

## ROC-2313 Reverse Osmosis Controller

### 1 General

The instrument is a combined control instrument of a reverse osmosis controller and an on-line conductivity instrument. It can perform the operation test, status control and on-line monitoring of water quality conductivity (combining PLC controller and conductivity meter). It takes multiple anti-interference measures, adopts unique process flow and graphical control panel with LED indicator lamp embedded, the interface is friendly; menu-driven operation is used, multiple groups of parameters can be set and modified, the requirements of automatic operation are met.

### 2 Process Flow Selections

There are two typical operation modes for RO system (as shown in Fig.1A and B). This instrument can operate in both modes in A and B.

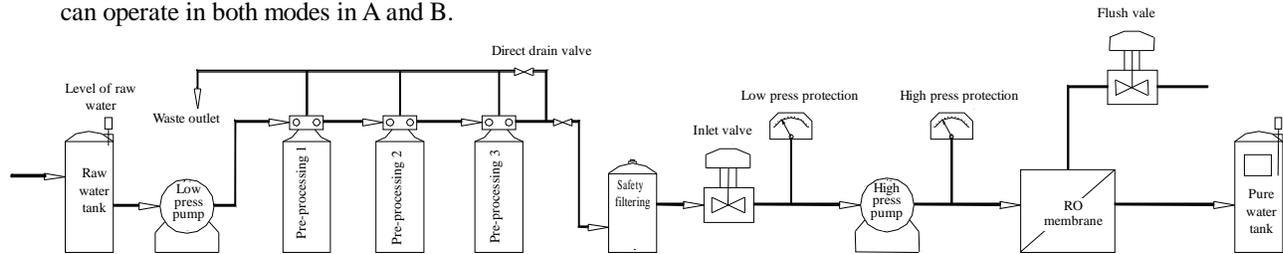


Fig. 1-A First level RO process flow with raw water tank

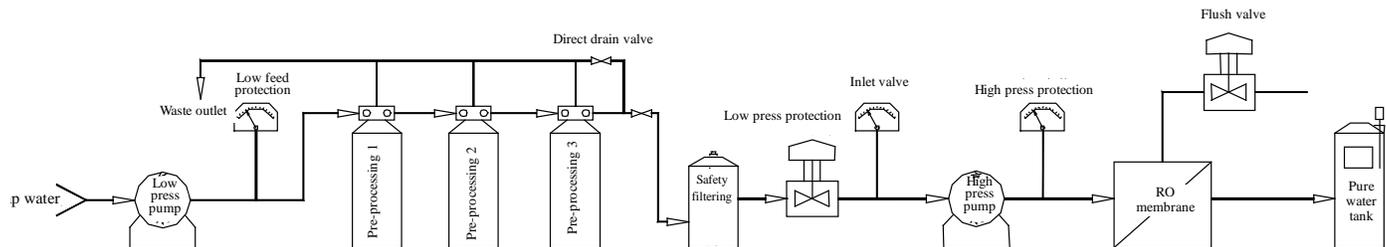


Fig. 1-B First level RO process flow with direct water supply

### 3 Functions and Main Technical Specifications

#### *Low feed protection:*

In case of raw water supply break-off, the “LOW FEED PRESS” lamp will be lightened, the nixie tube will display “ALA” and the buzzer will give an alarm, the controller will shut down the whole RO system. After that, the controller will keep detecting the low feed switch. When the water supply is resumed, the system will be restarted.

#### *Low pressure protection:*

In case of low pressure, the “LOW PRESS” lamp will be lightened, the nixie tube will display “ALA” and the buzzer will give an alarm, the controller will shut down the whole RO system and try to start up for the first time after 1 minute. If the water pressure is normal, the water producing process will be resumed. If the start-up fails for three times, the system will come into a dead-lock status. Press the ECS key(external control switch) or the reset key to exit and then restart.

#### *High pressure protection:*

In case of high pressure over limit, the “HIGH PRESS” lamp will be lightened, the nixie tube will display “ALA” and the buzzer will give an alarm, the controller will shut down the whole RO

system and wait for the elimination of high pressure. When the high pressure eliminates, the controller will try to start up for the first time after 1 minute. If the water pressure is normal, the water producing process will be resumed. If the start-up fails for three times, the system will come into a dead-lock status. Press the ECS key(external control switch) or the reset key to exit and then restart.

**Conductivity over limit alarm:**

When the conductivity of the measured solution is over limit, the “HIGH” lamp on the panel will be lightened, the buzzer will give an alarm, and the control relay will switch on (this relay can drive to turn on the by-pass valve. When the conductivity falls below the limit, the alarm will be set off.

**Main technical specifications:**

1. Power voltage: AC 220V ± 15% 50Hz      Power consumption: ≤ 3W
2. Environment conditions: 1) temperature: 0~50°C ;    2) humidity: ≤ 85%RH
3. Measuring range: 0~200 μ S /cm      accuracy: 1.5 level
4. Load capacity of output contact: 3A/250V AC (the magnetic valve should be driven through intermediate relay)
5. Operation pressure of conductance cell: 0~0.5Mpa
6. Medium temperature: 5~50°C
7. Temperature compensation: automatic temperature with 25°C as reference temperature
8. Distance of measuring range: less than 30m (the ex-factory configuration of electrode cable is 5m unless there is a special agreement)
9. Display mode: 3 1/2-digit LED digital display
10. Electrode selected: 1.0cm<sup>-1</sup>
11. outline dimensions: 96×96×110mm (height×width×depth)  
 meter board hole: 92×92mm (height×width)

**4 Front Panel Illustration**

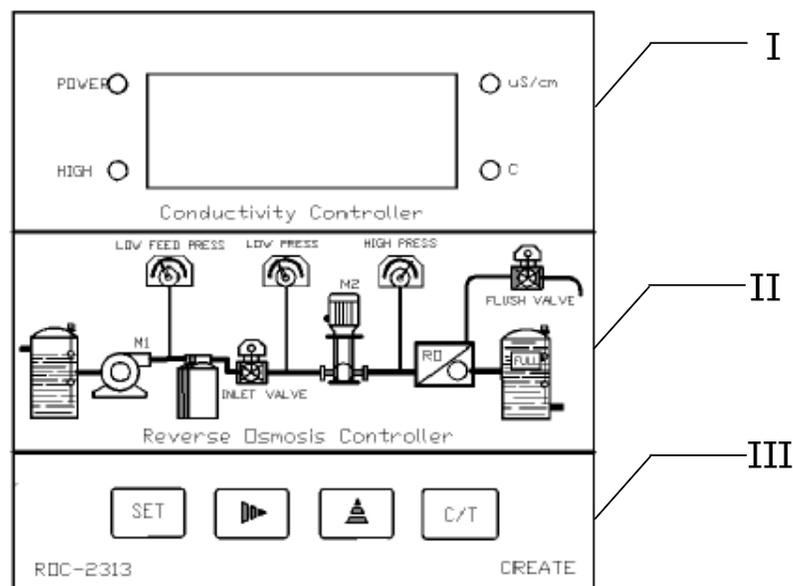


Fig. 2 Front panel

The display board is shown in the above figure, there are three areas from up to down: I, II and III.

**Part I** contains 4 LED status indicator lamps and conductivity value display area. The 4 LED status indicator lamps respectively indicate:

POWER----indicator lamp for power supply

HIGH----indication for conductivity over limit alarm

$\mu$  S/cm----conductivity value, representing that the displayed value is the conductivity value of the produced water

$^{\circ}$ C----temperature value of the fluid, representing that the displayed value is the temperature value of the current fluid

SLP(displayed in the nixie tube)----ECS is not switched on and system is in the standby status.

FULL (displayed in the nixie tube)----water tank is full and the “FULL” lamp will be lightened

ALA(displayed in the nixie tube)----“ALARM” lamp will be lightened when alarm appears.

**Part II** is the indication of RO system operation status, which contains 9 LED indicator lamps, and the lamps respectively indicate:

LOW FEED PRESS----indicator lamp for low feed alarm, indicating that there is no water in the raw water tank or the water is not sufficient.

LOW PRESS----indication for inlet water operation of high pressure pump, indicating that the inlet water operation pressure of high pressure pump is too low.

HIGH PRESS----indication for over pressure operation of high pressure pump, indicating that the outlet pressure of high pressure pump is too high.

INLET VALVE----indication for inlet magnetic valve turning on, indicating that the inlet magnetic valve is turned on.

M1----indication for low pressure pump operation, indicating that the low pressure pump is switched on.

M2---- indication for high pressure pump operation, indicating that the high pressure pump is switched on.

RO----indication for water producing status, indicating that the RO system is in water producing operation.

FLUSH VALVE----indication for flush magnetic valve turning on, indicating that the flush magnetic valve is turned on.

FULL----indication for full pure water tank, indicating that the water level in the pure water tank has reached the high limit.

**Part III** contains setting and operation keys, their meanings are:

----parameter setting key, select the parameter items to be modified or inquired.

----circularly select thousand, hundred, ten and unit digit, the selected digit flashes.

----adjust the number of the selected digit (circle from 0 to 9)

----C/T key, confirm to save the modified parameter in parameter modification or switch between the indication value of conductivity and temperature in measuring status.

## 5 Rear Panel Illustration

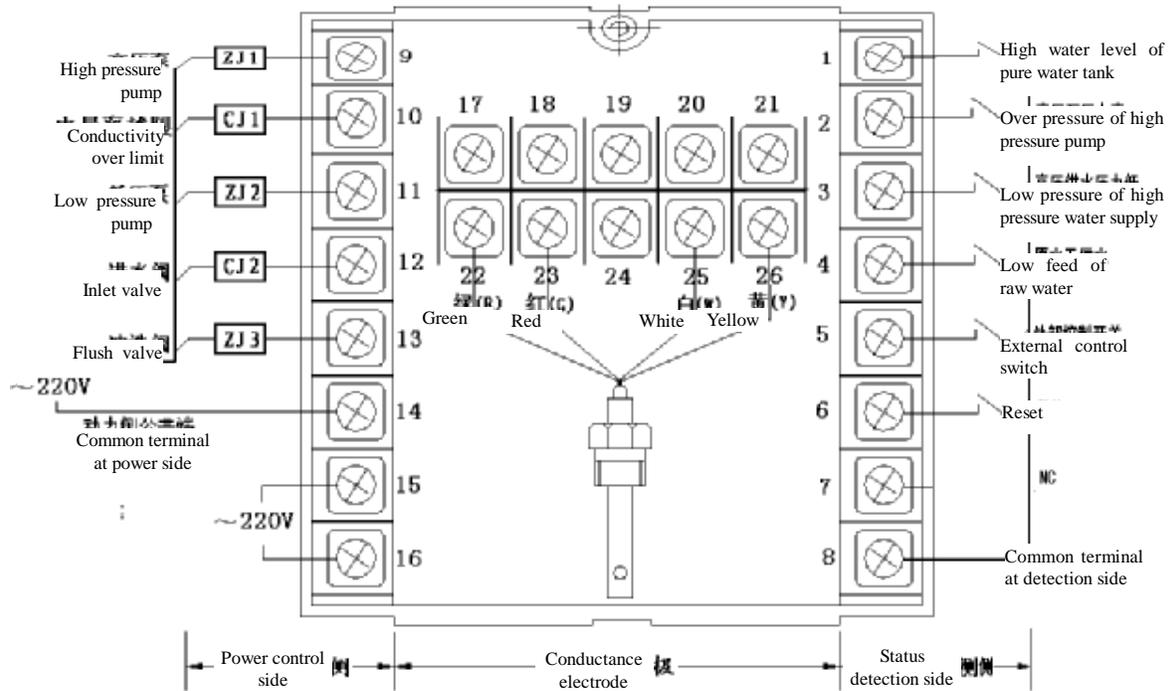


Fig. 3 Rear panel connection diagram

Since small relay is used in the controller, when driving larger inductive load, intermediate relay or contactor must be used, direct driving is not allowed.

Note: ZJ—intermediate relay      CJ---magnetic contactor (refer to appendix for type selection)

The rear connecting terminals are shown in the diagram, the definitions of the terminals are:

### Terminals from up to down on the left:

- 9---output contact terminal of high pressure pump on/off control (normally open, **passive**)
- 10---contact terminal of conductivity over limit control (normally open, **passive**)
- 11--- output contact terminal of low pressure pump on/off control (normally open, **passive**)
- 12--- output contact terminal of inlet magnetic valve on/off control (normally open, **passive**)
- 13--- output contact terminal of flush magnetic valve on/off control (normally open, **passive**)
- 14---a common terminal used jointly by the control signals of terminal 9, 10, 11, 12 and 13.
- 15, 16---connection terminal of 220V commercial power.

### Terminals from up to down on the right:

- 1---input terminal of high water level detection switch of pure water tank (**normally open, close in case of low water level of pure water tank**)
- 2---input terminal of booster pump over pressure detection switch (normally close, switch off in case of over pressure)
- 3---input terminal of insufficient low pressure detection switch (normally open, close at a preset pressure)
- 4---input terminal of raw water low feed detection switch (normally open, close when water exists)

If your system has a raw water tank as shown in Fig. 1-A, this terminal is connected to the normally open contact of the raw water tank low level limit, it will close when water exists; if your

system adopts direct water supply from tap water as shown in Fig. 1-B, then this terminal is connected to the normally open contact of the pressure switch of low feed protection, and it will close when water pressure is normal.

5---terminal of external operation switch of controller ,ECS (the system operates when it is switched on ). The ECS switch may be controlled by the key switch installed on the cabinet panel, **if a key switch is not used, please connect terminal 5 and 8 in short circuit.**

6---Reset signal, may be connected to a reset button on the cabinet panel, used for reset of high and low pressure alarms.

8--- a common terminal used jointly by the detection signals of terminal 1,2,3,4,5 and 6.

**Terminals from left to right in the middle:**

22---input wire of conductance electrode (green wire)

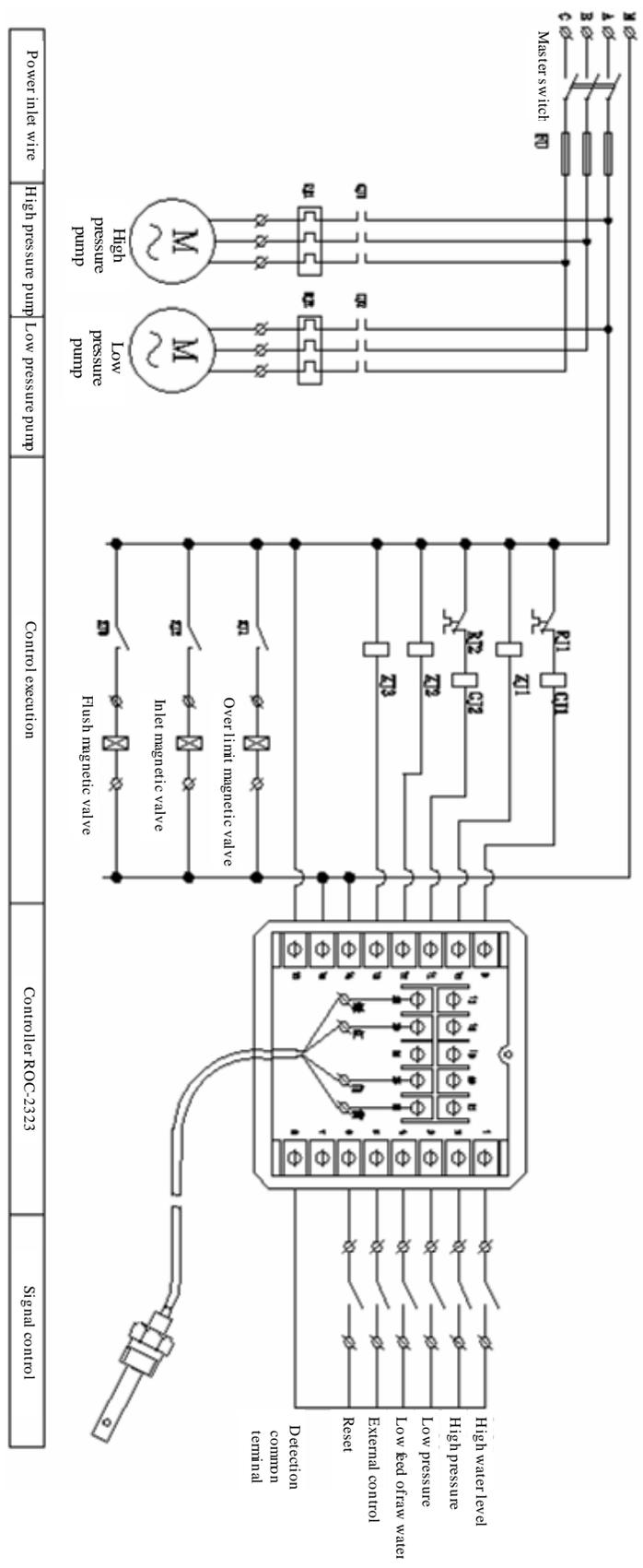
23---input wire of conductance electrode (red wire)

25---input wire of conductance electrode (white wire)

26---input wire of conductance electrode (yellow wire)

**Rest terminals** including terminal 7, 17,18,19,20,21,24 are not internally connected.

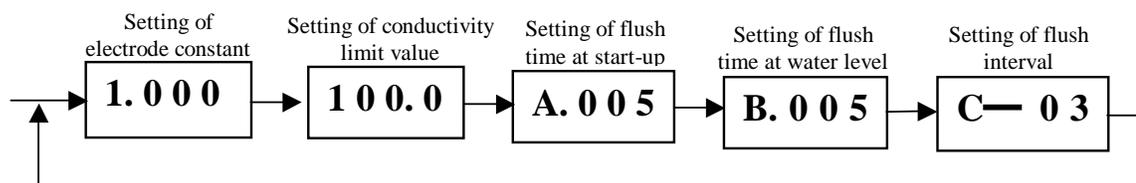
6 Electrical control circuit diagram 4 2313 (for reference)



## 7 Operation Method

When the instrument is powered on, the “POWER” lamp will be lightened, and the nixie tube will display the conductivity value. Switch on ECS to start water producing, stand by in the nixie tube if it is not switched on.

A Press  key, the nixie tube indicates “1.000” (electrode constant). Press  key again and again, the following menu items will come out:



Electrode constant: this value is keyed in by the manufacturer at ex-factory, it should not be modified at will. In case of replacement of electrode, please enter it under the direction of the manufacturer.

Conductivity limit value: the default value is “100.0” (operation limit).

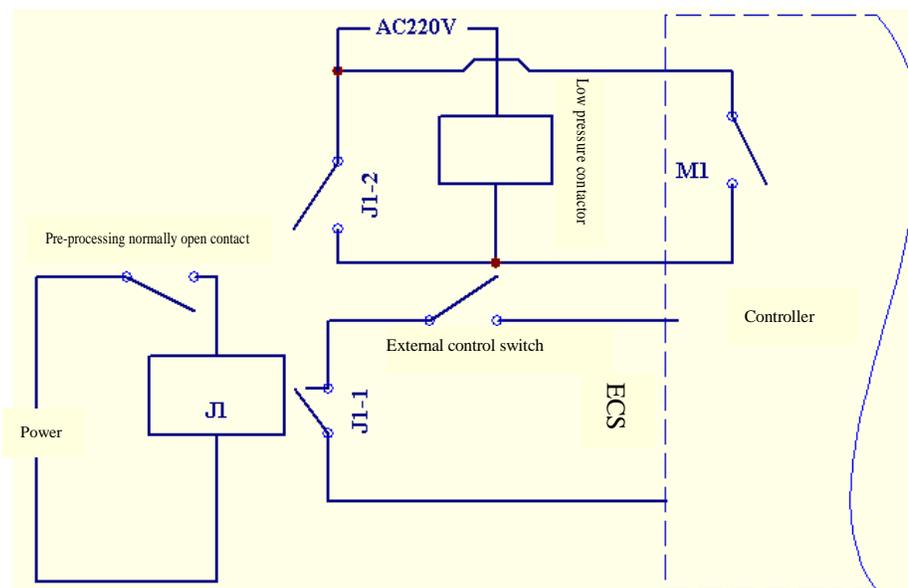
Flush time at start-up: “A-005” “005” is the default value, the unit is “second”, and the setting range is 0~249s. If the setting is “90”, then the membrane will be flushed for 90s in each time the system start up to produce water.

Flush time at water level: “B-005” “005” is the default value, the unit is “second”, and the setting range is 0~249s. If the setting is “90”, then in each time that the pure water tank is full and the system stops, or the system restart after low water level is detected, the membrane will be flushed for 90s.

Flush interval: “C-03” “03” is the default value, the unit is “hour”, and the setting range is 0~99h. If the setting is “03”, then the membrane will be flushed once at every 3 hours of continuous water producing or standing by status.

If you are not satisfied with the above mentioned parameter settings, you can modify them by ,  and  keys. When the data modification is finished, press  key to save the data and go back to measuring status (if you don't press this key, the system will automatically go back to measuring status after 3 minutes, but the data modification will not be saved.)

## 8 Connection for automatic reverse flushing:



Relay J1 should be added for reverse flushing. Two contacting points J1-1, J1-2 is normally open and close .J1 is controlled by pretreatment timer and time of reverse flushing is subject to close time of normally open contacting point.

## 9 Measurement electrode (CELL) installation

To ensure the real measurement result, data distortion caused by air bubble or dead water in conductance cell should be avoided. The installation should be performed strictly according to the following drawing:

- Notes: (1) The electrode should be installed at a lower location in the pipe where the flow speed is steady and air bubbles are seldom generated.
- (2) No matter the conductance cell is horizontally or vertically installed, it should be deeply inserted into the moving water.
- (3) The conductivity signal is weak electronic signal and its collecting cable should be separately installed. They should not be connected to the same group of cable joint or terminal board with the power line.
- (4) When the measurement cable needs to be lengthened, it's recommended to use the cable provided by the original manufacturer, When a longer distance is involved, the length of the cable (<30m) should be agreed on before delivery, and if the length is over 30m, a transmitter should be used.

## 10 Maintenance

- (1) The conductance cell, as a sophisticated component, can not be disassembled. Unless necessary the electrode cell should not be taken out of measurement cell .Conductance cell should be cleaned regularly for keeping surface clean. when the electrode platinum black coating is dirty, soak it in 10% dilute hydrochloric acid for two minutes , then rinse it with pure water to keep the surface clean.
- (2) The measurement cable is special cable and should not be changed at will or it will cause significant error.
- (4)The special auxiliary electrode cell should be used in case of damage .

### 11 Trouble shooting

- 1) The magnetic valve can not be opened ---wrong selection of magnetic valve, high voltage magnetic valve should be used.
- 2) Low pressure alarm when flush valve is opened---too much opening extend for flush valve ,leakage of pressure caused by wrong selection or too large hole. Selecting suitable magnetic valve or adjusting valve is used before the magnetic valve.

### 12 Complete sets of instrument

Panel meter	1	Sensor	1
Fixing clamp	1	Operation manual	1

Appendix: For using the following data, relative contactor should be selected

Water Outflow (m <sup>3</sup> /h)	Water Inflow (m <sup>3</sup> /h)	No.of membrane		Pre-processing low pressure pump		Reverse osmosis high pressure pump			
		4040 Model	8040 Model	Low pressure pump (KW)	contactor (A)	Low pressure membrane 1.05MPa (KW)	contactor (A)	High pressure membrane 1.55MPa (KW)	contactor (A)
0.25	0.5	1		0.37	10	0.37	10	0.5	10
0.5	1	2		0.37~0.75	10	0.5~1.5	10	2.2	10
0.75	1.5	3		0.37~0.75	10	1.5	10	2.2	10
1	2	4		0.37~1.1	10	1.5	10	2.2	10
1.5	3	6		0.55~1.1	10	2.2	10	4	10
2	3.3	8		0.55~1.1	10	3	10	4	10
2.5	4	10		0.55~1.5	10	3	10	4	10
3	4.3	12		0.55~1.5	10	3	10	4	10
4	6.6	16		1.1~1.5	10	4	10	5.5	20
5	8	20		1.1~2.2	10	5.5	20	7.5	20
6	10		6	1.1~2.2	10	5.5	20	7.5	20
8	13		8	2.2~4	10	11	40	11	40
10	17		10	2.2~5.5	10~20	11	40	15	40
15	21		15	4~7.5	10~20	11	40	15	40
20	28		20	4~11	20~40				

