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Product Specification Document Wayne-Dalton Corp. Pensacola, FL		
User Changeable Code (UCC) Transmitter Five Button Wall Station (Preliminary)		
Author: Richard Gagnon	R&D Approved:	Revised: 01/09/2003
Mfg. Approved:	QA Approved:	Revision: 8

1. Purpose

This document defines the hardware and software requirements of the five push-button (PB) wall station UHF transmitter for the Wayne-Dalton line of DoorMaster-type of garage door operators. This transmitter encrypts and transmits the KeeLoq code hopping (a.k.a. rolling-code) data format. This transmitter has the ability for a user to reprogram a portion of the serial number. It is powered by one 12 V battery and has an LED to indicate transmitter activity.

2. Power Source

- 2.1. One 12 V alkaline mini battery, Eveready brand #A23, Duracell MN21, or equivalent.
- 2.2. This product will operate from a power source of 8 V to 13.0 V.
- 2.3. If the power source is below 5.0 V, +/- 2.0 V, the LED will be off.
- 2.4. The operating current (one or more push-buttons activated) of this product is 11 mA or less.
- 2.5. The battery is user replaceable.
- 2.6. Transmission data is stored in non-volatile memory and is not lost during battery replacement.
- 2.7. If a push-button is continuously activated, the RF transmission shall cease after 30 sec, +/- 10 sec, to conserve battery power, "auto-shutoff". The RF transmission shall remain off until all buttons are released, then re-start on the next button activation.

3. RF Specifications

- 3.1. Transmitter center frequency
 - 3.1.1. Center RF: 372.5 MHz, +/- 100 kHz at -30°C to 70°C, (-22°F to 158°F).
 - 3.1.2. Center RF: 310.0 MHz +/- 100 kHz at -30°C to 70°C, (-22°F to 158°F).
- 3.2. The RF center frequency is control by a surface acoustic wave (SAW) device and is neither factory nor user adjustable.
- 3.3. This product's RF data transmission range is 300 feet minimum, open air, when tested with a companion receiving unit.

4. Transmitted Data

- 4.1. This product shall transmit the 66 bit KeeLoq code hopping data format, at a "1 out of 2" transmission data rate.
- 4.2. Each button pressed shall transmit a unique value (button code). Thus, this product is capable of transmitting five different valid button codes. (All buttons pressed is an invalid encryption.)

5. Data Format

- 5.1. This product uses a Microchip Technology PICmicro 12CE519 as its microcontroller. The firmware emulates a *HCS301 KeeLoq Code Hopping Encoder*.
- 5.2. This product is programmable via four-wires and the programming protocol will be similar to the *HCS301* device to allow programming with the same production programming equipment.
- 5.3. Limitations with the PICmicro requires the elimination of three words supported by the *HCS301 KeeLoq Code Hopping Encoder*:
 - 5.3.1. This product will not store nor use a Seed Value.

- 5.3.2. This product will not store nor use an Envelope key.
- 5.3.3. This product will not store nor use a Reserved word
- 5.4. The two Overflow Bits in the Configuration word shall be set to logic 1 (high) during the product's manufacturing process.
- 5.5. The 32 bit word for the serial number will use the lower 21 bits (b0-b20) for Serial Number generation , 5 bits for programmer identification (b21-b25) and 2 bits (b26-b27) for transmitter identification. Bit b26 shall be set to logic '0' and Bit b27 shall be set to logic '1' to indicate that this unit is a Wall Station transmitter. Valid Serial numbers are 8000000h to BFFFFFFh.
- 5.6. The transmitted data will consist of 66 bits that contain 32 bits of encrypted data, 13 bits of fixed data and 21 bits of re-programmable serial number data.
- 5.7. The encrypted data will contain 4 bits for button status, 2 bits for sync extension 10 bits for optional discrimination and 16 bits for the sync counter.

6. Non Volatile Data Requirements

- 6.1. 64 bits are required for an encryption key
- 6.2. 32 bits are required for a serial number value
- 6.3. 16 bits are required for a synchronization value
- 6.4. 16 bits are required for a configuration word
- 6.5. Total number of bits required are 128 (16 bytes)

Byte Address	Mnemonic	Description
0	KEY_0	64-bit encryption Key (byte 0)
1	KEY_1	64-bit encryption Key (byte 1)
2	KEY_2	64-bit encryption Key (byte 2)
3	KEY_3	64-bit encryption Key (byte 3)
4	KEY_4	64-bit encryption Key (byte 4)
5	KEY_5	64-bit encryption Key (byte 5)
6	KEY_6	64-bit encryption Key (byte 6)
7	KEY_7	64-bit encryption Key (byte 7)
8	SYNC_1	16-bit synchronization value (byte 0)
9	SYNC_2	16-bit synchronization value (byte 1)
10	SER_0	32-bit serial number (byte 0)
11	SER_1	32-bit serial number (byte 1)
12	SER_2	32-bit serial number (byte 2)
13	SER_3*	32-bit serial number (byte 3)
14	CONFIG_0	16-bit configuration word (byte 0)
15	CONFIG_1	16-bit configuration word (byte 1)

*the upper 6 bits (b26-b31) are used to indicate 2-transmitter type, 4-button status

7. Serial Number Generation

- 7.1. During normal use, a new serial number will be generated based upon the previous serial number using a proprietary encryption algorithm.
- 7.2. Activation of the new serial number shall be initiated upon applying the 10-5 process using only the *LAMP* button. The LED shall flash 3 times upon completion of the 10-5 process to indicate the successful activation of the new serial number.
- 7.3. The user has the ability to force this product to generate a new Serial Number.
- 7.4. The 21 least significant bits shall randomly change for serial number generation (2,097,152 possibilities).

- 7.5. The actions needed to force a new serial number shall not occur accidentally during normal product use, product storage, or product handling.

8. Push Button Description and Operation

- 8.1. DOOR: Activation of this button will cause the door to move up or down. In a constant contact mode, the door will not respond to safety interlocks. When activated while door is in motion, the door will stop.
- 8.2. LAMP: Activation of this button will cause the overhead lamp to turn on or off. When activated while door is in motion, the door will stop. This button is also used to generate a new serial number based upon the 10-5 process of button press sequence.
- 8.3. TIMER: Activation of this button will cause the door to move down after a predetermined amount of time. When activated while door is in motion, the door will stop.
- 8.4. PET: Activation of this button will cause the door to move up and stop after a predetermined amount of travel. When activated while door is in motion, the door will stop.
- 8.5. PROGRAM: Activation of this button will cause the operator to enter an installation program mode of operation.
- 8.5.1. Internal: Through small hole on cover. Transmission is sent upon button press.
- 8.5.2. External: To prevent accidental application, the button must be pressed and held for at least 10 seconds before transmission becomes active. During the ten second period, the LED will flash at a fast rate.

9. 10-5 Process Description

The 10-5 process is used to initiate an action based upon a strict sequence of a single button press.

- 9.1. Start: Press and hold the *LAMP* button until LED begins to flash (**10** seconds typical)
- 9.2. LED Flash: Release button within 4 seconds. (when released, LED is off)
- 9.3. LED Off: Press and hold the *LAMP* button within 4 seconds of release. (LED is on)
- 9.4. LED ON: Continue to hold button until LED begins to flash (**5** seconds typical)
- 9.5. LED Flash: Release button within 4 seconds.
- 9.6. Complete: Upon the final release, the LED will blink three times to confirm the intended action was successful.
- 9.7. If this process is not completed, the transmitter will revert to a low power state.

10. Special Operating Conditions

10.1. Inoperative Transmitter

- 10.1.1. The transmitter shall remain in an inoperative state until the Keeloq data has been programmed into the device.

10.2. Code Transmission Disable

- 10.2.1. The Code Transmission shall be disabled before the product is shipped.
- 10.2.2. The Code Transmission is disabled by applying an impedance of less than 1000 ohms across a set of "Reset" pads on the transmitter circuit board during insertion of battery. This impedance must be applied until the LED begins to flash rapidly. (typically 1 to 2 seconds)

- 10.2.3. In a disabled condition, the LED will produce a brief flash during any button press. A series of preamble pulses will be transmitted to allow random testing of the transmitters carrier frequency.
- 10.2.4. The Code Transmission can be enabled upon the successful action of generating a new serial number. (Refer to section 7.2 and sections 9.1 through 9.6)
- 10.3. Disabling “auto-shutoff” (Section 2.7)
 - 10.3.1. The “auto-shutoff” can be disabled by pressing and holding the *TIMER* button during insertion of battery. The “auto-shutoff” will remain disabled until the battery is removed and reinserted without pressing any button during insertion of battery.
- 10.4. Production Programming of Manufacturing Data
 - 10.4.1. When power is initially applied to the transmitter, the LED will flash to indicate power applied. If a button is not pressed within 5 to 7 seconds after application of power, the LED will again flash to indicate the transmitter has resumed a normal mode of operation.
 - 10.4.2. Programming of Manufacturing Data must be performed within this power up window or the programming will not be successful.
 - 10.4.3. During production programming, if the programmer is incorrectly configured to program a KEP product, the programming operation will fail.

11. Environmental Specifications

- 11.1. Operating
 - 11.1.1. Temperature:-30°C to 70°C (-22°F to 158°F)
 - 11.1.2. Humidity: 0 to 90% RH, non-condensing, to an altitude of 10,000 feet
- 11.2. Storage
 - 11.2.1. Temperature: -40°C to 85°C (-40°F to 185°F)
 - 11.2.2. Humidity: 0 to 90% RH, non-condensing, to an altitude of 10,000 feet

12. Markings

- 12.1. This unit shall be marked on the enclosure with its corresponding FCC ID, FCC statement and IC ID.
- 12.2. This unit shall be marked with a ‘U’ to indicate this product as a serial number generating transmitter.

13. Life

- 13.1. This product is intended to operate for a minimum of ten years, at six operations per day. (The battery may require replacements during that time.)
- 13.2. The battery will operate this product for a minimum of one year, at six, one-second operations per day.
- 13.3. The push-buttons will have a minimum life of 50,000 operations across temperature and humidity.

14. Miscellaneous

- 14.1. The LED’s operation shall be visible from a distance of four feet in a brightly-lit room. (Directly facing the LED.)

- 14.2. The enclosure shall be able to be opened by the user with a coin or similar item. The enclosure shall be able to be re-assembled and “snapped” together by the user.
- 14.3. The enclosure shall not open by itself during normal handling nor button operation.
- 14.4. The enclosure shall be able to be opened and re-assembled at least ten times and still remain tightly assembled.
- 14.5. The enclosure, button cover, and light pipe shall not deform nor show external signs of material relaxation when baked at 75°C (167°F) for 168 hours.

15. Drop Test

- 15.1. This product shall operate as intend after a Drop Test.
- 15.2. The drop test is from a height of three feet onto a concrete floor.
- 15.3. Each of the three planes and each of the four corners of the transmitter’s enclosure shall be tested. Each plane and corner shall be tested three times.
- 15.4. The enclosure shall not be broken nor cracked following the drop test. After each drop, the enclosure shall be visually checked for damage.
- 15.5. The transmitter’s enclosure is allowed to open (disassemble) itself during a drop test, but the product shall operate as intended when the enclosure is reassembled.

16. Regulatory Agencies

- 16.1. The transmitter shall meet all applicable regulatory requirements of the Federal Communications Commission (FCC).
- 16.2. If offered for sale in Canada, the transmitter shall meet all applicable regulatory requirements of the IC.
- 16.3. If offered for sale in other countries, the transmitter shall meet all applicable regulatory requirements for those countries.

17. Electrical Specifications Table

All parameters are across operating temperature and operating humidity, unless noted.

Parameter	Minimum	Typical	Maximum	Unit	Remarks
Operating Voltage	8	12	13.0	V	
Operating Current	-	7.7	11.0	mA	Button Press
Operating Current	-	3	5	uA	Standby
Operating Temperature	-30	-	70	°C	
Operating Humidity	0%	-	90%	RH	Non-condensing
Storage Temperature	-40	-	85	°C	
Storage Humidity	0%	-	90%	RH	Non-condensing
Auto Shutoff	20	-	40	s	
RF Center Frequency(s)	-	372.5	-	MHz	-22°F to 158°F
	-	310.0	-		
RF Transmission Range	300	-	-	ft	
Battery Life	1	-	-	year	6 op/day
PB Switch Life	50,000	-	-	op	

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18. Other Documentation

- 18.1. Microchip's *HCS301 KeeLoq Code Hopping Encoder* data sheet DS21143
- 18.2. Microchip PICE518 8-bit Microcontroller data sheet DS40139E
- 18.3. Schematic
- 18.4. PCB Drawing
- 18.5. Source Code

19. Associated Part Numbers

- 19.1. PCB: TBD
- 19.2. Complete Assembly: TBD
- 19.3. Model No.: TBD
- 19.4. Source Code

20. Revision History

Date	Change Description	Rev.	By
7/11/01	Originated	1	REG
9/11/01	Minor clean-up	2	REG
1/29/02	Added sections 8, 9 and 10. Changed section 7	3	REG
1/31/02	Final Draft additions and corrections	4	REG
4/22/02	Added 310MHz specifications	5	REG
5/2/02	Update LED operation when disabled	6	REG
6/11/02	Added inoperative state condition	7	REG
01/09/03	Changed UCC serial number range from 22 bits to 21 bits. Changed disabled mode of operation	8	REG