LONGER RS485 Protocol for WT600-1F (4F)

1. Data Format: 1start + 8data + 1even parity + 1stop, 1200bps.

This defines the data format: 1 start bit, 8 data bits, one even parity bit, and one stop bit at 1200 bits per second.

2. Command Format: flag+ addr + len + pdu + fcs.

flag: E9H is the start **flag** of a command string. Every command string is preceded with the start of E9H.

- In one command string, there is no other E9H except start **flag** E9H. When transmitting, E8H is replaced by E8H 00H, and E9H is replaced by E8H 01H except start **flag**. When receiving, E8H 00H is replaced by E8H, and E8H 01H is replaced by E9H.

addr: Pump address (i.e. Pump I.D.#.), take up 1 byte.

- The pump address can be set from 1 to 30. 31(1F) is broadcast address.
- In a command string from the control computer, if the **addr** is pump address, the corresponding pump will execute the command and respond. And if the **addr** is broadcast address, all the pumps execute the same command, and pumps don't respond.

len: Length of **pdu**, take up 1 byte.

Fcs: XOR of **addr**, **len**, **pdu**, take up 1 byte.

3. Pdu Format: application layer code format

3.1. Write Running Parameter of Flow Control Mode

Control computer command string:

WF	Set flow (4 bytes)	State1 (1 byte)

Pump response:

WF	Show flow (4 bytes)

- Flow unit: 1uL/min (1), 1 L=10^3 mL=10^6 μL.
- Flow range: 1- 9999000
- In a command string from the control computer, the **addr** can be pump address (1-30) and broadcast address (31). When the **addr** is pump address, the corresponding pump will execute the command and respond. When the **addr** is broadcast address, all the pumps execute the same command, and pumps don't respond.

3.2. Read Running Parameter of Flow Control Mode

Control computer command string:

RF

Pump response:

RF	Show flow (4 bytes)	State1 (1 byte)

- Flow unit: 1uL/min (1), 1 L=10^3 mL=10^6 μL.
- Flow range: 1- 9999000
- In a command string from the control computer, if the **addr** is one pump's address (1-30), the corresponding pump will respond.

3.3. Write Dispensing Parameter

Control computer command string:

WD	Disp Vol (4 bytes)	Copy No. (2 bytes)	Disp Flow (4 bytes)	Pause time (2 bytes)

Pump response:

WD

- Disp Vol unit: 0.1mL (1) Disp Vol range: 1-999000
- Copy No. range: 0-9999, 0 for infinity
- Disp Flow unit: 1uL/min (1) Disp Flow range: 1- 9999000
- Pause time unit: 0.1s (1) Pause time range: 1-59940
- In a command string from the control computer, the **addr** can be pump address (1-30) and broadcast address (31). When the **addr** is pump address, the corresponding pump will execute the command and respond. When the **addr** is broadcast address, all the pumps execute the same command, and pumps don't respond.

3.4. Read Dispensing Parameter

Control computer command string:

RD

Pump response:

RD	Disp Vol (4 bytes)	Copy No. (2 bytes)	Disp Flow (4 bytes)	Pause time (2 bytes)

- Disp Vol unit: 0.1mL (1) Disp Vol range: 1-999000
- Copy No. range: 0-9999, 0 for infinity
- Disp Flow unit: 1uL/min (1) Disp Flow range: 1- 9999000
- Pause time unit: 0.1s (1) Pause time range: 1-59940
- In a command string from the control computer, if the **addr** is one pump's address (1-30), the corresponding pump will respond.

3.5. Write Running Parameter of Dispensing Control Mode

Control computer command string:

WSD	State1 (1 byte)

Pump response:

WSD

- In a command string from the control computer, the **addr** can be pump address (1-30) and broadcast address (31).

3.6. Read Running Parameter of Dispensing Control Mode

Control computer command string:

RSD

Pump response:

RSD	State1 (1 byte)

- In a command string from the control computer, if the **addr** is one pump's address (1-30), the corresponding pump will respond.

3.7. Write Pump Head and Tubing.

Control computer command string:

WT	Pump Head No. (1 byte)	Tubing No. (1 byte)

Pump response:

WT

- In a command string from the control computer, the **addr** can be pump address (1-30) and broadcast address (31).

3.8. Read Pump Head and Tubing.

Control computer command string:

RT

Pump response:

RT	Pump Head No. (1 byte)	Tubing No. (1 byte)

- In a command string from the control computer, if the **addr** is one pump's address (1-30), the corresponding pump will respond.

3.9. Write Back Suction Parameter

Control computer command string:

WB	Back suction rev (2 bytes)

Pump response:

WB

- Back suction rev unit: 0.1rev (1) Back suction rev range: 0-99
- In a command string from the control computer, the **addr** can be pump address (1-30) and broadcast address (31).

3.10. Read Back Suction Parameter

Control computer command string:

RB

Pump response:

RB	Back suction rev (2 bytes)

- Back suction rev unit: 0.1rev (1) Back suction rev range: 0-99
- In a command string from the control computer, if the **addr** is one pump's address (1-30), the corresponding pump will respond.

3.11. Write Pump Address

Control computer command string:

WID	New pump I.D. #. (1 byte)

Pump response:

WID

- In a command string from the control computer, the **addr** can be pump address (1-30) and broadcast address (31).
- Pump address can be set one by one with broadcast address.

3.12. Read Pump Address

Control computer command string:

RID

Pump response:

RID

- In a command string from the control computer, if the **addr** is one pump's address (1-30), the corresponding pump will respond.

LONGER RS485 Protocol for WT600-1F (4F)

APPENDIX

1. The command characters in the **pdu** are characters from the standard ASCII character set.

Command character	B	C	D	F	I	R	S	T	W
ASCII	42H	43H	44H	46H	49H	52H	53H	54H	57H

2. The most significant byte is transmitted first and the least significant byte finally when transmitting Flow, Disp Vol, Pause time, Copy No., Back suction rev and so on.

3. State1: state byte 1.

   Bit 0 – start / stop bit, 1 to start the pump, 0 to stop the pump.

   Bit 1 – cw / ccw bit, 1 to run in cw, 0 to run in ccw.

   Bit 2 – prime bit, 1 to prime the pump at the max speed 600 rpm.

4. Default **addr**: default pump address is 1.

5. Pump head No.:

   1: YZ1515x 2: YZ2515x 3: YZII15 4: YZII25

   5: DMD25 6: KZ25 7: BZ25 8: DG15-24

6. Pump head No.-Tube No.-Tubeing ID

Pump Head No.	1: YZ1515x 3: YZII15						
Tube No.	1	2	3	4	5	6	7
Tubing	13#	14#	19#	16#	25#	17#	18#

Pump Head No.	2: YZ2515x		7: BZ25	8: DG15-24		
Tube No.	1	2	1	1	2	3
Tubing	15#	24#	24#	16#	25#	17#

Pump Head No.	4: YZII25 6: KZ25						
Tube No.	1	2	3	4			
Tubing	15#	24#	35#	36#			

Pump Head No.	5: DMD25						
Tube No.	1	2	3	4	5	6	

Tubing	15#	24#	35#	36#	119#	120#	

7. Examples

a. Write Dispensing Parameter

Control computer command string:

E9 01 0E 57 44 00 00 03 **E8 00** 00 C8 00 0F 42 40 00 0A 38

- The above command string from control computer will set dispensing parameter of pump 1 as follows: set Disp Vol to 100 mL, set Copy No. to 200, set Disp Flow to 1000 mL/min, set Pause time to 1.0 s.

- When transmitting a command string, E8H is replaced by E8H 00H.

Pump response:

E9 01 02 57 44 10

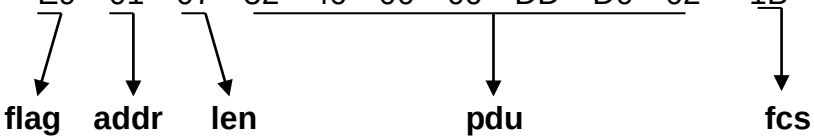
b. Read Running Parameter of Flow Control Mode

Control computer command string:

E9 01 02 52 46 17

Pump response:

E9 01 07 52 46 00 06 DD D0 02 1B



52 46 – RF

00 06 DD D0 – show flow (450000uL/min=450.0 mL/min)

02 – stop state, run in cw

c. Writing Pump Head and Tubing

Control computer command string:

E9 01 04 57 54 02 02 06

Pump response:

E9 01 02 57 54 00

- The above command string from control computer will set pump head and tubing of pump 1 as follows: pump head to YZ2515x, Tubing to 24#.

8. DB-15 External Control Interface

Pin 2 - RS485 B

Pin 3 - RS485 A