CM1620 AT 指令集

CM1620 AT command set

版本 Version	编写 / 修订 Compiled / revised	审核 View	日期 Date
V1.0	张凯		2020 年 7 月 29 日
			July 27th 2020

1、概述

1.1 会话

通信以主从方式进行，每次通信为一次会话，其中包括一条主机命令及一条从机响应信息。会话由主机发起，从机一次必须并仅响应一条有效的主机命令。通信链路建立受密码保护，除设备在线查询命令外，其他命令的响应必须通过登录命令建立合法链路后方可进行响应，无会话超时 5 分钟后，从机自动终止当前链路，主机需再次使用登录命令建立合法链路后恢复通信。

1 Overview

1.1 Session

Communication is carried out in a master-slave manner, and each communication is a conversation, which includes a master command and a slave response message. The session is initiated by the master, and the slave must respond to only one valid master command at a time. The communication link establishment is protected by a password. Except for the device online query command, the response of other commands must be established through the login command to establish a legal link before responding. After 5 minutes of no session timeout, the slave automatically terminates the current link, and the master needs use the login command to establish a legal link and resume communication.

1.2 命令格式

- 主机命令以“#”开始，从机命令响应以“@”开始，回车符(0x0D)结束命令，命令内容仅接受 0x0A(换行)及 0x20~0x7E 的 ASCII 码字符，其中不能包含“#”与“@”字符；

● 除 0x0A, 0x0D 及 0x20~0x7E 外的编码一律视为非法字符，并终止当前命令解释，从机以“@confused\n”回复；

● 从机无法识别的命令，将以“@confused\n”回复；

● 命令中英文字符(A~Z)不区分大小写；

● 命令中参数字段以空格字符(0x20)分隔，分隔符至少为一个空格符，可接受一个以上的连续空格符分隔；

● 除 hello，login 及 help 命令外，所有命令后加“ ?”参数为查询命令格式，从机将返回该命令的帮助说明信息；如主机发出“# logout ?\n”，从机响应为“@ logout infor: xxxx”，其中“xxxx”为帮助的文本信息，其中允许包括换行符(0x0A)。

1.2 Command format

● The master command starts with "#", the slave response starts with "@", and the carriage return (0x0D) ends the command. The command content only accepts 0x0A (line feed) and 0x20~0x7E ASCII characters, which cannot contain "#" "And "@" characters;

● All codes except 0x0A, 0x0D and 0x20~0x7E are regarded as illegal characters. If they are found, the interpretation of the current command is terminated, and the slave responds with "@confused\n";

● Commands that are not recognized by the slave will reply with "@confused\n";

● The English and Chinese characters (A~Z) are not case sensitive;

● The parameter fields in the command are separated by space characters (0x20), and the delimiter must be at least one space character. More than one consecutive space character is acceptable;

● Except for hello, login and help commands, all commands with "?" after the parameter are the query command format, and the slave will return the help information of the command; if the master sends out "# logout ?\n", the slave responds with " @ logout infor: xxxx", where "xxxx" is the help text information, and line breaks (0x0A) are allowed.

1.3 通信超时

主机在发起下一个会话前，需收到从机发送的至少一个命令起始符“@”以及至少一个回车符(0x0D)，或是在未接收到任何有效字符超过 500mS 后。

1.3 Communication timeout

Before the master initiates the next session, it needs to receive at least one command start character "@" and at least one carriage return (0x0D) sent by the slave, or after it has not received any valid characters for more than 500mS.

2、命令

2.1 设备在线查询（hello）

主机：#hello\n\r

从机：

@hello 2\n

hello-SL0 CM1620 AP1.0.0.0 BT1.0.0.0 HW1.0.0.0\n

hello-SL1 CM1620 AP1.0.0.0 BT1.0.0.0 HW1.0.0.0\n\r

…

CM1620：设备型号标识；

AP1.0.0.0：设备软件版本；

BT1.0.0.0：设备 boot loader 版本；

HW1.0.0.0：设备硬件版本号。

此命令无需先登录建立安全链路，任何时候有效。

2. Command

2.1 Equipment online query (hello)

Master: #hello\n\r

Slave:

@hello 2\n

hello-SL0 CM1620 AP1.0.0.0 BT1.0.0.0 HW1.0.0.0\n

hello-SL1 CM1620 AP1.0.0.0 BT1.0.0.0 HW1.0.0.0\n\r

…

CM1620: equipment model identification;

AP1.0.0.0: device software version;

BT1.0.0.0: device boot loader version;

HW1.0.0.0: Device hardware version number.

This command does not need to log in first to establish a secure link and is valid at any time.

2.2 建立安全链路（login）

主机：#login xxx\n\r

“xxx”为登录密码，默认状态下为“null”，此参数永远不为空。

从机：

@login 2\n

SL0 ok\n

SL1 ok\n\r

“xxx”为登录结果，成功为“ok”，密码错误为“error”。

安全链路建立后，如五分钟内无任何正确通信会话发生，从机将主动关闭链路；主机可以通过“logout”命令主动结束链路。

2.2 Establish a secure link (login)

Master: #login xxx\n\r

"Xxx" is the login password. By default it is "null"; this parameter is never empty.

Slave:

@login 2\n

SL0 ok\n

SL1 ok\n\r

"Xxx" is the login result, success is "ok", password error is "error".

After the safety link is established, if no correct communication session occurs within five minutes, the slave will actively close the link; the master can actively end the link through the "logout" command.

2.3 终止通信链路（logout）

主机：#logout\n\r

从机：@logout\n\r

此命令用于终止当前通信链路，再次恢复连接需重新发送 login 命令；通信链路的终止不影响当前从机的工作状态。

2.3 Terminate the communication link (logout)

Master: #logout\n\r

Slave: @logout\n\r

This command is used to terminate the current communication link and resend the login command to resume the connection; the termination of the communication link does not affect the working status of the current slave.

2.4 帮助命令（help）

主机：#help\n\r

从机：@help infor：xxx\n\r

从机回复的“xxx”为帮助文本信息，其中允许包括换行符(0x0A)；此命令用于枚举从机所支持的所有命令，给登录者提供操作帮助查询。

2.4 Help command (help)

Master: #help\n\r

Slave: @help infor: xxx\n\r

The "xxx" returned by the slave is the help text information, which allows to include line breaks (0x0A); this command is used to enumerate all the commands supported by the slave and provide operation assistance and query to the registrant.

2.5 充电命令（charge）

主机：#charge lipo 4.20V 12S 20000mAh 15.0A BLN\n\r

lipo：电池类型，取值包括 lipo，lihv，life；

4.20V：电池满充电压；

12S：电池串数，取值为 1~16S，如选择让充电器自动判定串数，此字段填“auto”；

当命令串数与电池实际串数不符时，charge 命令报参数错误；

20000mAh：此字段为电池标称容量，用于设置电池容量保护，此字段可取值“0mAh”表示禁用容量保护功能；

15.0A：充电电流设置值，此值不能取零；

BLN：充电模式，“BLN”为平衡充，“UBL”为非平衡充，当为“UBL”时，电池串数取值不能为“auto”；

从机：@charge xxx\n\r

“xxx”为命令执行结果，释义如下：

start：充电开始；

error：充电参数设置错误，命令执行失败；

busy：充电器处于忙状态，无法执行充电命令，当充电器正在充电中，再次发送充电命令也会导致返回此结果；

refuse：充电器拒绝执行充电命令，如级联拓扑错误，或其他错误未使用“recover”命令清除前，都会导致充电命令被拒绝。

2.5 Charge command (charge)

Master: #charge lipo 4.20V 12S 20000mAh 15.0A BLN\n\r

lipo: battery type, values include lipo, lihv, life;

4.20V: battery full charge voltage;

12S: battery string number, the value is 1~16S, if you choose to let the charger automatically determine the string number, fill in "auto" in this field;

When the number of command strings does not match the actual number of battery strings, the charge command reports a parameter error;

20000mAh: This field is the nominal battery capacity and is used to set battery capacity protection. The value "0mAh" for this field means that the capacity protection function is disabled;

15.0A: charging current setting value, this value cannot be set to zero;

BLN: Charging mode, "BLN" is balanced charging, "UBL" is unbalanced charging, when it is "UBL", the battery string value cannot be "auto";

Slave: @charge xxx\n\r

"Xxx" is the execution result of the command, and the definition is as follows:

start: charging starts;

error: The charging parameters are set incorrectly and the command execution failed;

busy: The charger is busy and cannot execute the charging command. When the charger is charging, sending the charging command again will cause this result to be returned;

Refuse: The charger refuses to execute the charging command. A cascading topology error, or other errors that are not cleared by the "recover" command, will cause the charging command to be rejected.

2.6 停止命令（stop）

主机：#stop\n\r

从机：@stop\n\r

该命令用于停止执行中的充电任务。

2.6 Stop command (stop)

To

Master: #stop\n\r

Slave: @stop\n\r

This command is used to stop the charging task in execution.

2.7 改变充电电流（adjust）

主机：#adjust 100.0A\n\r

100.0A：希望调节到的充电电流值；

从机：@adjust 20.0A\n\r

20.0A：从机实际能调节到的电流值；

2.7 Changing the charging current (adjust)

Master: #adjust 100.0A\n\r

100.0A: The charging current value that you want to adjust;

Slave: @adjust 20.0A\n\r

20.0A: The current value that the slave can actually adjust;

2.8 任务查询（task）

主机：#task\n\r

从机：

@task 2\n

SL0 charge lipo 4.20V 12S 20000mAh 15.0A BLN\n

SL1 charge lipo 4.20V 12S 20000mAh 15.0A BLN\n\r

从机返回已设定的任务参数，字段解释与 charge 命令相同；

2.8 Task Query (task)

To

Master: #task\n\r

Slave:

@task 2\n

SL0 charge lipo 4.20V 12S 20000mAh 15.0A BLN\n

SL1 charge lipo 4.20V 12S 20000mAh 15.0A BLN\n\r

The slave returns the task parameters that have been set, and the field explanation is the same as the charge command;

2.9 状态查询（status）

2.9.1 查询全部级联从机状态

主机：#status\n\r

查询全部级联从机的状态；

从机：

@status 1\n

SL0 32.0V 24.0V 30C N 85% UBL 000 standby\n\r

@status 1\n

*SL0 32.0V 24.0V 56C N 85% **BV** 000 standby\n*

3.785 3.785 3.785 3.785 3.785 3.785 3.785 3.785 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0\n\r

@status 1\n

SL0 32.0V 24.0V 30C N 85% UBL 407 abnormal\n\r

@status 1\n

SL0 32.0V 24.0V 56C N 85% BVR 000 ConstCurChging\n10.0A 400W 9.9A 15200mAh 00:00:30\n

3.785 3.785 3.785 3.785 3.785 3.785 3.785 3.785 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0\n

3.6 3.6 3.6 3.6 3.6 3.6 3.6 3.6 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0\n\r

@status 3\n

SL0 32.0V 24.0V 56C N 85% UBL 000 ConstCurChging\n40.0A 1000W 39.9A 15200mAh 00:00:30\n

SL1 32.0V 24.0V 56C N 85% UBL 000 ParallelChging\n

SL2 32.0V 24.0V 56C N 85% UBL 000 ParallelChging\n\r

从机输入电压：32.0V

从机输出电压：24.0V

从机内部温度，单位为摄氏度： 56C

输出端连接是否为 BattGO 电池：Y or N

电芯电量百分比：85%

平衡口连接指示：BV 有平衡口电压信息， BVR 有平衡口电压和内阻信息，UBL 无平衡口电压信息。若为 BLN，最后字段为 16 节平衡口电压和内阻值，数值不带单位，电压为 V，内阻为 mR。若为 BV，最后字段为 16 节平衡口电压。

错误代码：三位数字

001：登陆错误（密码）

002：登陆错误（超时）

101：参数错误（电池类型）

102：参数错误（任务）

103：参数错误（电流）

104：参数错误（电压）

105：参数错误（容量）

106：参数错误（平衡）

107：参数错误（串数）

151：并充错误（从机数目）

152：并充错误（平衡）

153：并充错误（输出电压）

154：并充错误（任务电流）

155：并充错误（启动错误）

156：并充错误（连接错误）

201：启动错误（未接平衡口）

202：启动错误（平衡口节点异常）

203：启动错误（平衡口过压）

204：启动错误（平衡口欠压）

205：启动错误（电池反接）

206：启动错误（不支持平衡口充电）

207：启动错误（不支持平衡口操作）

208：启动错误（输出过压）

209：启动错误（输入欠压）

210：启动错误（输入过压）

211：启动错误（不支持此任务）

212：启动错误（不支持此任务）

301：运行错误（输出过流）

302：运行错误（输出过压）

303：运行错误（输入过压）

304：运行错误（输入欠压）

305：运行错误（输入电压不稳）

306：运行错误（温度异常）

307：运行错误（超时错误）

308：运行错误（连接断开）

309：运行错误（电芯过压）

310：运行错误（连接错误）

311：运行错误（电芯电压异常）

312：运行错误（不支持此操作）

313：运行错误（超出最大容量）

401：测试错误（校准错误）

402：测试错误（BattGo 通讯错误）

403：测试错误（参考电压错误）

404：测试错误（温度错误）

405：测试错误（电流参考错误）

406：测试错误（风扇故障）

407：测试错误（反接错误）

408：测试错误（电池连接错误）

409：测试错误（输入欠压）

410：测试错误（输入过压）

411：测试错误（放电错误）

412：测试错误（升压测试低压）

413：测试错误（升压测试高压）

414：测试错误（降压测试低压）

415：测试错误（降压测试高压）

416：测试错误（出厂时间错误）

417：测试错误（降压测试不稳）

418：测试错误（升压测试不稳）

419：测试错误（运放电压错误）

420：测试错误（外部电压错误）

421：测试错误（VS45 电压错误）

422：测试错误（FBIPWM 错误）

423：测试错误（平衡口错误）

501：从机错误（通讯超时）

502：从机错误（启动超时）

当前任务状态:

1. Standby: 待机状态，后面没有待机信息
2. Abnormal：出错状态，当设备处于“abnormal”状态时，必须使用“recover”命令清除错误后方可再次启动充电任务；
3. ParallelChging: 并行充电状态；
4. 充电过程有以下 6 个充电过程：
   - Activate 激活充电
   - CurrentClimb 充电电流爬升
   - ConstCurChging 恒流充电
   - ConstVolChging 恒压充电

- NormalEnd 充电完成
- Trickling 涓流充电

充电状态后面跟着以下 5 个充电信息：

- 20.0A：从机任务电流；
- 400W：从机输入功率；
- 18.0A：从机实际输出电流；
- 15000mAh：已充入容量;
- 00:00:30：已充电时间

2.9 Status query (status)

2.9.1 Query the status of all cascaded slaves

Master: #status\n\r

Query the status of all cascaded slaves;

Slave:

@status 1\n

SL0 32.0V 24.0V 30C N 85% UBL 000 standby\n\r

@status 1\n

SL0 32.0V 24.0V 56C N 85% BV 000 standby\n

3.785 3.785 3.785 3.785 3.785 3.785 3.785 3.785 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0\n\r

@status 1\n

SL0 32.0V 24.0V 30C N 85% UBL 407 abnormal\n\r

@status 1\n

SL0 32.0V 24.0V 56C N 85% BVR 000 ConstCurChging\n10.0A 400W 9.9A 15200mAh 00:00:30\n

3.785 3.785 3.785 3.785 3.785 3.785 3.785 3.785 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0\n

3.6 3.6 3.6 3.6 3.6 3.6 3.6 3.6 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0\n\r

@status 3\n

SL0 32.0V 24.0V 56C N 85% UBL 000 ConstCurChging\n40.0A 1000W 39.9A 15200mAh 00:00:30\n

SL1 32.0V 24.0V 56C N 85% UBL 000 ParallelChging\n

SL2 32.0V 24.0V 56C N 85% UBL 000 ParallelChging\n\r

Slave input voltage: 32.0V

Slave output voltage: 24.0V

The internal temperature of the slave, in degrees Celsius: 56C

Whether the output terminal is connected to BattGO battery: Y or N

Battery power percentage: 85%

Balance port connection indication: BV has balance port voltage information, BVR has balance port voltage and internal resistance information, and UBL has no balance port voltage information. If it is BLN, the last field is the 16-cell balance port voltage and internal resistance value; the value does not include a unit, the voltage is V, and the internal resistance is mR. If it is BV, the last field is the 16-cell balanced port voltage.

Error code: three digits

001: login error (password)

002: Login error (timeout)

To

101: Parameter error (battery type)

102: Parameter error (task)

103: Parameter error (current)

104: Parameter error (voltage)

105: Parameter error (capacity)

106: Parameter error (balanced)

107: Parameter error (number of strings)

151: Parallel charge error (number of slaves)

152: Parallel charge error (balance)

153: Parallel charge error (output voltage)

154: Parallel charge error (task current)

155: Parallel charge error (start error)

156: Parallel charge error (connection error)

201: Start error (the balance port is not connected)

202: Startup error (abnormal balance port node)

203: Start error (overpressure at balance port)

204: Start error (undervoltage at balance port)

205: Startup error (reverse battery connection)

206: Startup error (does not support balance port charging)

207: Startup error (does not support balance port operation)

208: Start error (output overvoltage)

209: Startup error (input undervoltage)

210: Start error (input overvoltage)

211: Startup error (this task is not supported)

212: Startup error (this task is not supported)

To

301: Operation error (output overcurrent)

302: Operation error (output overvoltage)

303: Operation error (input overvoltage)

304: Operation error (input undervoltage)

305: Operation error (input voltage is unstable)

306: Operation error (abnormal temperature)

307: Operation error (timeout error)

308: Operation error (disconnected)

309: Operation error (cell overvoltage)

310: Operation error (connection error)

311: Operation error (abnormal cell voltage)

312: Operation error (operation not supported)

313: Operation error (maximum capacity exceeded)

401: Test error (calibration error)

402: Test error (BattGo communication error)

403: Test error (reference voltage error)

404: Test error (temperature error)

405: Test error (current reference error)

406: Test error (fan failure)

407: Test error (reverse connection error)

408: Test error (battery connection error)

409: Test error (input undervoltage)

410: Test error (input overvoltage)

411: Test error (discharge error)

412: Test error (boost test low pressure)

413: Test error (boost test high pressure)

414: Test error (low-voltage test under pressure)

415: Test error (low pressure test high pressure)

416: Test error (wrong factory time)

417: Test error (instability of step-down test)

418: Test error (boost test is unstable)

419: Test error (op amp voltage error)

420: Test error (external voltage error)

421: Test error (VS45 voltage error)

422: Test error (FBIPWM error)

423: Test error (balance port error)

501: Slave error (communication timeout)

502: Slave error (start timeout)

Current task status:

1.Standby: Standby state, there is no standby information behind

2. Abnormal: Error state, when the device is in "abnormal" state, you must use the "recover" command to clear the error before starting the charging task again;

3.ParallelChging: parallel charging status;

4. The charging process has the following 6 charging processes:

- Activate: activate charging
- CurrentClimb: increase charging current
- ConstCurChging: constant current charging
- ConstVolChging: constant voltage charging
- NormalEnd: charging completed
- Trickling: trickle charging

The charging status is followed by the following 5 charging information:

- 20.0A: slave task current
- 400W: slave input power
- 18.0A: actual slave current output
- 15000mAh: capacity charged
- 00:00:30: time charged

2.10 错误恢复命令（recover）

主机：#recover\n

从机：@recover ok\n

ok：“ok”为已完成错误标记清除，“refuse”为错误恢复执行失败，如级联拓扑错误，电池反接等错误无法通过命令清除错误状态。

2.11 电压校准

主机：#calibration 48.3V 50.4V 4.125V 4.120V 4.125V 4.125V 4.125V 4.125V 4.125V 4.125V 4.125V 4.125V 4.125V 4.120V 0.0V 0.0V 0.0V 0.0V\n\r

输入电压：48.3V;

输出电压：50.4V;

第 1 节平衡口电压：4.125V;

…

第 12 节平衡口电压：4.120V

第 13 节平衡口电压：0.0V

第 14 节平衡口电压：0.0V

第 15 节平衡口电压：0.0V

第 16 节平衡口电压：0.0V

从机：# calibration xxx\n\r

xxx”为命令执行结果，释义如下：

ok:校准完成；

error:校准失败；

2.10 Error recovery command (recover)

Master: #recover\n

Slave: @recover ok\n

ok: "ok" means that the error flag has been cleared, and "refuse" means that the error recovery execution failed, which occurs in cascade topology errors, battery reverse connection errors, and other errors that cannot be cleared by commands.

To

2.11 Voltage calibration

Master: #calibration 48.3V 50.4V 4.125V 4.120V 4.125V 4.125V 4.125V 4.125V 4.125V 4.125V 4.125V 4.125V 4.125V 4.120V 0.0V 0.0V 0.0V 0.0V\n\r

Input voltage: 48.3V;

Output voltage: 50.4V;

Section 1 balance port voltage: 4.125V;

…

Section 12 Balance port voltage: 4.120V

Section 13 balance port voltage: 0.0V

Section 14 balance port voltage: 0.0V

Section 15 balance port voltage: 0.0V

Section 16 balance port voltage: 0.0V

Slave: # calibration xxx\n\r

xxx" is the result of the command execution, and the definition is as follows:

ok: calibration is complete;

error: calibration failed;