VEROLINK T900 USER MANUAL

900MHz Data Transmission Module
Version：20230410V5.0

Verolink

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1.Product Overview

Verolink T900 is one of the digital radio stations in the T900 series.

It is mainly used fortransmission of high-power long distance industrial data.

It has the characteristics ofsmall volume, good integration, and high sensitivity.

The T900 operates in the902~928MHz band. In a good environment,

the maximum transmission distance of theT900 can be up to 200KM.

2.Technical Parameters

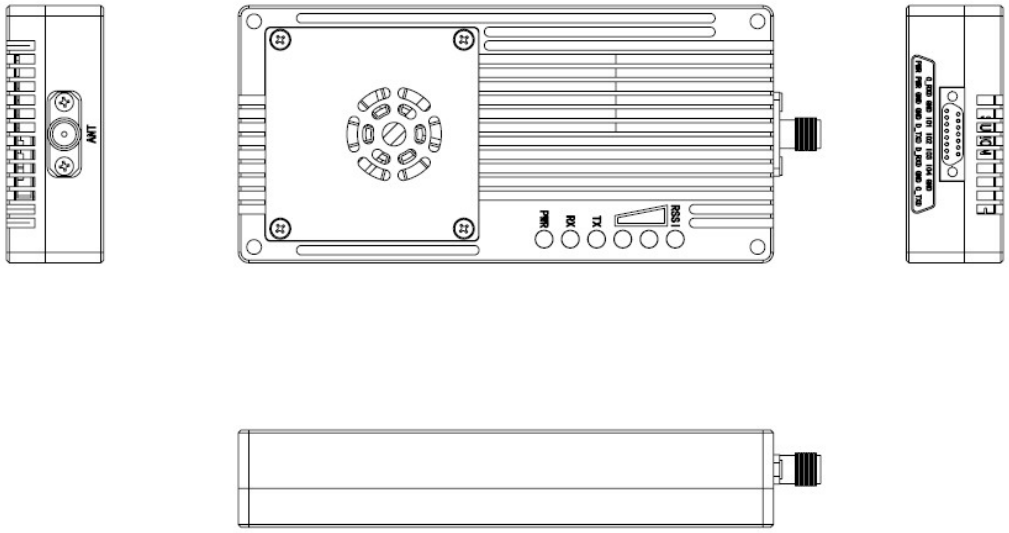
- Frequency Range: 902-928MHz
- Spread Spectrum Mode: FHSS
- Data Encryption: 256-bit physical layer encryption
- Range of Communication: Up to 100KM/200KM
- Output Power: 10W（40dBm）
- Orifice Speed: Up to 276.4kbps
- Serial Port Baud Rate: Up to 921.6kbps
- Working Temperature: -40℃+85℃
- Power Supply Voltage: DC15~26V, Typical value +24V

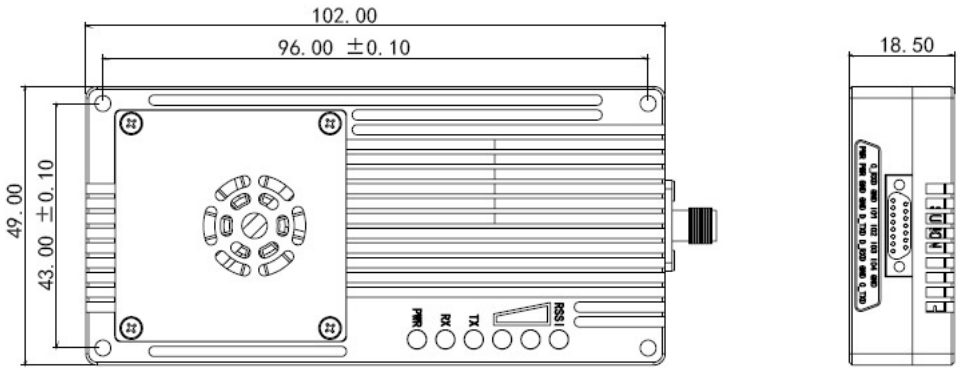
Power Supply Voltage	100% data full peak current (A)	100% data full power average current (A)
15V	3.20A	2.10A
18V	2.80A	1.74A
24V	2.00A	1.30A
26V	1.85A	1.20A

- Sensitivity:

Orifice speed	10^{-7} BER	100KM Maximum user speed	200KM maximum user speed
276.4kbps	-106 dBm	136kbps	128kbps
230.4kbps	-107 dBm	116kbps	104kbps
172.8kbps	-108 dBm	82kbps	74kbps
115.2kbps	-109 dBm	48kbps	42kbps
57.6kbps	-110 dBm	14kbps	10kbps

3.Mechanical Drawings



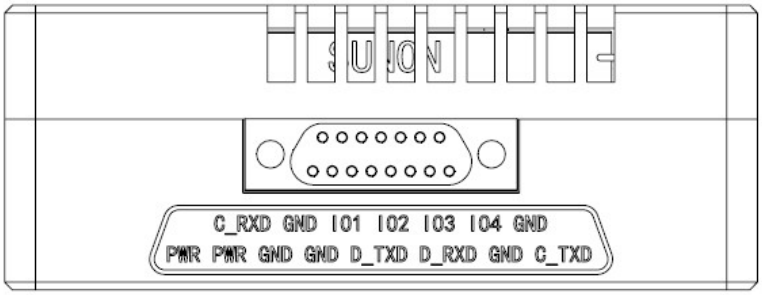


T900 Dimensional Diagram

- T900 Size: 111mm*49mm*18.5mm (with SMA head).
- T900 Weight:137g

4.Product Connector

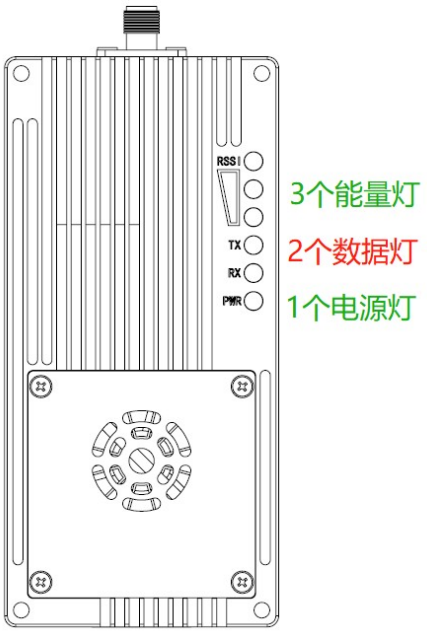
4.1 J30J-15pin Schematic Diagram



4.2 J30J-15pin Pin Definition

No.	Pin name	Description	Direction
1	PWR	The power terminal is positive	I
2	PWR	The power terminal is positive	I
3	GND	The power terminal is negative	I
4	GND	The power terminal is negative	I
5	D_TXD	Data serial port transmits data TX	O
6	D_RXD	Data serial port receives data RX	I
7	GND	The data serial port is grounded GND	O
8	C_TXD	Control serial port transmits data TX	I
9	C_RXD	Control serial port receives data RX	O
10	GND	The control serial port is grounded GND	O
11	IO1	* reserve *	IO
12	IO2	* reserve *	IO
13	IO3	* reserve *	IO
14	IO4	* reserve *	IO
15	GND	grounding	O
Note: Please confirm whether the serial port of the module is TTL level or RS232 level.			

5.Product Indicator Meaning



Power PWR（Green）

The power light lights up to indicate that the device is powered on.

Transmit Lamp TX（red）

When the TX lights up, it indicates that the module is sending data.

Receive Lamp RX（red）

When the RX lights up, it indicates that the module is receiving data.

Receiving signal strength lamp（RSSI 3 green lamps)

A greater number of energy lights indicates a greater strength of signal reception.

The RSSI lamp represents the strength of the received signal	
Numbers of RSSI energy lights on	Energy received dBm
All 3 RSSI lights are on	About -50dBm
2 RSSI lights are on	About-80dBm
1 RSSI lights is on	About -95dBm

Module Type	Mode	T900 Indicator Status		
		RX	TX	RSSI 123
All	AT command configuration mode	Turn off	Turn off	Turn off
Master	Normal operation	Flashing when receiving data	Turn on (steady light)	Proportional to the strength of the received signal
Slave	Non-synchronization	Turn off	Turn off	Cycle light every 860ms
Slave	Synchronization	Turn on (steady light)	Flashing when sending data	Proportional to the strength of the received signal
Repeater	Non-synchronization	Flashing alternately with the sending light	Flashing alternately with the receiving light	Cycle light every 860ms
Repeater	Synchronization	Flashing when receiving data Otherwise on	Flashing when sending data Otherwise on	Proportional to the strength of the received signal

6.AT Command/ Register Description

6.1 AT Command

AT command (both upper and lower case accepted)	Description
ATI1	Query the hardware version number
ATI2	Query the firmware version number
ATI3	234234 Query the software version number
ATI4	Query the SN number
AT&V	Display the current parameter list
AT&W	Save the current parameter table
ATA	Exit the AT command configuration mode and enter the data mode
ATSxxx?	Query the value of register Sxxx
ATSxxx=yyy	Write register Sxxx to the value yyy
ATSxxx /?	Display the help documentation for register Sxxx
AT&Fn	Load the factory default configuration: 7 ： Factory default settings for point-to-multipoint master 8 ： Factory default settings for point-to-multipoint slave 9 ： Factory default settings for point-to-multipoint repeater 10: Factory default settings for point-to-point master 11: Factory default settings for point-to-point slave 12: Factory default settings for point-to-point repeater

Note: All register changes must be saved using the AT&W command to take effect.

6.2 AT Command Register List

Register Number	Description
S101	Operating Mode
S102	Serial Baud Rate
S103	Wireless Link Rate
S104	Network Address (ID)
S105	Unit Address
S108	Output Power（dBm）
S110	Serial Data Format
S113	Packet Retransmissions
S114	Repeater Index
S118	Sync Address
S123	RSSI From Master RSSI（dBm）
S124	RSSI From Slave RSSI（dBm）
S133	Network Type

S140	Destination Address
S141	Repeater Y/N
S142	Serial Channel Mode
S143	Repeater Index Use GPIO
S159	Encryption Enable
S160	Encryption Key

6.2.1 S101 Operating Mode

Values
0 - Master
1 - Repeater
2 - Slave

The operating mode defines the role of each device on the network. Each T900 module can be configured in any mode and take on any role in the network.

- Master: There is one master in each network. In point-to-point and point-to-multipoint networks, it is used to synchronize the entire network.
- Repeater: In the network, it is used to extend the transmission distance, enhance the coverage of the network, and connect with the master or repeater.
- Slave: The slave is directly connected to the master or the repeater.

6.2.2 S102 Serial Baud Rate

Values (bps)	
0- 230400	6 - 14400
1- 115200	**7 - 9600 (Default)**
2- 57600	8 - 7200
3- 38400	9 - 4800
4- 28800	15 - 460800
5- 19200	16 - 921600

S102 is used to set the baud rate of the data serial port. When the serial port rate is changed, please note that the serial port baud rate of the device connected to the T900 should be modified.

6.2.3 S103 Orifice Speed

Values (bps)
0 - 172800 (Default)
1 - 230400
2 - 276480
3 - 57600
4 - 115200

The S103 determines the communication rate of the entire network. Each device on the network must be configured to the same rate. The higher the rate, the higher the network throughput, but the worse the sensitivity. The sensitivity difference between adjacent modes is about 1dB.

6.2.4 S104 Network Address (ID)

Values (0~4294967295)
Default 1234567890

All devices on a network must have the same network address. Devices with different network addresses do not communicate with each other. When multiple networks are operating simultaneously in the same area, the network address of each network must be guaranteed to be unique.

6.2.5 S105 Unit Address

Values (0~65535)
Default 0

On the same network, unit address is used for identification on the network, and each device should have a unique unit address.

For a point-to-point network, the default value is 0. The device automatically assigns the unit address. Users do not need to set this parameter. Users can also manually assign the non-0 unit addresses. In the same network, if automatic allocation is used, the unit address of all devices is set to 0. If manual assignment is used, you can set the unit address S105, synchronous address S118, and target address S140 for each device

to ensure that the network topology is correct.

For a point-to-multipoint networks, each device must be manually assigned a non-0 device address. For details, see Section 8.7.

6.2.6 S108 Output Power（dBm）

S108 is used to set the transmitting power of the local device.

Values（dBm）
30- 3W
33- 5W
35- 7W
40 - 10W（ Default ）

6.2.7 S110 Serial Data Format

Values
1 - 8N1（ Default ）

The data format of the serial port supports only 8N1.

6.2.8 S113 Packet Retransmissions

Values（0~255）
Default 3

This register determines the maximum number of times the packet can be retransmitted. The number of the retransmission is used to ensure the robustness of the system in complex environment or weak signal. Retransmission can cause additional data transfer, which can reduce system throughput. The maximum number of packet transmissions is the number of data retransmissions plus one.

6.2.9 S114 Repeater Index

Values（1~254）
Default **1**

In point-to-point mode, the register takes effect when the working mode is repeater and the unit address is 0. This register indicates the relative position of the repeater on the network. No additional configuration is required on the master and slaves to add or remove repeater devices on a point-to-point network. When the repeater device is started, it automatically connects to the point-to-point network, and when it is shut down, the network is reconnected.

When multiple repeaters are used, please ensure that the serial numbers of the repeaters from the master to the slave increase monotonously, which can be discontinuous.

6.2.10 S118 Sync Address

Values（0~65535）
Default **0**

You can set the synchronization address of the master device and the slave device to specify the synchronization address of the current device from the local device (S105) to the device (S118).

On the point-to-point network, when the local address (S105) is set to 0, the address is automatically assigned, and there is no need to set the synchronous address. When the local address (S105) is not 0, the synchronous address must be set to determine the network topology.

Values（dBm）
-255 ~ 0（read only）

On a point-to-multipoint network, you must manually set the correct synchronization address for each device.

For details, see Section 8.7.

6.2.11 S123 RSSI From Master RSSI（dBm）

Indicates the received signal strength of the slave or repeater. The value corresponds to

pins RSSI1, RSSI2, and RSSI3.

S123 of the repeater device indicates the signal strength of the upper device, and S124 indicates the signal strength of the lower device.

6.2.12 S124 RSSI From Slave RSSI（dBm

Values（dBm）
-255 ~ 0（read only）

Indicates the received signal strength of the master or repeater. The value corresponds to pins RSSI1, RSSI2, and RSSI3。

S123 of the repeater device indicates the signal strength of the upper device, and S124 indicates the signal strength of the lower device.

6.2.13 S133 Network Type

Values
0 - Point to Multipoint (point to multipoint) 1 - Point to Point (point to point)

This register is used to set the network type. On one network, the network type of all devices must be the same.

- Point-to-multipoint：The master broadcasts data to all devices, and all slave devices send data back to the master. （ There can be 0 or more repeaters）
- Point-to-point：Only master and slave endpoints communicate with each other. （There can be 0 or more repeaters）

6.2.14 S140 Destination Address

Values（0~65535）
Default 0

The master and repeater devices can set the destination address, which is used to specify the address of the child device connected to the local device.

On a point-to-point network, when the local address is set to 0, the address is

automatically assigned without setting the target address. When the local address is not 0, the destination address must be set to specify the network topology.

On a point-to-multipoint network, you must manually set the correct destination address for each device.

For details, see Section 8.7.

6.2.15 S141 Repeater Y/N

Values（0~1）
0 – without repeater （Valid only on the master side ）（Default）
1 – with repeater（ Valid only on the master side ）

This register is invalid on a point-to-point network where addresses are automatically assigned (unit address S105 is 0) but must be set to 0. In this case, the network automatically identifies whether the repeater exists. You do not need to set this parameter.

When manually assigning addresses, this register is set based on whether a repeater exists in the current network.

6.2.16 S142 Serial Channel Mode

Values
0 - RS232（ Default ）

This register configures the working mode of the data serial port。The default is RS232 and currently only RS232 mode is supported. In the future, it will support RS485 full duplex, RS485 half- duplex, and SBUS。

6.2.17 S143 Repeater Index Use GPIO

Values
0- Use the S114 register （Default）
1- Use the GPIO[4:1] to indicate the relay serial number

To make it easy for the repeater to change the sequence number, you can configure the repeater sequence number using GPIO [4:1].

When S143 is 0, the repeater sequence number is the value of S114, which ranges from 1 to 254.

When S143 is 1, the repeater sequence number is GPIO [4:1]+1, which ranges from 1 to 16.

Values
0- Turn off the encryption (Default)
1 - Turn on the encryption

If GPIO is used as the repeater number, the repeater number ranges from 1 to 16. Therefore, a maximum of 16 repeaters can be configured.

6.2.18 S159 Encryption Enable

Values
256bit secret key

The T900 provides 256bit data encryption, which is turned on or off through the S159 register.

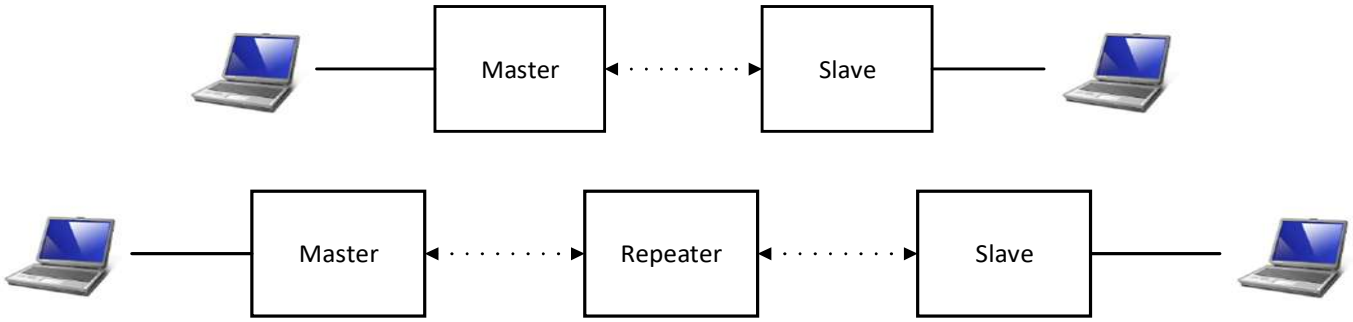
6.2.19 S160 Encryption Key

When using encryption, set a 256bit key for encryption and decryption. The same secret key must be configured at both ends to receive the correct data.

7.Point-to-Point Networks

In a point-to-point network, T900 module can be used to establish a data path between point A and point B. Point A could be the master, point B could be the slave. When point A and point B cannot be directly connected, you can add a repeater node. The network type register S133=1 needs to be configured for the point-to-point network.

The point-to-point networks can also be used in some special cases: When multiple slaves or repeaters are deployed, the master selects the desired slaves for communication by configuring the destination address S140.



7.1 Configuration Preparations

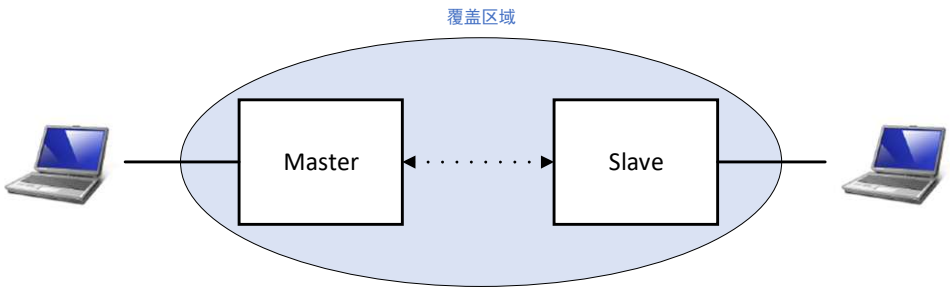
Before configuration, you must use the development board or user-designed hardware to provide power supplies and serial ports for the T900 module. The data serial port can be configured with registers using AT commands, and the control serial port can be configured with registers using API protocols. For details about interfaces, see Chapter 3 Hardware Description.

7.2 Working Mode

The T900's point-to-point network operates in three modes: master, slave, and repeater.

The master provides synchronization signals for the whole network to ensure that all devices can communicate normally.

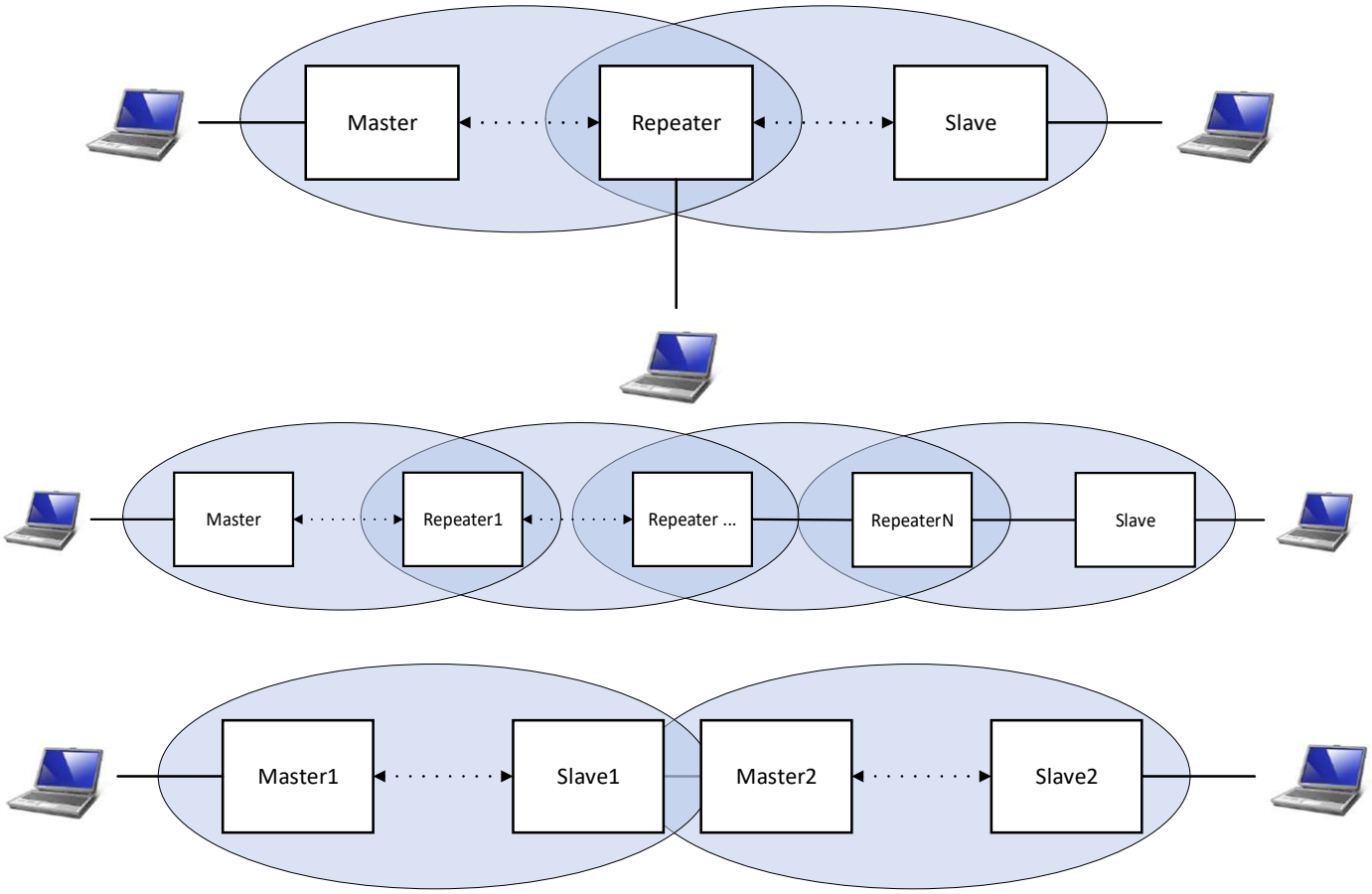
The slave end is the final node of the network and communicates directly with the master or repeater. When there is no user data transfer in the point-to-point network, the slave device will only synchronize with the master and will not send any information in the network.



The repeater can extend the coverage area of the master and forward the data. The

repeater synchronizes with the master or the upper-level repeater and sends synchronization signals to the lower-level devices. The repeater device can also be used as a slave to send and receive data through the data serial port。The output data is only the data sent by the upper-level device and does not output the data of the lower-level device. However, the input data will be confused with the data sent by the lower-level device and sent to the upper-level device.

Adding repeaters to the network reduces the total throughput of the network by half, but only by half and not as the number of repeaters increases. If a relay is required and the throughput is considered, another solution is to place two devices back-to-back at the repeater site. One is the slave of the upstream network and the other is the master of the downstream network. The serial ports of the two devices are connected in wired mode.



When the unit address is set to 0 on the P2P network of the T900, the IP address is automatically assigned. Users do not need to set the unit address, synchronous address,

and destination address.

The T900's point-to-point repeater mode is very flexible and easy to use. Adding a repeater device in a point-to-point network does not need additional configurations for the master and the slave. You only need to set the repeater to the same network ID, orifice rate, and set the repeater sequence number. After switching on, the existing network will automatically detect whether a repeater has joined. The repeater number must increase from the master to the slave in order but can be discontinuous. Pay attention to the repeater location to ensure link stability.

The working mode configuration register is S101. Run the following command:

- ATS101=0 --- Master
- ATS101=1 --- Repeater
- ATS101=2 --- Slave

7.3 Use Factory Defaults

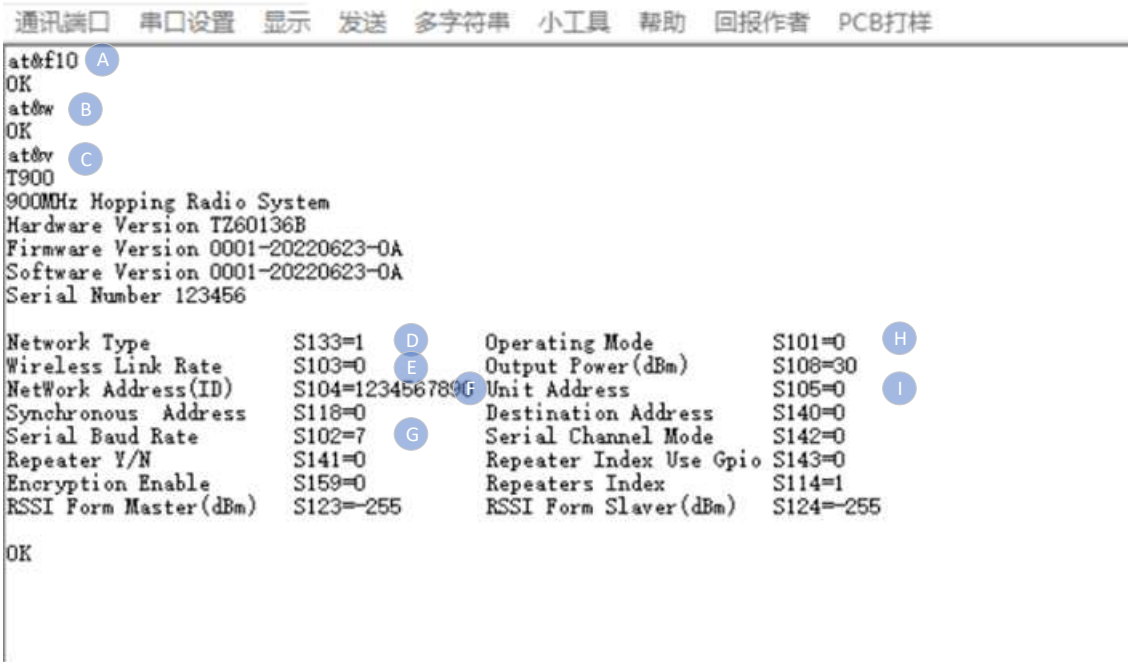
The factory default settings command can be used to quickly configure and deploy the T900 module, providing a fixed default configuration for each type of configuration. Using the factory defaults sets all registers to default values. Using the default settings has the following benefits:

- To speed up the configuration process. If there is no special requirement, use the default configuration.
- Troubleshoot issues. If communication cannot be established due to the adjustment of the settings, simply restore the factory defaults and any incorrect adjustments will be overwritten.

For most networking applications, the factory defaults are sufficient for all the functions required for point-to-point networking. No matter how complex the special requirements, you can start from the factory default settings configuration. All work modes and network types have corresponding factory default settings commands.

- AT&F10 --- Factory default settings for the point-to-point master
- AT&F11 --- Factory default settings for the point-to-point slave
- AT&F12 --- Factory default settings for the point-to-point repeater

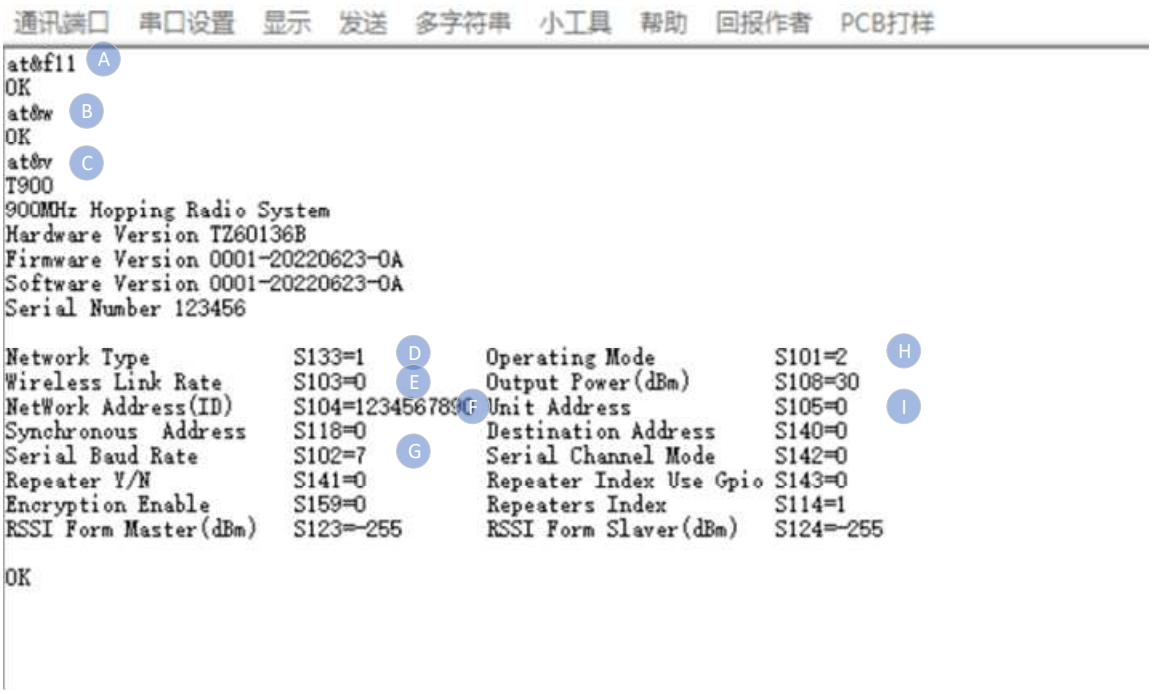
7.4 Master Setting



A) AT&F10 - Restore the factory default settings for the point-to-point master.
B) AT&W - Save setting parameters.
C) AT&V - Display the current settings.
D) S133 - The network type must be set to 1, corresponding to point-to-point network.
E) S103 - The wireless link rate on all devices on the network must be set to the same. The higher the rate, the greater the throughput, the lower the rate, and the better the sensitivity.
F) S104 - The network addresses (IDS) of all devices on the network must be the same. It is strongly recommended not to use the default setting 1234567890. To change the network address, use ATS104=xxxxxxxx.
G) S102 - The baud rate of the serial port matches that of the connected device.
H) S101 - The working mode must be set to 0, corresponding to the master.
I) S105 - The unit address is set to 0 to automatically assign the address.

After the configuration is completed, run the AT&W command to save the current settings. Run the ATA command to exit the AT command mode and the settings take effect.

7.5 Slave Setting



J) AT&F11 - Restore the factory default settings for the point-to-point slave.
K) AT&W - Save setting parameters.
L) AT&V - Display the current settings.
M) S133 - The network type must be set to 1, corresponding to point-to-point network.
N) S103 - The wireless link rate on all devices on the network must be set to the same. The higher the rate, the greater the throughput, the lower the rate, and the better the sensitivity.
O) S104 - The network addresses (ids) of all devices on the network must be the same. It is strongly recommended not to use the default setting 1234567890. To change the network address, use ATS104=xxxxxxxx
P) S102 - The baud rate of the serial port matches that of the connected device.
Q) S101 - The working mode must be set to 2, corresponding to the slave.
R) S105 - The unit address is set to 0 to automatically assign the address.

After the configuration is complete, run the AT&W command to save the current Settings. Run the ATA command to exit the AT command mode and the settings take effect.

7.6 Repeater Setting

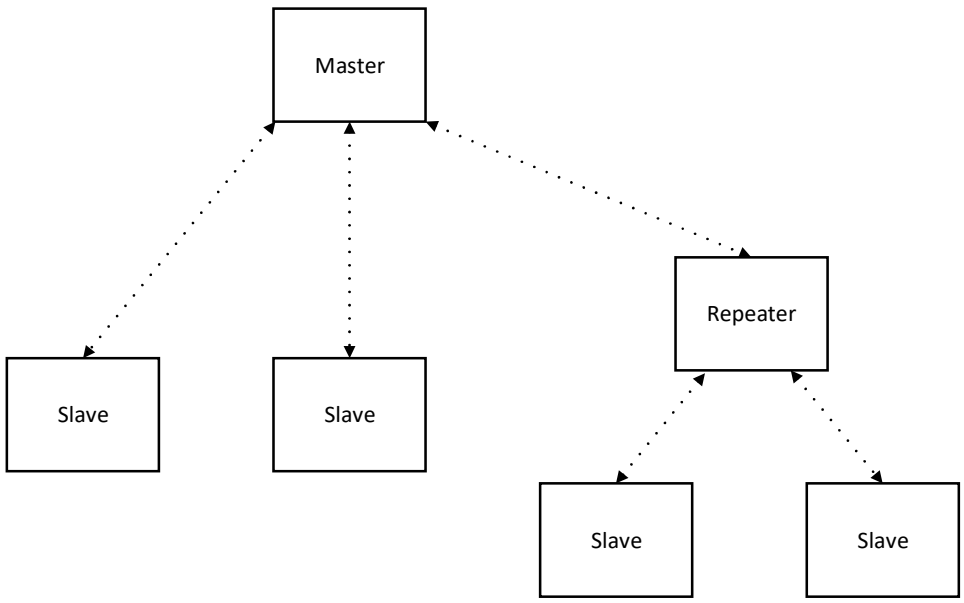
A) AT&F12 - Restore the factory default settings for the point-to-point repeater.
B) AT&W - Save setting parameters.
C) AT&V - Display the current settings.
D) S133 - The network type must be set to 1, corresponding to point-to-point network.
E) S103 - The port rates of all devices on the network must be the same. The higher the rate, the greater the throughput, the smaller the rate, and the better the sensitivity.
F) S104 - The wireless link rate on all devices on the network must be set to the same. It is strongly recommended not to use the default setting 1234567890. To change the network address use ATS104=xxxxxxxx.
G) S102 - The baud rate of the serial port matches that of the connected device.
H) S101 - The working mode must be set to 1, corresponding to the repeater.
I) S105 - The unit address is set to 0 to automatically assign the address.
J) S114 - The repeater sequence number represents the position of the repeater in the network, the closer to the master, the smaller the sequence number, and it can be discontinuous.

After the configuration is completed, run the AT&W command to save the current Settings. Run the ATA command to exit the AT command mode and the settings take effect.

8.Point-to-Multipoint Networks

In a point-to-multipoint network, the master can directly connect to multiple slaves or connect to multiple slaves through repeaters. The repeater also has the function of the slave end and can communicate with the master, but its uplink data will be confused with that of the slave. The network type register S133=0 needs to be configured for point-to-multipoint networks.

The master can use the target address S140 to temporarily select a particular slave or repeater to communicate with and filter out data transmission requests from other devices.



点对多点网络拓扑图

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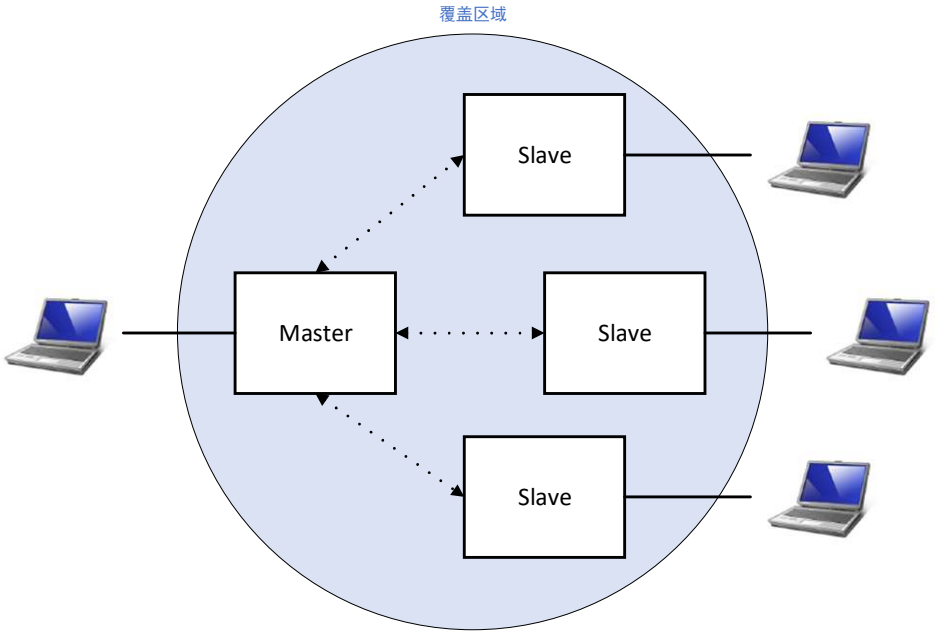
8.2 Working Mode

The T900 point-to-multipoint network operates in three modes: master, slave, and repeater.

The master provides synchronization signals for the entire network to ensure normal communication between all devices.

The slave is the final node of the network and communicates directly with the master or repeater. When there is no user data transfer in the point-to-multipoint network, the slave device will only synchronize the master and will not send any information on the network.



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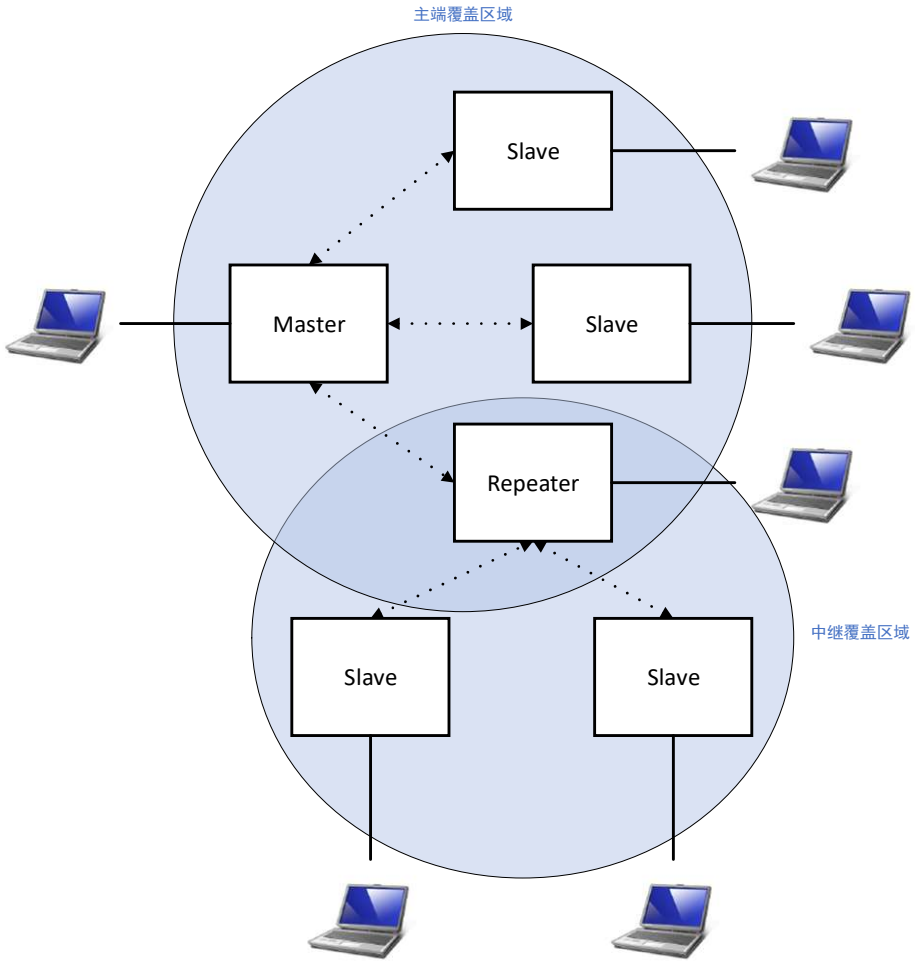
only the data sent by the upper-level device and does not output the data of the lower-level device. However, the input data will be confused with the data sent by the lower-level device and sent to the upper-level device.

Adding repeaters to the network reduces the total throughput of the network by half, but only by half and not as the number of repeaters increases. If a repeater is required and the throughput is considered, another solution is to place two devices back-to-back at the repeater site. One is the slave of the upstream network and the other is the master of the downstream network. The serial ports of the two devices are connected in wired mode.



The repeater of a point-to-multipoint network cannot be automatically added like a point-to-multipoint network. You need to manually configure registers S105, S118, and S140 to determine the network topology.

The working mode configuration register is S101. Run the following command:

- ATS101=0 --- Master

- ATS101=1 --- Repeater
- ATS101=2 --- Slave

8.3 Use Factory Defaults

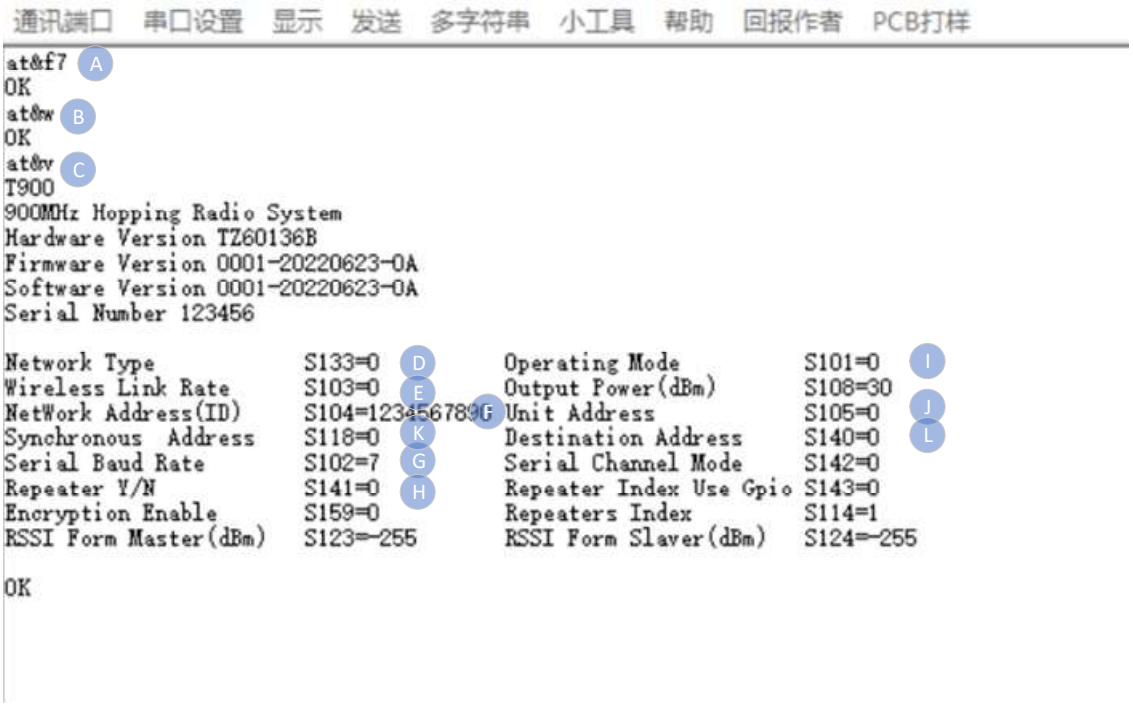
The factory defaults settings command can be used to quickly configure and deploy the T900 module, providing a fixed default configuration for each type of configuration. Using factory defaults sets all registers to default values. Using the default settings has the following benefits:

1. To speed up the configuration process. If there is no special requirement, please use the default configuration.
2. Troubleshoot issue. If communication cannot be established due to adjustments to the settings, simply restore the factory defaults and any incorrect adjustments will be overwritten.

For most networking applications, the factory defaults provide all the functionality required for point-to-multipoint network. No matter how complex the special requirements are, you can start from the factory default settings configuration. All work modes and network types have corresponding factory default settings.

- AT&F7 --- Factory default settings for the point-to-multipoint master
- AT&F8 --- Factory default settings for the point-to-multipoint slave
- AT&F9 --- Factory default settings for the point-to-multipoint repeater

8.4 Master Setting



A) AT&F7 - Restore the factory default Settings of the point-to-point master.
B) AT&W - Save setting parameters.
C) AT&V - Display the current settings.
D) S133 - The network type must be set to 0, corresponding to point-to-multipoint network.
E) S103 - The wireless link rate on all devices on the network must be set to the same. The higher the rate, the greater the throughput. The lower the rate, the better the sensitivity.
F) S104 - The network addresses (ids) of all devices on the network must be the same. It is strongly recommended not to use the default setting 1234567890. To change the network address use ATS104=xxxxxxxx.
G) S102 - The baud rate of the serial port matches that of the connected device.
H) S141 - Whether a repeater exists on the network.
I) S101 - The working mode must be set to 0, corresponding to the master.
J) S105 - For the unit address, see Section 9.7 for an example.
K) S118 - For the synchronize addresses, see Section 9.7 for example.
L) S140 - For the target address, see Section 9.7 for example.

After the configuration is completed, run the AT&W command to save the current Settings. Run the ATA command to exit the AT command mode and the Settings take effect.

8.5 Slave Setting

A) AT&F8 - Restore the factory default settings for the point-to-multipoint slave.
B) AT&W - Save setting parameters.
C) AT&V - Display the current settings.
D) S133 - The network type must be set to 0, corresponding to point-to-multipoint.
E) S103 - T The wireless link rate on all devices on the network must be set to the same. The higher the rate, the greater the throughput. The lower the rate, the better the sensitivity.
F) S104 - The network addresses (ids) of all devices on the network must be the same. It is strongly recommended not to use the default setting 1234567890. To change the network address use ATS104=xxxxxxxx.
G) S102 - The baud rate of the serial port matches that of the connected device.
H) S141 - Whether a repeater exists on the network.
I) S101 - The working mode must be set to 2, corresponding to the slave.
J) S105 - For the local address, see Section 9.7 for an example.
K) S118 - For the synchronize addresses, see Section 9.7 for example.
L) S140 - For the target address, see Section 9.7 for example.

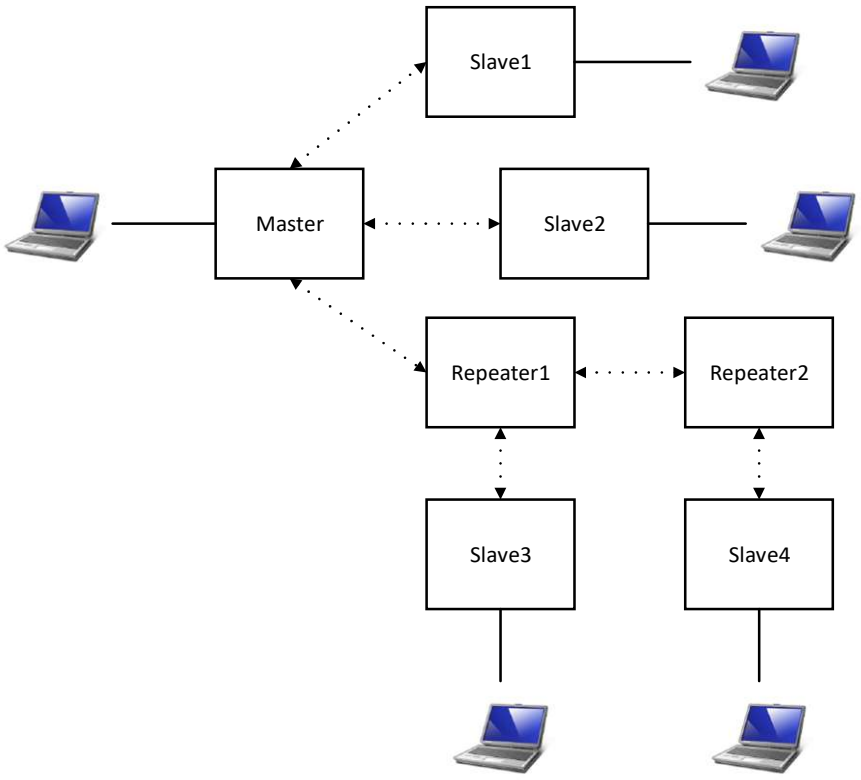
After the configuration is completed, run the AT&W command to save the current Settings. Run the ATA command to exit the AT command mode and the settings take effect.

8.6 Repeater Setting

A) AT&F9 - Restore the factory default settings for the point-to-multipoint repeater.
B) AT&W - Save setting parameters.
C) AT&V - Display the current settings.
D) S133 - The network type must be set to 0, corresponding to point-to-multipoint.
E) S103 - The wireless link rate on all devices on the network must be set to the same. The higher the rate, the greater the throughput. The lower the rate, the better the sensitivity.
F) S104 - The network addresses (ids) of all devices on the network must be the same. It is strongly recommended not to use the default setting 1234567890. To change the network address use ATS104=xxxxxxxx.
G) S102 - The baud rate of the serial port matches that of the connected device.
H) S141 - Whether a repeater exists on the network.
I) S101 - The working mode must be set to 2, corresponding to the repeater.
J) S105 - For the local address, see Section 9.7 for an example.
K) S118 - For the synchronize addresses, see Section 9.7 for example.
L) S140 - For the target address, see Section 9.7 for example.

After the configuration is completed, run the AT&W command to save the current Settings. Run the ATA command to exit the AT command mode and the settings take effect.

8.7 Examples for Configuring Point-to-Multipoint Network Addresses.



A point-to-multipoint network has one master, four slaves, and two repeaters. Slave 1, slave 2, and repeater 1 are synchronized to the master, repeater 2 is synchronized to repeater 1, slave 3 is synchronized to repeater 1, and slave 4 is synchronized at repeater 2. If S141 of the master is 1, there are repeaters on the network. The unit address and synchronization address of each device are set in the following table:

	Local address S105	Synchronous addressS118	Target address S140

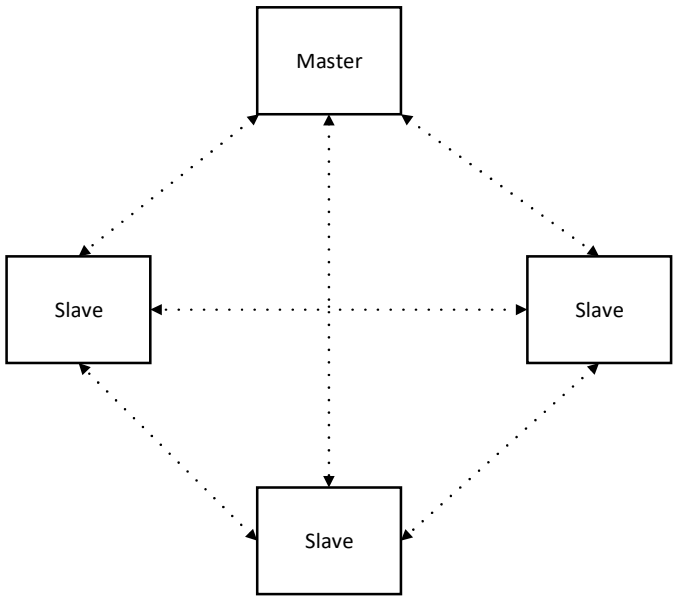
Master	1	0	0
repeater1	2	1	0
repeater2	3	2	0
slave1	4	1	0
slave2	5	1	0
slave3	6	2	0
slave4	7	3	0

On the same point-to-multipoint network, the unit address of each device must be unique and non-zero. The synchronization address is set to the unit address of its upper-level device. The destination address is usually set to 0, or the unit address of a device if you need to specify receiving a device.

9.Mesh With Center Networks

A central Mesh network is a special point-to-multipoint network. The center of the network is still the master, and all the slaves can exchange data with each other but do not forward data. The Mesh network with a center needs to be configured with the network type register S133=2. This network type does not support repeaters.

The master can use the target address S140 to temporarily select a particular slave to communicate with and filter out data transfer requests from other devices.



The Mesh with Center Network topology

9.1 Configuration Preparations

Before configuration, you must use the development board or user-designed hardware to provide power supplies and serial ports for the T900 module. The data serial port can be configured with registers using AT commands, and the control serial port can be configured with registers using API protocols. For details about interfaces, see Chapter 3 Hardware Description.

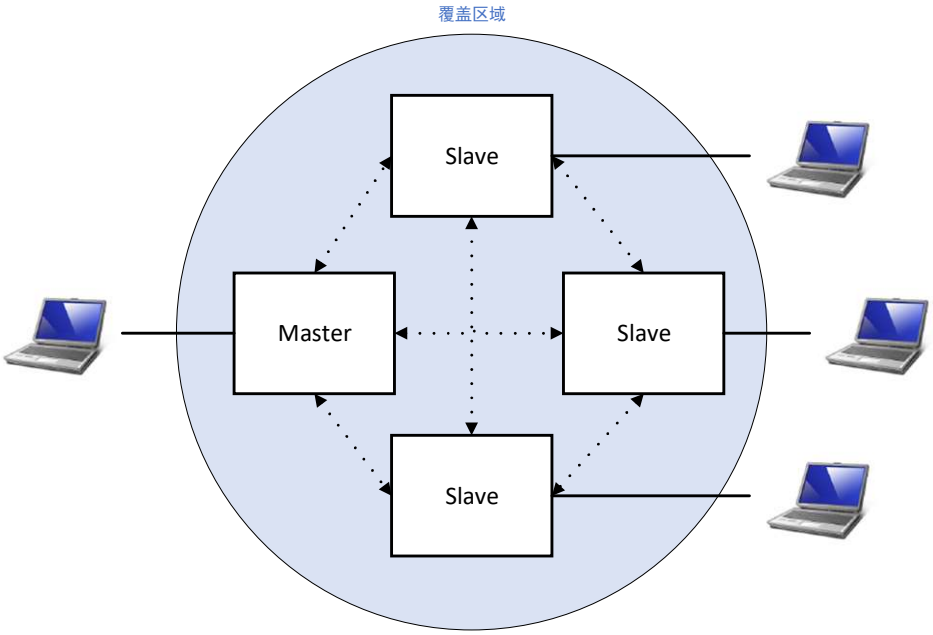
9.2 Working Mode

The T900's centered Mesh network supports only two operating modes: master and slave. The repeater is not supported.

The master provides synchronization signals for the whole network to ensure that all devices can communicate normally.

The slave is the final node of the network and communicates directly with the master or the salve. When no user data is transmitted on the point-to-multipoint network, the slave device synchronizes with the master device and does not send any information on

the network.



For a Mesh network with a center, registers S105, S118 and S140 need to be configured in advance to determine the network topology.

The working mode configuration register is S101. Run the following command:

- ATS101=0 --- Master
- ATS101=2 --- Slave

9.3 Use Factory Defaults

The factory default settings command can be used to quickly configure and deploy the T900 module, providing a fixed default configuration for each type of configuration. Using factory defaults sets all registers to default values. Using the default Settings has the following benefits:

1.To speed up the configuration process and use the default configuration if you don't need it.

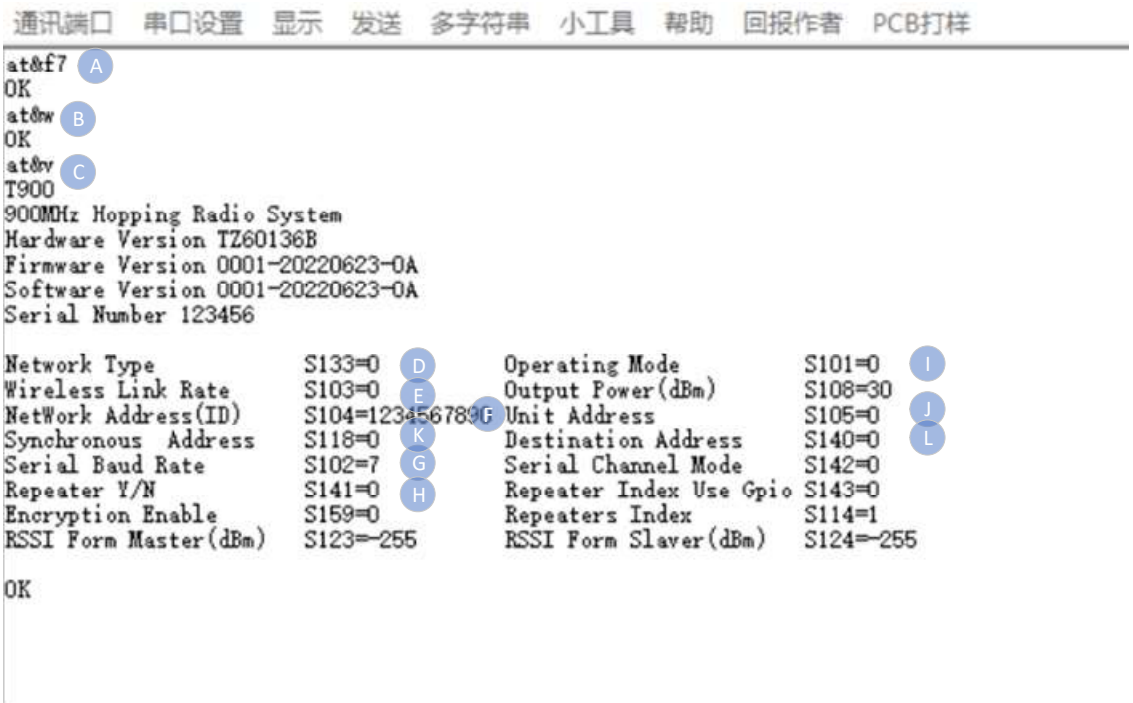
2. Troubleshoot issue. If communication cannot be established due to adjustments to the settings, simply restore the factory defaults and any incorrect adjustments will be overwritten.

For most web applications, the factory defaults are sufficient for all the functions

required for a centralized Mesh network. No matter how complex the special requirements, you can start from the factory default settings configuration. All work modes and network types have corresponding factory default settings.

- AT&F4 --- Factory default settings for the Mesh-with-Center master.
- AT&F5 --- Factory default settings for the Mesh-with-Center slave.

9.4 Master Setting



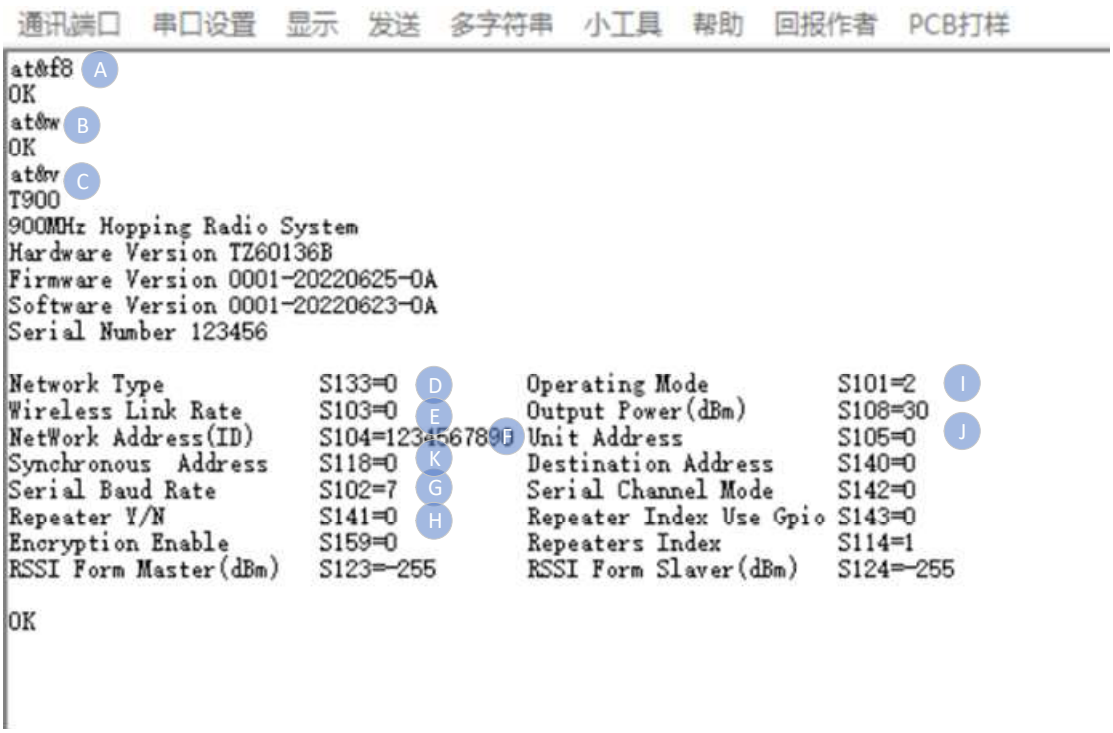
A) AT&F7 - Restore the factory default settings for the mesh-with-center master.
B) AT&W - Save setting parameters.
C) AT&V - Display the current settings.
D) S133 - The network type must be set to 2 with a central Mesh for pairs.
E) S103 - The wireless link rate on all devices on the network must be set to the same. The higher the rate, the greater the throughput. The lower the rate, the better the sensitivity.
F) S104 - The network addresses (ids) of all devices on the network must be the same. It is strongly

recommended not to use the default setting 1234567890. To change the network address use ATS104=xxxxxxxx

G) S102 - The baud rate of the serial port matches that of the connected device.
H) S141 - Whether a repeater exists on the network or not, the value must be set to 0.
I) S101 - The working mode must be set to 0, corresponding to the master side.
J) S105 - For the unit address, refer to the example in point-to-multipoint networks.
K) S118 - For the sync address, refer to the example in point-to-multipoint networks.
L) S140 - For the destination address, refer to the example in point-to-multipoint networks.

After the configuration is completed, run the AT&W command to save the current Settings. Run the ATA command to exit the AT command mode and the settings take effect.

9.5 Slave Setting



A) AT&F8 - Restore the factory default settings for the mesh-with-center slave.
B) AT&W - Save setting parameters.
C) AT&V - Display the current settings.
D) S133 - The network type must be set to 2 with a central Mesh for pairs.
E) S103 - The wireless link rate on all devices on the network must be set to the same. The higher the rate, the greater the throughput. The lower the rate, the better the sensitivity.
F) S104 - The network addresses (ids) of all devices on the network must be the same. It is strongly

recommended not to use the default setting 1234567890. To change the network address use ATS104=xxxxxxxx

G) S102 - The baud rate of the serial port matches that of the connected device.
H) S141 - Whether a repeater exists on the network or not, the value must be set to 0.
I) S101 - The working mode must be set to 2, corresponding to the slave side.
A) S105 - For the unit address, refer to the example in point-to-multipoint networks.
B) S118 - For the sync address, refer to the example in point-to-multipoint networks.
C) S140 - For the destination address, refer to the example in point-to-multipoint networks.
J)

After the configuration is completed, run the AT&W command to save the current Settings. Run the ATA command to exit the AT command mode and the settings take effect.

9.6 Packet Length Limit

In the case of a central Mesh network, when the channel access mode is TDMA, each device communicates with each other. When multiple devices send data, the data output from serial ports will interleave each other. To ensure the integrity of data packets, the length of data packets must be smaller than the maximum length sent by a single time slot. When the channel access mode is selected TDMA-AUTO, there is no limit on the packet length.

Orifice speed	Maximum length of a single packet
276.4kbps	175 bytes
230.4kbps	140 bytes
172.8kbps	100 bytes
115.2kbps	55 bytes
57.6kbps	15 bytes