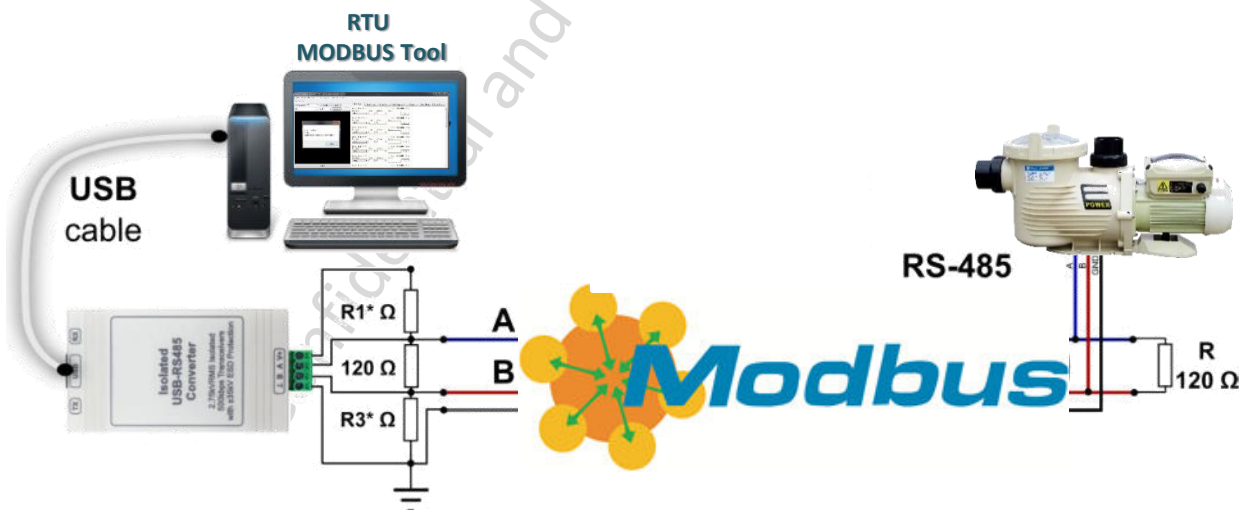


# Variable speed Pump

## RS485 MODBUS

### Client Software and CODE Manual

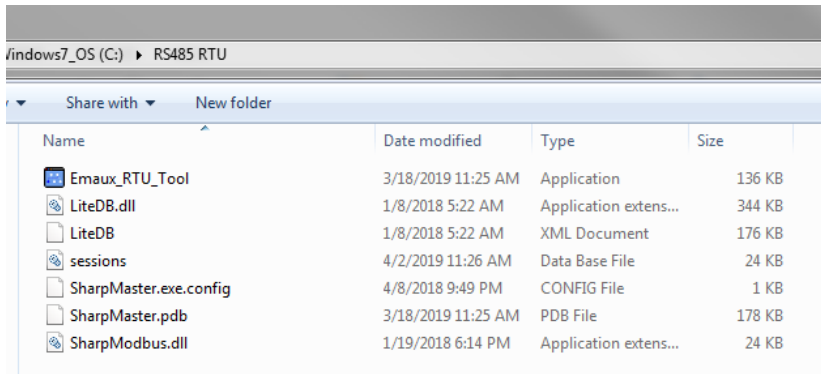


### Introduction

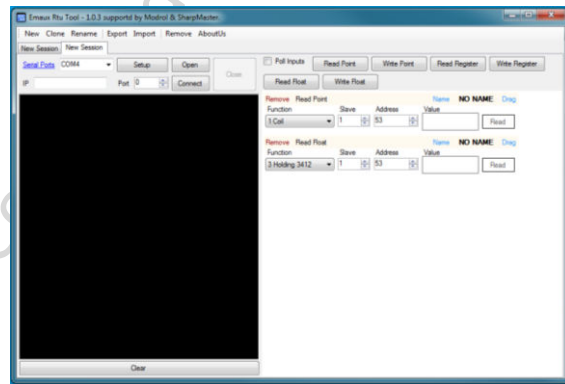
Emaux RTU Tool is designed for the purpose to connect from PC to EMAUX EPV and SPV variable speed pump with RS485 interface connection.

### Support Platform.

It is a direct run green software without installation and administrator right on window platform. It is just copy and paste under any drive such as C: .

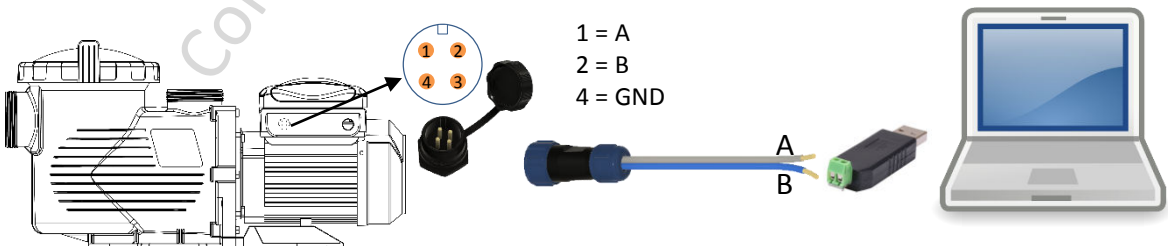


Click Emaux\_RTU\_Tool to run the program and will display like below. All data input and output is in decimal.



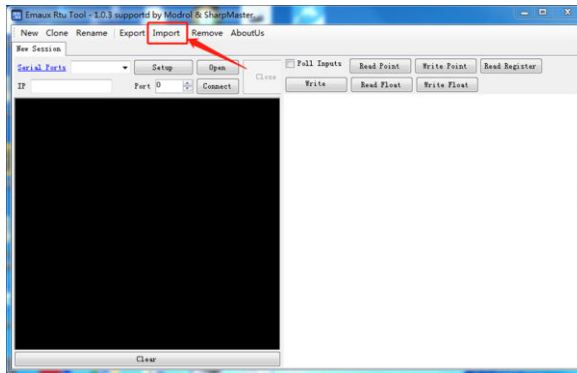
### Connect PC to RS-485 interface.

A USB to RS485 dongle (not provided) is needed with at least 2 pins A and B according to standard RS-485 connection as per below pin assignment. Pin 4 is ground option. Connect the SP1310 4 pins waterproof plug to the socket on the pump. For beyond 100m wiring, a 120 ohm terminal resistor is needed to add across A B lines.

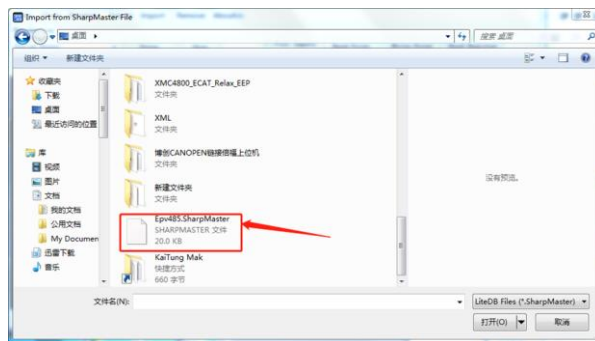


Import the standard setting

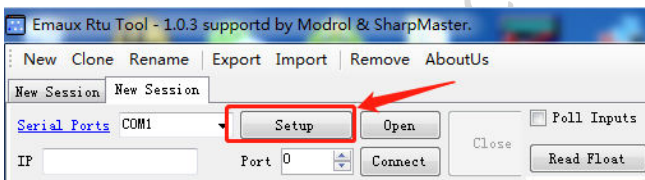
There is a standard file “EPV485.sharpMaster” is provided for import.



Click “Import” and Browser your explorer and select the file



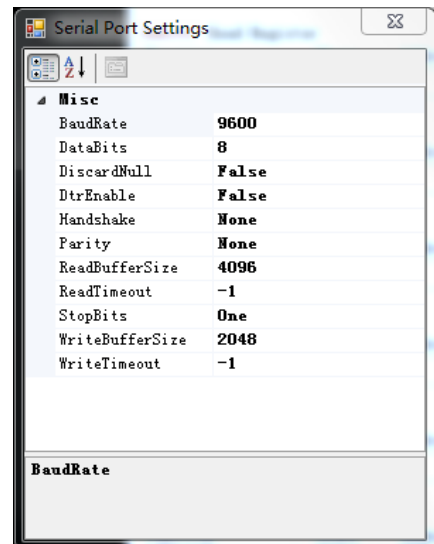
Click “Setup” and MODBUS setting will display



Then select the “com” port as refer to Hardware com port number.

Press Open to enable the com port to read Or write Data for variable speed pump.

All data input and output are in decimal.



## Modbus Protocol

The transmission mode used is RTU mode. The frame contains no message header byte, nor end of message bytes. It is defined as follows:



The data is transmitted in binary code.

CRC16: cyclical redundancy check.

The end of the frame is detected on a silence greater than or equal to 3 characters.

## Principle

The MODBUS protocol is a master-slave protocol. Only one device can transmit on the line at any time. The master manages the exchanges and only it can take the initiative. It interrogates each of the slaves in succession. No slave can send a message unless it is invited to do so. The master repeats the question when there is an incorrect exchange, and declares the interrogated slave absent if no response is received within a given time period. If a slave does not understand a message, it sends an exception response to the master. The master may or may not repeat the request. Direct slave to slave communications is not allowed.

For slave-to-slave communication, the application software must therefore be designed to interrogate a slave and send back data received to the other slave.

Two types of dialogue are possible between master and slaves:

- the master sends a request to a slave and waits for its response
- the master sends a request to all slaves without waiting for a response (broadcasting principle)

## Addresses

- The drive Modbus address can be configured from 1 to 247.
- Address 0 coded in a request sent by the master is reserved for broadcasting. EPV drives take account of the request, but do not respond to it.

## Supported Modbus functions

EPV supports the following Modbus functions

Function code	MODBUS Command	Effect
3 (0x03)	Read Holding Register	Read analogue and/or integer variables
4	Read Input Register	Read analogue and/or integer variables
6	Preset Single Register	Write and analogue or integer variable
16	Preset Multiple Registers	Write a consecutives series of analogue and/or integer variables

## Read Holding Registers (0x03)

Master to EPV Request			EPV to Master Response		
Bytes	Description	Remarks	Bytes	Description	Remarks
0	Slave Address	0x00 : Broadcasting 0x01 : EPV Slave Address	0	Slave Address	0x00 : Broadcasting 0x01 : EPV Slave Address
1	Function Code ( 0x03 )	0x03 : Read R/W register	1	Function Code ( 0x03 )	0x03 : Read R/W register
2	Start Address_Hi	Register Address Range : 0x00~0xff	2	No of Bytes (value)	No of Bytes Range : 2~254
3	Start Address_Lo		3	Value 1 Hi	Register value
4	Quantity of Registers_Hi	Value Range : 1~127	4	Value 1 Lo	
5	Quantity of Registers_Lo		.....	.....	
6	CRC16 Hi	CRC	.....	.....	
7	CRC16 Lo		2+n*2 -1	Value n Hi	
			2+n*2	Value n Lo	
			2+n*2 +1	CRC16 Hi	CRC
			2+n*2 +2	CRC16 Lo	

### Preset (write) Single Register(0x06)

Master to EPV Request			EPV to Master Response		
Bytes	Description	Remarks	Bytes	Description	Remarks
0	Slave Address	0x00 : Broadcasting 0x01 : EPV Slave Address	0	Slave Address	0x00 : Broadcasting 0x01 : EPV Slave Address
1	Function Code ( 0x06 )	0x06 : Write R/W register	1	Function Code ( 0x06 )	0x06 : Write R/W register
2	Address_Hi	Register Address Range : 0x00~0xff	2	Address_Hi	Register Address Range : 0x00~0xff
3	Address_Lo		3	Address_Lo	
4	Value_Hi	Value	4	Value_Hi	Value
5	Value_Lo		5	Value_Lo	
6	CRC16 Hi	CRC	6	CRC16 Hi	CRC
7	CRC16 Lo		7	CRC16 Lo	

### Preset (write) Multiple Registers (0x10)

Master to EPV Request			EPV to Master Response		
Bytes	Description	Remarks	Bytes	Description	Remarks
0	Slave Address	0x00 : Broadcasting 0x01 : EPV Slave Address	0	Slave Address	0x00 : Broadcasting 0x01 : EPV Slave Address
1	Function Code ( 0x10 )	0x10 : Write R/W register	1	Function Code ( 0x10 )	0x10 : Write R/W register
2	Start Address_Hi	Register Start Address Range : 0x00~0xff	2	Start Address_Hi	Register Start Address Range : 0x00~0xff
3	Start Address_Lo		3	Start Address_Lo	
4	Quantity of Registers Hi	Quantity of Registers	4	Quantity of Registers Hi	Quantity of Registers
5	Quantity of Registers Lo		5	Quantity of Registers Lo	
6	No of Bytes	max 254 Bytes	6	CRC16 Hi	CRC
7	Value 1 Hi	Value	7	CRC16 Lo	
8	Value 1 Lo				
	.....				
	.....				
6+n*2-1	Value n Hi				
6+n*2	Value n Lo				
6+n*2+1	CRC16 Hi	CRC			
6+n*2+2	CRC16 Lo				

### Read Input Register (0x04)

Master to EPV Request		
Bytes	Description	Remarks
0	Slave Address	0x00 : Broadcasting。 0x01 : OP Slave Address。
1	Function Code ( 0x04 )	0x03 : Read RO register
2	Start Address_Hi	Register Start Address Range : 0x00~0x7f
3	Start Address_Lo	
4	Quantity of Registers_Hi	Value Range : 1~127
5	Quantity of Registers_Lo	
6	CRC16 Hi	CRC
7	CRC16 Lo	

### Read Input Register (0x04)

Example 1. Read the data of the 0x0001 register in the read only (ro) register (read current speed)

> Master send request:

Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
01	04	00	01	00	01	60	0A

byte1: 01 = slave address

byte2: 04 = register read only (ro)

byte3,4: 00 01 read only register address 0x0001

byte5,6: 00 01 = N. of read only register is 1

byte7,8: 60 0A = CRC

< EPV response : 01 04 02 03 84 B9 A3

Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
01	04	02	03	84	B9	A3

byte1: 01 = slave address

byte2: 04 = register read only (ro)

byte3: 02 = no of byte of value is 2

byte4,5: 03 84 = register value is 0x0384 (hex) , 900 (decimal)

byte6,7: B9 A3 = CRC

### Read Holding Registers (0x03)

Example 2. Read value of R/W register 0x0011 (read SPEED2 value)

> Master send request:

Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
01	03	00	11	00	01	D4	0F

byte1: 01 = slave address

byte2: 03 = Read R/W register

byte3,4: 00 11 = R/W register address is 0x0011

byte5,6: 00 01 = No of byte of R/W register is 1

byte7,8: D4 0F = CRC

< EPV response:

Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
01	03	02	05	DC	BA	8D

byte1: 01 = slave address

byte2: 03 = Read R/W register

byte3: 02 = no of byte of response value is 2

byte4,5: 05 DC = register value is 0x05DC (hex) , 1500 (decimal).

byte6,7: BA 8D = CRC

### Preset (write) Single Register(0x06)

Example 3. Write value 1000 (0x0384) to R/W Register 0x0010 value. (set SPEED1 to 1000)

> Master request:

Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
01	06	00	10	03	E8	88	B1

byte1: 01 = slave address

byte2: 06 = write one output word

byte3,4: 00 10 = R/W register address is 0x0010

byte5,6: 03 E8 = write value is 0x03E8 (hex), 1000 (decimal), speed is 1000.

byte7,8: 88 B1 = CRC

< EPV Response:

Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
01	06	00	10	03	E8	88	B1

Delimitation same as above.

### Holding Register 16 bits parameter list

Address		Parameter name	Description	Type of	Default	Mini value	max value	Remark
dec	hex							
0	0x0	CurrentMin	Current Minute	rw	-	0	59	min
1	0x1	CurrentHour	Current Hour	rw	-	0	23	h
8	0x8	RunCtrl	Run Control	rw	0	0	2	1 : Run , 2 : Stop
9	0x9	SetSpeed	Speed setting	rw	0	0	3400	unit : RPM
10	0xA	SetSelectspeed	speed setting select	rw	1	1	4	range : 1~4
16	0x10	Speed1	Speed 1	rw	900	800	3400	unit : RPM , default 900rpm
17	0x11	Speed2	Speed 2	rw	1500	800	3400	unit : RPM , default 1500rpm
18	0x12	Speed3	Speed 3	rw	2500	800	3400	unit : RPM , default 2500rpm
19	0x13	Speed4	Speed 4	rw	2900	800	3400	unit : RPM , default 2900rpm
32	0x20	Sch1En	Schedule1 : enable	rw	0	0	1	1 : enable 0 : disable
33	0x21	Sch1TimeOnMin	Schedule1 : On time minute	rw	30	0	59	range : 0~59
34	0x22	Sch1TimeOnHour	Schedule1 : On time hour	rw	8	0	23	range : 0~23
35	0x23	Sch1TimeOffMin	Schedule1 : Off Timer minute	rw	30	0	59	range : 0~59
36	0x24	Sch1TimeOffHour	Schedule1 : Off Timer hour	rw	11	0	23	range : 0~23
37	0x25	Sch1SpeedSelect	Schedule1 : Run Speed (Speed 1-4)	rw	1	1	4	range : 1~4
40	0x28	Sch2En	Schedule2 : enable	rw	0	0	1	1 : enable 0 : disable
41	0x29	Sch2TimeOnMin	Schedule2 : On time minute	rw	30	0	59	range : 0~59
42	0x2A	Sch2TimeOnHour	Schedule2 : On time hour	rw	14	0	23	range : 0~23
43	0x2B	Sch2TimeOffMin	Schedule2 : Off Timer minute	rw	30	0	59	range : 0~59
44	0x2C	Sch2TimeOffHour	Schedule2 : Off Timer hour	rw	17	0	23	range : 0~23
45	0x2D	Sch2SpeedSelect	Schedule2 : Run Speed (Speed 1-4)	rw	1	1	4	range : 1~4
48	0x30	Sch3En	Schedule3 : enable	rw	0	0	1	1 : enable 0 : disable
49	0x31	Sch3TimeOnMin	Schedule3 : On time minite	rw	30	0	59	range : 0~59
50	0x32	Sch3TimeOnHour	Schedule3 : On time hour	rw	19	0	23	range : 0~23
51	0x33	Sch3TimeOffMin	Schedule3 : Off Timer minute	rw	30	0	59	range : 0~59
52	0x34	Sch3TimeOffHour	Schedule3 : Off Timer hour	rw	21	0	23	range : 0~23
53	0x35	Sch3SpeedSelect	Schedule3 : Run Speed (Speed 1-4)	rw	1	1	4	range : 1~4
56	0x38	Sch4En	Schedule4 : enable	rw	0	0	1	1 : enable 0 : disable
57	0x39	Sch4TimeOnMin	Schedule4 : On time minite	rw	30	0	59	range : 0~59
58	0x3A	Sch4TimeOnHour	Schedule4 : On time hour	rw	19	0	23	range : 0~23
59	0x3B	Sch4TimeOffMin	Schedule4 : Off Timer minute	rw	30	0	59	range : 0~59
60	0x3C	Sch4TimeOffHour	Schedule4 : Off Timer hour	rw	21	0	23	range : 0~23
61	0x3D	Sch4SpeedSelect	Schedule4 : Run Speed (Speed 1-4)	rw	1	1	4	range : 1~4
80	0x50	Var_Enable	variable speed : enable	rw	0	0	1	1 : enable 0 : disable
81	0x51	Var_TimeOnMin	variable speed : On time minite	rw	30	0	59	range : 0~59
82	0x52	Var_TimeOnHour	variable speed : On time hour	rw	7	0	23	range : 0~23
83	0x53	Var_TimeOffMin	variable speed : Off Timer minute	rw	30	0	59	range : 0~59
84	0x54	Var_TimeOffHour	variable speed : Off Timer hour	rw	18	0	23	range : 0~23
85	0x55	Var_MinSpeed	variable speed : mini speed	rw	900	800	3400	unit : RPM , default 900rpm
86	0x56	Var_MaxSpeed	variable speed : max speed	rw	2900	800	3400	unit : RPM , default 2900rpm
87	0x57	Var_Step	variable speed : variable step	rw	100	10	500	unit : RPM , default 100rpm
88	0x58	Var_Rhythm	variable speed : Rhythm	rw	10	5	99	range : 5~99 ( correspond 0.5-9.9s )
96	0x60	Language	language selection	rw	0	0	4	0 : English 1 : French 2: German 3 : Spanish 4 : Italian 5 : Chinese
112	0x70	SVRS_Enable	SVRS : enable	rw	0	0	1	1 : enable 0 : disable
113	0x71	SVRS_AlarmTime	SVRS : AlarmTime	rw	1	1	10	range : 1~10s
114	0x72	SVRS_Sensitivity	SVRS : Sensitivity	rw	1	1	100	range 1~100 , unit%
115	0x73	SVRS_AutoReset	SVRS : auto restart	rw	1	0	1	1 : auto restart 0 : no auto restart
116	0x74	SVRS_ResetTime	SVRS : ResetTime	rw	60	30	999	unit second
117	0x75	SVRS_ResetSpeed	SVRS : ResetSpeed	rw	900	800	3400	unit rpm
128	0x80	NoFlow_Enable	No flow : enable	rw	0	0	1	1 : enable 0 : disable
129	0x81	NoFlow_AlarmTime	No flow : AlarmTime	rw	10	5	30	range 5~30 , unit min
130	0x82	NoFlow_Sensitivity	No flow : Sensitivity	rw	1	1	100	range 1~100 , unit %
144	0x90	Priming_Enable	priming : enable	rw	1	0	1	1 : enable 0 : disable
145	0x91	Priming_Time	priming : priming time	rw	2	1	20	range 1~20 , unit min
146	0x92	Priming_Speed	Priming : priming speed	rw	2900	800	3400	unit : RPM , default 2900rpm
160	0xA0	Frozen_Enable	Freeze Protection : enable	rw	0	0	1	1 : enable 0 : disable
161	0xA1	Frozen_LastTime	Freeze Protection : run duration time	rw	4	1	8	range 1~8 , unit h
162	0xA2	Frozen_Speed	Freeze Protection : run speed	rw	1800	900	3400	unit rpm
163	0xA3	Frozen_Temperature	Freeze Protection : temperature	rw	4	0	10	range 0~10 , unit °C
255	0xFF	Reset	Reset	rw	0	-	-	1 : yes

Input Data Register	Description	para name	Type of	default value	Min	max	Remark
0x0	current time	CurrentTime	ro				current time HHMM, HH (hi) MM(lo)
0x1	current speed	CurrentSpeed	ro	-	-	-	Unit: RPM
0x2	current power	CurrentWatts	ro	-	-	-	Unit: W
0x3	run status	RunningStatus	ro	-	-	-	1 : run 0 : stop
0x4	error	FaultFlag	ro	-	-	-	1 : Error 0 : no error
0x5	error type	FaultCode	ro	-	-	-	see error code table
0x6	current speed 1~4 switch	SpeedSelected	ro	-	1	4	range : 1~4
0x7	current temperature	CurrentTemperature	ro	-			
0x8	Freeze Protection status	FreeModeStatus	ro				0: no active 1 : first time freeze protection 3 : return to freeze protection
0x9	current schedule	CurrentSchedule	ro	0	0	5	0 : schedule disable 1~4 ; 1 : schedule enable 1~4 ; 5 : variable speed mode
0xA	current flow rate	CurrentGPM	ro	-	-	-	GPM

0x05 Register Error Code table			
Fault No.	Display code	Fault No.	Display code
0	OC1	34	OPE4
1	OC2	35	OPE5
2	OV1	36	OPE6
3	OV2	37	OPE7
4	OC3	38	OPE8
5	UV1	39	OPE9
6	OC4	40	OPF
7	OV3	41	OUT
8	GF	42~49	-
9	OL3	50	OH1
10	OH2	51	PF1
11	BRE	52	PF2
12	BD	53	OS1
13	BER1	54	OS2
14	BER2	55	PGO
15	CRDE	56	PGE
16	PGF	57	OL2
17	CE	58	OL3
18	DRE	59	OL1
19	PRE	60	EE
20	EST	61	-
21	EF	62	CCE
22	LE	63~64	-
23	PRE1	65	JE
24	PRE2	66~67	-
25	PRE3	68	POE1
26	-	69	POE2
27	BER3	70	PID1
28	BER4	71~72	-
29	-	73	UV
30	UV	74	NF
31	OPE1	75	SVRS
32	OPE2	76	-
33	OPE3		