
DRF7020M17C
13dBm Metering Concentrator Module

V2.01

Features

- 433Mhz ISM frequency band
- Robust MESH network
- Automatically network building
- Network notes plug and play
- 6 levels of routing, up to 1024 notes
- 9.6k FSK bps data rate
- 17dBm Max. output power
- Baud rate configurable
- Net ID configurable
- Address configurable
- Standby current < 5uA
- Supply voltage 4.5~6.0V

Application

- Home automation
- Automatic meter reading
- Wireless data logger
- Wireless sensor network

DESCRIPTION

DRF7020M17C is a low-cost sub-1 GHz metering concentrator module designed for operations in the MESH network applications, especially for AMR (Automatic Metering Reading) applications. The module adopts high efficient RF chip from ADI and ARM7 processor. DRF7020M17C works at 60 MHz system frequency and supports complicated algorithm. It utilizes high efficient looped interleaving EDAC (Error Detection and correction) coding with coding gain up to 3dB which keeps in advance in EDAC and coding efficiency over normal FEC (Forward Error Correction).

By standard UART interface, DRF7020M17C communicates with the host (or server) through 15 commands. As to the use of commands, please refer to application document [MNET PROTOCOL \(ADW1001.PDF\)](#) for more details.

PIN FUNCTIONS

Connector	PIN	Name	Function	Description
J1	1,2	VCC1	Output	+3.3V
	3,5,7,9,11,13,15,17,19	GND	Ground	Ground (0V)
	4,6,8,10,12,14	NC	---	No connection
	16	Reset	Input	Low: effective
	18,20	VCC2	Input	+5V
	21	RXD	Input	UART input
	22	TXD	Output	UART output
J2	1	GND	---	No connection
	2	VCC	3.3V output	No connection
	3,4,5,6	NC	---	No connection

Table 1 DRF7020M17C Pin functions

ELECTRICAL SPECIFICATIONS

Symbol	Parameter (condition)	Min.	Typ.	Max.	Units
VCC	Supply Voltage	4.5		6	V
Temp	Operating temperature range	-30	25	85	°C
RH	Operating relative humidity	10		90	%
Freq	Frequency range	418		455	MHz
F _{DEV}	Modulation frequency deviation		28.8		KHz
Mod	Modulation type		GFSK		
I _{DD}	Receive mode			85	mA
	Transmit mode @ 17dBm			140	mA
	Sleep mode			5	uA
P _{out}	Output power			17	dBm
Sen	Receiving sensitivity @9.6K bps		-116.5		dBm
DR _{FSK}	GFSK data rate	2.4		9.6	Kbps
DR _{IN}	Interface data rate	9.6		115.2	Kbps
CH _{BW}	Channel spacing		200		kHz
T _{NET}	Networking time @ 250 nodes		20		Minute
RL	Routing level		10		
N _{MAX}	Max. network nodes			1024	
Z _{ANT}	Antenna Impedance		50		

Table 2 DRF7020M17C Electrical Specifications

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Min.	Max.	Units
V _{cc}	Supply Voltage	-0.3	6	V
V _I	Input voltage	-0.3	5	V
V _o	Output voltage	-0.3	5	V
T _{ST}	Storage temperature	-55	125	°C

Table 3 DRF7020M17C Maximum Ratings

COMMAND TABLE

Num.	Command	Description
1	DELNET	Delete network
2	CMD	Host communicating with nodes
3	TST	Testing module
4	BCTIME	Broadcasting time
5	RDNODE	Reading nodes existing in the network
6	RDFREQ	Reading frequency
7	WRFREQ	Writing frequency
8	RDNETID	Reading network ID
9	WRNETID	Writing network ID
10	MTNET	Maintaining network
11	STOPMT	Stop network maintenance
12	STATUS	Inquiring maintenance status
13	RATE	Writing serial data rate
14	IODELAY	Interface delay
15	MRATE	FSK data rate

Table 4 DRF7020M17C Commands

APPLICATION

Dorji Applied Technologies utilizes its own communication protocol MNET which has been successfully applied into many AMR networks. The MNET network includes a concentrator (DRF7020M17C) and many nodes (DRF7020M13N). The address length of node module is 6 bytes. Meanwhile the network also has its unique 2 bytes net ID. In the same network, the net ID of the concentrator must be the same as other node modules'. The network adopts Host/Client mode. The reading command only can be sent to nodes by the concentrator. The nodes can upload data passively as soon as receiving command from the concentrator. The net protocol encapsulates the network building and maintaining functions so the users can inquiry the status of nodes and read data from meters through the concentrator without any attention to the operation of network. The MNET network uses one command and can support 180 bytes transmit/receive. It supports

SILENT mode which can be achieved by setting the concentrator in 30 seconds. In SILENT mode, the concentrator and nodes in the same network will not transmit data automatically. The users can cancel the silent mode at any time. With this mode, users can activate the network at different time segments and then can read many networks at the same frequency. The MNET network adopts top-to-down networking method and uses the transmit/receive field strength to judge the quality of links, which decides the networking conditions. Each node in the MNET network might have many paths and supports many father nodes and can be used as father node so the MNET can choose reasonable routing path automatically.

In an activating MNET network, the ID of a new node can be recognized and added into the network in a certain time when it locates in the covering range of network. As to a deleted node, its corresponding ID will be removed in 18~24 hours automatically. Please note that the recognition and removal of a node can be realized only in an activating network. In the SILENT mode, the routing of network and the status of nodes are in freezing but the users still can read the data of meters through the concentrator.

Before the MNET network is built, the concentrator and nodes must be configured first. The configurable parameters of the concentrator include frequency, net ID and serial data rate. As to the note modules, users can write frequency, net ID and address into the meter terminal and the meter then compare these data with the node module in it when powering up. If the parameters are different, the meter then changes corresponding parameters of the node module online.

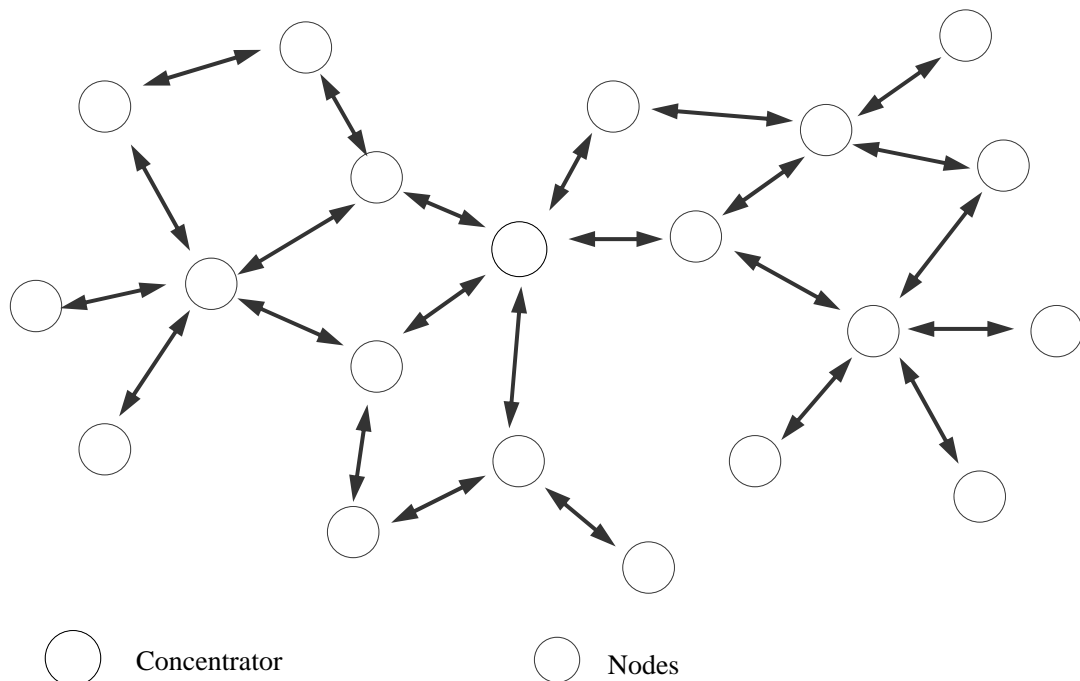


Figure 1: MNET Networking Demonstration

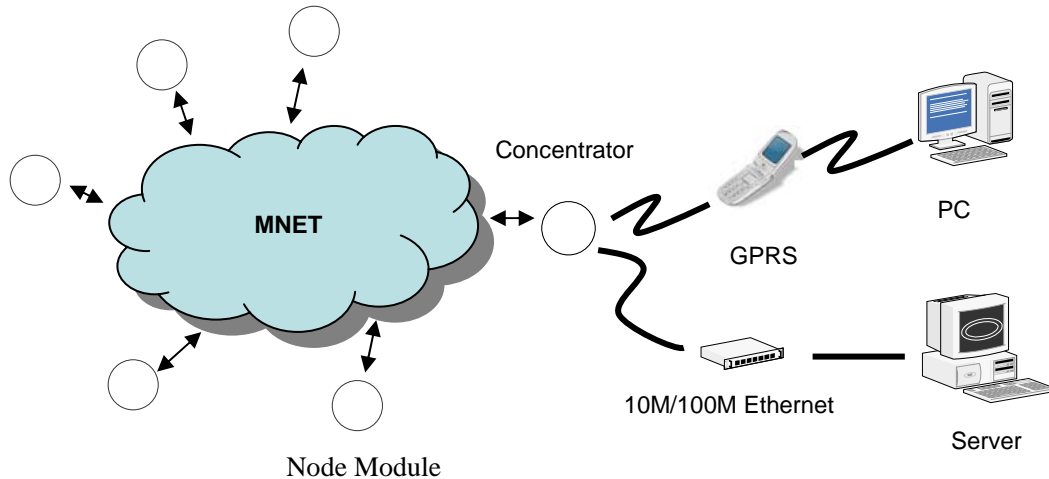


Figure 2: MNET Network Application

The MNET network can work at the same frequency in separated areas, which is similar to GSM network or AM/FM radio broadcasting in different cities. One system can have many MNET networks in different channels and the whole spectrum can be utilized in K (number) frequency multiplexing mode. The factors which affect the minimum distance (D) for frequency multiplexing are included but not confined to: the number of the same channel used by neighboring MNET networks, geographical features, active range of each network node, etc. The increasing of K will result in lengthening the frequency multiplexing distance D in order to reduce the co-channel interferences.

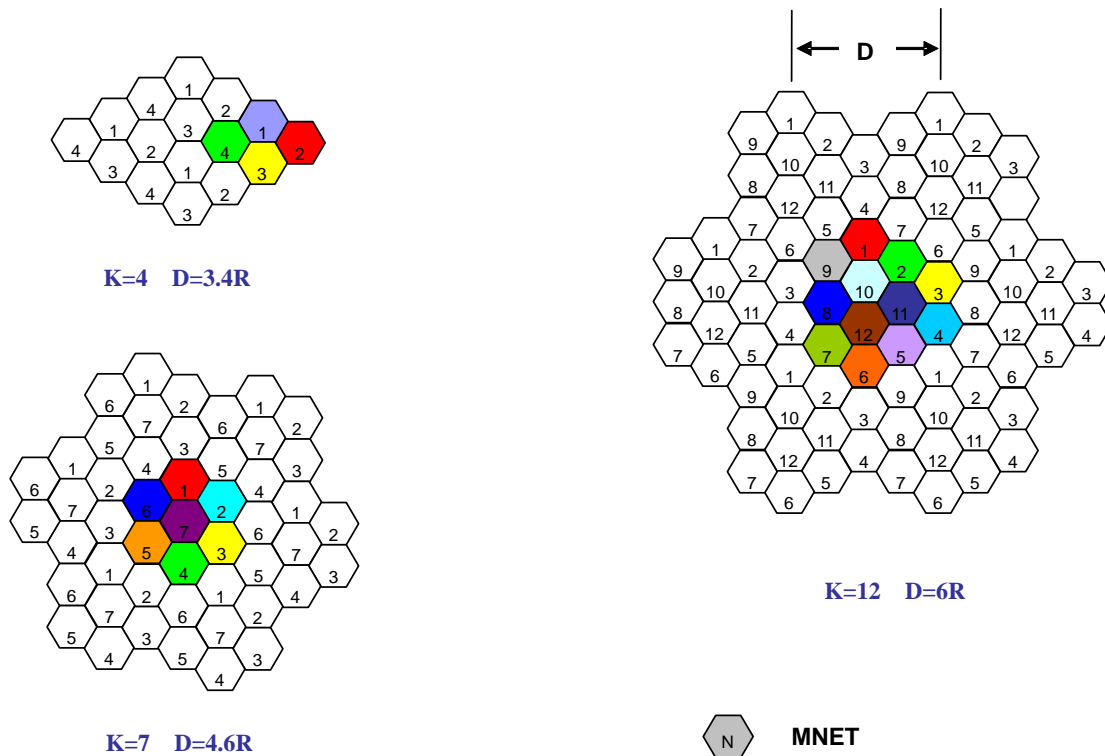


Figure 3: MNET Frequency Multiplexing Mode

For the same mechanism, MNET also can work in time multiplexing mode by taking advantage of its SILENT function. The minimum distance (D) for time multiplexing will be decided by the equation: $D = \sqrt{3KR}$

MECHANICAL DATA

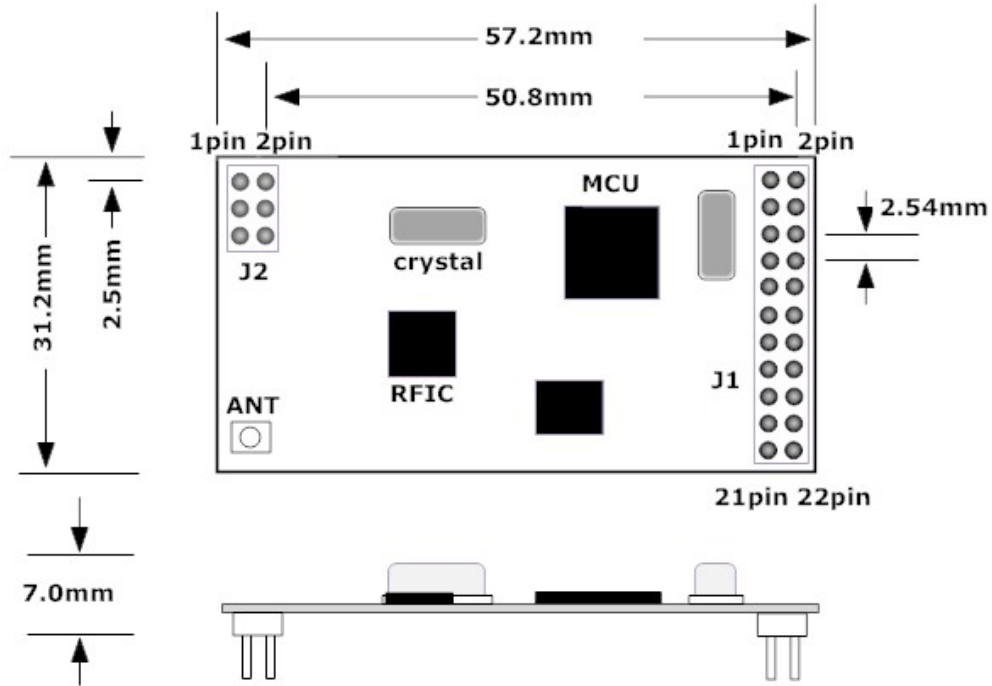


Figure 4: Mechanical Dimensions

ORDERING INFORMATION

DRF 7020 M 17 C— 043 A

- ① ② ③ ④ ⑤ ⑥ ⑦

Num	Symbol	Meaning
①	RF module	RF GFSK module
②	IC Type	ADF7020
③	Module Type	Metering Module
④	Power	17dBm output power
⑤	Module Function	Network Concentrator
⑥	Freq. Band	043: 433MHz
⑦	ANT Interface	DIP package with SMA connector

Table 5 Ordering information

<p>Dorji Applied Technologies A division of <i>Dorji Industrial Group Co., Ltd</i></p> <p>Add.: Xinchenuayuan 2, Dalangnanlu, Longhua, Baoan district, Shenzhen, China 518109</p> <p>Tel: 0086-755-28156122 Fax.: 0086-755-28156133 Email: sales@dorji.com Web: http://www.dorji.com</p>	<p>Dorji Industrial Group Co., Ltd reserves the right to make corrections, modifications, improvements and other changes to its products and services at any time and to discontinue any product or service without notice. Customers are expected to visit websites for getting newest product information before placing orders.</p> <p>These products are not designed for use in life support appliances, devices or other products where malfunction of these products might result in personal injury. Customers using these products in such applications do so at their own risk and agree to fully indemnify Dorji Industrial Group for any damages resulting from improper use.</p>
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