

Create Flow

Company certified by

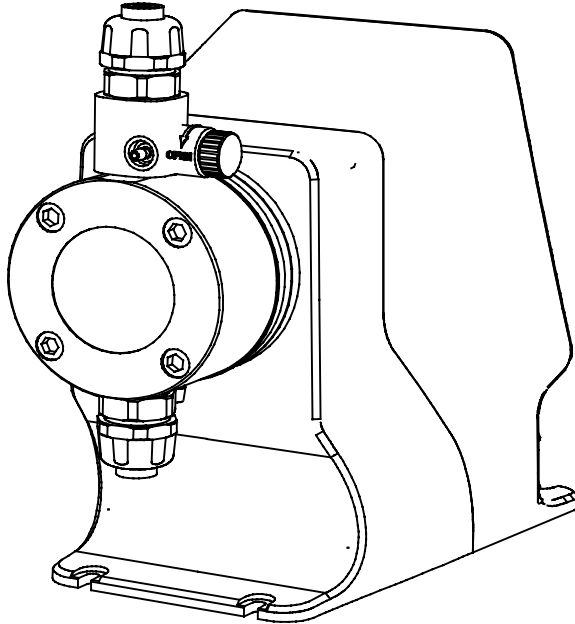


Management System
ISO 9001:2015



www.tuv.com
ID: 2916017962

ITC 
DOSING PUMPS



DO SMART **AC**

MODBUS

Create Flow

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SAFETY RULES

In order to avoid personal injury risks and environmental damage, and to ensure that the device works correctly, the personnel in charge of installing, operating and maintaining the device must follow the instructions given in this manual, paying particular attention to the recommendations and warning detailed in it. In addition, they must follow the specific instructions of use for the chemical products that they wish to dose.

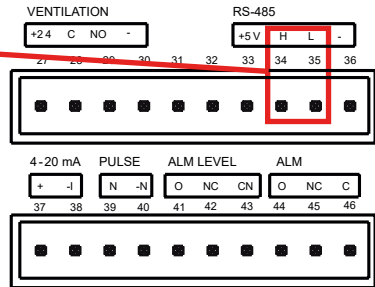
This device must not be used by people (including children) with reduced physical, sensory or mental capacities or a lack of experience and knowledge, unless they do so under supervision or they are informed of the correct procedures. Children must not play with the device unsupervised.

1. HOOK-UP AND CONFIGURATION

Connections

| | |
|----------------------|--------------------------------------|
| Bus | RS-485 |
| Communication/Wiring | Half-Duplex L(A) pin 35, H(B) pin 34 |
| Protocol | Modbus RTU |

Outputs



Serial communication

| | Default value | Value range |
|-----------------------------|---------------|---------------------------|
| Modbus slave address | 1 | 1-128 |
| Bits per second (baud rate) | 9600 | 1200/2400/4800/9600/19200 |
| Number of bits | 8 | 8 |
| Parity | None | Even / Odd / Neither |
| Stop bits | 1 | 1.2 |
| Hardware control | No | - |
| Software control | No | - |
| Character timeout | 20 ms | - |
| End of message timeout | 100 ms | - |

NB: If a RS232/RS485 converter or similar is required, make sure that the signal emitted does not produce an echo.

Supported modbus functions:

| | |
|--------------------------|------|
| Read Input Registers | 0x04 |
| Write Single Register | 0x06 |
| Write Multiple Registers | 0x10 |

NB: This version of the manual refers to pump firmware version **DOSmart v6.11**. For other versions, please contact sat@itc.es.

2. READ-ONLY VARIABLES

Supported functions: READ INPUT REGISTERS (0x04)

| MODBUS ADDRESS | DESCRIPTION | NOTES |
|----------------|---|---|
| 4501(0x1195) | Hardware version | B0: VERSION B1: SUBVERSION |
| 4502(0x1196) | Serial number | |
| 4503(0x1197) | Manufacture date | |
| 4504(0x1198) | Pump speed in cycles/min. | |
| 4505(0x1199) | Pump sub-status Operation mode / Interior menu / etc... | |
| 4506(0x119A) | Alarm stoppage flag. It is used alongside 4511(0x119F) to find out whether the pump is on or off. | |
| 4506(0x119A) | Alarm stoppage flag. It is used alongside 4511(0x119F) to find out whether the pump is on or off. | |
| 4507(0x119B) | Pump alarms | 0x01 → Level 1 0x02 → Level 2 0x04 → Flow 0x08 → Leakage 0x10 → Pressure |
| 4508(0x119C) | Circuit alarms | 0x01 -- > Short Circuit 0x02 -- > RESERVED 0x04 -- > OverTemp 0x08 -- > Voltage Range 0x10 -- > Motor Load 0x20 -- > Overload 0x40 -- > Temp Chip |
| 4509(0x119D) | Pulse loss alarm (X/Y mode) Flow out of range alarm (Prop. %/ppm) | 0 →ALARM OFF 1 →ALARM ON |
| 4510(0x119E) | Screen lock | 0 → Unlocked 1 → Locked |
| 4511(0x119F) | On flag. It is used alongside 4506(0x119A) to find out whether the pump is on or off. | |
| 4512(0x11A0) | RESERVED | RESERVED |
| 4513(0x11A1) | RESERVED | RESERVED |
| 4514(0x11A2) | RESERVED | RESERVED |
| 4515(0x11A3) | Temperature (°C) | |
| 4516(0x11A4) | Supply voltage (V x 10) | |
| 4517(0x11A5) | Filtered input value 0-4-20mA (mA x 100) | |
| 4518(0x11A6) | HIGH flow rate input reader: Filtered (Hz) | MSB |
| 4519(0x11A7) | HIGH flow rate input reader: Filtered (Hz) | LSB |
| 4520(0x11A8) | LOW filtered flow meter (ms/pulse) | MSB |
| 4521(0x11A9) | LOW filtered flow meter (ms/pulse) | LSB |
| 4522(0x11AA) | Current accuracy in (BAR x 10) o (PSI x 1) | |
| 4523(0x11AB) | Remote input status | 0 == off 1 == on |

| MODBUS ADDRESS | DESCRIPTION | NOTES |
|----------------|--|---------------------|
| 4524(0x11AC) | XY pulses input status | 0 == off 1 == on |
| 4525(0x11AD) | FLOW pulses input status (flow meter) | 0 == off 1 == on |
| 4526(0x11AE) | 4-20 output (mA x 10) | |
| 4527(0x11AF) | LEVEL 2 relay output status | 0 == off 1 == on |
| 4528(0x11B0) | ALARM relay output status | 0 == off 1 == on |
| 4529(0x11B1) | TEMP relay output status | 0 == off 1 == on |
| 4530(0x11B2) | Remote input flag | |
| 4531(0x11B3) | Calibration factor resulting from calibration and which applies to the nominal flow rate of the pump | |
| 4532(0x11B4) | Corrected nominal flow rate with regulation and calibration factor (l/h or gph x 104) | MSB |
| 4533(0x11B5) | Corrected nominal flow rate with regulation and calibration factor (l/h or gph x 104) | LSB |
| 4534(0x11B6) | Cylinder volume (litres or gallons x 106) | MSB |
| 4535(0x11B7) | Cylinder volume (litres or gallons x 106) | LSB |
| 4536(0x11B8) | 4-20 mA input value of pressure sensor (mA x 100) | |
| 4537(0x11B9) | Reserved | |
| 4538(0x11BA) | Calculated flow (m ³ /h or gpm x 100) | MSB |
| 4539(0x11BB) | Calculated flow (m ³ /h or gpm x 100) | LSB |
| 4540(0x11BC) | Recording counter in EEPROM | MSB |
| 4541(0x11BD) | Recording counter in EEPROM | LSB |
| 4542(0x11BE) | Total cycle counter | MSB |
| 4543(0x11BF) | Total cycle counter | LSB |
| 4544(0x11C0) | Operating time in hours | |
| 4545(0x11C1) | Stoppage counter due to short circuit | |
| 4546(0x11C2) | RESERVED | RESERVED |
| 4547(0x11C3) | Stoppage counter due to Temperature | |
| 4548(0x11C4) | Second counter until batch start | MSB |
| 4549(0x11C5) | Second counter until batch start | LSB |
| 4550(0x11C6) | Last cycle time (microseconds) | MSB |
| 4551(0x11C7) | Last cycle time (microseconds) | LSB |
| 4552(0x11C8) | Cycle counter until end of batch | MSB |
| 4553(0x11C9) | Cycle counter until end of batch | LSB |
| 4554(0x11CA) | Second counter until end of batch | MSB |
| 4555(0x11CB) | Second counter until end of batch | LSB |
| 4556(0x11CC) | Pump alarm memory | |
| 4557(0x11CD) | Flow meter pulse counter | |
| 4558(0x11CE) | Pump flow rate (l/h or gph x 104) | MSB |
| 4559(0x11CF) | Pump flow rate (l/h or gph x 104) | LSB |
| 4560(0x11D0) | Volume counter in proportional mode (litres or gallons x 106) | MSB |
| 4561(0x11D1) | Volume counter in proportional mode (litres or gallons x 106) | LSB |
| 4562(0x11D2) | Motor speed in (RPM x 103) | MSB |

| MODBUS ADDRESS | DESCRIPTION | NOTES |
|----------------|---|--|
| 4563(0x11D3) | Motor speed in (RPM x 103) | LSB |
| 4564(0x11D4) | Stoppage counter by voltage range | |
| 4565(0x11D5) | Stoppage counter due to chip temperature | |
| 4566(0x11D6) | Stoppage counter due to motor disconnection | |
| 4567(0x11D7) | Stoppage counter due to short circuit | |
| 4568(0x11D8) | Indicates whether the pump requires maintenance | 0x01 -- > Oil 0x02 -- > Valves 0x04 -- > Collar 0x08 -- > Membrane 0x10 -- > Bellows |
| 4569(0x11D9) | RESERVED | RESERVED |
| 4570(0x11DA) | RESERVED | RESERVED |
| 4571(0x11DB) | RESERVED | RESERVED |
| 4572(0x11DC) | Cycles remaining to change valves | MSB |
| 4573(0x11DD) | Cycles remaining to change valves | LSB |
| 4574(0x11DE) | Cycles remaining to change membrane | MSB |
| 4575(0x11DF) | Cycles remaining to change membrane | LSB |
| 4576(0x11E0) | RESERVED | RESERVED |
| 4577(0x11E1) | RESERVED | RESERVED |
| 4578(0x11E2) | Cycles remaining to change bellows | MSB |
| 4579(0x11E3) | Cycles remaining to change bellows | LSB |

3. READ AND WRITE VARIABLES

Supported functions: READ INPUT REGISTERS (0x04), WRITE SINGLE REGISTER (0x06), WRITE MULTIPLE REGISTERS (0x10)

| MODBUS ADDRESS | DESCRIPTION | BYTE ORDER |
|----------------|--|--|
| 0001(0x0001) | Pump status - on/off | 0 == off 1 == on |
| 4684(0x124C) | Current flow rate (l/h or gph x 104) | MSB |
| 4685(0x124D) | Current flow rate (l/h or gph x 104) | LSB |
| 4686(0x124E) | Partial cycle counter | MSB |
| 4687(0x124F) | Partial cycle counter | LSB |
| 4688(0x1250) | RESERVED | RESERVED |
| 4689(0x1251) | RESERVED | RESERVED |
| 4690(0x1252) | RESERVED | RESERVED |
| 4691(0x1253) | Permissible flow rate limit as % (% x100) | |
| 4692(0x1254) | Maximum pump pressure (Bar x 10 or psi x 1) | |
| 4693(0x1255) | Dosing profile | 0-STANDARD 1-SLOW_SUCTION 1 2-SLOW_SUCTION 2 |
| 4694(0x1256) | RESERVED | RESERVED |
| 4695(0x1257) | Flow rate units | 0 = litres 1 = gallons |
| 4696(0x1258) | Pressure units | 0 = Bar 1 = psi |
| 4697(0x1259) | Units - %/ppm | 0 = % 1 = ppm |
| 4698(0x125A) | Flow meter type | 0 = LOW (Counter) 1 = HIGH (Flow meter) |
| 4699(0x125B) | Reserved | Reserved |
| 4700(0x125C) | Flow meter K factor Counter: (l/pulse or g/pulse x 100) Flow meter: (pulses/l or pulses/g x 100) | MSB |
| 4701(0x125D) | Flow meter K factor Counter: (l/pulse or g/pulse x 100) Flow meter: (pulses/l or pulses/g x 100) | LSB |
| 4702(0x125E) | Time without pulses for Low flow meter (counter) to be zero (seconds) | |
| 4703(0x125F) | Pressure value at 4 mA (Bar x 10 or psi x 1) | |
| 4704(0x1260) | Pressure value at 20 mA (Bar x 10 or psi x 1) | |
| 4705(0x1261) | Number of pump cycles with no pulses in flow meter to activate alarm | |
| 4706(0x1262) | RESERVED | RESERVED |
| 4707(0x1263) | Output pulses per volume unit (pulses/litre or pulses/gallon x 100) | |
| 4708(0x1264) | % of pump corresponding to 4 mA at output | |
| 4709(0x1265) | % of pump corresponding to 20mA at output | |
| 4710(0x1266) | Level 1 and Level 2 alarm programming | B0: Alarm Level1 B1: Alarm Level2 b0 = Alarm ON(1)/OFF(0) b1 = Relay ON(1)/OFF(0) b2 = Stop ON(1)/OFF(0) |

| MODBUS ADDRESS | DESCRIPTION | BYTE ORDER |
|----------------|---|---|
| 4711(0x1267) | Flow detector and leakage alarm programming | B0: Flow alarm B1: Leakage alarm b0 = Alarm ON(1)/OFF(0) b1 = Relay ON(1)/OFF(0) b2 = Stop ON(1)/OFF(0) |
| 4712(0x1268) | Excess pressure alarm programming | B0: OverPressure alarm b0 = Alarm ON(1)/OFF(0) b1 = Relay ON(1)/OFF(0) b2 = Stop ON(1)/OFF(0) |
| 4713(0x1269) | Proportional mode | 0: X/Y mode 1: %/ppm mode |
| 4714(0x126A) | X (input pulses) of XY mode | |
| 4715(0x126B) | Proportional XY memory limit (pulses) | |
| 4716(0x126C) | Y cycles to complete in proportional XY mode | |
| 4717(0x126D) | Flow rate benchmark as % in XY mode (% x 100) | |
| 4718(0x126E) | %/ppm mode set-point (ppm or % x 100) | MSB |
| 4719(0x126F) | %/ppm mode set-point (ppm or % x 100) | LSB |
| 4720(0x1270) | % of pump in point 1 that corresponds to an input current defined in address 4733/0x127D in analogue mode (% x 100) | |
| 4721(0x1271) | % of pump in point 2 that corresponds to an input current defined in address 4734/0x127E in analogue mode (% x 100) | |
| 4722(0x1272) | RESERVED | RESERVED |
| 4723(0x1273) | Batch start | 0 = button 1 = external 2 = time |
| 4724(0x1274) | Time configuration between batches (seconds) | MSB |
| 4725(0x1275) | Time configuration between batches (seconds) | LSB |
| 4726(0x1276) | Cycles or seconds in batch dose mode | MSB |
| 4727(0x1277) | Cycles or seconds in batch dose mode | LSB |
| 4728(0x1278) | Batch type | 0 = cycles 1 = time |
| 4729(0x1279) | Flow rate benchmark as % for batch dose mode (% x 100) | |
| 4730(0x127A) | Indicates whether the pump must stop automatically in %/ppm proportional mode when it reaches a determined volume | 0 = Does not stop 1 = Stops at volume |
| 4731(0x127B) | Volume to dose in proportional mode for the pump to stop automatically (l or g x 10) | |
| 4732(0x127C) | RESERVED | RESERVED |
| 4733(0x127D) | Current corresponding to point 1 (address 4720/0x1270) for analogue mode (mA x 10) | |
| 4734(0x127E) | Current corresponding to point 2 (address 4721/0x1271) for analogue mode (mA x 10) | |
| 4735(0x127F) | Indicates if the 4-20 analogue output replicates the 4-20 input or if it represents a proportion of those defined in 4708(0x1264) and 4709(0x1265). | 0 = Proportion 1 = Copies input |
| 4736(0x1280) | Indicates if the pulse output acts as a pulse per litre counter (address 4707/0x1263) or if it replicates the pulse input of the flow meter/ counter. | 0 = Proportion 1 = Copies input |

| MODBUS ADDRESS | DESCRIPTION | BYTE ORDER |
|----------------|--|--|
| 4737(0x1281) | Indicates if the pump compensates the nominal flow rate with the pressure and if the pressure is assigned (address 4738/0x1282), or if it works with the pressure sensor | 0 = Compensation deactivated 1 = Compensation with assigned pressure 2 = Compensation with pressure sensor |
| 4738(0x1282) | Working pressure assigned for compensation of flow rate with pressure. (Bar x 10 or psi x 1) | |
| 4739(0x1283) | Pressure at which the excess pressure alarm will activate, if enabled. (Bar x 10 or psi x 1) | |

NB: We recommend reading and modifying variables that occupy two registers at the same time (reading/writing of two registers).

NB: You cannot change any variable if the pump is in operation, except for the flow rate benchmark in Manual mode → 4684(0x124C) and 4685(0x124D), and the set-point work point for %/ppm proportional mode → 4718(0x126E) and 4719(0x126F).

4. EXAMPLES

Reading one register READ INPUT REGISTERS (0x04)

Request

| Slave ID | Function | Reg ADDR HI | Reg ADDR LO | Num Reg HI | Num Reg LO | CRC HI | CRC LO |
|----------|----------|-------------|-------------|------------|------------|--------|--------|
| 0x01 | 0x04 | 0x11 | 0x94 | 0x00 | 0x01 | 0x75 | 0x1A |

Response

| Slave ID | Function | Byte Count | Value HI | Value LO | CRC HI | CRC LO |
|----------|----------|------------|----------|----------|--------|--------|
| 0x01 | 0x04 | 0x02 | 0x06 | 0x0B | 0xFB | 0x57 |

Query results:

| | |
|------------------|--------------|
| Software version | Version 6.11 |
|------------------|--------------|

Reading multiple registers (Flow, Cycle Counter) READ INPUT REGISTERS (0x04)

Request

| Slave ID | Function | Reg ADDR HI | Reg ADDR LO | Num Reg HI | Num Reg LO | CRC HI | CRC LO |
|----------|----------|-------------|-------------|------------|------------|--------|--------|
| 0x01 | 0x04 | 0x12 | 0x4C | 0x00 | 0x04 | 0x35 | 0x66 |

Response

| Slave ID | Function | Byte Count | Value1 HI | Value1 LO | Value2 HI | Value2 LO | Value3 HI | Value3 LO |
|----------|----------|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0x01 | 0x04 | 0x08 | 0x00 | 0x16 | 0xE3 | 0x60 | 0x00 | 0x00 |

| Value4 HI | Value4 LO | CRC HI | CRC LO |
|-----------|-----------|--------|--------|
| 0x05 | 0x5B | 0x87 | 0x3C |

Query results:

| | |
|---------------|---|
| Current flow | 0x0016E360 → 1500000 * 10 ⁻⁴ → 150.0000 (l/h or gph) |
| Cycle counter | 0x0000055B → 1371 cycles |

Writing one register WRITE SINGLE REGISTER (0x06)

| | |
|--------------------------------|----------------------------|
| Limit as % of flow rate | (0x1253) = 86.50% (0x21CA) |
|--------------------------------|----------------------------|

Request:

| Slave ID | Function | Reg ADDR HI | Reg ADDR LO | Value HI | Value LO | CRC HI | CRC LO |
|----------|----------|-------------|-------------|----------|----------|--------|--------|
| 0x01 | 0x06 | 0x12 | 0x53 | 0x21 | 0xCA | 0xE4 | 0xA4 |

Response:

| Slave ID | Function | Reg ADDR HI | Reg ADDR LO | Value HI | Value LO | CRC HI | CRC LO |
|----------|----------|-------------|-------------|----------|----------|--------|--------|
| 0x01 | 0x06 | 0x12 | 0x53 | 0x21 | 0xCA | 0xE4 | 0xA4 |

Writing multiple registers WRITE MULTIPLE REGISTERS (0x10)

| | |
|---|--------------------------|
| Batch start (0x1273) | 0x0002 = 2 (Time) |
| Time configuration between batches (seconds) | 0x000000FA = 250 seconds |
| Cycles or seconds in batch dose mode | 0x00000064 = 100 cycles |
| Batch type | 0x0000 = 0 (cycles) |
| Flow rate benchmark as % for batch dose mode | 0x1770 = 60.00% |

Request:

| Slave ID | Function | Reg ADDR HI | Reg ADDR LO | Num Reg HI | Num Reg LO | Byte Count | Value1 HI | Value1 LO |
|----------|----------|-------------|-------------|------------|------------|------------|-----------|-----------|
| 0x01 | 0x10 | 0x12 | 0x73 | 0x00 | 0x07 | 0x0E | 0x00 | 0x02 |

| Value2 HI | Value2 LO | Value3 HI | Value3 LO | Value4 HI | Value4 LO | Value5 HI | Value5 LO |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0x00 | 0x00 | 0x00 | 0xFA | 0x00 | 0x00 | 0x00 | 0x64 |

| Value6 HI | Value6 LO | Value7 HI | Value7 LO | CRC HI | CRC LO |
|-----------|-----------|-----------|-----------|--------|--------|
| 0x00 | 0x00 | 0x17 | 0x70 | 0x50 | 0xB1 |

Response:

| Slave ID | Function | Reg ADDR HI | Reg ADDR LO | Num Reg HI | Num Reg LO | CRC HI | CRC LO |
|----------|----------|-------------|-------------|------------|------------|--------|--------|
| 0x01 | 0x10 | 0x12 | 0x73 | 0x00 | 0x07 | 0x75 | 0x68 |

5. ERROR RESPONSE CODES

| Error response frames | | | | | Error description |
|-----------------------|--------------|------------------|---------------|---------------|--|
| Slave ID | Error | Exception | CRC HI | CRC LO | Invalid function code. |
| 0x01 | 0x84 | 0x01 | 0x82 | 0xC0 | |
| Slave ID | Error | Exception | CRC HI | CRC LO | Reading error. The number of registers to read is invalid (max. 80 registers) or one of the registers is not permitted. |
| 0x01 | 0x84 | 0x03 | 0x03 | 0x01 | |
| Slave ID | Error | Exception | CRC HI | CRC LO | Error writing single register. Register not permitted. |
| 0x01 | 0x86 | 0x02 | 0xC3 | 0xA1 | |
| Slave ID | Error | Exception | CRC HI | CRC LO | Error writing single register. The variable limits are out of range or the pump is turned on. |
| 0x01 | 0x86 | 0x04 | 0x43 | 0xA3 | |
| Slave ID | Error | Exception | CRC HI | CRC LO | Error writing multiple registers. The number of registers to read is invalid (max. 60 registers) or one of the registers is not permitted. |
| 0x01 | 0x90 | 0x03 | 0xC0 | 0x01 | |
| Slave ID | Error | Exception | CRC HI | CRC LO | Error writing multiple registers. The variable limits are out of range or the pump is turned on. |
| 0x01 | 0x90 | 0x04 | 0x4D | 0xC3 | |

Create Flow


EU DECLARATION OF CONFORMITY



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Declares that all models of the DOSmart AC products identified by serial numbers and manufacture years comply with the Machinery Directive 2006/42/EC, the Low Voltage Directive 2014/35/EU and the Electromagnetic Compatibility Directive 2014/30/EU, provided that the installation, use and maintenance are performed in accordance with current legislation and the indications given in the instruction manual.

Xavier Corbella
 Manager

| | |
|--|--|
|  ITC GUARANTEE | <p>I.T.C. S.L. guarantees the product specified in this document against all manufacturer or material faults for 1 year, provided that the device has been installed, used and maintained correctly.</p> <p>The device must be sent free of charge to an accredited workshop or to I.T.C. S.L.'s technical service, and it will be returned to you, cash on delivery.</p> <p>The warranty document bearing the purchase date and the stamp of the establishment where the device was purchased, or a photocopy of the purchase invoice, must be sent alongside the device.</p> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 45%;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> MODEL _____ </div> <div style="border: 1px solid black; padding: 5px;"> SERIAL NO. _____ </div> </div> <div style="width: 45%; border: 1px solid black; padding: 10px;"> <p>Purchase date and stamp of the establishment where the device was purchased</p> <p>DATE: _____</p> </div> </div> |
|--|--|

Original Manual

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