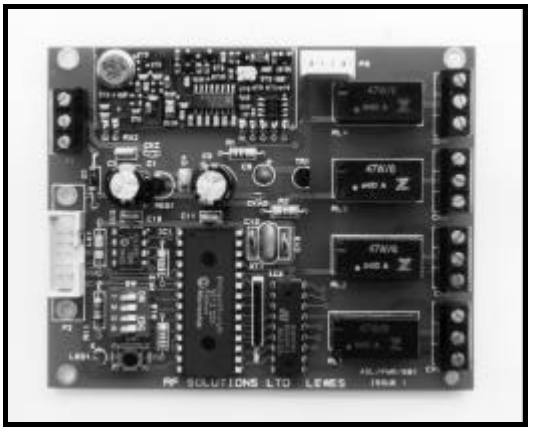
FARNELL ORDER CODE : 522 508

FM DECODER 4 RELAY O/P'S

FEATURES



- COMPLETE DECODER/RECEIVER BOARD ASSEMBLY.
- "CODE HOPPING" PROTOCOL FOR HIGH SECURITY.
- SELECTIVE DOUBLE CONVERSION SUPERHET.
- LOW POWER.
- WIDE SUPPLY VOLTAGE: 9 - 16 VOLTS.
- 4 DATA CHANNELS.
- 4 X DARLINGTON OPEN COLLECTOR AND 4 X RELAY OUTPUTS.
- DIRECTLY COMPATIBLE WITH R.F. SOLUTIONS FM TRANSMITTER/ENCODER UNITS.
- AVAILABLE AS 418MHz OR 433MHz.
- FURTHER EXPANDABLE TO OVER 16 OUTPUTS.

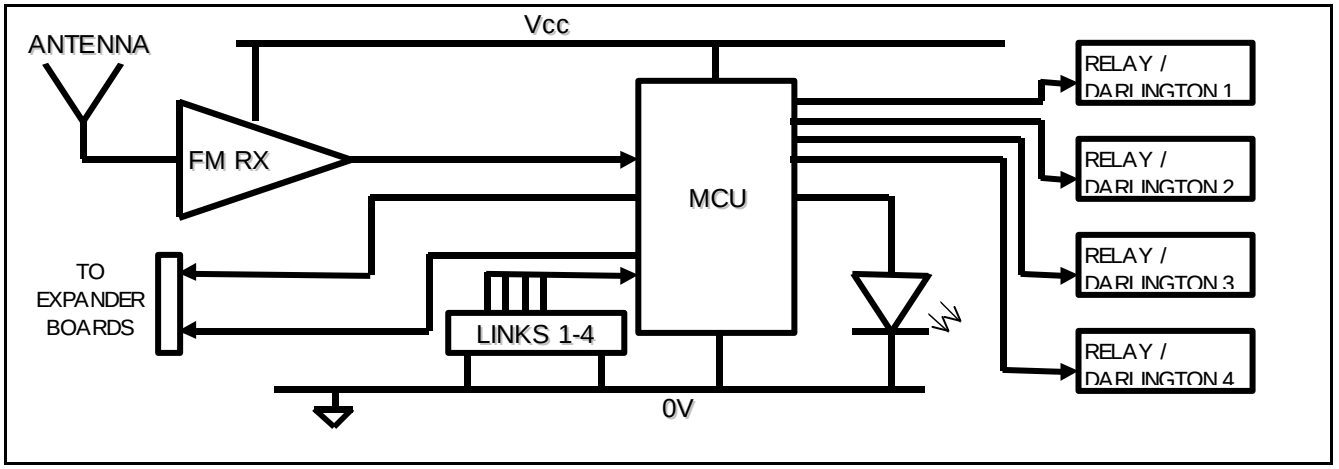
DESCRIPTION

The FM-DH4-XXX Receiver/Decoder is a compact board module containing an FM Superhet Receiver coupled to a custom programmed microprocessor, which is used to capture and decode data from the Transmitter/Encoder (see RF Solutions FM Encoder Module FM-EH4-XXX data sheet). When paired with the Transmitter/Encoder a complete high security "code hopping" remote control system is achieved, with comprehensive interfacing capabilities. These systems can operate over a range of up to 200m in direct sight. As a system it enables the user to "bolt on" a remote control system to an application with a simple interface and minimal configuration setup.

Benefits of FM transmission include high reliability, long range and low power, thus lending itself to many applications that cannot be achieved with an AM system.

The Decoder board can "learn" up to eight different Transmitter/Encoders with its non-volatile memory. Relay outputs for each of the identified channels are configured by a links to provide momentary or toggle action. Darlington open collector outputs provide switching for four different pre-set time periods.

The system may be further expanded to up to 16 data channels with the use of the FM Expander board (see FM-EXP-1 data sheet for more details). Custom solutions may also be supplied unique to customer specific requirements.



FUNCTIONAL DESCRIPTION

The FMDH4-XXX uses the FMRX1-XXX receiver double conversion FM Superhet with a data slicer to capture the transmitted signal. The signal is then passed through to the on-board microcontroller to be decoded. The microcontroller triggers the relay outputs according to the PCB Link configuration which is set by the user. The Darlington open collector outputs operate for pre-set time periods only, regardless of links settings.

Warning - Do not adjust the trimmer on the receiver module. It controls the receive frequency and has been factory set.

RELAY OPERATION

The four PCB links are numbered to correspond to the four relay circuits. If a link is connected, the corresponding relay will work in toggle mode, otherwise it will work in momentary mode. In toggle mode, each activation of the transmitter will cause the relay to change state. In momentary mode, the relays are normally de-energised, but will be energised for the duration of the transmitter keypress.

DARLINGTON OUTPUT OPERATION

When a channel is activated, the corresponding Darlington open collector output will switch to ground for the following time periods:

Channel No.	Period (sec)
1	5
2	10
3	30
4	60

During the activation period, a further operation of that channel from the transmitter will cancel the activation (i.e. toggling is possible during the activation period).

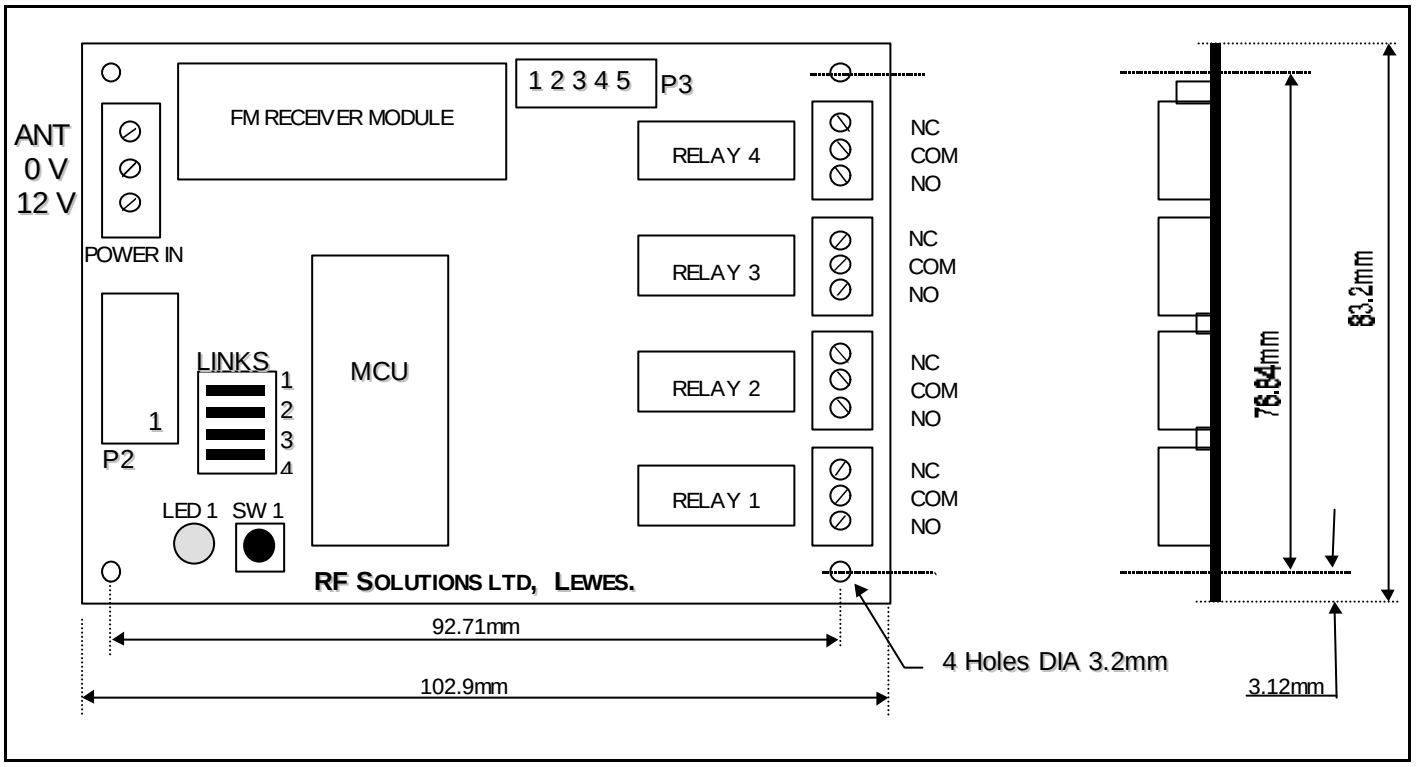
LEARNING NEW TRANSMITTERS

1. Hold down the programming switch on the Decoder board (SW1) throughout the following operations. The LED will light.
2. Depress any transmitter key once. The Decoder board LED will start a rapid flash, unless the transmitter is one which has previously been learnt, in which case the LED will go out (if this is the case, release the programming switch and start again with a different transmitter).
3. Wait 3 seconds. The LED will light continuously.
4. Press the transmitter button again. If the transmitter has now been learnt successfully, the LED will go out (otherwise it will start a slow flash, and the programming sequence should be re-started).
5. Release the programming switch.
6. The transmitter will now operate the system.

TO ERASE ALL TRANSMITTERS FROM MEMORY

Press the programming button 5 times in rapid succession until the LED lights continuously for about 3 seconds. All transmitters have then been erased from the decoder's memory.

MECHANICAL DETAILS



RELAY CONNECTIONS

All relays have the same connection configuration. Each relay has two sets of contacts and each set of contacts has three connections; Common, Normally Closed and Normally Open.

DARLINGTON OUTPUTS

Output port P3 provides the darlington drive outputs. The pcb has been designed to accept a Molex type connector. Connector Pin 1 (the leftmost pin, next to the RF module) supplies Vcc out via a silicon diode. Pins 2 to 5 (left to right) carry the Darlington open collector output signals for circuits 1 to 4 respectively.

P2 CONNECTOR

Use this to connect the decoder to expander boards (FM-EXP-1) to increase the number of system outputs. 10-way IDC connectors should be used to make up the connector leads. Pin functions of this connector are as follows:

Pin No.	Description	Pin No.	Description
1	Reserved	6	Power GND
2	Signal GND	7	Power GND
3	Demodulated signal	8	Power from Receiver Board
4	Carrier detect	9	Power from Receiver Board
5	Signal GND	10	Not connected

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (Vcc to GND).....-0.3 to +18Volts.
Storage Temperature.....-10 to +70° Celcius.
Operating Temperature.....0 to +55° Celcius.

TECHNICAL SPECIFICATION

Ambient temperature = 20° Celcius. Supply Voltage Vcc = 12.0 Volts.

ELECTRICAL CHARACTERISTICS	MIN	TYPICAL	MAX	DIMENSION	NOTE
Supply Voltage	9	12	16	V	
Supply Current					
(All Relays Activated)		150		mA	
(Quiescent)		20		mA	
Operating Frequency	-	418.0	-	MHz	
Overall Frequency Accuracy	-100	0	+100	KHz	
Receiver Sensitivity for 20dB S/N	-	0.5	1.0	µV	
Data output:					
Open Collector Output Current			500	mA	
Open Collector Output Voltage			Vcc		
Relay Rating			1	A	@ 50V DC

ANTENNA DESIGN

The range achieved from the system is dependant on the choice and position of the antenna. The space around the antenna is as important as the antenna itself. The optimum position is to locate the antenna so that is protrudes directly out the top of the transmitter box. If this is not possible due to other design constraints, try to keep the antenna away from other metal in the system such as transformers, batteries and PCB tracks, especially ground planes. In particular, the 'HOT' end of the antenna should be kept as far away as possible from these.

The following three types of antenna are recommended for the transmitter:

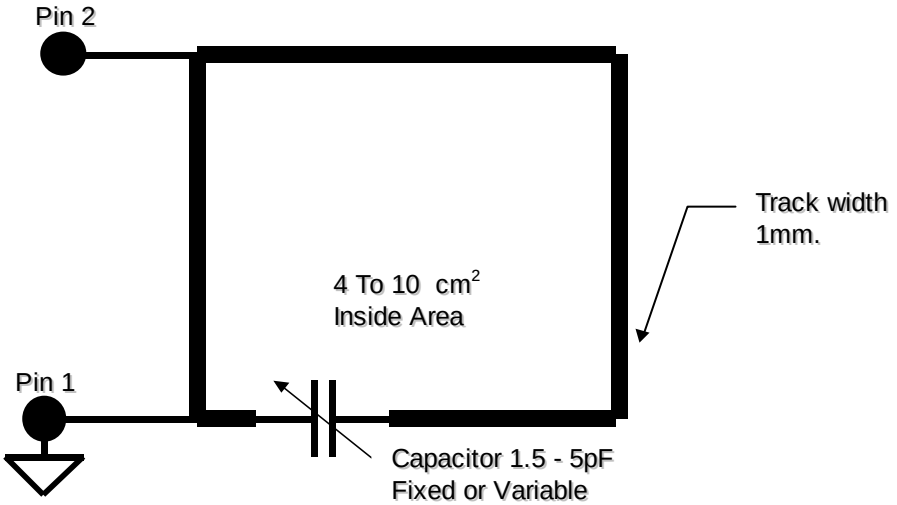
Antenna 1 - Helical Coil

Wire coil, connected directly to Pin 2, open circuit at the other end. This antenna has a high Q Factor, for trimming, the length may be adjusted. This is a popular antenna as it consumes little space.

34 Turns of enamelled copper wire diameter 0.5mm close wound on 2.5mm diameter former.

Antenna 2 - Loop

A PCB Track tuned by the Capacitor to ground at the 'HOT' end. Fed from Pin 2 at a point 20% from the ground end.



Antenna 3 - Whip

Can be either PCB Track, Wire Rod, or a combination of the two.
One end connected to Pin 2, the other open.
Optimum total length is 17cm (1/4 wave @ 418mhz)
Ensure separation from metal components to prevent detuning.

Wire, Rod, PCB Track or combination thereof.
Optimum Length is 16.5cm.

Advantages / Disadvantages of Each Antenna			
Feature	**Helical**	**Loop**	**Whip**
Performance	☺☺	☺	☺☺☺
Ease of design	☺☺	☺	☺☺☺
Size	☺☺☺	☺☺	☺
Immunity to hand detuning and or components in close proximity	☺☺	☺☺☺	☺

ORDERING INFORMATION FM RECEIVERS / DECODERS		
PART No	**DESCRIPTION**	
FM-DH4 - XXX	Receiver/Decoder, 4 Channel, 418MHz.	522 508
FM-DH4 - XXX	Receiver/Decoder, 4 Channel, 433MHz.	
XXX = FREQUENCY; 418MHz OR 433MHz		

Should you require further assistance, please call;

R. F. Solutions Ltd.,
Unit 21, Cliffe Industrial Estate,
South Street,
Lewes,
E Sussex, BN8 6JL. England.

Tel +44 (0)1273 898 000. Fax +44 (0)1273 480 661.

Email sales@rfsolutions.co.uk
http://www.rfsolutions.co.uk.

R F Solutions Ltd is a member of the Low Power Radio Association.