



Agilent 7890 GC Firmware

## **Release Notes – Revision B.02.07.0.128 and A.01.16**

# Notices

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## Firmware Revision

This guide is valid for the B.02.07.0.128 and A.01.16 of [Agilent 7890 GC firmware](#)

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# 1

## Introduction

The purpose of this document is to provide users of the Agilent 7890 Gas Chromatograph guidance to relevant support documentation that contains further levels of information and detail.

**Table 1** Terms and abbreviations used in this document

Terms	Description
SSB	Software Status Bulletin
CDS	Chromatographic Data System
U	Update
SP	Service Pack
HF	Hotfix
SR	Service Release
[xx]	Final Build Numbers of a released product
DSA	Data System Adapter

### For our Regulated Customers

When any change is made to Agilent software/firmware, the validation status of the software needs to be re-established by the user/customer.

Whenever software/firmware changes, a validation analysis should be conducted to validate an individual change and determine the extent and impact of that change on the entire system.

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## 2

# Agilent 7890 GC Firmware – What's new?

### What's new in 7890 B.02.07.0.128 Firmware?

- *Support for CFT calculator*
- *Quality improvements and bug fixes*

# 3

## Compatibility

### Supported Agilent Data Systems

- OpenLab CDS (2.8, 2.7, 2.6, 2.5, 2.4, 2.3)
- OpenLab CDS ChemStation Edition (C.01.10, C.01.09, C.01.08)
- GC/MS MassHunter Acquisition (10.2, 10.1, 10.0, B.07.06 SR1 or higher)
- OpenLab CDS EZChrom Edition (A.4.10, A.04.09, A.04.08 (update 6))

### Supported Agilent GC Driver

- Agilent GC Driver (3.5 or higher. Current 4.2)
- Agilent GC Driver (3.4 – Limited Support).

GC Driver 3.9.141 (or later) is required to support G6597A Hydrogen Sensor Module.

#### Important Information:

1. Please use Firmware Update Utility 3.1.30.0 or newer; it contains the correct 7890 B.02.07.0.128 version of FW.

### Non-Agilent Chromatography Data System (CDS)

- The 3rd-party CDS software vendor is responsible for compatibility testing with the respective CDS revision.
- The 3rd-party CDS software vendor defines the minimum firmware revision required for CDS compatibility.
- The 3rd-party CDS release notes issued by the respective CDS vendor may use different terminology for the firmware requirements, such as "tested firmware," "supported firmware," "firmware requirements," "minimum tested firmware," etc.



## 4

# Support Information

Agilent recommends using the latest firmware revision to avoid interoperability issues.

### **OQ/PV - Validation Information**

- If a firmware upgrade has been performed, no revalidation of the module/system is normally required. This is stated in the released Service Note applicable to the release.
- In addition, this information is stated further in this document.

### **Agilent on the web**

Visit [Agilent's website](#) for up-to-date information on Agilent Systems.

## 5 Resolved Issues

The current firmware for the 7890B/7890A+ is B.02.07.0.128.

Released Jun 2025

[https://www.agilent.com/cs/library/firmware/public/7890B\\_FW\\_2.7.0.128.bin](https://www.agilent.com/cs/library/firmware/public/7890B_FW_2.7.0.128.bin)

To download this version, use GC Firmware Update Utility 3.1.30.0 or newer.

*Updating to this firmware does not require instrument revalidation.*

Service Note Numbers: D0132912

**Table 2** Resolved Issues (7890B/7890A+ GC Firmware)

Issue ID	Current Behavior	Resolution
046326	78xx: Hydrogen Sensor Error at High Altitude	Resolved
046038	Add config item in keypad for 3rd party cryo use	Resolved
046362	Diagnostic information should now include module firmware version for Sensor module for G6598A	Resolved
045909	7890B can report an invalid solvent mode for the installed ALS to the driver	Resolved
045372	Report Oven Door Open Via WSDL	Resolved
046667	GC FW to ignore Salus reported Gas IDs other than 0 (no gas), 1 (hydrogen), and 2 (hydrogen mixture)	Resolved
046913	7890B Dashboard Add Vial Number and BCR Status	Resolved
046946	7890B/7697A with G3520 configured as Aux heater reports method resolution repeatedly	Resolved
046951	Function: Freeze Acquisition application on Data Sysem with G7890A+, G2913A and G2614A	Resolved
046975	7890B goes offline after the first run	Resolved
046979	Function: ALS errors setting does not work in case of missing vial	Resolved
046993	7890B shows Post wash before injecting the sample	Resolved
047009	Function: Unable to download a method to GC (MH Acq, 7890Aplus-7000C)	Resolved
047041	4.0.107 Driver does not handle Sampler Error 2324 as a recoverable error	Resolved



## 6

## Agilent 7890 GC Firmware - Previous Version Changes

### Previous Firmware Versions. (7890B only).

This section details previous versions of 7890B firmware giving release notes.

#### **B.02.06.1**

*Released 20th Nov 2023*

<https://download.chem.agilent.com/firmware/7890B.02.06.1.bin>

To download this version, use GC Firmware Update Utility 2.9.12.0 or newer.

*Updating to this firmware does not require instrument revalidation.*

**Service Note Number:** D0042300

**Table 3    Resolved Issues (7890B/7890A+ GC Firmware)**

Issue ID	Current Behavior	Resolution
044953	Hydrogen Sensor EMF and Service Due are enabled after installing FW B.02.06 on a 7890B GC without Hydrogen Sensor Module installed.	Resolved
045055	7890 Hydrogen Sensor reports calibration cylinder lot number as module serial number.	Resolved
045065	7890 Diagnostics screen updates for clarity: Changed "The ID number of the H2 sensor" to "Module ID of the H2 sensor". Changed "Serial #" to "Sensor serial #". Changed "The serial number of the H2 sensor" to "The serial number of the H2 sensor module".	Resolved
045077	'Service due' and 'Service Warning' under EMF are missing after power cycling GC with holding in the clear button.	Resolved
044799	78xx WSDL commands GetSyringeInfo() and GetLinerInfo() do not set Position in the response.	Resolved
045113	Oven going into Standby mode after a run has been started.	Resolved
045128	7890B EMF Error. EMF error is generated and cannot be closed when Early Maintenance Feedback Counters is selected.	Resolved
045141	FID H2 is not shut off after GC 'inlet pressure shutdown' occurred during a run.	Resolved
045180	EMF Error – Missing metadata after updating from B.02.05.3 to B.02.06.	Resolved
045201	Hydrogen Sensor Maintenance EMF Settings Revert to ON when GC reboots.	Resolved

Agilent 7890 GC Firmware - Previous Version Changes

B.02.06 7890B GC Firmware.

Released Jun 2023

Updating to this firmware does not require instrument revalidation.

MMON Version 5.31

Fpga version 1.1c

Changes/Fixes made since the last version. (B.02.05.03):

- Support for the G6597A Hydrogen Sensor Module - The optional Hydrogen Sensor Module Series 2 for 8890, 8860, and 7890B GC systems checks for free hydrogen in the GC column oven that may come from leaks in the flow path. When properly calibrated, the sensor monitors the free hydrogen level in the oven. It will trigger a shutdown of all hydrogen gas flows before the hydrogen level in the oven reaches 1% – well below the limit that may pose a risk.
- Quality improvements and bug fixes

Issue ID	Current Behavior	Resolution
043807	Impossible to save Romania as the country code for the G4513A Injector and the G4514A Tray	Resolved
043993	Disable Analog out for XCD	Resolved
038277	7890B shows "Jan 1, 2000" and "DHCP Bind IP Address" in the event log	Resolved

B.02.05.03 7890B GC Firmware.

Released Jan 2020

Updating to this firmware does not require instrument revalidation.

MMON Version 5.31

WSDL VERSION 480

Fpga version 1.1c

Changes/Fixes made since the last version. (B.02.05.02):

TT 036177: The VICI multiple port valve switcher is false triggered to position 1 in EFT testing.

The MPV is not switched to position 1 if the BCD input is undefined.

TT 036886: Add Romania into country lists in 7890B GC FW

TT 032288: Volatile inlet split mode not working.

During a split injection the VI goes through a sampling time after the injection. Instrument will change to a forward flow mode during the

## Agilent 7890 GC Firmware - Previous Version Changes

sampling time, even though it should it should stay in a split mode the entire time. Sampling time is only used during a splitless injection.

TT 035848: Incorrect Error Reporting for 8255 NCD when GC display setup is in Chinese.

The GC configuration is front detector / FID, back detector / NCD. The issue is when back NCD not ready but 7890B GC reported front NCD not ready.

### B.02.05.02 7890B GC Firmware.

*Released Sep 2018*

*Updating to this firmware does not require instrument revalidation.*

MMON Version 5.31

WSDL VERSION 480

Fpga version 1.1c

Changes/Fixes made since the last version. (B.02.05.01):

TT 31310 The XCD Burner H2 flows turn on even if the burner temps are off or below minimum values (Inactive).

GC should monitor the temperatures and prevent hydrogen flow until the base temperature reaches 150 °C and the burner temperature reaches 200 °C. Once the detector temperatures reach these minimum limits, the GC turns on the hydrogen flow." The problem was fixed in B.02.05.02.

### B.02.05.01. 7890B GC Firmware

*Released Apr 2018*

*Updating to this firmware does not require instrument revalidation.*

MMON Version 5.31

WSDL VERSION 480

Fpga version 1.1c

G3430 version A.02.18

Changes/Fixes made since the last version. (B.02.05):

TT29440 - Lower flap gain in range of 60 to 75 degrees.

The 7890B oven temperature oscillates when set between 60-80deg. The temperature oscillates +/- 5 deg either side of setpoint. The oven flaps are continuously opening and closing causing the deviation. The DC of the oven heater changes between 0 and 50%.

TT29893 - Fix GetStatus for CP detectors.

## Agilent 7890 GC Firmware - Previous Version Changes

PDHID actual temperature is fine on 7890B GC, but it was found PDHID actual temperature is 0deg on below data system.

These data system works on bundle PC Z240, Windows10.

OL CDS 2.2 / GC Driver B.01.02.055

MH acq B.07.05 SR1 / GC Driver A.03.02.021

OL CDS ChemStation C.01.08 / GC Driver B.01.03.092

TT29650 - Fix XCD oxidizer shutdown popup.

Have NCD-FID installed on front detector position. When there is an oxidizer shutdown, the popup says Back Detector Oxidizer Shutdown.

TT29178 - Fix extraneous third detector shutdown.

There was an oxidizer shutdown on a tandem NCD-FID system. The Oxidizer flow was restored and the NCD returned to the ready state. The shutdown is not cleared in Status. The FID-NCD does not have makeup controlled by the NCD. This shutdown is extraneous. It should not be even in the list. It was possible to do a blank run so the mkup shutdown not clearing does not keep the system from being used. However, the GC Status will be rather annoying. I did not try to reproduce.

TT28965 - Retune CS4 inlet.

It was discovered that the PID values used for the PTV inlet were incorrect.

TT29017 - Limit negative excursion of integral term.

When the CoC inlet is cooling down from a high temperature to a lower setpoint (i.e. 250°C to 75°C), it will pass through and overshoot the lower setpoint without turning the inlet heater on. It will then wait another ~2 minutes after overshooting the setpoint before turning on the heater to get to the setpoint.

TT29075 - 7890A/B can't store "Warning beep mode".

Customer wants to change "Warning beep mode". The default is "5". It will return to default 5 after 7890 power cycle even if "Warning beep mode" is set to 9.

Option > Key board & Display > Warning beep mode (default is 5).

Move WarningBeepMode to pfRam.

TT29671 - Fix wsdl date for MS7000D.

For single quad GCMS systems (7890B-5977B) with GC firmware B.02.05 and LVDS communication enabled acquisition will fail to initialize. The error message displayed is "An attempt to download settings to the GC was blocked because the driver was in the wrong state."

When LVDS is enabled with B.02.05 GC firmware the information displayed on the GC front panel will show that the MS is a 5975. When the GC firmware is downgraded the correct MS model information will be displayed.

TT28964 - Add Enable to GCxGC.

## Agilent 7890 GC Firmware - Previous Version Changes

A 7890B FW modification is required for the release of the new Macallan hardware. However, these changes should also support previously released GCxGC hardware.

Fix Update2dgc, set valve state properly.

### B.02.05 7890B GC Firmware

*Released March 2017*

*Updating to this firmware does not require instrument revalidation.*

MMON Version 5.31

WSDL VERSION 473

Fpga version 1.1c

G3430 version A.02.18

Changes/Fixes made since the last version. (B.02.04.3):

TT26100 - Invalid BCR heater range. Changed the info message and enter routine to support 35-80 deg C.

TT27713 - Add 7000D to MSD Type list

TT27559 - Add 7010B to MSD type selection.

TT27560 - fix reset of MSD type on reboot

TT27671 - Fix XCD H2 check with O2 as oxidizer.

TT27621 - Add configure XCD oxidizer to O2 instead of air

TT22718 - Add XCD Burner Pressure as a diagnostic signal.

TT26549 - Fix XCD detector fault messages.

TT27066 - Reversed Sandwich Injection added

### B.02.04.3 7890B GC Firmware

*Released August 2016.* Changes/Fixes made since the last version. (B.02.04.2)

TT25458 - Fix display of long bar codes causing GC to reboot.

TT25296 - FPD plus Emission block heater temperature can't change from OL ChemStaion.

TT24448 - Back inlet leak check broken.

TT23775 - New Chinese messages.

TT25405 - Change MSD ready to include acquiring data. In 7890B/5977B with MH Acq B.07.04, GC front panel Not Ready status turn on after injection due to "MS is not ready".

Fix in FPGA to eliminate front detector cyclical baseline oscillation.

### B.02.04.2 7890B GC Firmware

*Released March 2016*

Changes made since the last version. (B.02.04.1)

TT24271 - Key sequences cause GC to reboot. (Fixed)

TT22435 - Two Aux EPC modules cause Mass Hunter 7.04 to crash.

TT24279 - Fixed PTV EMF values.

## Agilent 7890 GC Firmware - Previous Version Changes

TT23993 - Resolved Problem with PCM/AUX configuration.  
TT23022 - Oven Temp Standby Info incorrect.  
TT24410 - Allow BackCryo and Chiller Bath to be configured.  
Fix in FPGA to eliminate front detector cyclical baseline oscillation.

### B.02.04.1 7890B GC Firmware

*Released December 2015*

Firmware Revision B.02.04 was not released to manufacturing.

TT23872 - If a numeric entry was inputted as a column configuration exit, the GC will reboot.

TT23776 - Front detector heating too slowly.

Full compatibility for the XCD Corona.

Full compatibility for the 5977B MS.

Fix QQQ\_BF pressure programming bug with the Collision Cell backflush ready EPC Module

TT 23721 Fix Vent Done message PopUp

TT23661 - QQQ\_BF only configurable with const or ramped flow.

TT23699 - Add High Energy Source to 5977B & 7010

TT19466 - Set inlet leak test pressure limits based on column and connection.

TT20498 - Fix COC Septum Purge Regulator AutoZero.

TT22938 - CP\_DET is allowed to have column + fuel = constant.

TT22287 - Improve cryo timeout info.

TT23533 Cannot configure instrument with FPD+ with older versions of Chemstation.

Added "Reboot Request" when MSD IP config change is accepted.

TT20914 Have 7697 headspace synchronize clock when connecting.

Add FPGA version to Instrument Status.

Allow access to GC setpoints during vent processing.

TT23086 - Fixed FPD+ Emission block On/Off.

TT22436 - Fix MMI & SS purge flow when column flow is negative

TT 020066 - H2 sensor configuration freezes the keyboard.

TT 19845 - Improper manufacturing date on H2 sensor.

TT 19939 - Reset LTM tag readiness to +12 to -3 degrees during run Idle.

TT 19692 - Fix updating column LTM tag info.

In addition to the above changes a modification has been made to the FPGA to help resolve an issue that we are seeing resulting in detector baseline noise and oscillation.

The download of the FPGA is done as part of the firmware download.

Status not ready if Fpga version < 1.1b ***This version of FPGA must be installed with B.02.04.1***

### B.02.03.2 7890B GC Firmware

## Agilent 7890 GC Firmware - Previous Version Changes

### **Fix diagnostic thermal duty cycle signals.**

Duty cycle signals from the PPIP heater now available.

### **Keyboard information for QQQ backflush fixed.**

The EPC Channel does not set Ignore Ready to TRUE.

Set Ignore Ready to TRUE for the Backflush EPC Channel. The channel still shows Not Ready -Fixed

### **Info for Collision cell gas type.**

Corrected info screen on collision cell gas type

### **Gas Type Configuration for QQQ backflush.**

Fixed problem with configuring carrier gas type.

### **Column Compensation in Analog Out.**

Fixed inability to run column comp in Analog out.

### **Added MS7010A to Mass Spec Type.**

## **B.02.03.1 7890B GC Firmware.**

Released June 2014

Added QQQ II Aux diag panel

Stop display of pressure program for QQQ modules.

Fix event log message for QQQ BF Shutdown.

Add QQQ II Aux pressure diagnostic signals.

Add QQQ II module for Backflush

Fix Detector Zone heating too slowly.

## **B.02.03 7890B GC Firmware**

Released March 2014

### **Improper manufacturing date on H2 sensor.**

The factory calibration date for H2 sensor can now be read from the GC.

### **Reset LTM transfer module (tag) readiness to +12 to -3 degrees during run Idle.**

The GC oven temperature affects the LTM II transfer line readiness delaying the start of the next run. Readiness band widened to +12 deg to -3 deg.

### **Fix updating column LTM tag info.**

LTM II modules not allowing hot swap - customer changes without powering off the GC,

damages components and wrong info written to the chip. Turn off LTM Module added in Service Mode.

### **Do not modify setpoints if in OvenTrack.**

The PCOC oven track temperature jumps to a high temperature during the early part of a run and then resets itself to the setpoint. Problem caused "sampler method" being loaded when ALS finishes post washes.

### **Do not reset LTM to initial values after method loading.**

LTM Temp Ramp drops mid run and then recovers. Problem caused "sampler method" being loaded when ALS finishes post washes.

## Agilent 7890 GC Firmware - Previous Version Changes

### **NPD H2 Off resets.**

The 7890 NPD H2 off value resets during run. Problem caused "sampler method" being loaded when ALS finishes post washes.

### **Reset signal display filter when delta is > 100000**

FID signal displays incorrectly.

### **QQQ Argon flow incorrectly reported.**

QQQ Collision Cell displays Ar Collision Gas Actual as higher than setpoint and GC Actual.

### **MMI Cryo Fast Cool Down**

In B.02.01 firmware, if a MMI is the front inlet and cryo fast cool down is being used, the GC would automatically reboot.

### **Stop Key Pressed reported late.**

Manually pressing STOP during a run on the 7890B is not executed immediately on the Open Lab Data Handling systems. The 7890A STOP is handled correctly.

### **Fix timeout on ALS.**

With the Data System connected but not in a sequence or run method resolution occurs saying that an injector is missing when the injector is still physically connected. There have been periodic loss of the injector in the configuration. This has occurred sporadically. It will also happen during runs.

This has happened over several revs of the 7890A firmware also.

### **Change default method to Oven ON @ 30C**

Default Method changed to 30 degC and ON.

### **Fix field width for MMI split ratio**

MMI Split Ratio field on the GC Display has too many characters

### **Fix MSshutdown for flow programmed columns**

Start MS Shutdown loads inlet as 'Sleep mode', pressure 0 when non-H2 gas; LTM configuration hides Aux EPC inlet setting.

## **B.02.02 7890B GC Firmware**

Released August 2013

### **Firmware Support for GC/MS Triple Quad 7000 Direct Communication**

It is possible to enable Direct Communication with the 7890B GC and GC/MS Triple Quad.

### **Strange Characters are Displayed in Chinese Mode**

In Chinese mode, strange characters were displayed intermittently after power on.

### **Updated TCD Error Messages**

When an error is created, the Not Ready light will blink and the Status key will say X Detector Fault, where X is the position of the TCD. The error will either say TCD Open Filament when it is open or TCD Bridge Voltage when there is a short.

### **Split Vent Test Default Total Flow Value are Changed**

The default value is dependent on gas type; it is 150 for Nitrogen and 400 for any other gas type.

### **INFO Key Text is Available for Gas ID Voltage**



## Agilent 7890 GC Firmware - Previous Version Changes

Gas ID Voltage can be used to identify if there is a mismatch in gas configuration and the actual gas coming into the instrument. When viewing the Gas ID Voltage, press the INFO key to determine what the voltage should be for different gas types.

### **7697A Headspace Information is Displayed on the GC**

7697A Headspace configuration and actuals can be viewed on the 7890B GC when Direct Communication is enabled.

### **Error When 7683 ALS is Installed on the Back Injection Port**

Sample Error 133 would appear when the 7683 ALS was installed on the back injection port. This is resolved in B.02.02 firmware.

### **Injector Ready Behavior**

When the Injector is off of the post, the GC status is ready (Status will read ALS not mounted). The ALS status is Fault. When the injector door is open, the GC status is not ready (Status will read Front/Back Inj Door Open). The ALS Status is Fault.

### **MMI Cryo Fast Cool Down**

In B.02.01 firmware, if a MMI is the front inlet and cryo fast cool down is being used, the GC would automatically reboot.

### **Cool on Column EPC Auto Zero Septum Purge**

In previous versions of firmware, the Cool on Column EPC Auto Zero Septum Purge was OFF by default. The default is now ON.

### **Bar Coding Events**

In previous versions of firmware, bar coding events were not passed to the software, which caused issues when a bar code reader was used with the 7890B GC connected to software versions prior to A.01.05 OpenLAB CDS and B.07.00 GCMS MassHunter.

### **Updates to INFO key text and Terminology for SLEEP and WAKE Scheduling Behavior of Selecting Vent then Pump-down on a System with Direct Communication Enabled**

In previous versions of firmware, if a user had Direct Communication enabled between their 7890B GC and 5977A MSD and decided to vent the system and changed their mind to pump down the system instead, the mass spec would go into pump down and became ready as expected but the GC continued to load the setpoints for the Vent Method. In B.02.02 firmware, pump down will exit the GC from the shutdown and/or fast vent.

### **Default 7890 Model when New 7890B Logic Board is Installed in 7890B GC**

In previous versions of firmware, when a new 7890B logic board was installed in a 7890B GC, the default view in status showed that the GC was a 7890A+. After entering the serial number and power cycling the GC, the view showed that it was a 7890B GC. The default view in status has been changed to a 7890B GC.

### **GC Will Not Exit SLEEP Status if GC Cannot Communicate with ALS Controller Board**

In previous versions of firmware, if the GC could not communicate with the ALS controller board and a SLEEP method was loaded, the GC would not exit SLEEP status.

## Agilent 7890 GC Firmware - Previous Version Changes

### **The MS Will Not Wake Up When the GC Goes Into Conditioning Run**

In previous versions of firmware, if a conditioning run was selected to run before the GC loads the WAKE method, the MS would stay in SLEEP status until after the conditioning run was complete. In B.02.02, the MS will WAKE up when the Conditioning Method is loaded on the GC.

### **GC will Turn Off Hydrogen Gas if in Shut Down State**

If the Air source is no longer sufficient, the detector Air Flow and Hydrogen Flow will be turned off.

### **B.02.01 7890B GC Firmware.**

*Released April 2013*

#### **Oven Standby Configuration Mode**

An oven standby configuration mode is now available in B.02.01 7890B GC firmware. This standby mode will allow for a high oven temperature when a user has not injected a sample for a period of time.

#### **GC x GC Valve Parameter**

GC x GC valve name has been changed from Sample Time to Inject Time.

#### **Removed Serial Number from Syringe Barcode Configuration**

Changed Serial Number to Lot Number for Syringes

#### **Added 5977A MSD Status to 7890B Status Parameters**

Added MS status and MS Transfer Line status to the 7890B Status

#### **Changed Sleep/Wake INST Schedule text to Schedule**

#### **LTM Maintenance Column Length Threshold Limits**

In B.02.00 Firmware the LTM column length range was invalid.

#### **Added Status Message for Bar Code Scanning**

Added "waiting for info from data system" status message after scanning Syringes or Liners from the GC. After the syringe or liner has been read, the installation date will be recorded as verification that the action was logged by the instrument.

#### **EMF for Bead On Time Changed to Hours**

#### **Cryo On/Off Determines the Use of Cryo for the Cyro Focus Zone**

#### **Scanning Column, Liner or Syringe and Entry to Maintenance Log**

When a column, liner or syringe is scanned by a bar code reader, this event will be logged in the maintenance log.

#### **7890B GC Error Message Handling with MS Goes into Shutdown**

When the MS goes into shutdown, the GC goes into a shutdown state. It is not possible to change set points until the MS Shutdown state is cleared from the DET key.

#### **Hyperion 1300g Scanner**

The Hyperion 1300g scanner stops decoding when left idle for 13 days. A clock table event has been added to the GC to power cycle the scanner so that it does not go idle.

#### **5977 MSD Parameters are Not Translated**

## Agilent 7890 GC Firmware - Previous Version Changes

In B.02.00 Firmware, some items were not translated in Chinese. In B.02.01 Firmware all translated text is available.

### **Volatiles Inlet and Cool on Column Maintenance Feedback**

In B.02.00 Firmware, the Volatiles Inlet and Cool on Column Inlet showed a maintenance counter for a liner which is invalid. The liner has been removed in B.02.01 Firmware.

### **Volatiles Inlet Bar Code Scanning**

In B.02.00 Firmware, the Volatiles Inlet allowed for a liner to be scanned with a bar code reader which is invalid. The liner scanning has been removed in B.02.01 Firmware.

### **Liners and Syringes Display Install Date**

In B.02.00 Firmware, when a liner or syringe was scanned with the bar code reader, the installation date was not recorded. It is recorded starting with B.02.01 Firmware.

### **"EMV at Last Tune" Maintenance Counter**

In B.02.00 Firmware, the "EMV at Last Tune" counter displayed a value with 3 digits to the right of the decimal. The software shows these values in whole numbers and the B.02.01 Firmware was updated to match the software.

### **Manufacturer information added for Syringes and Liners**

### **When a Headspace or CTC is Connected, Inlet Counters are Not Incremented**

In B.02.00 Firmware, the column, detector and instrument run counts would increment but the inlet counters would not increment. This is fixed in B.02.01 Firmware.

### **Corrected Chinese Translation for Column Configuration Parameters**

In B.02.00 Firmware, the Config Column Install Date and "waiting for info" text was not translated. It is translated in B.02.01 Firmware.

### **Added AUX #2 Temperature Info Range**

In B.02.00 Firmware, the Aux #2 Temperature range is 0 to 0 degrees C or OFF.

## Previous Firmware Versions. (7890A).

This section details previous versions of 7890A firmware giving release notes.

### **A.01.06 to A.01.07**

*(Released Jan 2008)*

Addition of GC Modulator parameters.

Enhancements:

Baseline Subtraction now available

Digital Signal Auto Zeroing available

Column Compensation available from Keyboard

Cryo Type for PTV and Oven now configurable.

Thermal Aux 3 temperature can now be entered

## Agilent 7890 GC Firmware - Previous Version Changes

Able to save method from Chemstation to GC

Valve Box supports Single 70W or 100W heater, or two 70 W heaters (heater nominal wattages  $\pm 20\%$ ).

The ECD Pulsar is turned On and Off with the Gas 3 On and Off.

Many info screens have been added in GC Keyboard Diagnostics If the GC has an FID and AIB installed, both detectors are reported as FID. Fixed

Computer connection information access needs improvement. This information has been added under Service Mode | Diagnostics | Communications. There is a line for number of connections and

two lines for owner, one for the title and one for the owner ID. This way the owner ID can be displayed up to 29 characters without needing to parse it into multiple lines.

Incorrect text under power diagnostics: Under Service Mode |

Diagnostics | Electronics | Power Info, the line for Back Detector actually says Front Detector.

Bugs Fixed:

Column Dimensions not rounded down. Column id of customized column now read correctly.

GC keyboard now displays when Septum Purge Flow actual does not match setpoint.

PCM pressure stays NOT READY when column outlet is configured to MSD

The Aux Channel of a PCM in back pressure mode with no column attached will maintain an absolute pressure, with the setpoint expressed in NTP Gauge.

Channel partner configuration causes heater thermal shutdown Error: "Front Inlet heating too slowly: temperature shut off" should read Front Inlet heating too slowly.

DataNotification returns fixed IP address rather than active IP address

### A.01.07 to A.01.08

*(Released April 2008)*

Remove temperature line when valve box is not configured.

Prevent clock table from running when chemstation is connected

Update Chinese messages

Fix several service test info keys.

Fix atmospheric pressure column compensation

Silent upgrade of instrument configuration from 1.06 & 1.07 to 1.08. (If firmware versions

A.01.06 or A.01.07 is upgraded to A.01.08, the GC configuration will remain unchanged).

Release ownership of counters for LMD.

Add switch for auto zero of signal files.

Add diagnostic signal AverageLinearVelocity to columns

Add COC inlet leak down test

## Agilent 7890 GC Firmware - Previous Version Changes

Fix Access Error caused by premature closing of socket.  
Fix sporadic loss of connection caused by lan reusing an open local port.  
Prevent lan from using local port 1434 possible conflict with firewall.  
Fix NPD detector analog out.  
MMON 4.05 Pick up lan patches  
Fix problem with PTV configuration display.  
MMON 4.04 fix flow control for PCM modules.  
Stop bad displays on NPD when error occurs.  
Fix inlet tests  
Add inlet tests to clock table  
Add second heater to valve box and detectors in WSDL  
Report Volatiles inlet plumbed/capped status in WSDL  
Cryo Focus option  
FPGA rev 2\_18  
Fix NPD bead voltage after chemstation re-configure BLOS Bead configuration switch.  
Add several diagnostic thermal zones to WSDL.  
Change PTV solvent vent mode to a gage pressure when configured to MSD.  
PTV is forced to ready during solvent vent when vent pressure is set to 0.  
Run never starts if AutoPrepRun engaged  
- disable AutoPrepRun when license is accepted.  
- change WSDL to report actual value of AutoPrepRun.  
Anomalous behavior for FPD PMT On/Off  
Fixed update detectors and set Pmt On/Off  
Disable oven track mode if not a COC inlet.  
Add cryo trap as Thermal Aux type  
Fix Zero Request to account for fewer than 2 zero times.  
Align P3 selector to chemstation use for PCM and AUX modules  
Add Cryo-Trap to aux thermal zones.  
Updated WSDL to latest chemstation version.  
Removed Cryo Focus from configuration  
Fix improper column heater configuration.  
Add CP\_Inlet to configuration to allow PCM or PP modules  
Labels do not persist correctly  
Cannot turn off small zone after epc shutdown.  
Clock Table does not auto adjust dual NPD  
NPD AutoAdjust calculation changed.  
NPD Config Max BeadVoltage added  
NPD Config AutoAdjust on turn-on added  
NPD Config Bead Drying added  
New state machine with new displays and info  
New state machine for FID/FPD and TCD  
Detectors do not turn on until temperature ready

## Agilent 7890 GC Firmware - Previous Version Changes

New status displays and updated info messages  
OF needs to support detector module test in MMON  
Small zone control added to MMON  
Conversations to control small zones added to MMON  
Configure detector module added  
Conversations to read detector data added to MMON  
Valve box display disappears when there is a heater fault  
Fix small zone temperature ramps after method download.  
Fix Chinese labels for inlets and detectors. Add labels for Aux Epc channels.  
2DGC delay time error message does not match the info  
2DGC the cycle time can be set to less than the sample time.  
The sample time must be less than the cycle time.  
PTV inlet temperature needs to hold setpoint through post-run.  
Unplugging an EPC board creates a beep but no messages.  
Pop-Up added for comm. Loss for Inlets, Aux, Pcm, and Detectors  
Disconnect and reconnect log entries created for comm. Loss.  
Communications lost is displayed for missing epc modules.  
A missing module is not ready.  
A missing module may be ignored.  
When epc is reconnected, everything resumes.

### A.01.08 to A.01.09 (Released September 2008)

Changes applicable to Customers and Support Providers are as follows.

Able to specify Cryo Type for User Aux Heaters  
Fixed analog out noise problem.  
Turn on PMT voltage when FPD flame is turned ON.  
Turn off FID air and H2 on ignition fail and gas shutdown  
Enable test signals for valve box heaters  
Add current limit to NPD SetBead voltage. If current exceeds 100pA during bead turn on, detector will turn off.  
Add ColComp setpoints to method.  
Add zone\_limit to AuxHeater config reporting  
Add several aux temp models for ICPMS  
Fix reporting of AuxDet Heater On/Off  
Remove Cryo Focus Valve configuration.  
Add Configure Collision Gas Control Module.  
Fix status display to not allow flow on COC.  
Add Column Compensation output in analog and digital modes (via config detector).  
Network settings (IP address, DHCP etc) can now be modified from the keyboard

## Agilent 7890 GC Firmware - Previous Version Changes

while in MMON mode.

ALS appeared to go off line after 3 weeks of continuous use. Power reset resolved issue. Now fixed.

(ALS firmware A.01.01)

Gaps in Bar Code Reader can now be read. (ALS firmware A.01.01)

### A.01.09 to A.01.09.1

*(Released October 2008)*

A list of defects fixed are as follows:

Fix cryo trap for JAS

Fix oven cryo shutdown.

Fix download during run for oven thermal, and pressure zones.

Fix download during a run for column flow programs.

PCM AuxC reports as PCM AuxB Not Ready (p\_aux.c)

Fix detector makeup mode for download.

Fix status message for bad serial #.

Fix entering zero value for analog out.

Fix analog out for detector OFF.

### A.01.09.1 to A.01.09.2

*(Released November 2008)*

The heating control coefficients (PIDs) have been modified in the firmware to better control and resolve these fluctuating temperatures.

The new firmware revision is A.01.09.2

If you have a customer with a PCOC inlet, regardless of whether they are experiencing temperature problems or not, it is advisable to update the firmware to A.01.09.2

### A.01.09.2 to A.01.10

*(Released March 2009)*

Enhancements:

Support for the 7693A ALS and associated modules.

Support for the 7000A Triple Quad GCMS.

Support for the MMI.

Fixes:

Fix PTV Cryo for SOLVENT VENT Time.

Fix method download during a run for non-programmed zones.

New PCOC PID  $\frac{1}{2}$ s and control.

Fix missing small zone fault messages and events.

## Agilent 7890 GC Firmware - Previous Version Changes

Fix download of column calibration.  
Clean up small zone readiness calculations.  
Fix small zone shorted sensor detection.  
Add delay to valve state upload during a run.  
Fix power up procedure to not energize the small zone contactor when there is a shorted driver.  
Fix detector thermal shutoff status messages.  
Fixed readiness for external devices  
Fix method file upload and download of inlet temperature ramps.

### A.01.10 to A.01.10.1 (Released May 2009)

Front/Back detector hardware fault Spurious error message.  
Error introduced in A.01.10. Evident at power on.  
NPD Analog signal always 0.0V.  
Error introduced in A.01.10. Digital Signal works OK.  
At times, GC keyboard, UI & LAN response is sluggish/stalled  
PTV cryogenic cooling operating as per A.01.07. Cryo did not control inlet during run.  
Fixes for External ready for 7820A.  
Fix method file upload and download of inlet temperature ramps.  
Fix power up procedure to not energize the small zone contactor when there is a shorted driver.  
Fix detector thermal shutoff status messages.  
Fix download of column calibration.  
Clean up small zone readiness calculation.  
Fix small zone shorted sensor detection.  
Add delay to valve state upload during a run.  
Fix PTV Cryo for SOLVENT VENT Time.  
Fix method download during a run for non-programmed zones.  
New PCOC PIDs and control.  
MMI Temperature minimum for MMI multimode inlet set to -180 degC  
LVI with a 500ul syringe set incorrect draw speed.  
Fix Solvent Vent pressure calculation, use gage pressure. Give MMI inlets 10 ramps.  
7693 ALS  
7890 System Calibration should fail if G4514A internal calibration not completed  
Tray LED does not flash when G4514A does not find a bottle during return all.  
GC display updates BCR firmware revision correctly after a firmware update.  
Tray chiller info and text modified  $i\frac{1}{2}$  chiller temperature upper limit is now 60C.  
Give MMI inlets 10 ramps  
Fix error in FPD single heater configuration.



## Agilent 7890 GC Firmware - Previous Version Changes

Tray Chiller configuration items added under Tray Config  
Tray Chiller temperature added to GC readiness  
Sampler devices reset after a firmware update/SN change causes 7890 to reconfigure QQQ  
Fix collision cell fault messages.  
Add QQQ to system readiness,  
Add QQQ shutdown test.  
Add QQQ diagnostic panels.  
Add Argon control mode to QQQ based on ECD Nitrogen and Argon frit calibrations.  
Add QQQ Collision cell gas controller  
Fix cannot pick collision cell from aux epc list

### **A.01.10.1 to A.01.10.2** *(Released October 2009)*

Fixes:  
7890 GC keypad now allows entry of serial numbers for injectors and tray.  
In certain circumstances the oven will not shut down if it cannot reach temperature for reasons such as an oven flap failure – This has now been fixed.  
Lab advisor can now connect to the GC whilst it is in MMON mode resolving firmware download connection problems.  
7890 GC can now store barcode labels that contain more than 34 characters  
Injector light is inconsistent with 7890 Tower LED

### **A.01.10.2 to A.01.10.3** *(Released March 2010)*

Fixes:  
The parameters for the draw Speed, dispense speed are displayed with Use Method Value.  
However, they are using the Values of the default Default Method and not of the Method loaded.  
This causes the Enhanced Syringe Carriage to stall unless manual values are entered.  
Lab Advisor needs to query 7890 to retrieve injectors and tray logs.  
S/SL inlet and configured for Hydrogen. create a leak and after a few minutes you get a beep, then a different two-tone and an error message "Front inlet flow shutdown".  
You DO NOT get "Hydrogen Safety Shutdown" as described in the service manual.  
By pressing "Status" then scrolling down you can see a message "Hydrogen shutdown", not "Hydrogen Safety Shutdown".

## Agilent 7890 GC Firmware - Previous Version Changes

Event Log shows "Front inlet flow shutdown" but should show "Hydrogen Safety Shutdown".

Recovery after power cycling does not match the 7890 service manual.

The PTV temperature control lags that of the 6890 PTV control.

There is a preceptable difference in the time to reach final temp during the last part of the heat up. It appears to take about .5 min longer to reach final temp than the 6890. This is in the control algorithm.

The expected temperature is the temperature the user would expect to be reached.

For the PTV with the following temp program:

The 7890 has six heated zones. Some of the zones although configured may not be used during the run and are turned off.

Intermittently the zones that are turned off exhibit the error message "Thermal zone heating too slowly" on the GC display.

### A.01.10.03 to A.01.11

*(Released July 2010)*

Enhancements

Compatible with new MMI Thermocouple Board.

Ability to Ignore Ignition to allow for manual ignition without ignitor.

Column configurations and Max Temp added for LTM

Zone cannot be turned by method load if it has been shut down pneumatically (requires interaction at keyboard)

TCD filament and gasses turn off during hydrogen shutdown or any inlet pneumatic shutdown.

FID Flame and gasses turn off during hydrogen shutdown or any inlet pneumatic shutdown.

NPD Bead and gasses turn off during hydrogen shutdown or any inlet pneumatic shutdown.

Post Run temperature and total flows can have changed for the MMI.

If the GC is connected to Chemstation which goes down the GC can be forced not ready via Host Not Ready configuration.

Configured using <CONFIGURE><INSTRUMENT><Require host connection>.

Mass Spec Transfer line configuration now kept in flash memory.

MMI Thermocouple type kept in flash memory.

Bug Fixes

Uploading Method sometimes multiplies the event value by 1000.

uECD unit modified for Chemstation.

GC loses ALS configuration after power fail.

FID fuel gasses turned off if makeup gas is shut down.

### A.01.11 to A.1.11.1

*(Released Feb 2011)*

## Agilent 7890 GC Firmware - Previous Version Changes

Bug Fixes.

Blank run causes soap parse error

Parsing of SubscribeToData request requires a specific ordering of attributes

Allow ICPMS interface to be correctly configured.

### A.01.11.1 to A.01.12

*(Released March 2011)*

Enhancements and defects fixed.

If ignitor is defective and the user tries to ignite flame, the H2 gas would remain on.

Changed state to off.

G4514A Tray Parked Status is now reported with status request within Chemstation.

Film Thickness entry fixed for Non-ID LTM columns

Manufacturing Date gets lost.

Thermal Aux Cryo shutdown used with the Cryo Focus Module and cryo traps.

LTM II basic support

Update UDP poll response to A.01.02

Add owner name and address to UDP poll response.

Add port 9101 owner address to UDP poll response

MMON 4.25 Update UDP poll response to A.01.02

Add port 9101 owner to MMON UDP poll response

SetUserConfiguration for Ion Trap

Change Ion Trap transfer line messages to Ion Trap GCHI.

LTMII changes to populate LTM status in WSDL

Add ICP transfer line and argon preheater types to WSDL aux type for driver ve4rsion later than 2010-10-1.

TCD run table editing from front panel (polarity change).

Signal zeroing is fixed as well as any other data time events (freeze and signal switch).

Add Ion Trap transfer line to 7890 configurations.

LTM enhancements and bug fixes

New ALS controller A.02.09 to support the Shot and Chaser and BCR offset

Configure multiple LTM columns

Diagnostics detect multiple columns and both boards

The LTM board can be connected now to any of the 3 channels

Allow 0 length columns

Block loading method if in shutdown

Ignore setting Unknown heater type

### A.01.12 to A.01.12.1

*(Released May 2011)*

## Agilent 7890 GC Firmware - Previous Version Changes

### Enhancements:

XLSI compatible. (Added XLSI to Aux Heater configuration menu)

### Defects:

LTM status when no LTM's present reported incorrectly

Thermal Shutdown caused by open sensor does not show up GC Status.

Set LTM II max rate to 1800 and fix error message

Column ID Film Thickness is in nM, 7890 uses uM\*100/Divide by 10.

Change scale of LTM column equilb time to minutes \* 1000

Change Max LTM Column equilb time to 9.999 minutes

Maximum ramp rate for LTMII column

Thermal Shutdown" is reported as a FAULT

Allow diagnostic temperature signal for detectors with no epc module.

Stop reporting old run log events.

LTM column configuration values

Fix column max temp override OFF.

Remove Film Calib from ID<sub>2</sub>d columns

Column ID chip status installed.

Time over column Max Temperature (seconds 0 .. 100Days).

Time over column MaxProgram Temperature (seconds 0 .. 100days).

Maximum temperature applied to column (degrees 100 .. 600).

Time column is installed (seconds 0 .. 1941 days)

Number of runs for this column (0 .. 196600)

Length change from manufactured length (-32000mm .. 32000mm)

Diameter change from manufactured diam (-10.0 .. 10.0uM)

Film change from manufactured film (-1.0 .. 1.0uM)

Create Colum temperature override value (Column PgmMax .. 450)

Zeigler-Nichols control terms for ION-TRAP transfer line.

Shutdowns involving LTM II

LTMII Diagnostics

LTMII override Column Absolute max temp

LTMII column configuration

Excess LTM information

Shutdown events for PCM flow shutdown

5in LTM II column with tag is not configured correctly

LTM II columns 2,3,4 display Rate as \*\*\*

### A.01.12.1 to A.01.13

*(Released October 2011)*

Nonexistent column max temp is being enforced.

Incorrect column segment diameter and film thickness info.

Column segment configure info is changed to reflect actual limits.

Small zones turning off after 3-4 weeks.

## Agilent 7890 GC Firmware - Previous Version Changes

Comm Error Events are not properly reported in the GC Status.  
Barcode Vial command error handling.  
Method that exceeds column max can be loaded.  
LTM fan fault is not displayed in GC Status  
Column Max Temp set to 0.  
Column calibration from flow and pressure is blocked on the 7890 for multi segment columns. Single columns work as before.  
If 7890 gets into an error state (like flame off) this is NOT reported with the 7890 status window.  
Fix clear detector events for FID & FPD states.  
Fix LTM temperature and setpoint signals for Chemstation.  
XLSI type is added.  
7890 Keyboard lock works independently of Chemstation keyboard lock.  
Keyboard setting temperature fails to turn LTM zone ON.  
Two LTM modules can be configured to the same address.  
LTM II - Keyboard entry of temperature ignored if zone is off and set to same value.  
If a column is configured for an LTM II heater and the module is missing there is no indication of the problem.  
If an LTM II module is broken there is no status message.  
PCM Pressure Setpoint missing in Status, using Channel 1 of the PCM - the pressure setpoint shows up in the main PCM menu, but not in the GC Status.  
Inlet type OTHER is implemented. - Allows ALS to be mounted onto a non Agilent Inlet.  
LTM column equilb time is not handled correctly.  
LTM not ready during a run is not in run log.  
LTM tag zones go not ready during a run.  
Unable to set column equilb time.  
Add LTM configuration faults to column display.  
Add Module fault tests and status displays.  
Add LTM Module Status display.  
Add LTM Column Temp to status display.  
Update max column temperature when override is turned off.  
Retune LTM PIDs for transfer heaters and add variable bounds testing for readiness.  
Change LTM equilb time to use setpoint for test.

### A.01.13 to A.01.14 (Released April 2012)

Driver displays inlet flow setpoint instead of actual.  
Open sensor not reported for thermal aux3  
LTM fault event logs do not have column #.  
PTV Solvent Vent Time and Purge Time are not checked & info is incorrect.

## Agilent 7890 GC Firmware - Previous Version Changes

Septum purge mode switching added to MMI.  
Oven not shut off when PP inlet shuts down.  
COC Septum purge error and info messages changed.  
VI total flow calculations wrong when column length = 0.  
Thermal shutdown if oven > 260 and turned on.  
Add gas flows for CP DET with epc.  
Add missing RIS message in Configure Aux.  
Thermal Aux cryo not properly reported in wsdl.  
ECD Makeup info range is wrong.  
Reset of MPV blocked if configuration does not change.  
PTV table shows Rate 4.  
PTV Config  
Heating too slowly test blocked when zone is inhibited by power management.  
COC overtack info updated.  
VI Purge time info now shows Entry > sample time.  
Add support for G4567  
FPD Flameout at 120C.  
Third detector shutdown by epc comm error.  
Allow lowed column outlet pressure setting. Changed from -3 to -12psi.  
Make the selection of the type of MSD transfer line a user option. RIS is added as a configurable type.  
Instrument actuals is not showing MPV position.  
Multi-Position Valve Support - current position is added to the wsdl  
ECD is turned OFF with makeup gas OFF. Feature removed.  
Add config command (config SN = US0000000) to application.

In addition, the firmware package contains a modification to the Boot Loader order. This was released to overcome the possibility of heated zone runaways. The Boot Loader can only be changed with Instrument Utilities A.01.07 in CE Mode.

### **A.01.14 to A.01.15 (Released March 2013)**

- Inlet heating too slowly when using user defined PID value
- Inlets and PCM's are ready during flow auto zero

Keyboard lock does not lock state of Sample Tray Vial Heater and Vial Mixer  
Add Detector Fuel On/Off to run time events  
7890A remains Not Ready when an injector is swapped while in a fault condition  
Edit film thickness on column segments  
Fix valve box max temp configuration  
Cryo trap can start a run in the wrong state  
Update 7890A FW to lower default wash and pump cycle speeds towards reduced plunger bending

## Agilent 7890 GC Firmware - Previous Version Changes

UPS power capacity protection feature  
7890A not indicating Not Ready for ALS fault  
Move Method load and store under keyboard lock  
Fix total inlet flow for backflush  
Add constant fuel flow to detectors  
All counts in reminder increase with each run changed to detect front/back injector for syringe liner and septum counters (columns still increment always)  
Automatic septum purge zero does not work for COC inlet.  
Don't calculate flow for columns with undefined inlet.  
Change RIS heater from 60W to 70W  
Status will report not present when the chiller is not present.  
All Disp speeds draw speeds and injection volumes were not properly compensated for syringe volume.  
Column outlet pressure range changed to -12 to 15psi.  
Volatiles Inlet added to type of inlet supporting negative column flow.

### A.01.15 to A.01.15.2

*(Released October 2013)*

In certain circumstances and configurations, the GC would report that the ALS was missing. This was caused by a timeout issue in the G3430.elf.S19 file.  
When the Injector was installed on the parking post the ALS would register as Not Ready making it not possible to inject in Manual Mode without an error.  
Default COC to be set to auto septum purge ON.  
Turn OFF H2 to flame detector when air slowly shuts down.

# 7 Changelog

## Revision History

Table 19 Revision History

Revision	Release Date	What's New/What Changed
Rev 1.00	3 <sup>rd</sup> Feb 2015	Initial release
Rev 1.01	1 <sup>st</sup> Sep 2015	Added Waters info
Rev 1.02	6 <sup>th</sup> Nov 2015	Updated to B.02.04.1
Rev 1.03	2 <sup>nd</sup> March 2016	Updated to B.02.04.2
Rev 1.04	19 <sup>th</sup> August 2016	Updated to B.02.04.3
Rev 1.05	28 <sup>th</sup> March 2017	Updated to B.02.05
Rev 1.06	22 <sup>nd</sup> March 2018	Added 7890A info
Rev 1.07	14 <sup>th</sup> May 2018	Updated to B.02.05.1
Rev 1.08	10 <sup>th</sup> Oct 2018	Updated to B.02.05.2
Rev 1.09	28 <sup>th</sup> Feb 2020	Updated to B.02.05.3
Rev 1.10	9 <sup>th</sup> Jun 2023	Updated to B.02.06; use new document template
Rev 1.11	20 <sup>th</sup> Nov 2023	Updated to B.02.06.1
Rev 1.12	18 <sup>th</sup> Jun 2025	Updated to B.02.07.0.128

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