TMS2020

Installation and Configuration Manual

CERULEAN
a coesia company

S/C 13948

Change History

Issue	Change
1.0	First release
2.0	Added to DIP switch settings table

Manual Scope

Installation Manuals are provided to give information on how to configure the instrument including installation and set-up.

Further Assistance

Cerulean can provide training courses on more in-depth technical knowledge, fault finding, diagnostics, and maintenance and on the instrument. For these options, please contact your regional Cerulean Sales or Service Manager.

Cerulean also offer a comprehensive installation, spares, repairs, breakdown service, annual maintenance and contract service. For these options, please contact your regional Cerulean Sales or Service Manager.

For further technical support of the instrument contact technical.support@cerulean.com, or your regional Cerulean office.

CONTENTS

1 — SAFETY

1.1 Safety Information

While every effort is made to ensure that this product can be operated safely, it is important that reasonable precautions must be taken. In particular, only qualified persons should operate this equipment.

Warnings – avoid injury to personnel

The warning sign indicates a potential hazard location. These signs are fixed on unprotected covers that can be opened while the machine is in operation, where access is required for setting and maintenance purposes. Under no circumstances must the machine be run with covers removed or guard switches disabled in order to operate the machine in an unsafe condition.

In all circumstances operators and technicians should take extreme caution when working in designated locations. Failure to do so may result in personal injury.

Cautions — avoid damage to equipment

Any persons maintaining this equipment must wear an anti-static earth strap that is connected to a suitable earth point. The equipment contains static sensitive components that can be damaged in the event of static electricity being discharged through them.

Caution: Do not fit the TMS2000 configuration PCB (Daughter board) onto the TMS2020. The TMS2000 configuration PCB board does not contain a protective circuit.

1.2 European Community (EC) Directive Statement

When this equipment is installed in accordance with the instructions, it will conform to the protection requirements of the appropriate European regulations. At the time of manufacture the equipment complied with all the appropriate regulations. Cerulean is not responsible for any interference caused by other cables and connectors that are not specified, or by any changes or modifications to the equipment. This is not a declaration of conformity. A copy of the declaration of conformity is available from Cerulean on request.

When this product has reached the end of its life it must be disposed of in accordance with local regulations. Please contact your local agent for further information.

When performing the modifications described in this document, Safe Working Practices must always be followed, as described in the following paragraph.

1.3 Prevention of electrostatic discharge

Some of the components in the TMS2020 are sensitive to ESD (Electro Static Discharge) which can damage the TMS2020. It is essential to handle the TMS2020 carefully, in particular:

- Switch off the voltage supply to the instrument before any service or repair work.
- Wear a grounding wrist strap connected to a known good earth point.
- Remove ICs with the correct tool. NEVER use a screwdriver.

2 — INSTALLATION

The TMS2020 is supplied with links fitted. If different configuration is required, the instructions supplied in this document should be used. In some cases soldering of components will be required. This work should be performed by a competent electronics technician, preferably Cerulean trained. The TMS2020 comes as part of a kit (Cerulean Stock Code 94000) which contains the hardware and leads necessary for most upgrades from the TMS2000 boards. Some hardware items in the instrument being upgraded will be discarded and some will be re-used.

Before starting, in all cases, remove the power and air supplies to the instrument.

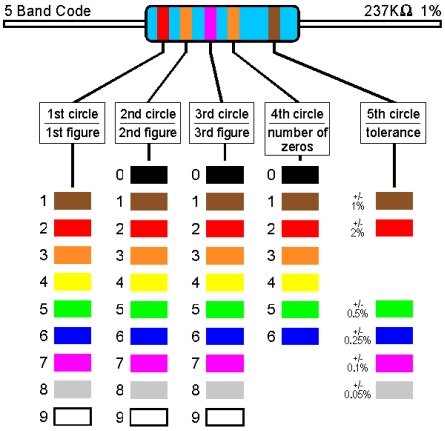
2.1 Tools required

When installing the TMS2020, the following tools will be required:

- 3 mm Hexagonal key to remove and replace the screws that secure the panels.
- Wrist strap to prevent electrostatic discharge that may damage the TMS2020.
- Soldering iron and solder for the resistors that will be required for some installations.
- Digital voltmeter to check voltages on the TMS2020.
- 5 mm spanner to remove the retaining nuts on the existing boards.
- IC removal tool to remove the ICs safely from the existing boards.

2.2 Identifying the resistors

The kit contains several resistors. Use the following figure to identify the correct values:

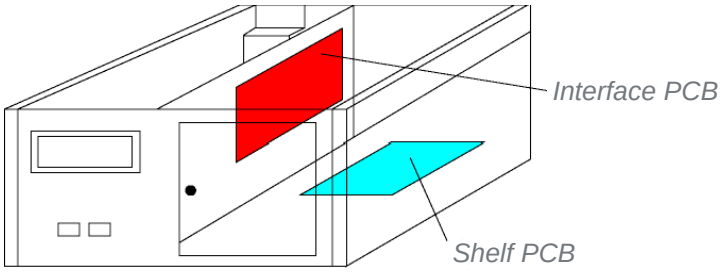


Note: The colour of the fifth band from the left (tolerance band) is not important, as close tolerance resistors are not required in this situation.

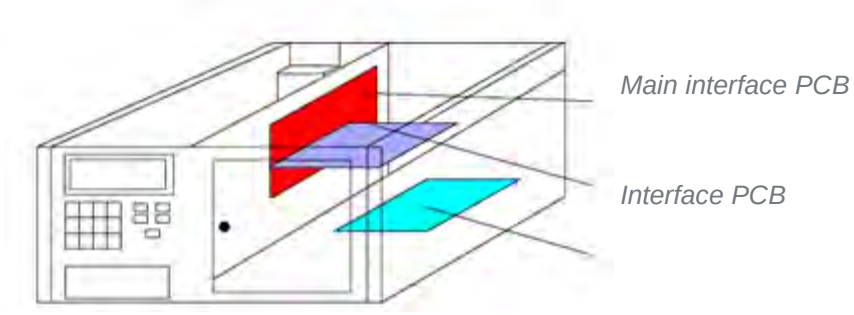
Note: The coloured bands on the resistors shown on the configuration boards in this document are NOT necessarily correct; the resistors shown are for position purposes only. The correct resistor values are listed in the appropriate table.

3 — PCB LOCATION

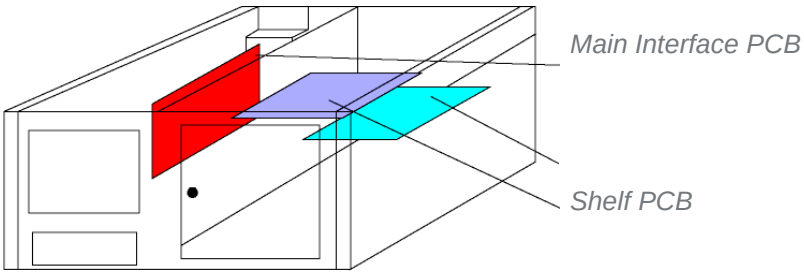
The following diagrams show the locations of the TMS boards that are fitted in the QTM modules.



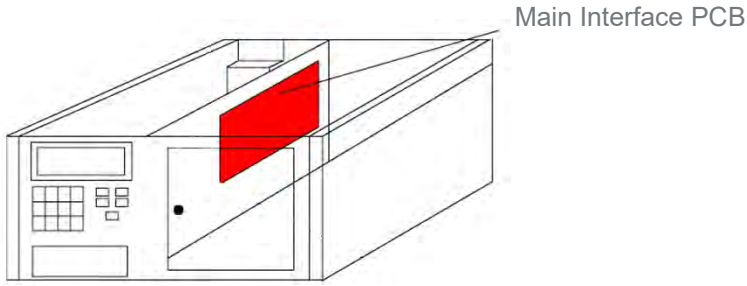
QTM 3, 4, 5, 5u, 6, 7, 8 and 9 measurement modules



QTM 0 Top Box



QTM 9PX



QTM 1 / 2 Top Box

For new configurations and recent upgrades, use the tables below to identify the Byte Switch positions.
If older software versions are to be retained, do not change these switch settings, leave them as found.

Application	Byte Switch Positions							
	SW1	SW2	SW3	SW4*	SW5	SW6	SW7	SW8
QTM 0	1	0	0	1	0	0	1	0
QTM 1	1	0	0	1	0	0	0	0
QTM 2	1	0	0	1	0	1	1	0
QTM A	1	0	0	1	0	0	1	1
QTM S	1	0	0	1	0	0	0	1

*For a four maker QTM, set SW4 to 0

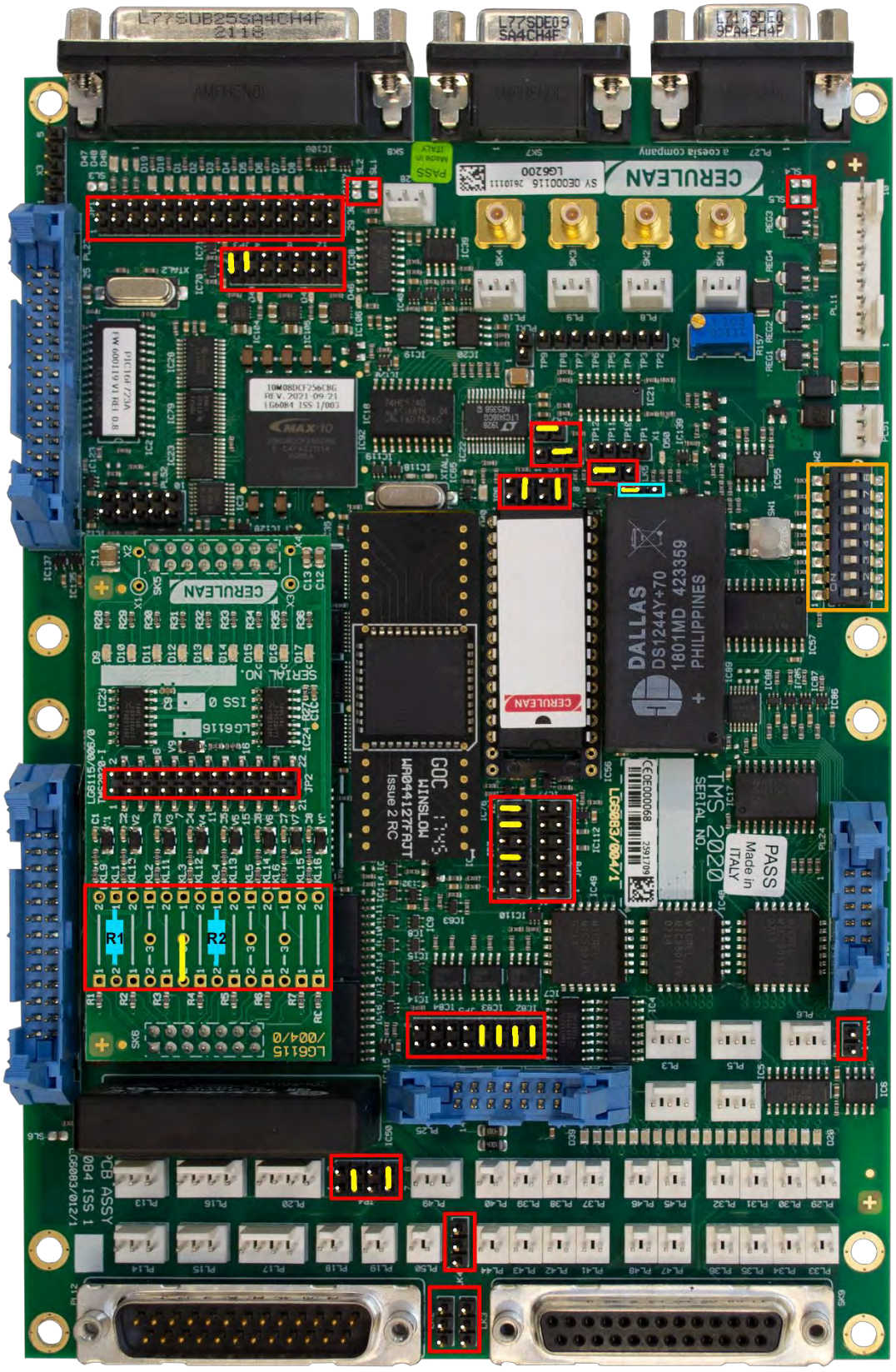
Note for Slims QTMs:
If the PCBs that are being replaced contain special software e.g. slims versions of QTMs, please refer to the specific manual or contact Technical Support.

Note for PST:
See user manual for switch settings.

Application	Byte Switch Positions							
	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
SMS100	0	0	0	0	0	0	0	0
SMS200	1	0	0	0	0	0	0	0
SLG400	0	0	0	0	0	0	0	0
SLG400C	1	0	0	0	0	0	0	0
QLG400	1	0	0	0	0	0	0	0
QLG400C	1	0	0	0	0	0	0	0
SNL200	0	0	0	0	0	0	0	0
QNL200	0	0	0	0	0	0	0	0
SNL220	1	1	0	0	0	0	0	0
QNL220	1	1	0	0	0	0	0	0
QHM104 Slims only	1	0	0	0	0	0	0	0
SHM104 Slims only	1	0	0	0	0	0	0	0

4 — TMS BOARD REPLACEMENT

4.1 PST Upgrade from TMS2000 to TMS2020



PST Upgrade from TMS2000 to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor (See Addendum)	Replacement for IC51	13330	1
DS1244Y+70	Replacement for IC52	13317	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5(highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and a link to the new Configuration PCB.

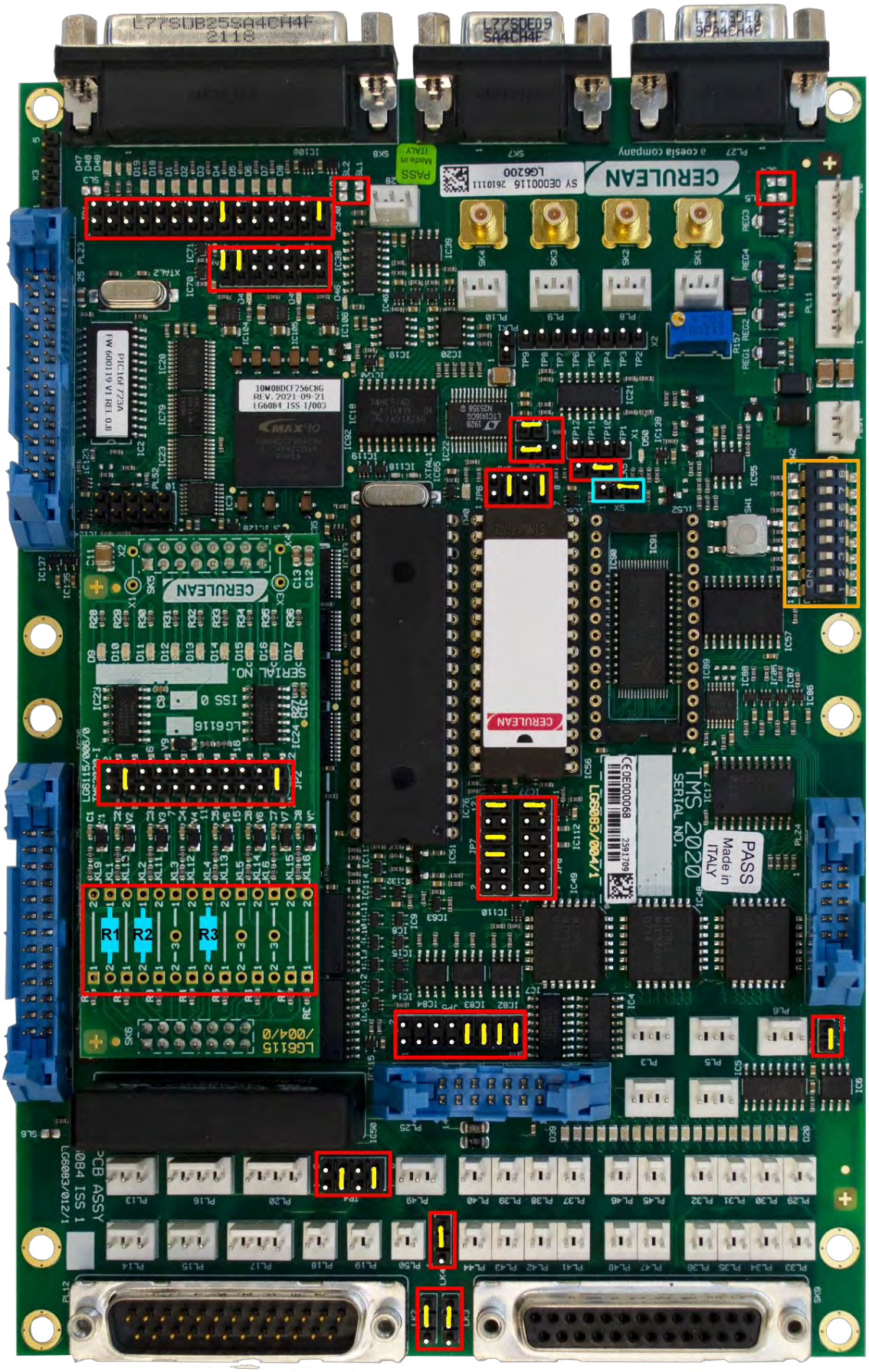
Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL3	2 – 3	-	Wire link
LKL4	1 – 2	R2	47 Ω resistor

3. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB, see the PST manual for settings.
4. Remove the TMS2000 from the instrument then remove and retain the EPROM IC4.
5. Fit the retained EPROM into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2000.
6. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
7. Fit the new 80C32 processor into position IC51.
8. Fit the new DS1244Y+70 into position IC52.
9. Fit the TMS2020 into the instrument in the same position as the original TMS2000 with the two 25 pin D connectors towards the front.
10. Connect the connectors shown in the following table.

TMS2020	Connector type	Description
PL4	3 pin Molex	Auxiliary serial port 3
PL11	10 pin Molex	Power input
PL24	10 pin header	Keyboard
PL23	26 pin header	Expansion port
PL25	14 pin header	Digital i/o
SK1	SMB co-ax	Analogue i/o 0
SK2	SMB co-ax	Analogue i/o 1
SK8	25 pin D socket	Main serial port
PL12	25 pin D plug	Multiple digital input
SK9	25 pin D socket	Multiple digital output

11. Reconnect the power supply but do not connect the air supply.
12. Connect a DVM to the test points TP1 (–) and TP10 (+). Switch on and adjust R31 for a reading of +2.5 V ± 5 mV.
13. Switch off the instrument, refit all the covers, then connect the air supply.
14. Switch on and allow 30 minutes for the instrument to warm up.
15. Reconfigure and test.

4.2 QTM 0/1/2 Main Interface upgrade from TMS2000 to TMS2020



QTM 0/1/2 Main Interface upgrade from TMS2000 to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C320 processor	Replacement for IC51	13349	1
DS1244Y+70	Replacement for IC52	13317	1
EPROM with v6 firmware	***Not supplied with the kit***	-	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the Configuration PCB.

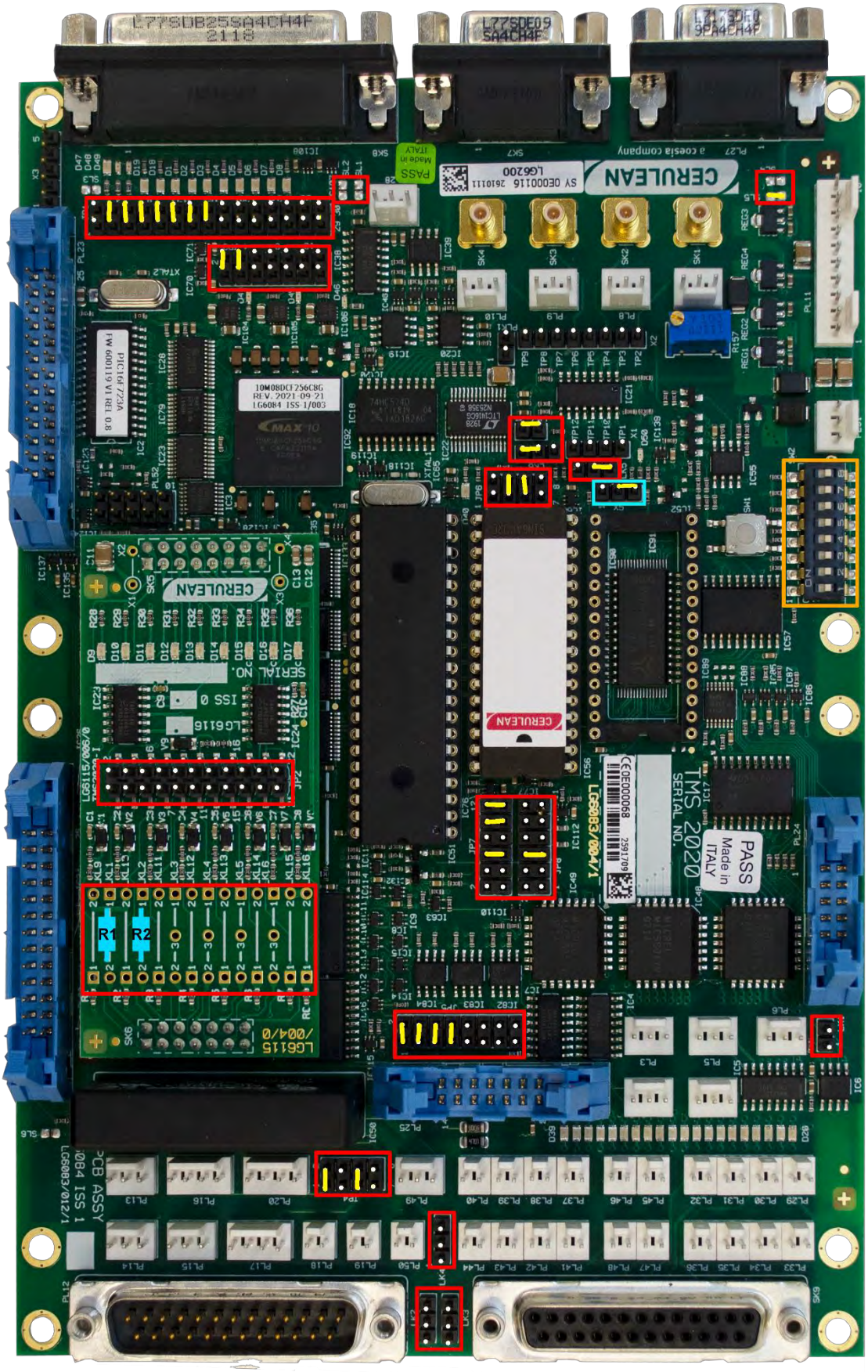
Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL2	1 – 2	R2	330 Ω resistor
LKL4	1 – 2	R3	100 Ω resistor
JP2	3 – 4	-	Jumper
JP2	21 – 22	-	Jumper

3. Fit the new Configuration PCB (daughterboard) to the TMS2020.
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB, see the table on page 9.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
6. Fit the new 80C320 processor into position IC51.
7. Fit the new DS1244Y+70 into position IC52.
8. Remove the TMS2000 from the instrument.
9. Fit the TMS2020 in the same position as the TMS2000 with the two 25 pin D connectors towards the front.
10. Connect the connectors shown in the following table.

TMS2020	Connector type	Description
PL12	25 pin D plug	Multiple digital input
SK9	25 pin D socket	Multiple digital output
PL25	14 pin header	Digital I/O
PL2	3 pin Molex	Auxiliary serial port 1
PL3	3 pin Molex	Auxiliary serial port 2
PL4	3 pin Molex	Auxiliary serial port 3
PL5	3 pin Molex	Auxiliary serial port 4
PL6	3 pin Molex	Auxiliary RS485
PL24	10 pin header	Keyboard
PL11	10 pin Molex	Power input
SK8	25 pin D socket	Main serial port

11. Refit all the covers, then connect the power and air supply.
12. Reconfigure and test.

4.3 QTM 3/4/5/5U/6/7/8 and Hopper Interface upgrade from TMS2000 to TMS2020



QTM 3/4/5/5U/6/7/8 and Hopper Interface upgrade from TMS2000 to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C320 processor (See Addendum)	Replacement for IC51	13349	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the new Configuration PCB.

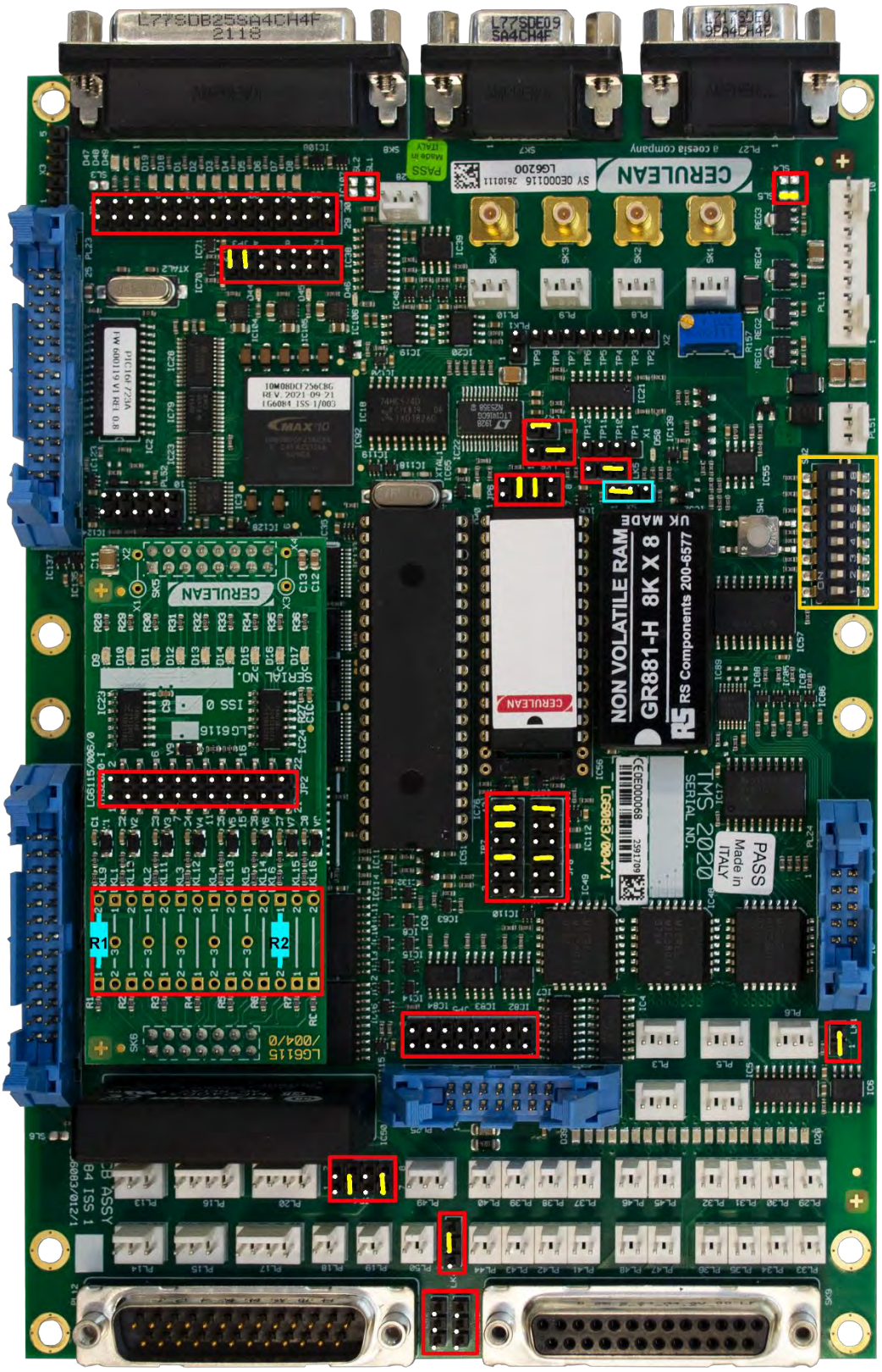
Link	Position	Resistor	Comment
LKL1	1 – 2	R1	100 Ω resistor
LKL2	1 – 2	R2	330 Ω resistor

3. Fit the new Configuration PCB (daughterboard) to the TMS2020.
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB, see the table on page 9.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
6. Fit the new 80C320 processor into position IC51.
7. Do not fit an IC in position IC52.
8. Remove the TMS2000 from the instrument.
9. Fit the TMS2020 in the same position as the original TMS2000 with the two 25 pin D connectors towards the front.
10. Connect the connectors shown in the following table.

TMS2000	Connector	Description
PL3	3 pin Molex	Auxiliary serial port 2
PL13	3 pin Molex	Single input LSB
PL11	10 pin Molex	Power input
PL2	3 pin Molex	Auxiliary serial port 1 (***NOT*** *for 0 hopper*)
PL25	14 pin header	Digital i/o (***NOT*** *for 0 hopper*)
SK7	9 pin D socket	Daisy chain serial port 1 (*For 0 hopper* ***ONLY***)
PL27	9 pin D plug	Daisy chain serial port 2 (*For 0 hopper* ***ONLY***)

11. Connect the power and air supplies.
12. Switch on and allow 30 minutes for the instrument to warm up.
13. Reconfigure and test.

4.4 QTM 3 SLG400/QLG400 Shelf upgrade from TMS2000 to TMS2020



QTM 3 SLG400/QLG400 Shelf Upgrade from TMS2000 to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite, then remove the Configuration PCB. Ensure the link in X5 (highlighted in blue) Is fitted as shown.
2. With reference to the following table and the photograph opposite, fit jumpers then solder resistors and links to the Configuration PCB.

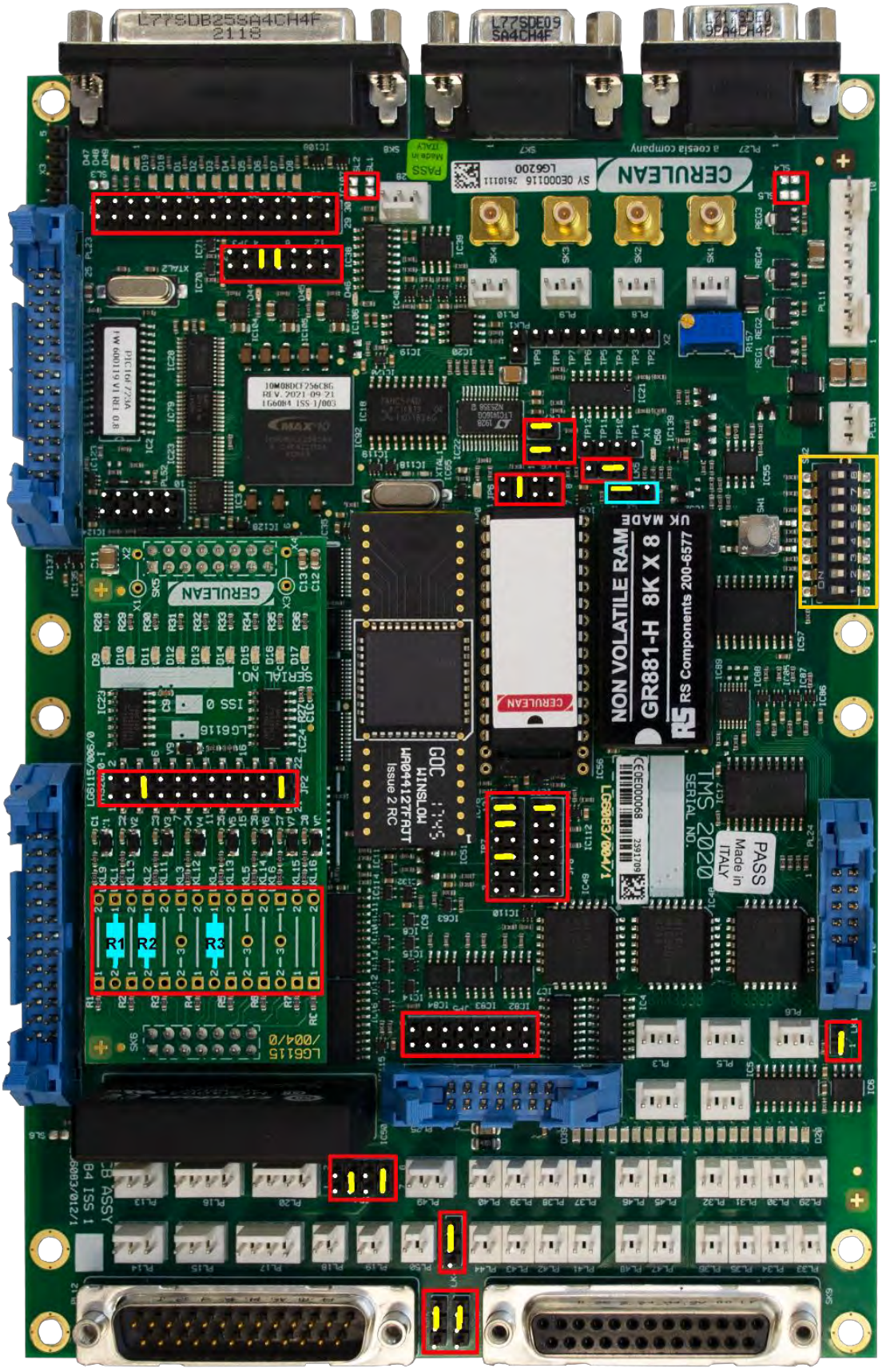
Link	Position	Resistor	Comment
LKL9	2 – 1	R1	1K Ω resistor
LKL6	1 – 2	R2	100 Ω resistor

3. Fit the Configuration PCB (daughterboard) to the TMS2020 **(Please refer to the safety section)**
4. If the instrument is used in stand-alone mode, note the configuration settings.
5. Unplug the inlet sensor connector and note its location.
6. Remove each connector and using the following table, identify its position on the new TMS2020.

TMS2000	Connector type	Description
SK8	25 pin D socket	Main serial port
PL3	3 pin Molex	Auxiliary serial port 2
PL11	10 pin Molex	Power input
PL46	2 pin Molex	Single digital output
PL14	3 pin Molex	Single input (motor relay)
PL45	2 pin Molex	Single digital output (motor relay)
PL47	2 pin Molex	Single digital output (motor relay)
PL17	4 pin Molex	Single input (rod in sensor)
PL16	4 pin Molex	Single input (rod out sensor)
PL13	3 pin Molex	Single input LSB (slot sensors)

7. Remove and retain IC51, IC52 and the EPROM IC56.
8. Fit the retained IC51 and IC52 on to the TMS2020.
9. Fit the retained EPROM to IC56. **Important:** Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
10. Fit the new TMS2020 to the measurement shelf and connect the cables.
11. Tighten the shelf stop, refit the input sensor and refit all the covers.
12. Reconnect the power and air supplies.
13. Switch on and allow 30 minutes for the instrument to warm up.
14. Reconfigure and test.

4.5 QTM 4 STG100 Shelf upgrade from TMS2000 to TMS2020



QTM 4 STG100 Shelf upgrade from TMS2000 to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor	Replacement for IC51	13330	1
GR881-150	NOVRAM to replace IC52	13323	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the new Configuration PCB.

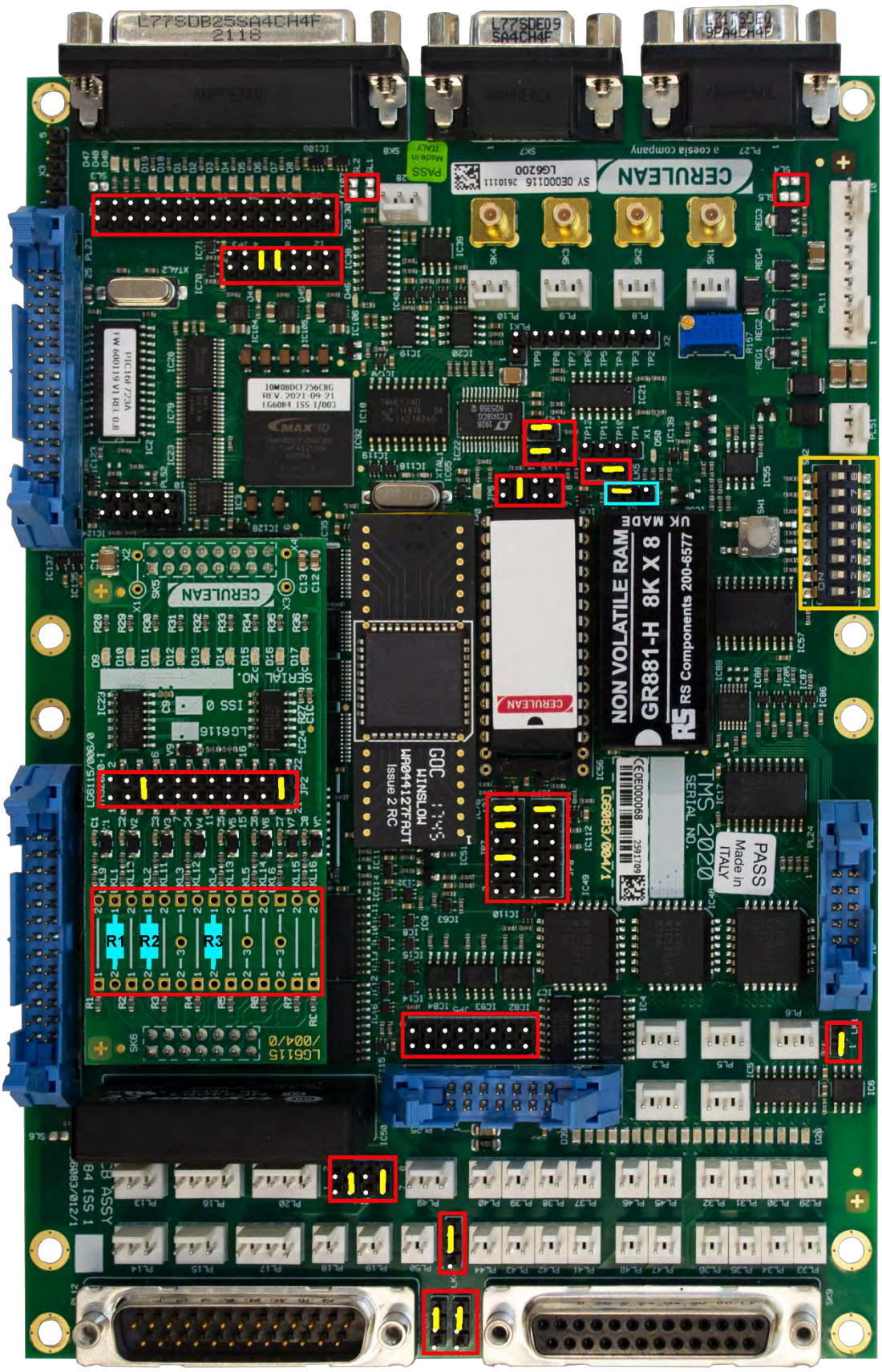
Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL2	1 – 2	R2	330 Ω resistor
LKL4	1 – 2	R3	100 Ω resistor (**NOT** used in cigar version)
LKL4	2 – 3	-	Wire link (cigar version **ONLY**)
LKL12	1 – 2	-	3k3 resistor (cigar version **ONLY**)
JP2	5 – 6	-	Jumper
JP2	21 – 22	-	Jumper

3. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020
6. Fit the new 80C32 processor into position IC51.
7. Fit the new GR881 non-volatile RAM into position IC52
8. Remove the TMS2000 from the instrument and fit the TMS2020 in the same position with the two 25 pin D connectors towards the front.
9. Connect the connectors shown in the following table.

TMS2000	Connector type	Description
PL11	10 pin Molex	Power input
SK9	25 pin D socket	Multiple digital output
PL18	2 pin Molex	Single input
PL16	4 pin Molex	Single input
PL14	3 pin Molex	Single input
PL13	3 pin Molex	Single input LSB
SK8	25 pin D socket	Main serial port
SK1	SMB co-ax	Analogue input 0
PL7	3 pin Molex	Analogue power

10. Refit and connect the power supply but do not connect the air supply.
11. Connect a DVM to test points TP1 (–) and TP10 (+). Switch on and adjust R31 for a reading of + 2.5V ± 5mV.
12. Switch off the power, tighten the shelf stop, refit all the covers, then connect the air supply.
13. Switch on and allow 30 minutes for the instrument to warm up.
14. Reconfigure and test.

4.6 QTM 5 SVP100 Shelf upgrade from TMS2000 (MKS Transducers) to TMS2020



QTM 5 SVP100 Shelf upgrade from TMS2000 (MKS Transducers) to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor (See Addendum)	Replacement for IC51	13330	1
GR881-150	NOVRAM to replace IC52	13323	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the new Configuration PCB.

Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL2	1 – 2	R2	330 Ω resistor
LKL4	1 – 2	R3	100 Ω resistor
JP2	5 – 6	-	Jumper
JP2	21 – 22	-	Jumper

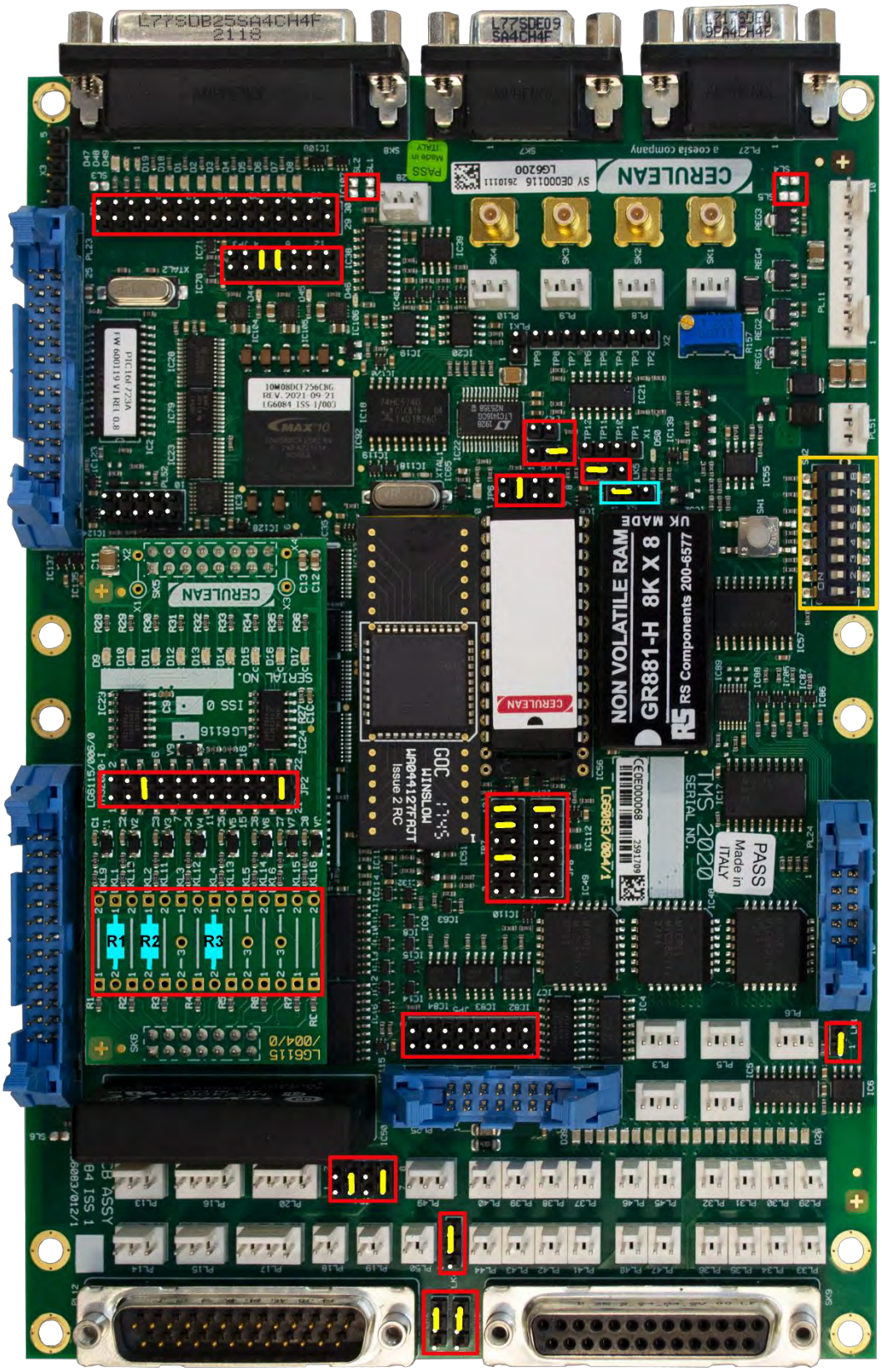
3. Fit the new Configuration PCB (daughterboard) to the TMS2020.
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020
6. Fit the new 80C32 processor into position IC51.
7. Fit the new GR881 non-volatile RAM into position IC52
8. Remove the TMS2000 from the instrument and fit the TMS2020 in the same position with the two 25 pin D connectors towards the front.
9. Connect the connectors shown in the following table.

TMS2000	Connector type	Description
SK8	25 pin D socket	Main serial port
SK9	25 pin D socket	Multiple digital output
SK1	SMB co-ax	Analogue input 0
SK2	SMB co-ax	Analogue input 1
PL12	25 pin D plug	Multiple digital input
PL7	3 pin Molex	Analogue power
PL8	3 pin Molex	Analogue power
PL11	10 pin Molex	Power input

10. Refit and connect the power supply but do not connect the air supply.
11. Connect a voltmeter to the test points TP1 (–) and TP10 (+). Switch on and adjust R31 to give a reading of +1.2V ± 5mV (for MKS transducers)
12. Switch off the power, tighten the shelf stop, refit the input sensor, refit all covers, then connect the air supply.
13. Switch on and allow 30 minutes for the instrument to warm up.
14. Reconfigure and test.

4.7 QTM 5 SVP100 Shelf upgrade from TMS2000 (Setra Transducers) to TMS2020

Note: The TMS2020 configuration described in this section should only be used if Setra transducers are fitted.



QTM 5 SVP100 Shelf upgrade from TMS2000 (Setra Transducers) to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor (See Addendum)	Replacement for IC51	13330	1
GR881-150	NOVRAM to replace IC52	13323	1
25 way cable	Fitted with low-profile connectors	70004	2

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the new Configuration PCB.

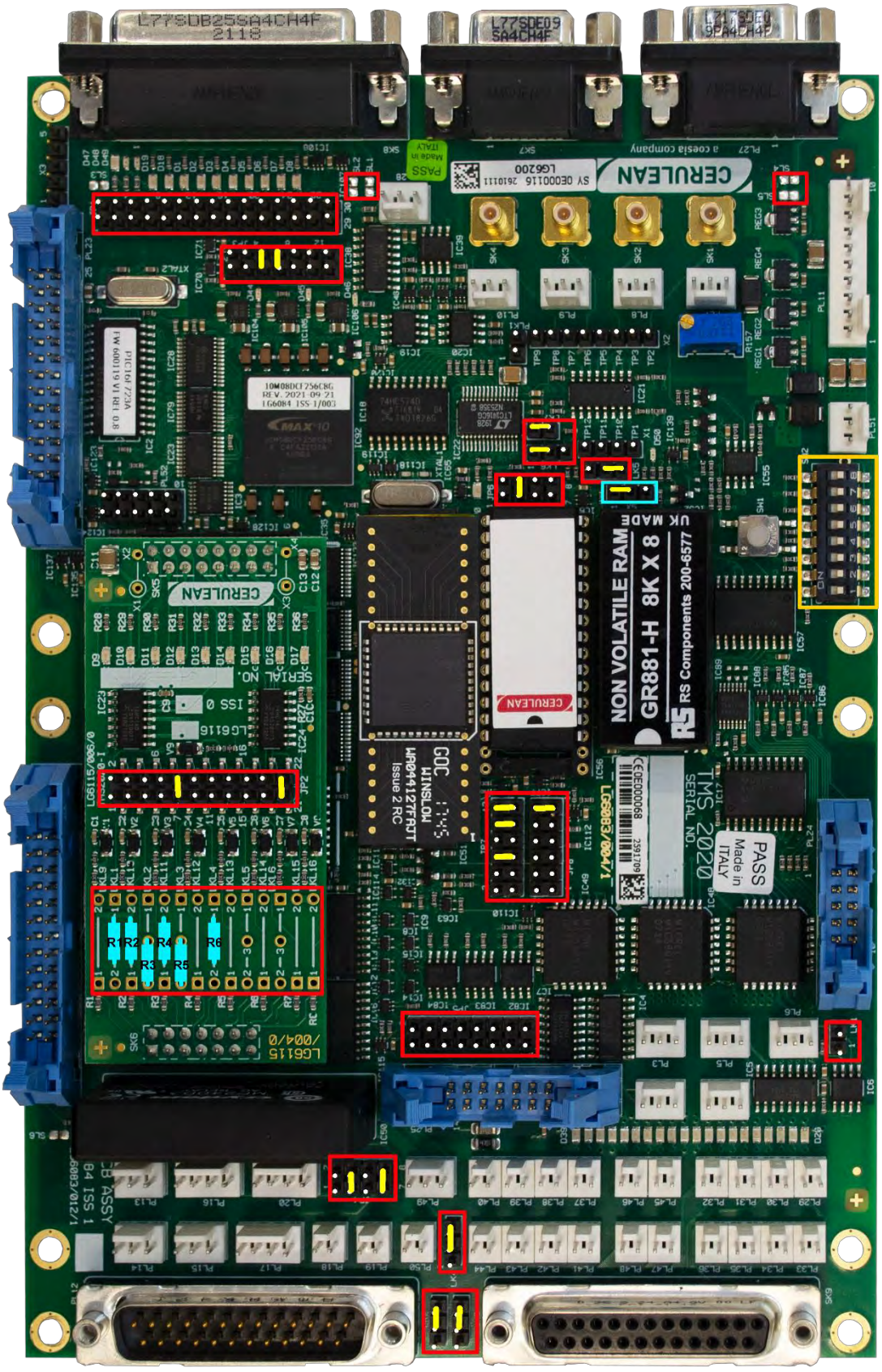
Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL2	1 – 2	R2	330 Ω resistor
LKL4	1 – 2	R3	100 Ω resistor
JP2	5 – 6	-	Jumper
JP2	21 – 22	-	Jumper

3. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020
6. Fit the new 80C32 processor into position IC51.
7. Fit the new GR881 non-volatile RAM into position IC52
8. Remove the TMS2000 from the instrument and fit the TMS2020 in the same position with the two 25 pin D connectors towards the front.
9. Connect the connectors shown in the following table.

TMS2000	Connector type	Description
SK8	25 pin D socket	Main serial port
SK9	25 pin D socket	Multiple digital output
SK1	SMB co-ax	Analogue input 0
SK2	SMB co-ax	Analogue input 1
PL12	25 pin D plug	Multiple digital input
PL7	3 pin Molex	Analogue power
PL8	3 pin Molex	Analogue power
PL11	10 pin Molex	Power input

10. Refit and connect the power supply but do not connect the air supply.
11. Connect a voltmeter to the test points TP1 (–) and TP10 (+). Switch on adjust R31 for a reading of +2.5V ± 5mV.
12. Switch off the power, tighten the shelf stop, refit the input sensor, refit all covers, then connect the air supply.
13. Switch on and allow 30 minutes for the instrument to warm up.
14. Reconfigure and test.

4.8 QTM 5U SVP200 Shelf upgrade from TMS2000 (MKS Transducers) to TMS2020



QTM 5U SVP200 Shelf upgrade from TMS2000 (MKS Transducers) to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9. Components required:

Description	Comment	Cerulean Stock Code	Qty
80C32 processor	Replacement for IC51	13330	1
GR881-150	NOVRAM to replace IC52	13323	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the Configuration PCB.

Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL2	2 – 3	R3	2k2 resistor
LKL3	2 – 3	R5	2k2 resistor
LKL4	1 – 2	R6	100 Ω resistor
LKL10	1 – 2	R2	1k5 resistor
LKL11	1 – 2	R4	1k5 resistor
JP2	9 – 10	-	Jumper
JP2	21 – 22	-	Jumper

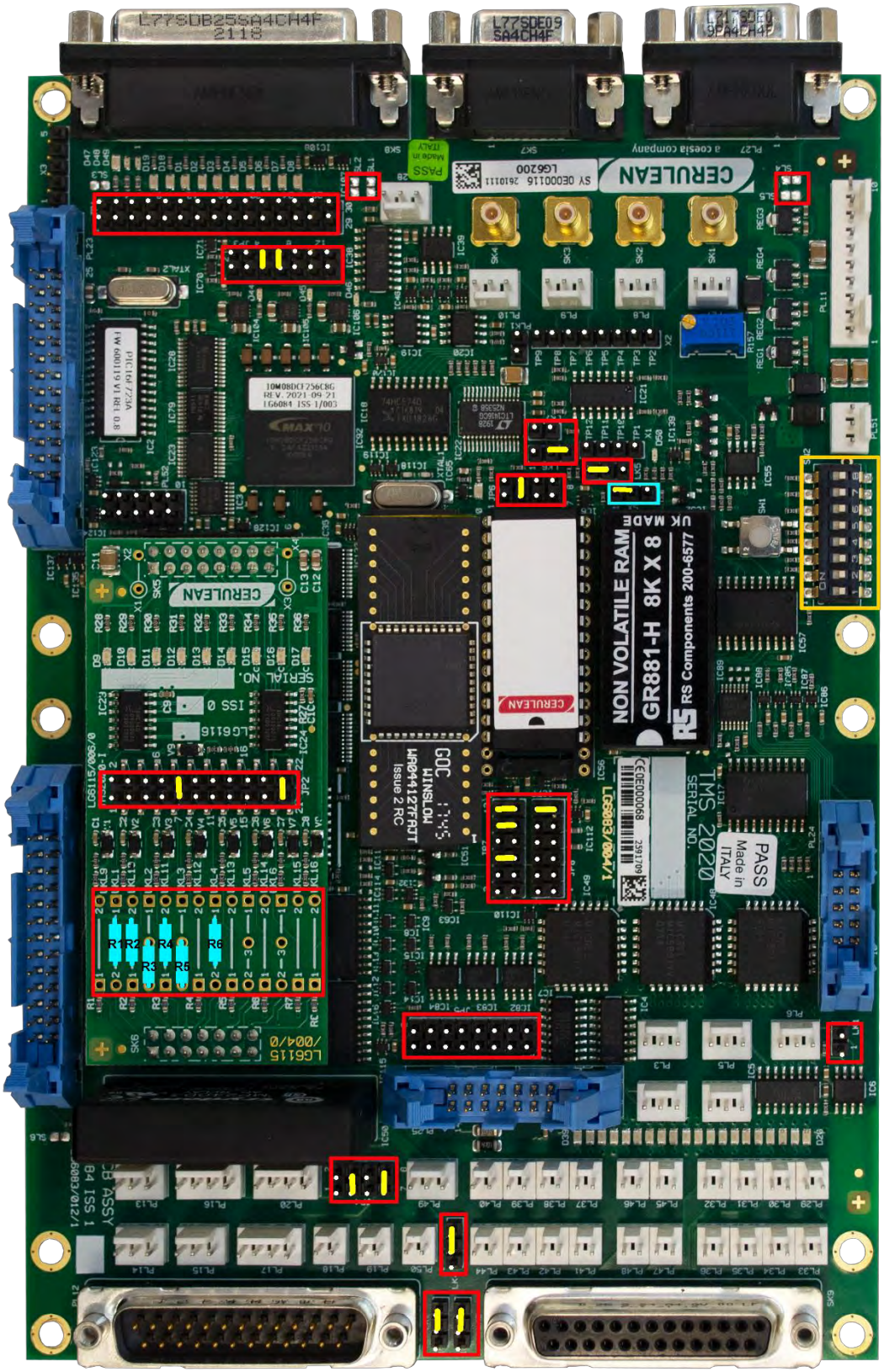
3. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020
6. Fit the new 80C32 processor into position IC51.
7. Fit the new GR881 non-volatile RAM into position IC52.
8. Remove the TMS2000 from the instrument and fit the TMS2020 in the same position with the two 25 pin D connectors towards the front.
9. Connect the connectors shown in the following table.

TMS2000	Connector type	Description
SK1	SMB co-ax	Analogue input 0
SK2	SMB co-ax	Analogue input 1
SK3	SMB co-ax	Analogue input 2
PL7	3 pin Molex	Analogue power
PL8	3 pin Molex	Analogue power
PL9	3 pin Molex	Analogue power
PL11	10 pin Molex	Power input
PL12	25 pin D plug	Multiple digital input
PL29, PL30, PL31, PL32	8 pin Molex (4 x 2 pin)	Single digital output
PL33, PL34, PL35, PL36	8 pin Molex (4 x 2 pin)	Single digital output
PL45, PL46	2 x 2 pin Molex	Single digital output
PL37, PL38, PL39, PL40	8 pin Molex (4 x 2 pin)	Single digital output
PL47	2 pin Molex	Single digital output
PL41, PL42, PL43, PL44	8 pin Molex (4 x 2 pin)	Single digital output
SK8	25 pin D socket	Main serial port
PL3	3 pin Molex	Auxiliary serial port 2

10. Refit and connect the power supply but do not connect the air supply.
11. Connect a voltmeter to the test points TP1 (–) and TP10 (+). Switch on and adjust R31 to give a reading of +1.2V ± 5mV (for MKS transducers) .
12. Switch off the power, tighten the shelf stop, refit the input sensor, refit all covers, then connect the air supply.
13. Switch on and allow 30 minutes for the instrument to warm up.
14. Reconfigure and test.

4.9 QTM 5U SVP200 Shelf upgrade from TMS2000 (Setra Transducers) to TMS2020

Note: The TMS2000 configuration described in this section should only be used if Setra transducers are fitted.



QTM 5U SVP200 Shelf upgrade from TMS2000 (Setra Transducers) to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor (See Addendum)	Replacement for IC51	13330	1
GR881-150	NOVRAM to replace IC52	13323	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the Configuration PCB.

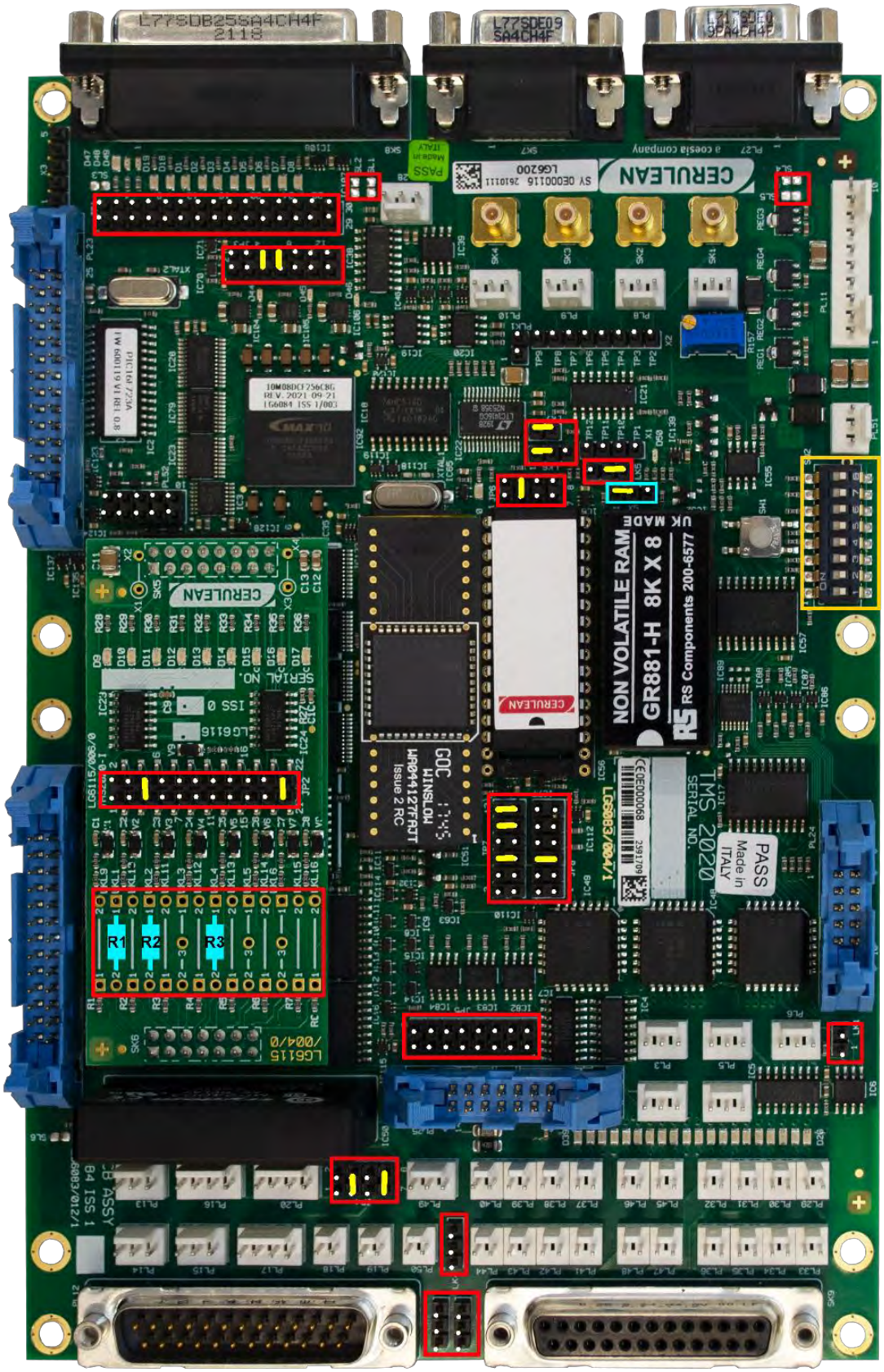
Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL2	2 – 3	R3	2k2 resistor
LKL3	2 – 3	R5	2k2 resistor
LKL4	1 – 2	R6	100 Ω resistor
LKL10	1 – 2	R2	1k5 resistor
LKL11	1 – 2	R4	1k5 resistor
JP2	9 – 10	-	Jumper
JP2	21 – 22	-	Jumper

3. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020
6. Fit the new 80C32 processor into position IC51.
7. Fit the new GR881 non-volatile RAM into position IC52.
8. Remove the TMS2000 from the instrument and fit the TMS2020 in the same position with the two 25 pin D connectors towards the front.
9. Connect the connectors shown in the following table.

TMS2000	Connector type	Description
SK1	SMB co-ax	Analogue input 0
SK2	SMB co-ax	Analogue input 1
SK3	SMB co-ax	Analogue input 2
PL7	3 pin Molex	Analogue power
PL8	3 pin Molex	Analogue power
PL9	3 pin Molex	Analogue power
PL11	10 pin Molex	Power input
PL12	25 pin D plug	Multiple digital input
PL29, PL30, PL31, PL32	8 pin Molex (4 x 2 pin)	Single digital output
PL33, PL34, PL35, PL36	8 pin Molex (4 x 2 pin)	Single digital output
PL45, PL46	2 x 2 pin Molex	Single digital output
PL37, PL38, PL39, PL40	8 pin Molex (4 x 2 pin)	Single digital output
PL47	2 pin Molex	Single digital output
PL41, PL42, PL43, PL44	8 pin Molex (4 x 2 pin)	Single digital output
SK8	25 pin D socket	Main serial port
PL3	3 pin Molex	Auxiliary serial port 2

10. Refit and connect the power supply but do not connect the air supply.
11. Connect a DVM to the test points TP1 (–) and TP10 (+). Switch on and adjust R31 for a reading of +2.5V ± 5mV.
12. Switch off the power, Tighten the shelf stop, refit the input sensor, refit all covers, then connect the air supply.
13. Switch on and allow 30 minutes for the instrument to warm up.
14. Reconfigure and test.

4.10 QTM 6V/6A/6P SPD100/103/104 Shelf upgrade from TMS2000 (MKS Transducers) to TMS2020



QTM 6V/6A/6P SPD100/103/104 Shelf upgrade from TMS2000 (MKS Transducers) to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor	Replacement for IC51	13330	1
GR881-150	NOVRAM to replace IC52	13323	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the new Configuration PCB.

Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL2	1 – 2	R2	330 Ω resistor
LKL4	1 – 2	R3	100 Ω resistor
JP2	5 – 6	-	Jumper
JP2	21 – 22	-	Jumper

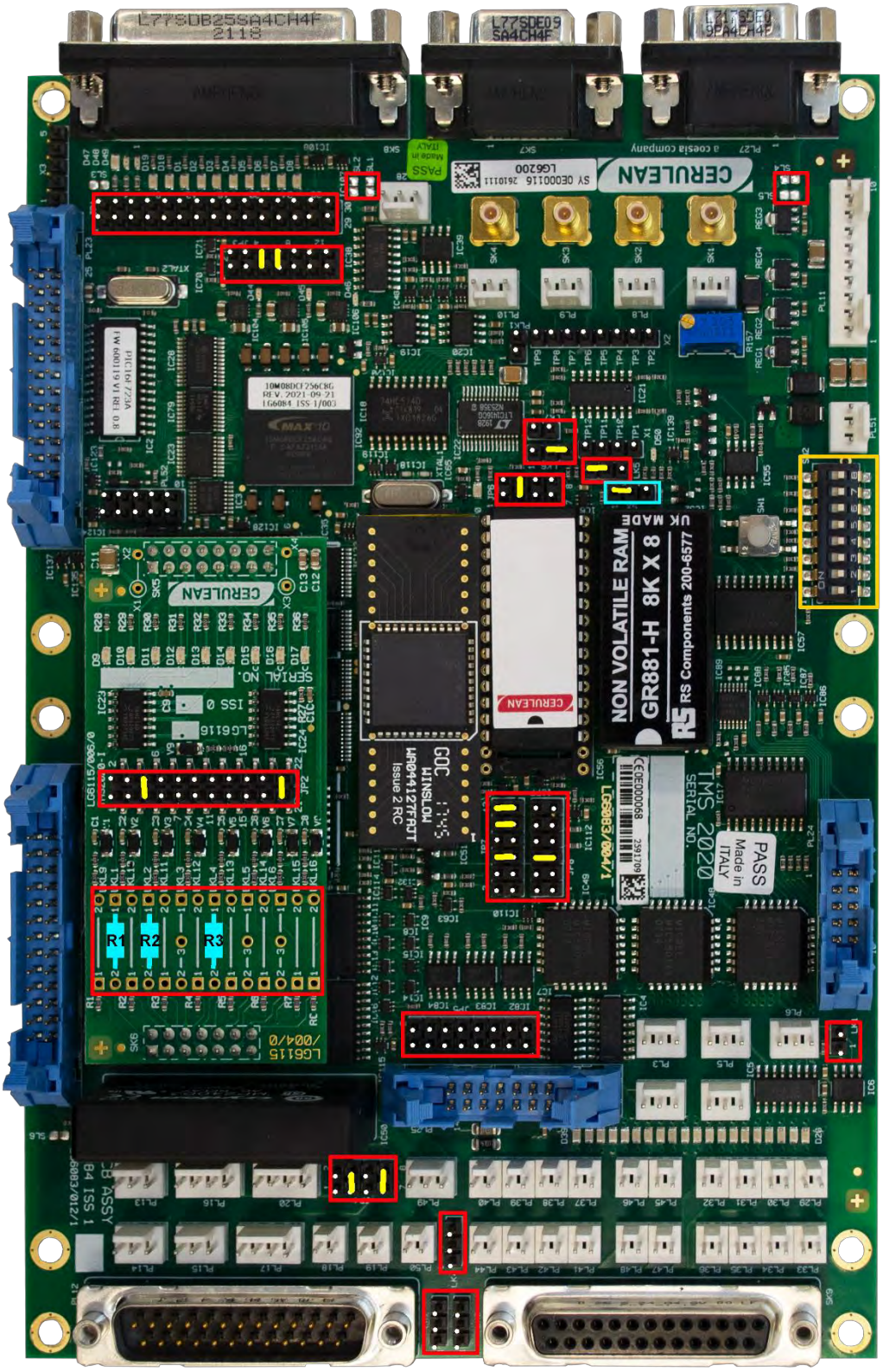
3. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020
6. Fit the new 80C32 processor into position IC51.
7. Fit the new GR881 non-volatile RAM into position IC52.
8. Remove the TMS2000 from the instrument and fit the TMS2020 in the same position with the two 25 pin D connectors towards the front.
9. Connect the connectors shown in the following table.

TMS2000	Connector type	Description
SK8	25 pin D socket	Main serial port
SK9	25 pin D socket	Multiple digital output
SK1	SMB co-ax	Analogue input 0
SK2	SMB co-ax	Analogue input 1
PL12	25 pin D plug	Multiple digital input
PL7	3 pin Molex	Analogue power
PL8	3 pin Molex	Analogue power
PL11	10 pin Molex	Power input

10. Refit and connect the power supply but do not connect the air supply.
11. Connect a voltmeter to the test points TP1 (–) and TP10 (+). Switch on and adjust R31 to give a reading of +1.2V ± 5mV.
12. Switch off the power, tighten the shelf stop, refit the input sensor, refit all covers, then connect the air supply.
13. Switch on and allow 30 minutes for the instrument to warm up.
14. Reconfigure and test.

4.11 QTM 6 SPD100 Shelf upgrade from TMS2000 (Setra Transducers) to TMS2020

Note: The TMS2000 configuration described in this section should only be used if Setra transducers are fitted.



QTM 6 SPD100 Shelf upgrade from TMS2000 (Setra Transducers) to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor (See Addendum)	Replacement for IC51	13330	1
GR881-150	NOVRAM to replace IC52	13323	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the new Configuration PCB.

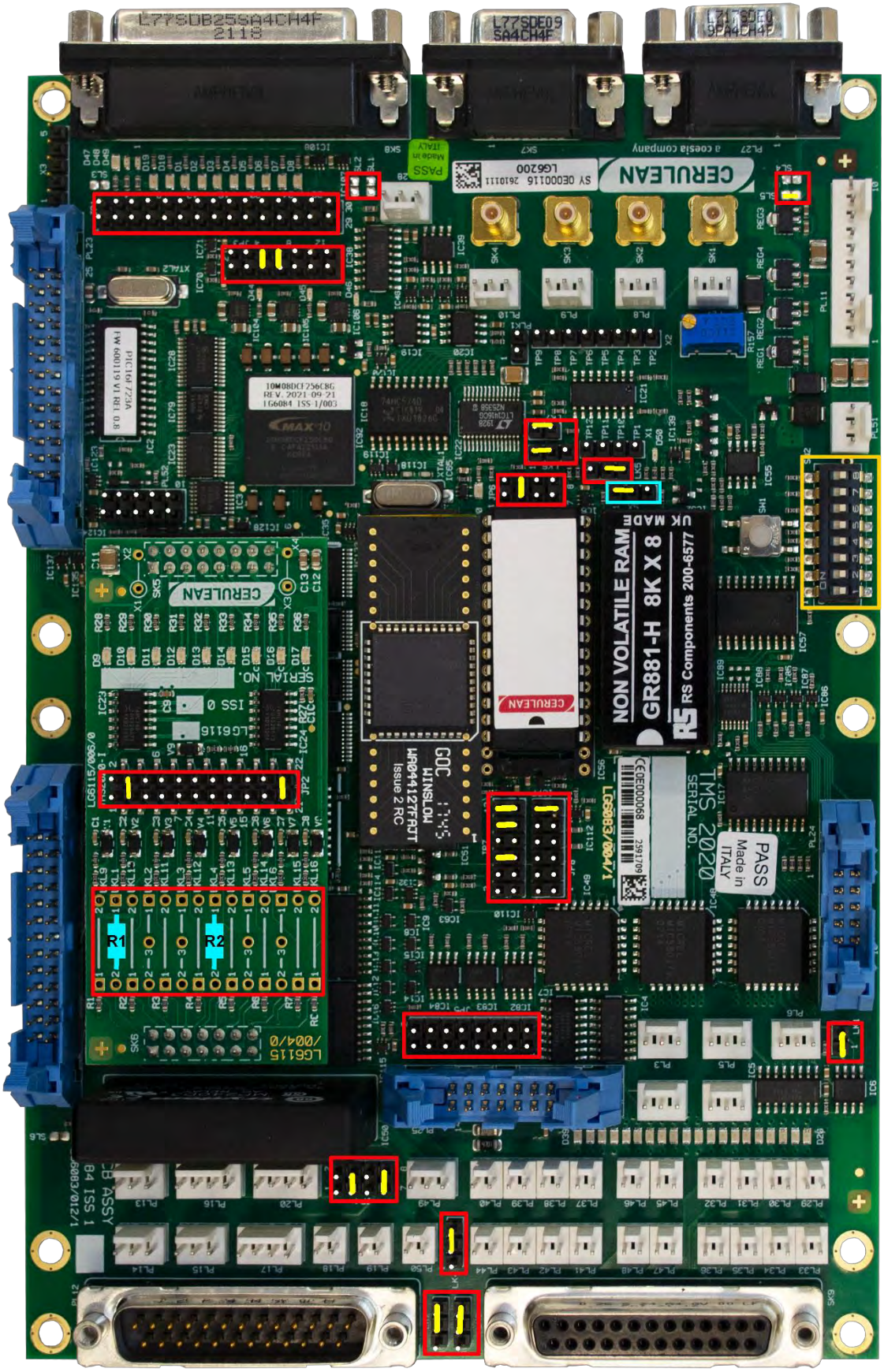
Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL2	1 – 2	R2	330 Ω resistor
LKL4	1 – 2	R3	100 Ω resistor
JP2	5 – 6	-	Jumper
JP2	21 – 22	-	Jumper

3. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020
6. Fit the new 80C32 processor into position IC51.
7. Fit the new GR881 non-volatile RAM into position IC52.
8. Remove the TMS2000 from the instrument and fit the TMS2020 in the same position with the two 25 pin D connectors towards the front.
9. Connect the connectors shown in the following table.

TMS2000	Connector type	Description
SK8	25 pin D socket	Main serial port
SK9	25 pin D socket	Multiple digital output
SK1	SMB co-ax	Analogue input 0
SK2	SMB co-ax	Analogue input 1
PL12	25 pin D plug	Multiple digital input
PL7	3 pin Molex	Analogue power
PL8	3 pin Molex	Analogue power
PL11	10 pin Molex	Power input

10. Refit and connect the power supply but do not connect the air supply.
11. Connect a voltmeter to the test points TP1 (–) and TP10 (+). Switch on and adjust R31 for a reading of +2.5 V ± 5 mV.
12. Switch off the power, tighten the shelf stop, refit the input sensor, refit all covers, and then connect the air supply.
13. Switch on and allow 30 minutes for the instrument to warm up. Reconfigure and test.

4.12 QTM 7 SHM102/104 Shelf upgrade from TMS2000 to TMS2020



QTM 7 SHM102/104 Shelf upgrade from TMS2000 to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor (See Addendum)	Replacement for IC51	13330	1
GR881-150	NOVRAM to replace IC52	13323	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown
2. Using the following table and the photograph opposite, solder resistors and links to the new Configuration PCB.

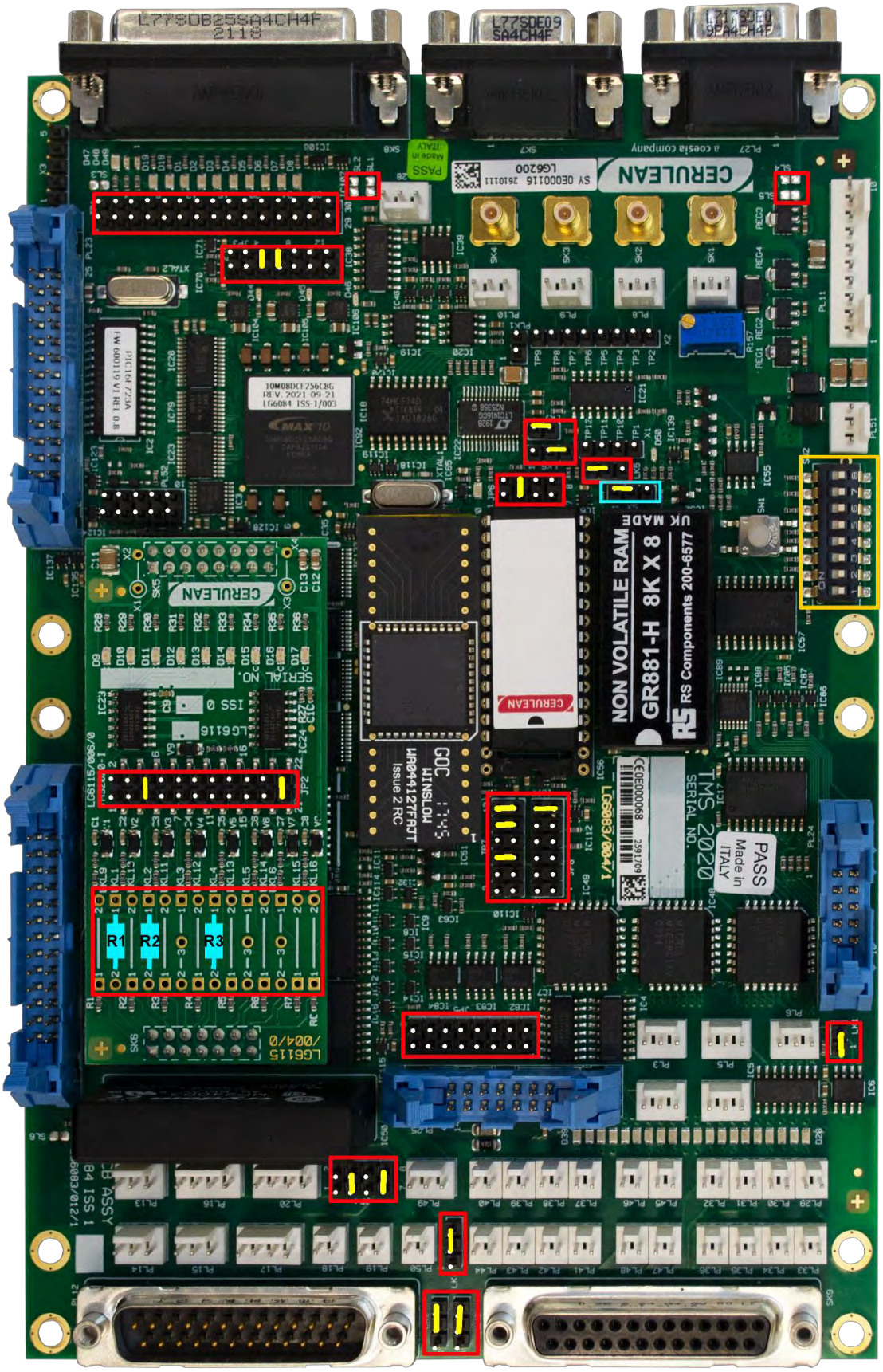
Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL4	1 – 2	R2	100 Ω resistor
JP2	3 – 4	-	Jumper
JP2	21 – 22	-	Jumper

3. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020
6. Fit the new 80C32 processor into position IC51.
7. Fit the new GR881 non-volatile RAM into position IC52.
8. Remove the TMS2000 from the instrument and fit the TMS2020 in the same position with the two 25 pin D connectors towards the front.
9. Connect the connectors shown in the following table.

TMS2000	Connector type	Description
SK8	25 pin D socket	Main serial port
SK9	25 pin D socket	Multiple digital output
PL12	25 pin D plug	Multiple digital input
PL11	10 pin Molex	Power input

10. Refit the covers.
11. Connect the power and air supplies.
12. Switch on and allow 30 minutes for the instrument to warm up.
13. Reconfigure and test.

4.13 QTM 8 SIW100 Shelf upgrade from TMS2000 to TMS2020



QTM 8 SIW100 Shelf upgrade from TMS2000 to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor (See Addendum)	Replacement for IC51	13330	1
GR881-150	NOVRAM to replace IC52	13323	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (Highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the new Configuration PCB.

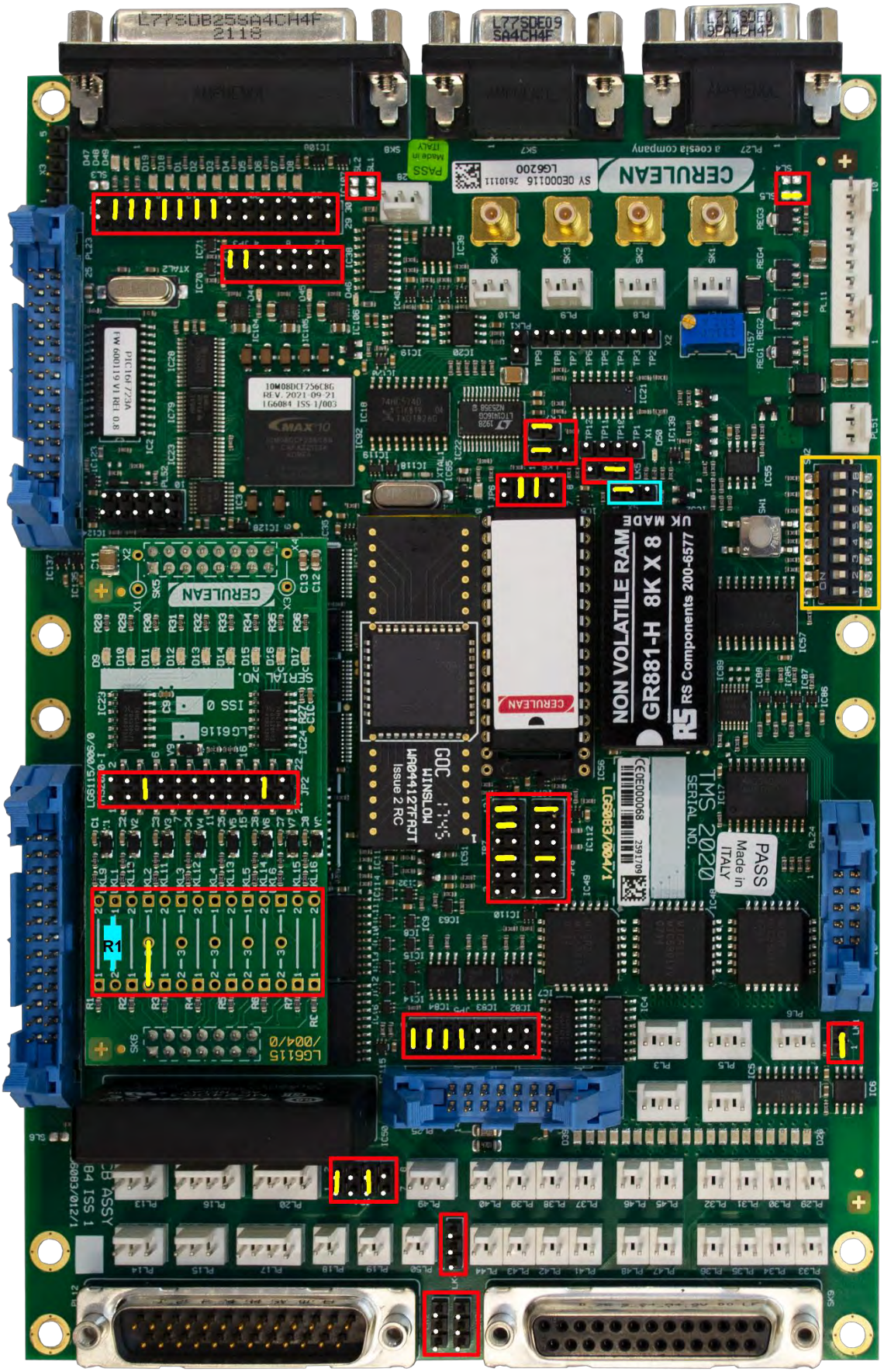
Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL2	1 – 2	R2	330 Ω resistor
LKL4	1 – 2	R3	100 Ω resistor
JP2	5 – 6	-	Jumper
JP2	21 – 22	-	Jumper

3. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020
6. Fit the new 80C32 processor into position IC51.
7. Fit the new GR881 non-volatile RAM into position IC52.
8. Remove the TMS2000 from the instrument and fit the TMS2020 in the same position with the two 25 pin D connectors towards the front.
9. Connect the connectors shown in the following table.

TMS2000	Connector type	Description
PL11	10 pin Molex	Power input
PL13	3 pin Molex	Single input
PL16	4 pin Molex	Single input
PL18	2 pin Molex	Single input
SK9	25 pin D socket	Multiple digital output
PL45	2 pin Molex	Multiple digital output
SK1	SMB co-ax	Analogue input 0
SK8	25 pin D socket	Main serial port

10. Refit and connect the power supply but do not connect the air supply.
11. Connect a voltmeter to the test points TP1 (–) and TP10 (+). Switch on and adjust R31 for a reading of +1.8 V ± 5 mV.
12. Switch off the power, tighten the shelf stop, refit the input sensor, refit all the covers then connect the air supply.
13. Switch on and allow 30 minutes for the instrument to warm up. Reconfigure and test.

4.14 QTM 9S SMD100 Shelf upgrade from TMS2000 to TMS2020



QTM 9S SMD100 Shelf upgrade from TMS2000 to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor (See Addendum)	Replacement for IC51	13330	1
GR881-150	NOVRAM to replace IC52	13323	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the new Configuration PCB.

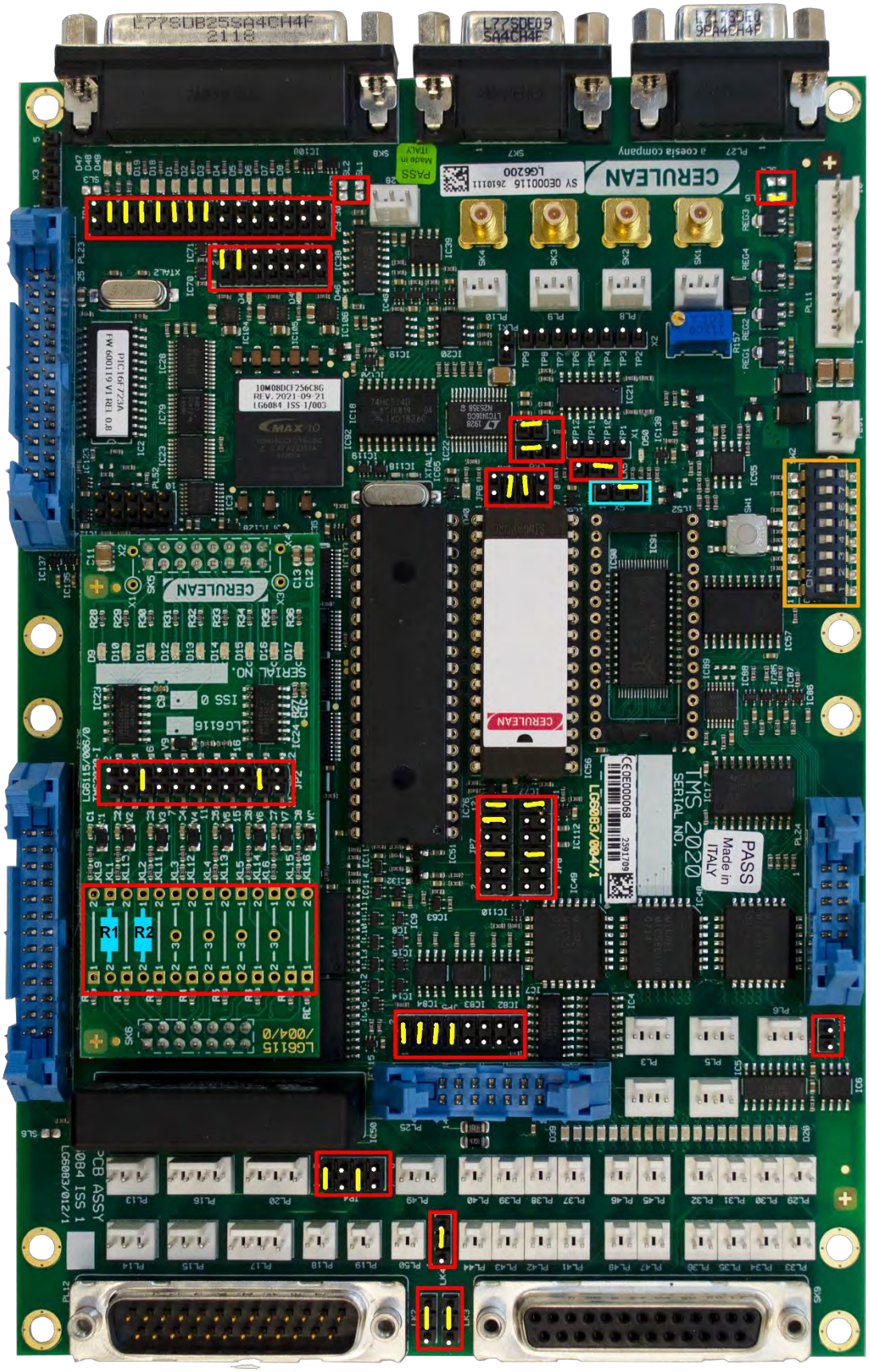
Link	Position	Resistor	Comment
LKL1	1 – 2	R1	100 Ω resistor
LKL2	2 – 3	-	Wire link
JP2	5 – 6	-	Jumper
JP2	19 – 20	-	Jumper

3. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020
6. Fit the new 80C32 processor into position IC51.
7. Fit the new GR881 non-volatile RAM into position IC52.
8. Remove the TMS2000 from the instrument and fit the TMS2020 in the same position with the two 25 pin D connectors towards the front.
9. Connect the connectors shown in the following table.

TMS2000	Connector type	Description
SK8	25 pin D socket	Main serial port
PL11	10 pin Molex	Power input
PL25	14 pin header	Digital i/o
PL48	2 pin Molex	Single digital output
PL46	2 pin Molex	Single digital output
PL17	4 pin Molex	Single input
PL16	4 pin Molex	Single input
PL13	3 pin Molex	Single input LSB
PL14	3 pin Molex	Single input
PL2	3 pin Molex	Auxiliary serial port 1

10. Refit and connect the power and air supplies.
11. Switch on and allow 30 minutes for the instrument to warm up.
12. Reconfigure and test.

4.15 QTM 9S Interface upgrade from TMS2000 to TMS2020



QTM 9S Interface upgrade from TMS2000 to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C320 processor	Replacement for IC51	13349	1
EPROM with v6 firmware	***Not supplied with the kit***		1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the new Configuration PCB.

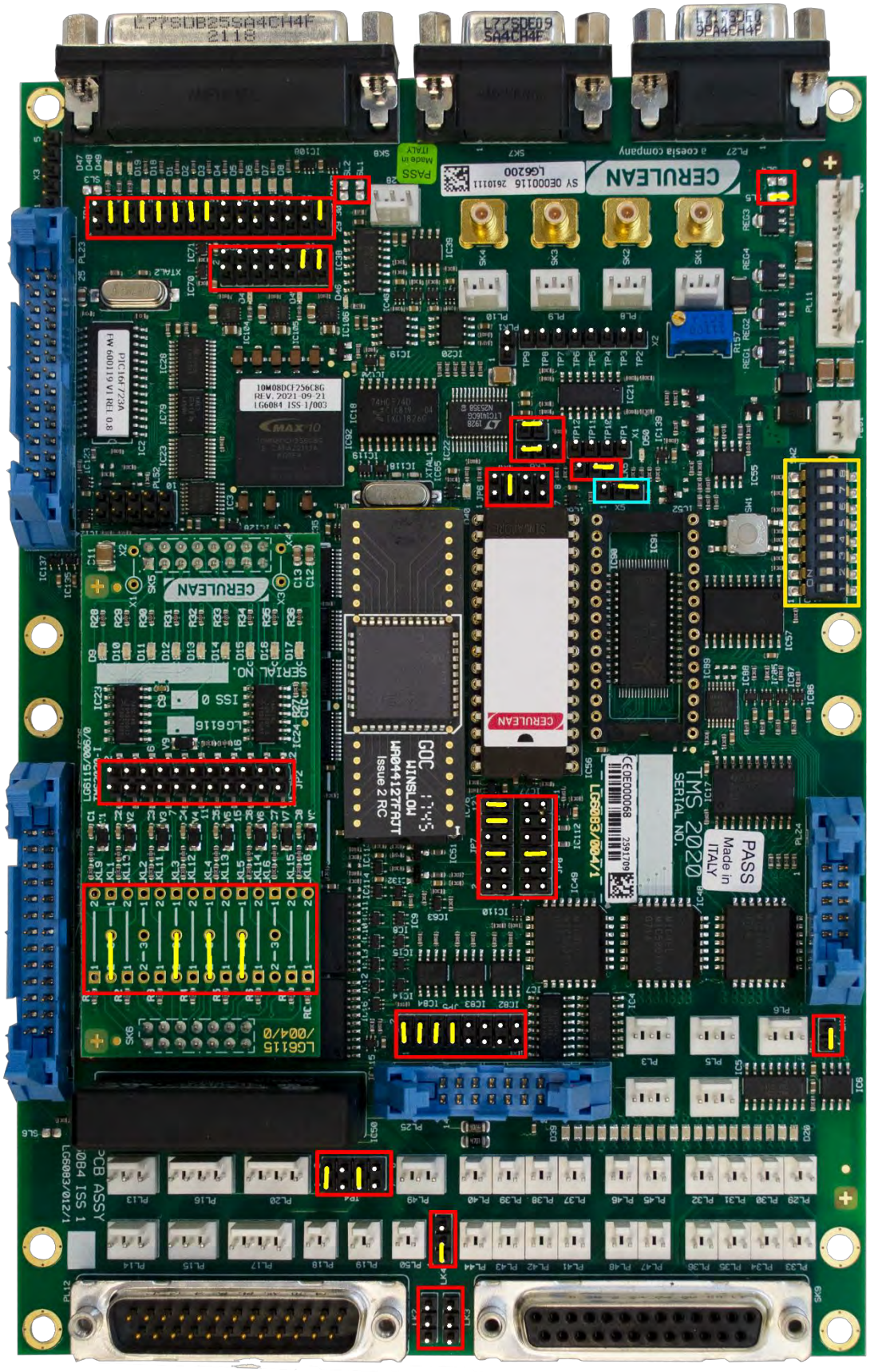
Link	Position	Resistor	Comment
LKL1	1 – 2	R1	100 Ω resistor
LKL2	1 – 2	R2	330 Ω resistor
JP2	5 – 6	-	Jumper
JP2	19 – 20	-	Jumper

3. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
6. Fit the new 80C32 processor into position IC51.
7. Remove the TMS2000 from the instrument and fit the TMS2020 in the same position with the two 25 pin D connectors towards the front.
8. Connect the connectors shown in the following table.

TMS2000	Connector type	Description
PL11	10 pin Molex	Power input
PL25	14 pin header	Digital i/o
PL2	3 pin Molex	Auxiliary serial port 1
PL3	3 pin Molex	Auxiliary serial port 2
PL13	3 pin Molex	Single input LSB
PL14	3 pin Molex	Single input

9. Refit and connect the power and air supplies.
10. Switch on and allow 30 minutes for the instrument to warm up.
11. Reconfigure and test.

4.16 QTM S Upgrade from TMS2000 to TMS2020



QTM S Upgrade from TMS2000 to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor (See Addendum)	Replacement for IC51	13330	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the new Configuration PCB.

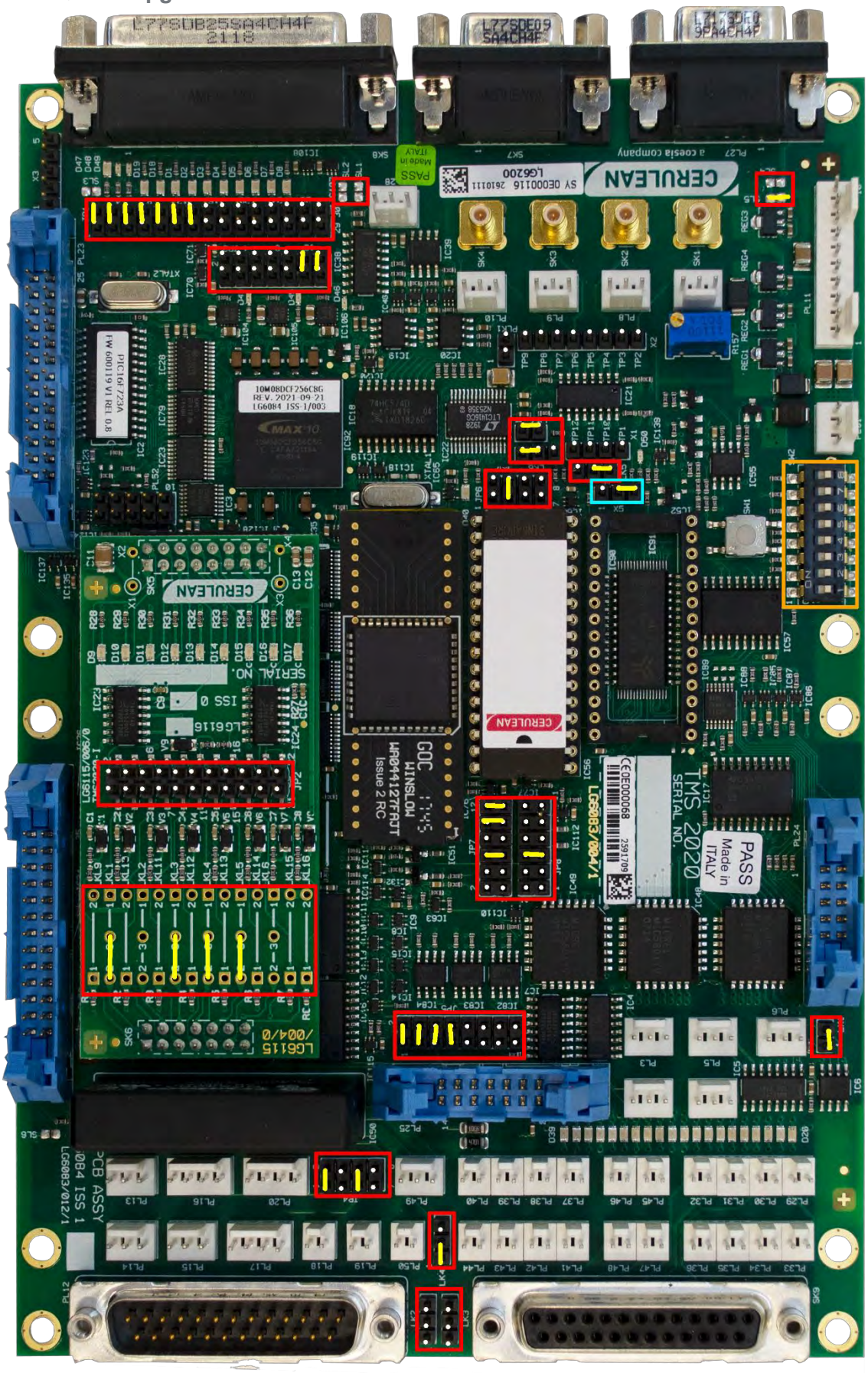
Link	Position	Comment
LKL1	2 – 3	Wire link
LKL3	2 – 3	Wire link
LKL4	2 – 3	Wire link
LKL5	2 – 3	Wire link

3. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
6. Fit the new 80C32 processor into position IC51.
7. Remove the TMS2000 from the instrument and fit the TMS2020 in the same position with the two 25 pin D connectors towards the front.
8. Connect the connectors shown in the following table.

TMS2000	Connector type	Description
SK7	9 pin D socket	Daisy chain serial port 1
PL11	10 pin Molex	Power input
PL48	2 pin Molex	Single digital output
PL46	2 pin Molex	Single digital output
PL17	4 pin Molex	Single input
PL16	4 pin Molex	Single input
PL13	3 pin Molex	Single input LSB
PL23	26 pin header	Expansion port

9. Refit the covers.
10. Connect the power and air supplies.
11. Switch on and allow 30 minutes for the instrument to warm up.
12. Reconfigure and test.

4.17 QTM A upgrade from TMS2000 to TMS2020



QTM A upgrade from TMS2000 to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor (See Addendum)	Replacement for IC51	13330	1

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and links to the new Configuration PCB.

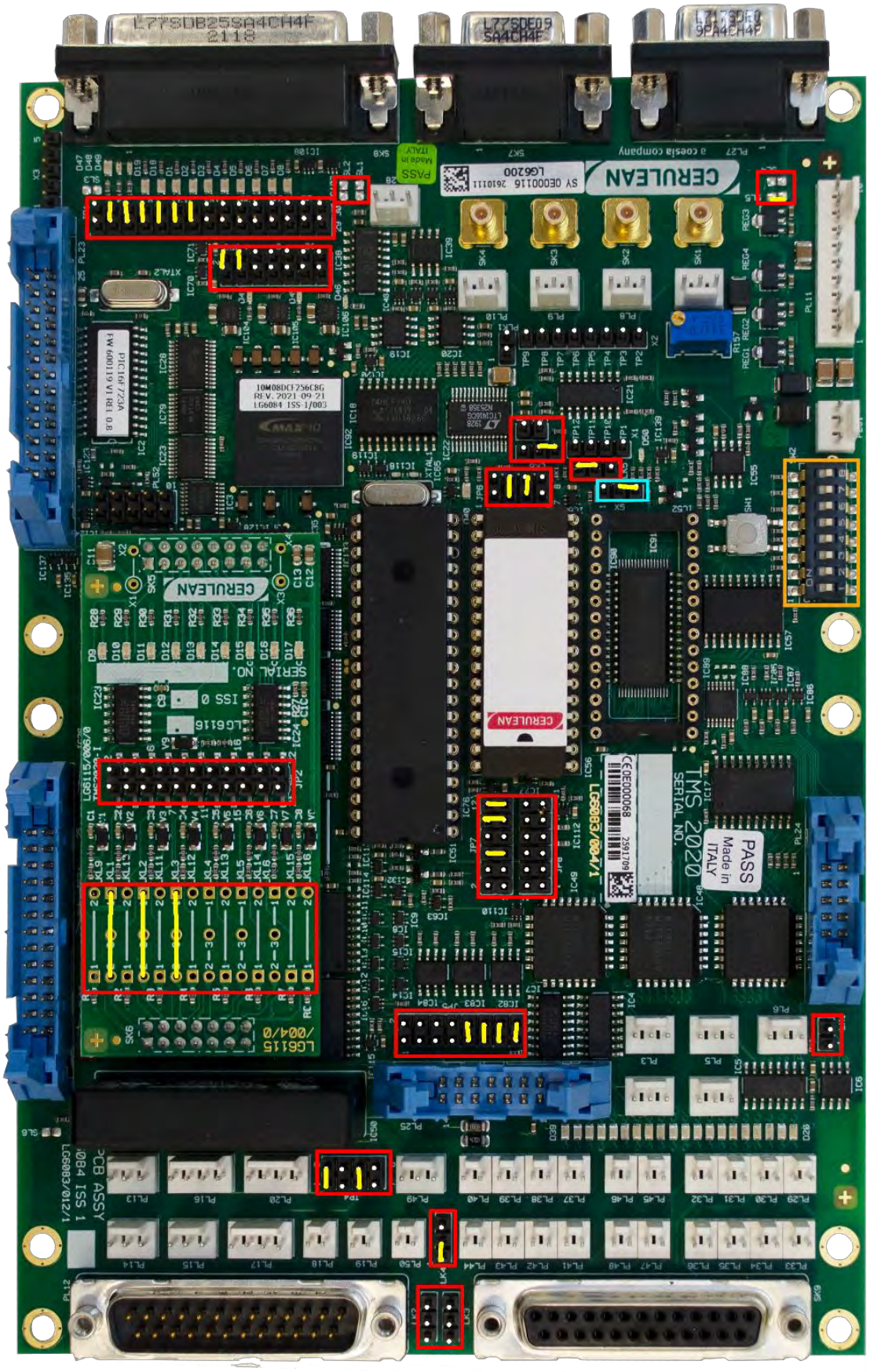
Link	Position	Comment
LKL1	2 – 3	Wire link
LKL3	2 – 3	Wire link
LKL4	2 – 3	Wire link
LKL5	2 – 3	Wire link

3. Fit the new Configuration PCB daughterboard to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches SW2 to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
6. Fit the new 80C32 processor into position IC51.
7. Remove the TMS2000 from the instrument and fit the TMS2020 in the same position with the two 25 pin D connectors towards the front.
8. Connect the connectors shown in the following table.

TMS2000	Connector type	Description
SK7	9 pin D socket	Daisy chain serial port 1
PL11	10 pin Molex	Power input
PL3	3 pin Molex	Auxiliary serial port 2
PL17	4 pin Molex	Single input
PL16	4 pin Molex	Single input
PL23	26 pin header	Expansion port

9. Refit the covers.
10. Connect the power and air supplies.
11. Switch on and allow 30 minutes for the instrument to warm up.
12. Reconfigure and test.

4.18 SM405/410/450/RH/CR20i/iE/CL80 Puff Engine TMS2000 Replacement to TMS2020



SM405/410/450/RH/CR20i/iE/CL80 Puff Engine TMS2000 Replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. With reference to the following table and the photograph opposite, solder links to the Configuration PCB.

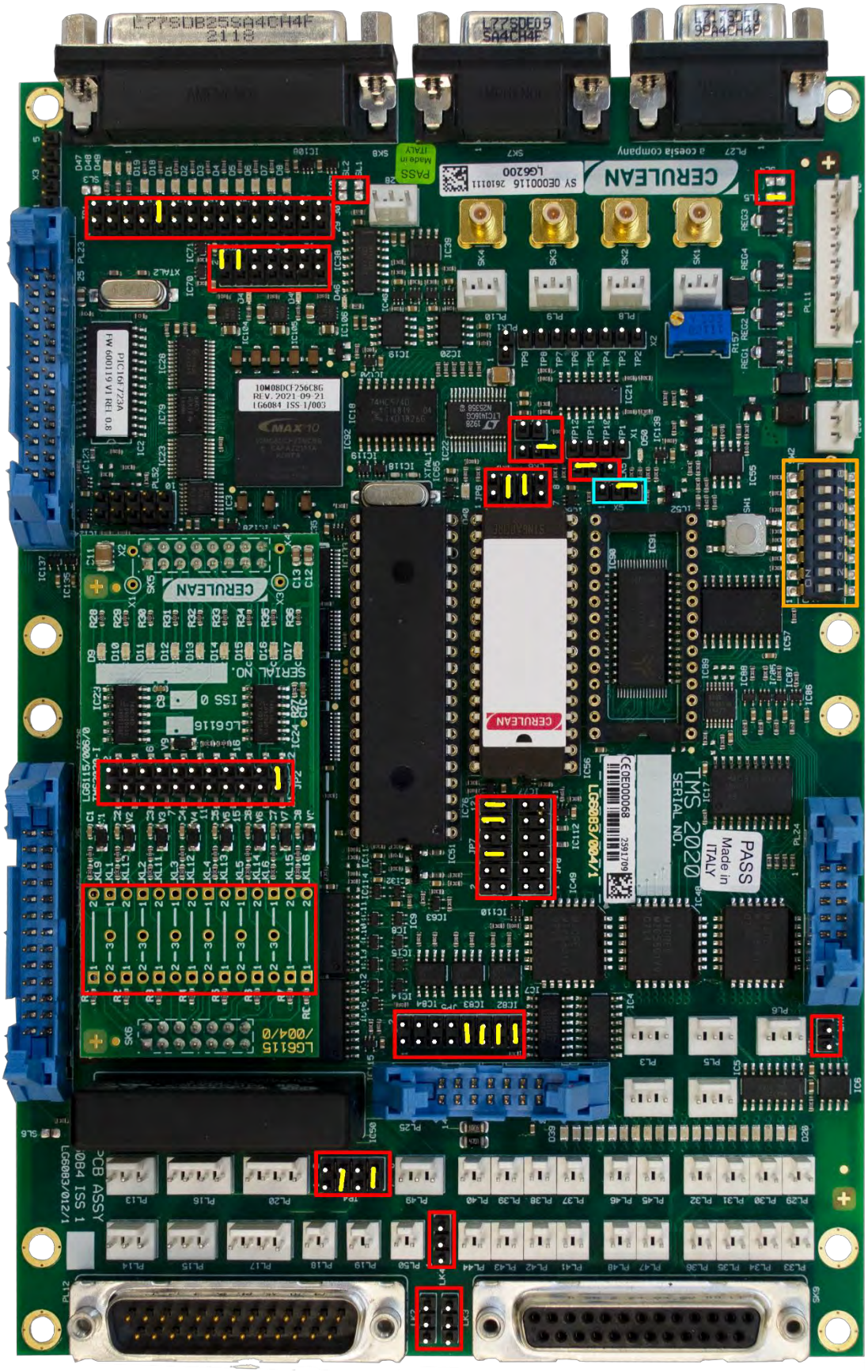
Link	Position	Comment
LKL1	1 – 2	Wire link
LKL2	1 – 2	Wire link
LKL3	1 – 2	Wire link

3. Fit the Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Open the Smoking Cabinet front doors.
5. Remove the smoking bags.
6. Remove the cover plates
7. Remove the 12 screws that secure the cover on the Puff Engine junction box which contains the PCB to be replaced.
8. Note the positions of the connectors on the TMS2000, then remove them.
9. Remove the TMS2000.
10. Remove the EPROM IC56 from the TMS2000 and fit it into position IC56 on the TMS2020.
    Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
11. Fit the TMS2020 into the Puff Engine junction box and connect the cables.
12. Attach all the connectors to the 8 channel Puff Engine multiplexer PCB.
13. Refit and secure the Puff Engine junction box cover.
14. Refit the cover plates.
15. Reconnect the smoking bags.
16. Reconnect the power and air supplies.
17. Switch on and check for correct operation.

SM450RH, CR20i and CR20iE

- If present, remove the jumper from pins 7 to 8 at JP1 on the TMS2020.
- For RH:
    i. Replace the EPROM with APC450RH v02.00.04 or later.
- For CR20i and CR20iE:
    i. Carousel EPROM with APC450 v05.00.04 (V01.00.02)
    ii. Lighter control EPROM with CR20LGTR (V01.00.00)
- See documents KU0441 and KU0439 then attach a cable from the multiplexer PL11 to the TMS2020 PL25.

4.19 VFA450/RH TMS2000 Replacement to TMS2020



VFA450/RH TMS2000 Replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

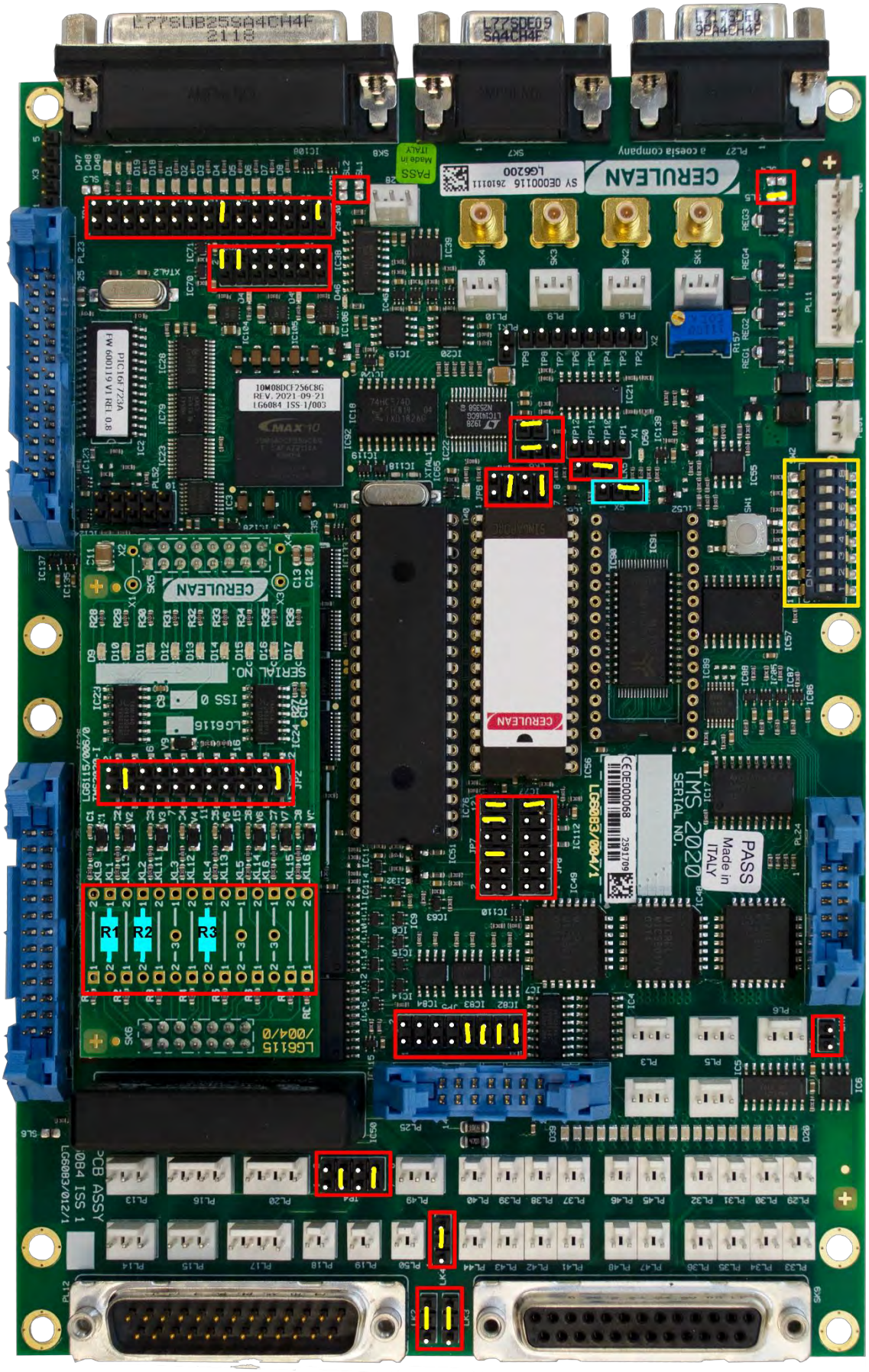
Procedure

1. Fit jumpers to the new TMS2020 as shown in the photograph opposite, then remove the Configuration PCB. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. With reference to the following table and the photograph opposite, fit a jumper to the Configuration PCB.

Link	Position	Comment
JP2	21 – 22	Jumper

3. Note the positions of the connectors on the TMS2020, then remove them.
4. Remove the TMS2000, then remove and retain the EPROM IC56.
5. Fit the retained EPROM to IC56 on the TMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
6. Fit the new TMS2020 into the main chassis and connect the cables.
7. **VFA450** — Set switch 1 on the 8 way DIP switches SW2 to *ON*.
8. **VFA450RH** — Set switch 1 on the 8 way DIP switches SW2 to *OFF*.
9. Make sure that the plug to JP8 is fitted correctly. The white wire connects to pin 9 and the grey wire to pin 5.
10. Reconnect the power supply.
11. Connect a voltmeter to the test points TP1 (–) and TP10 (+). Switch on and adjust R31 for a reading of +2.2 V ± 5 mV.
12. The above step will need to be repeated when the VFA is first calibrated.
13. Check for correct operation.

4.20 QTM Zero PC TMS2000 Replacement to TMS2020



QTM Zero PC TMS2000 Replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components Required

Description	Comment	Cerulean Stock Code	Qty
80C320 processor	Replacement for IC51	13349	1

Procedure

1. Fit jumpers to the TMS2020 and solder link SL5 as shown in the photograph opposite. Ensure the link in X5 (highlighted In blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and fit links to the configuration PCB.

Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL2	1 – 2	R2	330 Ω resistor
LKL3	2 – 3	-	2.5 amp fuse *
LKL4	1 – 2	R3	100 Ω resistor
JP2	3 – 4	-	Jumper
JP2	21 – 22	-	Jumper

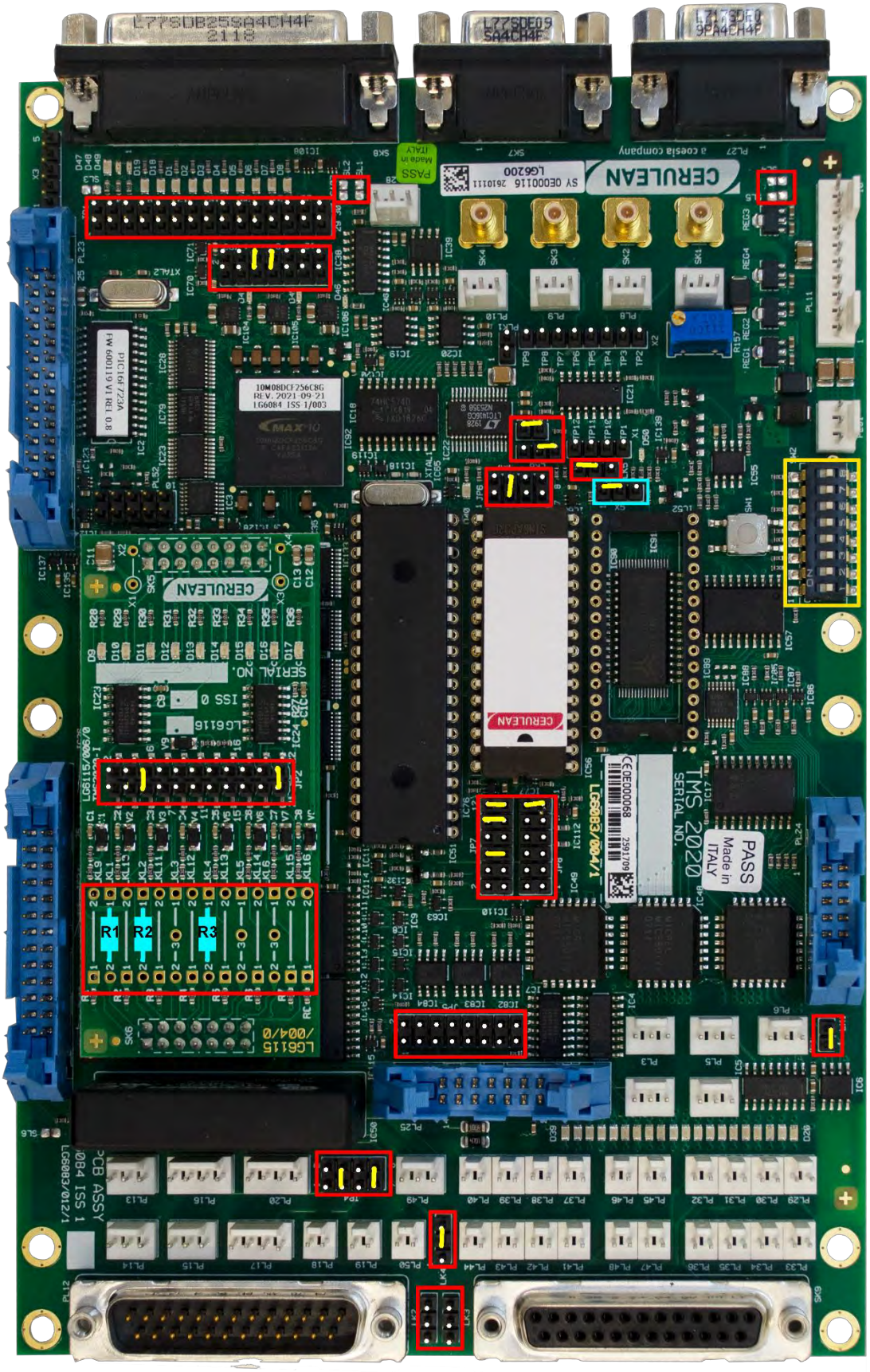
** The 2.5 amp fuse is only required for a Quantum with Contact Length measurement.*

3. Fit the Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into theTMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
6. Fit the new 80C320 processor in position IC51.
7. Note the positions of the connectors on the TMS2000 Top Box (nearest to the hopper) then remove them.
8. Remove the TMS2000 from the instrument.
9. Fit the new TMS2020 in the same position as the original TMS2000.
10. Connect the connectors as shown in the following table.

TMS2000	Connector type	Description
PL12	25 pin D plug	Multiple digital input
SK9	25 pin D socket	Multiple digital output
PL25	14 pin header	Digital i/o
PL2	3 pin Molex	Auxiliary serial port 1
PL3	3 pin Molex	Auxiliary serial port 2
PL4	3 pin Molex	Auxiliary serial port 3
PL5	3 pin Molex	Auxiliary serial port 4
PL6	3 pin Molex	Auxiliary RS485
PL24	10 pin header	Keyboard
PL11	10 pin Molex	Power input
SK8	25 pin D socket	Main serial port

8. Refit the top cover plate.
9. Reconnect the power and air supplies.
10. Switch on and allow 30 minutes for the instrument to warm up.
11. Reconfigure and test.

4.21 Quantum Weight Shelf QIW203 TMS2000 Replacement to TMS2020



Quantum Weight Shelf QIW203 TMS2000 Replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components Required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor (See Addendum)	Replacement for IC51	13330	1
GR881-150	NOVRAM to replace IC52	13323	1

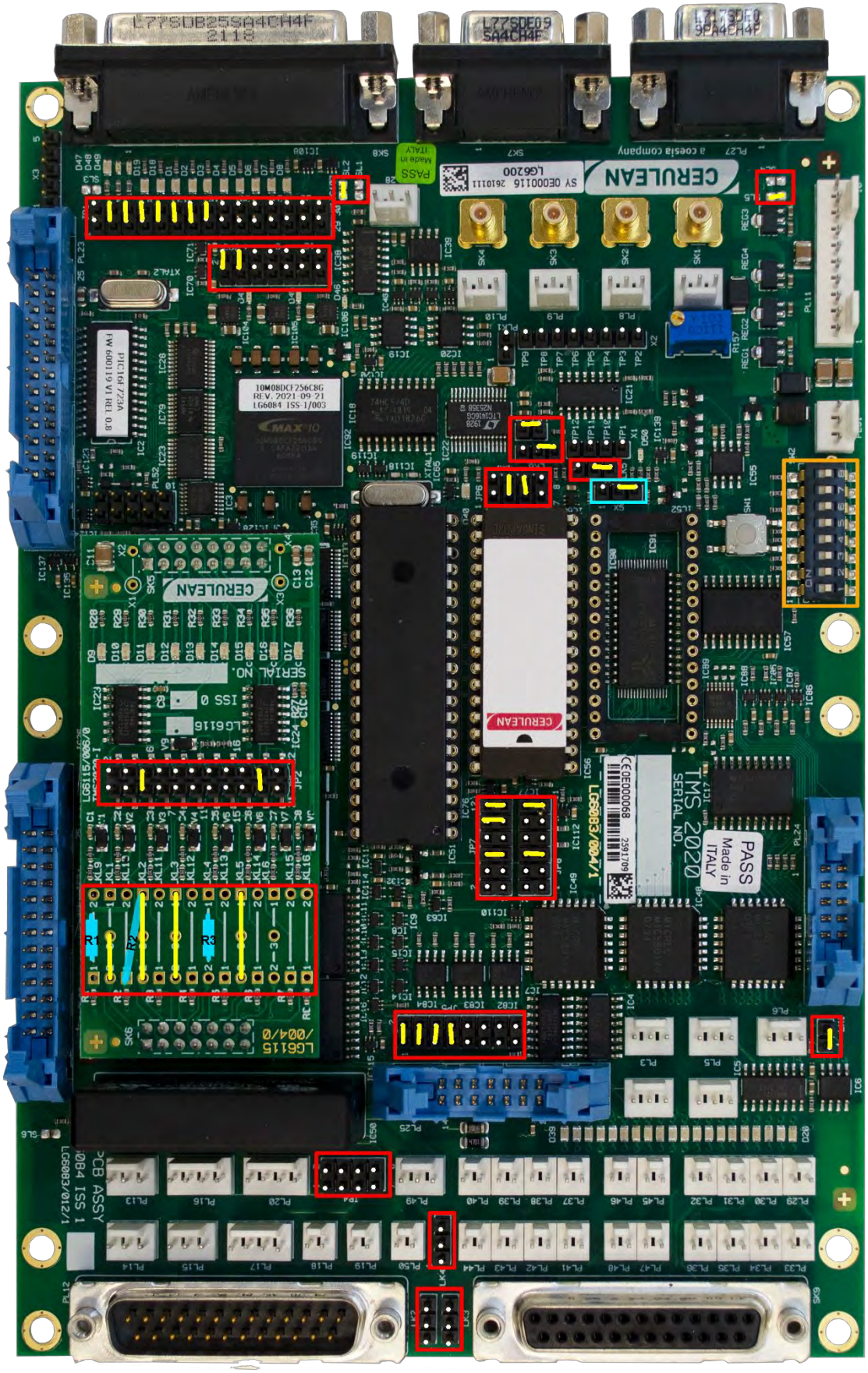
Procedure

1. Fit jumpers to the TMS2020 and solder link SL5 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photograph opposite, solder resistors and fit links to the configuration PCB.

Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL2	1 – 2	R2	330 Ω resistor
LKL4	1 – 2	R3	100 Ω resistor
JP2	5 – 6	-	Jumper
JP2	21 – 22	-	Jumper

3. Fit the new configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches to the same settings as the DIP switches on the TMS2000 PCB.
5. Remove the EPROM IC56 from the TMS2000 and fit it into theTMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
6. Fit the new 80C32 processor in position IC51.
7. Fit the new GR881 non-volatile RAM into position IC52.
8. Slide out the SIW203 weight shelf to the service position.
9. Unplug the inlet air supply connector and note its location.
10. Disconnect the power cable from the shelf.
11. Remove the earth strap and slide the shelf out of the Quantum.
12. Note the positions of the connectors on the TMS2000, then remove them.
13. Remove the TMS2000, then remove and retain the EPROM IC56.
14. Fit the TMS2020 with the two 25 pin D connectors towards the front of the shelf.
15. Connect the cables to the TMS2020.
16. Refit and connect the power supply but do not connect the air supply.
17. Switch off the power and refit the shelf, earth strap and air supply.
18. Switch on and allow 30 minutes for the instrument to warm up.
19. Reconfigure and test.

4.22 Non-contact Length Shelf TMS2000 replacement to TMS2020



Non-contact Length Shelf TMS2000 replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Procedure

1. Fit jumpers to the TMS2020 and as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Using the following table and the photo opposite, solder resistors and fit links to the new configuration PCB.

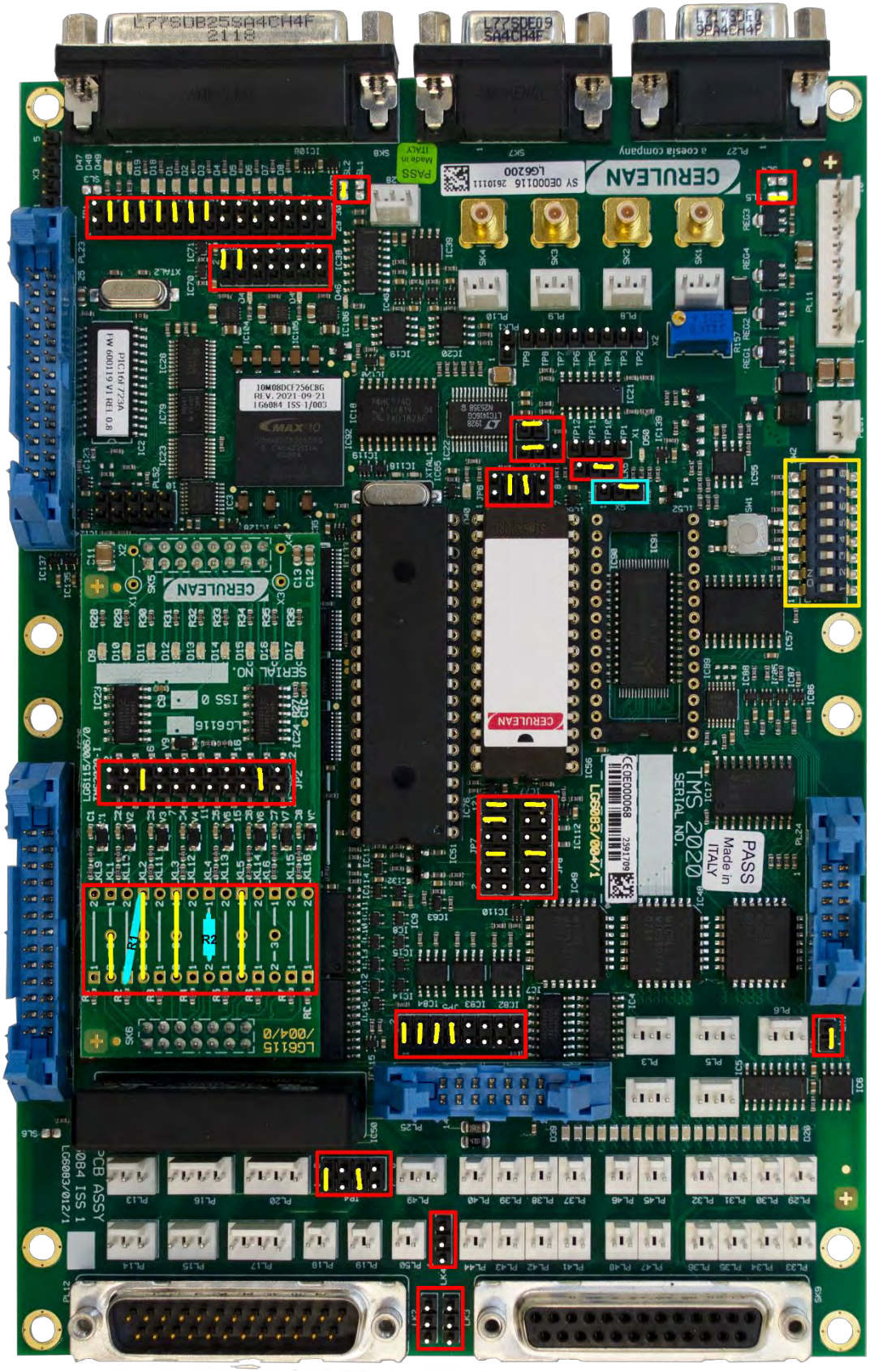
Link	Position	Resistor	Comment
LKL1	2 – 3	R1	Wire link
LKL2	1 – 2	-	Wire link
LKL2 to LKL10	LKL2 pin 1 – LKL10 pin 1	R2	3k3 resistor
LKL3	1 – 2	-	Wire link
LKL4	1 – 2	R3	100 Ω resistor
LKL9	1 – 2	-	1k resistor
LKL5	1 – 2	-	Wire link
JP2	5 – 6	-	Jumper
JP2	19 – 20	-	Jumper

3. Fit the new configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. Set the 8 way DIP switches to the same settings as the DIP switches on the TMS2000.
5. Remove the EPROM IC56 from the TMS2000 and fit it into theTMS2020.
   Important: Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
6. Fit the new 80C32 processor in position IC51.
7. Fit the new GR881 non-volatile RAM into position IC52.
8. Unplug the inlet sensor connector and note its location.
9. Remove each connector and using the following table, identify its position on the new TMS2020.

TMS2000	Connector type	Description
SK8	25 pin D socket	Main serial port
PL3	3 pin Molex	Auxiliary serial port 2
PL11	10 pin Molex	Power input
PL46	2 pin Molex	Single digital output
PL14	3 pin Molex	Single input (motor relay)
PL45	2 pin Molex	Single digital output (motor relay)
PL47	2 pin Molex	Single digital output (motor relay)
PL17	4 pin Molex	Single input (rod in sensor)
PL16	4 pin Molex	Single output (rod out sensor)
PL13	3 pin Molex	Single input LSB (slot sensors)

10. Remove the resistor kit mounted underneath IC51.
11. Fit the resistor kit shown below right into the socket IC51, then refit IC51 (on top of the resistor kit).
12. Remove IC52 and replace it with a DS1244Y+70.
13. Fit the TMS2020 and connect the cables.
14. Tighten the shelf stop, refit the input sensor and refit all the covers.
15. Refit and connect the power and air supplies.
16. Switch on and allow 30 minutes for the instrument to warm up.
17. Reconfigure and test.

4.23 Plasticizer SPZ100 and Moisture Density Shelf TMS2000 replacement to TMS2020



Plasticizer SPZ100 and Moisture Density Shelf TMS2000 replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite, then remove the Configuration PCB. Ensure the link in X5 (highlighted in blue) Is fitted as shown.
2. With reference to the following table and the photograph opposite, fir jumpers then solder resistors and links to the Configuration PCB.

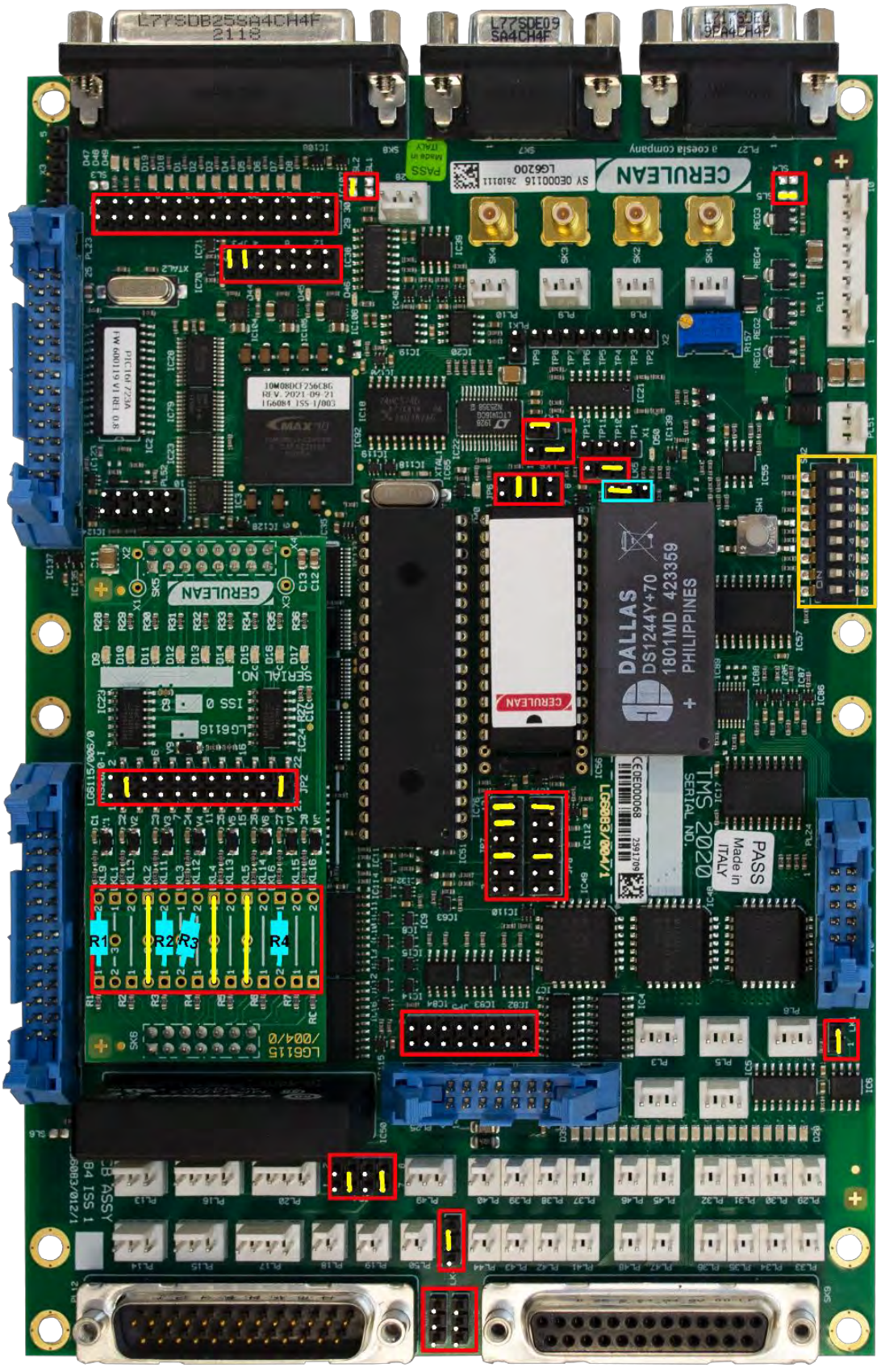
Link	Position	Resistor	Comment
LKL1	1 – 2		Wire link
LKL2	1 – 2		Wire link
LKL2 to LKL10	LKL2 pin 1 –		3k3 resistor
LKL3	1 – 2		Wire link
LKL4	1 – 2		100 Ω resistor
LKL13	1 – 2		1k resistor
LKL5	2 – 3		Wire link
JP2	5 – 6		Jumper
JP2	19 – 20		Jumper

3. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
4. If the instrument is used in stand-alone mode, note the configuration settings.
5. Unplug the inlet sensor connector and note its location.
6. Remove each connector and using the following table, identify its position on the new TMS2020.

TMS2000	Connector type	Description
SK8	25 pin D socket	Main serial port
PL3	3 pin Molex	Auxiliary serial port 2
PL11	10 pin Molex	Power input
PL46	2 pin Molex	Single digital output
PL14	3 pin Molex	Single input (motor relay)
PL45	2 pin Molex	Single digital output (motor relay)
PL47	2 pin Molex	Single digital output (motor relay)
PL17	4 pin Molex	Single input (rod in sensor)
PL16	4 pin Molex	Single input (rod out sensor)
PL13	3 pin Molex	Single input LSB (slot sensors)

7. Remove and retain IC51, IC52 and the EPROM IC56.
8. Fit the retained IC51 and IC52 on to the TMS2020.
9. Fit the retained EPROM to IC56. **Important:** Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
10. Fit the new TMS2020 to the measurement shelf and connect the cables.
11. Tighten the shelf stop, refit the input sensor and refit all the covers.
12. Reconnect the power and air supplies.
13. Switch on and allow 30 minutes for the instrument to warm up.
14. Reconfigure and test.

4.24 Laser Shelf STS100 / SMS100 / SMS200 TMS2000 replacement to TMS2020



For Byte switch settings please refer to P9

Laser Shelf STS100 / SMS100 / SMS200 TMS2000 replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite, then remove the Configuration PCB. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. With reference to the following table and the photograph opposite, fit jumpers then solder resistors and links to the Configuration PCB.

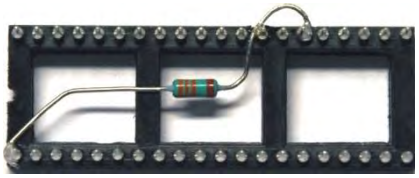
Link	Position	Resistor	Comment
LKL9	1 – 2	R1	1k resistor
LKL2	1 – 2	-	Wire link
LKL11	1 – 2	R2	1k resistor
LKL3	1 – 2	-	Wire link
LKL3 – LKL12	LKL3 – 2 to LKL12 – 2	R3	2k7 resistor
LKL4	1 – 2	-	Wire link
LKL5	1 – 2	-	Wire link
LKL6	1 – 2	R4	22 Ω resistor
JP2	3 – 4	-	Jumper
JP2	21 – 22	-	Jumper

Note:C1-C8 have to be removed from the Configuration PCB.

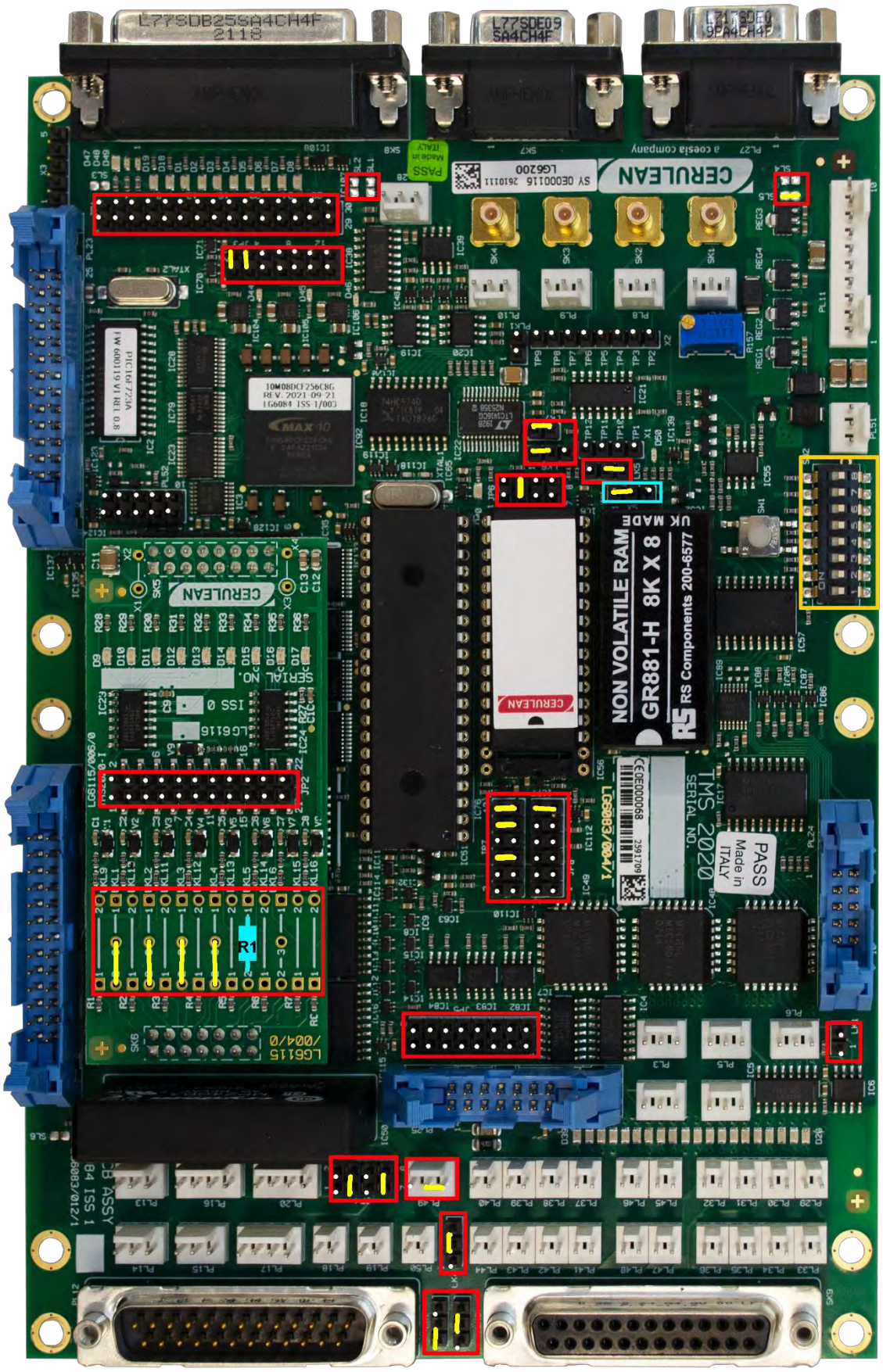
3. If the instrument is used in stand-alone mode, note the configuration settings.
4. Unplug the inlet sensor and note its location.
5. Remove each connector and using the following table, identify its position on the new TMS2020.

Description	TMS2000	Connector type
Main serial port	SK8	25 pin D socket
Auxiliary serial port 2	PL3	3 pin Molex
Power input	PL11	10 pin Molex
Single digital output	PL46	2 pin Molex
Single input (motor relay)	PL14	3 pin Molex
Single digital output (motor relay)	PL45	2 pin Molex
Single digital output (motor relay)	PL47	2 pin Molex
Single input (rod in sensor)	PL17	4 pin Molex
Single input (rod out sensor)	PL16	4 pin Molex
Single input LSB (slot sensors)	PL13	3 pin Molex

6. Remove and retain IC51, IC52 and the EPROM IC56.
7. Remove the resistor kit mounted underneath IC51.
8. Refit the Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
9. Fit the resistor (S/C LG377) shown right, into socket IC51, then refit IC51 (on top of the resistor kit) and IC52.
10. Fit the retained EPROM to IC56. **Important:** Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2000.
11. Refit the TMS2020 and connect the cables.
12. Tighten the shelf stop, refit the input sensor and refit all the covers.
13. Refit and connect the power and air supplies.
14. Switch on and allow 30 minutes for the instrument to warm up.
15. Reconfigure and test.



4.25 Non-contact Laser Length Shelf SNL200 TMS2000 replacement to TMS2020



Non-contact Laser Length Shelf SNL200 TMS2000 replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Procedure

1. If the instrument is used in stand-alone mode, note the configuration settings. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Remove each connector and using the following table, identify its position on the new TMS2020.

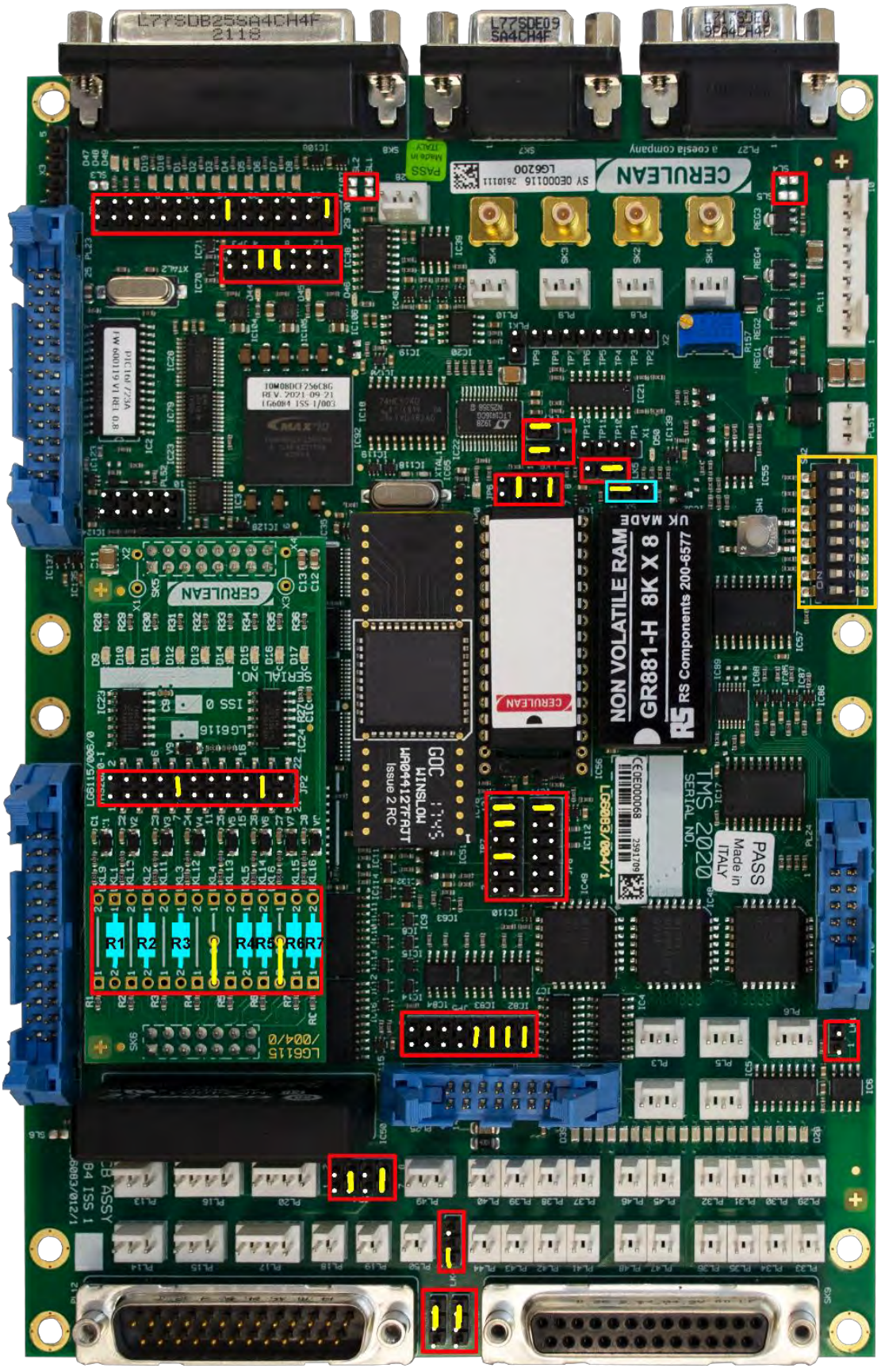
Description	TMS2000	Connector type
Main serial port	SK8	25 pin D socket
Multiple digital output	SK9	25 pin D socket
PX4 Platform 4 position sensor	PL13	3 pin Molex
PX3 Platform 3 position sensor	PL14	3 pin Molex
PX2 Platform 2 position sensor	PL15	3 pin Molex
PX1 Platform lift position sensor	PL16	4 pin Molex
TB1 Rod exit detect sensor	PL17	4 pin Molex
RS2 Platform datum position sensor	PL18	2 pin Molex
SW1 shelf position switch	PL19	2 pin Molex
RS1 Platform 1 position sensor	PL20	4 pin Molex
Auxiliary serial port 2	PL3	3 pin Molex
Power output	PL51	3 pin Molex
Power input	PL11	10 pin Molex

3. Remove and retain IC51, IC52 and the EPROM IC56.
4. Fit jumpers to the TMS2020 as shown in the photograph opposite, then remove the Configuration PCB.
5. With reference to the following table and the photograph opposite, solder a resistor and links to the Configuration PCB.

Link	Position	Resistor	Comment
LKL1	2 – 3	-	Wire link
LKL2	2 – 3	-	Wire link
LKL3	2 – 3	-	Wire link
LKL4	2 – 3	-	Wire link
LKL5	1 – 2	R1	330 Ω resistor

6. Fit the new Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
7. Refit IC51 and IC52.
8. Fit the retained EPROM to IC56. **Important:** Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
9. Refit the TMS2020 and connect the cables.
10. Tighten the shelf stop and refit all the covers.
11. Refit and connect the power and air supplies.
12. Switch on and allow 30 minutes for the instrument to warm up.
13. Reconfigure and test.

4.26 Quantum Neo TMS2000 replacement to TMS2020



Quantum Neo TMS2000 replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

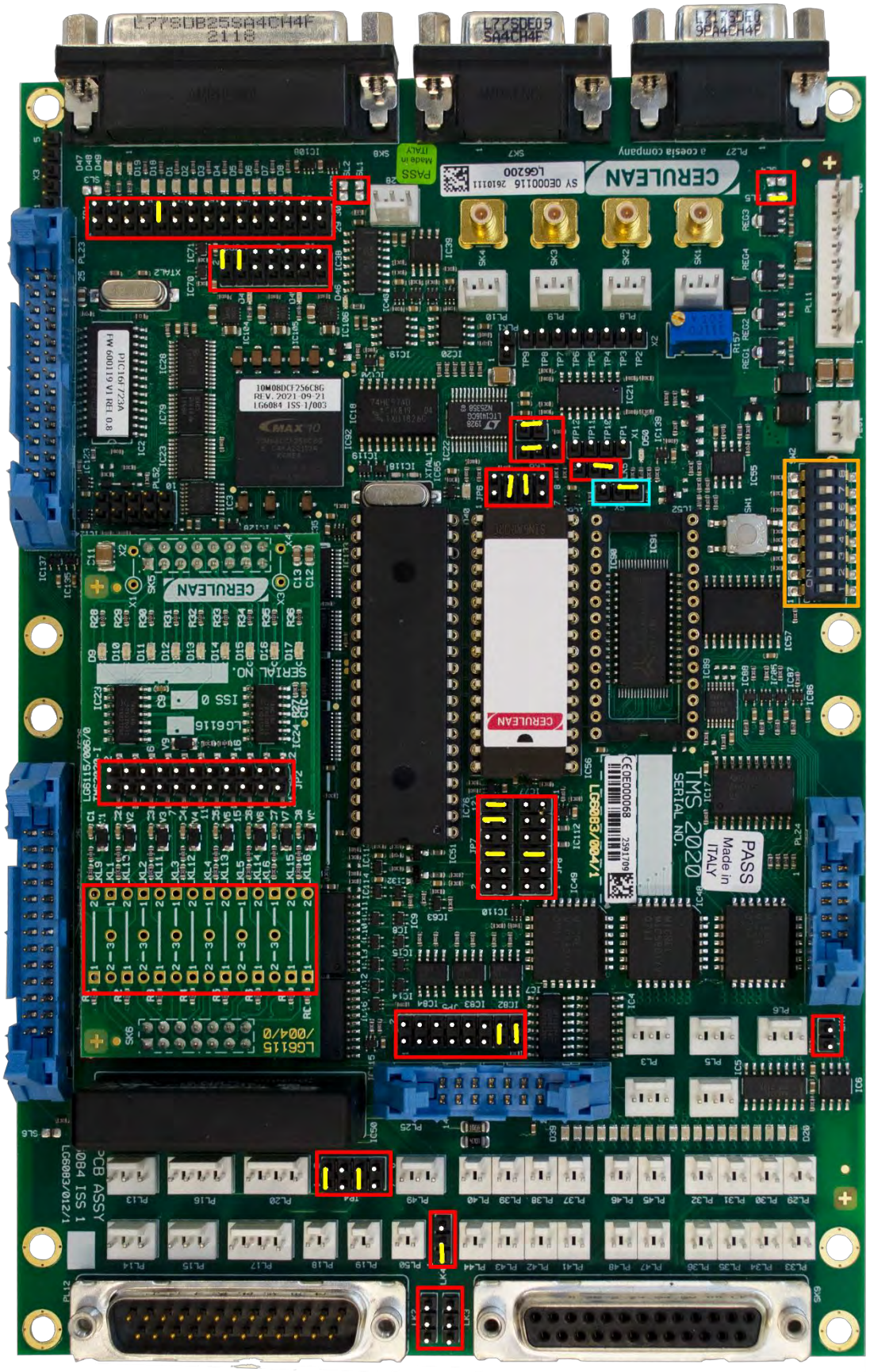
Procedure

1. Fit jumpers to the new TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) Is fitted as shown.
2. With reference to the following table and the photograph opposite, solder resistors and links to the new Configuration PCB.

Link	Position	Resistor	Comment
LKL4	2 – 3		Wire link
LKL6	2 – 3		Wire link
LKL1	1 – 2		330 Ω resistor
LKL2	1 – 2		330 Ω resistor
LKL3	1 – 2		180 Ω resistor
LKL5	1 – 2		100 Ω resistor
LKL14	1 – 2		1k2 resistor
LKL15	1 – 2		1k2 resistor
LKL16	1 – 2		1k2 resistor
JP2	9 – 10		Jumper
JP2	19 – 20		Jumper

3. Note the position of each connector, and remove it from the TMS2000.
4. Remove and retain IC51, IC52 and the EPROM IC56.
5. Ft the Configuration PCB to the TMS2020. **(Please refer to the safety section)**
6. Fit IC51 and IC52.
7. Fit the retained EPROM to IC56. **Important:** Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
8. Fit the new TMS2020 and connect the cables.
9. Refit all the covers.
10. Refit and connect the power and air supplies.
11. Switch on and allow 30 minutes for the instrument to warm up.
12. Reconfigure and test.

4.27 CETI 8 TMS2000 replacement to TMS2020



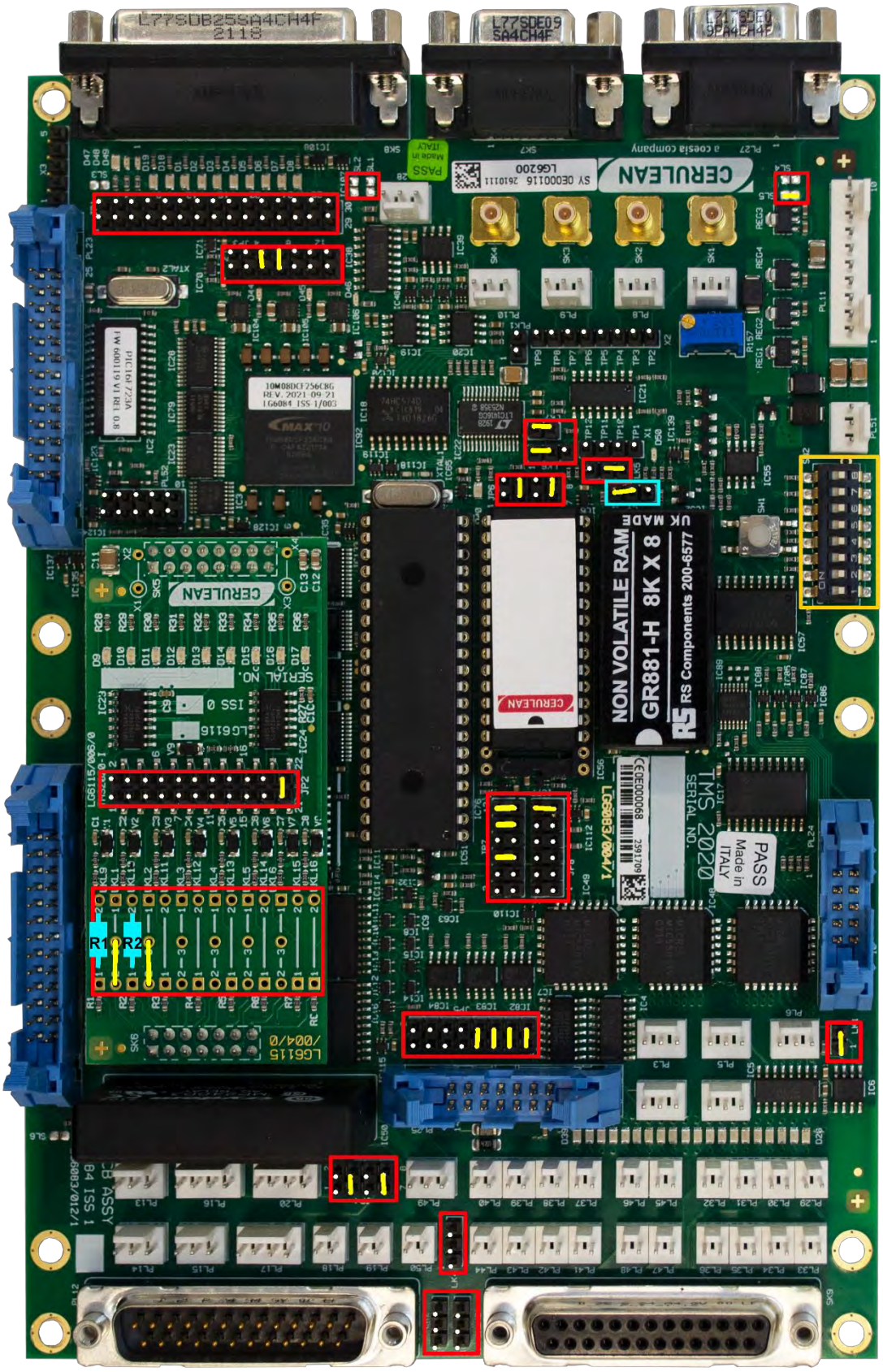
CETI 8 TMS2000 replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Procedure

1. Remove the cover from the CETI 8.
2. Make a note of the position of each connector on the TMS 2000, and remove the connectors.
3. Remove and retain IC51, IC52 and the EPROM IC56.
4. Fit jumpers to the new TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
5. Check that there are no resistors or wire links fitted to the Configuration PCB.
6. Refit the Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
7. Fit IC51 and IC52.
8. Fit the retained EPROM to IC56. **Important:** Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
9. Fit the new TMS2020 and reconnect the connectors removed in step 2.
10. Refit all the covers.
11. Reconnect the power and air supplies.
12. Check that the instrument works correctly.

4.28 Docking Station SDS100 TMS2000 replacement to TMS2020



Docking Station SDS100 TMS2000 replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

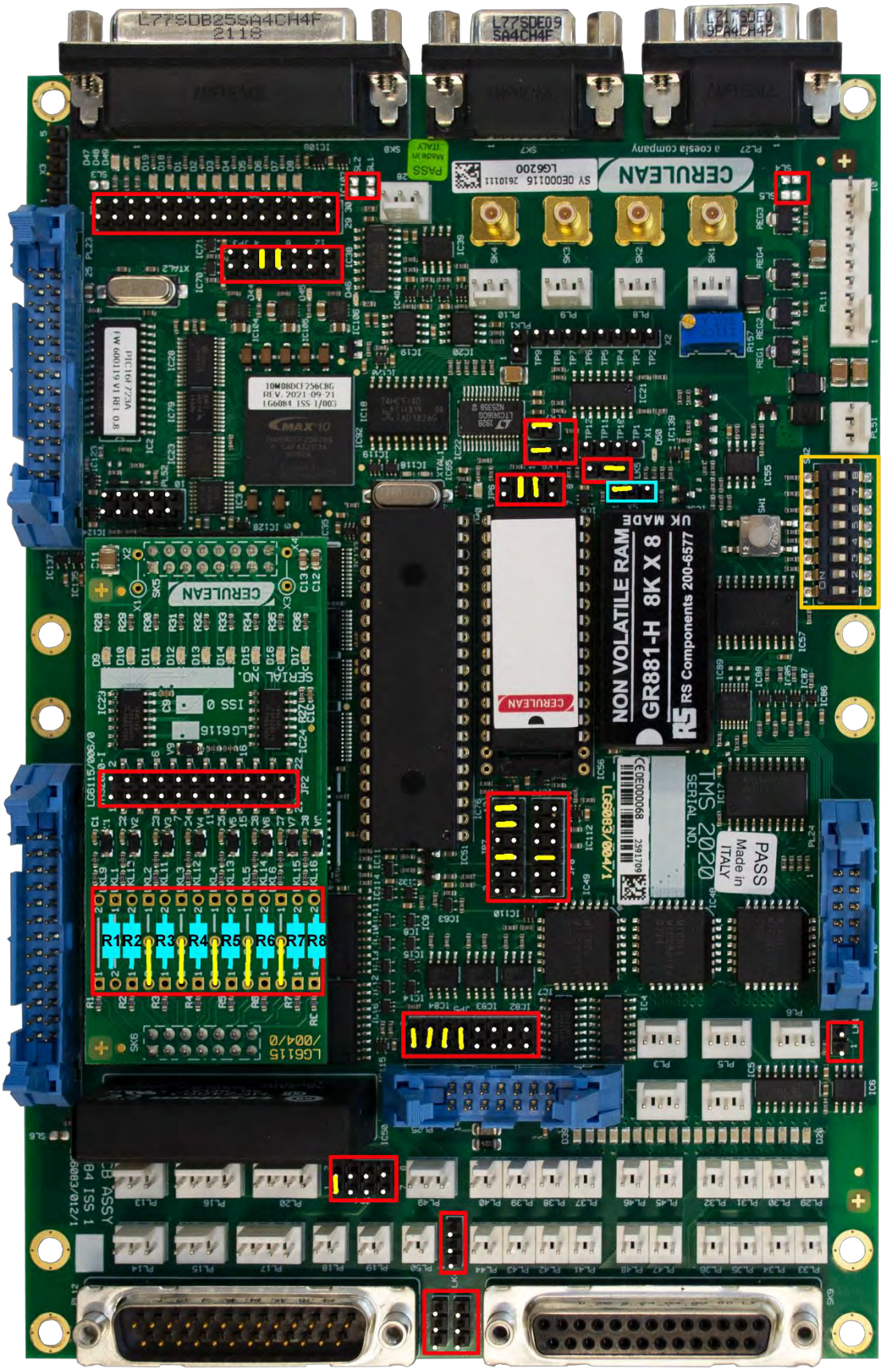
Procedure

1. Fit jumpers to the new TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. With reference to the following table and the photograph opposite, solder wire links and resistors and fit jumper to the configuration PCB.

Link	Position	Resistor	Comment
LKL9	1 – 2	R1	2k2 resistor
LKL1	2 – 3	-	Wire link
LKL10	1 – 2	R2	2k2 resistor
LKL2	2 – 3	-	Wire link
JP2	21 – 22	-	Jumper

3. Remove the cover from the docking station control box.
4. Make a note of the position of each connector on the TMS 2000 and remove the connectors.
5. Remove and retain IC51, IC52 and the EPROM IC56 from the TMS2000
6. Fit the Configuration PCB (daughterboard) to the new TMS2020. **(Please refer to the safety section)**
7. Fit the retained EPROM to IC56. **Important:** Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
8. Fit IC51 and IC52.
9. Fit the new TMS2020 and reconnect the connectors removed in step 4.
10. Refit the cover on the control box.
11. Reconnect the power and air supplies.
12. Check that the instrument works correctly.

4.29 Auto Sorter SAS100 TMS2000 replacement to TMS2020



Auto Sorter SAS100 TMS2000 replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

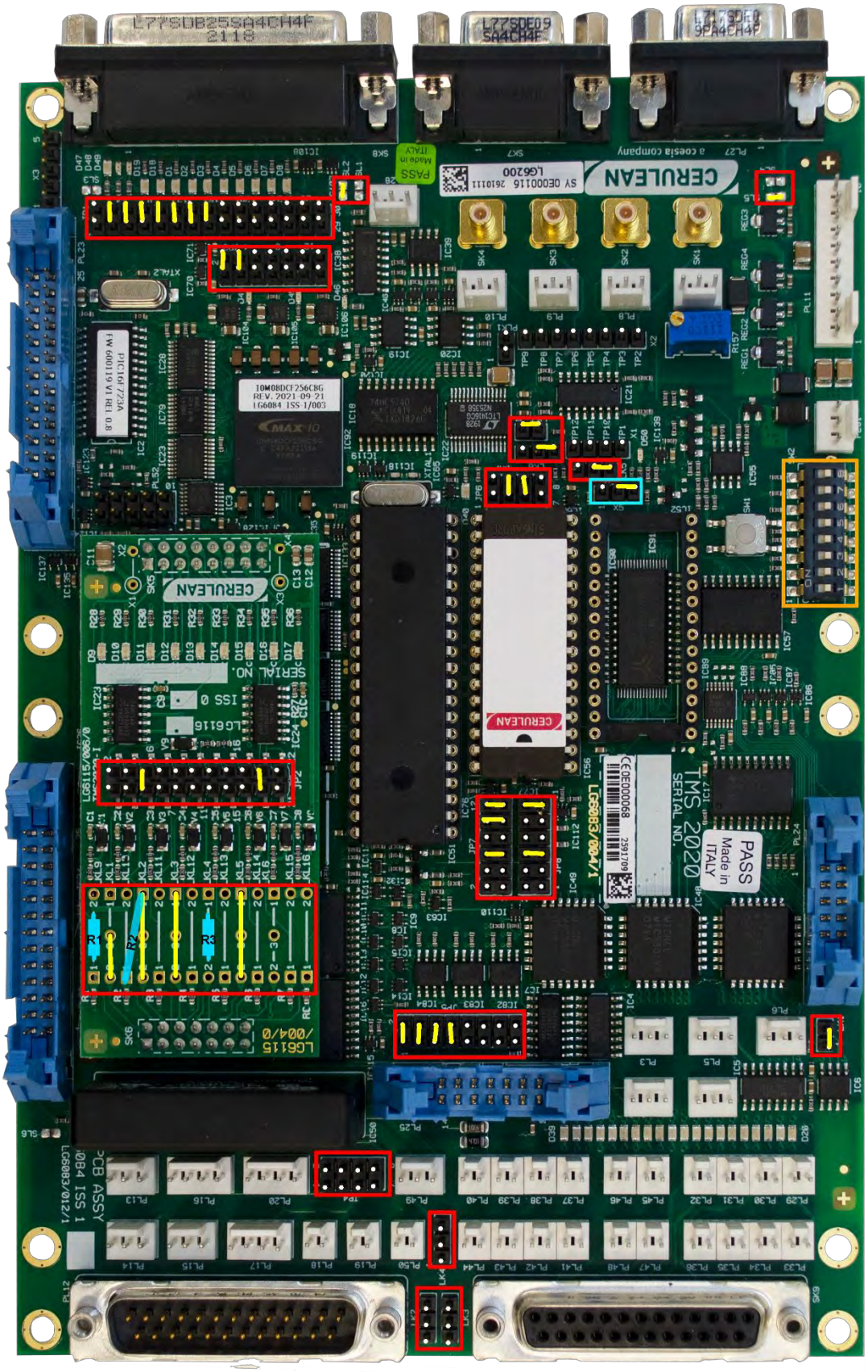
Procedure

1. Fit jumpers to the TMS2020 as shown in the photograph opposite. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. With reference to the following table and the photograph opposite, solder wire links and resistors to the Configuration PCB.

Link	Position	Resistor	Comment
LKL1	2 – 1	R1	100 Ω resistor
LKL10	1 – 2	R2	3k3 resistor
LKL2	2 – 3	-	Jumper
LKL11	1 – 2	R3	3k3 resistor
LKL3	2 – 3	-	Jumper
LKL12	1 – 2	R4	3k3 resistor
LKL4	2 – 3	-	Jumper
LKL13	1 – 2	R5	3k3 resistor
LKL5	2 – 3	-	Jumper
LKL14	1 – 2	R6	3k3 resistor
LKL6	2 – 3	-	Jumper
LKL15	1 – 2	R7	3k3 resistor
LKL16	1 – 2	R8	3K3 resistor
JP2	1 - 2	-	Jumper
JP2	21 - 22	-	Jumper

3. Slide out the SAS100 Auto Sorter shelf to the service position.
4. Unplug the inlet air supply connector and note its location.
5. Disconnect the power / communications cable from the shelf.
6. Note the positions of the connectors on the TMS2000, and then remove the connectors.
7. Remove the TMS2000.
8. Remove and retain IC51, IC52 and the EPROM IC56 from the TMS2000.
9. Fit IC51 and IC52 onto the new TMS2020.
10. Fit the retained EPROM to IC56. **Important:** Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
11. Refit the Configuration PCB (daughterboard) to the TMS2020. **(Please refer to the safety section)**
12. Fit the TMS2020.
13. Connect the cables to the TMS2020.
14. Refit the shelf.
15. Connect the power / communications cable and air supply connector.
16. Slide the shelf into the run position.
17. Switch on and allow 30 minutes for the instrument to warm up.

4.30 Moisture/Density/Length Shelf TMS2000 replacement to TMS2020



Moisture/Density/Length Shelf TMS2000 replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Components required

Description	Comment	Cerulean Stock Code	Qty
80C32 processor	Replacement for IC51	13349	1
GR881-150	NOVRAM to replace IC52	13323	1
EPROM	Firmware EPROM	13277	1
IC51 Resistor Kit	To be fitted under IC51	LG0377	1

Procedure

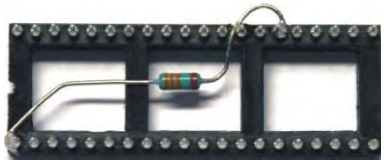
1. Fit jumpers to the TMS2020 as shown in the photograph opposite, then remove the Configuration PCB. Ensure the link in X5 (highlighted In blue) is fitted as shown.
2. With reference to the following table and the photograph opposite, fit jumpers then solder resistors and links to the Configuration PCB.

Link	Position	Resistor	Comment
LKL1	2 – 3	-	Wire link
LKL2	1 – 2	-	Wire link
LKL2 to LKL10	LKL2 pin 1 – LKL10 pin	R2	3k3 resistor
LKL3	1 – 2	-	Wire link
LKL4	1 – 2	R3	100 Ω resistor
LKL9	1 – 2	R1	1k resistor
LKL5	1 – 2	-	Wire link
JP2	5 – 6	-	Jumper
JP2	19 – 20	-	Jumper

3. If the instrument is used in stand-alone mode, note the configuration settings.
4. Unplug the inlet sensor connector and note its location.
5. Remove each connector and using the following table, identify its position on the new TMS2020.

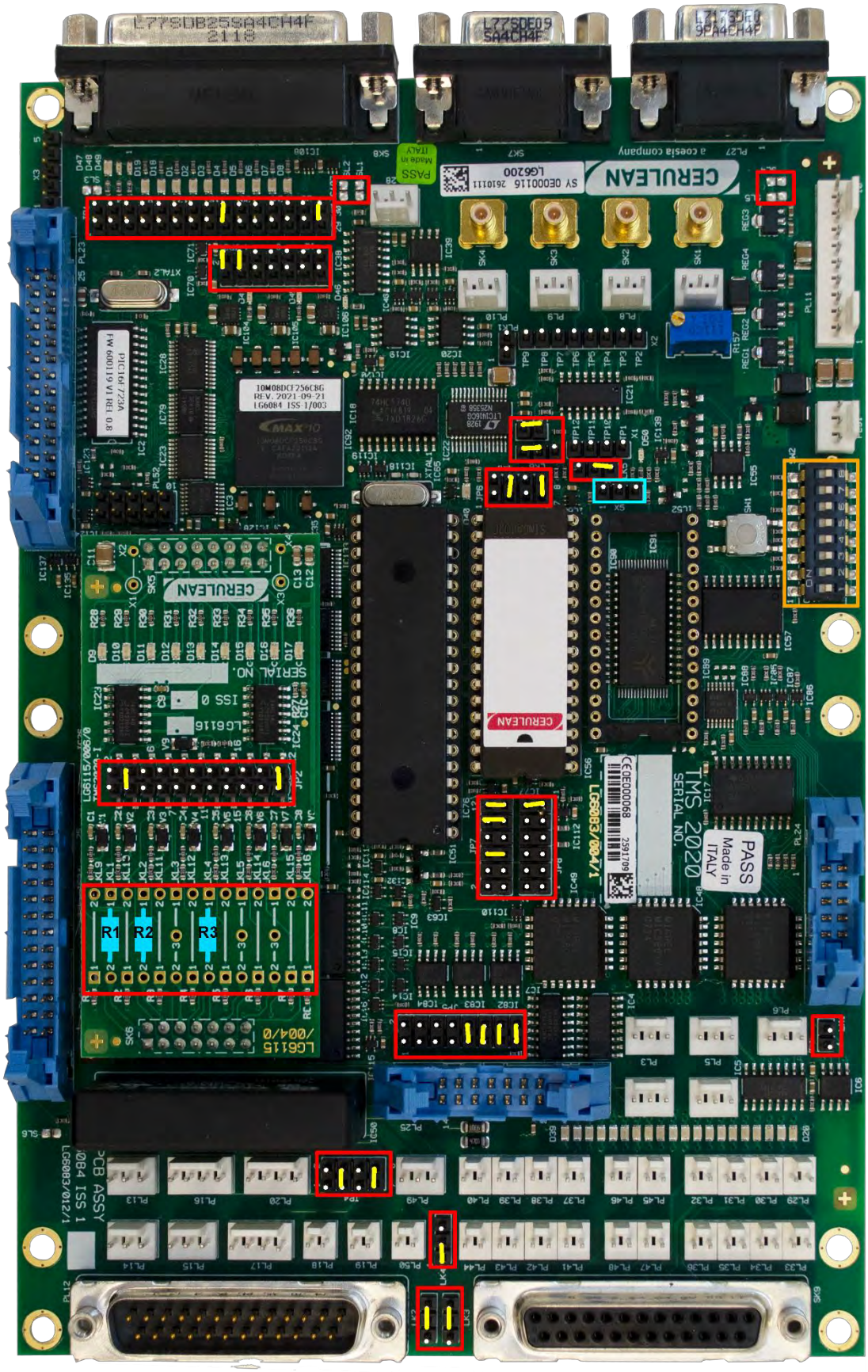
TMS2020	Connector type	Description
SK8	25 pin D socket	Main serial port
PL3	3 pin Molex	Auxiliary serial port 2
PL11	10 pin Molex	Power input
PL46	2 pin Molex	Single digital output
PL14	3 pin Molex	Single input (motor relay)
PL45	2 pin Molex	Single digital output (motor relay)
PL47	2 pin Molex	Single digital output (motor relay)
PL17	4 pin Molex	Single input (rod in sensor)
PL16	4 pin Molex	Single output (rod out sensor)
PL13	3 pin Molex	Single input LSB (slot sensors)

6. Remove and retain IC51, IC52 and the EPROM IC56.
7. Remove the resistor kit mounted underneath IC51.
8. Fit the Configuration PCB to the TMS2020.
9. Fit the resistor kit shown below right into the socket IC51, then refit IC51 (on top of the resistor kit).
10. Fit GR881-150 in position IC52.
11. Fit the retained EPROM to IC56. **Important:** Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
12. Fit the TMS2020 and connect the cables.
13. Tighten the shelf stop, refit the input sensor and refit all the covers.
14. Refit and connect the power and air supplies.
15. Switch on and allow 30 minutes for the instrument to warm up.
16. Reconfigure and test.



S/C 13948

4.31 Quantum Solo TMS2000 replacement to TMS2020



Quantum Solo TMS2000 replacement to TMS2020

Before starting, please refer to the general instructions on pages 6 to 9.

Procedure

1. Note the position of each connector, and remove it from the TMS2000. Ensure the link in X5 (highlighted in blue) is fitted as shown.
2. Remove and retain IC51 (13349), IC52 (13374) and the EPROM IC56 (13277).
3. Remove the TMS2000.
4. Fit jumpers to the new TMS2020 as shown in the photograph opposite.
5. With reference to the following table and the photograph opposite, solder resistors and links to the Configuration PCB.

Link	Position	Resistor	Comment
LKL1	1 – 2	R1	330 Ω resistor
LKL2	1 – 2	R2	330 Ω resistor
LKL4	1 – 2	R3	100 Ω resistor
JP2	3 – 4	-	Jumper
JP2	21 – 22	-	Jumper

6. Refit the Configuration PCB (daughterboard) to the TMS2020.
7. Refit IC51 and IC52.
8. Fit the retained EPROM to IC56. **Important:** Fit the IC so that pin **1** of the IC goes into pin **3** of the socket on the TMS2020.
9. Fit the new TMS2020 and connect the cables.
10. Refit all the covers.
11. Refit and connect the power and air supplies.
12. Switch on and allow 30 minutes for the instrument to warm up.
13. Reconfigure and test.

5 — TMS2000 GLOSSARY OF TERMS AND TEST POINTS

Glossary of terms

Term	Meaning
A – D	Analogue to Digital convertor
EPROM	Erasable Programmable Read Only Memory
ESD	Electrostatic Discharge
FRAM	Flash Random Access Memory
GND	Ground
i/o	Digital Input and Output
JP	Jumper Link
LED	Light Emitting Diode
LKL	Wire or resistor link
NOVRAM	Non-Volatile Random Access Memory
PIC	Programmable Integrated Circuit
PLA	Programmable Logic Array
RAM	Random Access Memory
ROM	Read Only Memory
SL	Solder Link
SSR	Solid State Relay
TMS	Tiny Micro System
TP	Test Point
UART	Universal Asynchronous Receive Transmit
V_{cc}	Logic Positive supply (+5V)
V_{reff}	Voltage Reference

Test Points

Test Point	Signal	Comment
TP1	Analogue ground	Not A – D ground
TP2	A – D input from SK1	Transducer 1
TP3	SK1 ground	Not analogue ground
TP4	A – D input from SK2	Transducer 2
TP5	SK2 ground	Not analogue ground
TP6	A – D input from SK3	Transducer 3
TP7	SK3 ground	Not analogue ground
TP8	A – D input from SK4	Transducer 4
TP9	SK4 ground	Not analogue ground
TP10	Voltage reference adjusted with R31	Set according to application
TP11	Analogue input (+) to A – D convertor	Post multiplex and attenuation
TP12	Analogue input (–) to A – D convertor	Post multiplex and attenuation

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