KEMPPI
The Joy of Welding

Service manual FastMig MXF feeders version 2.0

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WARNING!

Before removing any covers or commencing any testing or measurement disconnect the power source from the mains voltage

Wait at least one minute for the capacitors to become discharged.

The device may be repaired only by a person legally authorized to perform electric work.

Electrostatic Discharge

Electrostatic discharge (ESD) is phenomenon that occurs almost everywhere and often. At its most powerful, it is known as thunder and lightning electrical charges as high as one billion volts can be discharged between clouds or between clouds and the ground below. This type of electrical discharge cannot occur at normal ground level, of course.

Movement and friction generate static discharges of a few thousand volts in certain conditions. For example, stroking a cat can generate thousands of volts.

Electronic appliances welding machines included are now designed and manufactured in ways that take into account the ESD problem. It is only apparent when an appliance is taken apart for servicing. At that time the ground terminal is often disconnected and sensitive electronic components can be prone to electrostatic discharge. The best way to protect against ESD when handling electronic cards or microchips is an earth connection. You frequently hear of people who wonder why a new, unused electronic card works at first and then stops working afterwards. The reason may well be that some of its components are damaged by ESD. Memory circuits are especially sensitive. It may be that a memory circuit damaged by ESD breaks down only weeks later. It looks like a software problem but in fact it is a tiny defect in the memory circuit itself.

A simple, effective enough way to protect against ESD is to wear an earth bracelet when handling electronic circuits or cards. The bracelet is earthed to the frame of the appliance being serviced. An equally important shielding device is an earth pad on the workbench. Also wearing clothing manufactured from natural fiber (cotton) decreases electrical charging.

All Kemppi factory parts susceptible to ESD (e.g. control cards) are delivered in packaging or pouches that protect and earth the components. Packets and pouches carry yellow ESD labels. Parts susceptible to ESD must be kept in their original packages only removed just before installation.

Parts subject to ESD are labelled as such.

Article taken and abridged from Kemppi PRONEWS

Tools and testing equipments

While repairing Kemppi machines there is no need to have any special hand tools. Most of the work can be done with normal workshop tools and testing can be done by digital multimeter and Kemppi Multipower or a standard workshop power source.

Hand tools and accessories:
Metric combination wrenches 8-19mm, 28mm
Screwdrivers: flat 0,5 x 3mm and torx T10-T25
Needle-nose pliers
Side cutters
Cable ties





Testing equipments:
Digital multimeter True RMS (800VDC, 600VAC for safe operation)
Regular workshop power source (with 50VDC output) or Kemppi Multipower (50VDC)

Useful extra tools:
Digital oscilloscope 10MHz or greater

General service procedure

It is recommended that a systematic method is used on all repair or maintenance work, each repair is a special case and should be handled as required, but by following a routine, less mistakes and safety issues will occur. Here is an example of a general routine:

1. General troubleshooting
2. Static tests
3. Repair work
4. Test welding

Always try to isolate failure to certain blocks. This manual has several tests to make conclusions and to isolate the problem. Be careful not to make assumptions, because it might lead you to change the wrong parts.

General troubleshooting

Always try to get a detailed description of the complaint!

This troubleshooting guide is to remind the service technician, to check the simple things first, a visual inspection can often help with fault finding. If visual damage can be seen, replace all broken parts. If everything looks normal, or broken parts are changed, it is recommended, that a low voltage test is carried out.

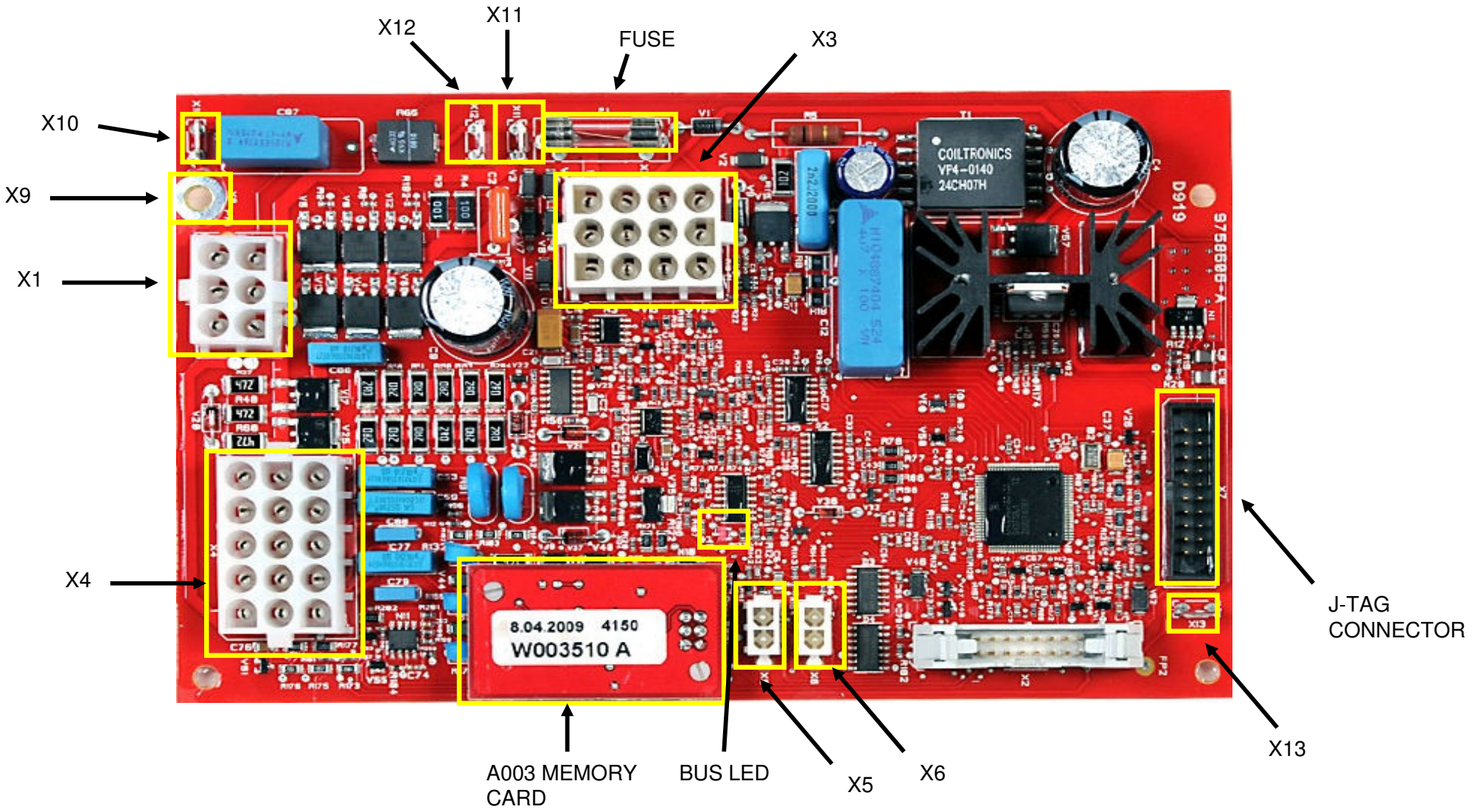
Disconnect the machine from the input supply and remove covers, then check:

- Are there any breaks in the cables?
- Are the cables correctly connected?
- Are there any loose components?
- Are mains fuses/circuit breakers OK & correct valves?
- Any signs of burning or arching?

Connect the machine to the mains input supply and check:

- Is there a stable 50VDC input inside the machine?
- Is the machine in shut down mode?
- Is there any error codes?
- Are the user settings OK?

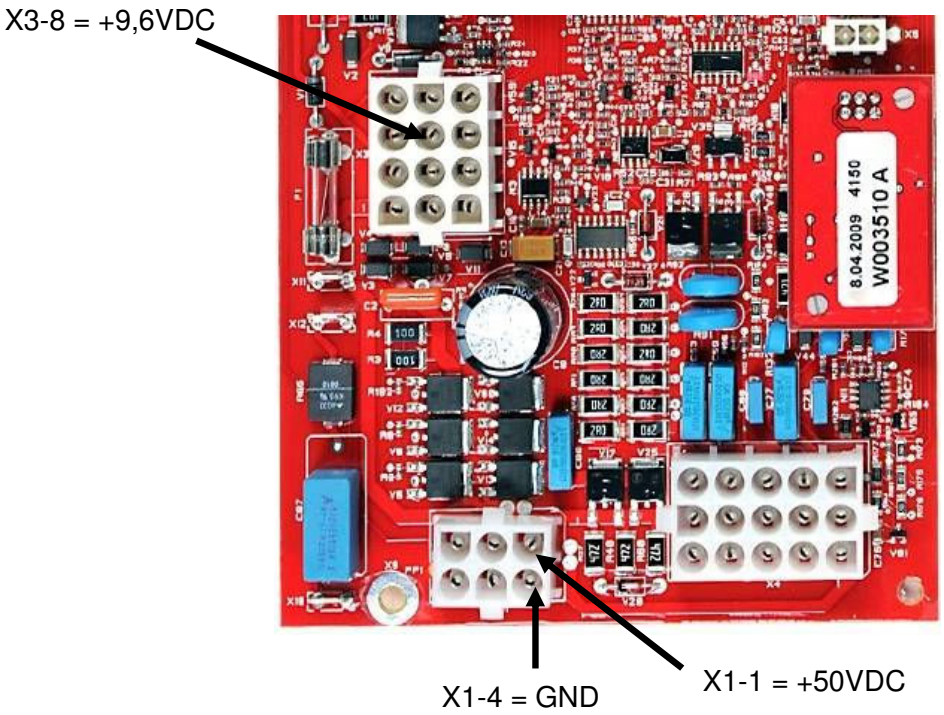
Motor Control Card A001 layout

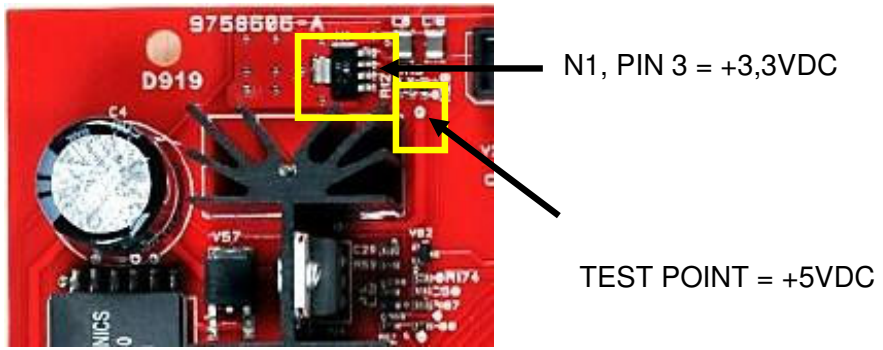


Motor control card A001 voltages

A001 motor control card power supply generates several voltages from +50VDC. These voltages can be measured in several points. Ground is located in X1-4.

- +50VDC CAN bus voltage in X1-1 (in upper right corner)
- +9,6VDC in X3-8 (third row from bottom, second column from left)
- +5VDC in test point
- +3,3VDC in regulator N2 pin 3 (third from bottom)
    - Note! Be careful when measuring voltage to avoid unnecessary short circuit.





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Motor voltage

Motor voltage can be measured by oscilloscope and DMM. Creep start have to be switched off to measure needed voltages.

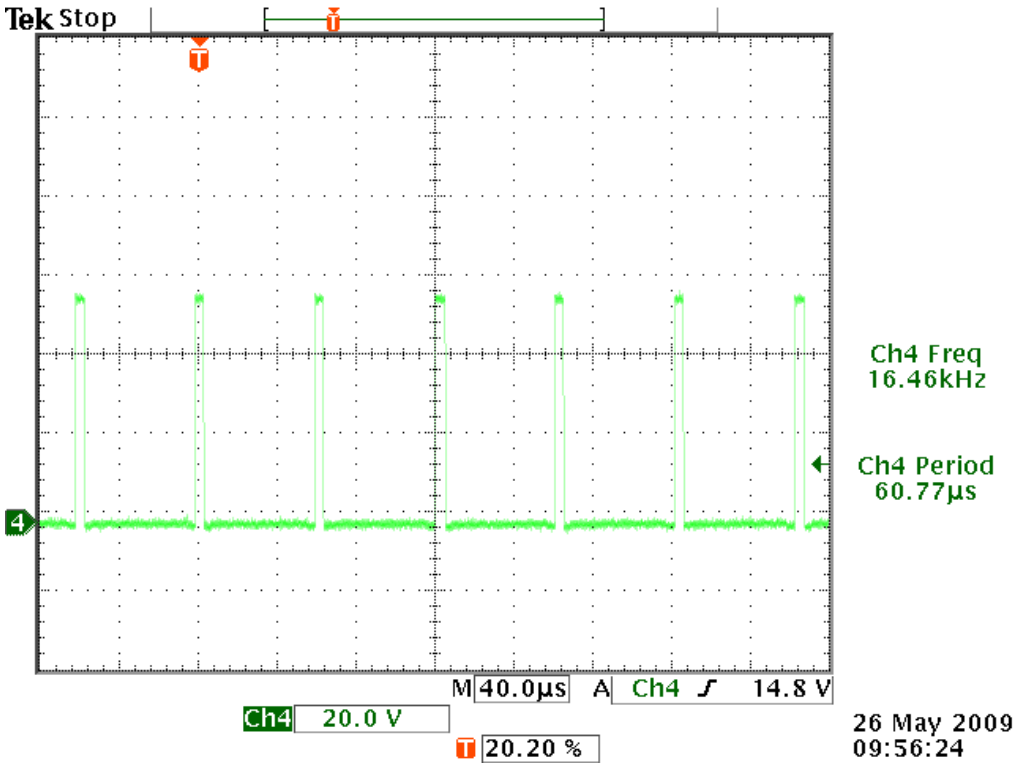
- To change this function:
  - Use power source setup panel and select
  - Edit channel
  - Welding functions
  - Values: 10-99%, off, curve,
    - select off

Motor voltage by oscilloscope:

- Measuring points:
  - X4-3 motor voltage positive
  - X4-15 motor voltage negative
- See attached oscilloscope picture:
  - Pulse width depends on set value
  - Voltage peak value +50VDC (CAN bus voltage)

Motor voltage by DMM:

- Measuring points:
  - X4-3 motor voltage positive
  - X4-15 motor voltage negative
- Wire feed speed is comparable to motor voltage
  - Approx 1V = 1m/min



Tacho signal

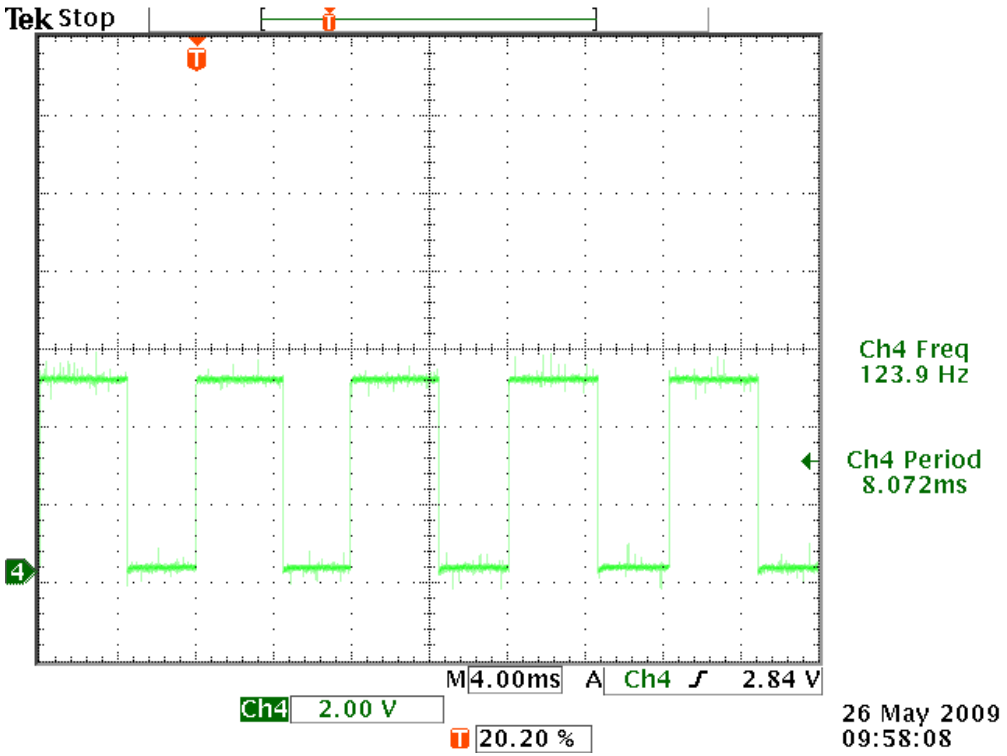
Tacho signal can be measured by oscilloscope and DMM

Tacho signal by oscilloscope:

- Measuring points:
  - X1-5 ground
  - X1-6 tacho signal
- Signal may vary
  - Voltage range 0-5V
  - Duty cycle 50%
  - Frequency range 25-600Hz

Tacho signal by DMM:

- Measuring points:
  - X1-5 ground
  - X1-6 tacho signal
- Wire feed motor static tacho signal 5VDC
  - 5m/min – 2,7VDC
  - 10m/min – 2,65VDC
  - 15m/min – 2,6VDC
  - 20m/min – 2,5VDC
  - 25m/min – 2,45VDC



Note! Wire feed motor running at a very fast speed, could mean a problem with the tacho feedback signal .

Gas valve control

Gas valve control can be measured by oscilloscope and DMM.

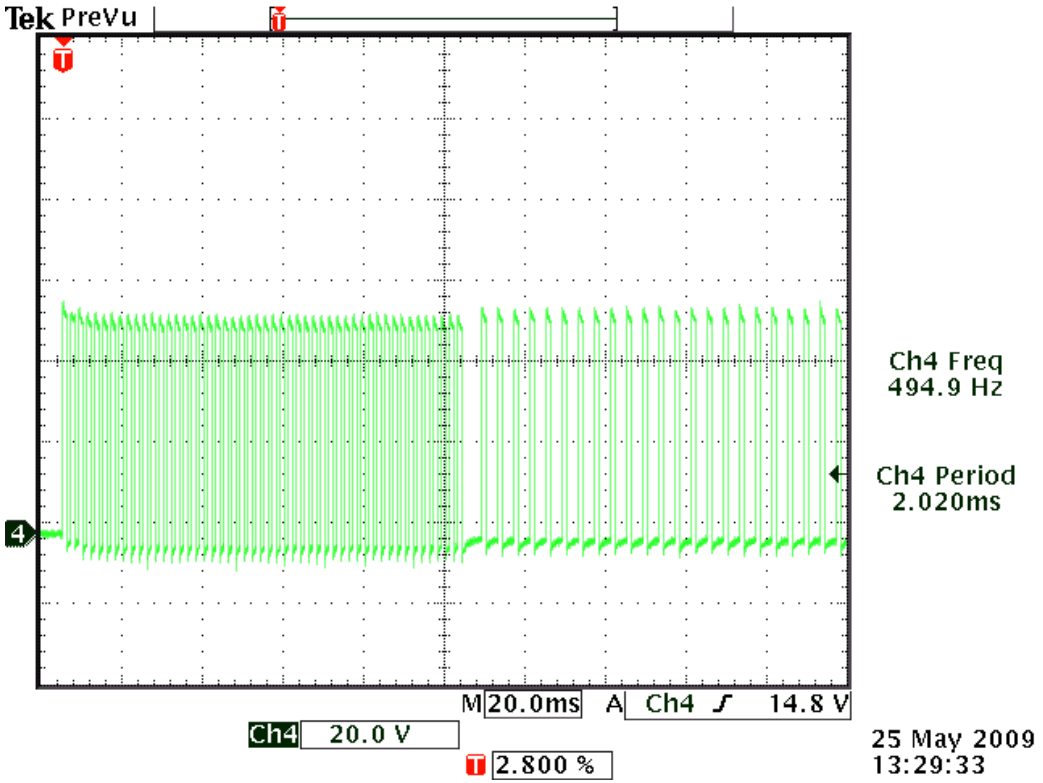
Gas valve control by oscilloscope:

- Measuring points
  - X4-10 gas valve ground
  - X4-12 gas valve positive
- Gas valve control is two stage:
  - Duty cycle:
    - First 100ms 500Hz, 50%
    - Then 250Hz, 25%
  - Voltage peak value +50VDC (CAN bus voltage)

Gas valve control by DMM:

- Measuring points
  - X4-10 gas valve ground
  - X4-12 gas valve positive
- Can be measured only a second stage
- Voltage cam be calculated from following equation:

$$U_{25\%} = 0{,}25 \times 50VDC = 12{,}5VDC$$



Motor control card A001 connectors

Connector/pin	Connector type	Description
X1/1	6-pin wire to board	Bus 50V
X1/2	MATE-N-LOCK	Bus 50V
X1/3		Tacho 5V
X1/4		Gnd
X1/5		Gnd
X1/6		Tacho signal

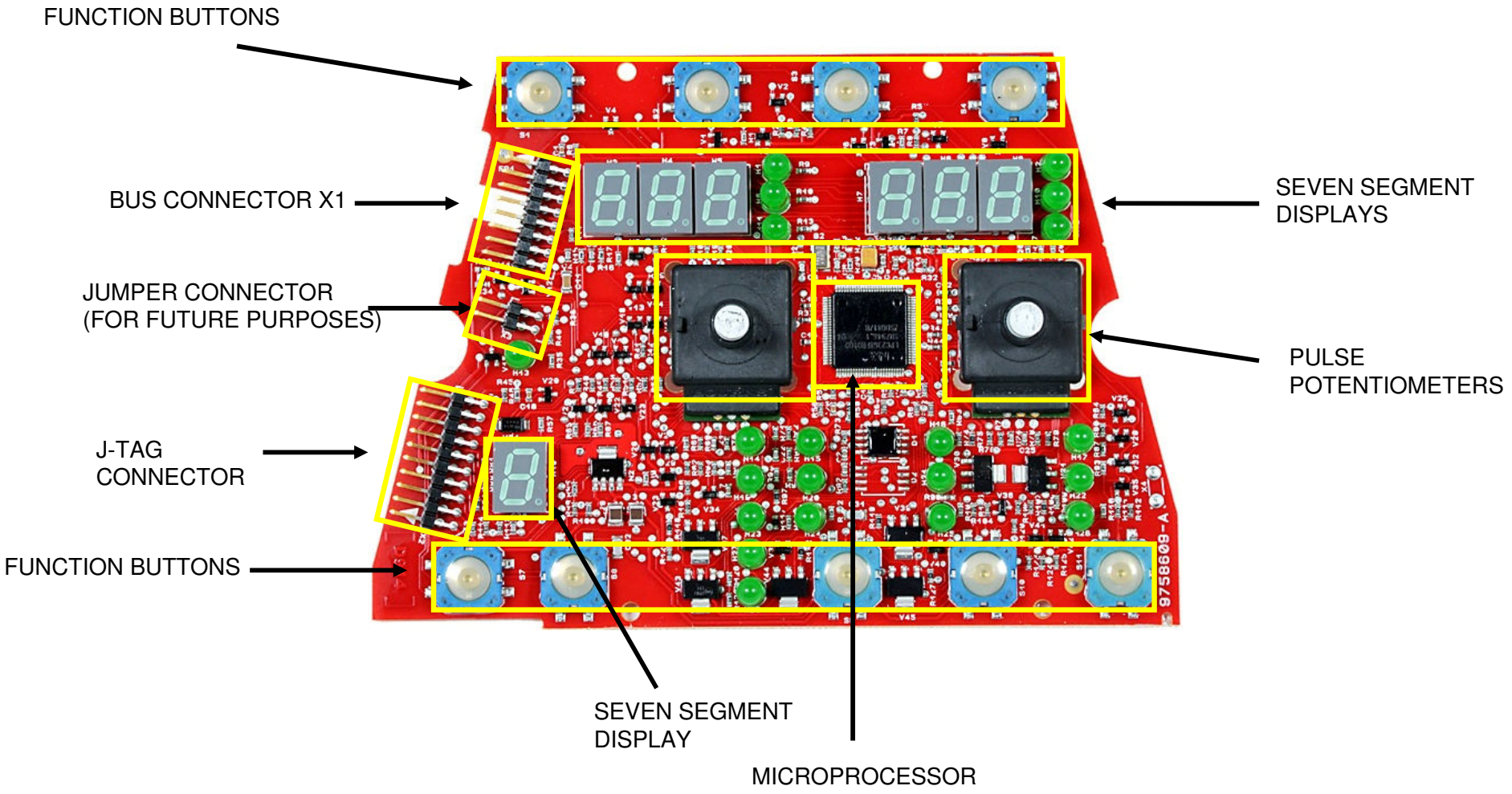
Connector/pin	Connector type	Description
X3/1	12-pin wire to board	50V
X3/2	MATE-N-LOCK	-
X3/3		Motor+
X3/4		-
X3/5		Gnd
X3/6		SubMotor-
X3/7		Res.
X3/8		9V
X3/9		SubMotor +
X3/10		Meas EMF Sub
X3/11		Sub Tacho
X3/12		Sub Control

Connector/pin	Connector type	Description
X4/1	15-pin wire to board	Pot Gnd
X4/2	MATE-N-LOCK	Start 2
X4/3		Motor +
X4/4		Pot2 0-5VDC
X4/5		Start 1
X4/6		Pot 5V
X4/7		ID-Bus 2
X4/8		Can Data
X4/9		Can Data
X4/10		Gas Valve Gnd
X4/11		Pot1 0-5VDC
X4/12		Gas Valve +
X4/13		ID-Bus 1
X4/14		GND
X4/15		Motor -

Motor control card A001 connectors

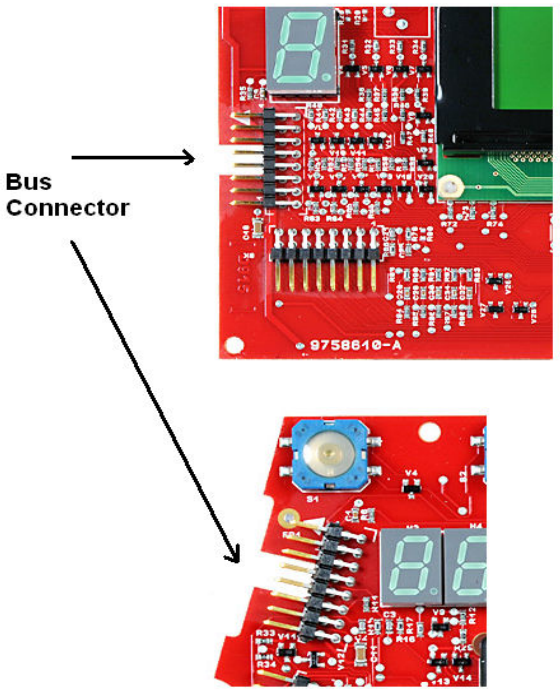
Connector/pin	Connector type	Description
X5/1	2-pin wire to board	Gas guard (+)
X5/2	MATE-N-LOCK2	Gas guard (-)
X6/1	2-pin wire to board	Door switch (+)
X6/2	MATE-N-LOCK2	Door switch (-)
X7	20-pin box header	JTAG (production programming)
X8	6-pin header	Memory board connector
X9	Plated PCB hole	Chassis ground
X10	Tab terminal 6,3mm	Chassis ground
X11	Tab terminal 6,3mm	Spool space heater (+)
X12	Tab terminal 6,3mm	Spool space heater (-)
X13	Tab terminal 6,3mm	GND, panel board

Welding panel card P001 layout



Welding panel card P001 connectors and testing

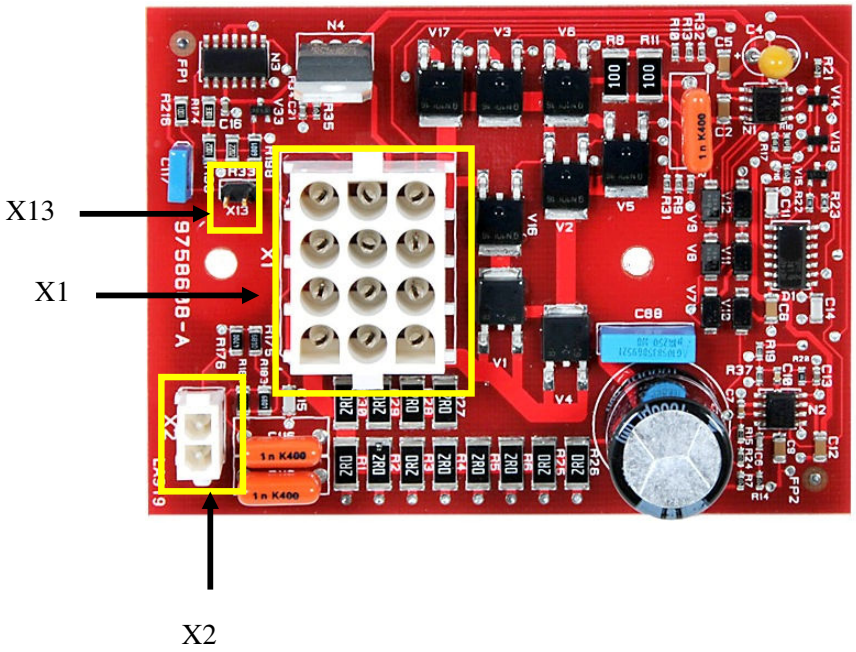
PF65 (X1) and P65 (X1) CAN bus interfaces are identical. Both Panels use CAN interface and KeBus protocol.



Connector/pin	Connector type	Description
X1/1	Pin header, 2.54mm	Not connected
X1/2	Pin header, 2.54mm	Not connected
X1/3	Pin header, 2.54mm	Not connected
X11/4	Pin header, 2.54mm	Not connected
X1/5	Pin header, 2.54mm	WF number
X1/6	Pin header, 2.54mm	CAN transfer
X1/7	Pin header, 2.54mm	GND
X1/8	Pin header, 2.54mm	CAN receive
X1/9	Pin header, 2.54mm	Not connected
X1/10	Pin header, 2.54mm	Not connected
X1/11	Pin header, 2.54mm	Not connected
X1/12	Pin header, 2.54mm	Not connected
X1/13	Pin header, 2.54mm	Not connected
X1/14	Pin header, 2.54mm	Not connected
X1/15	Pin header, 2.54mm	+5VDC
X1/16	Pin header, 2.54mm	GND

When panel starts all LEDs light and all the display segments should be on, during this period of any of the buttons are pressed, all led light turn off and panel software version number is shown in display. This function can be used to test the panel buttons and LEDs/displays. This test mode is only possible when panel is starting

Sync card A004 layout and connectors



Connector/pin	Connector type	Description
X1/1	12-pin wire to board	+50V
X1/2	MATE-N-LOCK	Motor (-), Motor pistol
X1/3		Not Connected
X1/4		Motor (-), Sub feeder
X1/5		Current sense
X1/6		GND
X1/7		Motor (+)
X1/8		+9V
X1/9		Motor voltage
X1/10		EMF-control
X1/11		Tacho signal, output
X1/12		Motor voltage control
X2/1	2-pin wire to board	Tacho signal, input
X2/2	MATE-N-LOCK2	GND
X13/1	Pin header, 2.54mm	Tacho signal control
X13/2		

Sync card A004 voltages

SuperSnake sync card has two input voltages and control signal to motor speed. Lack of these voltages may be the problem in connections (between the A001 and A004) or in the feeder A001 control card itself.

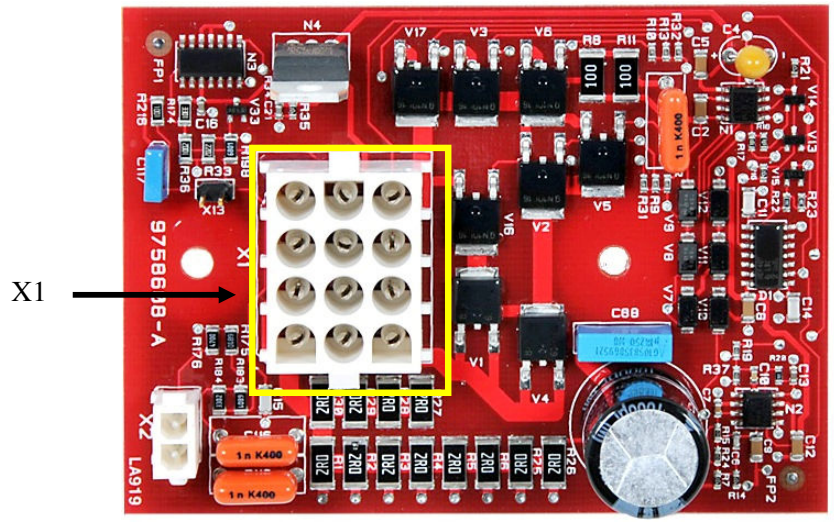
- GND is located in A004 sync card connector X1-6

Voltage to feeding motor power supply:
- +50VDC in A004 sync card connector X1-1

If voltage is missing, sub feeder motor won't be running.

Voltage to feeding motor control electronics:
- +9VDC in A004 sync card connector X1-8

If voltage is missing, sub feeder motor won't be running

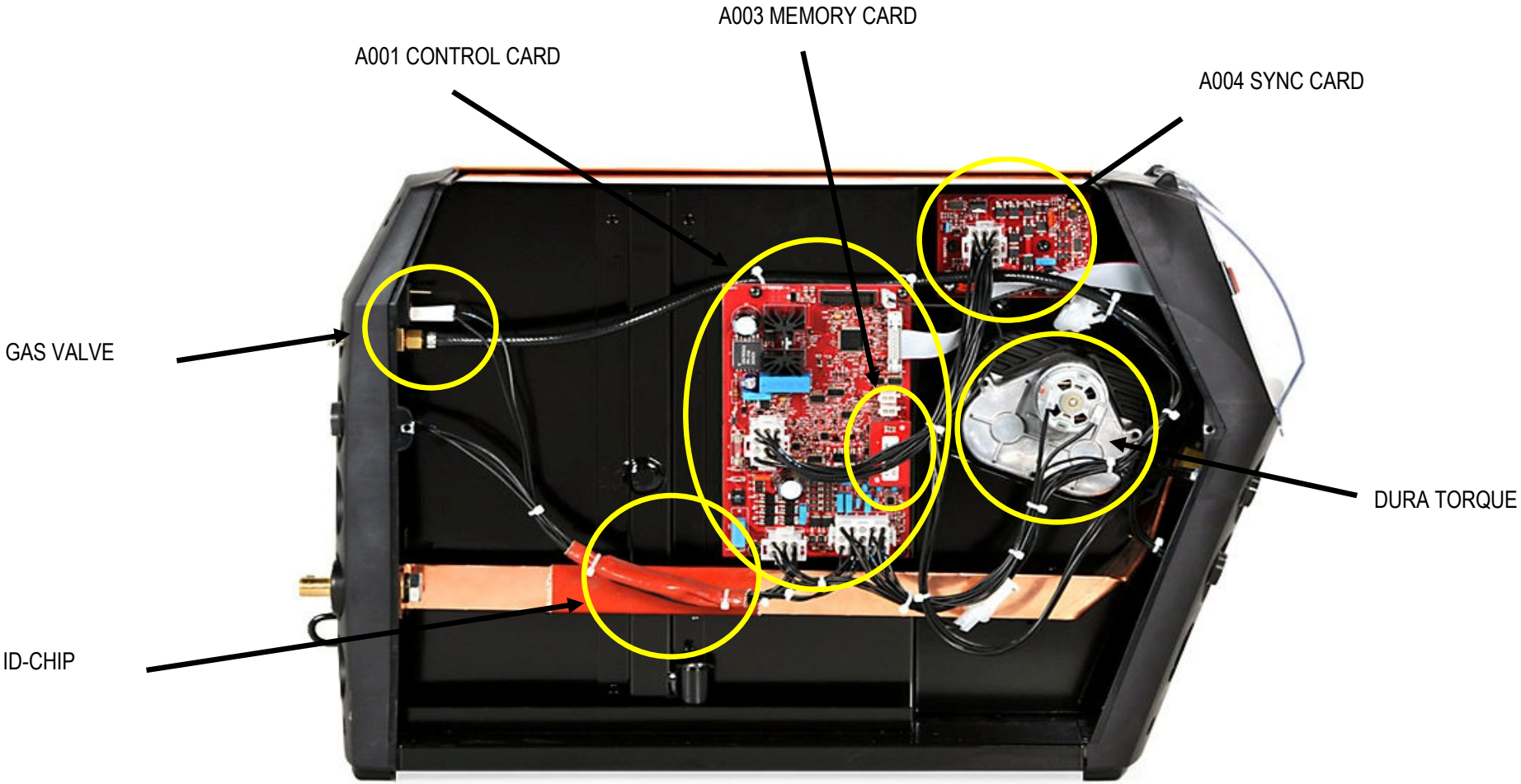


Motor speed control signal:
- Voltage range is between 0-4,5VDC in connector X1-12
- 0VDC = motor stopped
- Any voltage = motor should be running, higher value – faster speed

If connection is lost motor will be running at very fast speed and probably won't stop

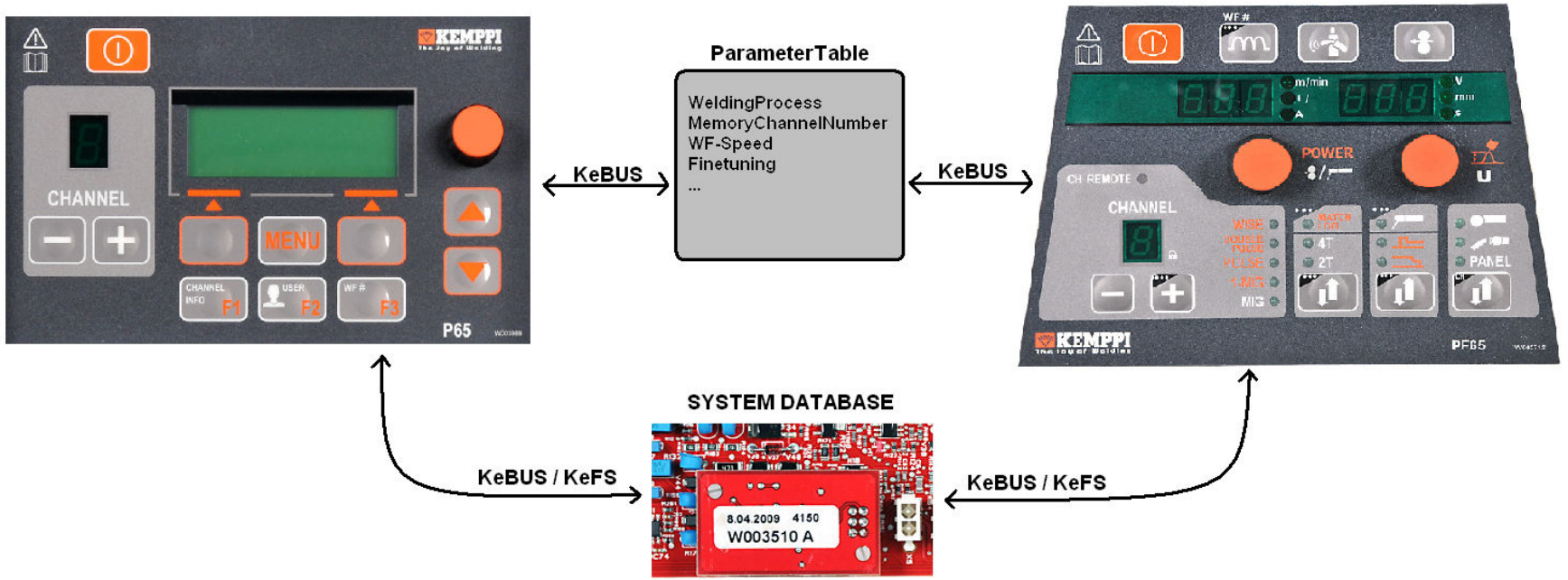
Note! If X1-9 is disconnected, voltage feedback is lost and wire feed motor runs at very fast speed <u>but</u> it stops when start is disconnected.

Construction, left side



Construction, right side

Panel communication



KeBus (Kemppi BUS)
- System BUS that controls Parameter and File transfer.

KeFS (Kemppi File System)
- System function that controls file transfer.

Parameter Table (Parameter Memory)
- Panels use ParameterTable to direct panel to panel communication.

System Database (System Memory)
- 10 users 10 Memory channels.
- 10 users 10 Recall memory channels (used in restore user settings).
- Setup parameters.
- Other system setting (Error log, Curves…)

Fastmig Pulse compatibility

Fastmig pulse family and SuperSnake can be used with synergic family with some limitations:

- SuperSnake won't work with KMS + MSF + SF
- MSF feeders won't work with FM Pulse power source
- New MXF welding panel PF65 won't work on MSF

	FM Pulse	FM KMS	FM KM
MXF 65	yes	yes	no
MXF 67	yes	yes	no
MSF 55	no	yes	no
MSF 57	no	yes	no
MF 29	no	no	yes

Power source and feeder compatibility

	SuperSnake & MXF Sync 65
MXF 65	yes
MXF 67	yes
MSF 55	no
MSF 57	no
MF 29	no

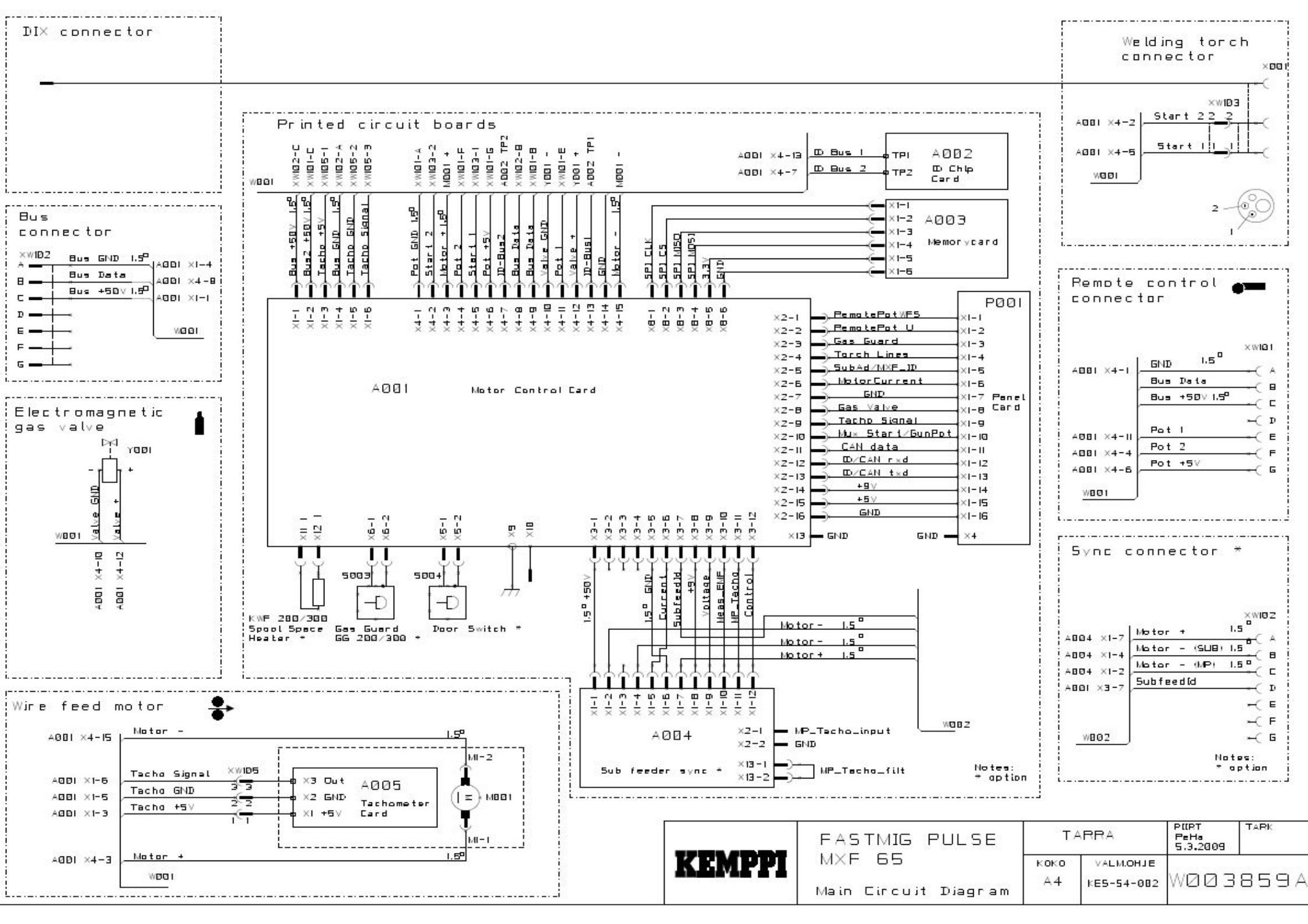
Feeder and SuperSnake compatibility

	SF 53	SF 54	PF 65
MXF 65	yes	yes	yes
MXF 67	yes	yes	yes
MSF 55	yes	yes	no
MSF 57	yes	yes	no
MF 29	no	no	no

Feeder and panel compatibility

Error codes

Error	Problem description	Solution description
Err 1	Power source not calibrated or calibration data cannot be read	Restart power source, if the problem continues after multiple startups, check the power source control cards.
Err 3	Over voltage, mains supply	Check the main voltage.
Err 4	Over heat, power source	Do not shut down the machine, cooling fans will cool the machine. Check the ventilation. If cooling fans are not running, check the power source connections and voltages.
Err 5	Auxiliary voltage +15VDC too low (control card led H9 +15VDC)	Main supply voltage is too low or aux supply faulty, check the main/aux supplies. Can show up also if one of the mains phases is missing. Note! Only one of the three phases can affect this error if missing (one where aux transformer is NOT connected).
Err 8	FPGA not configured	Restart the power source, if the problem continues after multiple startups check the power source control cards.
Err 27	Water cooler error	Check the water cooler connections and functions. For more details check the cooler service manual.
Err 42	WF Motor over current warning, delayed fault at 3,5A	Check the gun and the consumable parts.
Err 43	WF Motor over current error, delayed lock at 5A	Check the gun and the consumable parts.
Err 45	Gas guard alert (only if gas guard connected and activated)	Check the shielding gas, gas guard and all the connections.
Err 50	Function is not activated	If function is required, please order proper license.
Err 62	Power source not connected or not identified	Check the intermediate cable. Feeder is powered up but it can not identify the power source.
Err 81	Welding program not found	If welding program is required, please order proper welding program and license.
MEM ERR	Error while reading or writing to memory	Machine can not write to feeder memory card, check the cables and connections, possibly broken control/memory card.
NO BUS	Panel can not connect to the CAN bus	Check the flat cables. Check the panels


DIX connector
Welding torch connector
XW003
Start 2
Start 1
A001 X4-2
A001 X4-5
W001
Printed circuit boards
A002
ID Chip Card
A003
Memory card
A001
Motor Control Card
P001
Panel Card
Bus connector
XW002
Bus GND 1.5
Bus Data
Bus +50V 1.5
Electromagnetic gas valve
Y001
Valve GND
Valve +
Remote control connector
XW101
GND 1.5
Bus Data
Bus +50V 1.5
Pot 1
Pot 2
Pot +5V
Sync connector *
XW102
Motor + 1.5
Motor - (SUB) 1.5
Motor - (MP) 1.5
Subfeedid
A004 X1-7
A004 X1-4
A004 X1-2
A001 X3-7
Notes:
* option
KWF 200/300
Spool Space Heater *
Gas Guard GG 200/300 *
Door Switch *
S003
S004
Wire feed motor
Motor -
Motor +
Tacho Signal
Tacho GND
Tacho +5V
A005
Tachometer Card
M001
A004
Sub feeder sync *
MP_Tacho_input
MP_Tacho_filt
KEMPPI
FASTMIG PULSE
MXF 65
Main Circuit Diagram
TARRA
PIIPT PeHa 5.3.2009
TAPK
KOKO A4
VALM.OHJE KES-54-002
W003859A