RF Explanation Specification

RF transmitting module

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PHILIPS

RCS
REMOTE CONTROL SYSTEMS
ISO 9000 certified

RF Explanation Specification

RF transmitting module

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1. Introduction

1.1 Purpose of this document

The purpose of this document is to define and identity the requirements for the RF transmitter module. All people with sufficient knowledge of the application domain should understand this document.

1.2 Edition history

Version	Status	Date	Author	Modification(s)
0.1	Draft	2000-11-06	PGP	Initial revision
0.2	Draft	2000-11-22	PGP	Changes after review
1.0	Approved	2000-11-29	PGP	Changes after review
2.0	Approved	2002-05-14	JWO	Update for IR/RF RCMM code sequence, adapted for 36 kHz carrier only

1.3 Definitions, acronyms and abbreviations

RCS	Remote Control Systems
IR	Infra Red
RF	Radio Frequency
OTP	One Time Programmable
ROM	Read Only Memory
RS232	Serial communication protocol
RAM	Random Access Memory
uP	Micro processor
MSG	Code

1.4 Reference documents

[FEAS_FLASH]	Title	Feasibility Flash codes for Blaster
	Document ID	SD-xxxx
	Author	Peter Griep
	Publisher	RCS
	Version	0.1
	Date	2000-10-23

[RF_IR_EXT]	Title	Software Requirement Specification RF/IR Extender
	Document ID	SD-7519-JWO02
	Author	Wouters, Johan
	Publisher	RCS
	Version	0.2
	Date	1999-07-13

2. General product description

2.1 Product perspective

The product, hereafter referred to as RF transmitter, comprises of a HW module including SW. The RF transmitter transmits RF control signals. The module can be built in as such or be integrated on a PWB of a control device (e.g. remote control). It will be used in conjunction with a receiving device that does a conversion of the transmitted RF control signal into IR control signals for controlling legacy IR reception devices (e.g. VCR, TV, STB, PreAmp,…).

2.2 Product functions

The function of the RF transmitter is to provide user control over devices that are not in line of sight, as is needed by legacy IR devices (VCR, TV, …).
Dedicated RF codes are transmitted and converted to any of the legacy IR protocols that are known by the RF receiving device.

The receiver converts it back into the original IR codes and transmits those to the legacy IR reception devices.

The RF transmitter is designed to carry IR codes over RF to RF receiving devices. The HW-SW combination used in the RF transmitter does not support any other type of transmission such as data transfer.

2.3 User characteristics

The product will be used in the house. Users of the RF transmitter can be adults or kids. They have no particular technical expertise.

2.4 General technical constraints

The product uses a fixed RF frequency that is in the license-free ISM band. No physical RF channels are provided so interference may occur with neighbouring devices that are transmitting at the same RF frequency. To limit susceptibility to neighbouring devices the RF codes must have a device ID and home ID where the product will check on at reception.

The chosen ISM band frequency is subject to the RF emission standards, which may be different for different countries. Therefore the product hardware is configured specifically for use in a particularly country.

Due to the limitations of the hardware, some specific IR codes cannot be transmitted correctly by the product. The specific IR codes are flash codes with a pulse totaltime of less than 286 µs, see also [FEAS_FLASH].

2.5 Assumptions and dependencies

Assumed is that the RF transmitter is able to handle all IR codes from the RCS universal codeset lookup table, with exception of some IR codes, see paragraph: general constraints. Next to that the RF transmitter should be able to handle any IR code that is learned by the user and stored on the transmitting device.

3. Functional requirements

3.1 Description of processes

The RF transmitter generates two different RF codes parts to specify 1 legacy IR code to be generated by an RF/IR extender.
The first RF codes part consists of a set of recognition codes that uses the RCMM IR-RF format (specified below) modulated at 36kHz to describe the carrier period of the legacy IR code.
The second RF codes part consists of IR control codes (modulated over RF). These codes are hereafter referred to as the control envelope. The control envelope comprises of the envelope of legacy IR control code modulated at 36kHz.

3.1.1 Recognition code format and timing

This format describes IR codes using the RCMM protocol. The different RF/IR modes are described in [RF_IR_EXT].

Mode	Customer ID	Home ID	Device ID	Re-served	RF/IR Mode	RF/IR Recognition code
6 bits	6 bits	2 bits	4 bits	2 bits	2 bits	10 bits
000011	001011	xx	Xxxx	00	xx	xxxxxxxxxx

The length of the recognition codes varies depending on the number of zeros in the codes. Worst-case one recognition code can take 30.22 milliseconds. Since 3 recognition codes are transmitted after each other with a separation time of 1 millisecond. Resulting in a maximum recognition codes length of 92.66 milliseconds.

3.1.2 Control envelope format and timing

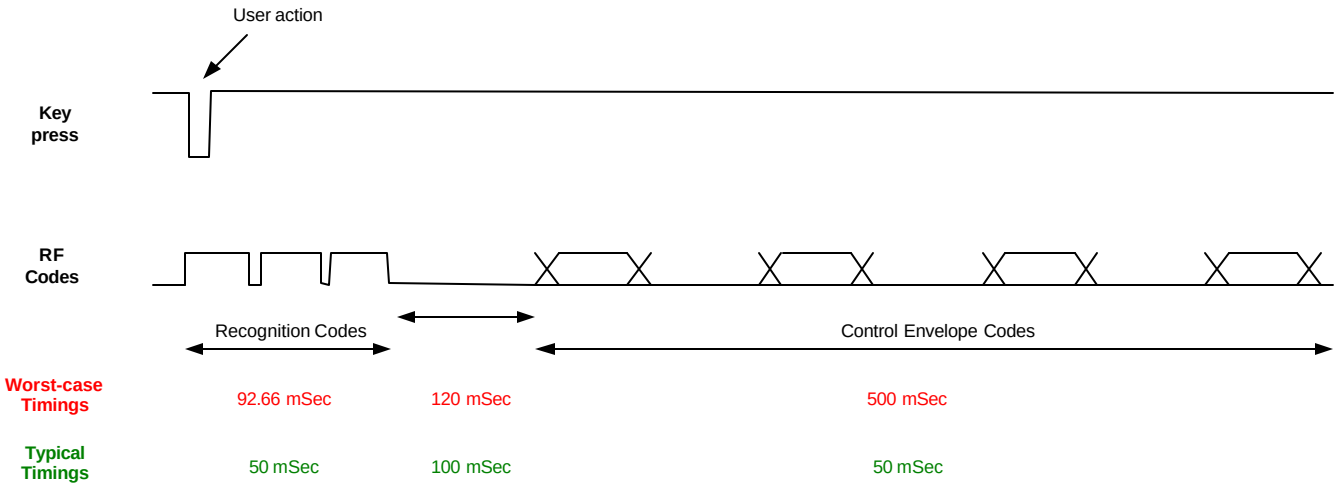
The format of the control envelope code depends on the legacy IR control code that needs to be transmitted over RF.

The principle of an IR control code:
When the user presses a key (beginning of user action) an initial sequence of control codes is transmitted. When the user keeps the key pressed a second sequence of control codes is transmitted (repeating part of the control code). This repeating part is repeated until the user releases the key. Some IR control protocols have a third sequence of control codes (end-of-transmission codes) that are transmitted on releasing the key (end of user action).

Worst case the duration of the sequence of control codes (Initial, repeating and end-of-transmission control codes) after the termination of the user action is 500 milliseconds.

3.1.3 Overall worst case timing:

Below drawing describes the worst-case timing of the sequence of RF code (recognition and control envelope codes) after the user has terminated an action.
Worst-case timing is generated when a user presses a key for a very short time (press and immediate release).


User action
Key press
RF Codes
Recognition Codes
Control Envelope Codes
Worst-case Timings
92.66 mSec
120 mSec
500 mSec
Typical Timings
50 mSec
100 mSec
50 mSec

4. Non-functional requirements

The RF transmitter should be capable of handling the IR codes from the RCS universal codeset lookup table with exception of some ‘fast’ codes as mentioned before in this document and mentioned in [FEAS_FLASH].

5. Design constraints

5.1 Hardware compliance

The RF transmitters integrated in our products follow the requirements of FCC and ETSI.