transceivers are powered and set to LORA Mode. If a Target is set to GFSK or FLRC Mode, simply press Button 1 until “LORA” is shown in the display:



**DLP-RFS1280ACT DEMONSTRATION PLATFORM (Serving as a Target for this demonstration)**

To initiate Learn Mode, the user would hold down the LEARN Button on the Master and turn the power on.



The Master will then send out the first Learn packet and wait for a set period of time. Each Target transceiver within range will receive this packet, delay a random period of time (<65mS) and reply with their 16-bit ID (which only takes 2mS to transmit). The Master saves all received IDs in temporary memory, and then it sends each Target a command to Stay Quiet so that it will not respond to the next Learn packet. Each new Target ID received by the Master increments a counter on the LCD display. This process is then repeated until no new Target IDs are received. At this point, the user presses the DOWN button, and the IDs are combined with the Master's previously stored IDs and then written to non-volatile memory in the Master. Once "STORED" is shown on the LCD display, the Master can be powered off.

## SEARCH MODE

To search for a specific Target and determine the direction to its location, the Master's power switch should be set to the SEARCH position. The Master will then immediately begin to ping the Active Target. The Active Target is either the transceiver that was searched for previously (before power was turned off) or the Target corresponding to the first ID in the list of stored IDs if none had been previously selected. The Target ID will be presented on the LCD display. To select a different Target ID and make it the Active Target, press the UP and DOWN buttons. (The Active Target ID is also saved in non-volatile memory so that it is retained and used after the next power cycle.)

Note: The first time the UP or DOWN buttons are pressed, they will silence the audible beep indicator but not change the Active Target selection. Subsequent UP or DOWN presses will select a different Target ID from the list of stored Targets. To re-activate the beeper during Search Mode, simply switch power off and back on.

To perform the Search Function, hold the Master PCB such that the antenna is oriented horizontally, and point the antenna in all directions while listening to the beep tone or looking at the LCD display. The frequency of the beep tone will be higher when the antenna is pointed directly at the Active Target. If the antenna used by the Target is oriented vertically, then a more definitive directional response may be achieved by holding the Master PCB with its antenna oriented vertically. The LCD display will show the Active Target ID together with a positive numeric reference level (0 to 100) and a bar graph indicating the direction to the Target.

## RANGING MODE

Once the direction to the Active Target has been determined, the Power Switch on the Master can be set to Ranging Mode to determine the distance to that Target. The Active Target selected in Search Mode will be used as the Active Target. Continue to point the Master directly at the Active Target while performing the Ranging process. Estimated distance between the Master and Active Target will be presented on the LCD display in both feet and meters.

Every pass of the Ranging Function starts with the Master sending a ping packet to the Active Target in LORA Mode with a spreading factor of 12. The Active Target responds with the RSSI level of the Master's ping packet. Depending upon this RSSI level, both the Master and Target select either a spreading factor of 6 or 10 and enter the Ranging Function. The Master repeatedly sends Ranging packets on 40 channels (2.402GHz to 2.48GHz) to the Active Target and measures the time of flight for those packets. This time data is accumulated by the Master, and the distance between the two transceivers is calculated for presentation on the LCD display.