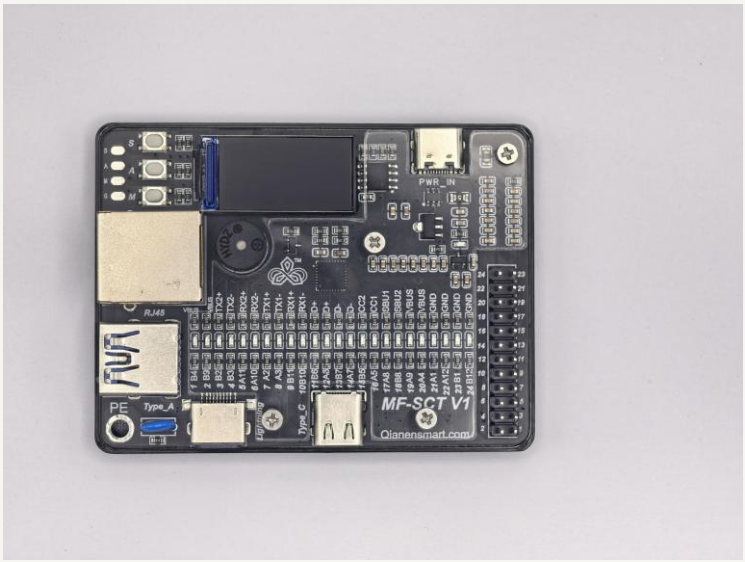
多接口线缆短路检测仪使用说明书

MF-SCT V1　上位机与仪器本体

本说明书介绍单端线缆短路筛查、电脑端结果查看、自定义工装及产线操作。日常使用只需选择接口、接入被测线，再触发一次检测。



实物正面

快速上手

01 用上部 PWR_IN USB-C 给仪器供电；连接电脑时使用支持数据传输的 USB 线。

02 选择与被测接口对应的档位，插好线缆；另一端保持悬空。

03 按本体 S 键、外接 S 按钮，或在已连接的上位机点击“开始测试”。

04 确认本次结果已更新，再依据短路分组及工位判定标准处理产品。

适用范围 仅测试无外加电源的被动线缆或工装。无短路结果不代表断线、线序、线阻或全部功能合格。

1 接口与外接按钮

以下方位以屏幕及丝印正向朝向操作者的主视图为准。接线前断开供电，先核对工装接线表。

位置或标识	用途
上部 PWR_IN USB-C	5V USB 供电及电脑通信；连接电脑的数据线。
待测接口	TYPE-C、TYPE-A、LIGHTNING、RJ45；选择相应档位后测试，每次只接一个待测对象。
右侧 24Pin 排针	CUSTOM 工装接入口，支持最多 24 芯被动线缆；汽车插头需配匹配的转接工装。
左侧四个金色触点	自上而下 S、A、M、G，可外接三个按钮，G 为按键公共端。
左下 PE	连接工位保护地，用于静电泄放；不作为外接按钮公共端。

三个按钮的作用

按键及接点	主界面	菜单及确认页

按键及接点	主界面	菜单及确认页
S 接 S 与 G	触发一次检测	循环选择下一项
A 接 A 与 G	无检测操作	确认选择并保存；恢复出厂页再次确认
M 接 M 与 G	进入菜单	返回或取消；已确认保存的设置仍保留

外接使用三个常开瞬时无源按钮，分别跨接 S–G、A–G、M–G；按钮公共端只接左侧 G。不要接到 PWR_IN USB-C，也不要向按键触点注入外部电压。

2 仪器本体操作

开机检查

接入 USB 电源后，仪器显示自检及启动画面，然后进入主界面。正常工位开机时应松开三个按钮。

显示	含义与处理
通信 或 COMM OK	内部检测芯片通信正常；不代表电脑已连接。
通信 或 COMM FAIL	内部检测通信异常；检查供电、接线及仪器，恢复正常后再使用。
配置 或 CONF DEFAULT	采用默认设置；首次使用或恢复出厂后可能出现，需核对所需档位与免报组。
KEYS LOW	开机检测到按键为按下状态；松开按键，检查外接按钮是否卡住或接线短接。

选择接口并检测

01 按 M 进入菜单，按 S 循环选择 RJ45、TYPE-C、LIGHTNING、TYPE-A 或自定义 CUSTOM。

02 按 A 确认档位并保存，仪器返回主界面；仅浏览时可按 M 返回。

03 插入匹配的被测线，另一端悬空；按下并松开 S，触发一次检测。

04 查看右侧结果、板上引脚指示灯；需要具体分组引脚时查看上位机。更换下一件后再次按 S。

S 按一次测一次，长按不会持续触发。插入下一根线缆后必须重新触发；显示内容不会仅因换线而自动成为新结果。

LCD 短路格中的数字是组序号，不是具体引脚号。超过 4 组时末格显示总组数；完整分组请查看上位机。

3 上位机连接与三步检测

上位机位于配套文件夹的“上位机/index.html”，基于浏览器串口运行。使用支持 Web Serial 的桌面版 Chrome 或 Edge。

01 连接设备 使用数据线连接电脑与仪器上部 PWR_IN USB-C。点击“连接串口”，在浏览器弹窗中选择对应的 CH340 串口并授权。

02 选择接口 在“接口选择”中选择对应档位，确认仪器与软件一致，然后插好被测线缆。

03 开始测试 点击“开始测试”，或按本体／外接 S 按钮。查看测试序号、更新时间及结果分组，确认本件已完成检测。



用户提供的实际检测界面示例

连接成功后顶部显示“已连接”；串口打开本身不证明已收到本件检测结果。测试序号由仪器产生，更新时间为电脑收到结果的本地时间，不是测试耗时。

若双击 HTML 无法连接，由工位管理员在该文件目录运行 python -m http.server 8000，再打开 http://localhost:8000。同一串口一次只由一个程序或标签页占用。

4 检测结果判读

结果	含义	操作
无短路	在当前档位和免报规则下，未发现需报警的互通组。	按工位规范处理；不等同于线缆全部性能合格。
发现短路	存在需报警的互通组；同一组中的引脚检测为互通。	按组和 P 序号检查线缆、插头及工装。
不支持检测	检测到当前算法无法可靠判别的耦合形态。可能涉及芯片、识别电路或电容，也可能是真实短路。	隔离并复核；不得作为无短路放行。
检测器离线	仪器内部检测芯片通信或扫描失败；与浏览器串口断开是不同状态。	检查供电和仪器，故障排除后重测。

用分组与颜色定位

“短路互通组”按组着色，相同颜色表示同组引脚。提供的实际截图中，第 1 组为 P11 与 P13，第 2 组为 P12 与 P14。组数不是短路引脚总数。

蓝框“预设互通”表示被当前规则免报的已知互通，仅提示不报警。非当前接口检测范围的格子灰显；其他未着色引脚也不能据此判定导线未断。

板载灯显示报警组与免报组对应引脚，因此亮灯不一定是短路。以本次 LCD／上位机状态及分组共同判断；不支持检测时固件关闭结果灯且不鸣叫。

引脚名称与截图版本

操作统一使用 P01–P24 并对照工装接线表。所附实际截图与本次仓库代码的部分 Type-C 信号名映射存在版本差异；不要把截图中的 A/B 脚名直接用作新工装接线依据。

5 自定义线缆与免报组

CUSTOM 使用 24 路检测通道。通过匹配的转接线或工装，可检测最多 24 芯的汽车插头等被动线缆。通道按 P 序号管理，不会自动识别汽车插头针脚名称。

由工艺人员配置

01 断电制作转接工装，记录“被测插头针脚—工装通道 P 序号”的对应关系，核对不存在误接。

02 连接工装至右侧 24Pin 排针，启动仪器与上位机，选择 CUSTOM。

03 点击“从设备读取”，核对现有免报组。只为图纸规定应互通的引脚建立免报组。

04 在配置区选择至少两个 P 引脚，点击“将选中脚存为一组”；需要时继续添加其他组。

05 点击“写入设备”，等待同步成功；再次“从设备读取”核对。网页添加或删除组后，均须写入设备才能生效。

06 用已知良品及已知短路样件验证。换型时重新核对工装、档位和免报组，再开始生产。

配置限制	实际行为
最多 8 组，每组至少 2 脚	同一引脚不能重复归属多组；写入后掉电保存。
仅 CUSTOM 生效	其他接口使用固件内置规则；修改自定义免报组不会更改其他接口规则。
组内互通免报	检测到的互通组完整落在一个免报组内时免报，子集也免报；不验证组内应有连接是否缺失。

示例 若工艺仅允许 P01 与 P02 互通，就只将 P01、P02 设为一组。检测到 P01、P02、P03 连成一组时，应作为越出免报组的报警处理。不要用扩大免报组的方法掩盖故障。

6 产线工位操作

工位连接

电脑通过上部 PWR_IN USB-C 供电并通信；左侧 S、A、M、G 触点接三个外接按钮；右侧排针接定制工装；左下 PE 接工位保护地，用于静电泄放。按键 G 与 PE 不可混用。

工位设置完成后，工人可只使用外接 S 按钮逐件检测，电脑屏幕显示同次结果。A 与 M 仍可用于确认和菜单操作，与本体按钮作用一致。

每班与换型检查

01 确认产品型号、工装编号及接线表；检查接口、排针、按钮和 PE 接线牢固。

02 核对档位、免报组及蜂鸣器设置。保留当前配置记录；不同线束不能直接沿用未核对的免报组。

03 分别检测已知良品和已知缺陷样件，确认能按该工位标准区分后投入使用。

逐件操作

01 插好本件线缆，未参与工装的另一端保持悬空；不要接汽车电源、充电器或终端设备。

02 按下并松开外接 S，或点击“开始测试”；确认测试序号／更新时间变化。

03 按本件状态及工位标准分拣。短路、不支持检测、离线均转复核；没有新结果时不得沿用上一件结果。

04 取下本件，放入下一件，再次触发检测。异常集中出现时暂停工位并检查工装。

本版没有自动插线识别或工件在位确认；空工装、未插好或断线也可能显示无短路。此工位用于短路筛查，完整质量判定需配合相应的通断／线序等工序。

7 设置与连续测试

蜂鸣器

本体菜单可开关蜂鸣器；上位机也可切换，并设置短路提示音次数及每声时长。选择参数后可“试音”，点击“设置”并等待成功提示才会保存。

开启时，无短路固定 1 声；短路默认 3 声，每声 40 ms。可设置 1–5 声、30–200 ms（页面提供若干固定选项）。关闭蜂鸣器时无声；不支持检测也不鸣叫，不能仅用有无声音判定。

语言与设置保存

本体菜单的语言项通过 A 在中英文间切换，并掉电保存。上位机右上角 EN／中文只切换电脑界面，保存在该浏览器；不会同步更改仪器 LCD 的语言。接口、免报组及声音参数按设备保存。

恢复出厂设置

本体选择恢复出厂后，需再次按 A 确认，按 M 取消。上位机点击“恢复出厂设置”后，也有确认弹窗。确认后回到 TYPE-C、清空自定义免报组、开启蜂鸣器、短路提示音恢复 3 声 × 40 ms、本体语言恢复中文。

恢复前记录当前工装设置。恢复后重新选择档位、配置免报组，并用标准样件验证后再投入生产。

连续测试用于稳定性检查

01 在“压测”区域选择接口和次数，固定同一稳定样件与接线，再点击“开始”。

02 软件按该接口第一次结果建立基准，比较后续结果并显示差异、离线、超时及往返延迟；运行期间静音，结束时尝试恢复原蜂鸣器状态。

压测区称为“误判”的统计实际是与首次结果不一致，不等同于经标准样件验证的真实误判率；首次结果本身可能有错。压测不是逐件自动验收，测试中不要换件或改线。选择“全部轮巡”后，结束时应重新选择实际生产档位。

8 常见问题与维护

现象	检查方法
上位机无法连接	换用支持数据传输的 USB 线，确认接上部 PWR_IN；检查 CH340 串口驱动、浏览器串口授权，关闭占用同一串口的程序。
连接成功但没有新结果	确认档位后重新点击“开始测试”或按 S；看测试序号／时间是否更新。端口打开不等于扫描成功。
突然掉线或重新插线	软件会尝试自动重连已授权端口；检查线缆和供电。若未恢复，手动“连接串口”。主动点“断开”后不自动重连。
反复短路或大量互通	断开待测线另一端的电源／设备，核对档位、工装和免报组；用已知标准样件交叉检查。
显示不支持检测	可能为电子元件耦合，也可能为真实短路；转复核，不按良品放行。
外接按钮失效或卡住	断电后核对 S–G、A–G、M–G 常开接点；检查 G 公共端，勿混接 PE 或 USB-C；检查按钮复位。
配置改了却不生效	自定义免报组仅用于 CUSTOM；点击“写入设备”并等待确认，再读取核对。换型后重新检测。

维护与工位记录

断电后清理接口异物，保持电路与亚克力盖板干燥；排针、USB 插座或按钮松动损坏时先停用。保留工装编号、接线表、免报组、样件确认记录及异常复核记录。

原始数据日志用于当前会话排查，页面最多保留约 500 条，不是生产追溯数据库。需要留存时及时复制到工位记录。

9 功能范围与版本依据

档位	检测通道数	使用说明
TYPE-C	24	脚名按固定朝向显示；正反插需核对对应关系。
TYPE-A	9	USB 3.0 接口对应的 9 路检测。
LIGHTNING	8	插座侧固定脚名，反插核对镜像；电子元件耦合可能无法判别。
RJ45	8	仅做对应通道短路筛查；线对／速率提示不是网络认证。
CUSTOM	24	通过专用工装适配最多 24 芯线缆，支持自定义免报组。

本版功能边界

本版仅做短路筛查，不验证断线、错序、线阻、耐压或 E-Marker。内置免报和不支持检测属于固件规则，不能可靠识别全部线材结构；新工装及特殊线材须先验证适用性。

版本与资料来源

说明书版本 1.0　适用产品 MF-SCT V1　编制日期 2026 年 10 月 23 日

源码快照
29538245314770bb04c2e53c2c879084eca2b5c3

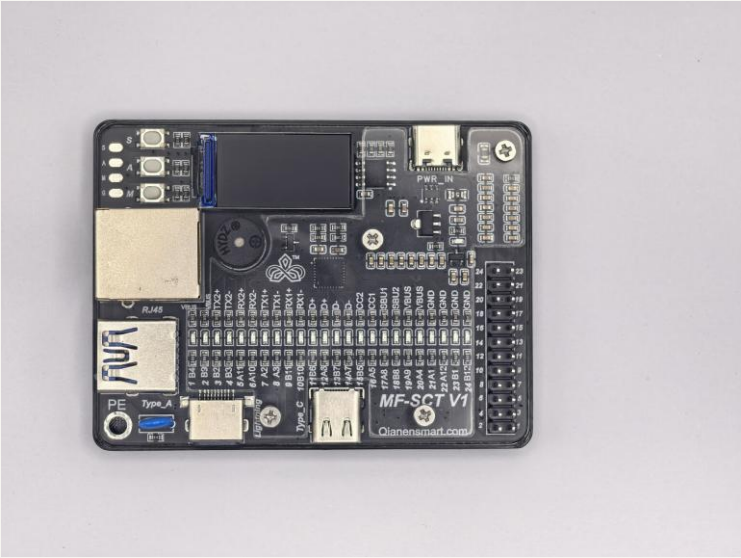
源码仓库 https://github.com/zhugevitar/USB_Short_Test
核对文件 Source/main.c、Source/ui_menu.c、Source/key.c、Source/settings.c、Include/board_config.h、Include/settings.h、上位机/index.html。界面插图采用用户提供的实际截图，实物照片采用用户提供的主视图。

本手册依据界面与控制代码整理，未连接实际仪器完成台架验证。交付软件／固件有更新时，应重新核对界面、引脚映射、免报规则和操作步骤。

Multi-Interface Cable Short-Circuit Tester User Manual

PC SOFTWARE AND STANDALONE TESTER

This manual covers single-ended short-circuit screening, PC result viewing, custom fixtures and production-line operation. Select the interface, insert the cable and trigger one test.



Actual product front view

Quick Start

Power the tester through the top PWR_IN USB-C port. Use a data-capable USB cable for PC operation.

Select the matching interface mode and insert the cable. Leave its far end unconnected.

Press S on the tester or external control, or click Start Test in the connected PC software.

Confirm a fresh result, then act on the grouped findings and your workstation acceptance criteria.

Scope: test only unpowered passive cables or fixtures. No Short does not verify continuity, wire order, resistance or full cable functionality.

1 Ports and External Buttons

Locations refer to the upright front view with the display facing the operator. Disconnect power and check the fixture wiring map before wiring.

Location or Label	Purpose
Top PWR_IN USB-C	5 V USB power and PC communication; connect the PC data cable here.
Test receptacles	TYPE-C, TYPE-A, LIGHTNING and RJ45; select the matching mode and test one item at a time.
Right 24-pin Header	CUSTOM fixture connection for up to 24 conductors; automotive plugs require a matching adapter fixture.
Four Left Gold Contacts	Top to bottom: S, A, M, G. Three external buttons share the G common.
Lower-left PE	Connect to workstation protective earth for static discharge; not the button common.

Three Button Functions

Button and Contacts	Main Screen	Menu and Confirmation
S to G	Run one test	Select the next item
A to G	No test action	Confirm and save; confirm factory reset
M to G	Open menu	Back or cancel; confirmed changes remain saved

Use three normally open momentary dry-contact buttons across S–G, A–G and M–G. Connect their common only to the left G contact. Do not use PWR_IN for buttons or apply external voltage to these contacts.

2 Standalone Tester Operation

Power-on Check

After USB power is applied, the tester shows self-check and startup screens, then the main screen. Release all three buttons during normal startup.

Display	Meaning and Action
通信 或 COMM OK	The internal detector communication is normal; this is not the PC connection indicator.
通信 或 COMM FAIL	Internal communication fault; check power, wiring and the tester before use.
配置 或 CONF DEFAULT	Defaults are in use; this can occur at first use or after reset. Check mode and exemptions.
KEYS LOW	A key is held at startup; release it and check for a stuck external button or wiring short.

Select a Mode and Test

Press M for the menu, then S to cycle through RJ45, TYPE-C, LIGHTNING, TYPE-A and CUSTOM.

Press A to confirm and save the interface, returning to the main screen. Press M to leave without confirming a pending selection.

Insert the matching cable with the far end free. Press and release S to run one test.

Read the result and pin indicators. Use the PC software for detailed group membership. Replace the item and press S again.

S triggers once per press; holding it does not repeatedly test. Trigger again after changing the cable; replacing a cable alone does not create a fresh result.

Numbers in the LCD short-circuit grid are group indices, not pin numbers. Above four groups, the last cell shows the total; use the PC software for all groups.

3 PC Connection and Three-step Testing

Open 上位机/index.html from the supplied package in a desktop Chrome or Edge browser with Web Serial support.

Connect Device: connect a data cable from the PC to top PWR_IN USB-C. Click Connect, select the matching CH340 serial port and grant access.

Select Interface: choose the matching mode and confirm the tester and software agree, then insert the cable.

Start Test: click Start Test or press the onboard/external S button. Check the sequence, update time and groups to confirm a fresh result for this item.



Actual test screenshot supplied by the user

The header shows Connected after the serial port opens. This alone does not prove a new item result was received. The sequence comes from the tester; update time is the PC receipt time, not test duration.

If direct file opening cannot access the port, the station administrator can run python -m http.server 8000 in that folder and open http://localhost:8000. Use one application or tab per serial port.

4 Understanding Test Results

Result	Meaning	Action
No Short OK	No alarmed link was found under the active mode and exemption rules.	Apply station criteria; this is not a full-function cable pass.
SHORT	An alarmed linked group was found; pins in that group are electrically linked by this test.	Inspect the cable, plug and fixture using group and P numbers.
Not Testable NOSUPPORT	The detected coupling cannot be reliably classified; electronics, capacitors or a real short may be involved.	Set aside for review; do not release as No Short.
Detector Offline OFFLINE	Internal detector communication or scanning failed; this differs from a browser serial disconnect.	Check power and the tester, resolve the fault and retest.

Read Groups and Colors

Short groups use distinct colors; pins sharing a color belong to one group. In the supplied example, group 1 contains P11 and P13, and group 2 contains P12 and P14. Group count is not pin count.

Blue-framed expected links are exempted by the active rules and shown without alarm. Pins outside the active interface range are greyed out. An uncolored pin does not prove continuity.

The onboard LEDs show both alarmed and exempted pins, so a lit LED alone does not mean a defect. Read the current status and groups together. For Not Testable, firmware turns result LEDs off and gives no beep.

Pin Names and Screenshot Version

Use P01–P24 together with the fixture wiring map. Some Type-C signal-name mappings in the supplied screenshot differ from the reviewed source version. Do not wire a new fixture from the screenshot A/B names.

5 Custom Cables and Exempt Groups

CUSTOM scans 24 channels. A matching adapter fixture supports passive automotive and other cables with up to 24 conductors. Channels use P numbers; automotive pin names are not detected automatically.

Setup by the Process Technician

With power off, build the adapter and record the DUT pin-to-P-channel map. Check it for wiring errors.

Connect the fixture to the right 24-pin header, start the tester and PC software, and select CUSTOM.

Click Read from Device and review existing exemptions. Create groups only for links that the product drawing explicitly permits.

Select at least two P pins and click Add Group. Add further groups if required.

Click Write to Device and wait for confirmation, then read back to verify. Adding or deleting groups on the page takes effect only after writing.

Validate with known-good and known-short samples. Recheck fixture, mode and groups after each product changeover.

Limits	Behavior
Up to 8 groups, at least 2 pins each	A pin cannot belong to multiple groups. Written settings survive power loss.
CUSTOM only	Other interfaces use built-in firmware rules.
Within-group links exempted	A detected group contained within one exemption is exempted, including a subset; missing expected links are not checked.

Example: if only P01–P02 is allowed, exempt just those pins. A detected P01–P02–P03 group extends outside it and alarms. Do not enlarge exemptions to conceal a fault.

6 Production-line Operation

Station Connections

The PC powers and communicates through top PWR_IN USB-C. The left S, A, M, G contacts serve three external buttons; the right header connects the custom fixture. Lower-left PE connects to station earth for static discharge. Do not interchange button G and PE.

Once the station is configured, the operator can use external S for each item while viewing the same result on the PC. External A and M retain the onboard confirmation and menu functions.

Start-of-shift and Changeover Checks

Confirm product, fixture ID and wiring map. Check receptacles, header, buttons and PE connection.

Verify mode, exemption groups and buzzer settings. Keep a configuration record; do not reuse unverified exemptions for a different harness.

Test known-good and known-defective references and verify the station criteria before production.

Per-item Work Cycle

Insert the item securely. Keep any far end not used by the fixture free; do not connect vehicle power, a charger or an end device.

Press and release external S or click Start Test. Confirm the sequence or update time has changed.

Sort using the current result and station criteria. Route SHORT, Not Testable or Offline to review. Never reuse the previous item result.

Remove the item, insert the next and trigger again. Pause the station if abnormal results cluster and inspect the fixture.

This version does not confirm insertion or part presence. An empty fixture, poor insertion or an open wire may also show No Short. Use this station for short screening alongside continuity or wire-order checks required by your process.

7 Settings and Repeated Testing

Buzzer

Toggle the buzzer in the device menu or PC software. On the PC, choose short-alarm beep count and duration, try the sound, then click Set and wait for confirmation to save.

When enabled, No Short gives one beep. The default short alarm is three 40 ms beeps. Set 1–5 beeps and 30–200 ms using the offered choices. Muted and Not Testable results are silent; do not judge by sound alone.

Language and Saved Settings

Use A on the device Language menu item to switch Chinese/English; the device saves it. EN/中文 on the PC changes only the browser interface and is stored there; it does not change the LCD language. Interface, exemptions and sound settings are stored on the device.

Factory Reset

Select Factory Reset on the tester, then press A again to confirm or M to cancel. The PC also asks for confirmation. Reset restores TYPE-C, no custom exemptions, buzzer on, three 40 ms alarm beeps and Chinese LCD language.

Record fixture settings before resetting. Restore the required mode and exemptions, then validate reference samples before returning to production.

Repeated Testing for Stability Checks

Select an interface and run count in Stress Test. Keep the same stable sample and wiring, then click Start.

The first result for each interface becomes its baseline. Later differences, offline events, timeouts and round-trip latency are counted. The run mutes the buzzer and attempts to restore its prior state on completion.

The UI false-result count measures disagreement with the first result, not a validated false-decision rate; the baseline itself may be wrong. Stress Test is not automatic item acceptance. Do not change the sample or wiring during a run. After All Interfaces, reselect the production mode.

8 Troubleshooting and Care

Symptom	Checks
PC cannot connect	Use a data-capable cable at top PWR_IN. Check CH340 enumeration/driver, browser permission and other applications using the port.
Connected but no fresh result	Confirm the mode, trigger again and check sequence/time. An open port does not prove a completed scan.
Connection drops	Software attempts to reconnect authorized ports. Check USB and power; reconnect manually if needed. A manual Disconnect disables automatic reconnection.
Repeated or extensive shorts	Disconnect far-end power/devices. Check mode, fixture and exemptions, then compare with reference samples.
Not Testable	Electronic coupling or a real short may be present; review the item instead of releasing it as good.
External button fails or sticks	With power off, check normally open S–G, A–G and M–G contacts, G common and button return. Do not use PE or USB-C.

Symptom	Checks
Configuration not applied	Exemptions apply only to CUSTOM. Write, wait for confirmation and read back. Retest after a changeover.

Care and Station Records

Remove debris with power off and keep the board and acrylic dry. Stop using loose or damaged headers, sockets or buttons. Retain fixture ID, wiring map, exemptions, reference checks and exception records.

The raw log is a current-session diagnostic view retaining about 500 lines, not a production traceability database. Copy needed details into station records promptly.

9 Capabilities and Version Basis

Mode	Channels	Usage
TYPE-C	24	Fixed-orientation labels; verify correspondence when reversed.
TYPE-A	9	Nine-channel scan for the Type-A USB 3.0 receptacle.
LIGHTNING	8	Fixed labels; check mirrored mapping when reversed. Electronic coupling may be unclassifiable.
RJ45	8	Short screening; pair/speed notes are not network certification.
CUSTOM	24	Up to 24 conductors through an application-specific fixture, with custom exemptions.

Limits of This Version

This version screens shorts, not opens, wire order, resistance, insulation withstand or E-Marker data. Exemptions and Not Testable are firmware rules, not universal cable identification. Validate new fixtures and special cables before use.

Version and Sources

Manual version 1.0 • Product MF-SCT V1 • Prepared 23 October 2026

Source snapshot
29538245314770bb04c2e53c2c879084eca2b5c3

Source repository: https://github.com/zhugevitar/USB_Short_Test
Reviewed files: main.c, ui_menu.c, key.c, settings.c, board_config.h, settings.h and 上位机/index.html. The user supplied the actual screenshot and product photograph.

This manual is based on UI and control-code review; no live hardware bench validation was performed. Recheck UI, pin mapping, exemptions and procedures when the delivered software or firmware changes.