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# I-Max Touch

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CE 0459



## Service Manual

## Revision history

Rev.	Date	Page/s	Modification description
0	13.03.09	-	Release for Owandy internal use.
1	20.05.09	All	First release
2	25.09.09	From i to vi, 2-6, from 3-1 to 3-22, 4-1, 4-3, 4-6, 5-1, 5-2, 6-4, from 6-9 to 6-14, from 7-20 to 7-22, from 8-31 to 8-33, from 8-35 to 8-72, 9-67, 10-2, 10-7, 10-8	110-120V version added. Service programs descriptions improvement. Warning label added on "Symbols used" paragraph. Fixing dowels specification improvement on pre-installation chapter. Technical data update (Tubehead nominal power and HVL values). (Ref. RDM 6936, 7029, 7043, 7094, 7113)

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This manual in English is the original version.

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# 1. INTRODUCTION



**NOTE:**

The present manual is updated for the product it is sold with in order to grant an adequate reference in performing diagnostics and repair operations normally carried out by the service engineer.  
The manual may not reflect changes to the product not impacting service operations.

The I-Max Touch, produced by Owandy, is an X-ray device for the radiographic analysis of the maxillo-facial complex.

The basic version of the I-Max Touch performs Panoramic, Emi-panoramic, Reduced dose Panoramic, Frontal dentition, Improved orthogonality Panoramic, Sinus and TMJ examinations of the maxillo-facial complex.

The following options are available, and must be ordered separately:

- DIGITAL CEPH; it allows the execution of the following examinations, all available in high resolution and normal resolution (high speed) modality:
  - CEPH exam in different formats
  - CARPUS exam.

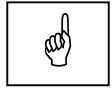
This manual provides to the technical personnel the instructions for proper and safe installation and maintenance of the appliance.  
This manual is limited to the description of the X-ray device; instructions on the Digital Acquisition System are given in the relevant Manuals, supplied with the Direct Digital Sensor.

The device must be used complying with the procedures described and never be used for purposes different from those herewith indicated.

The I-Max Touch is an electro-medical device and it can be used only under the supervision of a physician or of highly qualified personnel, with the necessary knowledge on X-ray protection.

The user is liable as concerns legal fulfilment related to the installation and the operation of the device.

## 1.1. Icons appearing in the manual



**This icon indicates a NOTE;** please read thoroughly the items marked by this picture.



**This icon indicates a WARNING message;** the items marked by this icon refer to the safety aspects of the patient and/or of the operator.

## 1.2. Technical service

For any technical queries please contact the technical service of your vendor.

## **2. SAFETY INFORMATION**



**WARNING:**

Please read this chapter thoroughly.

---

Owandy designs and builds its devices complying with the related safety requirements; furthermore it supplies all information necessary for a correct use and the warnings related to danger associated with X-rays generating units.

**Owandy cannot to be held responsible for:**

- use of the I-Max Touch different than the intended use,
- damages to the unit, to the operator, to the patient, caused both by installation and maintenance procedures different than those described in this manual and/or by wrong operations,
- mechanical and/or electrical modifications performed during and after the installation, different than those described in the service manual.

**Installation and any technical intervention must only be performed by qualified technicians authorized by Owandy.**

**Only the authorised personnel can remove the covers and/or have access to the components under tension.**

## 2.1. Warnings

This device has not been designed for use in environments where vapours, anaesthetic mixes flammable with air, or oxygen and nitrous oxide can be detected.

Avoid pouring water, even accidentally, or other liquids into the device, as this could cause short-circuits.

Before cleaning the device, be sure that the main power supply has been disconnected from the equipment. Pushing the ON/OFF button on the basement of the equipment, it mustn't switch on.

Wherever necessary, instruct the customer regarding the following:

- to use the proper accessories, such as the leaded aprons, to protect the patient from radiations
- while performing the radiography, no one, apart from the operator and the patient, must remain in the room
- **to replace the disposable bite protective sleeve and the ear-centring devices after the use.**

The I-Max Touch has been built to support a continuous operation at intermittent load; therefore please follow the described use cycles to enable the device cooling down.

Though this unit has been designed with a quite acceptable protection level from electromagnetic interference, it is advisable to install it at a certain distance from electric energy transformation chambers, from Uninterruptible Power Supply (UPS) units, from receiving-transmitting units for amateurs use. Mobile telephones are only admitted at a distance of more than 1.5 m (4.9 ft) from any component of the device.

Other medical instruments and devices that could be used in the installation area of the device, must comply with the Electromagnetic Compatibility rules in force. Non-complying instruments, of which the poor immunity from electromagnetic fields is well known, must be installed at least 3 m (9.8 ft) from the I-Max Touch and supplied by a different electrical line.

The I-Max Touch must be switched off while using devices such as electrical lancets or the like.

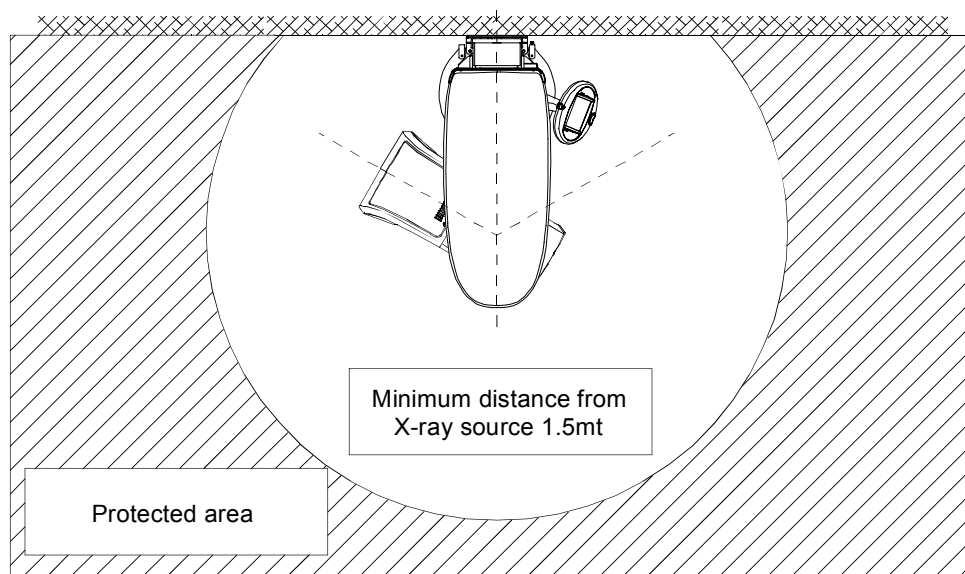
Please clean and disinfect, when necessary, all parts that can be in contact with the patient.

**Never try to rotate the moving arm manually when the unit is switched on, to avoid permanent damage to the unit.**

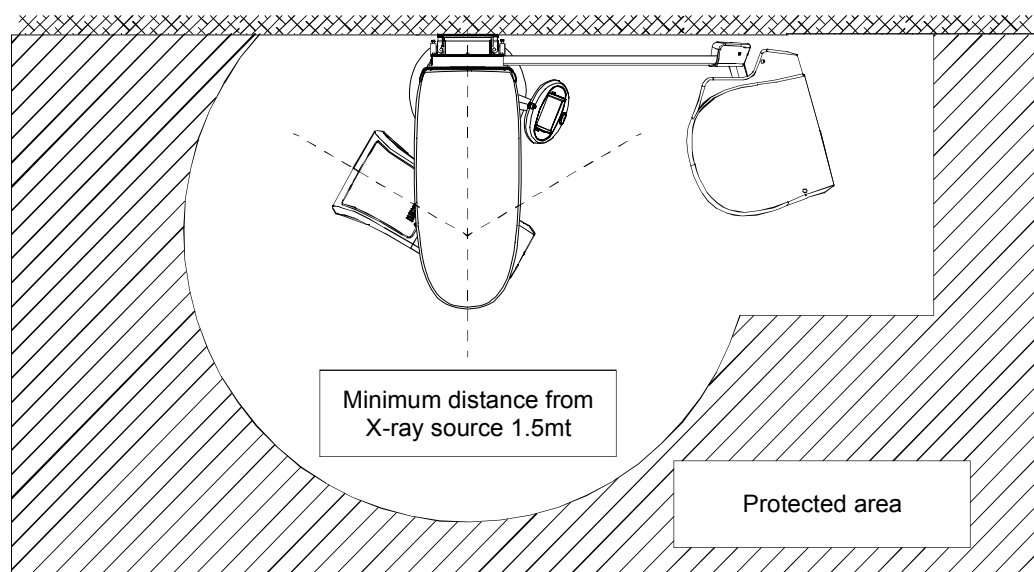
The authorised technician must be sure that the unit is disconnected from the main power supply before removing the covers.

The high frequency generator, located on the rotating arm, can hold dangerous voltage for more than 2 minutes from the power off.

Though the X-ray quantity supplied by dental X-ray units is quite low and distributed on a small surface, the operator must adopt the precautions and/or fit protections for the patient and himself, during the execution of a radiography. It is advisable to control the X-ray emission from a protected area, by means of a remote control. In case it is necessary to operate near the patient, please stay as far as the cable of the remote control allows it, or at least 1.5 m (4.9 ft) both from the X-ray source and from the patient, as shown in the picture below.



*Figure 2-1 - Panoramic version*



*Figure 2-3 - Cephalometric version*

**WARNING: PRECAUTIONS WHILE USING LASER CENTRING DEVICES**

Also if the laser devices, according to EN60825-1, are in Class I:

- It is necessary to have an adequate illumination in the room.
- Do not look into the output windows of laser centring units.
- Do not stare at the reflections of laser pointers.
- Instruct the patient to keep his/her eyes closed as long as the laser pointers are active.
- Before starting an examination, the patient must remove earrings, glasses, necklaces and whatever else could reflect the laser beam or be impressed on the radiographic image.
- Do not clean the openings of the laser centring devices with tools that could modify the optics. Necessary cleaning must be performed only by authorised technicians. Operations different than those indicated could cause the ejection of dangerous non-ionising radiations.

**WARNING: PRECAUTIONS DURING INSTALLATION AND SERVICE INTERVENTIONS**

- Please take the highest care while mounting the column to the wall and strictly follow the instructions listed in this manual.
- Before removing the covers of the column, or before removing the covers of the Generator board (A10), disconnect the power supply to the device, both switching the main switch and the magneto-thermal differential off, and wait at least 2 minutes.
- When the device is supplied without the above mentioned coverings, pay the highest attention since high voltage is generated in the supply unit, and the voltage is at about 400 Vdc on the Generator board. This is indicated by the green LED H1. Should the LED be off and before any other intervention, disconnect the device from the net, wait at least 2 minutes, then check the fuses F1 (10AF) or F2 (5AF) on the Generator board (see circuit diagram).
- Each intervention must be performed after having disconnected the device from the supply net and after LED H1 is OFF. It is anyway advisable to wait at least 2 minutes from the LED's switching off.
- **The system construction does not allow the repair of faulty/damaged parts that must be replaced using original spare parts supplied by Owandy. Only trained personnel are authorized to make service interventions on the unit, following the instructions contained in this manual.**

**WARNING:**

The USB port on the keyboard MUST NOT be used with an external Hard Disk with own mains connection. It has to be used only with USB Pen Drives.

## **2.2. Environmental risks and displacement**

The device contains in some of its parts, materials and liquids that at the end of the unit's life, must be disposed of at appropriate disposal centres.


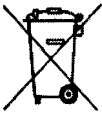







Particularly the device contains the following materials and/or components:

- **Tubehead:** dielectric oil, lead, copper, iron, aluminium, glass, tungsten.
- **Control panel and remote control:** iron, copper, aluminium, glass-resin, non-biodegradable plastic material packaging.
- **Column, rotating arm and extensions:** iron, lead, aluminium, copper, glass-resin, and non-biodegradable plastic material.



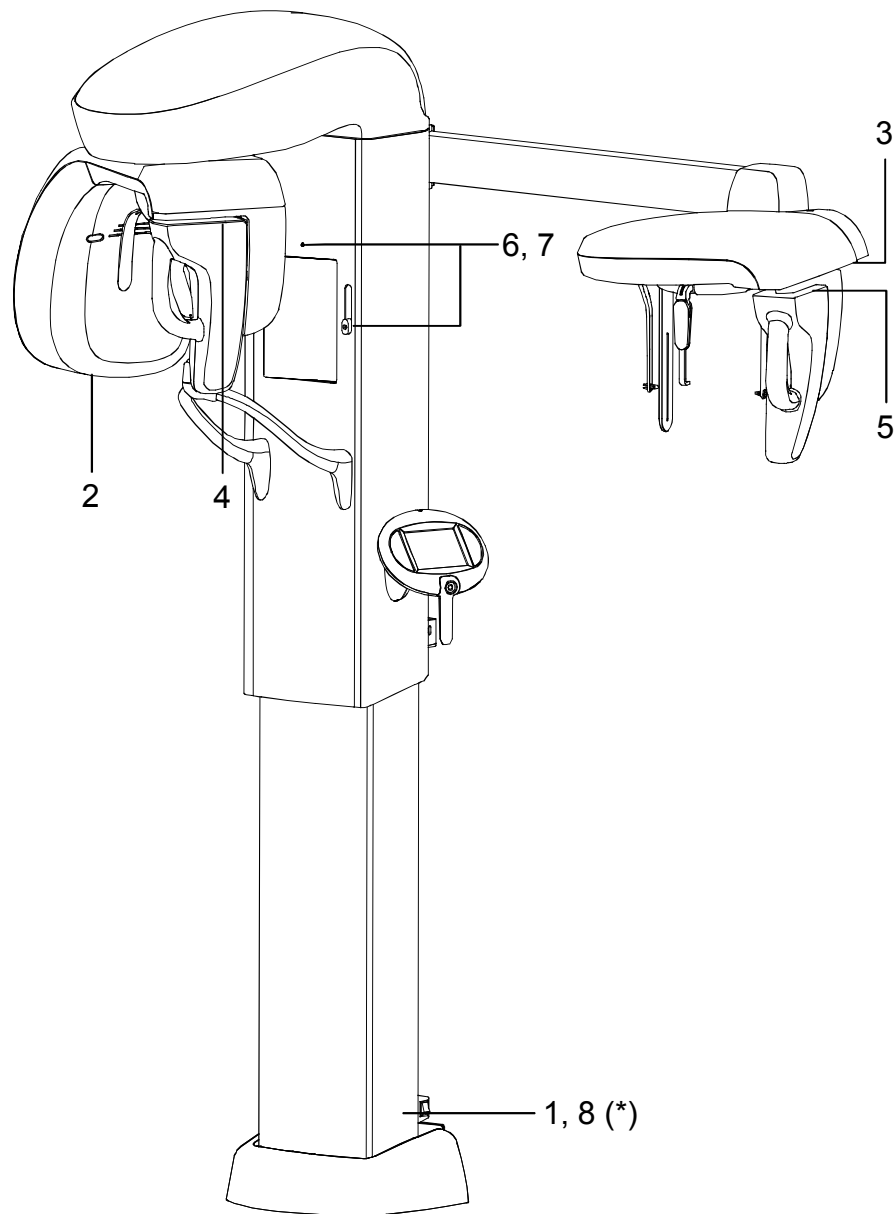
### 2.3. Symbols used

In this manual and on the I-Max Touch itself, apart from the symbols indicated on the control panel, the following icons are also used:

Symbols	Description
	Device with type B applied parts
	The device contains in some of its parts, materials and liquids that at the end of the unit's life, must be disposed of at appropriate disposal centres
~	A.C.
<b>N</b>	Connection point to the neutral conductor
<b>L</b>	Connection point to the line conductor
	Protection grounding
	Operation grounding
○	OFF ; device not connected to the net
	ON ; device connected to the net
	Laser
	Laser source output
	Dangerous voltage
	Moving parts <b>MUST NOT</b> be cleaned or lubricated
 0459	Conformity to the CE 93/42 Directive

### **3. DESCRIPTION**

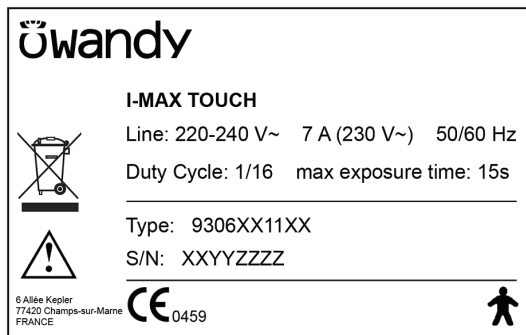
#### **3.1. Identification labels and laser labels**



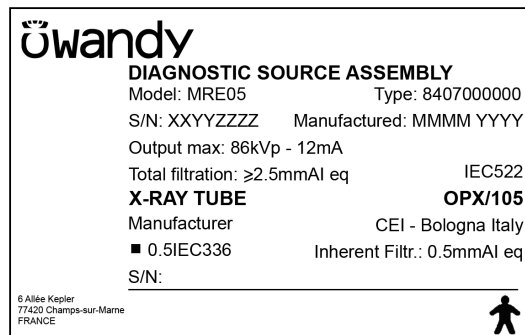
*(\*) Only for 110-120V version*

### 3.1.1. Identification labels and laser labels "220-240V" version

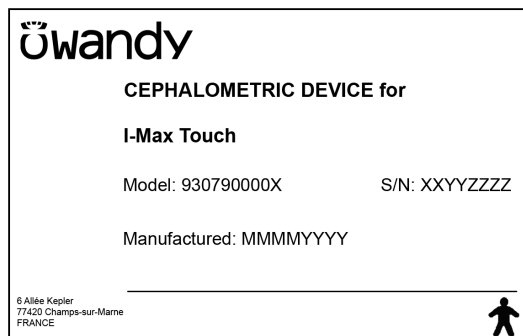
**1**  
I-Max Touch  
identification label



**2**  
Tube-head  
identification label



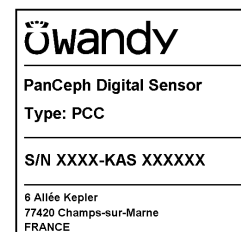
**3**  
CEPHALOMETRIC device  
identification label



**4**  
PANO  
Digital Sensor  
identification label



**5**  
PANCEPH.  
Digital Sensor  
identification label



**6**  
(N° 2) Spot Laser  
identification label

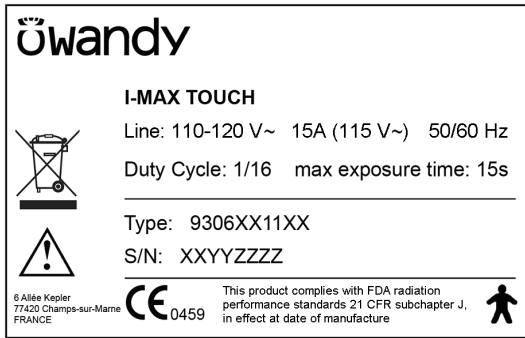


**7**  
(N° 2) Laser  
symbol label

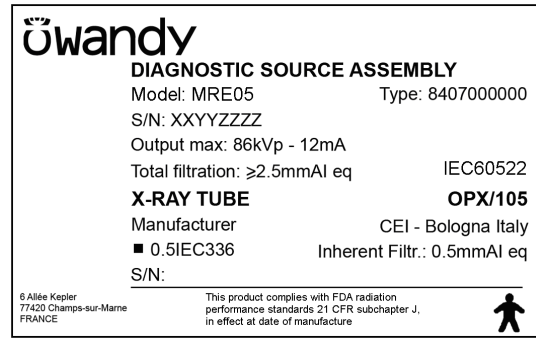


**3.1.2. Identification labels and laser labels "110-120V" version**

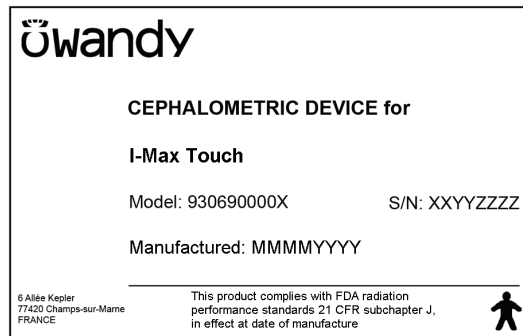
**1**  
I-Max Touch  
identification label



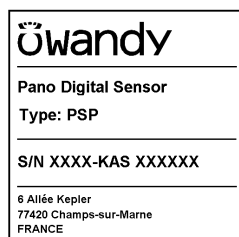
**2**  
Tube-head  
identification label



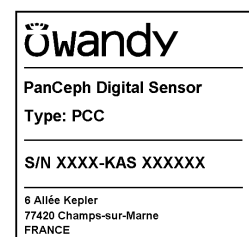
**3**  
CEPHALOMETRIC device  
identification label



**4**  
PANO  
Digital Sensor  
identification label



**5**  
PANCEPH.  
Digital Sensor  
identification label



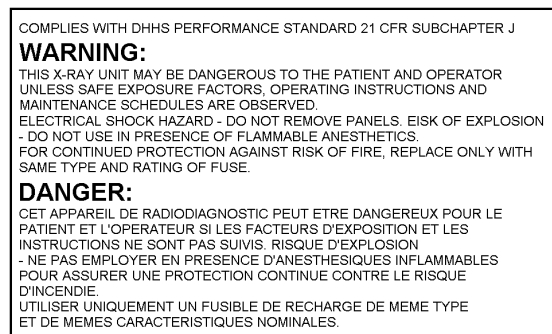
**6**  
(N° 2) Spot Laser  
identification label



**7**  
(N° 2) Laser  
symbol label



**8**  
WARNING label



## **3.2. Function, Models and Version**

The I-Max Touch, produced by Owandy, is a complete panoramic system, which enables to perform all radiographies commonly necessary in dental field (except for endoral X-rays).

In some versions, certain examination modes are not available but the device (thanks to its computerised control system) can be expanded and updated with new releases, directly at the Dentist premises.

The basic version performs Panoramic, Emi-panoramic, Reduced dose Panoramic, Frontal dentition, Improved orthogonality Panoramic, Sinus and TMJ examinations.

Optional functions enable the system to perform the following additional examinations:

- **CEPH**

Allows you to carry out the following examinations:

- CEPH exam in different formats
- CARPUS exam.

### **3.2.1. Basic version**

The basic version enables to perform the following examinations:

- Adult or Child, with 3 Sizes and 3 Types of Biting for a total of 18 combinations in Automatic selection; in manual selection it is possible to select high voltage between 60kV and 86kV, in 2kV steps and anodic current from 6 mA to 10 mA in 1 mA steps.
- Sinus enables to perform images of the paranasal sinuses with front projection (postero/anterior).
- TMJ mouth closed/open in lateral projection.
- The right or left Emi-panoramic is used when the patient is known to have a problem only on one side of the arch, in order to reduce the radiation
- The reduced dose Panoramic reduces the dose radiated on the dentition by excluding the TMJ's ascending rami from the exams
- The frontal dentition enables to perform examinations of the front part (roughly from canine to canine)
- The Panoramic with improved orthogonality reduces the overlap of the teeth, thereby improving the diagnosis of interproximal decay.

### **3.2.2. Version with cephalometric device**

The version with cephalometric device allows you to perform the following examinations:

- Panoramic, Sinus, TMJ, Emi-panoramic, Reduced dose Panoramic, Frontal dentition and Improved orthogonality Panoramic, Adult and Child, with the same characteristics described for the base version.
- Digital Cephalometry for Adult and Children with 3 Sizes each. Within each combination, it is possible to select an examination in High or Normal Resolution, for a total of 12 combinations in Automatic selection. In Normal Resolution, the examination is carried out with a lower scanning time, allowing a further reduction of the dose. In Manual selection it is possible to vary the High Voltage from 60kV to 86kV, with 2kV steps, the anodic current from 6mA to 12mA with 1mA steps. The positioning of the sliding primary collimator, the secondary collimator and the Digital Sensor (inside the relative sensor holder) is automatic according to the selected format projection. The Soft Tissues Filter is motorized, to obtain the best possible emphasis of the face profile.
- Examination to evaluate the bone growth (Carpus) only Child with 3 Sizes. It is possible to select an examination in High or Normal Resolution, for a total of 6 combinations in Automatic selection. In Normal Resolution, the examination is carried out with a lower scanning time, allowing a further reduction of the dose. In Manual selection it is possible to vary the High Voltage from 60kV to 86kV, with 2kV steps, the anodic current from 6mA to 12mA with 1mA steps. The positioning of the sliding primary collimator, the secondary collimator and the Digital Sensor (inside the relative sensor holder) is automatic according to the selected image size and exam projection.

### 3.3. Block diagram

This paragraph provides a brief description, at block diagram level, of the I-Max Touch. Aim of this paragraph is to provide a brief description of the system. More details about the electronic circuits which compose the system can be obtained by analyzing the schematics provided in Chapter 9.

During the description of the block diagram, please refer to Figure 3-1.

From the electrical point of view, the system can be divided into 4 main blocks:

- Power supply assembly
- Main CPU board (A5)
- Generator board (A10), Generator CPU board (A9) and tubehead
- Column CPU board (A1)
- Keyboard with its control board.

All control boards above listed are equipped with a local microcontroller that shares information with the main CPU board (A5) using a CANBus transmission line and protocol.

Each of the main blocks above listed is here after described.

### **3.3.1. Power supply assembly**

It is located in the rear part of the column and is mainly composed by the mains switch (S1), a 24Vdc 7A switching mode power supply which supplies all circuits of the machine excluding the column motor, and a further power supply which supplies the column motor and the enabling circuit for X-ray emission.

The power supply assembly also acts as an interface with a number of external signals and circuits like:

- Input for remote X-ray push button (S7) and output to the CPU of the same signal.
- Outputs for the "Ready" and "X-ray ON" lamps (X3).
- Driving of the DC column motor (M1): this motor can be activated either through its control board (A1), in case the movement is requested by the operator acting on the keyboard, or through the switch S2 located in the rear part of the column base. This switch can be used to raise/lower the column during the installation phase when the CPU has not been yet connected to the system.
- Input for the emergency column motor microswitches (S3 and S5): these microswitches indicate the limit for the movement of the column. If for any reason, the column goes beyond these microswitches, the motor is de-activated by cutting the voltage. Normally, the position of the column is also monitored by two other microswitches (S4 and S6) that, as for all the other positioning sensors, provide their signals to the Column CPU board (A1).

The unit does not include a voltage selector circuit for the mains voltage. Therefore, the unit is manufactured in different versions, depending on the line voltage of the installation place.

The power supply assembly module also includes the Column CPU board (A1) that is dedicated to the control of the vertical column motion during all phases (slow speed, ramp up to high speed, ramp down from high to low speed, end run microswitches control, etc.).



### 3.3.2. CPU Board (A5 and A6)

It is located in the arm movement assembly on top of the unit.

Main tasks are:

- General controlling of the unit, receiving the signals from the keyboard and from the different microswitches.
- Driving of the 3 stepper motors which compose the system.
- Monitoring the functioning of the motors through the analysis of the signals coming from the positioning sensors.
- Driving of the HF group (Generator board and tubehead) in order to provide the X-ray doses set by the operator on the keyboard (kV and mA set point) and in the meantime, check the functioning of this group through the managing of the relevant alarm signals.
- Activation of the 2 luminous centering devices.
- Managing of the alarms that can be generated by anomalous conditions present in the unit and caused by the operator or by a fault. These signals are sensed by the local CPUs and signalled using specific CANBus messages.

The CPU board is based on a 32 bit Motorola Microprocessor MCF5232, mounted on a piggy-back PCB (A6), which also includes the Flash EPROM, the RAM and other logic and passive components.

The CPU board also includes a number of input/output channels necessary for the functioning of the system and 3 stepper motor driving stages based on integrated motor drivers. Each of these motors is associated to positioning sensors that monitor their functioning. The signals of these sensors are fed back to the CPU board.

The number and the type of sensors depend on the function of each motor. In general, optical switches are used.

Depending on the physical location of the motors on the machine, their signals and the ones of the relevant positioning sensors are routed directly to the CPU through dedicated cables, or passing through interconnection boards located nearby.

The transmission of the motion from the motor to the relevant movement assemblies is achieved through toothed belts (rotation motor and Y axis motor) or through actuators (column motor, primary collimator, Soft Tissue Filter, secondary collimator and Ceph sensor).

The functioning of the different motors and relevant positioning sensors can be tested through the use of the Service Programs (Passwords). For more details, please refer to paragraph 8.3.

The circuits of the CPU board are supplied starting from the +24Vdc (LED H12) provided by the Power supply assembly and generating on board the requested voltages (+5V, +3.3V and +1.5V). Three LED's on the board indicate the presence of these 3 voltages (+5V=LED H2, +3.3V=LED H3, +1.5V=LED H5).

### **3.3.3. Generator Board (A10) and Tubehead**

The Generator board and the tubehead are located on the rotating arm, very close to each other. The power supply voltage is directly provided by the Power supply assembly.

Dedicated switching circuits, directly located on the board, generate the voltage used on the board itself.

Managing of the Generator board is done by the dedicated Generator CPU board (A9) that is interfaced with the main CPU board (A5) using the CANBus cable (X20-X20). This cable also has a dedicated wire to bring the X-ray button signal to this board, so the "dead man switch" method is generated directly on the board.

The high frequency (HF) circuit is based on an inverter circuit working at the frequency about 100kHz, which drives the tubehead through an output stage based on IGBT components.

The Generator board receives the signals concerning the X-ray dose to provide (kV and mA), from the CPU board through CANBus messages; it is the Generator CPU that generates the commands used for the X-ray emission. The Generator board provides to the tubehead the voltages that drive the high voltage transformers that then drive anode and filament of the X-ray tube, also giving the relevant timing.

The tubehead is composed by the X-ray tube (CEI OPX/105) inserted in a sealed container, together with the high voltage transformers, filled with dielectric oil.

Checking of proper functioning of the X-ray emitting system is achieved through the analysis of feed back signals generated inside the tubehead and transmitted to the Generator board and relevant Generator CPU. Possible anomalous conditions are then communicated to the main CPU board (A5) which in turn generates error codes to alert the operator.

### 3.3.4. Keyboard

The keyboard is the interface with the operator, and is composed by the following items:

- Matrix of keys, constituted by microswitches with short stroke, necessary to activate the different available functions
- Signalling LED integrated in the touch panel
- LCD display equipped with back-light and touch screen, displaying the control buttons and a text area for messages (matrix of 16 characters and 2 rows)
- Keyboard PCB.

The keyboard PCB is directly connected to the main CPU board (A5) which controls it. The language of the messages shown on the display can be selected among 5 different options (English, Italian, French, German, Spanish, Portuguese and Dutch). The language selection is only available for the messages dedicated to the user. The messages relative to the service programs (Password) are always in English.

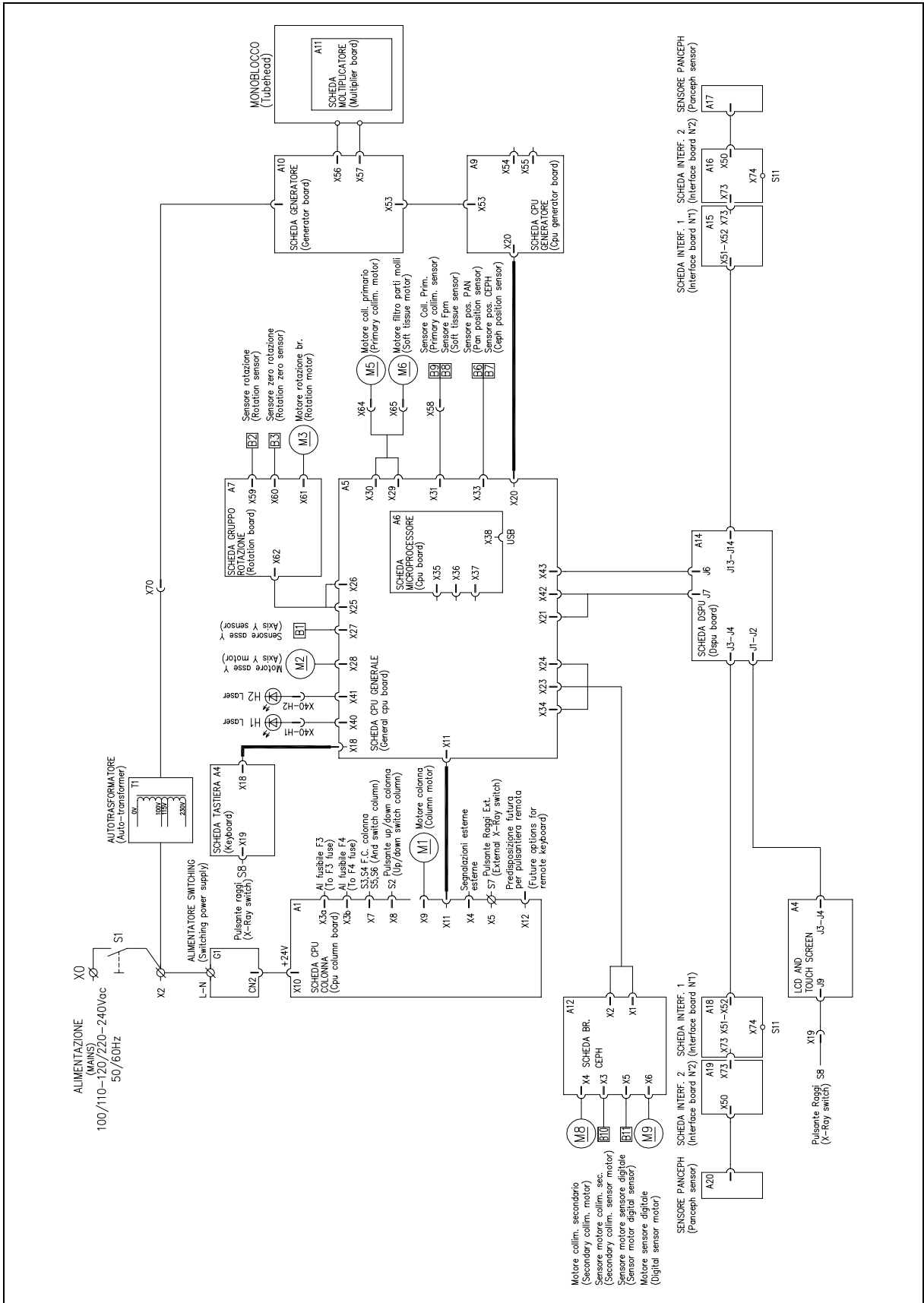


Figure 3-1 – Block diagram

### 3.4. Control panel - Descriptions and functions

The I-Max Touch keyboard is divided into function areas, plus a display to view the operative messages and error signals.  
The next figure shows a general view of the keyboard, while details on each functional area are provided in the following pages.

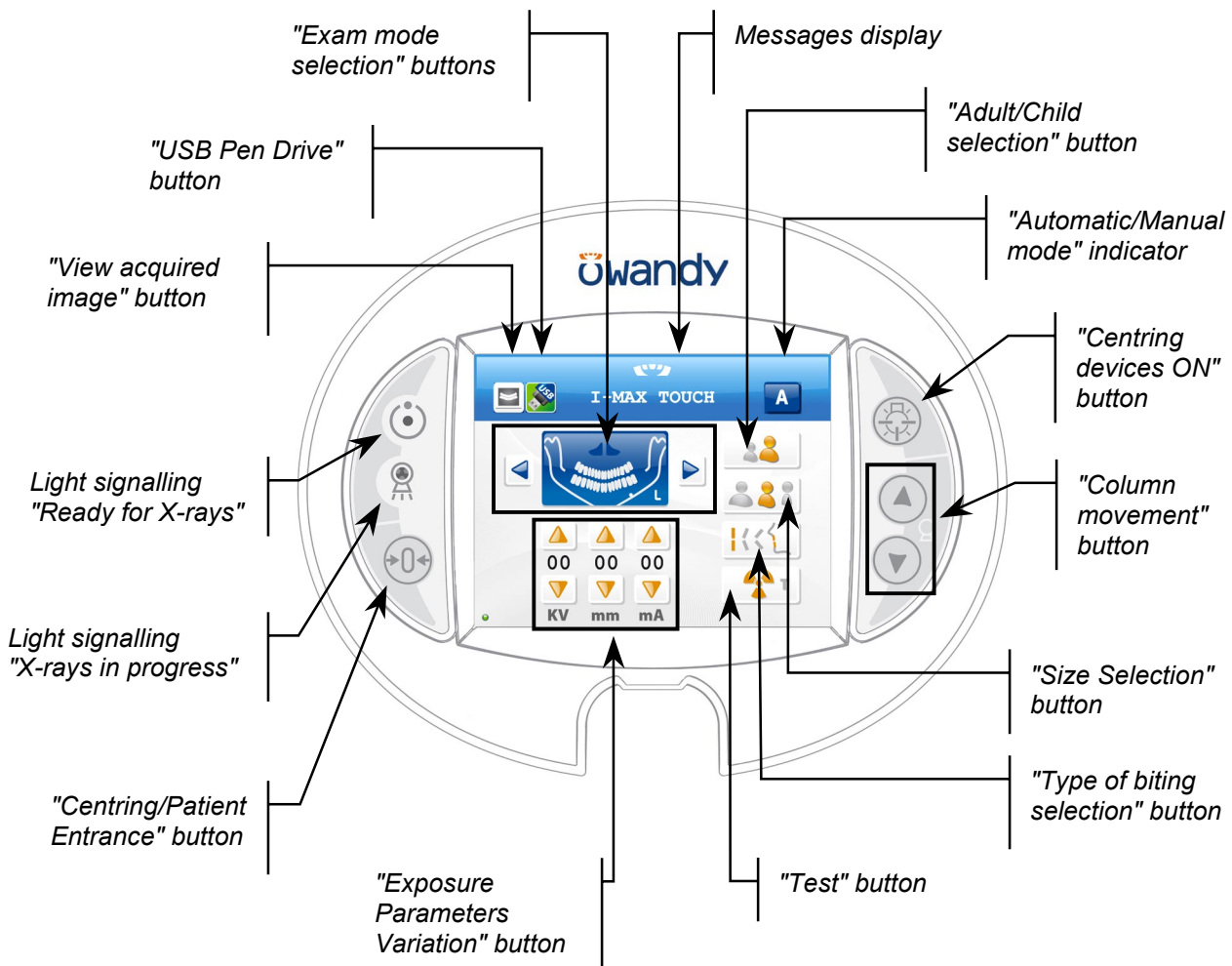


Figure 3-2



**WARNING:**

The USB port on the keyboard MUST NOT be used with an external Hard Disk with own mains connection. It has to be used only with USB Pen Drives.

The next figure shows a general view of the display of the acquired image, details on each functional area are provided in the following pages.

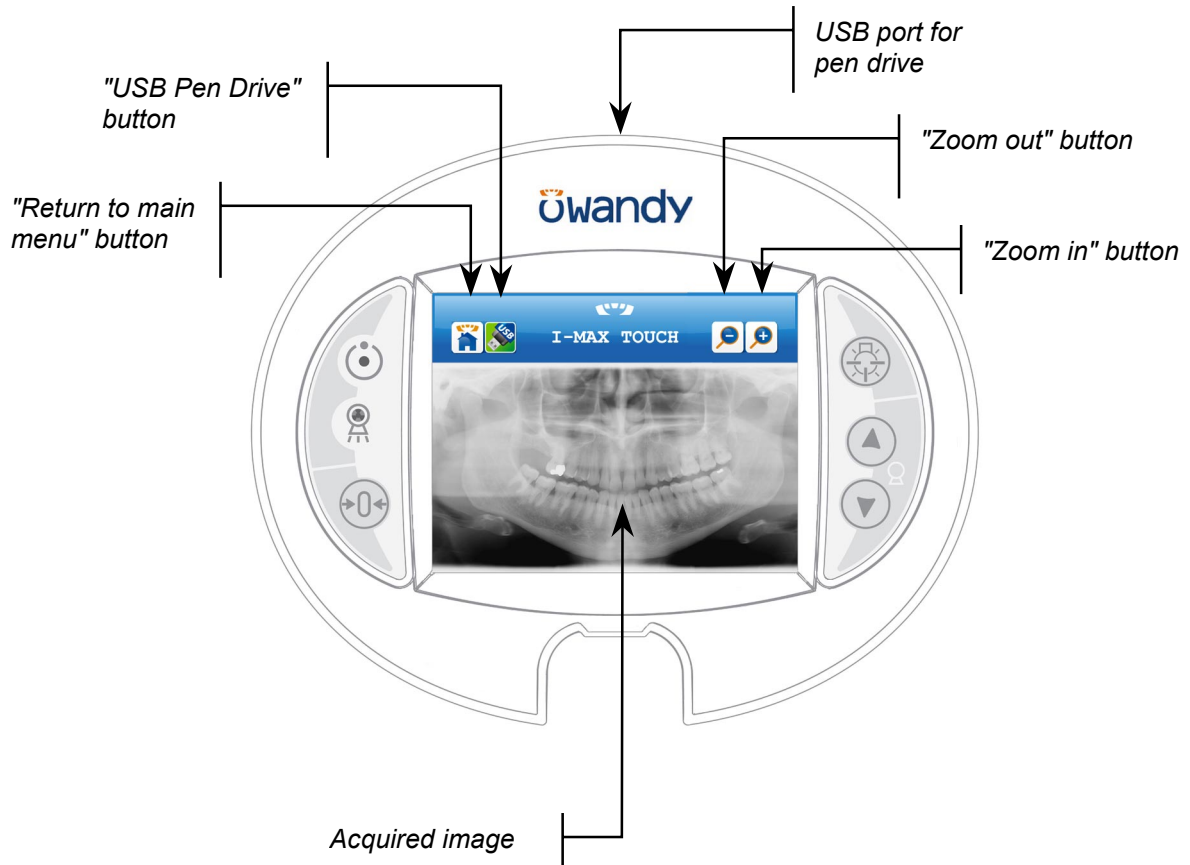


Figure 3-3



**WARNING:**

The USB port on the keyboard **MUST NOT** be used with an external Hard Disk with own mains connection. It has to be used only with USB Pen Drives.

The next figure shows a general view of the machine setup display, details on each functional area are provided in the following pages.

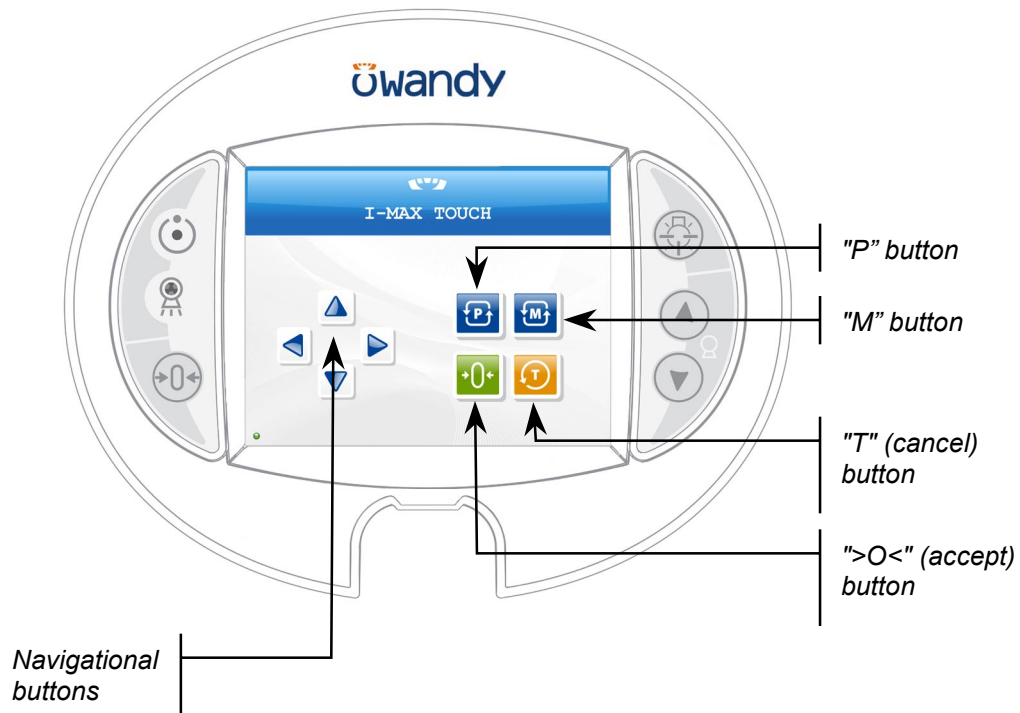


Figure 3-4



**WARNING:**

The USB port on the keyboard MUST NOT be used with an external Hard Disk with own mains connection. It has to be used only with USB Pen Drives.

The "Centring/Patient Entrance" button is used to:

- start/stop the start examination procedures
- bring the rotation arm to the patient entrance position at the end of the exam.



The "Examination Selection Mode" takes place by means of three keys: the first one, the main button, helps select the exam mode between Panoramic, TMJ, Sinus, and Cephalometric. The other two, identified by the arrows, help navigate within the exams of each mode.



It is possible to select the anatomic mode examinations (anatomic selection), using prefixed exposure values.

This kind of selection enables to choose between Adult/Child, each with three different sizes (small, medium, large).

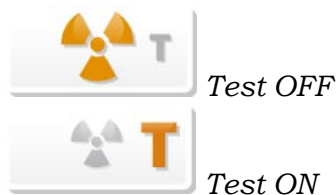
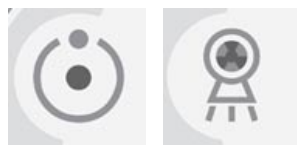
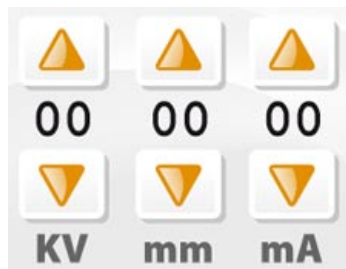


The Panoramic mode enables to select the patient's type of biting between: protruded, standard or retracted, as indicated within the button.

The arch selection does not influence the values of kV and mA but acts on the position of the focus layer.







Furthermore there is the possibility to manually select the exposure parameters; in this case, it is possible to set the parameter with the desired value.

The parameters available are: kV and mA (Soft Tissue Filter position, mm, only in cephalometry). By holding the indicator for more than 1 second the special mode is activated and the indicator changes colour. In special mode modified exposure parameters can be stored or exposure verification tests can be performed.

There are two light indicators; the first one on the left indicates the condition "Machine Ready", indicating the user that by pressing the X-ray button key once more, X-rays emission will start; the second indicates the effective emission of X-rays.

The movement of the column is controlled by the appropriate keys. The speed has two set values. The movements are enabled during equipment setting.

The key "Luminous centring device" helps turn ON/OFF the laser centring devices that allow the correct positioning of the medial-sagittal and Frankfurt planes, by adapting the I-Max Touch to the patient's anatomy.

The key "Test" is used to avoid the X-rays emission, in order to check the absence of collisions with the patient.

This key displays the acquired image stored in the memory of the unit; the main menu area is replaced by the image.



This key is used to return to the control panel (main menu) when an acquired image is displayed.



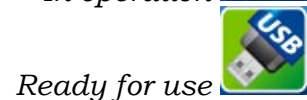
The Pen Drive key appears when a pen drive (memory stick) is inserted in the USB connector of the control panel; it writes the acquired image that is stored in the memory of the unit on the pen drive that is inserted.



When this key is green, the pen drive is recognised, has enough free space and is ready for use.



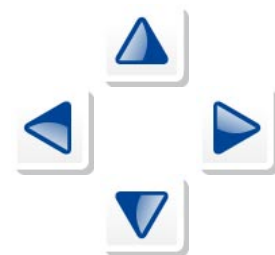
When the key is orange, it is busy; the image is being written on the pen drive. When the key is red, the pen drive does not have enough free space on it, or it is not recognised.



When the acquired image is displayed on the control panel screen, it is possible to zoom in and out of the image using these two keys.



In the setup screen the navigational buttons allow the user to navigate through the menus and submenus as indicated in the manual (up, down, left, right).



In the setup screen the following buttons are used to change parameters as indicated in the manual.



### 3.4.1. Key functions description

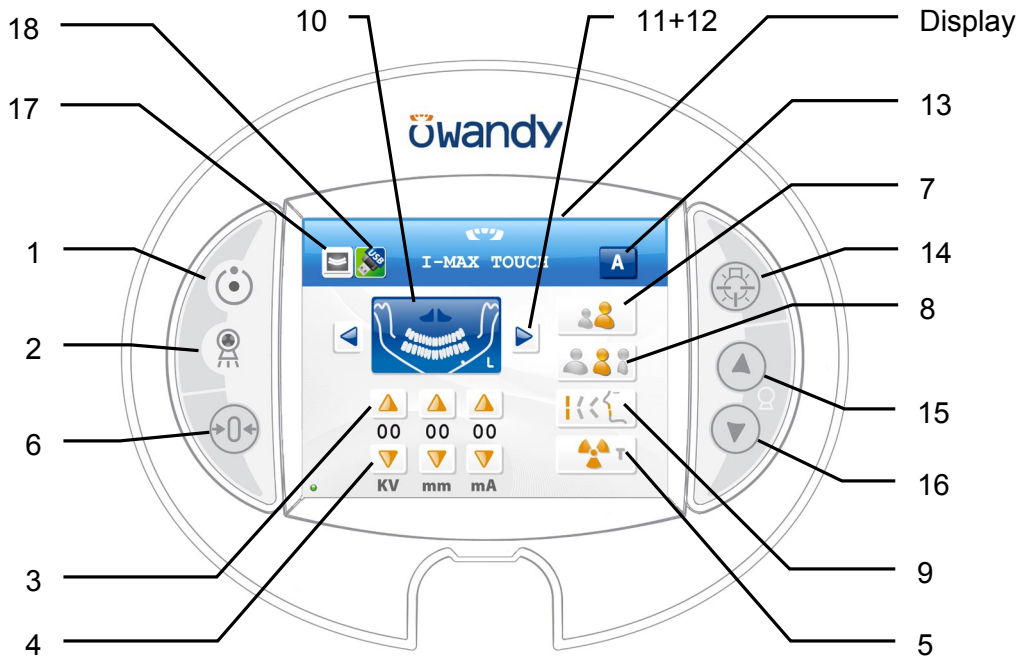


Figure 3-5 - Control panel

**LEGEND:**

**Messages**

Display: indicates operative messages, warnings and exposure parameters.

**Signal lights**

- 1 - Light indicating the machine is ready for X-ray emission (green LED)
- 2 - Yellow LED indicating X-ray emission

**Manual setting of exposure parameters**

- 3 - kV, mA and Soft Tissue Filter increase keys
- 4 - kV, mA and Soft Tissue Filter decrease keys

**Preparation functions**

- 5 - Key to set Test function
- 6 - Key for:
  - > Resetting and realigning the device's axes (in case of collision with patient or in case of release of rays button)
  - > Repositioning the rotation group (to bring the group to the initial position after the examination and to exit from the "making an exposure" mode)
  - > Confirmation

**Anatomic selection**

- 7 - Patient selection key: Adult or Child
- 8 - Size selection key: Small, Normal, or Large
- 9 - Arch selection key: Protruded, Standard or Retracted (for panoramic execution)

**Examination mode**

- 10 - Exam mode selection key
- 11 +12 - Type of exam selection keys (only for panoramic mode)
- 13 - Mode indicator : Anatomic or Manual

**Centring devices**

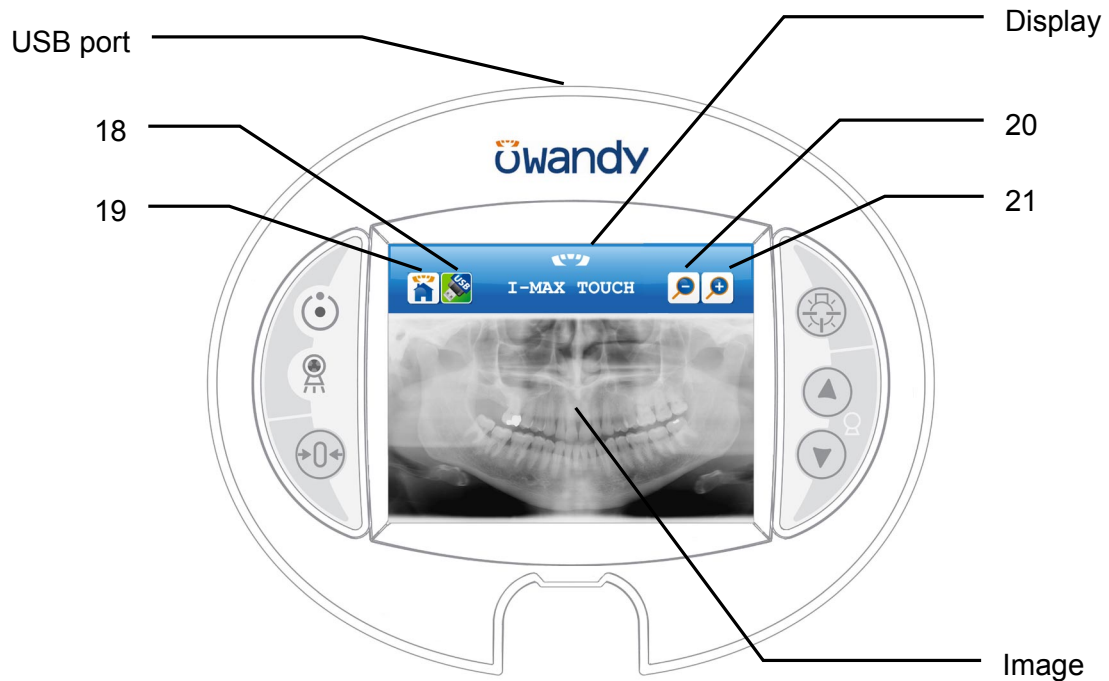
- 14 - Sagittal and Frankfurt plane centring device ON key

**Column height adjustment**

- 15 - Column up key
- 16 - Column down key

**Other**

- 17 - Display acquired image key
- 18 - USB Pen Drive key



*Figure 3-6 – Acquired image display*

**LEGEND:**

**Messages**

*Display: indicates operative messages, warnings and exposure parameters.*

**Other**

*18 - USB Pen Drive key*

*19 - Return to control panel (main menu)*

*USB port: to connect a pen drive*

**Acquired image display**

*Image: displays the last acquired image, stored in the memory of the unit*

*20 - Zoom out on the image*

*21 - Zoom in on the image*



Figure 3-7 – Setup display

**LEGEND:**

**Messages**

Display: indicates operative messages, warnings and exposure parameters.

**Setup display**

22 - Navigational keys (up, down, left, right)

Parameter change keys:

23 - "P" key

24 - "M" key

25 - ">O<" (accept) key

26 - "T" (cancel) key

### **3.5. Service programs description**

The I-Max Touch allows the authorised technicians to access to the different functional parameters of the unit through a dedicated software composed by the following service programs. Each service program can be accessed through a dedicated password.

The service programs available are the following:

- **Password 92:** Configuration of the system (see paragraph 1.1.1)
- **Password 112:** Fault check (see paragraph 8.3.6)
- **Password 118:** Test on motors/positioning sensors, setting of the zero offsets of the axes and the collimators (see paragraph 8.3.4)
- **Password 124:** Definition of the parameters for the cephalometric examination (see paragraph 8.3.5).


### **3.6. Service tools**

In order to perform a correct system calibration, is suggested the use of the following tools:

<b>Code</b>	<b>Description</b>	<b>Function</b>
6107900100	Laser centering tool	Used for Panoramic function adjustment and calibration
6107900200	Symmetry check tool	
5209900900	Digital sensor centering tool	Used for Sensor calibration and Cephalometric arm checks
5607900800	Copper filter for Digital sensor	
5807304100	Calibration programs CD	

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## 4. TECHNICAL DATA

General features		
Type	I-Max Touch	
Manufacturer	OWANDY Champs sur Marne, France	
Class	Class II B for European Directive for Medical Devices 93/42 Class II for Canadian MDR Class I with type B applied parts according to IEC 60601-1 Class II according to 21CFR-subchapter J (for 110-120V version) 	
Protection degree	IPX0 standard device	
Rated line voltage	220-240 V~	110-120 V~
Line frequency	50/60Hz	
Maximum line current	7 A @ 230 V~ 50/60 Hz	15 A @ 115 V~ 50/60 Hz
Power consumption	1.6 kVA @ 230 V~ 50/60 Hz	1.7 kVA @ 115 V~ 50/60 Hz
Protection fuse (F1)	7 A T	15 A T
Protection fuse (F2) <b>of switching power supply</b>	1.6 A T	3 A T
Generator board protection fuses	F1: 10 A F F2: 5 A HF F3: 2 A T	
Line apparent resistance	0.5 $\Omega$ max	--
Line voltage regulation	--	< 3 % at 99 V~
Rated output voltage (kVp)	60 ÷ 86 kV <sub>p</sub> , with 2 kV <sub>p</sub> steps	
Anodic current	6 ÷ 10 mA, with 1 mA steps for PAN, TMJ, and Sinus 6 ÷ 12 mA in 1 mA steps for Ceph (up to 76 kVp) 6 ÷ 10 mA in 1 mA steps for Ceph (from 78 kVp to 86 kVp)	
Sensor cover additional filtration	0.5 mm Al eq @ 70 kV <sub>p</sub>	



<b>Exposure times</b>	
Panoramic (PAN)	13.8 s PAN Adult / 13.4 s PAN Child
EmiPanoramic	7.4 s Adult / 7.3 s Child
Improved orthogonality Panoramic	11.9 s Adult / Child
Reduced dose Panoramic	11.4 s Adult / Child
Frontal Dentition	4.4 s Adult / Child
TMJ mouth closed/open	2.44 s per image for left and right joint in open and closed condition, total of 9.7 s
Sinus P/A projection	9.4 s
Cephalometry (Ceph)	Exposure time variable according to the type of resolution and format selected. Minimum 4.5 s (18x22 nR), maximum 15 s (30x22 HR)
Exposure time accuracy	± 10 %
<b>Examination modes</b>	
Examination selection	<ul style="list-style-type: none"> <li>• Automatic selection for Adult and Child, 3 Sizes</li> <li>• 3 biting modes (in Panoramic)</li> <li>• Manual selection</li> <li>• Collimator with automatic positioning</li> </ul>
Panoramic	<ul style="list-style-type: none"> <li>• Standard Panoramic</li> <li>• Half Panoramic L/R</li> <li>• Improved orthogonality Panoramic</li> <li>• Reduced dose Panoramic</li> <li>• Frontal dentition</li> </ul>
TMJ (Temporal Mandibular Joint)	TMJ open and closed mouth
Sinus	Sinus P/A projection
Cephalometry and Carpus	<ul style="list-style-type: none"> <li>• Normal resolution cephalometry in Latero-Lateral or Antero-Posterior projection (different formats)</li> <li>• High resolution cephalometry Latero-Lateral or Antero-Posterior projection (different formats)</li> <li>• Normal and High Resolution Carpus exam</li> <li>• Motorized Soft Tissue Filter.</li> </ul>

<b>Image magnification</b>	
Standard Panoramic	Constant over dentition part: 1: 1.23 Adult - 1 : 1.25 Child
TMJ open/closed mouth, 4 images	1: 1.20 (nominal)
Sinus	1: 1.22 (nominal)
Ceph	1: 1.10 (on the sagittal medial plane in LL projection)
<b>Tube-head characteristics</b>	
Model	MRE 05
Manufacturer	Villa Sistemi Medicali S.p.A. 20090 Buccinasco (MI) Italia
Maximum tube voltage	86 kV <sub>p</sub>
kV <sub>p</sub> accuracy	± 8 %
Maximum anodic current	12 mA
Anodic current accuracy	± 10 %
Duty cycle	1 : 16
Nominal power	1.032 kW (86 kV <sub>p</sub> - 12 mA)
Total filtration	2.5 mm Al eq. @ 70 kV <sub>p</sub>
HVL (Half value layer)	> 3.1 mm Al eq. @ 80 kV <sub>p</sub>
Transformer insulation	Oil bath
Cooling	By convection
Leakage radiation at 1 m	< 0.5 mGy/h @ 86 kV <sub>p</sub> - 12 mA - 3 s duty cycle 1/16
Tube-head maximum thermic capacity	310 kJ
<b>X-ray tube characteristics</b>	
Manufacturer	CEI Bologna (Italy)
Type	OPX 105
Nominal focus size	0.5 EN 60336
Inherent filtration	0.5 mm Al eq.
Anode tilt	5°
Anode material	Tungsten
Nominal maximum voltage	105 kV <sub>p</sub>
Filament max current	4 A
Filament max voltage	8 V
Anode thermal capacity	30 kJ

<b>Digital Sensor</b>	
Sensible area (H x L)	<ul style="list-style-type: none"> <li>PAN sensor: 146 x 6 mm</li> <li>PANCEPH sensor: 220 x 6 mm</li> </ul>
Pixel dimensions	48 µm, 96 µm in binning 2x2 (PAN and PANCEPH HR), 144 µm CEPH nR
Pixel (H) NOTE: Number of horizontal pixels depends on the exam and resolution on CEPH.	<ul style="list-style-type: none"> <li>PAN: 1536</li> <li>CEPH: 1536 in nR, 2304 in HR</li> </ul>
<b>Laser centring devices</b>	
2 laser beams are used for the patient positioning; beams align mid Sagittal and Frankfurt planes (please refer to relevant paragraphs for detailed explanation).	
Wave length	650 nm
Divergence	12.5 mRad
Optical power on the working surface	< 0.5 mW
Laser class	Class I according to EN 60825-1+A1+A2
DNRO in 30s application period	0.05m
<b>Mechanical characteristics</b>	
Focus-receptor distance (PAN, TMJ and Sinus)	50 cm (20")
Focus-receptor distance (CEPH)	165 cm (65")
Telescopic motorised column run	85 cm (33.5")
Maximum total height	245 cm (96.5")
Weight	<ul style="list-style-type: none"> <li>161 kg (354 lbs) base version</li> <li>186 kg (409 lbs) version with Ceph</li> </ul>
Column weight	87 kg (192 lbs)
Weight of arm support, rotating arm and tube head	74 kg (163 lbs)
CEPH arm	25 kg (55 lbs)
Legs (optional)	30 kg (66 lbs)
Sensor holder weight	2 kg (5 lbs)

<b>Working conditions</b>	
Minimum room size (please refer to paragraph 5.3 of the Service Manual)	<ul style="list-style-type: none"><li>• 130x120 cm (51.2"x47.2") without CEPH</li><li>• 145x202 cm (57.1"x78.7") with CEPH</li></ul>
Recommended room size (please refer to paragraph 5.3 of the Service Manual)	<ul style="list-style-type: none"><li>• 130x140 cm (51.2"x55.1") without CEPH</li><li>• 160x222 cm (63"x86.6") with CEPH</li></ul>
Maximum working temperature range	+ 10° ÷ + 40°
Relative working humidity (RH) range	30% ÷ 75%
Temperature range for transport and storing	- 20° ÷ + 70°
Humidity range for transport and storing	< 95% without condense
Minimum atmospheric pressure for transport and storing	630 hPa

## 4.1. Applied safety regulations

The I-Max Touch complies with the following standards:

**CE** 0459 The symbol CE grants that I-Max Touch complies with directives 93/42 for medical devices issued by the European Community.

- Canadian Medical Device Regulations
- 21 CFR Subchapter J (for 110-120V version)
- General safety:  
IEC 60601-1:1988 + A1:1991 + A2:1995  
IEC 60601-1-4:1996 + A1:1999  
IEC 60601-2-7:1998  
IEC 60601-2-28:1993  
IEC 60601-2-32:1994
- Electromagnetic compliance:  
IEC 60601-1-2:2001
- Protection against radiation:  
IEC 60601-1-3:1994  
IEC 60825-1:1993 + A1:1997 + A2:2001

### Classification

I-Max Touch is an electro-medical X-ray device belonging to Class 1 and Type B as per classification IEC 60601-1, foreseen for a continuous working at intermittent load.

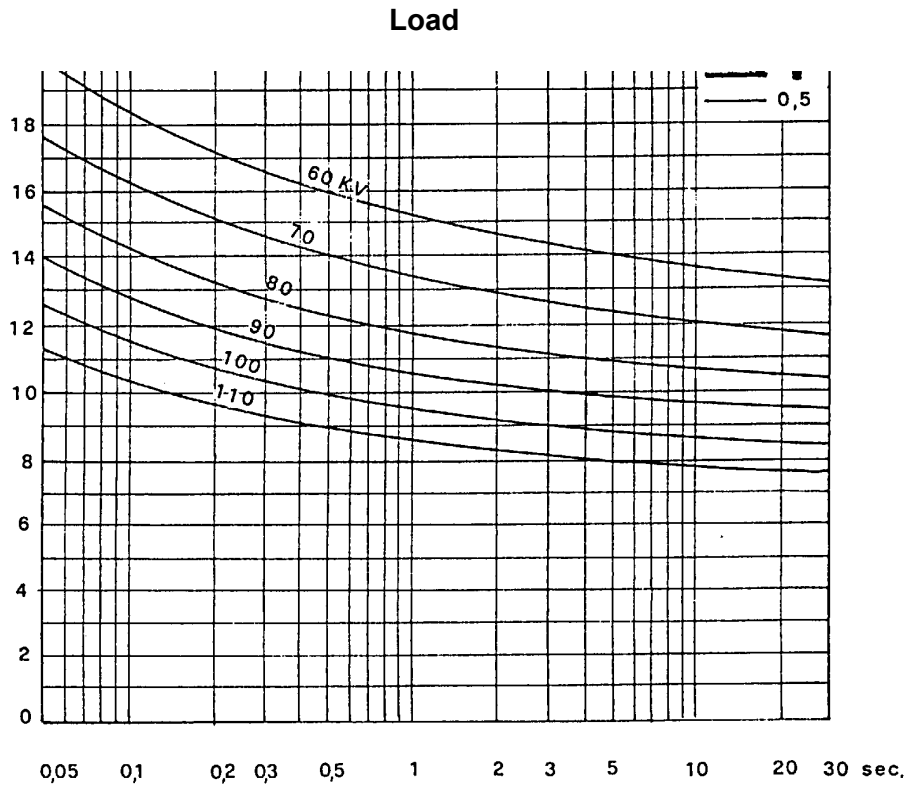
According to CE 93/42 directive for medical devices, the equipment belongs to class II B.

According to Canadian MDR, the equipment belongs to class II.

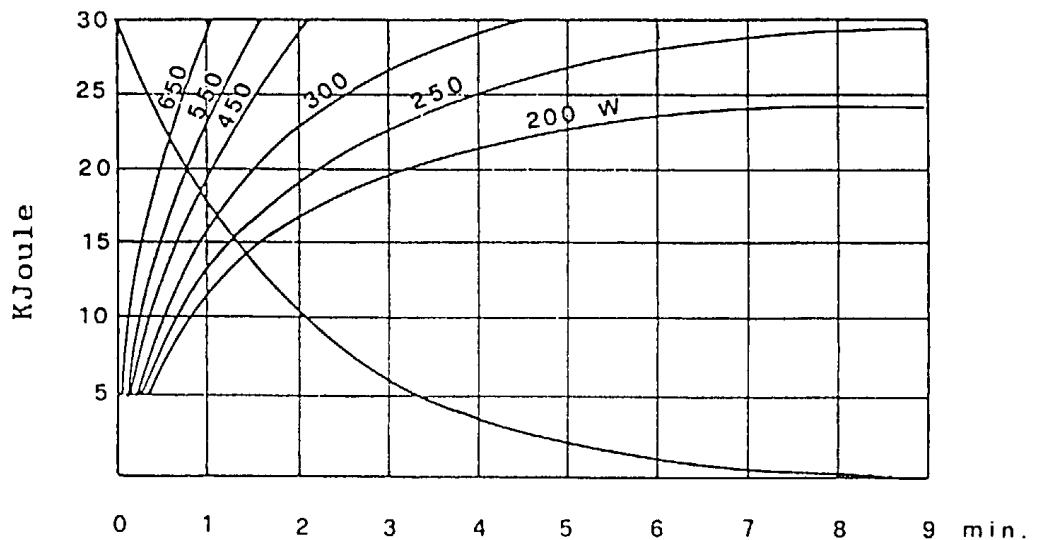
According to FDA 21 CFR, the equipment belongs to class II (for 110-120V version).

## 4.2. Loading curve of the tube and cooling curve of the anode

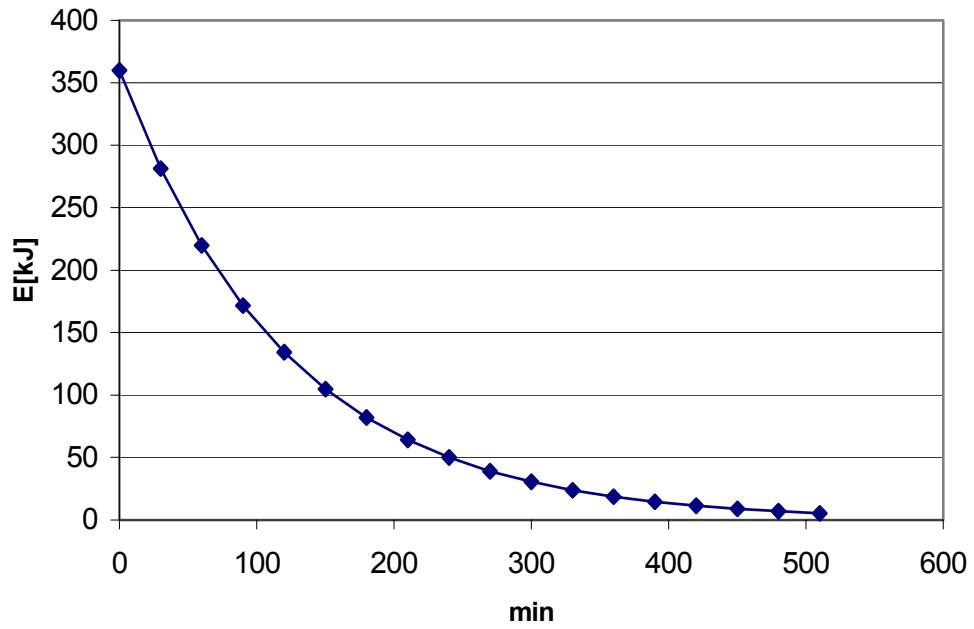
Tube "CEI - OPX / 105" (0.5 IEC 336)



Anode cooling curve



Tube-head heating and cooling curve



### 4.3. Measurement method of technical factors



**WARNING:**

These measurements require the removal of the HF group covers; this means to gain access to internal parts where high voltage are normally present.

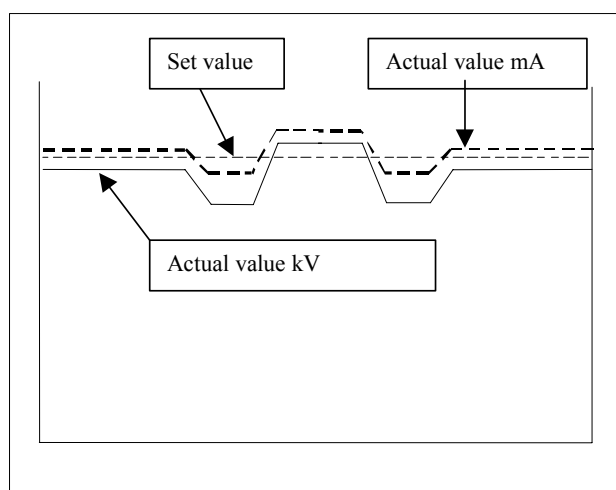
For the measurement of the exposure parameters with the invasive method, please follow the procedure described in paragraphs 7.2.1, 7.2.3 and 7.2.2 of this manual.



**WARNING:**

During the panoramic examination, the set value of kV and tube current varies according to a pre-determined curve in order to compensate the different absorption of X-ray beam due to different anatomical structures. In this way, it is possible to obtain a good uniformity of the image contrast. Particularly, the chosen value is lowered on the initial phase of the panoramic and increased on the scissors/canine zone, in order to compensate the effect of the cervical spine.

The value displayed during the panoramic examination corresponds to the one chosen by the user, while the real value can be different; these effects must be considered in case of measure of the exposure factors using standard diagnostic mode. As an example, the variation follows the curve hereafter:



Accuracy declared on the section "Technical data" is referred to the actual value of kV and/or mA. In any case, the manufacturer guarantees that the accuracy of the loading factors is always in compliance with the international standard for safety of medical devices IEC 601-1.

Particularly, in accordance with IEC 601-2-7, the maximum deviation (including the correction and instrument's accuracy) is less than or equal to  $\pm 10$  for kV, while for tube current is less than or equal to  $\pm 15\%$ .



#### 4.4. Verification method of exposure parameters



The exposure parameters (kV, time and dose) can also be verified using the so called "non-invasive method".



**WARNING:**

The machine collimator gives a narrow X-ray beam. Measurement by a non invasive kV meter on a very narrow beam can be difficult and/or unreliable and special probes with reduced sensitive area must be used. It may result helpful to use a fluorescent screen to locate the X-ray beam and consequently position the probe of the kV meter.

The exposure parameters can be checked with a non-invasive instrument by performing the following procedure:

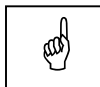
1. With the unit switched on, be either in Anatomic or Manual mode, press the "Anatomic/Manual" mode indicator until it turns green and displays "S"  , then press the "Test function" (5)  key to enter the exposure verification mode, the display shows:

x	x	k	V	x	x	m	A	x	x	.	x	s		
E	M	I	S	S	I	O	N	P	R	O	G	R	A	M



**WARNING:**

The following operations involve the emission of X-rays, so the Authorised Technician must pay the greatest attention and respect the protection regulations in force in that country.




**NOTE:**

This program allows you to carry out the measuring of the exposure parameters with the tube-head arm in a fixed position (not rotating) without variations due to spine compensation.

3. Place the measuring instrument.

4. The KV and mA parameters can be modified by pressing the

increase key and the decrease key  of the KV or mA on the

display.

The parameters can vary within the limits shown in the following table:

Parameter	Minimum value	Maximum value
<b>kV</b>	60	86
<b>mA</b>	6	12

5. Perform an exposure; the emitted parameters (kV and Time) can be read on the measuring instrument.



**NOTE:**

The performances are guaranteed only if the measurement of kV and time is done with the invasive method, due to the fact that the non-invasive method may introduce errors for instruments tolerance or wrong measurement condition.

6. To end the control program, press any key other than the increase

and decrease keys  ; the display will indicate:

x	x	k	V		x	x	m	A		x	x	.	x	s
P	A	N	O	R	A	M	I	C	-	S	T	D		

and the unit will return to standard mode.

**4.5. Dimensions**

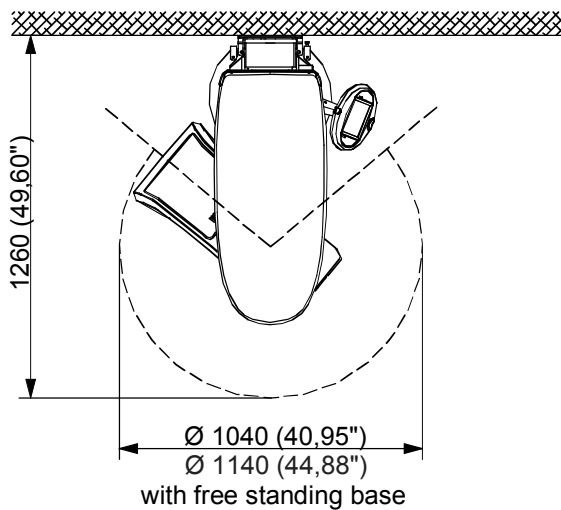
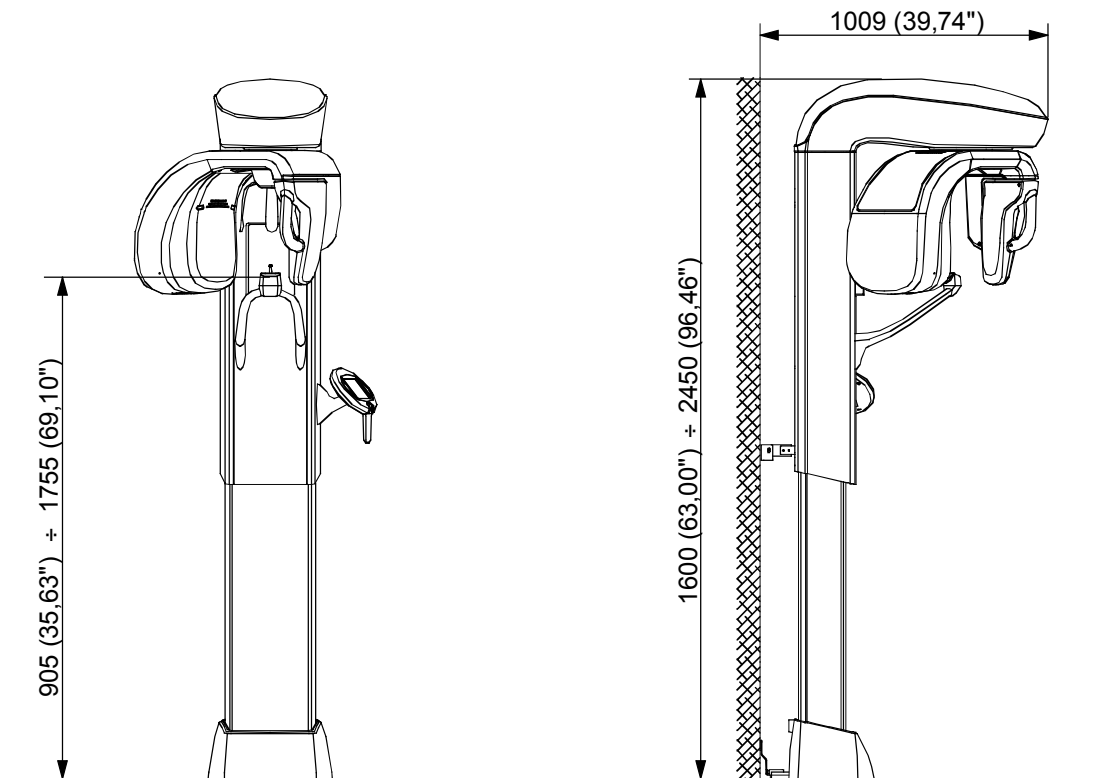
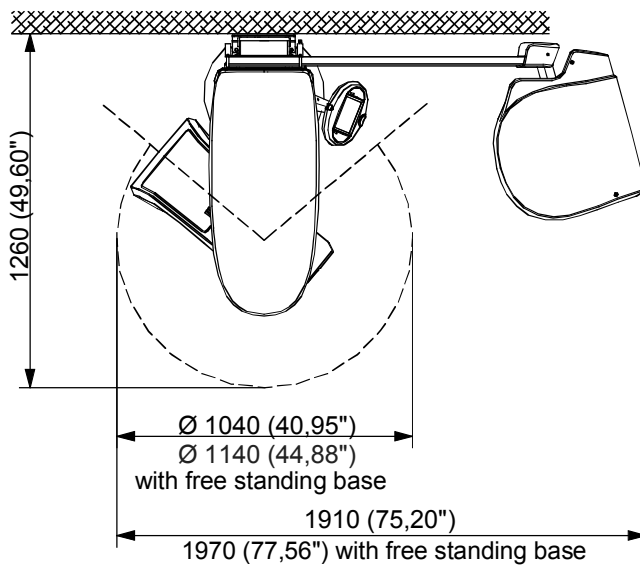
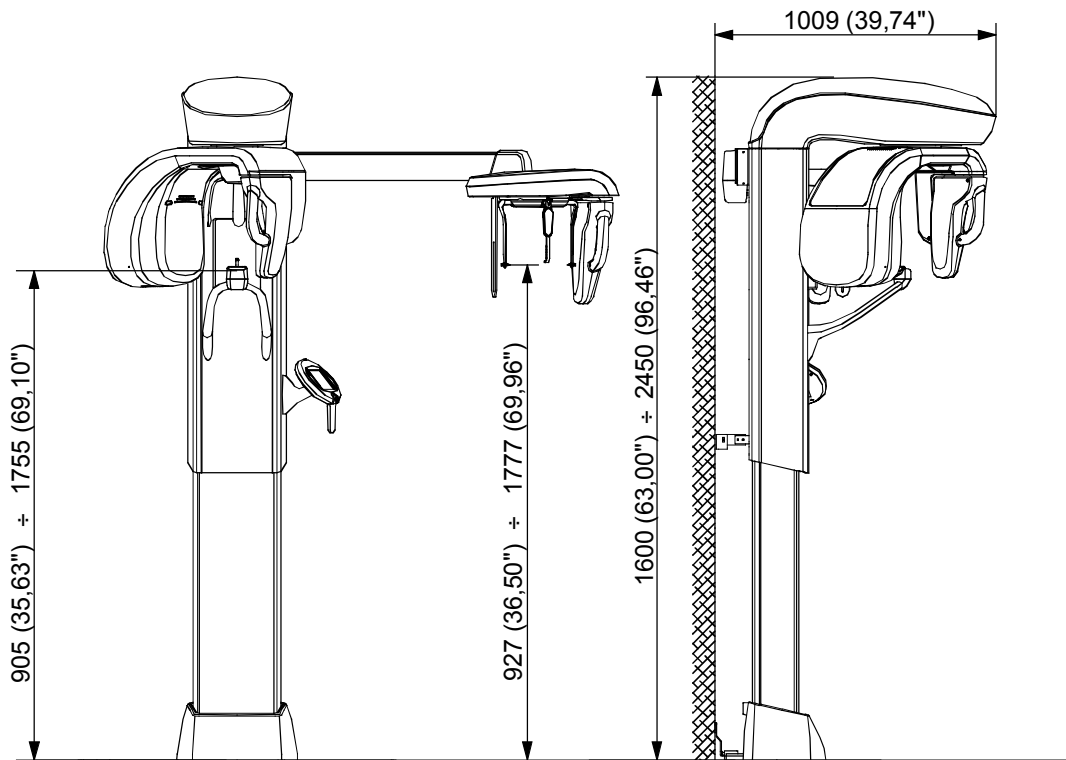


Figure 4-1 - Base version



*Figure 4-3 - Version with cephalometric unit*

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## **5. PRE-INSTALLATION**

The instructions indicated in this and in the following chapter enable to perform a correct installation in order to grant a regular operation of the I-Max Touch.

The supplier can supply the assistance and the necessary technical advice for pre-installation, all masonry works and the pre-installation phase are at the customer's charge and must be performed complying with the indications given below.

The requirements for a correct installation of the I-Max Touch are:

- minimum height of the room: 2.5 m (8.20 ft) and a surface variable according to the configuration of the I-Max Touch to be installed, as indicated in the picture at paragraph 5.3
- a certain distance from heating devices
- the entries in the room, for the transport of the unit, must have a minimum width of 80 cm (31.50").



**WARNING:**

In its standard versions, the I-Max Touch must be fixed to the wall with the two brackets supplied. Each dowel must support a max. extraction force of 120 kg (264 lbs).

The fixing dowels to be employed, for any kind of wall, are the following:

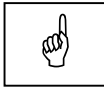
- **full or concrete bricks:** screw anchors (provided with the installation kit) in cast-iron M6 or chemical screws WURTH (not provided)
- **wood mountings:** self-threading screws (not provided)
- **hollow bricks:** chemical dowels (not provided).

A special floor mount option is available; in this case the equipment **MUST** be fixed to the floor.

The manufacturer is not responsible for any installations that do not comply with the specifications stated above.

---





**NOTE:**

The electrical connection must be done on the terminal board X0 (see operation circuit diagram – chapter 9).

---



**NOTE:**

The unit only provides the closing contacts relative to the above mentioned functions. Power voltages for the relevant devices have to be provide from outside, making sure not to exceed the indicated ratings.

---

To connect all control and warning devices it is advisable to set 6 wires with 0.5 mm<sup>2</sup> section minimum.



## 5.2. Packaging

The I-Max Touch in base version is delivered in two carton-board boxes; the device equipped with Cephalometric unit will be delivered in three boxes.

Contents	Weight	
	Net	Gross
- Axis movement device, complete with tubehead - Covers	80 kg (176 lbs)	95 kg (209 lbs)
- Column complete of touch screen - Covers - Digital sensor holder - Accessories	145 kg (319 lbs)	160 kg (352 lbs)
- Cephalometric device - Covers - Accessories for Cephalometric device	57 kg (126 lbs)	72 kg (159 lbs)



**NOTE:**

All boxes mount shock detectors.

At the receiving and before opening boxes, verify that those sensors have not been activated.

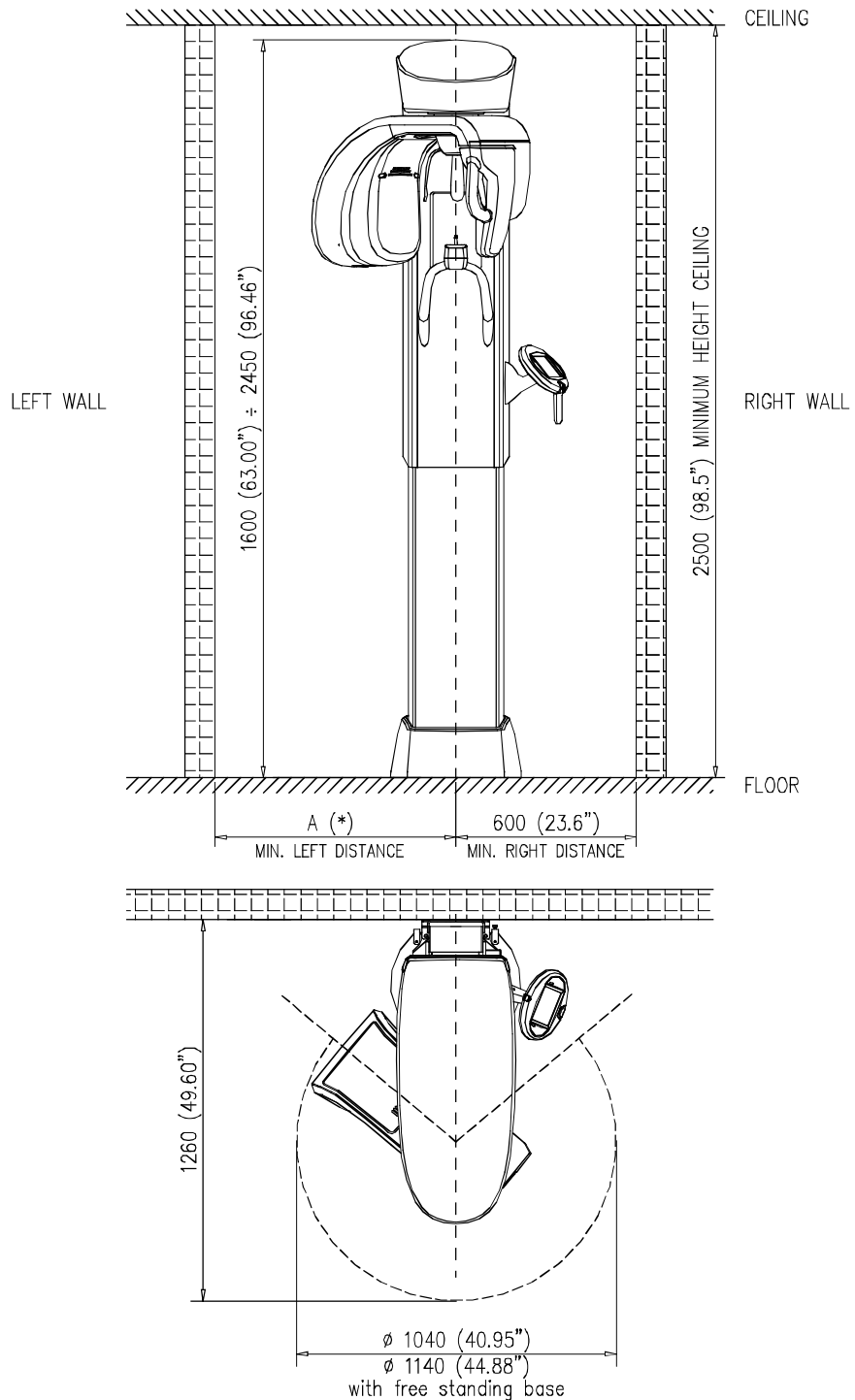


**WARNING:**

**Owandy will not bear any responsibility for damages caused to the equipment due to improper unpacking procedure, and for the relevant costs.**

### 5.3. Space requirements

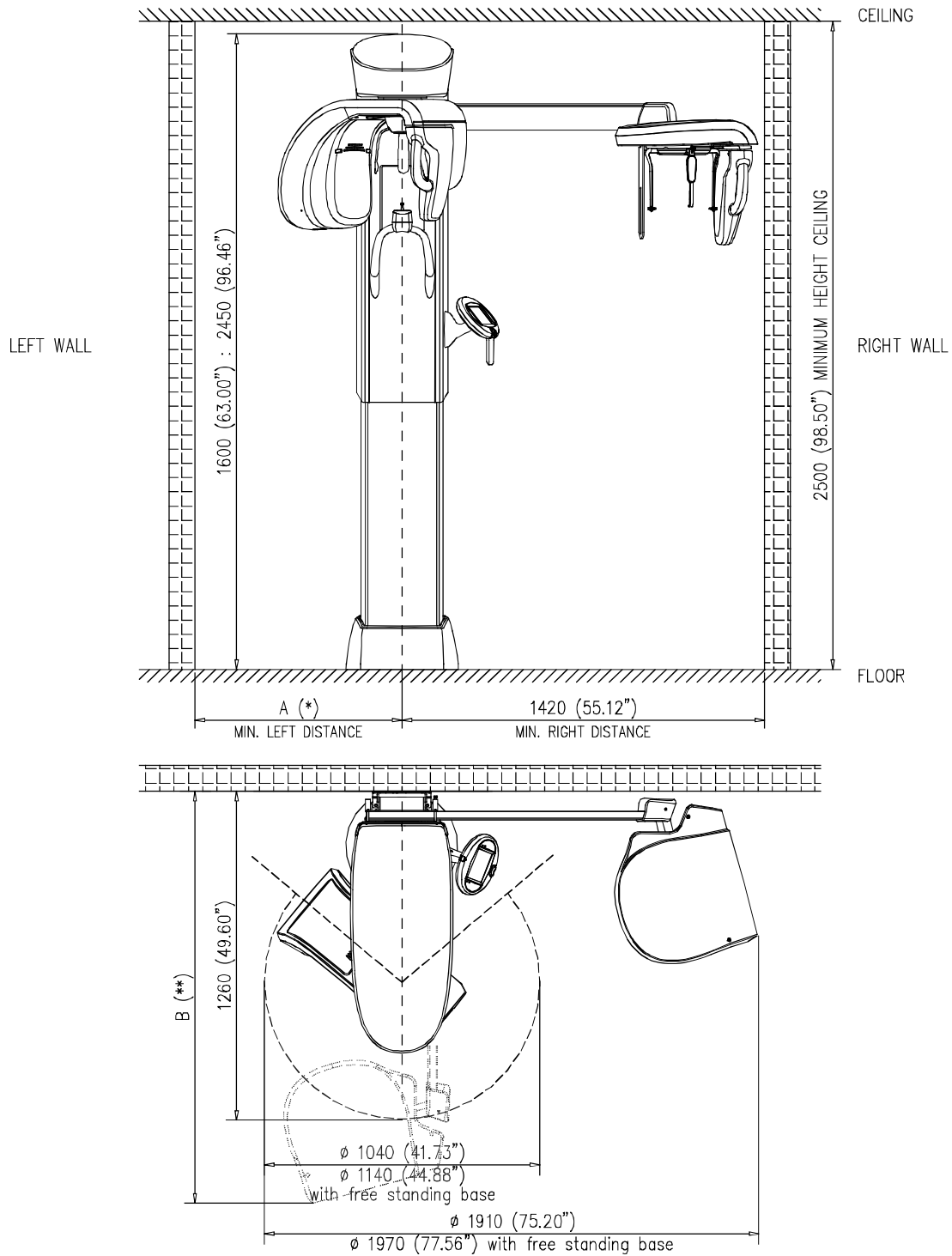
#### 5.3.1. Version without CEPH



*(\*) A = minimum 600 mm (23.6"), recommended 800 mm (31.5") for service purpose*

Figure 5-1

5.3.2. Version with CEPH



(\*) **A** = 600 mm (23.6") minimum, 800 mm (31.5") recommended for service purpose  
 (\*\*) **B** = 1450 mm (57") minimum front space, 1600 mm (63") recommended front space for service purpose

Figure 5-3

## **6. INSTALLATION**



**NOTE:**

The I-Max Touch is delivered pre-mounted in groups; it is contained in 2 (PAN version) or 3 boxes (CEPH version).

The mechanical mounting consists exclusively in assembling the above mentioned groups. Most of the adjustments are carried out in factory.

Two technicians will be necessary to perform some procedures; the phases requiring the intervention of two men are identified in the related chapters.

---

## 6.1. Setting of the wall



**NOTE:**

This paragraph is valid only for wall mounted version.



**NOTE:**

The I-Max Touch has been designed for a wall fixing by two brackets, each of which requires to be fixed by two dowels. In order to find the right position of the brackets, it is necessary to use the quotes indicated in the Figure 6-1.

**It is very important the vertical alignment of the central holes and the perpendicularity with the floor; it is strictly suggested to use a plumb.**

1. Mark the wall by a centre punch, at the level of the fixing holes; drill the wall according to the type of dowels (see chapter 5).
2. Mount the upper wall bracket "C" (Figure 6-3) and tighten the fixing screws.

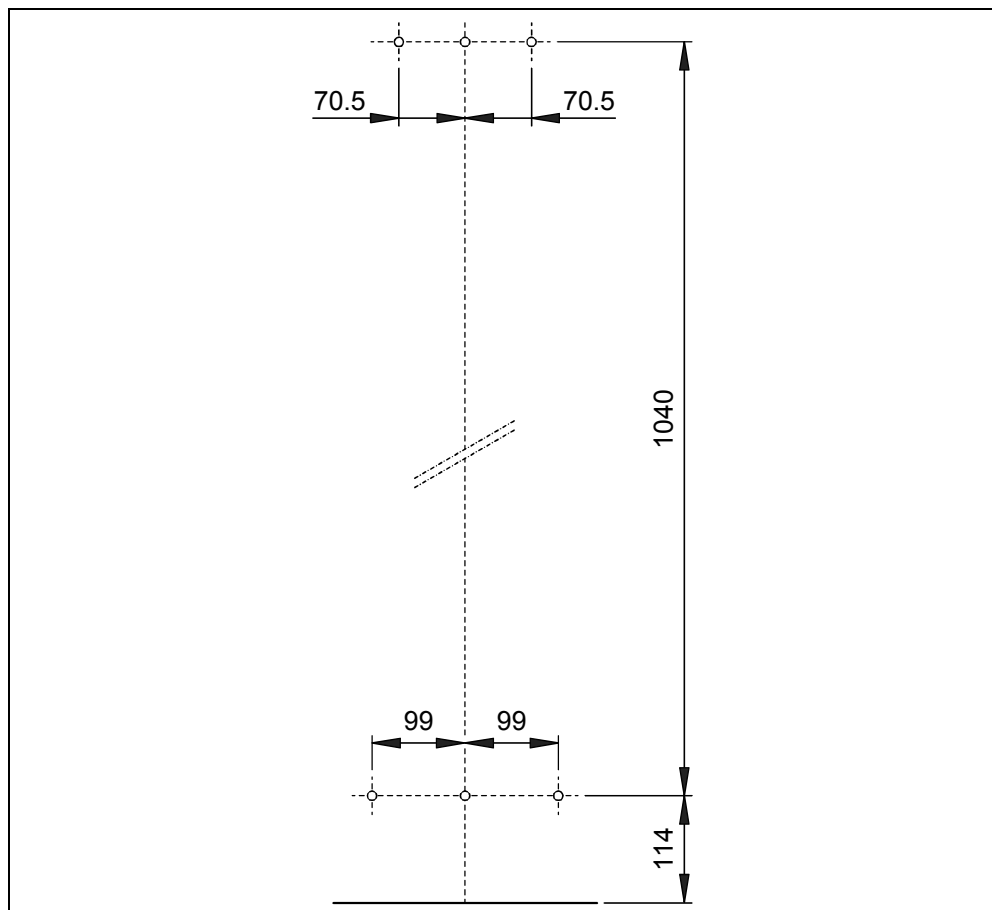
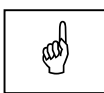


Figure 6-1

## 6.2. Column mounting

The column is delivered in a carton box containing the column itself, the patient support arm and the keyboard. All those parts are fixed to a wooden pallet using two fixing brackets (A); an additional retaining bracket (B) is fixed at the upper part of the column (Figure 6-2). Verify the presence of the four adjustment feet in the lower side of the column.



**NOTE:**

In case of free standing base version, it is necessary to remove the four feet before raising the column.

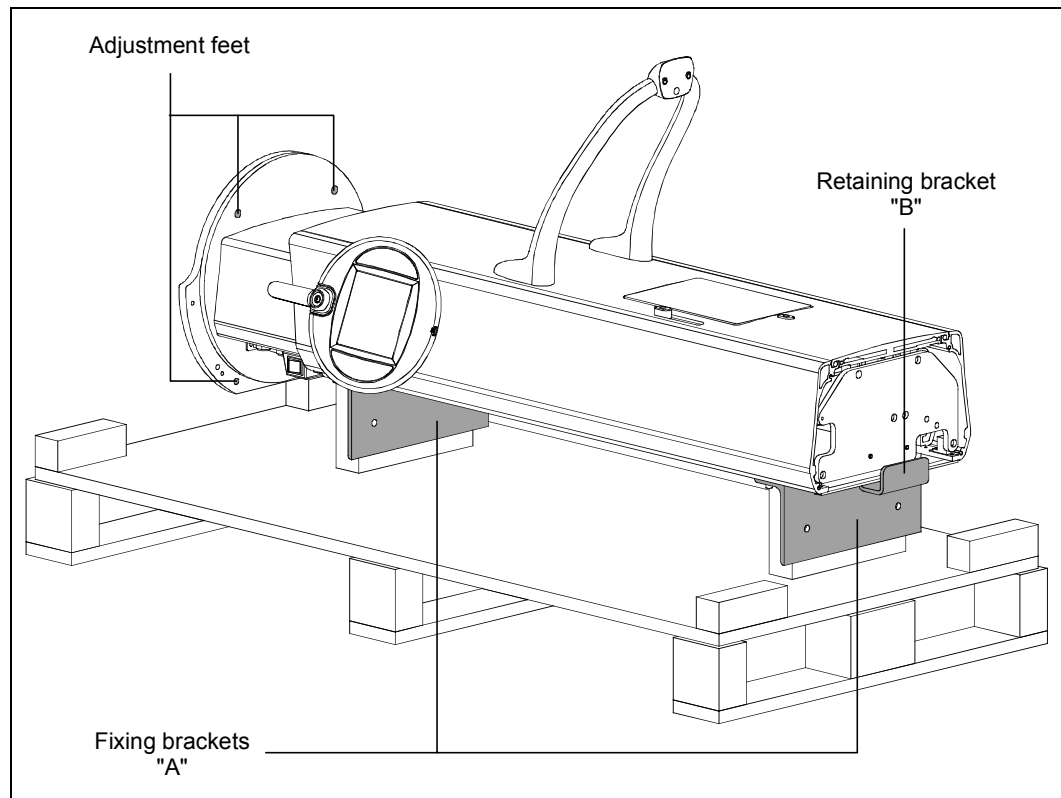


Figure 6-2

1. Remove the screws used to fix the column to the wooden pallet and raising it (this operation requires the presence of two persons).
2. With the column in vertical position, remove only the two fixing brackets "A".



**NOTE:**

Leave the retaining bracket "B" in place, because it will be necessary for the operations of support arm mounting.



**NOTE:**

The following procedure is not valid for free standing base version.

3. Mount on the column basement the lower fixing plate "D"; mount on the column the upper fixing plate "E" and mount the fixing bracket "F" on the fixing plate "E" only with the two external screws (Figure 6-3), without tighten the screw in order to permit the rotation of the plate.
4. Position the column close to the wall.
5. Rotate and insert the upper fixing bracket "F" to the relevant wall bracket "C". Insert the remaining screws and tight all the screws between fixing bracket "F" and wall bracket "C".
6. Fix the lower fixing plate "D" to the wall, without tighten the screws.
7. Verify, with the bubble level positioned on the chin rest support, the parallelism between column and wall.  
In order to correct this position, it is possible to insert some spacers (Figure 6-3 - provided with the column) between the lower bracket and wall. Once the position is reached, tighten the screws.
8. Acting on the feet grub screws, adjust them in order to level the feet on the floor. At the end, cover the grub screws with the provided cups.



**NOTE:**

The I-Max Touch is equipped with a switch (S2) which allows to move the column vertically for service use. It is located in the back lower side of the column, protected by a metallic cover.

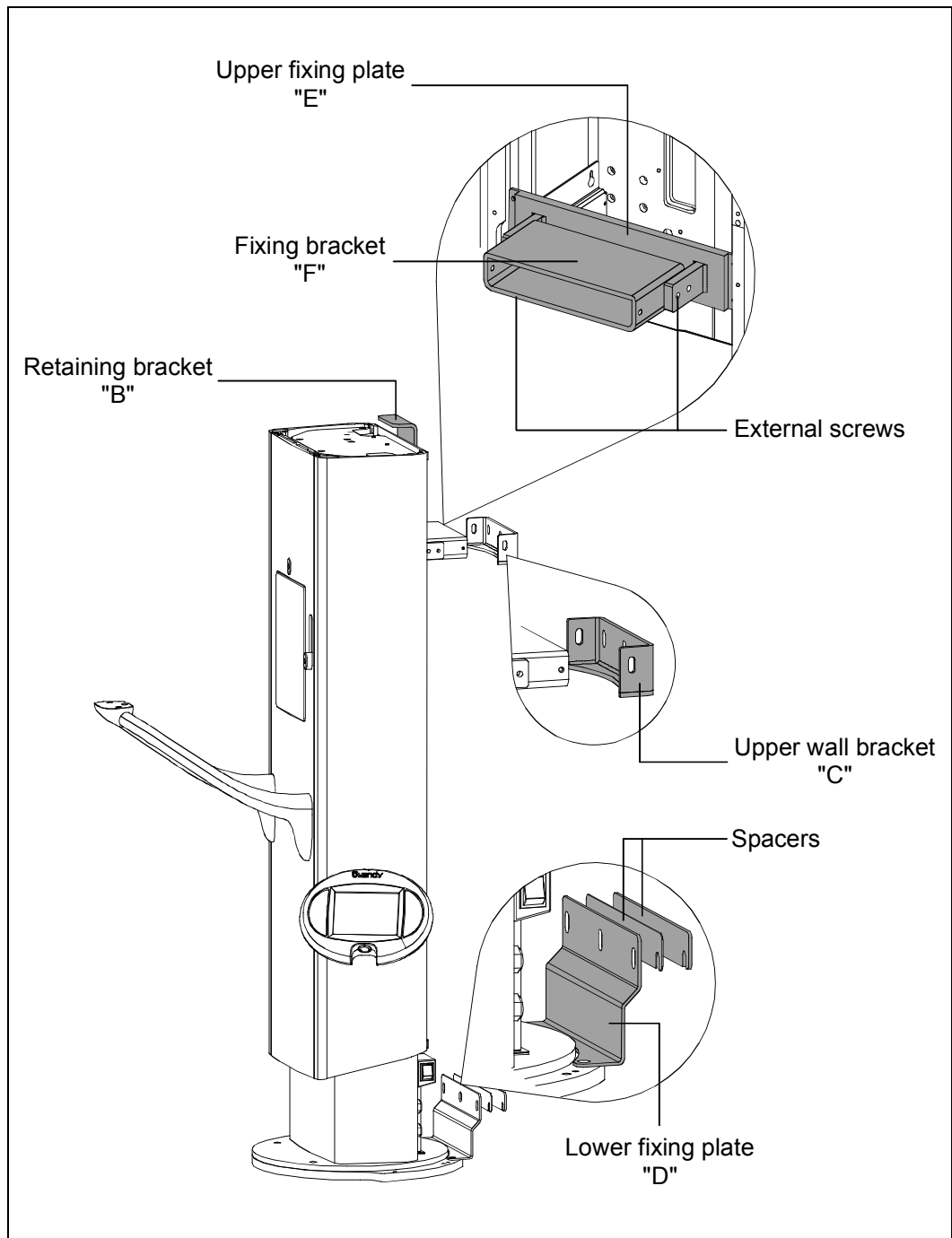


Figure 6-3



### 6.3. Mounting of the rotating arm assembly

1. Unscrew the fixing screws of the carton box from the lower pallet.  
Raise the carton box to gain access to the wooden frame that holds the rotating arm.
2. Remove the screws fixing the rotating arm to the wooden frame.  
Raise up the support/rotating arm using the designated handling zones (Figure 6-4 - This operation requires the presence of two persons).

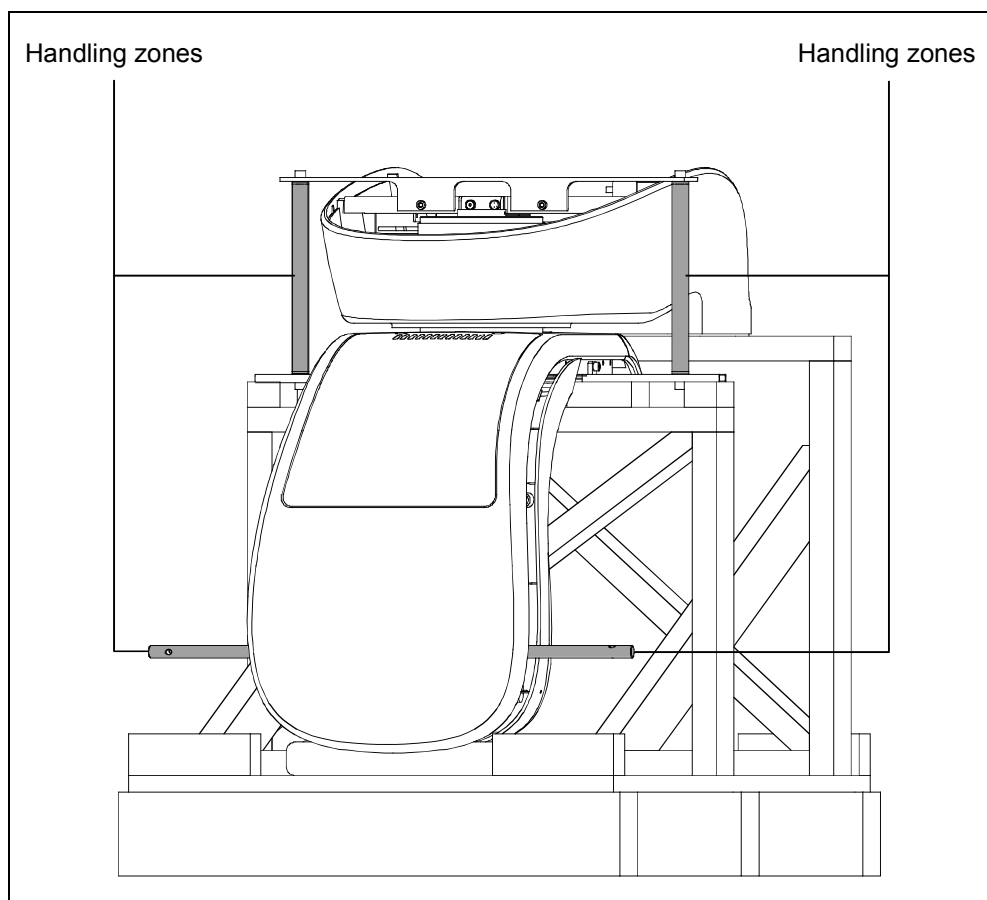
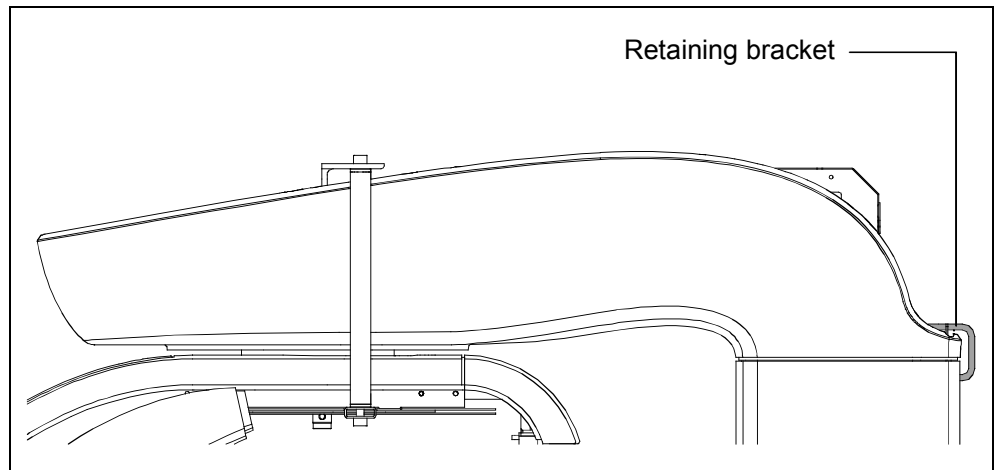


Figure 6-4

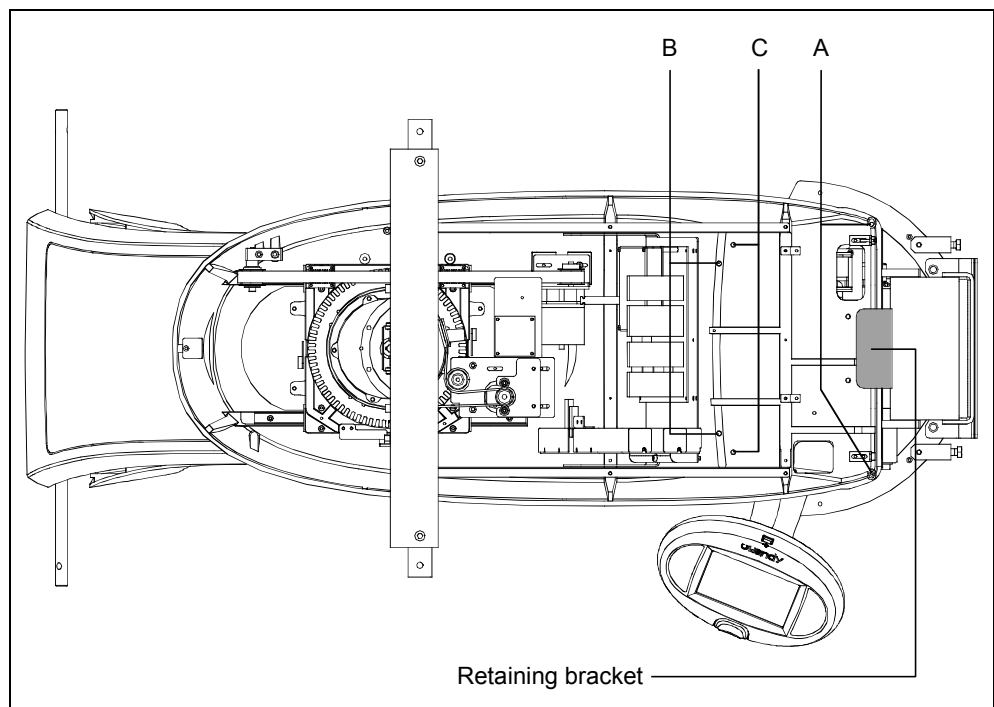
3. Move the rotating arm near the column from lateral side in order to avoid contacts between the Digital Sensor holder and the chin support.

4. Position the rotating arm on the column inserting it in the retaining bracket (Figure 6-5). While a person keeps it in position, the other has to fix the two backside screws "A" (Figure 6-6) to the column without tightening them.



*Figure 6-5*

5. Remove the two posterior screws fixing the CPU board support plate to the rotating arm and tilt it at about 75°; lock the support plate to the lateral frame.
6. Insert the reference pins "B" (Figure 6-6) between the rotating arm and column using a hammer. Insert the remaining two screws "C" (Figure 6-6) and tighten all the fixing screws.



*Figure 6-6*

7. Remove all brackets and rotate the rotating arm about 90° in clockwise direction in order to reach easily the covers screws.
8. Remove the tubehead cover; remove the two spacers "D" and the lower fixing bracket "E" (Figure 6-7).

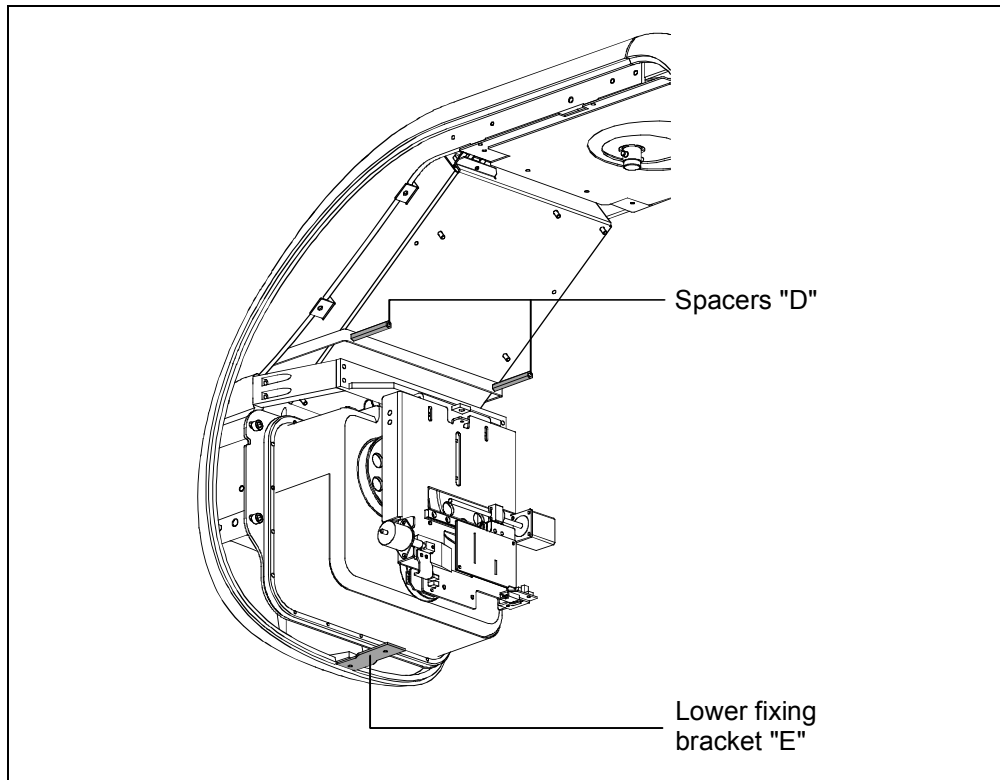
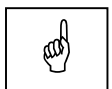


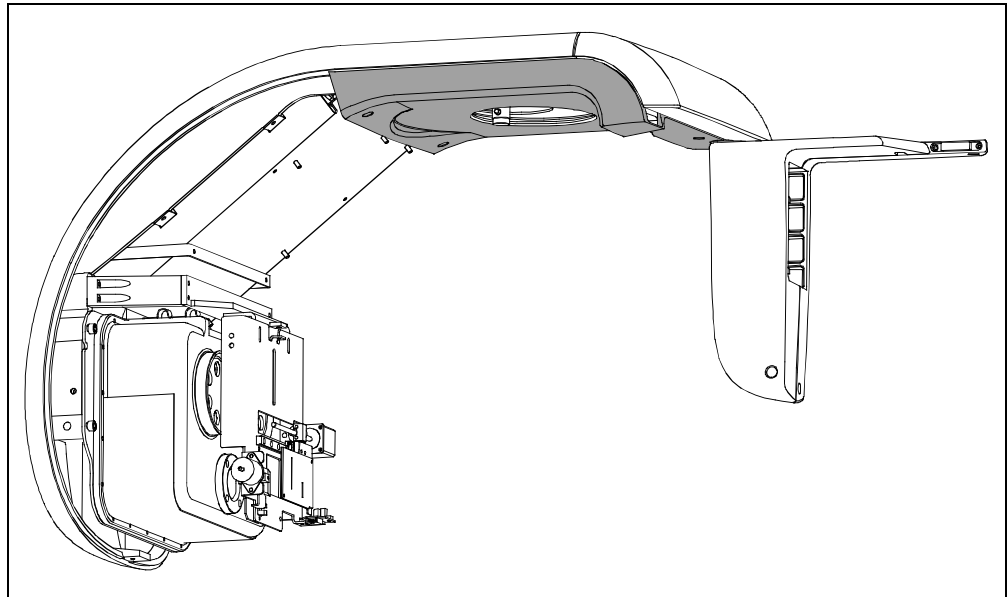
Figure 6-7

9. Open the sensor holder and mount the rotating arm lower cover (Figure 6-8).



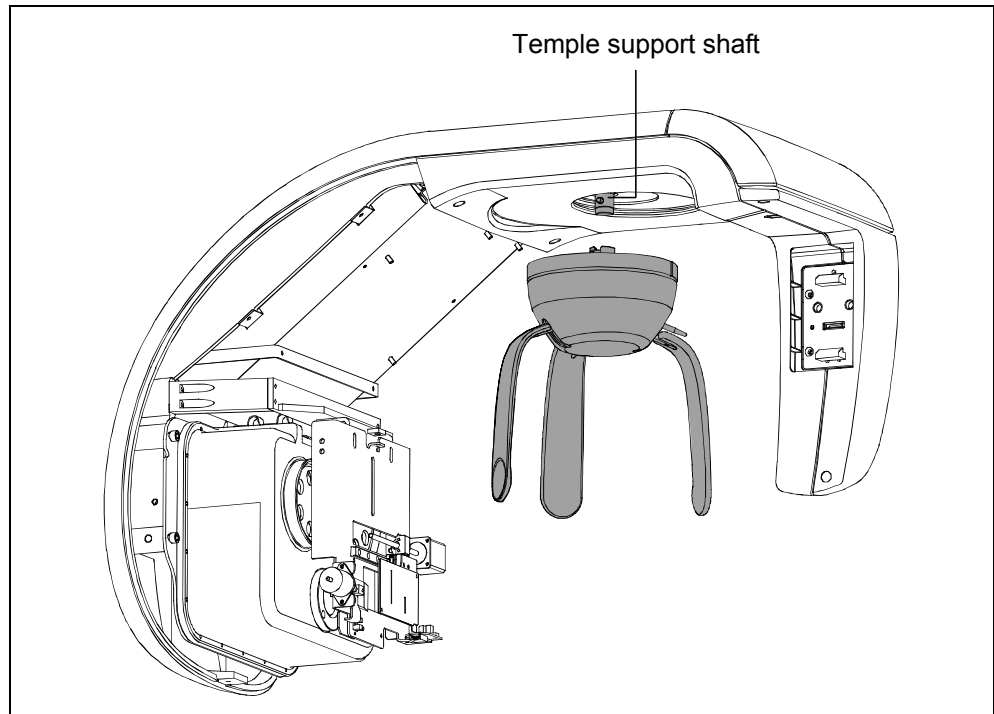
**NOTE:**

In case of Ceph up-gradable version or single sensor version, in order to mount the rotating arm lower cover, it is necessary to remove the sensor holder internal covers.



*Figure 6-8*

- 10.** Mount the temple support group inserting and rotating it in the relevant shaft (Figure 6-9) until the group is locked.



*Figure 6-9*

11. Insert the cables between column and rotating arm through the holes present in the rotating arm; reposition and fix the CPU board and connect the cables to the related connectors.



**NOTE:**

For 110-120V version, to access to the CPU board connectors, it is necessary to remove the metallic cover.

At the end of the connections, position the cables in the relevant seating and remount the cover.

---

## 6.4. Mounting of CEPH-arm (Optional)

The CEPH kit can be installed on the machine both during the first installation and later as updating of the device. In case the I-Max Touch is sold already equipped with the Ceph arm, centering between the X-ray beam and the Sensor will be very quick as the arm is already adjusted and pinned in the factory.

In case the arm is provided later (unit upgrade), the unit is already pre-set to accept it, but the centering between the X-ray beam and the Sensor must be performed in the field.

The Ceph device is shipped in a dedicated packaging and is already pre-assembled in a single piece composed of the following parts:

- Ceph arm including the handle for installation
- Skull clamp and ear centering device
- Arm covers
- Sensor holder.

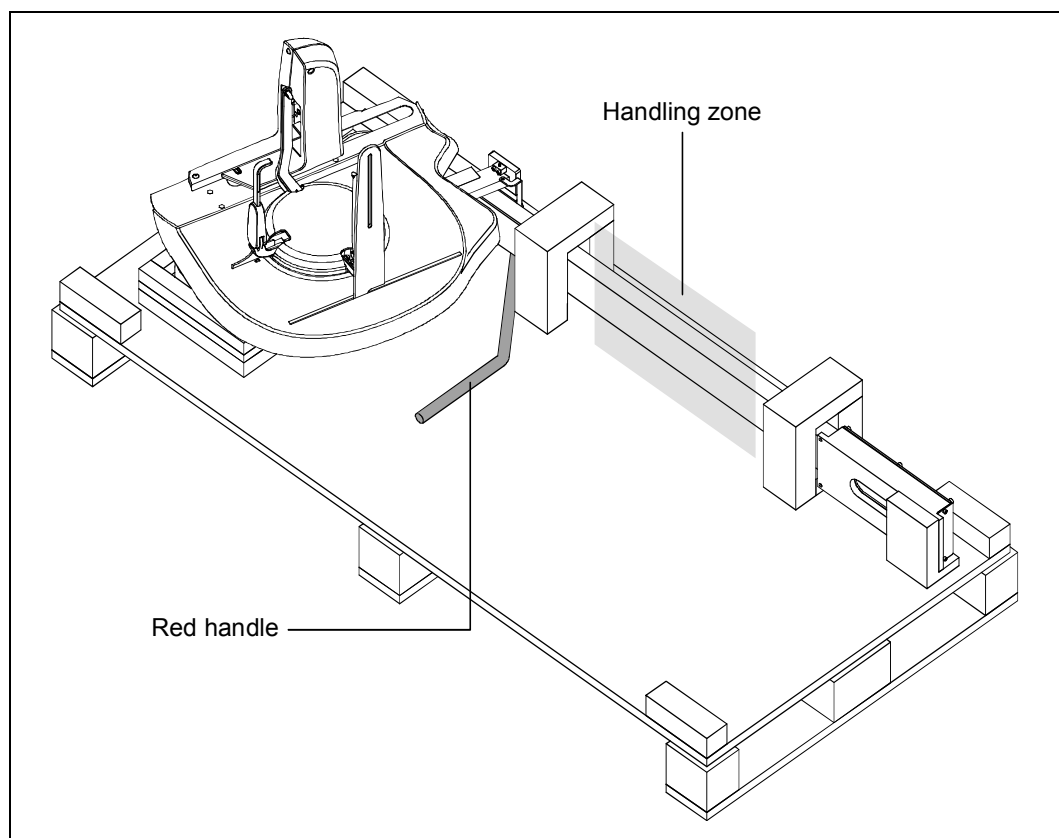


Figure 6-10



**NOTE:**

Do NOT remove the handle before the complete installation of the Ceph arm on the column.

1. Remove the column rotation fixing screw located in the back side of the column basement and loose the upper fixing bracket "F" (Figure 6-3) removing the two screws in column side and the two in wall side and loosening the two central screws. Rotate the upper fixing bracket "F".
2. Rotate the column in clockwise direction in order to reach the column back side.
3. Lift the Ceph arm with the red handle and the handling zone and remove it from the package (Figure 6-10).
4. Position the Ceph arm near the column and using the reference pins and screws, fix the Ceph arm to the column (Figure 6-11).
5. Insert the cables in the hole between column and rotating arm and connect them to the relevant connectors on the CPU and Digital boards.
6. Remove the red handle.

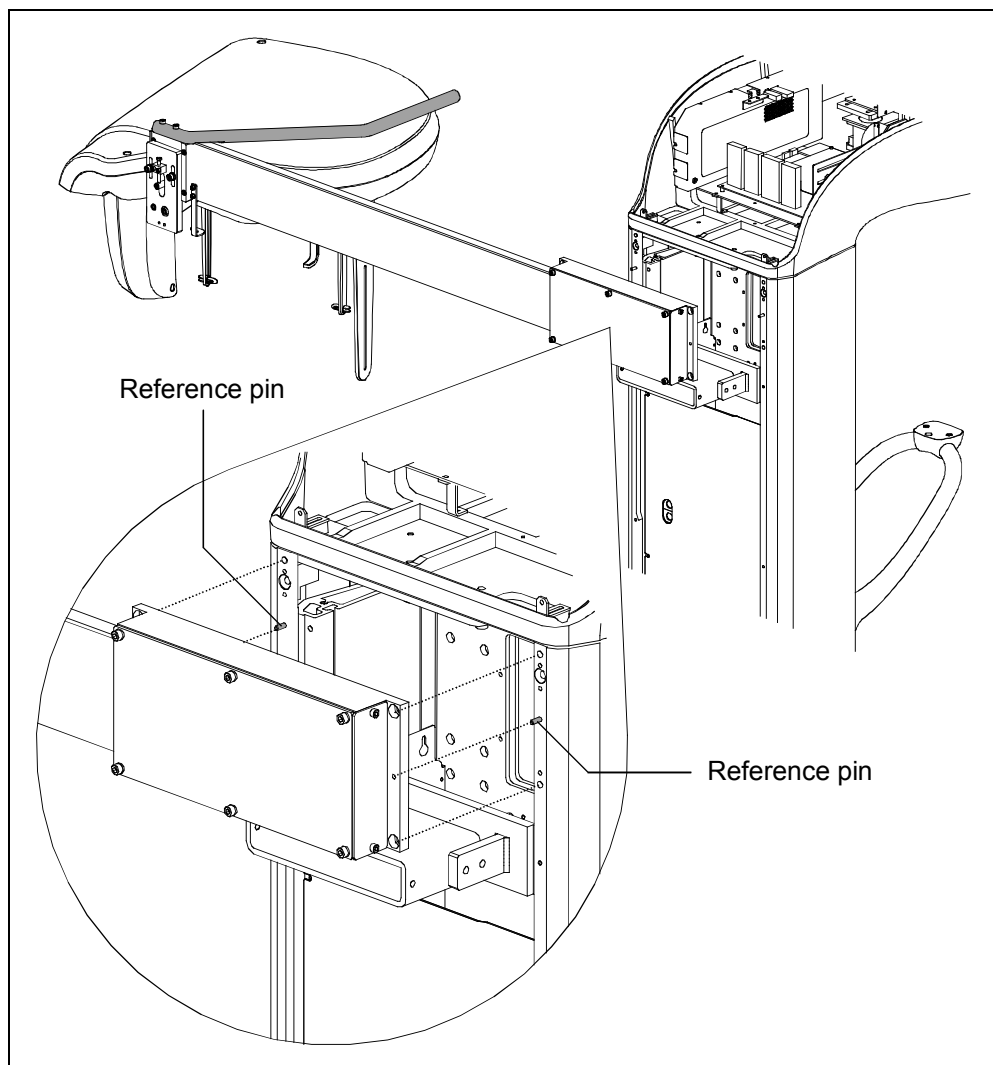


Figure 6-11

## 6.5. How to mount the covers



**NOTE:**

If necessary, to easily access to the covers back side screws, remove the column rotation fixing screw located in the back side of the column basement and loose the upper fixing bracket "F" (Figure 6-3) removing the two screws in column side and the two in wall side and loosening the two central screws. Rotate the upper fixing bracket "F" and rotate the column in clockwise direction in order to reach the column back side.

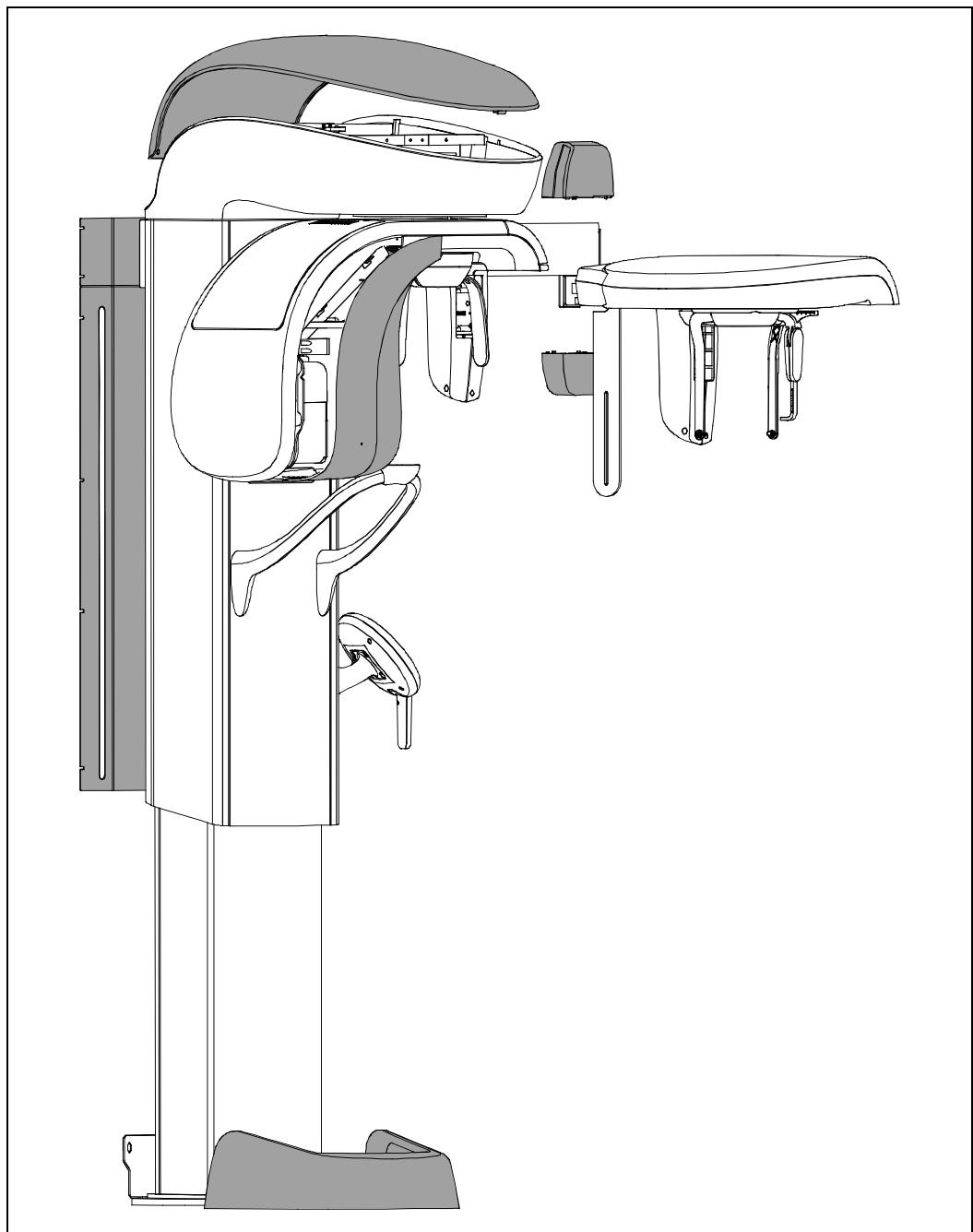


Figure 6-12



## 6.6. Inserting the sensor in the sensor holder



**NOTE:**

Not valid for PAN only version.

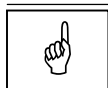
In order to insert the sensor in the desired station, carry out the following operations:

1. Grip the sensor by the appropriate handgrip; close your fingers to form a fist, by engaging the control lever and bring it to the position where the lever disappears inside the handgrip, so that the whole mobile system retracts.
2. Keep the sensor with the relative handgrips vertical, so that the upper plane is parallel to the horizontal part of the sensor holder, bring the sensor close to the fixed station, by engaging the protruding part of the mobile sensor into the relative casing.
3. Push the sensor mobile part to the very end, in order to engage the mobile part onto the fixed hooking system.
4. Carry out a movement towards the lower part, ensuring that the movement is complete.
5. **Only at this point, release the hooking lever**, checking that the sensor is correctly engaged before releasing the handgrip.



**WARNING:**

During the lever releasing operation, hold the sensor firmly, to prevent the sensor from falling during the insertion phase due to possible errors.



**NOTE:**

All sensor types are equipped with a shock detection sensor; this sensor is also visible from the outside to enable the operator to perform checks. Possible shocks are displayed by a change in colour (from transparent/white to red) of this sensor. The digital sensor can still function correctly also when the colour changes, displaying a fall that might also not have damaged the sensor.



**NOTE:**

The fallen sensor colour change interrupts the warranty on the sensor.

## **7. MAINTENANCE AND SERVICING**

As with all electrical appliances, this unit must be used correctly and maintenance and inspections must be made at regular intervals. Such precautions shall guarantee the safe and efficient function of the appliance.

Periodic maintenance consists in inspections made directly by the operator and/or Technical Service Department.

The inspections made directly by the operator are the following:

- ensure that the rating labels are intact and correctly fastened
- check whether there are any traces of oil on the tubehead
- check to ensure that the X-rays push-button switch cable is not split or damaged
- check to ensure that there is no external damage to the appliance which could jeopardise protection from radiation.



**WARNING:**

The operator is recommended to perform these inspections before each session of operations.

If the operator detects irregularities or damage, he should immediately inform the Technical Service Department.

---

The appliance's performance is checked and, where necessary corrected, during the maintenance activities performed by the Technical Service Department, in accordance with the indications provided in the following chapters. Such interventions are recorded in the "Maintenance Logbook" in the User's Manual.

The periodic maintenance performed by the Technical Service Department comprises the performance of the following additional inspection activities to be made yearly:

- general visual inspection
- grounding of all the accessible conductive parts
- condition of the internal and external cables: wear and tear and fastenings
- the tightening of the primary bolts and screws such as the wall fastening systems, the moving mechanisms and the chin rest arm
- the status of cleanness of the console
- the correct functioning of the luminous indicators of the console
- verification of the exposure parameters: kV, mA, time
- verification of the correct function and status of cleanness of the laser centering devices
- verification of the correct centering of the secondary collimator and of the Ceph sensor.



**WARNING:**

Components may only be replaced by original spare parts.

---



**NOTE:**

The Service Engineer has to take special care for all what concerns electrical safety of the device and must make sure of restoring all provisions for electrical safety which may be affected during a service intervention and to solicit the customer to have the electrical safety tests repeated every time the intervention has caused the replacement of important parts or the intervention has significantly affected safety provisions of the device.

---

## **7.1. Verification and centering adjustment**

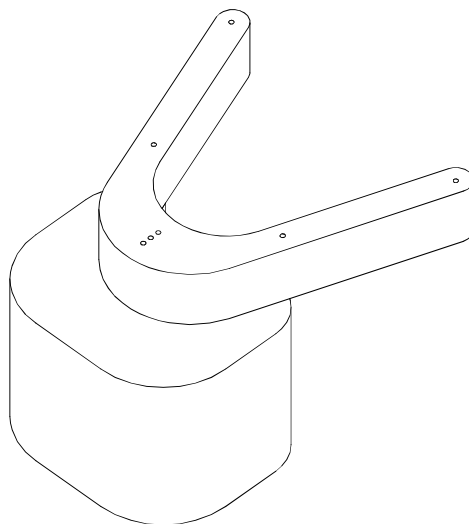
### **7.1.1. Centering the X-ray beam for the PANORAMIC function**



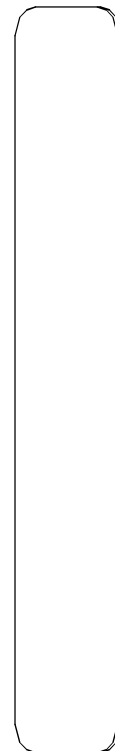
**WARNING:**

X-rays will be emitted during the performance of the following operations. Authorised Technicians are therefore recommended to use the greatest caution and to comply with the safety regulations and laws of their country.

1. Switch on the machine and go to Exam Selection.
2. Select the Standard Panoramic function.
3. Place the centering tool (P/N 6107900200 - Figure 7-1) on the chin rest and the sensor calibration tool (P/N 5607900800 - Figure 7-2) in front of the sensor fixing it with tape.

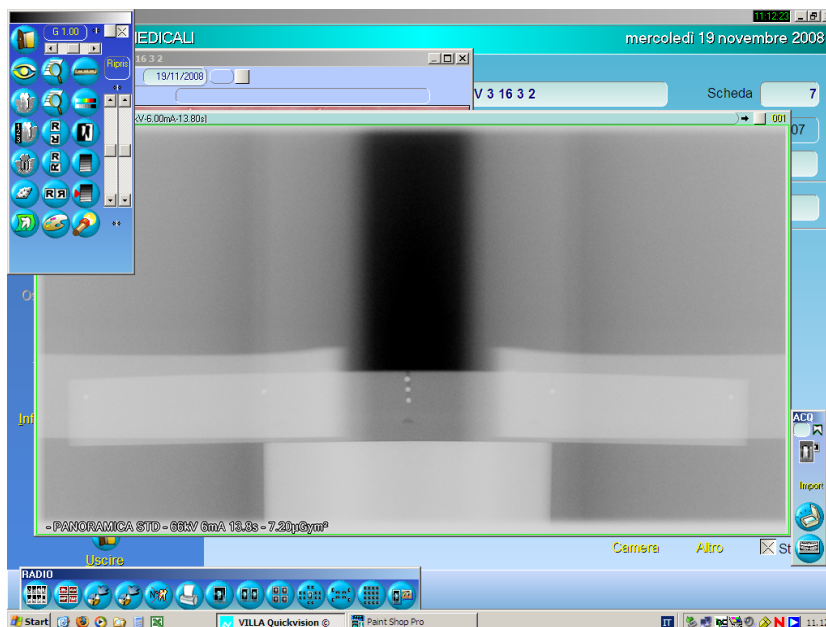


*Figure 7-1*  
*Centering tool P/N 6107900200*

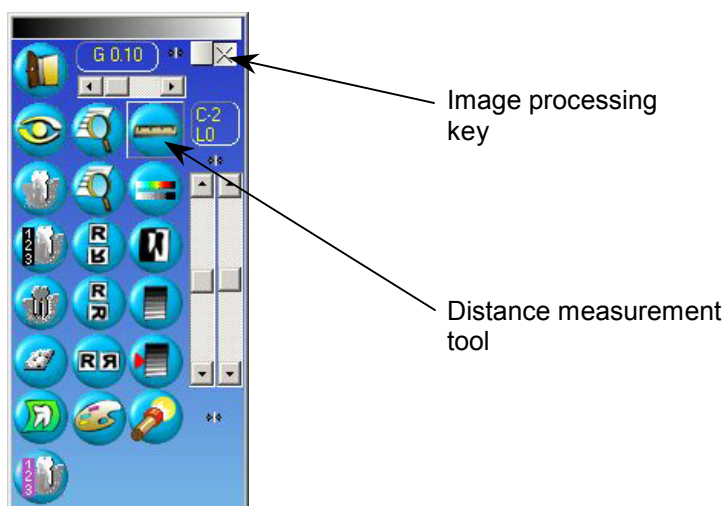


*Figure 7-2*  
*Sensor Calibration tool*  
*P/N 5607900800*

4. Make an exposure in Adult mode at 72 kV – 6mA, acquired in the Quickvision program; the following image will be displayed.

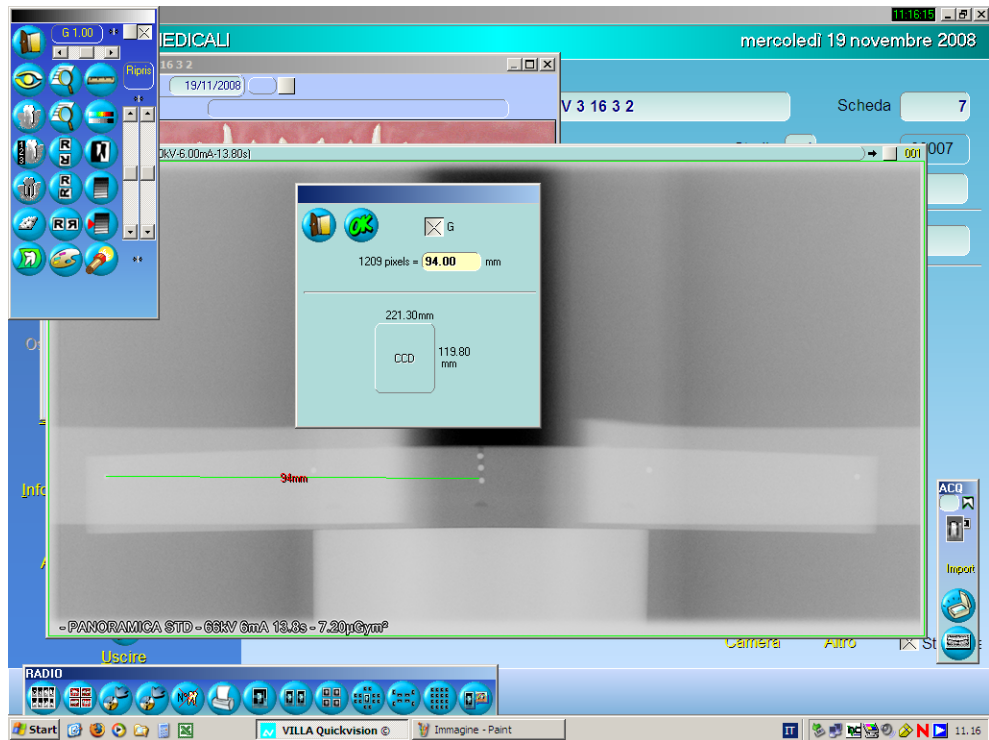


5. Set contrast and brightness level to have good visibility of all centering balls.
6. Pressing the key in the upper-right region of the instruments box for image processing, it is possible to view the image in the scale 1:1 which facilitates the next steps.



7. Using the dedicated cursors, position the image to see the balls of the left side.
8. Select the instrument which measures distance and position the cursor on the center of the ball on the left of the image.

- Click on the right button of the mouse and keeping it pressed, drag the pointer to the center of the central ball. Releasing the button, the following image shows up, where it is possible to read the distance in mm, which must be in the range  $94 \pm 1$  mm.



In the measuring window the number of pixel measured is also reported and this measurement is more sensitive, so this is a preferred method. Record the number of pixel (1209 in the example).



- Repeat the measurement on the right side of the image.
- If the distance between the projection of the side spheres with that of central sphere is not symmetrical (and not within the tolerance range of  $\pm 1$  mm or 11 pixel), adjust the rotation axis (see paragraph 8.3.4.1) accordingly and repeat the exposure.
- Make a measurement also of the distance between the most right and most left ball: it must be inside the range  $188 \text{ mm} \pm 2 \text{ mm}$ .
- If distance is outside the tolerance range, adjust the Y axis (see paragraph 8.3.4.2) accordingly and repeat the exposure.

**7.1.2. Axes alignment for the CEPH function**



**NOTE:**

When these operations are performed during Maintenance it will be necessary to remove some of the covers.




**NOTE:**

This adjustment needs a personal computer directly connected to the I-Max Touch where the "QuickVision" program is installed and the use of the CD (P/N 5807304100) supplied with the centering tools kit.


To verify the centering of the Cephalometric function it is necessary to:

1. Switch on the machine and access "CEPH SETTING" service program following the operations sequence described in paragraph 8.3.1.


Using the increase key and the decrease key  set the password

equal to 124 and confirm with the "Patient entrance" (6/25) 

key. Close the Panoramic sensor holder, if open, and press key

(6/25)  ; the following message will be displayed:

C	E	P	H	P	O	S	I	T	I	O	N	I	N	G
P	R	E	S	S	>	0	<							

2. Press key (6/25)  . The machine will move and the following messages will be displayed:


				W	A	I	T	F	O	R				
M	A	C	H	I	N	E	S	E	T	T	I	N	G	

followed by



C	E	P	H	P	O	S	I	T	I	O	N	I	N	G
P	L	E	A	S	E	W	A	I	T					

When the machine stops moving, the following message will be displayed:


D	I	G	I	T	A	L	C	E	P	H					
E	N	A	B	L	E	S	E	N	S	O	R				

3. Press key (6/25)  , the following message will be displayed:


D	I	G	I	T	A	L	C	E	P	H					
C	E	P	H	I	S	D	I	S	A	B	L	E	D		

4. Using increase key and the decrease key   select the following option to enable the digital CEPH:

D	I	G	I	T	A	L	C	E	P	H				
C	E	P	H	I	S	E	N	A	B	L	E	D		

5. Press key "T" (26)  and if the setting has been changed the following message will be displayed:

U	P	D	A	T	E	C	H	A	N	G	E	S	?
>	0	<	=	Y	,	T	=	N					

6. Press key (6/25)  to store the changes; the following message will be displayed:

D	I	G	I	T	A	L	C	E	P	H					
E	N	A	B	L	E	S	E	N	S	O	R				

The digital ceph centering complete procedure is composed by the steps reported on the following table, perform them in the correct order:

Step	Action	Reference paragraph
<b>I</b>	Rotation arm alignment	7.1.2.1
<b>II</b>	Ear centering circles setting	7.1.2.2
<b>III</b>	Secondary collimator centering	7.1.2.3
<b>IV</b>	Ceph sensor centering	7.1.2.4
<b>V</b>	Soft Tissue Filter adjustment	7.1.2.5





**WARNING:**

**Do NOT modify the "Digital CEPH Y offset" of Password 124: functionality can be severely impaired.**

---





**WARNING:**

X-rays will be emitted during the performance of the following operations. Authorised Technicians are therefore recommended to use the greatest caution and to comply with the safety regulations and laws of their country.


---

### 7.1.2.1. Rotation arm alignment

To perform the rotation arm alignment start from point 6 of paragraph 7.1.2 and:

7. Press keys "Arrow right" or "Arrow left"   until the following is displayed:

D	I	G	I	T	A	L		C	E	P	H			
R	O	T	A	T	I	O	N		O	F	F	S	E	T

8. Press "Patient entrance" (6/25)  . The following message will be displayed




P	L	E	A	S	E		W	A	I	T	.	.	.	
---	---	---	---	---	---	--	---	---	---	---	---	---	---	--

while the slit primary collimator moves to the DIGITAL CEPH central position.

Then the following message will be displayed:


T		Z	E	R	O		f	f			a	b	c	d
Z	E	R	O		O	F	F	S		±	e	e	e	e

9. A more precise setting have to be performed with X-ray: pressing on

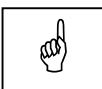
key "P" (23)  and on keys increase and decrease   set

values (kV and mA) for the exposure (suggested values: 50kV and 4mA).

10. Open QuickVision and activate virtual keyboard.

11. Press key "M" (24)  on the machine keyboard; the system gets ready to take the Rotation Arm alignment test, moving the sensor to a correct position.

12. Press the X-ray button and keep it depressed until the end of the exposure.



**NOTE:**

If the following message will be displayed:

D	I	G	I	T	A	L		S	E	N	S	O	R		
				I	S		N	O	T		R	E	A	D	Y


check the connection with the PC.


Press key (6/25)  to reset the message.

- 13.** On the image taken with QuickVision, using the instructions in paragraph 7.1.1, measure the distance between the borders of the image and the borders of the central vertical stripe (Figure 7-3); to take the measure easily, you can use the QuickVision pseudo color function.



- 14.** The right and left distance must not differ more than  $\pm 3\text{mm}$ . If it is

not the case, with keys increase and decrease  set a speed

value (suggested value 2) and with keys  turn the tubehead arm, increasing the displayed offset value if the left distance is lower than the right one or viceversa; repeat the test from point 11.

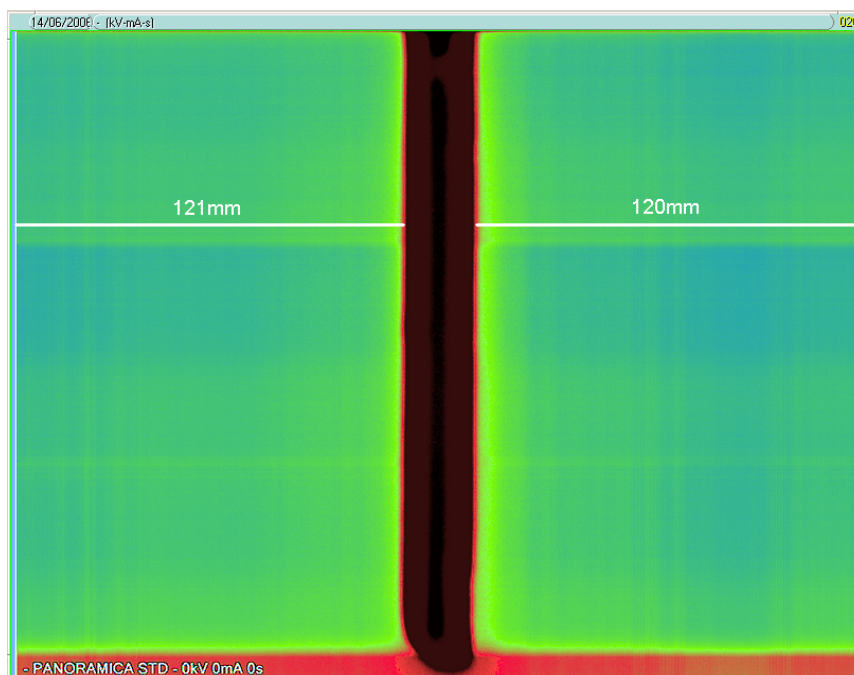





Figure 7-3

- 15.** When the right setting is reached press key "T" (26)  to exit the menu item and if modifications have been performed the following message will be displayed:

U	P	D	A	T	E	C	H	A	N	G	E	S	?	
>	0	<	=	Y	,	T	=	N						

- 16.** Press key (6/25)  to store the changes. While key (26)  to cancel them.  
The sensor will move to the parking position.

**Write down the new value in the relevant box in Appendix A.**

**7.1.2.2. Ear Centering Circles setting**



**NOTE:**

This adjustment needs a personal computer directly connected to the I-Max Touch where the "QuickVision" program is installed and the use of the CD (P/N 5807304100) supplied with the centering tools kit.

Place the Ear Centering device in a Latero-Lateral position with the Ear Centering Circles in a completely open position.

To perform the ceph sensor alignment start from point 16 of paragraph 7.1.2.1 and:

- 17.** Press keys "Arrow right" or "Arrow left"   until the following is displayed:

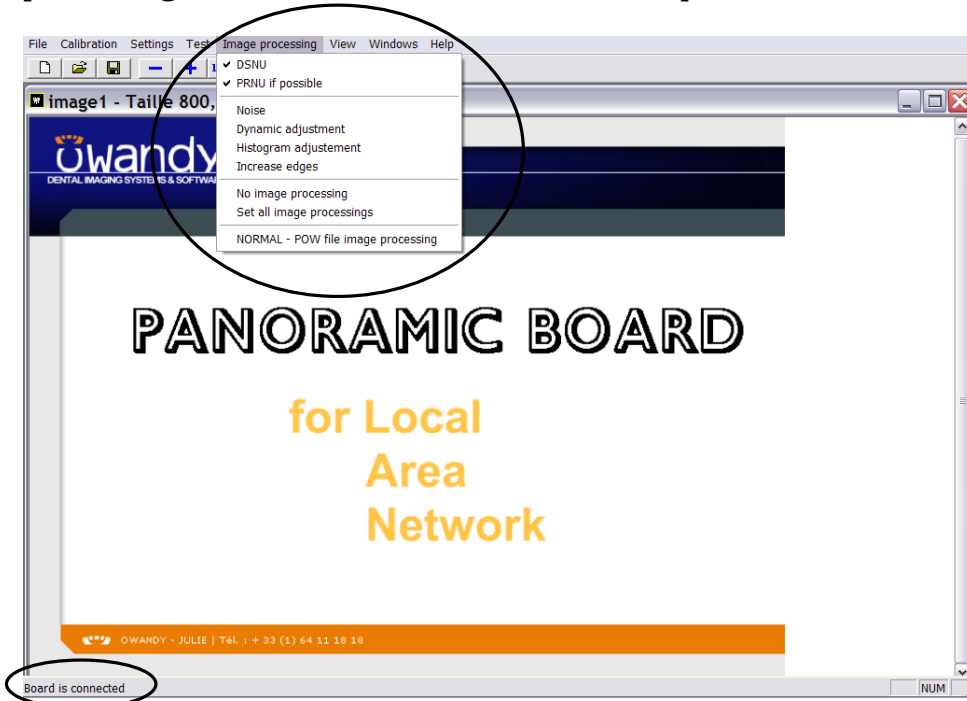
D	I	G	I	T	A	L	C	E	P	H			
L	I	N	I	N	G		U	P		T	E	S	T


- Press key "Patient entrance" (6/25)  . The following message will be displayed:

	7	2	k	V		0	6	m	A		1	.	0	0	s
L	I	N	I	N	G		U	P		T	E	S	T		

This is a short exam specific to take images to adjust the Ear Centering Circle.

- 18.** Open the "Ear centering" program on the CD (P/N 5807304100) and wait until the message "Board is connected" is displayed on the bottom bar of the program. Check that in the menu "Image processing" all the items are not selected except for DNSU and PRNU.





- 19.** Press key "M" (24)  . The machine gets ready to take a 10x22 exam.





**NOTE:**  
If the following message will be displayed:

D	I	G	I	T	A	L	S	E	N	S	O	R		
			I	S	N	O	T	R	E	A	D	Y		

check the connection with the PC.

- Press key (6/25)  to reset the message and press key (24)  again.

- 20.** Acting on key "P" (23)  and on keys increase or decrease  set the exposure parameters, as suggestion set 60kV, 6mA.



**WARNING:**  
X-rays will be emitted during the performance of the following operations. Authorised Technicians are therefore recommended to use the greatest caution and to comply with the safety regulations and laws of their country.

- 21.** Press the X-ray push button and keep it depressed until the end of the exposure.
- 22.** Check on the image if the Ear Centering Circles are concentric (small circle inside the big circle – i.e. as shown in Figure 7-9); if it is necessary to adjust the Ear Centering Circles position, perform the setting actions described in paragraphs 7.1.2.2.1 and 7.1.2.2.2.
- 23.** Repeat steps 21 and 22, take a new images until the Ear Centering Circles are concentric.

- 24.** At the end of Ear Centering calibration, evaluate on the image if the X-ray beam is vertically displaced (i.e. more than 10 mm upper or lower white border present); if it will be necessary to change the height of the CEPH arm, loose the two screws "A" (Figure 7-4), and acting on the screw "B" adjust the height of the Ceph group. Repeat the exposure until the vertical alignment is reached. Tighten the loosened screws "A".

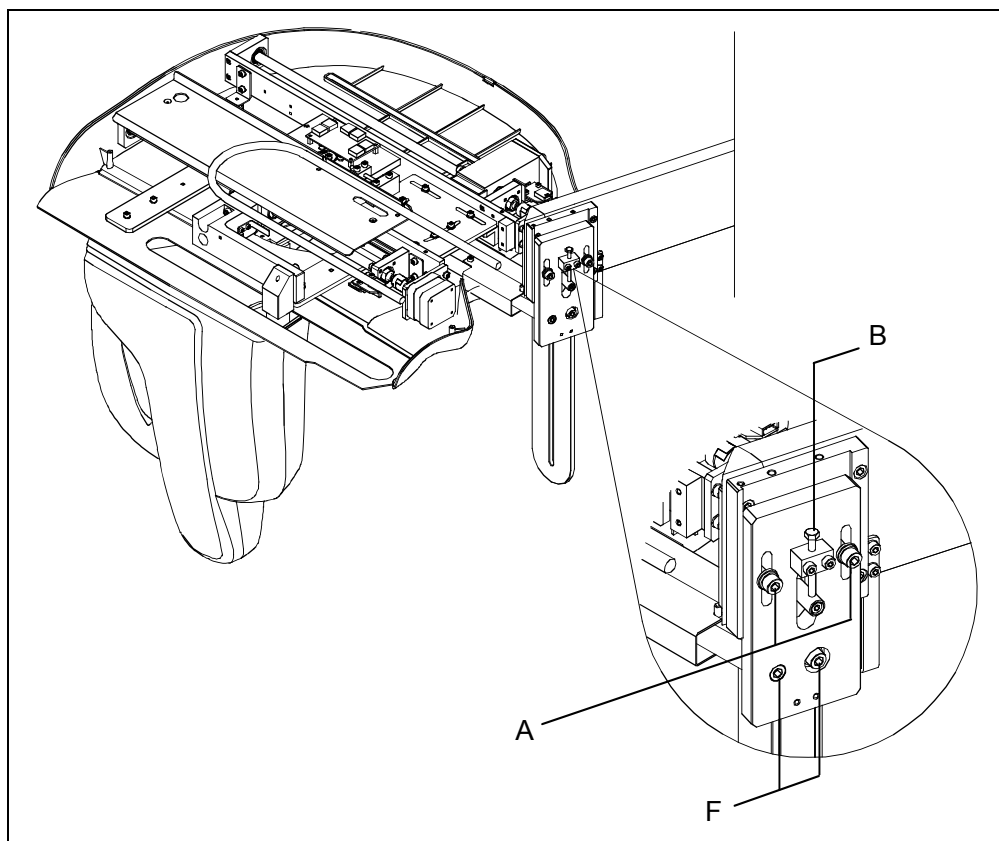



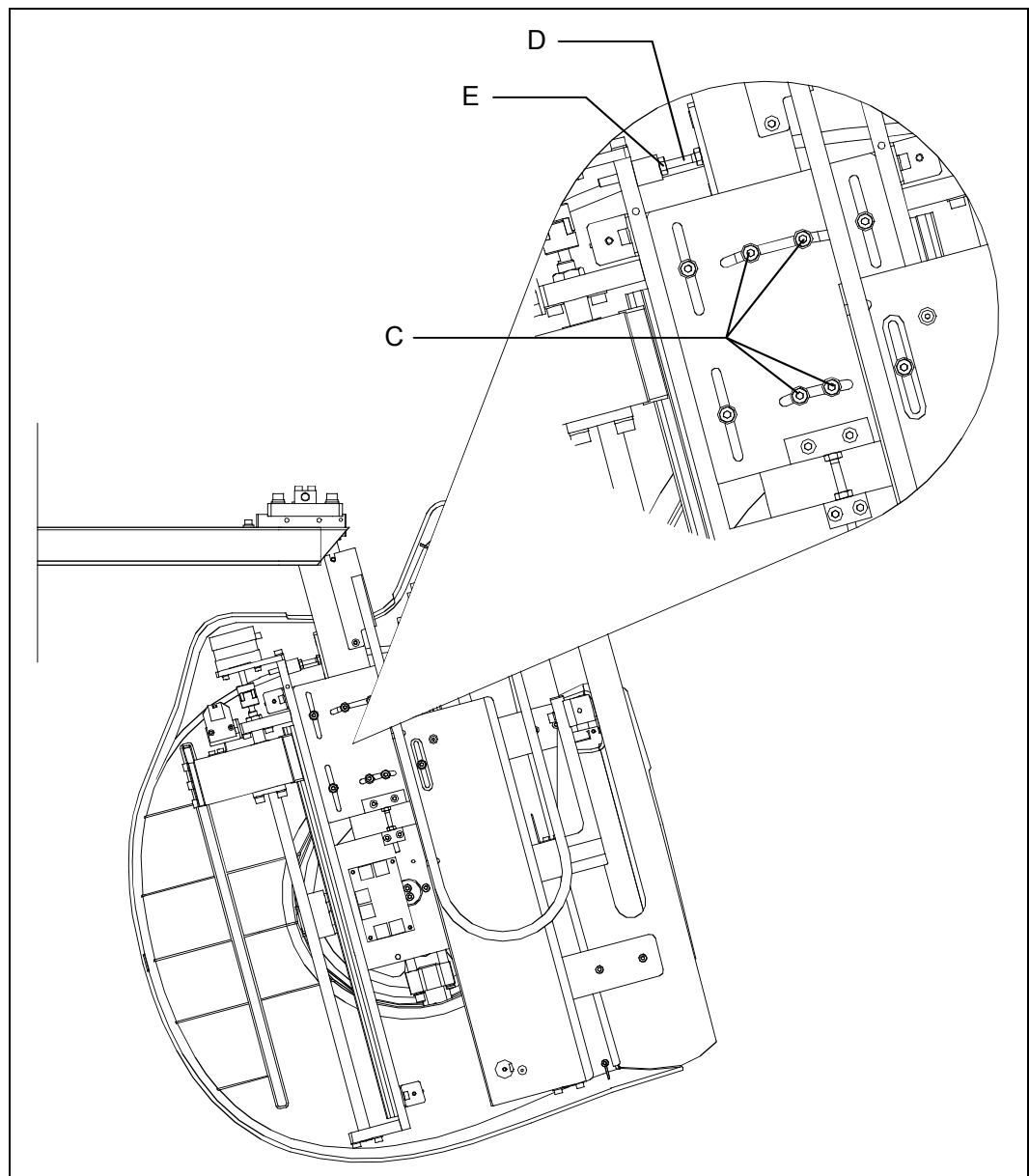
Figure 7-4

- 25.** When the right setting is reached press key (6/25)  to exit the menu item.

### 7.1.2.2.1. Projection of Non-Concentric Ear Centering Circles

Loosen the four fixing screws "C" (Figure 7-5) and using adjustment screw "D" adjust (rotate) the Ceph group.

If the greater diameter (ear set farthest from the sensor) is shifted more towards the nose-rest with respect to the smaller diameter (ear-rest nearer to the sensor), screw adjustment screw "D" and manually turn the group clockwise. In the opposite case, unscrew adjustment screw "D" and the group will shift automatically. Once the correct centering is obtained (a test exposure is required), fix screws "C" and block adjustment screw "D" using security nut "E".



*Figure 7-5 (Top view)*



**7.1.2.2. Projection of Vertically Non-Concentric Ear Centering Circles**

Loosen the two screws "F" (Figure 7-4). Adjust position of the arm acting on screw "G" (Figure 7-6). Once the aligned position has been reached tighten bolt "H" (Figure 7-6) and tighten screws "F". Upon completion of the adjustment a test exposure is required, to verify it.

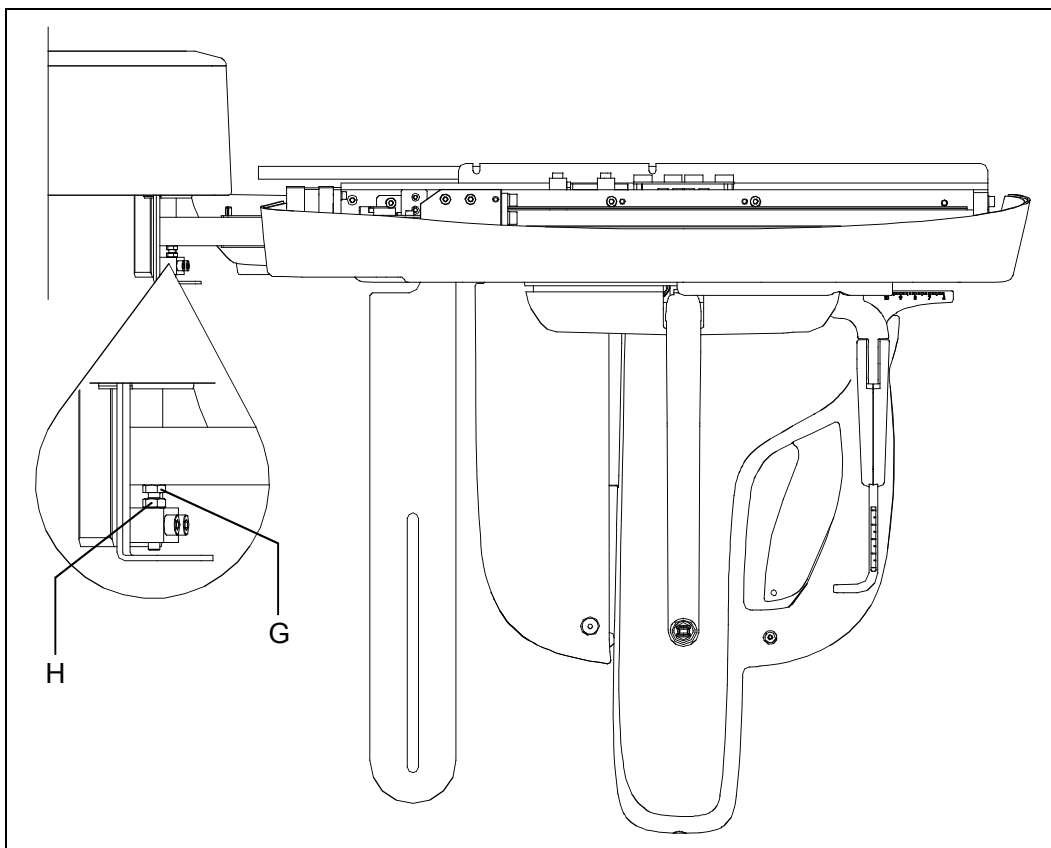




Figure 7-6 (Side view)

### 7.1.2.3. Secondary collimator centering

To perform the ceph secondary collimator alignment start from point 25 of paragraph 7.1.2.2 and:

26. Press keys "Arrow right" or "Arrow left"  until the following is displayed:

D	I	G	I	T	A	L		C	E	P	H				
C	E	P	H		S	.	C	O	L	.		Z	E	R	O


27. Press key "Patient entrance" (6/25)  and the following message will be displayed:

C		Z	E	R	O	[	f	f	]		a	b	c	d
Z	E	R	O		O	F	F	S		±	e	e	e	e

28. Acting on key "P" (23)  and on keys increase or decrease 

set the exposure parameters (suggested values: 60kV and 6mA).

29. Open QuickVision and activate the Virtual Keyboard.

30. Press key "M" (24)  on the machine keyboard. The primary

collimator and the CEPH sensor will be automatically placed in the CEPH central position, the secondary collimator on the outer position and the system gets ready to take the secondary collimator test.

31. Press the X-ray button and keep it depressed until the end of the exposure.





**NOTE:**

If the following message will be displayed:

D	I	G	I	T	A	L		S	E	N	S	O	R	
				I	S	N	O	T		R	E	A	D	Y

check the connection with the PC.

Press key (6/25)  to reset the message and press key (24) 

again.

- 32.** On the image taken with QuickVision, using the instruction in paragraph 7.1.1, measure the distances between the borders of the image and the borders of the central vertical stripe (Figure 7-7); to take the measure easily, you can use the QuickVision pseudo color function.



- 33.** The right and left distances must not differ more than  $\pm 3\text{mm}$ .

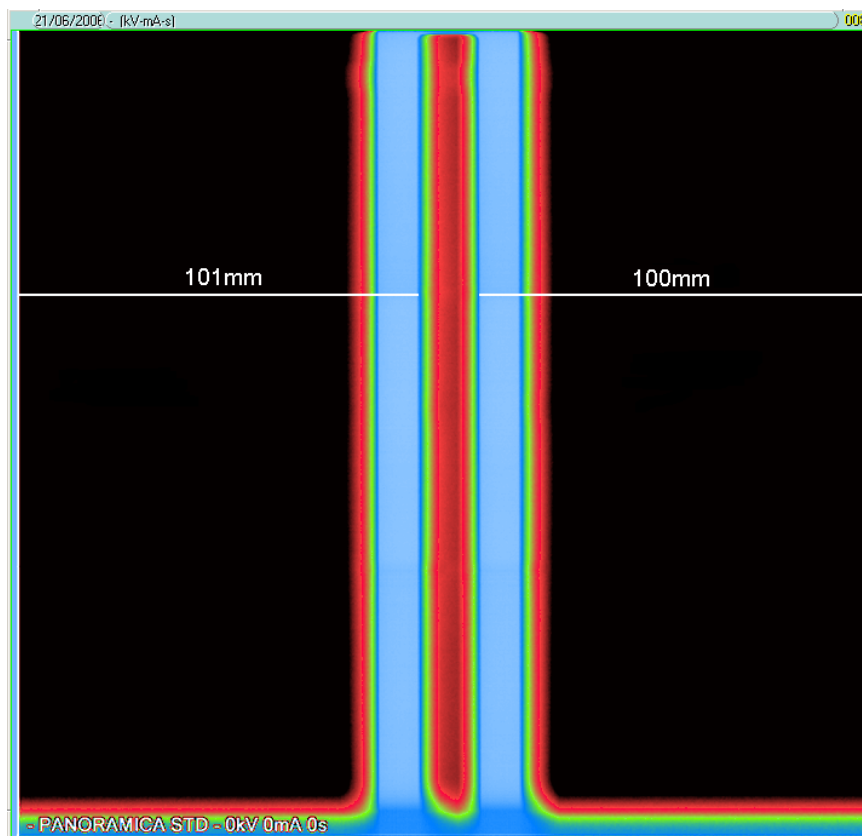





Figure 7-7

**34.** If it is not the case, with keys increase and decrease  set a


speed value (suggested value 3) and with keys   move the

the secondary collimator, increasing the displayed offset value if the left distance is lower than the right one or vice versa; repeat the test from point 30.





**NOTE:**

This is a fine setting; if the zero offset ( $\pm eeeee$ ) is lower than  $-1000$  steps or greater than  $1000$  steps repeat the first step of ceph arm centering described in 7.1.2.1.

**35.** When the right setting is reached press key "Test" (26)  to exit

the menu item and if modifications have been performed the following message will be displayed:

U	P	D	A	T	E	C	H	A	N	G	E	S	?
>	0	<	=	Y	,	T	=	N					

**36.** Press key (6/25)  to store the changes. While key (26) 

to cancel them.

**Write down the new value in the relevant box in Appendix A.**

## 7.1.2.4. CEPH Sensor centering




**NOTE:**

This adjustment needs a personal computer directly connected to the I-Max Touch where the "QuickVision" program is installed and the use of the CD (P/N 5807304100) supplied with the centering tools kit.

To perform the ceph sensor alignment start from point 36 of paragraph 7.1.2.3 and:

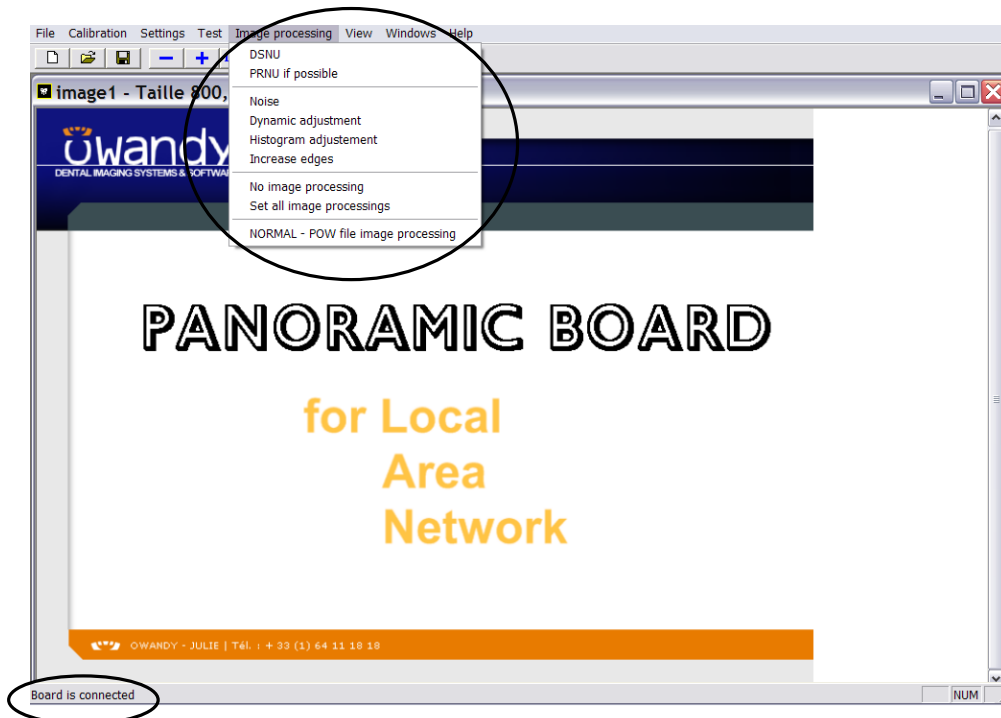
37. Press keys "Arrow right" or "Arrow left"   until the following is displayed:


D	I	G	I	T	A	L		C	E	P	H				
C	E	P	H		S	E	N	S	O	R		Z	E	R	O

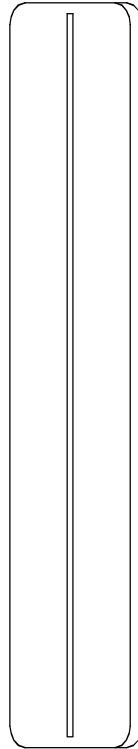
38. Press key "Patient entrance" (6/25)  and the following message will be displayed:

S		Z	E	R	O			f	f			a	b	c	d
Z	E	R	O		O	F	F	S		±	e	e	e	e	e



39. Open the "Sensor Centering" program on the CD (P/N 5807304100) and wait until the message "Board is connected" is displayed on the bottom bar of the program. Check that in menu "Image processing" all the items are not selected.



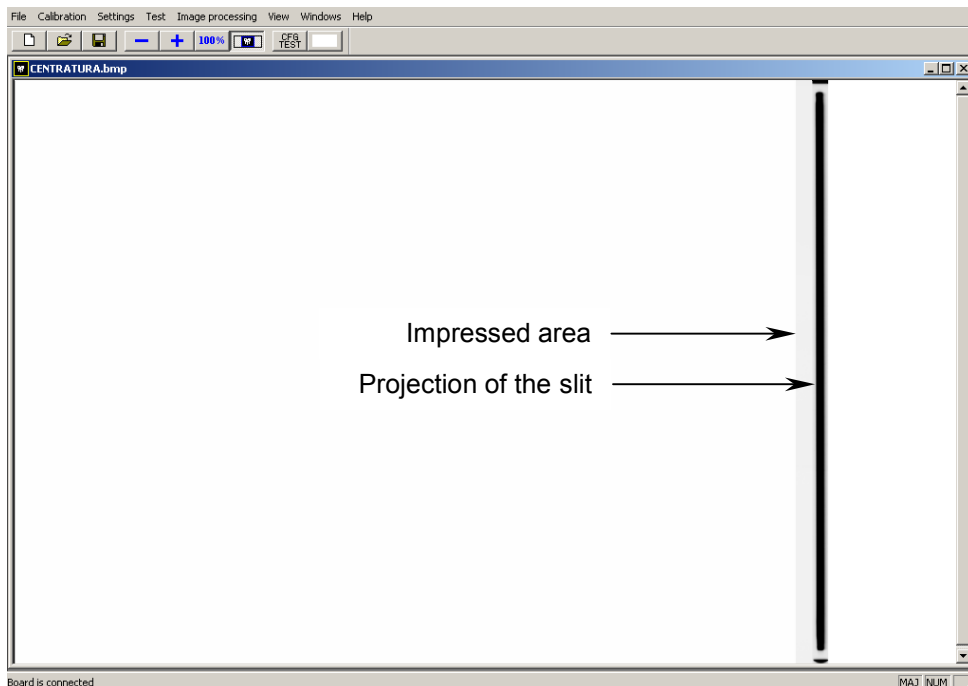
- 40.** Press key "Patient entrance" (6/25)  . The primary and secondary collimators and the ceph sensor go to the ceph central position. Place the centering tool P/N 5209900900 (Figure 7-8) on the secondary collimator.



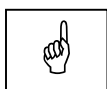
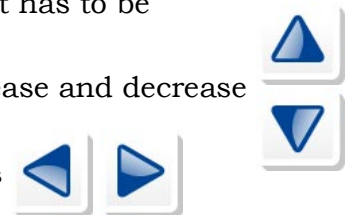
*Figure 7-8*  
*Centering tool P/N 5209900900*

- 41.** Select with key "P" (23)  respectively kV, mA and exposure time and use keys increase or decrease  to set values for the exposure (suggested values: 60kV, 6mA and 0.2s).

- 42.** Take X-ray pressing the X-ray button and check if in the obtained narrow image the projection of the slit of the centering tool is vertical and in the middle of the impressed area.




If it is horizontally displaced the CEPH sensor offset has to be corrected following this instruction: with keys increase and decrease set a speed value (suggested value 3) and with keys move the CEPH sensor.





**NOTE:**

If the image taken is totally white, perform the step 42 without the tool (P/N 5209900900 - Figure 7-8) in order to make a rough centering. Then place again the tool on the secondary collimator and repeat step 42 to perform a fine setting.

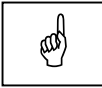
**43.** When the right setting is reached press key "T" (26)  to exit the menu item and if modifications have been performed the following message will be displayed:

U	P	D	A	T	E		C	H	A	N	G	E	S	?
>	0	<	=	Y	,	T	=	N						

**44.** Press key (6/25)  to store the changes. While key (26)  to cancel them.

**Write down the new value in the relevant box in Appendix A.**

### 7.1.2.5. Soft Tissue Filter (STF) adjustment




**NOTE:**

This adjustment needs a personal computer directly connected to the I-Max Touch where the "QuickVision" program is installed.

This adjustment is accessed by activating password 124 as described in paragraph 7.1.2.

1. When in password 124 scroll the menu items pressing keys "Arrow right" or "Arrow left"   until reaching the following display:


D	I	G	I	T	A	L	C	E	P	H				
S	T	F		Z	E	R	O		O	F	F	S	E	T

2. Press key "Patient entrance" (6/25) . The following message will be displayed:

P	L	E	A	S	E		W	A	I	T	.	.	.	

and at the end of positioning

S	T	F		Z	E	R	O		[	0	]				
Z	E	R	O		O	F	F	S	E	T		±	x	x	x

3. Open QuickVision and activate the Virtual Keyboard.
4. Press key "M" (24)  on the machine keyboard. The machine gets ready to take a 18x22A exam and the Soft Tissue Filter will be automatically placed in the X-ray field.





**NOTE:**

If the following message will be displayed:

D	I	G	I	T	A	L	S	E	N	S	O	R		
			I	S		N	O	T		R	E	A	D	Y

check the connection with the PC.

Press key (6/25)  to reset the message and press key (24)  again.



5. Acting on keys "P" (23)  and on keys increase or decrease 

set the exposure parameters, as suggestion set 60kV - 6mA.





**WARNING:**

X-rays will be emitted during the performance of the following operations. Authorised Technicians are therefore recommended to use the greatest caution and to comply with the safety regulations and laws of their country.

6. Press the X-ray button and keep it depressed until the end of the exposure; the following message will be displayed:

E	N	T	E	R		I	M	G		O	F	F	S	E	T
O	F	F	S	E	T		(	m	m	)				5	0

7. On the image taken with QuickVision, using the instruction in paragraph 7.1.1, measure the distance "A" (Figure 7-9) between the Soft Tissue Filter (STF) edge and the center of the rings; perform the measure in "mm".
8. If the distance "A" is different from  $50 \pm 2$ mm, press keys increase and

decrease  up to reach the measured value; press key (6/25) 

to store the change.

The system will calculate automatically the new Soft Tissue Filter offset.

If distance "A" is  $50 \pm 2$  mm no correction is needed; press key

"T" (26)  to exit.

In both cases the following message will be displayed:

S	T	F		Z	E	R	O		O	F	F	S			a
O	F	F	S	E	T		±	x	x	x					

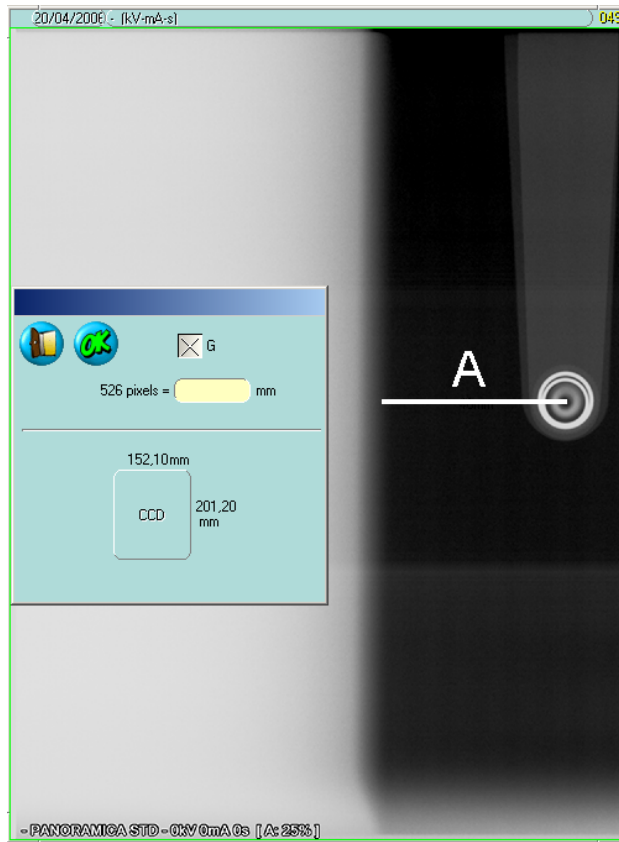


Figure 7-9

9. Check proper alignment of the Soft Tissue Filter by performing a new exposure (repeat the actions from point 3 to point 8). If the alignment is correct, store it into the non-volatile memory of the unit by pressing key (26) . The display will show:

U	P	D	A	T	E	C	H	A	N	G	E	S	?
>	0	<		=		Y	,		T	=		N	

Press key (6/25) to permanently store the change.

**Write down the new value in the relevant box in Appendix A.**

10. Press key (26) to exit password 124, the following message will be displayed

C	O	N	F	I	R	M	E	X	I	T	?			
>	0	<		=		Y	,		T	=		N	>	0

Press key (6/25) to exit the program and store the changes.

## 7.2. Verification of exposure time parameters

kVp and time can be measured directly (invasive method) on the Generator board (A10); this method has higher accuracy than the so called non-invasive mode. The system accuracy is guaranteed by this measuring method.



**NOTE:**

If the following actions are performed during maintenance some covers have to be removed:

- a. Remove the outer covering of the HF generator placed on the rotating arm.
- b. Remove the protection grid of the Generator board.



**WARNING:**

**The Generator board has a working voltage of about 400V.**

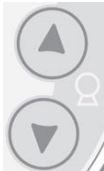
The exposure parameters can be checked with the procedure described:

1. Power off and on the unit. The following message will be displayed:

				I	M	A	X		T	O	U	C	H				
R	E	L	E	A	S	E			*	.	*	*	*				



After 3 seconds, the following message will be displayed:


When this message appears, press the column up and column down

keys  simultaneously and hold them pressed. After 3 seconds,

the setup screen with the following message will be displayed



				S	E	R	V	I	C	E		M	E	N	U		
C	O	N	F	I	G	U	R	A	T	I	O	N					


2. Using the scroll right and scroll left keys   to change the message displayed until the "TROUBLESHOOTING" message appears on the lower text display row.  
When the following menu is displayed:

	S	E	R	V	I	C	E	M	E	N	U			
T	R	O	U	B	L	E	S	T	O	O	T	I	N	G

Pressing the patient centering keys the next message is displayed:

	S	E	T	U	P								
P	A	S	S	W	O	R	D	=	1	0	0		

3. Using the increase/decrease keys, set the password equal to 112 and confirm with the Patient Centering.
4. Using the scroll right and scroll left keys   go to the

"RX EMISSION" menu and confirm with the Patient centering key 


At the selection of the X-ray emission test, the display will show the following message:

X	-	R	A	Y	E	M	I	S	S	I	O	N	
7	2	k	V	0	6	m	A	1	4	.	0	S	



**WARNING:**

From now, the emission is enabled; it starts with the X-ray button press, so take care of this situation.

Pressing the parameter changes key , it is possible to choose a different combination of parameters. Once pressed, the display will show:

>	7	2	k	V	0	6	m	A	1	4	.	0	S

Where the symbol ">" is showing the parameter to be changed; in this case the kV. To move to mA and exposure time, press "P" key once or twice again.

In this situation, the keys increase and decrease will change the parameter.

Pressing the X-ray button will start the emission.

The allocable values for exposure parameters are on the following table:

Parameter	Minimum value	Maximum value
<b>kV</b>	6	86
<b>s</b>	0,2	15
<b>mA</b>	6	12



**NOTE:**

This action allows you to carry out the measuring of the exposure parameters having the tubehead-arm in a fix position (not rotating).



**WARNING:**

X-ray will be emitted during the performance of the following operations. Authorised technicians are therefore recommended to use the greatest caution and to comply with the safety regulations and laws of their country.

### **7.2.1. kVp**

Use a multimeter (R input  $\geq 10\text{M}\Omega$ ) in working conditions VDC and end of scale 5/10V (maximum value 4.3 V); position the cold pole on TP45 (GND) and the hot pole on TP44 (kV) on the Generator board (A10). Set the following parameters in CEPH mode: 60kV-6mA-3s.

Perform an exposure and considering that the ratio between the value on the voltmeter and high voltage is  $1\text{V} = 20\text{kV}$ , verify that the value indicated by the multimeter ranges from  $2.85 \div 3.15\text{ V}$  ( $3\text{V} \pm 5\%$ ).

Should this last value be outside the specified limit, detect the "set kV" voltage supplied by CPU, connecting the voltmeter between TP45 GND test points and TP46 kV (set nearby X57). The value on these points must range from 2.7 and 3.3 V ( $3\text{V} \pm 3\%$ ). If it is out of tolerance replace the Generator CPU board (A9), otherwise replace the Generator board.

Measured values for different set values are contained in the following table.

<b>kV</b>	<b>Nominal value</b>	<b>Minimum value</b>	<b>Maximum value</b>
<b>60</b>	3	2.85	3.15
<b>70</b>	3.5	3.325	3.825
<b>80</b>	4.0	3.8	4.2
<b>86</b>	4.3	4.085	4.515

If all measures are within the specified range, and there is an evidence of a performance loss, measure the high voltage supplied by the tubehead, and the exposure time using a non-invasive kilovoltmeter with  $\leq \pm 3\text{kVp}$  tolerance. The high voltage value must be within 8% of the set value, while the time value must be within 10% of the set value. If the voltage is not within the expected range, replace the tubehead; otherwise replace Generator CPU board.

### 7.2.2. mA Check

Use a multimeter (R input  $\geq 10M\Omega$ ) in working conditions VDC and end of scale 5/10 V (maximum value 4 VDC), position the cold pole on TP40 (GND) and the hot pole on TP43 (mA). Set the following parameters in CEPH mode: 60kV-6mA-3s.

Perform an exposure and considering that a ratio 1V DC  $\approx$  3 mA, verify that the value indicated by the multimeter ranges from 1.86÷2.138V (6 mA $\pm$ 8%).

Set 80kV - 12mA - 3s. The value read must range from 3.643 to 4.276 V (12mA $\pm$ 8%).

Measured values for different set values are contained on the following table.

mA	Nominal value	Minimum value	Maximum value
6	1.98	1.822	2.138
7	2.31	2.125	2.495
8	2.64	2.429	2.851
9	2.97	2.732	3.208
10	3.30	3.036	3.564
11	3.63	3.340	3.920
12	3.96	3.643	4.277

In case the detected values are outside these ranges, check that the voltage between TP40 (GND) and TP34 (mA) is contained in the above ranges. If not, replace the Generator CPU board (A9).

### 7.2.3. Time

Verify the accuracy of the exposure time using an oscilloscope connected at the same test points used to measure mA (TP40 for GND and TP43 mA) of the Generator board (A10). The exposure time calculated at about 75% of the maximum kV value, must correspond to the set one  $\pm$ 10%. In case the time is outside the prescribed values, replace the CPU.


### 7.3. Storing of automatic exposure parameters

The pre-set technical exposure factors can be varied according to the needs of the user, or to obtain somewhat more contrasted images.


To modify the automatic exposure parameters, please follow the indicated procedure:


1. Select the examination, the type of patient and the size to be modified.

2. Modify the KV, mA and/or time (for Cephalometric programs) parameters to suit your needs; the "Anatomic/Manual" mode

indicator changes to manual .



New parameters can only be saved in "Manual" mode.

3. Press the "Anatomic/Manual" mode indicator until it turns green and displays "S" .

key (10)  to store the modified parameters for the examination and type and size of patient you have selected.

4. After pressing the key, the display will show the following message:






S	T	O	R	E	?														
>	0	<	=	Y	,	T	=	N											

Press the key "Patient Entrance" (6)  to confirm or the key "Test" (5)  to cancel the setting.








**7.3.1. Table of pre-set anatomic parameters**






**PANORAMIC**

	Adult 	Child 
Small 	68 kV 6 mA	64 kV 6 mA
Medium 	72 kV 6 mA	66 kV 6 mA
Large 	74 kV 6 mA	68 kV 6 mA






**TMJ open/close mouth**

	Adult 	Child 
Small 	68 kV 6 mA	62 kV 6 mA
Medium 	72 kV 6 mA	64 kV 6 mA
Large 	76 kV 6 mA	66 kV 6 mA






**SINUS**

	Adult 	Child 
Small 	66 kV 6 mA	62 kV 6 mA
Medium 	70 kV 6 mA	64 kV 6 mA
Large 	72 kV 6 mA	66 kV 6 mA

**CEPHALOMETRY (L.L.)**

	Adult 	Child 
Small 	66 kV 6 mA	62 kV 6 mA
Medium 	70 kV 6 mA	64 kV 6 mA
Large 	72 kV 6 mA	66 kV 6 mA

**CEPHALOMETRY (A/P - P/A)**

	Adult 	Child 
Small 	74 kV 12 mA	70 kV 10 mA
Medium 	76 kV 12 mA	72 kV 10 mA
Large 	80 kV 10 mA	74 kV 10 mA

## **8. TROUBLESHOOTING**

### **8.1. Generator board A10 LED**

The following table shows the LED that are present on the Generator board, their colours, their significance and the recommended corrective actions in case of defects. To locate the LED, refer to the layout of the Generator board illustrated in chapter 9, drawing 11, of this manual:

<b>LED</b>	<b>Status of the LED under normal conditions</b>	<b>Corrective actions in case of defect</b>
<b>H1</b>	ON	Check fuse F1 and F2 on the Generator board. - If they are not blown, check the line voltage to the board and to the unit. Replace the Generator board if the line voltage is present and OK. - If blown, replace with new ones respecting the value and types; perform a new exposure and check if they blow again. If they blow, check, on the Generator board, if V6 and/or V31 and V36 are short-circuited and in this case replace the tubehead and Generator board. If not short circuited, replace the tubehead.
<b>H2</b>	ON	As per H1 above.
<b>H3</b>	ON	If OFF, check fuse F3 of the Generator board. - If not blown, replace the Generator board. - If blown, replace it with a new one of the same value and type, make another exposure and, if it will blow again, replace the Generator board.
<b>H4</b>	OFF	Check that connector X53 of the board is well inserted. Power off the unit and power it ON again after about 30 s; if the LED will glow again (it may take some seconds), replace the board.
<b>H5</b>	OFF	Check the correct insertion of X57; if it is correct, replace the tubehead, otherwise insert it correctly and make another exposure. Replace the tubehead if it will glow again.
<b>H6</b>	OFF	As per H5 above.


## 8.2. Displayed messages

The I-Max Touch is fully driven by a microprocessor which controls the programming of the emission parameters and indicates via displayed messages the different conditions of the unit and any defects and errors that occur.

The messages are divided into two groups:

- **Operational messages:** messages that guide the operator in setting up the unit for performing an examination (see User Manual).
- **Error messages:** messages that are displayed when an error occurs. There are three types of error messages:


- 1 -** Messages that could have been caused by the operator when releasing the X-ray button or pressing key "Patient entrance"

(6)  when a movement is in progress.

This message will be displayed as follows:

E	x	x	x																
P	R	E	S	S	R	E	S	E	T										

*xxx code number of the error message*

Operating conditions are reset by pressing key (6)  .

- 2 -** Messages arising from a system defect. In this case, the Technical Service must be called.  
The messages that require the intervention of the Technical Service are displayed as follows:

E	x	x	x																
C	A	L	L	T	E	C	H	A	S	S	.								

*xxx code number of the error message*

- 3 -** Messages related to problems regarding the Generator board (A10). In this case, the unit must be switched off. Wait a few seconds for the circuit capacitors to discharge and then switch the unit on again. If the problem persists, call the Technical Service.

E	x	x	x																
S	W	I	T	C	H	O	F	F	S	Y	S	T	.						

*xxx code number of the error message*

The error messages are divided into different areas that can be distinguished by the error number; the following table contains the different errors with meanings.

<b>Rotation motor</b>		
<b>Code</b>	<b>Error description</b>	<b>Reference chapter</b>
<b>200</b>	Zero position optical sensor of rotation axis always activated	<b>8.2.2.1</b>
<b>201</b>	Zero position optical sensor never activated	<b>8.2.2.1</b>
<b>204</b>	Unexpected activation of rotation optical sensor	<b>8.2.2.1</b>
<b>205</b>	Timeout on rotation	<b>8.2.2.2</b>
<b>206</b>	Patient collision	<b>8.2.2.3</b>
<b>Y motor</b>		
<b>Code</b>	<b>Error description</b>	<b>Reference chapter</b>
<b>240</b>	Zero position micro Y always active	<b>8.2.2.4</b>
<b>241</b>	Zero position micro Y never active	<b>8.2.2.4</b>
<b>242</b>	Unexpected activation of Y axis	<b>8.2.2.4</b>
<b>243</b>	Timeout on Y axes	<b>8.2.2.4</b>
<b>Ceph digital Sensor</b>		
<b>Code</b>	<b>Error description</b>	<b>Reference chapter</b>
<b>280</b>	Unexpected activation of optical sensor Ceph Sensor	<b>8.2.2.5</b>
<b>281</b>	Timeout on ceph sensor optical sensor	<b>8.2.2.5</b>
<b>282</b>	Sensor ceph micro never active	<b>8.2.2.5</b>
<b>283</b>	Sensor ceph micro always active	<b>8.2.2.5</b>
<b>Secondary collimator on Digital CEPH</b>		
<b>Code</b>	<b>Error description</b>	<b>Reference chapter</b>
<b>300</b>	Unexpected activation of optical sensor secondary collimator	<b>8.2.3.1</b>
<b>301</b>	Timeout on ceph secondary collimator	<b>8.2.3.1</b>
<b>302</b>	Secondary collimator micro never active	<b>8.2.3.1</b>
<b>303</b>	Secondary collimator micro always active	<b>8.2.3.1</b>
<b>Primary slit collimator</b>		
<b>Code</b>	<b>Error description</b>	<b>Reference chapter</b>
<b>320</b>	Unexpected activation of optical sensor primary collimator for CEPH	<b>8.2.3.2</b>
<b>321</b>	Timeout on primary collimator for CEPH	<b>8.2.3.2</b>
<b>322</b>	Primary collimator for CEPH micro never active	<b>8.2.3.2</b>
<b>323</b>	Primary collimator for CEPH micro always active	<b>8.2.3.2</b>

<b>Sensor holder</b>		
<b>Code</b>	<b>Error description</b>	<b>Reference chapter</b>
<b>340</b>	Sensor holder not on PAN	<b>8.2.3.3</b>
<b>X-ray Controls</b>		
<b>Code</b>	<b>Error description</b>	<b>Reference chapter</b>
<b>360</b>	RX button pressed on start-up or before exam	<b>8.2.3.4</b>
<b>361</b>	Remote RX button pressed on start-up or before exam	<b>8.2.3.4</b>
<b>362</b>	RX button released during emission	<b>8.2.3.5</b>
<b>CanBus</b>		
<b>Code</b>	<b>Error description</b>	<b>Reference chapter</b>
<b>380</b>	Invalid CANBus message	<b>8.2.3.6</b>
<b>381</b>	Timeout on activating CAN unit of Generator board (A10)	<b>8.2.3.7</b>
<b>382</b>	Generator board (A10) not answering	<b>8.2.3.7</b>
<b>Soft Tissue filter</b>		
<b>Code</b>	<b>Error description</b>	<b>Reference chapter</b>
<b>400</b>	Timeout of zero position optical sensor of STF	<b>8.2.4.1</b>
<b>401</b>	STF zero position sensor always active	<b>8.2.4.1</b>
<b>Generator Board A10</b>		
<b>Code</b>	<b>Error description</b>	<b>Reference chapter</b>
<b>750</b>	Alarm "power loss" on Generator board	<b>8.2.5.1</b>
<b>751</b>	Alarm "overvoltage kV"	<b>8.2.5.2</b>
<b>752</b>	Alarm "overload of filament" on Generator board	<b>8.2.5.3</b>
<b>753</b>	Alarm "overload anodic current"	<b>8.2.5.3</b>
<b>754</b>	Alarm "filament not OK"	<b>8.2.5.4</b>
<b>755</b>	Alarm "backup timer"	<b>8.2.5.6</b>
<b>756</b>	Alarm "PFC not OK"	<b>8.2.5.5</b>
<b>758</b>	Alarm "NO X-ray"	<b>8.2.5.6</b>
<b>759</b>	Alarm "unexpected emission"	<b>8.2.5.6</b>
<b>771</b>	Frame longer than expected	Protocol errors; power off the unit and on again. If error is still present, call Technical Assistance
<b>772</b>	Invalid Analogue channel selection	
<b>773</b>	Unknown command	
<b>774</b>	RX button not pressed on Generator board	<b>8.2.5.7</b>
<b>775</b>	RX button released during emission (on Generator board)	<b>8.2.5.8</b>
<b>776</b>	Watchdog CAN intervention	Action as per E771

<b>Vertical motor</b>		
<b>Code</b>	<b>Error description</b>	<b>Reference chapter</b>
<b>800</b>	Timeout on CAN activation for vertical motor	<b>8.2.6.1</b>
<b>801</b>	ON/OFF command for vertical motor not changed on planned time	<b>8.2.6.2</b>
<b>Keyboard</b>		
<b>Code</b>	<b>Error description</b>	<b>Reference chapter</b>
<b>850</b>	More than one key pressed on Power on	<b>8.2.7.1</b>
<b>851</b>	Column up and/or Column down pressed on power on	<b>8.2.7.2</b>
<b>852</b>	Key RESET (patient centering) pressed during movement	<b>8.2.7.3</b>

**8.2.1. Errors with code from E000 to E199**

All these are errors related to the main CPU board (A5) and its internal peripherals.

Power off the unit and, after 1 minute delay, power it on again; if the error is displayed again, replace the Microprocessor CPU board (A6).

### **8.2.2. Errors with code from E200 to E299**

These errors are related to the various axis movements and require the replacement of some parts; only the following error message E206 can be generated by a special condition and can be reset.



**8.2.2.1. E200: Zero position optical sensor of rotation always active /  
E201: Zero position optical sensor of rotation never active /  
E204: Unexpected activation of zero position rotation sensor**

These messages mean that, during the rotation, there is no change or an unexpected activation of the optical sensor B3.

The position of rotation is controlled by the optical sensor B3, that is activated at the start of the rotation travel; if this sensor is found active at the start up phase, and it is never sensed de-activated, the E200 message error is displayed, meaning that the sensor itself is broken or that the motor is not running.

In case that it is never sensed activated, the E201 is displayed, and the reasons are the same.

E204 means that, during some movements, the sensor changes its status to activated in an abnormal condition.

Entering the rotation motor service program it is possible to check the cause of the error.

T	Z	E	R	O		f	f				a			
Z	E	R	O		O	F	F	S		±	e	e	e	e

In normal conditions the display must visualise "X" in place of the character "a".

In all cases, the sensor's functionality can be checked by placing an opaque thin material in the optical path and looking at the voltage coming out from the sensor.

Using the left and right arrows it is possible to rotate the arm, checking if the status of sensor changes accordingly.

1. If there is no variation of the above signals, if the arm does not move or moves with difficulty or jumps:
  - check the belt and verify that it is not broken; if the belt is loose, adjust its tension
  - check cable of stepper motor; there can be a short circuit or a broken wire; check also for a loosen contact. In case of short circuit, replace the cable, verifying also that no damage has been caused to the motor driver on the CPU.
2. If the arm moves, verify the cable up to the CPU board (A5). If it still continues to have no variation of the signals when there is an activation of the switches, change the CPU board.

### **8.2.2.2. E205 Timeout on rotation**

This message means that no change on the rotation's signal is detected; please follow the steps described above.

### **8.2.2.3. E206 Patient collision**

It is caused by a possible collision between the patient and the rotating arm. After having the patient removed from the system, press the patient centering key to restart the power on procedure to correctly set the unit.

If the error message is again displayed, there is a fault on the rotation sensing circuit and perform the following steps:

- 1.** Check that rotation motor M3 is rotating; if not, check the cable from the motor to Rotation Group board (A7), connector X61 up to the main CPU board (A5), connector X25/X25.
- 2.** If the motor is running, check the optical sensor B2 and its cables to X60 of A7 up to connector X25/X26 of main CPU board (A5). Replace the sensor or the faulty cables.

**8.2.2.4. E240: Zero position sensor for Y axes always active /  
E241: Zero position sensor for Y axes never active /  
E242: Unexpected activation of Y axes /  
E243: Timeout of Y axes**

These errors are signalling a problem on the Y axis movement.

Entering in the Y-axis service program it is possible to check the cause of the error.

Y	Z	E	R	O		f	f					a		
Z	E	R	O		O	F	F	S		±	e	e	e	e

In normal conditions the display must visualize "X" instead of the character "a".

Using the left and right arrows it is possible to rotate the arm, checking if the status of the sensor changes accordingly.

1. If there is no variation of the above signal, if the arm does not move or moves with difficulty or jumps.
  - Check the belt and verify that it is not broken; if the belt is loose, adjust its tension
  - Check cables of the Y axes motor; there can be a short circuit or a broken wire; check also for a loosen contact. In case of short circuit, replace the cable, verifying also that no damage has been caused to the motor driver (D27) on the CPU.
2. If there is no variation of the above signal and the arm moves, verify the cable from the optical sensor up to the CPU board (A5). If still there is no variation of the signals when there is an activation of the switches, change the CPU board.

In case of no motion, it is possible that the problem is related to the motor: in order to check this, connect the driver of the Y-axis motor to the rotation motor, putting cable X28 into connector X26 on CPU board (A5).

**8.2.2.5. E280: Unexpected activation of zero position sensor on CEPH /  
E281: Timeout of zero position sensor on CEPH /  
E282: Zero position sensor for CEPH never active /  
E283: Zero position sensor for CEPH always active**

All the messages refer to the optical barrier that is sensing the zero position of the Digital Ceph sensor holder; differences between their meanings are that the first one (E280) may occur during the examination, meaning that the sensor activation has occurred before the expected time. This can be caused by the loss of motion of the stepper motor due to a collision with the patient or a fault of the motor stepper driver.

In case that no collision has been observed or the message is frequently displayed, follow the procedure.

The last 3 messages are displayed during the power on phase, when the system is controlling the functionality of the whole system.

E281 and E282 mean that the zero position sensor is never activated; due to a motor not running or to a fault of the optical barrier (the sensor or its harness); E283 means that this sensor is always activated. Also in this case the fault can be the motor or the optical barrier.

- Check that during the power on phase there are movements on these axes; the normal motion is going to engage the sensor and a reverse motion to disengage it. If no motion is observed, the fault can be the stepper motor or the cable connecting it to the main CPU. Check that the cables between the motor M8 and X6 of board A12 is well inserted, as for the cable X1-X2 of A12 to X23, X24 and X34 of the main CPU board (A5)
- Check continuity of the above cables, from M8 to board A12 and from X1-2 of board A12 up to X23, X24 and X34 of the main CPU (A5)
- Repeat the power on sequence, verifying the motion.

If still there is no motion, replace the stepper motor and, if not fixed, replace the CPU.

If a motion has been observed, but messages are displayed, this can be the sensor or its wiring:

- Power off the system and try to manually disengage the sensor, taking care of a smooth motion.
- Power on the system and check the functioning of the sensor, measuring the DC voltage on the terminal of the sensor B10, with and without an obstacle manually inserted. A variation of about 3.5 V minimum should be observed. If not, replace the sensor.
- If the variation is observed and the message still continues to be displayed, check the correct insertion of cable X5 on board A12 and from X1-2 of the board up to X23, X24 and X34 of the main CPU; check the continuity of the interested wires and replace the faulty one (if any).
- If all cables are OK, the fault is on the main CPU, so replace it.

### 8.2.3. Errors with code from E300 to E399

- 8.2.3.1. E300: Unexpected activation of zero position sensor on secondary CEPH collimator /**  
**E301: Timeout of zero position sensor on secondary CEPH collimator /**  
**E302: Zero position sensor for secondary CEPH collimator never active /**  
**E303: Zero position sensor for secondary CEPH collimator always active**

The X-ray beam coming out from the tube head assembly is collimated to the area under exam by a secondary collimator that is moving synchronously with the CEPH sensor holder; this collimator is moved by a stepper motor M7.

All the above messages refer to this mechanism; all the considerations above described for E280 to E283 for patient's collision.

In case of absence of collision between the secondary collimator and the patient, the cause can be a fault on motor M7 and/or optical sensor barrier B11.

- Check that during the power on phase there are movements on these axes; the normal motion is going to engage the sensor and a reverse motion to disengage it. If no motion is observed, the fault can be the stepper motor or the cable connecting it to the main CPU (A5). Check that the cables between the motor M7 and X4 of board A12 is well inserted, as for the cable X1-X2 of A12 to X23, X24 and X34 of the main CPU.
- Check continuity of the above cables, from M7 to X4 A12 and from X1-2 of A12 up to X23, X24 and X34 of the main CPU.
- Repeat the power on sequence, verifying the motion.

If still there is no motion, replace the stepper motor and, if not fixed, replace the CPU.

If a motion has been observed, but messages are displayed, this can be the sensor or its wiring.

- Power off the system and try to manually disengage the sensor, taking care of a smooth motion.
- Power on the system and check the functioning of the sensor, measuring the DC voltage on the terminal of the sensor B11, with and without an obstacle manually inserted. A variation of about 3.5 V minimum should be observed. If not, replace the sensor.
- If the variation is observed and the message still continues to be displayed, check the correct insertion of cable X3 on board A12 and from X1-2 of the board up to X23, X24 and X34 of the main CPU; check continuity of the interested wires and replace the faulty one (if any).
- If all cables are OK, the fault is on the main CPU, so replace it.

**8.2.3.2. E320: Unexpected activation of zero position sensor on primary collimator /  
E321: Timeout of zero position sensor on primary collimator /  
E322: Zero position sensor for CEPH never primary collimator /  
E323: Zero position sensor for CEPH always active collimator**

All the messages refer to the optical barrier that is sensing the zero position of the primary beam collimator that is moved by a stepper motor. This mechanism is located in front of the tube head assembly. The slit collimator does not move during the PAN examination, while it has a scanning motion during Ceph exams, synchronously with the secondary collimator and CEPH sensor holder.

Also in this case, the first one (E320) may occur at the end of an examination, while the system is checking the correctness of the motion, meaning that the sensor activation has occurred before the expected time. This can be caused by the loss of motion of the stepper motor.

The last 3 messages are displayed during the power on phase, when the system is controlling the functionality of the whole system. E321 and E322 mean that the zero sensor position is never activated; due to a motor not running or to a fault of the optical barrier (the sensor or its harness); E323 means that this sensor position is always activated. Also in this case the fault can be the motor or the optical barrier.

- Power off the system and remove the frontal cover of the tubehead assembly.
- Check that during the power on phase there are movements on the primary slit collimator; the normal motion is going to engage the sensor and a reverse motion to disengage it. If no motion is observed, the fault can be the stepper motor M5 or the cable connecting it to the main CPU. Check that the cables between the motor M5 and X64 is well inserted, as for the cable X64 to X29 and X30 of the main CPU A5.
- Check continuity of the above cables, from M5 to X64 and from X64 up to X29 and X30 of the main CPU A5.
- Repeat the power on sequence, verifying the motion.

If still there is no motion, replace the stepper motor and, if not fixed, replace the CPU.

If a motion has been observed, but messages are displayed, this can be the sensor or its wiring.

- Power off the system and try to manually disengage the sensor, taking care of a smooth motion.
- Power on the system and check the functioning of the sensor, measuring the DC voltage on the terminal of the sensor B8, with and without an obstacle manually inserted. A variation of about 3.5 V minimum should be observed. If not, replace the sensor.

- If the variation is observed and the message still continues to be displayed, check the correct insertion of the cable from the sensor B8 to X58 and from that connector to X31 of the main CPU A5; check continuity of the interested wires and replace the faulty one (if any).
- If all cables are OK, the fault is on the CPU, so replace it.

### **8.2.3.3. E340: Sensor holder not in PAN position**

An examination requiring the sensor holder in PAN position has been selected, but it is not sensed in the proper position.

Close the PAN sensor holder to its position and press the Patient centering key to restart the power on procedure.

If this does not reset the error message:

- Check the proper function of optical sensor B6.
- Check continuity of cables from optical sensor to board A8, connector X48, and from that board to main CPU board (A5), connector X33.



#### 8.2.3.4. E360 and E361: X-ray button pressed during power on

This message is displayed if, during the power on procedure, the X-ray button, local (E360) or remote (E361) have been sensed as pressed. Release the button if it was pressed: the error condition is reset powering off the unit and on again.

If the error is still present, check the continuity of cables of the interested button. For the local one, S8, it is connected to X18 of the keyboard and it is transferred to the main CPU using the CANBus cable.

- Check that the cable X18-X18 to the main CPU is well inserted and its continuity.
- From the main CPU, the signal is routed to the Generator board (A10), using the CANBus cable X20-X20; check also that this cable is well inserted and its continuity. Replace it if damaged.
- If the error is still present, check the correct insertion of the flat cable between the Generator CPU board (A9) to the Generator board (A10). The cable is labelled X53-X53; replace it if damaged.



**WARNING:**

**On the Generator board (A10) there are dangerous high voltages, 230 VAC and 400 VDC.**

**Before accessing the Generator CPU and power board (A9 and A10), it is mandatory to switch off the mains and wait up to 2 minutes in order to allow the discharge of the capacitor.**

---

**8.2.3.5. E362: X-ray button released during the examination procedure**

X-ray emission is commanded using the technique called "dead man's switch", that means that it must be held pressed down until the end of the emission, also during the interrupted emission phase of TMJ.

If this does not happen, the above error message is displayed; the emission is stopped and all motors released in order to allow for the patient's exit.

Press the reset button and restart the operation as suggested by the control system.

**8.2.3.6. E380: Invalid CANBus message (from Generator CPU board A9)**

This error is displayed when the main CPU board (A5) receives an invalid message from the Generator board (A10); that is a message which contents is not listed on the valid data dictionary of the unit.

This can be generated by a bad connection or by a fault of the local Generator CPU board (A9).

Check the CANBus cable X20-X20 and replace it if faulty, otherwise replace the Generator CPU board.

**8.2.3.7. E381: Timeout on activating CAN protocol on Generator board /  
E382: HF not answering to CAN protocol**

These two messages have the same meaning, that is a no answer to main CPU (A5) from CAN messages, but their occurring is in different times. E381 is generated during power on, while E382 is displayed after a regular power on sequence.

In both cases, the error can be generated by a bad connection of the CANBus or a fault on the local Generator CPU board, so the steps above described for E380 are applied.

## **8.2.4. Errors with code from E400 to E499**

### **8.2.4.1. E400: Timeout of zero position sensor on Soft Tissue Filter / E401: Zero position sensor for Soft Tissue Filter always active**

The Soft Tissue Filter for cephalometric examinations is controlled by the stepper motor. During the power on, the system checks the correctness of the motion, sensing the activation and deactivation of the optical sensor B9. If it is not sensed activated, the timeout message E400 is displayed, while if it is always active, the E401 is displayed. In both cases, the error can be generated by the loss of movement of the stepper motor or by a fault of the sensor B9.

- Power off the system and remove the frontal cover of the tubehead assembly.
- Check that during the power on phase there are movements on the primary slit collimator; the normal motion is going to engage the sensor and a reverse motion to disengage it. If no motion is observed, the fault can be the stepper motor M6 or the cable connecting it to the main CPU. Check that the cables between the motor M6 and X65 is well inserted, as for the cable X65 to X29 and X30 of the main CPU A5.
- Check continuity of the above cables, from M6 to X65 and from X65 up to X29 and X30 of the main CPU A5.
- Repeat the power on sequence, verifying the motion.

If still there is no motion, replace the stepper motor and, if not fixed, replace the CPU.

If a motion has been observed, but messages are displayed, this can be the sensor or its wiring.

- Power off the system and try to manually disengage the sensor, taking care of a smooth motion.
- Power on the system and check the functioning of the sensor, measuring the DC voltage on the terminal of the sensor B9, with and without an obstacle manually inserted. A variation of about 3.5 V minimum should be observed. If not, replace the sensor.
- If the variation is observed and the message still continues to be displayed, check the correct insertion of the cable from B9 in X33 of the main CPU and the continuity of the connection.
- If all cables are OK, the fault is on the CPU, so replace it.

### 8.2.5. Errors with code from E700 to E799

**WARNING:**

Those errors are related to the X-ray generator, so they can be safety related.

**In case of Error messages E759 and E755, the system must be immediately powered off, because there is an unexpected emission (E759) or the emission has not been terminated into the expected time.**

---

**WARNING:**

**On the Generator board (A10) there are dangerous high voltage, 230 V AC and 400 VDC.**

**Before accessing the Generator CPU and power board (A9 and A10), it is mandatory to switch off the mains and wait up to 2 minutes in order to allow the discharge of the capacitor.**

---

### **8.2.5.1. E750: No power to the Generator board**

This message is signalling that the Generator board (A10) is not powered.

Check that if LED H3 of the Generator board is ON; in affirmative case, check connector X53 insertion and insert it correctly. Check the voltage between TP1 and TP2; it should be 10 V DC  $\pm$  2 V; if the value is inside the range, replace the Generator CPU board (A9). If the value is zero (or very low), replace the Generator board.

If LED H3 is off, perform the appropriate operations as described in the previous chapter.

### **8.2.5.2. E751: Over voltage kV**

This message is displayed when a value higher than expected has been detected on the Generator board (A10).

Check that connector X57 is well inserted. With the connector inserted, measure the resistance between pins 2 and 4 of connector (harness to tubehead) that should be 13.3k  $\pm$  2% while is 14.3k  $\pm$  2% between pins 4 and 3 of the same connector; if correct values are measured, replace before the tubehead and, eventually, the Generator board. If incorrect values are measured, replace the tubehead.

### **8.2.5.3. E752: Filament overload / E753: Overload on Anodic current**

These messages are displayed when an abnormal value of filament current has been detected.

Replace the tubehead.

### **8.2.5.4. E754: Broken filament**

This message is displayed when there is a fault on the power circuit of the filament, not only the filament itself.

Check that connector X56 is well inserted.  
Check the continuity of wires from X57 to the tubehead.  
Verify the correctness of pre heating parameters.  
If all OK, replace the tubehead.

### **8.2.5.5. E756: PFC failure**

This message is signalling that the PFC (Power Factor Control) circuit is not correctly functioning.

If the error is present in stand-by mode, replace the Generator board (A10).  
If the error appears during an exposure, reset the error and repeat the exposure; if the error still appears, replace the tubehead.

**8.2.5.6. E755: Alarm “Backup timer intervention” /  
E758: Alarm “No X-ray” /  
E759: Alarm “unexpected emission”**

The correctness of X-ray emission is checked by the Generator board (A10) measuring the anodic current against the set nominal value. When the system is in the idle mode, that is in a non emitting state, this signal must be low, and the Generator CPU board (A9) is checking this condition. If this does not happen, the E759 message is displayed.

When the CPU command for the emission, the X-ray on signal is set to on condition when it reaches the 75% of its set value at the beginning and is higher than 25% at the end of emission.

If the first condition is not met, the exam is halted and the system has to be reset, and the **message E758 "No X-ray"** is displayed.

In this case, check the correct insertions of X56 and X57 between the Generator board to the tubehead and X53-X53 (flat cable) between Generator board and Generator CPU board (A9).

Check the CANBus connection between the Generator CPU board (A9) and the main CPU A5 (cable X20-X20).

If all connections are OK and the fault is repetitive, replace the tubehead.

If the second condition is not met, that is, the X-ray emission do not fall under the value in a pre set time, the **message E759 "Unexpected emission"** is displayed. This message can be also displayed if the signal X-ray on is sensed during the idle state.

In this case, check the main CPU board (A5) and the local Generator CPU board (A9) and the cable X20-X20. If all OK, replace the Generator board.

The emission is controlled also through a safety backup timer that interrupts the power to the tubehead also in case of a fault (hardware or software) to the Generator CPU board. The intervention of the backup timer, **message E755**, is signalled by a lighting of the red LED H4.

This alarm can be reset only by powering off the unit, wait for at least 1 minute and power it on again. If the LED H4 continues to be ON, replace the Generator board.

If the LED, after the power ON is not lighted, repeat an emission and, if the message is appearing again, replace the Generator board.



**8.2.5.7. E774: RX button not pressed**

This error message is displayed when the Generator CPU board (A9) is not detecting the X-ray button pressed also if the main CPU (A5) has commanded the emission with the corresponding CANBus message. In this case a possible interruption on cable X20-X20 from main CPU A5 to Generator CPU A9 is possible.

From the main CPU, the signal is routed to the Generator board, using the CANBus cable X20-X20; check also that this cable is well inserted and its continuity. Replace it if damaged.

If the error is still present, check the correct insertion of the flat cable between the Generator CPU board to the Generator board. The cable is labelled X53-X53; replace it if damaged.

**8.2.5.8. E775: RX button released during the emission**

This message has the same meaning as the corresponding error E362, but it is generated by the Generator CPU board (A9), that is signalling a possible broken connection with the main CPU (A5). Repeat the test as per error E774 above.

## **8.2.6. Errors with code E800 and E801**

These messages are signalling an error caused on the column movement.

### **8.2.6.1. E800: Timeout on CAN activation for vertical motor**

This error is displayed when there is no answer to main CPU board (A5) from CAN messages during power on.

The error can be generated by a bad connection of the CANBus or a fault on the Column CPU board (A1).

Check the CANBus cable X11-X11 and replace it if faulty, otherwise replace the Column CPU board.

**8.2.6.2. E801: ON/OFF command for vertical motor not changed on planned time**

This message is displayed when there is a fault on the column movement.

Check that the column movement power supply fuse F4 is not blown. Check the safety column movement microswitches work correctly, otherwise replace the microswitches assy (microswitch + cable). CANBus cable X11-X11 and replace it if faulty, otherwise replace the Column CPU board.

## 8.2.7. Errors with code E850, E851 and E852

These messages are signalling an error caused on the operator's interface.

### 8.2.7.1. E850: More than one button pressed during power on

During the power on phase, the local control board of the keyboard is controlling that during power on no more than 1 button is pressed. Only the case of column up/column down is allowed and used to enter the set up procedure, so if this procedure is started without an explicit request, it means that those buttons are pressed. In this case, replace the keyboard membrane and after the control board.

Otherwise the following message is displayed:

E	8	5	0	(	x	x	x	x	x	x	x	x	)
C	A	L	L	T	E	C	H	A	S	S	.		

*xxxxxxxx code number for message 850*

Release the corresponding key if pressed and repeat the power on procedure. Otherwise replace the keyboard membrane and after the control board.

### 8.2.7.2. E851: Column up or Column down pressed at power on

This message is signalling that only one of the two buttons is pressed. Release the pressed button and power off the system and power on it again. If the message is displayed again, replace first the keyboard membrane and after the control board.

**8.2.7.3. E852: One key pressed during the movement**

During the system movements, the keyboard is inactive, but at the pressure of one button all movements are stopped and this message is displayed.

This is useful in case an abnormal motion is detected, for instance the column does not stop at the release of the corresponding button but still continues to move.

Check if one button has been involuntarily been pressed and restart the operation with a new power on procedure.

In case there is a stuck key, one of the previous message E850 and E851 must be displayed, so acts accordingly.

### 8.3. Service programs descriptions

This paragraph provides a brief description of the service programs (passwords) of the unit.

#### 8.3.1. Accessing the service programs

The following procedure must be followed to access the service program:

1. Power OFF and ON the unit; the system will wait until DSPU board will answer (about 45 s). Meantime the display will show the HW and SW release of the keyboard board. Wait until the following message is displayed:

			I	M	A	X		T	O	U	C	H		
R	E	L	E	A	S	E		*	.	*	*	*		

After 3 seconds, the following message will be displayed:

				>	T	E	S	T	<					
--	--	--	--	---	---	---	---	---	---	--	--	--	--	--

When this message appears, press the column up and column down

keys




simultaneously and hold them pressed. After 3 seconds,


the following message will be displayed

		S	E	R	V	I	C	E		M	E	N	U	
C	O	N	F	I	G	U	R	A	T	I	O	N		

The service menu is directly accessed, but some functions are protected by further password.

2. Using the scroll right and scroll left keys  it is possible

to select the service program to be used; the list is as follows:  
CONFIGURATION ⇔ AXIS ALIGNMENT ⇔ CEPH SETTINGS ⇔  
TROUBLESHOOTING ⇔ SYSTEM ⇔ BURN IN ⇔ SHOW CONFIG ⇔  
CONFIGURATION ⇔

Select the desired Service Program and press key  to confirm

the selection; for each selection, different operations are possible.








**NOTE:**

SYSTEM and BURN-IN operations are used only during factory set-up; there are special passwords not accessible to Service Engineers. For this reason, they are not explained on the manual.

## 8.3.2. General information on the use of keyboard

In all menus of the service programs, the keyboard and display keys provide the following usage.

	(6)	<p><b>Patient centering (&gt;0&lt;):</b> is used to confirm the chosen selection or, exiting from a service program going to the upper level of menu. If some parameters have been changed into the quitting service program, it will confirm the changes storing new values on the configuration area. This operation is generally signalled by a specific message on the display.</p>
	(25)	
	(26)	<p><b>Test (T):</b> it is used to quit a service program, passing to an upper level. It is also used, alternatively to the Patient Centering, to discard the performed changes on the interested parameters. This operation is signalled by a specific message on the display.</p>
		<p><b>Left/Right scroll:</b> are used to scroll into different parameters or menus.</p>
		<p><b>Parameter increase and decrease:</b> are used to change the value of the selected parameter.</p>

### 8.3.3. Password 92: Configuration menus


When the following menu is displayed,

S	E	R	V	I	C	E	M	E	N	U		
C	O	N	F	I	G	U	R	A	T	I	O	N

Pressing the patient centering keys the next message is displayed:

S	E	T	U	P								
P	A	S	S	W	O	R	D	?	1	0	0	

Using the increase/decrease keys , set the password equal to "92"

and confirm with key (6/25) ; now it is possible to access the configuration menus of the following list:

- LANGUAGE ⇔ DATE-TIME SET ⇔ ⇔ DISABLE X-RAY ⇔
- DISPL. BRIGHTNESS ⇔ DISPLAY CONTRAST ⇔ LED BRIGHTNESS ⇔
- KEY CLICK SOUND ⇔ KEY CLICK VOLUME ⇔ MANAGE PANO OPT. ⇔
- DIGITAL MODE ⇔ PAN ONLY OPTION ⇔ SENSOR HANDLING⇔
- DSPU IP ADDRESS ⇔ DSPU NET MASK ⇔ LANGUAGE .....

The selection is confirmed pressing the patient centering (>0<) keys. The exit from each menu is performed using the Test (T) key; the value is updated or not by pressing the appropriate key as an answer to the following message:

U	P	D	A	T	E	C	H	A	N	G	E	S	?
>	0	<	=	Y	,	T	=	N					

In both cases, the upper level of service menu is reached.



### **8.3.3.1. Language**

In this menu, it is possible to select the language of displayed message of the user's panel (language of service menus is always English) in one of the following:

ITALIANO ⇔ FRANCAIS ⇔ DEUTCH ⇔ ESPANOL ⇔ ENGLISH ⇔  
PORTUGUÊS ⇔ NEDERLANDS ⇔

### 8.3.3.2. Date-Time set

In this menu, it is possible to adjust the internal Real Time Clock (RTC); this RTC is used to check the correctness of the Cooling Down time of the tubehead.



**NOTE:**

It will take care of standard operation (hour and date change, leap year calculation, etc.) but does not consider Summer Time Hour Changes.

The RTC clock is set at the Factory hour/date (Central Europe date/time) during the final test of the equipment. It is the installer's responsibility to set, if wanted, the local date/time.

Once selected, the following message is displayed:

D	A	T	E	-	T	I	M	E	S	E	T			
D	A	T	E	:	D	D	/	M	M	/	Y	E	A	R

It is possible to scroll between the date and time set.

Confirming the Date change, the display changes as follows:

		A	D	J	U	S	T		D	A	T	E		
D	>	X	X		M		Y	Y		Y		Y	Y	

The ">" symbol is signalling which parameter is going to be modified; in this case the day, while the month and year are to be modified if one of the following message is displayed, respectively.

		A	D	J	U	S	T		D	A	T	E		
D		X	X		M	>	Y	Y		Y		Y	Y	

		A	D	J	U	S	T		D	A	T	E		
D		X	X		M		Y	Y		Y	>	Y	Y	

### 8.3.3.3. Disable X-ray

This selection is used to enable or disable the emission; this operation is useful for exhibitions, leaving the unit functioning as in the normal mode.

**NOTE:**

If the emission is OFF, a warning message will be displayed just after the initial message one and before the TEST message. The display is cleared by pressing the Patient Centering (>0<) key.

---

### 8.3.3.4. Manage pano opt.

This menu allows to enable the additional Panoramic examination projections; those are enabled only if the protection key match the hardware value.

In case this option has been already enabled, the display will visualize the already stored value, otherwise it will show the default value. In both cases, it is possible to change and set the value according to the protection key received.

F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
V	A	L	U	E	[	0	]	=	F	F				

Where VALUE[x] is the value assigned to the couple of digits, with "x" ranging from 0 to 7, and "FF" is the hexadecimal value assigned to the specific couple. Using the standard buttons to move into the selected field, set its value equal to the one received for the appropriate position. Values are displayed and changed using a couple of digits, with a variation of one unit for each pressure of the parameter increase/decrease keys; the auto repeat function for fast changes is enabled.

### 8.3.3.5. Digital mode

In this menu, it is possible to set the system for digital or film base; the

selection is performed using the parameter increase/decrease



keys

and selection is confirmed in the usual way.



**WARNING:**  
Changing the set mode will affect the complete system functionality.

### 8.3.3.6. PAN only option

In this menu, it is possible to set the system for PAN only, PAN ready for Digital CEPH or PAN + CEPH configuration.

After the selection, the display will show the following message:


P	A	N		O	N	L	Y		O	P	T	I	O	N
P	A	N		O	N	L	Y		I	S		O	N	

or

P	A	N		O	N	L	Y		O	P	T	I	O	N
P	A	N		O	N	L	Y		I	S		O	F	F

according to the factory setting.

It is possible to change the set value using the parameter

increase/decrease  keys; select "PAN ONLY IS ON" for PAN only

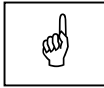
system or "PAN ONLY IS OFF" for PAN ready for Digital CEPH or PAN + CEPH systems.



**WARNING:**

**Wrong setting provides message "Close cassette to Panoramic" at the start-up for PAN only system, or Error 420 for PAN+CEPH system when Cephalometric exam is selected.**

### 8.3.3.7. Sensor handling



**NOTE:**

For PAN only system, changes on this menu do not have any effect on system functionality.

This menu allows to set the system for 1 mobile sensor or 2 fixed sensors configuration.

After the selection, the display will show the following message:

S	E	N	S	O	R		H	A	N	D	L	I	N	G	
S	E	N	S	O	R		I	S		M	O	B	I	L	E

or

S	E	N	S	O	R		H	A	N	D	L	I	N	G	
S	E	N	S	O	R		I	S		F	I	X	E	D	

according to the factory setting.

It is possible to change the set value using the parameter

increase/decrease



keys; select "SENSOR IS MOBILE" for 1 sensor

configuration or "SENSOR IS FIXED" for 2 fixed sensors configuration.



**WARNING:**

**Wrong setting provide operative messages not consistent with the equipment configuration.**

### 8.3.3.8. DSPU IP address

The DSPU has its own static IP address that is used for the connection with the external PC. The default set value for IP address is 010.000.000.215.

### 8.3.3.9. DSPU NET mask

The DSPU has also a specific net mask, default set value of 255.255.255.0000.

Using the standard method to change the value, set both according to values defined by the Network manager of the installation.

**NOTE:**

Those values are used only by the DSPU, so only on the Digital units; do not update those in case of an analog (film) unit, and/or change those only to adhere at the specified values of the network manager in case of IP address conflict.

### 8.3.4. Password 118: Axis alignment menu

When the following menu is displayed,

	S	E	R	V	I	C	E	M	E	N	U	
C	O	N	F	I	G	U	R	A	T	I	O	N

Using the left/right scroll arrow is possible to change the message, use the keys until to the following message is visualized:


	S	E	R	V	I	C	E	M	E	N	U		
A	X	I	S	A	L	I	G	N	E	M	E	N	T

Pressing the patient centering (>0<) keys the next message asking for the correct password is shown.

S	E	T	U	P	U	P						
	P	A	S	S	W	O	R	D	?	1	0	0



Using the parameter increase / decrease keys, set the password

equal to "118" and confirm with the patient centering  key. Before

entering the relevant menu, the system centering functions are performed; those operations can be interrupted, if needed, by pressing once again the patient centering (>0<) key.



**NOTE:**

Interruption of this operation must be performed only in case those functions are used to check some hardware faults. If the system needs to be centered, the operation must be completed.

Once the operation is finished (or interrupted), it is possible to access the following list of submenus:

ROTATION ZERO ⇔ Y AXIS ZERO ⇔ CASSETTE ZERO ⇔  
PR. COLL. SETUP ⇔ ROTATION ZERO ...

The selection is confirmed pressing the patient centering (>0<) keys.



The exit from each menu is performed using the Test (T) key; the value is updated or not by pressing the appropriate key as an answer to the following message:

U	P	D	A	T	E		C	H	A	N	G	E	S	?	
	>	0	<		=	Y		,		T		=		N	

In both cases, the upper level of service menu is reached.



**WARNING:**

**Changes to one or more offset values affect the system's functionality, so take care to not alter those values if not needed. Normally only the replacement of faulty parts (motors, belts, zero optical sensors, etc.) will require to act on those data.**





### 8.3.4.2. Y Axis zero

This function allows the set of the offset of Y axis, the motion along mid sagittal plane of the patient, in order to place the correct position of the central path. Once the patient centering (>0<) key is pressed, the following message is displayed:

Y	Z	E	R	O		Y	Y						a
Z	E	R	O	O	F	F	S		±	x	x	x	x

where:

- "YY" is the stepper motor speed, that can be changed using the parameter increase/decrease  keys.
- "a" is the status of the zero optical barrier; 1 means engaged (i.e. barrier interrupted), 0 otherwise.
- "xxxx" is the current value of the offset, that can be changed with the left/right  keys.

### 8.3.4.3. Cassette zero

This function is not active on the digital mode; if selected it will generate an error message.

### 8.3.4.4. Primary collimator setup



**WARNING:**


**In this menu the emission is enabled; it starts with the X-ray button press, so take care of this situation.**

This function allows to center the offsets of the linear slit collimator. Once the patient centering (>0<) key is pressed, the following message is displayed:

P	C	C		Z	E	R	O			Y	Y					a
Z	E	R	O		O	F	F	S		±	x	x	x	x	x	

where:

- "YY" is the stepper motor speed, that can be changed using the

parameter increase/decrease  keys.

- "a" is the status of the zero optical barrier; 1 means engaged (i.e. barrier interrupted), 0 otherwise.

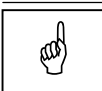
- "xxxx" is the current value of the offset, that can be changed with the

left/right  keys.

This function is used to check the beam alignment; the emission is started by the X-ray button pressing and the exposure parameters can

be set by pressing the key  ; when it has been pressed, the

normal change procedure to set manual exposure parameters is followed.



**NOTE:**

The position of the primary slit is set to the correct value during the factory final test; changes on the stored value must be done only in case of:

- Replacement of one part of the linear slit collimator (motor, zero barrier sensor, etc.); in this case the beam must be aligned to the sensor entrance acting on the offset value.
- Replacement of a defective tubehead; in this case, the beam aligned moving the tubehead **leaving the offset value unchanged.**

### 8.3.5. Password 124: CEPH settings



**NOTE:**

The complete procedure to enter in password 124 is described on paragraph 7.1.2 and following.

When the following menu is displayed:


		S	E	R	V	I	C	E		M	E	N	U		
C	E	P	H		S	E	T	T	I	N	G	S			

Pressing the patient centering (>0<) key the next message is displayed, asking for the correct password.

		S	E	T		U	P	=							
P	A	S	S	W	O	R	D	=	1	0	0				



Using the increase / decrease keys, set the password equal to

"124" and confirm with the Patient Centering  key. The system

will begin the sequence to align the X-ray beam to the Ceph arm. The operations contained in this menu are useful to enable the Ceph examination and perform all operation to center the Ceph. Once completed the zeroing, the following message is visualized:

D	I	G	I	T	A	L		C	E	P	H				
E	N	A	B	L	E		S	E	N	S	O	R			

And it is possible to select one of the following operations:

- ENABLE SENSOR ⇔ Y OFFSET ⇔ ROTATION OFFSET ⇔
- LINING UP TEST ⇔ CEPH S. COL. ZERO ⇔ CEPH SENSOR ZERO ⇔
- STF ZERO OFFSET ⇔ ENABLE SENSOR ...

The selection is confirmed pressing the patient centering (>0<) keys. The exit from each menus is performed using the Test (T) key; the value is updated or not by pressing the appropriate key as an answer to the following message:

U	P	D	A	T	E		C	H	A	N	G	E	S	?	
>	0	<		=	Y	,		T	=		N				

In both cases, the upper level of service menu is reached.

### 8.3.5.1. Enable sensor

This menu is used to enable or disable the digital Ceph examination.  
After the selection, the display will show the following message:

D	I	G	I	T	A	L	C	E	P	H			
C	E	P	H	I	S	E	N	A	B	L	E	D	


or

D	I	G	I	T	A	L	C	E	P	H			
C	E	P	H	I	S	D	I	S	A	B	L	E	D

according to the factory setting.

It is possible to change the set value using the parameter

increase/decrease   keys.

Pressing the  key will quit the menu and the disabled/enabled status is temporarily stored in volatile memory. The system will return to the upper level, that is the Ceph menu where it is possible to proceed with the other operations.

## 8.3.5.2. Y Offset





**WARNING:**

**Do NOT modify this parameter: functionality can be severely impaired.**

This function allows the set of the offset of Y axis, the motion along the mid sagittal plane of the patient, but its function is to center the X-ray beam on the ceph sensor. Once the patient centering (>0<) key is pressed, the following message is displayed:

Y	Z	E	R	O		Y	Y						a
Z	E	R	O		O	F	F	S	±	x	x	x	x

where:

- "YY" is the stepper motor speed, that can be changed using the parameter increase/decrease  keys.
- "a" is the status of the zero optical barrier; 1 means engaged (i.e. barrier interrupted), 0 otherwise.
- "xxxx" is the current value of the offset, that can be changed with the left/right  keys.





### 8.3.5.5. CEPH secondary collimator zero

This menu allows to adjust the zero offset for the secondary collimator (the collimator that is used to limit the X-ray beam before patient on CEPH).

When the display is showing the following messages, using the left/right arrows selects the message



D	I	G	I	T	A	L	C	E	P	H				
E	N	A	B	L	E	C	E	P	H					
D	I	G	I	T	A	L	C	E	P	H				
C	E	P	H	S	.	O	L	L	.	Z	E	R	O	

and confirm with the patient centering (>0<) key.

The display will change as follows:

C	Z	E	R	O	[	Y	Y	]	a	b	c	d		
Z	E	R	O	O	F	F	S	±	x	x	x	x	x	

where:

- "YY" is the stepper motor speed, that can be changed using the parameter increase/decrease  keys.
- "xxxx" is the zero offset actual value, that can be changed with the left/right  keys.
- "abcd" represents the status of various optical barrier sensors; "a" is the one of the secondary collimator, that is 0 when not engaged and 1 otherwise.

**8.3.5.6. CEPH sensor zero**

This menu allows to adjust the zero offset for the digital sensor. When the display is showing the following messages, using the left/right scroll keys selects the message



D	I	G	I	T	A	L		C	E	P	H			
E	N	A	B	L	E		C	E	P	H				

D	I	G	I	T	A	L		C	E	P	H			
C	E	P	H		S	E	N	S	O	R	Z	E	R	O

and confirm with the patient centering (>0<) key. The display will change as follows:

S		Z	E	R	O		Y	Y		a	b	c	d		
Z	E	R	O		O	F	F	S		±	x	x	x	x	x

where:

- "YY" is the stepper motor speed, that can be changed using the parameter increase/decrease  keys.
- "xxxx" is the zero offset actual value, that can be changed with the left/right  keys.
- "abcd" represents the status of various optical barrier sensors; "b" is the one of the zero of digital sensor, that is 0 when not engaged and 1 otherwise.

**8.3.5.7. STF zero**

This program is used to adjust the offset of the Soft Tissue motorized filter.

### 8.3.6. Password 112: Troubleshooting

When the following menu is displayed:

S	E	R	V	I	C	E		M	E	N	U			
T	R	O	U	B	L	E	S	T	O	O	T	I	N	G

Pressing the patient centering (>0<) keys the next message is displayed:

S	E	T		U	P									
		P	A	S	S	W	O	R	D	?		1	0	0

Using the increase / decrease  keys, set the password equal to

"112" and confirm with the patient centering  key; now it is

possible to access the configuration menus of the following list:

AXIS MOVEMENTS ⇔ TEST COLUMN ⇔ TEST INPUT PORTS ⇔  
 TEST SENS. CLOCK ⇔ PAN RX EMISSION ⇔ CEPH RX EMISSION ⇔  
 AUTO-CALIBRATION ⇔ I2C BUS TEST ⇔ AXIS MOVEMENTS ...



**NOTE:**

Of these submenus, actually only the Test Column, Test Input Ports and X-ray emission are active.

The selection is confirmed pressing the Patient centering (>0<) keys.  
 The exit from each menu is performed using the Test (T) key.

### 8.3.6.1. Test column

This function is used to verify the functionality of the column UP / DOWN end run microswitches.

The display will be updated as follows:

C	O	L	U	M	N		T	E	S	T									
I	D	L	E								0	0	0	a	b				

Using the column up/column down keys



verify that the last two

digits change status:

- **a** = 1, column up
- **b** = 1, column down.

**8.3.6.2. Test input ports**

This function is used to carry out diagnostics at low level of the various input signals of the CPU board A5. It may be used, for example, to verify the limit switches without necessarily moving the axes but manually activating the optical sensor / microswitches.

The display will be updated as follows:

T	E	S	T	I	N	P	U	T	P	O	R	T	S
R	y					7	6	5	4	3	2	1	0

where:

- **Ry**= selected port code (R4, R5, R6, R7)
- **76543210**= logic status of the port inputs.



**NOTE:**

The following table describes the correspondence between the displayed figures and the corresponding input signal. The digits are numbered from 7 to 0. The 7 digit corresponds to the character furthest to the left on the display, while digit 0 corresponds to the character furthest to the right.

Port	Bit	Association	µSwitch / Optical sensor	Logic status
<b>R4</b>	7	not used		-
	6	not used		-
	5	DSPU board initialization		0 for Analog 1 for Digital
	4	Motor +5V power supply (0 = alarm status)		1
	3	Column CPU board A1 initialization		1
	2	Generator board A10 initialization		1
	1	not used		-
	0	not used		-
<b>R5</b>	7 (*)	Primary collimator position optical sensor	B8	0
	6 (**)	Soft tissue filter 0 position	B8	1
	5	not used		-
	4	not used		-
	3	not used		-
	2 (**)	Digital Sensor ready		0
	1	not used		-
	0	not used		-
<b>R6</b>	7 (*)	Panoramic cassette start position	B5	1
	6 (*)	Panoramic cassette end position	B4	1
	5 (*)	CEPHALOMETRIC cassette present	S10	0
	4 (*)	PANORAMIC cassette present	S9	0
	3	Cassette / Sensor holder in CEPHALOMETRIC position	B7	1
	2	Cassette / Sensor holder in PANORAMIC position	B6	1
	1	Remote control X-rays button	X71-1 / X71-2	1
	0	X-rays button on column	S8	1
<b>R7</b>	7	not used		1
	6 (**)	Ceph sensor holder start position	B11	1
	5	not used		1
	4 (**)	Ceph secondary collimator start position	B10	1
	3 (**)	Slit primary collimator 0 position	B9	1
	2	Y axis start position	B1	1
	1	not used		-
	0	Rotation arm 0 position	B3	1

(\*) *Functionality only on Analog version*

(\*\*) *Functionality only on Digital version*



**NOTE:**

The logic status of these signals depends on the physical position of the relevant optical sensor / microswitch with respect to the "0" position.

### 8.3.6.3. X-ray emission

This menu is used to test the X-ray emission excluding all interlocks that are active during examination. It is used to test the function of the X-ray generator and tube head assembly.

At the selection of the X-ray emission test, the display will show the following message

X	-	R	A	Y	E	M	I	S	S	I	O	N		
7	2	k	V	0	6	m	A	1	4	.	0	S		



**WARNING:**

In this menu the emission is enabled; it starts with the X-ray button press, so take care of this situation.

Pressing the parameter changes  key, it is possible to choose a different combination of parameters. Once pressed, the display will show:

>	7	2	k	V	0	6	m	A	1	4	.	0	S	

Where the symbol ">" is showing the parameter to be changes; in this

case the kV. To move to mA and exposure time, press  key once

or twice again.

In this situation, the increase and decrease keys will change the parameter.

Pressing the X-ray button will start the emission.

### **8.3.7. System / Burn-in**

Both those menus are used only for factory set and testing, so they are not available for field service.

In any case, accession to those is protected by a special password, to avoid the risk of dangerous operations.

### **8.3.8. Show configuration**

This menu allows to show all parameters with its own set value; there is no possibility to change the parameters. This menu is useful to record on a paper sheet the condition of the machine.

Its usage is suggested at the end of installation to review and record the parameters.

Using the right/left scroll keys, it is possible to view all parameters.





**NOTE:**

The last displayed value is the Hardware Protection Key code; this is an alternate method to view it.

---



### 8.3.9. Touch screen calibration

To calibrate the touch screen of the display, when in the Setup mode, press simultaneously the "Patient centering" key (6)  and the "Luminous centring device" key (14)  .

The screen is cleared and the user is prompted to touch 9 points on the screen successively. Please use a stylus to touch each point as precisely as possible. After the last point has been touched, the screen reverts back to the Setup display.

## **8.4. Detection and correction of possible defects in dental radiographies**

### **8.4.1. Defects due to incorrect position of the patient**

<b>Problem</b>	<b>Description</b>	<b>Solution</b>
Incisors too large and blurred.	The patient is not positioned correctly. He is too far back from the optimal focal plane.	Position the patient correctly, and verify that he is holding the bite with his incisors on the fit notch and that the bite holder rod is vertical.
Incisors too small and blurred.	The patient is not positioned correctly. He is too far forward of the optimal focal plane.	Position the patient correctly, and verify that he is holding the bite with his incisors on the fit notch and that the bite holder rod is vertical.
Radiography with blank central area.	The patient's spine inhibits the passage of the X-rays because it is too compressed.	Check the alignment of the Frankfurt plane. Try to stretch out the cervical tract of the spine correcting the height of the cursor and moving the patient's feet forward (see 6.4.3.3/4/6/7 of the User Manual).
Dental arch not symmetrical.	The median sagittal line does not correspond to the laser centering beam.	Realign the patient (see 6.4.3.6 of the User Manual).
Upper apical area too dark.	The patient does not keep his lips closed and his tongue is not against the palate.	See paragraph 6.4.3.8 of the User Manual.
Upper central apical area out of focus.	The patient's head is turned backwards (Frankfurt plane not aligned).	Position the patient correcting the Frankfurt plane.
The image is slanted with respect to the longitudinal axis of the image and some of the anatomical structures are not symmetrical.	The patient's head is slanted (not vertical).	Position the patient correcting the sagittal plane.
The teeth are bigger on one side than the other.	The patient's head is turned with respect to the axis of the bite.	Position the patient correcting the sagittal plane and checking that the head is not turned.
(In CEPH examination) white area on the lower part of the film.	Panoramic chin-rest mounted.	Repeat the examination removing the PAN chin-rest.

### 8.4.2. Defects due to radiological data input

<b>Problem</b>	<b>Description</b>	<b>Solution</b>
Under or overexposed plate.	The set kV values are not suitable for the size of the patient. Possible error during development.	Repeat the examination changing the kV values. See paragraph 6.4.4 of the User Manual.
Completely white image.	No X-ray emission.	Check if the acoustic and led signal (led "2") indicating the X-ray emissions are active. If the problem persists call Technical Assistance
Soft Tissues not or poorly visible in L-L projection.	The STF value is not correct.	Refer to paragraph 6.9.3 of the User's Manual to adjust the position of the "STF". If the value is correct but the effect on the image is poor, retake the exposure setting a lower value for the STF.
	A symmetric format was selected.	Select an asymmetrical format (which will enable the STF filter).

### **8.4.3. Defects due to the unit**

The experience from field problems observed on the I-Max Touch has allowed to list under this chapter some possible typical problems that can affect the radiological quality.

- 1.** The Panoramic or Cephalometric image results in a light one also if the exposure parameters are correctly selected for the patient size may mean a not corrected alignment between X-ray beam and a sensor (PAN or CEPH) or a partial or total lack of X-ray. Refer to the described procedure to check the X-ray emission, beam alignment and sensor functionality.
- 2.** For Cephalometric examinations in latero lateral projections if soft tissue structures are poorly visible an adjusting of the STF setting may be requested to the Technical assistance. An alternative solution can be setting a lower STF value than that read on the nasion ruler; in this way the filter gives a higher attenuation in the soft tissue area.

## 8.5. Analysis of the problems on the panoramic examinations

This chapter is aimed at giving a more detailed and in depth description of defects affecting panoramic images; basically this chapter deals with the same type of problems described in paragraph 8.4 adding a more detailed explanation of the cause and corrective actions to take.

The panoramic radiography is the examination of the maxillo-facial region normally used to view the dental region inside the complete head and sinuses-orbital complex. A good panoramic examination allows distinguishing the main anatomical structures that are shown in the next drawing:

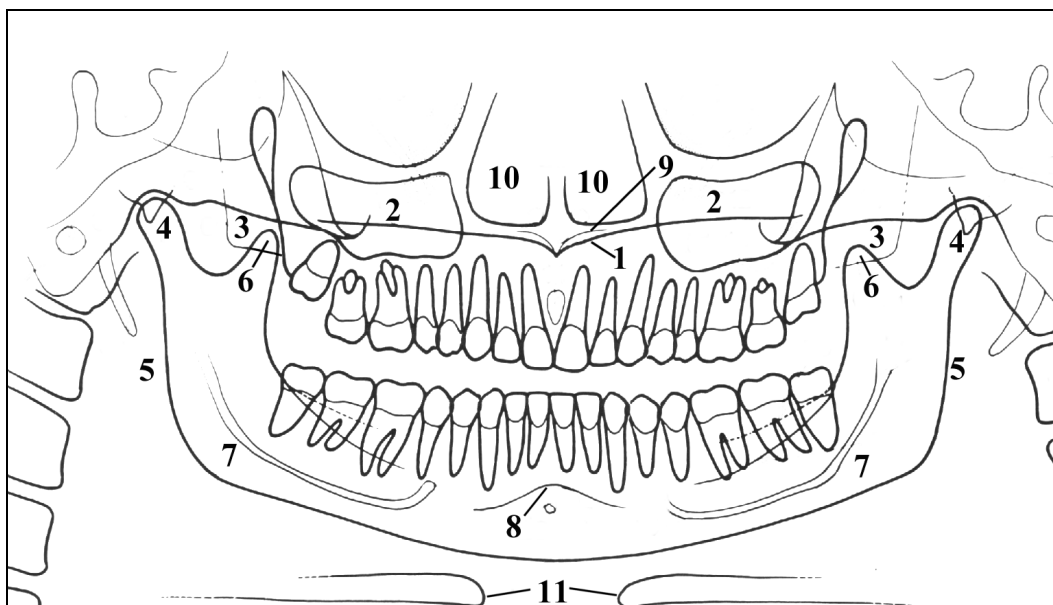


Figure 8-1

**Ref. Anatomic structure**

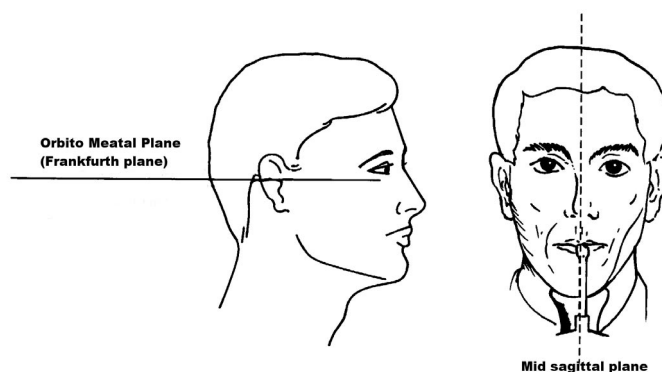
- 1 Hard palatal plane
- 2 Maxillary sinus
- 3 Mandible
- 4 Temporo mandibular condyle
- 5 Ascending ramus of the TMJ
- 6 Coronoid process
- 7 Mandibular canal
- 8 Foramen
- 9 Nasal anterior spine
- 10 Nose
- 11 Ioid bone (normally duplicated)

### **8.5.1. Proper positioning of the patient**

The proper positioning of the patient during the panoramic examination is very important in order to get a good quality radiography. This is due to the fact that the shape of the focussed area, e.g. of the layer clearly shown on the film, tends to follow the dental arch and has a non-constant deepness.

The objects outside this focussed area will therefore appear blurred on the resulting radiography.

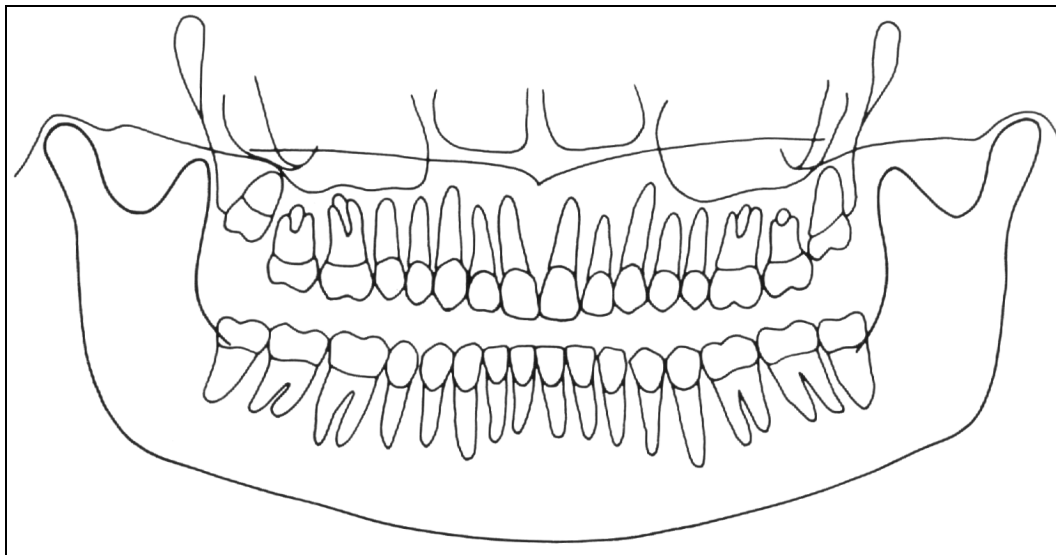
- 1.** The patient should not wear clothes that may interfere with the X-ray beam, also leave more space between the patient's shoulders and the rotating arm of the machine. Care must be taken in order to avoid interference between the X-ray beam and the protective apron worn by the patient.
- 2.** Metal objects (neck chain, ear-ring) must be avoided; these objects not only create radio-opaque images in their own position but also false images projected in other parts of the radiography, so disturbing the correct view of the anatomy.
- 3.** The patient's head must be slightly tilted downward in order to have the Frankfurt plane horizontal. In this way, the hard palatal ceiling will be projected slightly over the superior apex of the anterior teeth. If the patient has a low palatal ceiling, slightly increase the tilting downward.
- 4.** Align the middle sagittal plane with the centre of the chin support, normally indicated by the relevant light beam.
- 5.** Check that the vertical light beam falls on the canine and lies between the third and fourth teeth. This will insure that the apex of the anterior teeth are positioned within the focussed area and therefore will be properly reproduced on the radiography. Normally, the panoramic equipment has a narrower focussed layer in the front area, and therefore a proper positioning of the anterior teeth is of the utmost importance.



*Figure 8-2*

6. The patient must extend the spine; this is normally obtained by asking the patient to step forward, making sure that all other conditions are unchanged. If not properly extended, the spine will cause the appearing of a lower exposed area (clearer) in the front part of the film.
7. The patient's tongue must be positioned against the palate, otherwise the air between the tongue and the palate will create a lower absorbance area which will result on the film as a darker area which in turn will hide the apex of the superior incisor teeth.

The result of all the above listed actions will be a radiography where all the parts are properly exposed and are well identifiable as in the schema of Figure 8-3.



*Figure 8-3*

It must be noted that the radiography is quite symmetrical, with the ascending rami of the temporo mandibular joints almost parallel. The occlusal plane is shown slightly tilted upward, the palatal plane does not overlap the apex of the upper arch and therefore allows a good view of the same.

### 8.5.2. Error due to a bad patient's positioning

- **The film shows the anterior teeth with reduced magnification and not well defined. The cervical spine is showing an evident white shadow.**

In addition, on the molar zone there are too many shadows, disturbing the view.

The resulting image is similar to the schema shown on Figure 8-4.

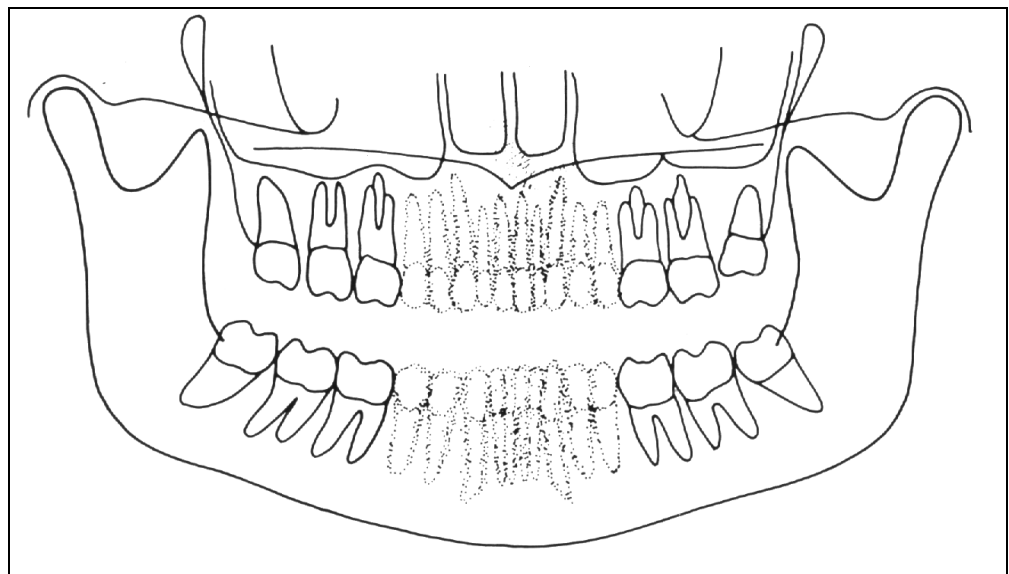


Figure 8-4



#### **Possible cause:**

The patient is positioned too forward, the anterior teeth will result unfocussed and reduced.

#### **Remedy:**

Check the patient positioning.

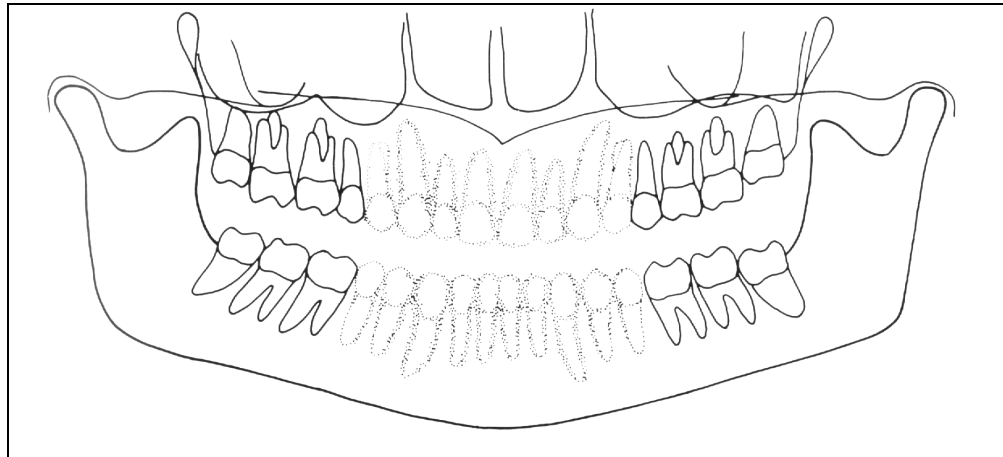
If, after the correct patient's positioning, the problem still remain, check the alignment of rotating arm.

A more accurate check can be performed using the service tool and verifying the distance between the two lateral metal parts.



- **Anterior teeth are enlarged and blurred**

The Figure 8-5 depicts the resulting image.



*Figure 8-5*



**Possible cause:**

In this case the patient is positioned too backward

**Remedy:**

Check the patient positioning.

If, after the correct patient's positioning, the problem still remains, check the alignment of rotating arm.

A more accurate check can be performed using the service tool and verifying the distance between the two lateral metal parts.

- **Part of the image is enlarged while the other one is reduced**

The schema described on Figure 8-6 the image obtained; it is possible to observe that one part of the radiography is blurred and enlarged, while the other one is reduced and seems to be on focus; the two condyles are at the same height on the film.

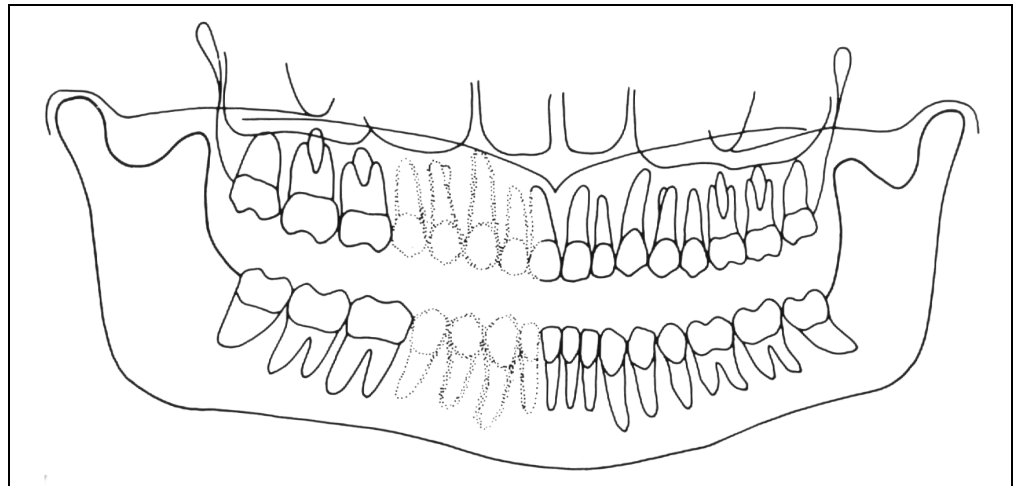
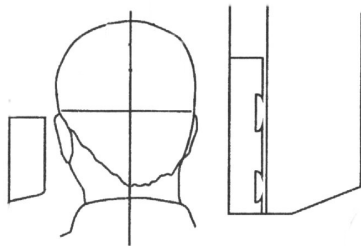


Figure 8-6

**Possible cause:**



This effect can be due to two different causes.

In the first one, the median-sagittal plane is not aligned with the relevant centring light beam, which falls at the centre of the chin support.

In the second case instead, the centre of the median-sagittal plane matched the centre of the chin support, but the patient's head is rotated.

In both cases, one side is closer to the image plane than the other, thus resulting in a different magnification of the two sides; the part more distant from the sensor will be more magnified while the part closer to the image plane will result smaller. This error in positioning the patient will result in a radiography as shown in picture above: the right-most area of the image shows a bigger magnification that can be noticed either on the teeth and on the ascending rami of the TMJ.

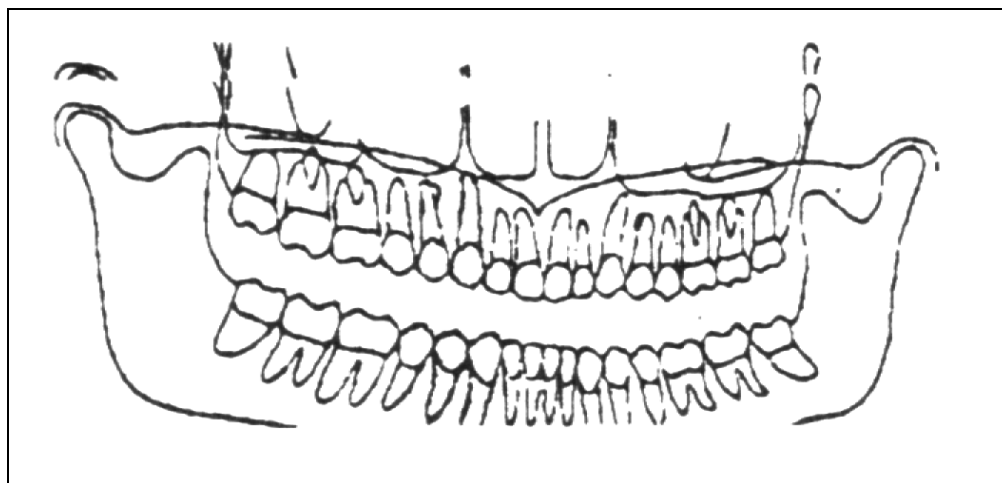
**Remedy:**

Check the positioning of the median-sagittal plane by using the relevant centring light beam.

A more accurate check is performed using the special tool and making an image; the dimensions measured on the obtained image must match those reported in the paragraph 7.1.1.

- **The image shows the TMJ at different height**

This fact is described in Figure 8-7.



*Figure 8-7*

**Possible cause:**

**The mid sagittal plane is not vertical.** This can be a patient's problem, but if the defect is always present, check the laser beam.

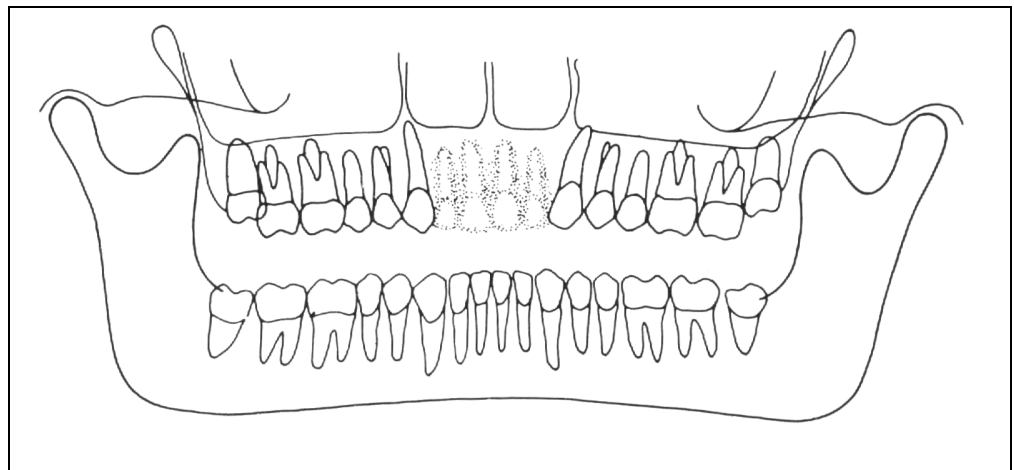
**Remedy:**

Verify that the laser beam is vertical; this check can be performed very quickly using the laser beam and verifying that falls on the center of the chin support; remove the chin support itself and check that the beam falls on the center of the holes used to fix the chin itself.

If not, a possible cause can be due to a non perfect horizontality of the chin arm that must be adjusted using the relevant screws.

- **The image shows undulated teeth rows**

As can be seen on Figure 8-8, the upper teeth are magnified and unfocused, with the shadow of the hard palate positioned over the superior apex. The temporomandibular joints are exposed outward, with lines divergent upward. In some cases, the condyle vertex might not appear on the image.

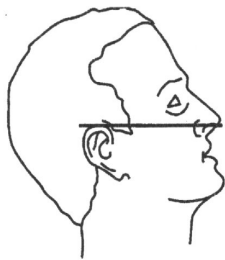


*Figure 8-8*

**Possible cause:**

Patient's head tilted upward.

A Frankfurt plane too tilted upward produces different anomalies that may also appear contemporaneously. A chin support plane too high during the patient positioning or when extending the spine may generate this mistake. In this condition, the rear side of the patient's head may also interfere with the rotating arm of the panoramic equipment.



- **The radiographic image shows the teeth row too curved upward with the lower incisor non-focused**

Additional defects shown on Figure 8-9, the temporo-mandibular joints will be positioned too high with lines converging upward. In some cases the upper condyle might not be visible in the image.

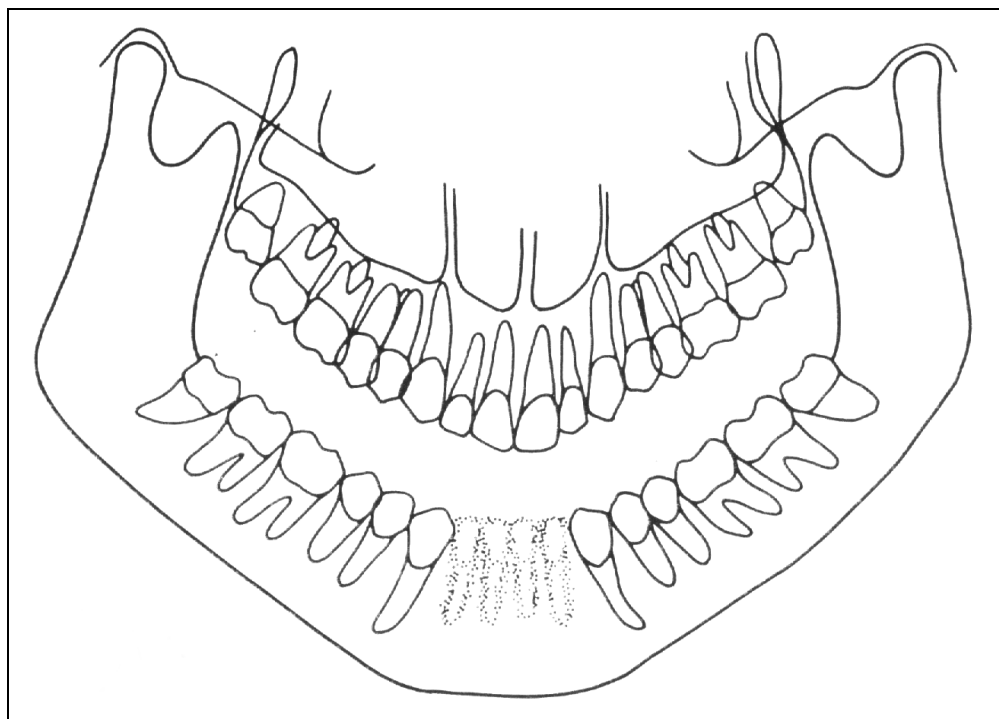


Figure 8-9

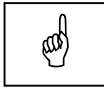


**Possible cause:**

**Patient's head tilted downward**, as on the aside schema.

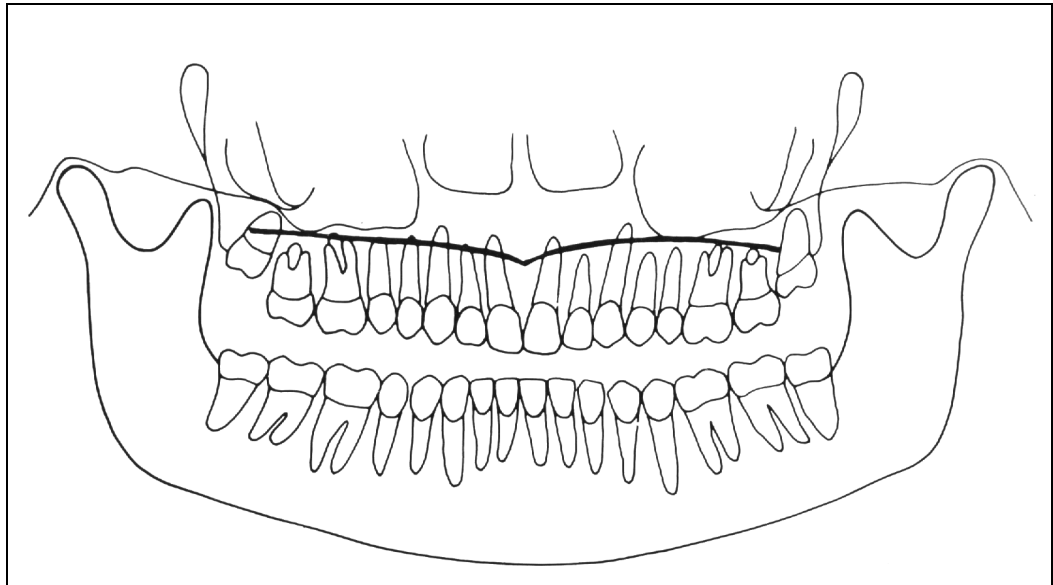
**Remedy:**

Check the positioning of the patient by aligning it with the help of the corresponding light beam.



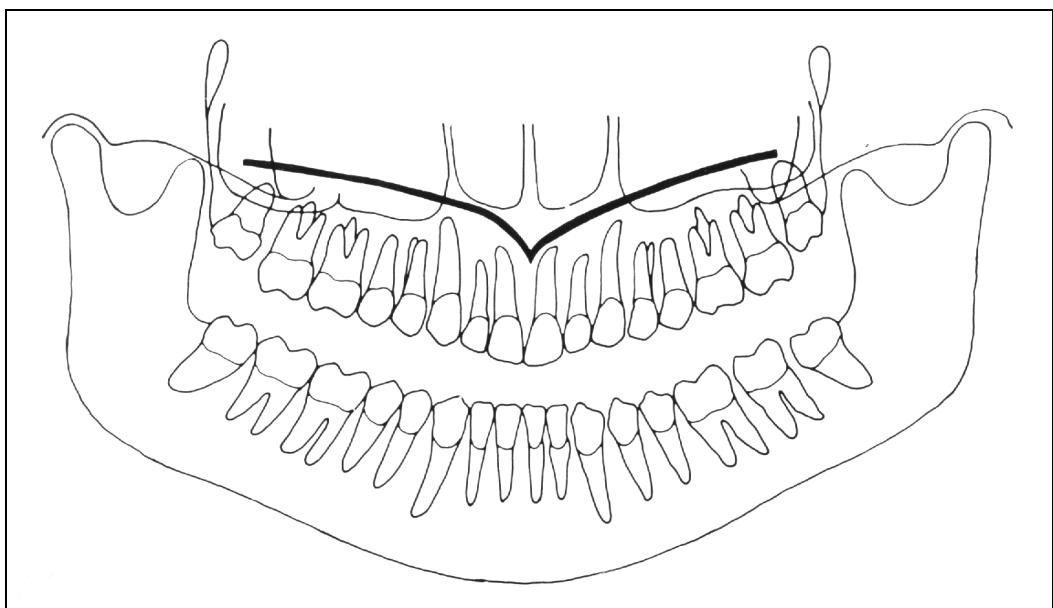
**NOTE:**

In some cases the positioning of the Frankfurt plane too tilted downward produces a correct image of the lower incisors, but the projection of the palate falls on the upper teeth apex, as shown on Figure 8-10.



*Figure 8-10*

In this case, a light tilting downward of the Frankfurt plane causes the palate to be projected over and far enough from the roots of the teeth of the maxillary arch, without distortion of the incisor teeth, as on Figure 8-11.



*Figure 8-11*

### 8.5.3. Images with artefacts

- **Radiographs that show images with soft tissues or artefacts**

The radiographs may show anatomical parts of the soft tissues or show radiographic artefacts.

Normally the soft tissues might be more or less present depending on the patient positioning, while the presence of artefacts is strictly dependent on the presence of foreign objects on the trajectory of the X-ray beam.

Next figure shows these cases; please consider that all structures have a bilateral duplicate.

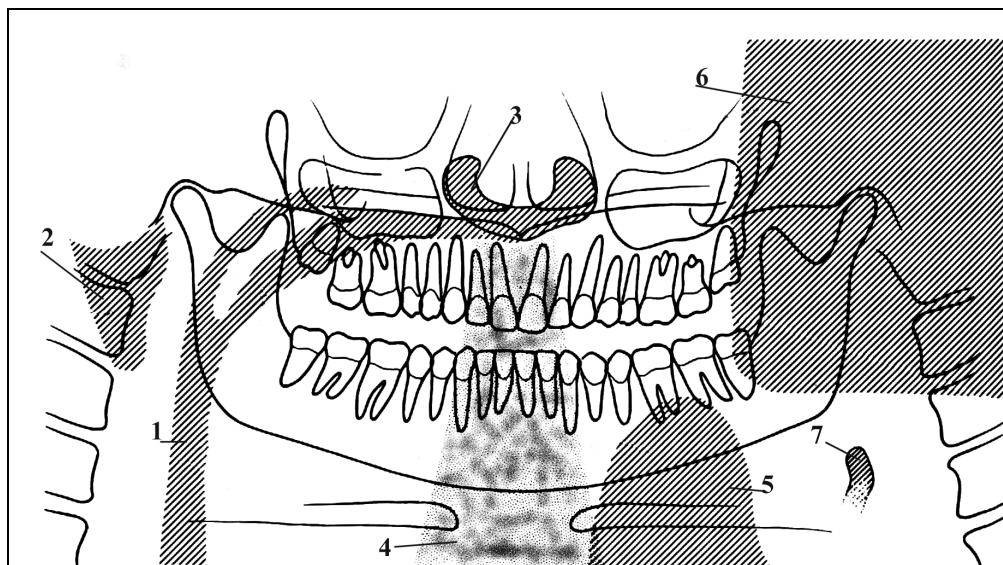


Figure 8-12

Where different references are described among with the cause/remedy, if any.

Soft tissue	Description	Artifacts	Description
2	Ear soft tissue	1	Dark shadows due to the air gap between tongue and palate
3	Nose soft tissue	4	Spine column
7	Epiglottis	5	Leaded apron too high

The part identified with "6" in Figure 8-12 represents the image of the controlateral mandible (the other side of the mandible). That therefore results as a clearer area overlapped to the real image. Very often the resulting darker area in the bottom corner is noticed and is considered as an artefact of the radiological image.

**This is not true, because it is derived from the projection geometry used to obtain the panoramic image. The effect can be more evident if the film is underexposed due to wrong radiological parameters.**

With reference to the previous Figure 8-12, let's analyse the cause and remedy.

- **Wrong positioning of the spine**

In the case the image shows a too clear and unfocussed area in the central portion (see point "4" - Figure 8-12), this is probably caused by the wrong position of the spine that has not been properly extended by the patient. In this case, the spine absorbs a too big quantity of radiation that therefore causes the image to be too clear. This lightness can be noticed especially in the lower part of the film, while it's normally less visible on the upper part of the film.

**Remedy:**

Ask the patient to step forward thus extending the spine, in order to reduce X-ray absorption.

- **Shadows or bright artefacts**

The most common cause for the presence of these artefacts is the presence of metal objects worn by the patient (ear-rings, necklace). The necklace worn on the neck of the patient can normally result in a radio-opaque arch positioned in the chin area. This arch normally overlaps the chin itself and the shadow of the spine, disturbing the diagnosis of possible problems in the chin area and in the area of the superior apex.

The ear-rings instead create real images in the proper position and shadow images projected in the contro-lateral area, thus hiding possible problems or generating bright areas within the paranasal sinuses.

In some cases, that may depend either on the trajectory of the panoramic machine or on the position of the metal objects, they can generate up to three images (one real and two shadows), thus further disturbing the correct diagnosis.

This situation may occur especially if the patient has large prosthesis or metal cures and if it is associated to a positioning error that projects the shadow of the metal part on a wide area of the image.



- **Non-exposed area in the lower-central part of the image**

If the problem appears as shown in point "5" of the previous Figure 8-12, it indicates that there has been interference between the leaded apron worn by the patient and the X-ray beam.

**Remedy:**

Properly position the leaded apron (it must be worn well tight to the shoulder and neck of the patient) then carry out a new examination.

- **The teeth rows are overexposed**

As already described, if the tongue is not positioned against the palate during the exposure, it will create an air chamber between the tongue and the palate; this air gap creates a less absorbing area that overlaps the teeth, often in the apex area. This area is identified with reference "1" in Figure 8-12.

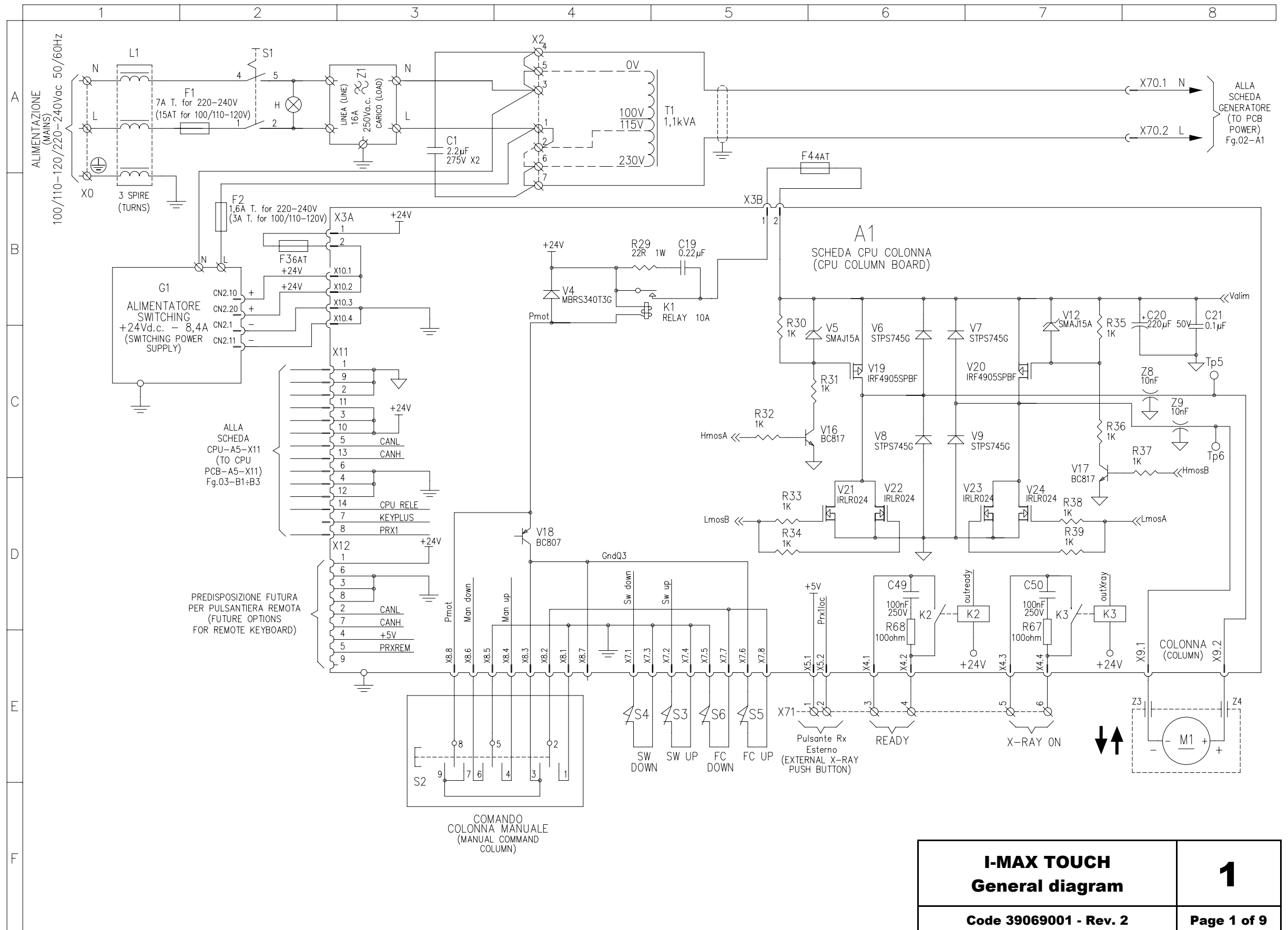
**Remedy:**

Ask the patient to position the tongue against the palate during the exposure.

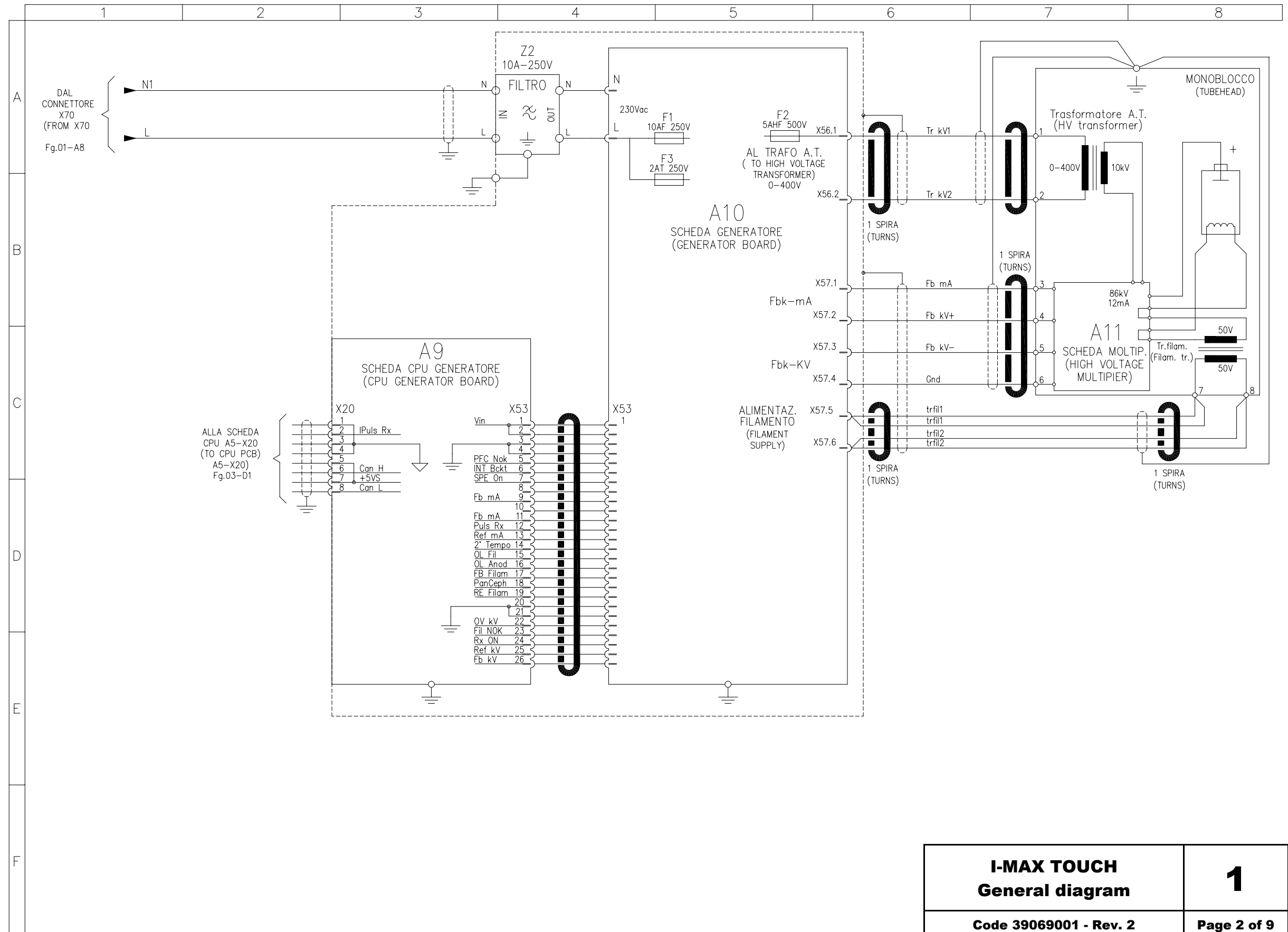
## **9. SCHEMATICS AND DRAWINGS**

1. General diagram
2. Lay-out Column CPU PCB A1
3. Circuit diagram Column CPU PCB A1
4. Lay-out CPU PCB A5
5. Circuit diagram CPU PCB A5
6. Lay-out Microprocessor PCB A6
7. Circuit diagram Microprocessor PCB A6
8. Lay-out and Circuit diagram Rotation Group PCB A7
9. Lay-out Generator CPU PCB A9
10. Circuit diagram Generator CPU PCB A9
11. Lay-out Generator PCB A10
12. Circuit diagram Generator PCB A10
13. Lay-out and Circuit diagram CEPH arm connection PCB A12

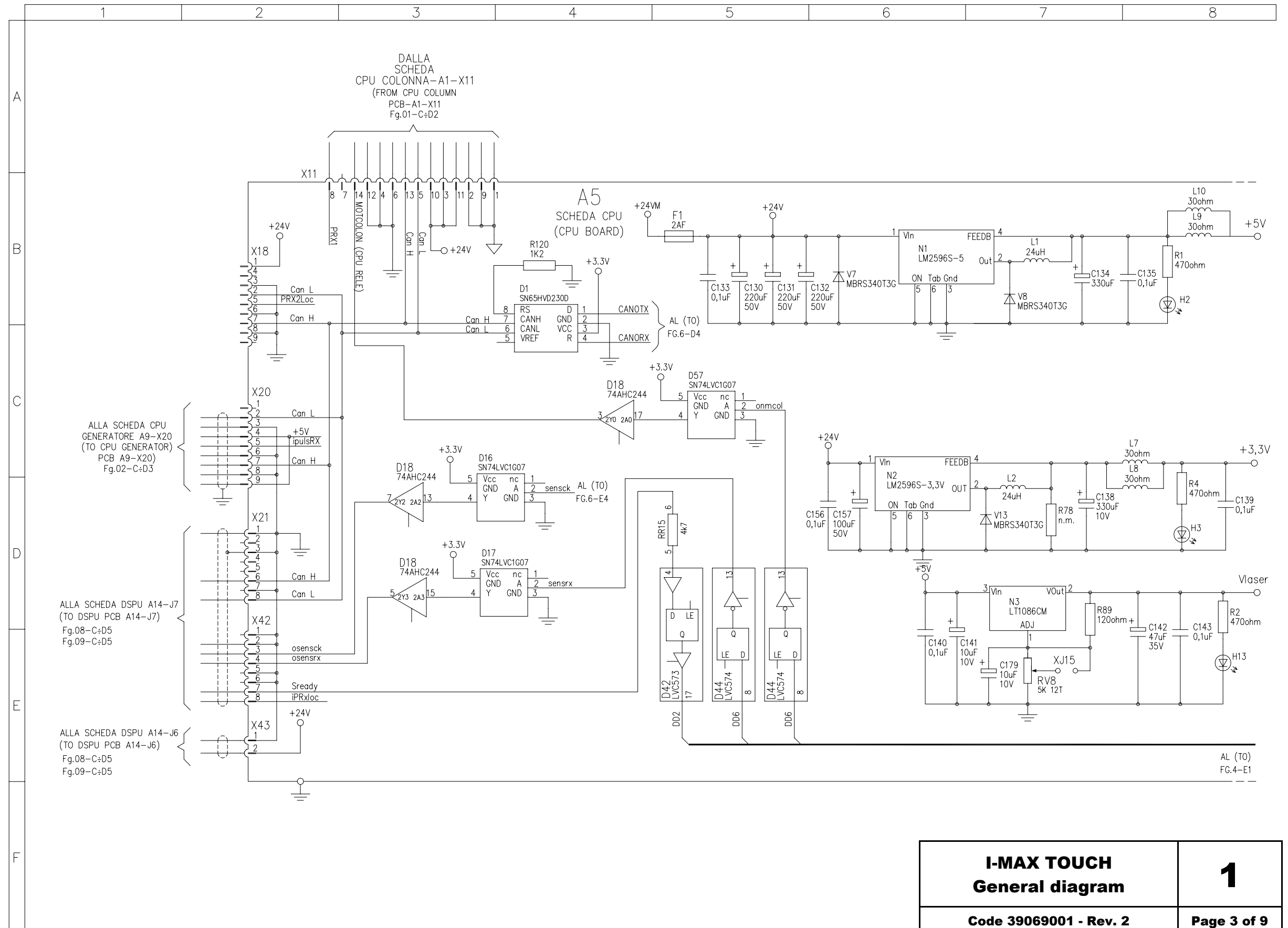
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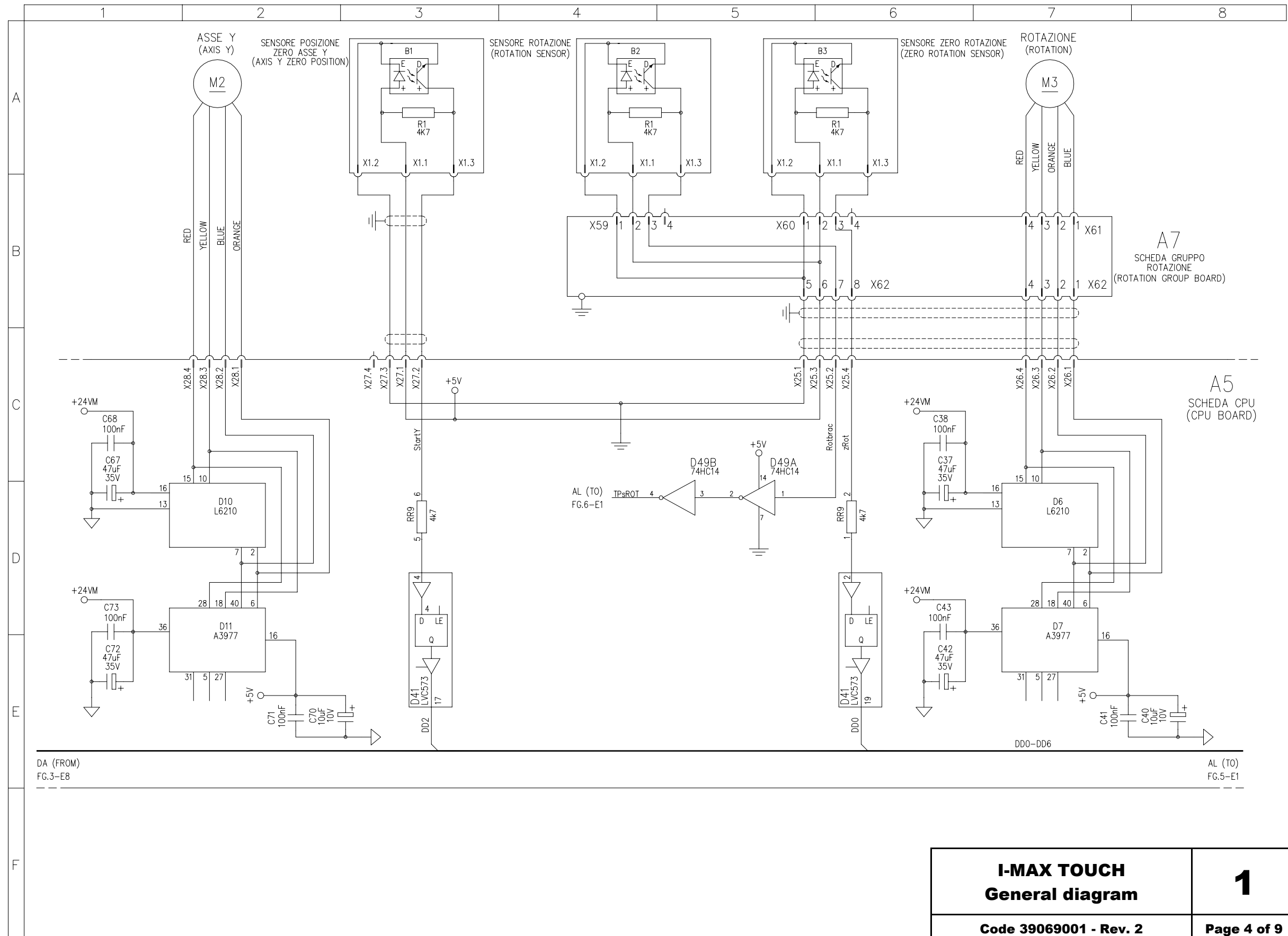
<b>I-MAX TOUCH</b> <b>General diagram</b>	<b>1</b>
<b>Code 39069001 - Rev. 2</b>	<b>Page 1 of 9</b>



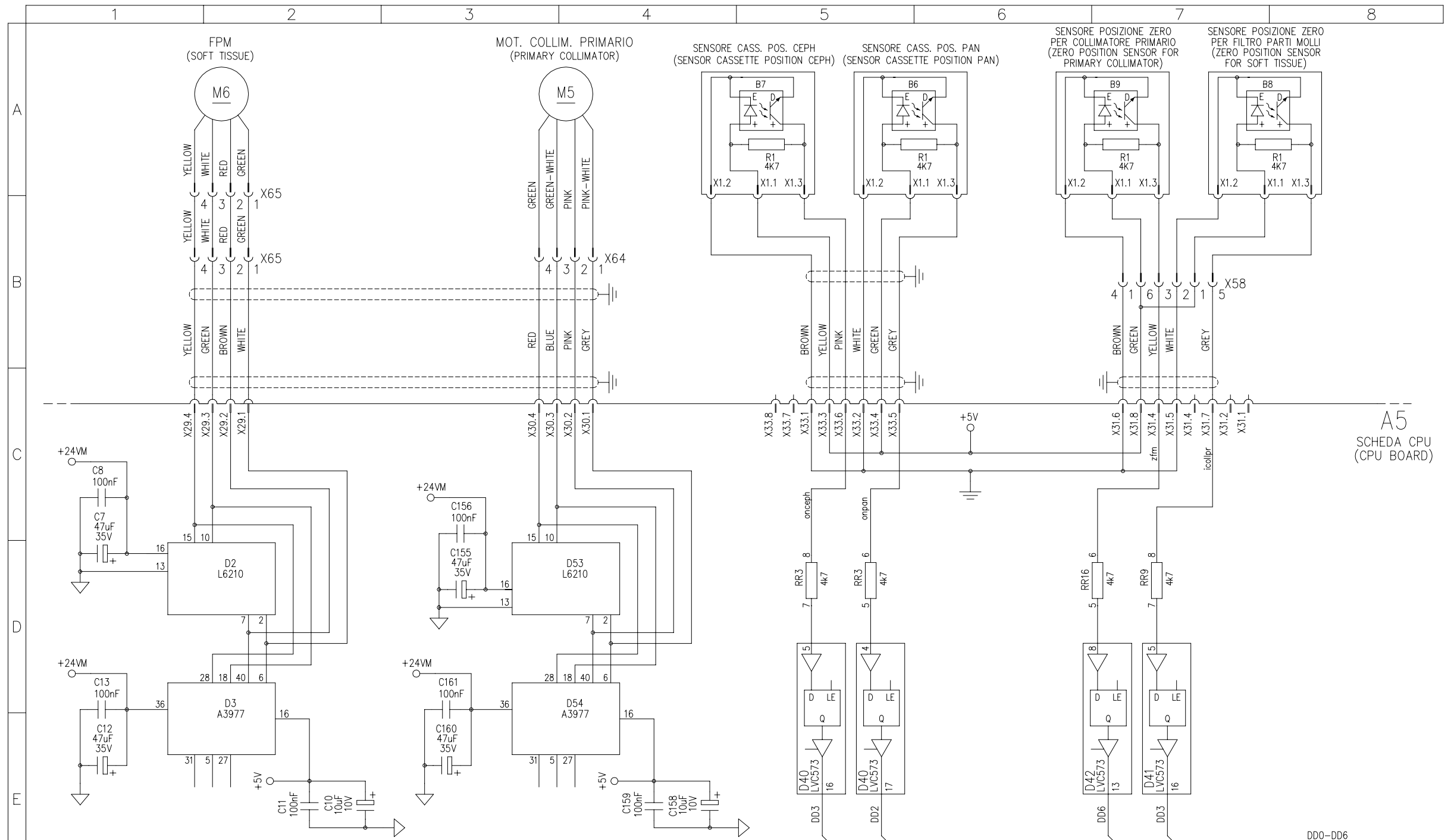
<b>I-MAX TOUCH</b> <b>General diagram</b>	<b>1</b>
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<b>I-MAX TOUCH</b> <b>General diagram</b>	<b>1</b>
<b>Code 39069001 - Rev. 2</b>	<b>Page 4 of 9</b>

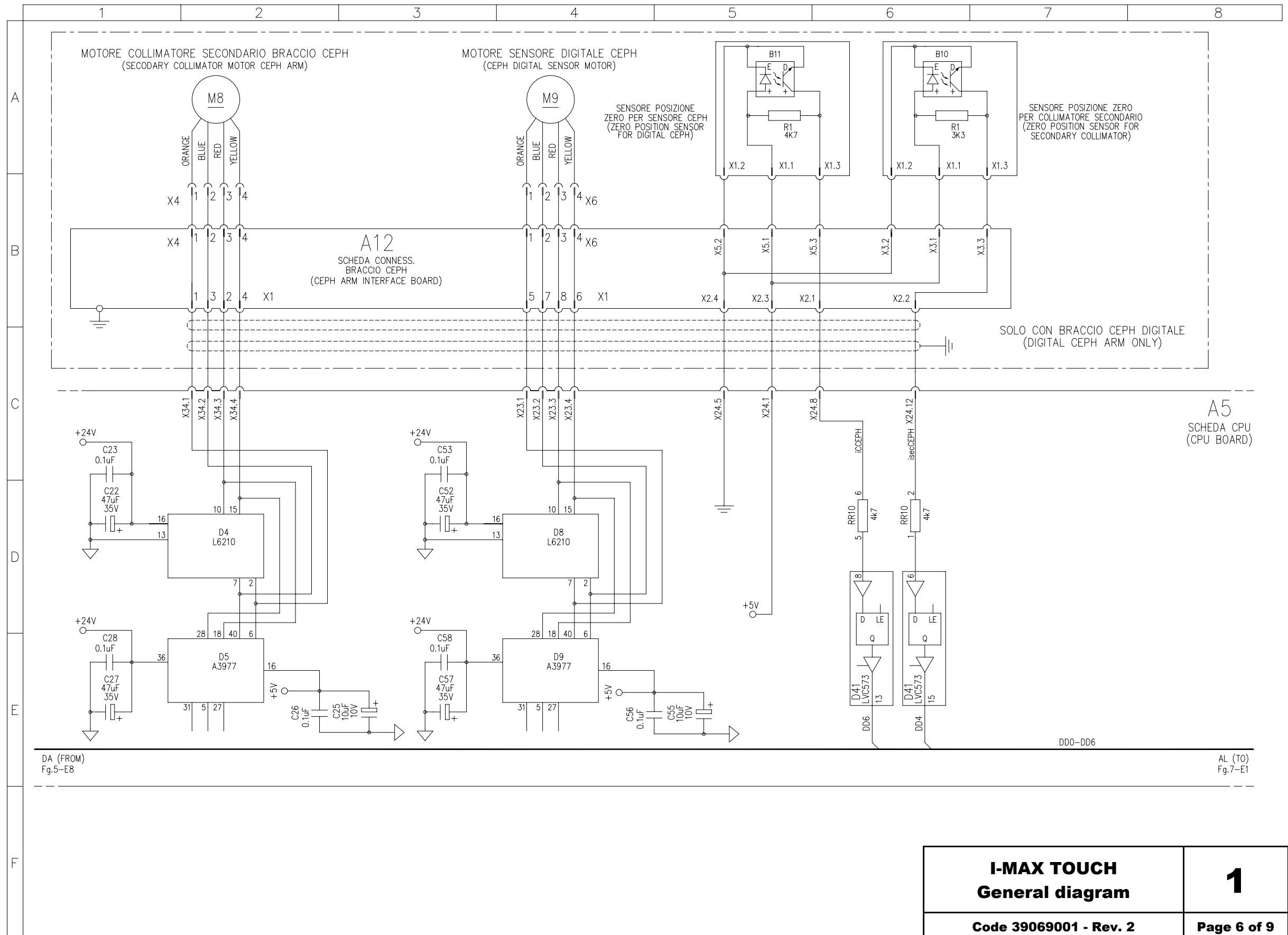


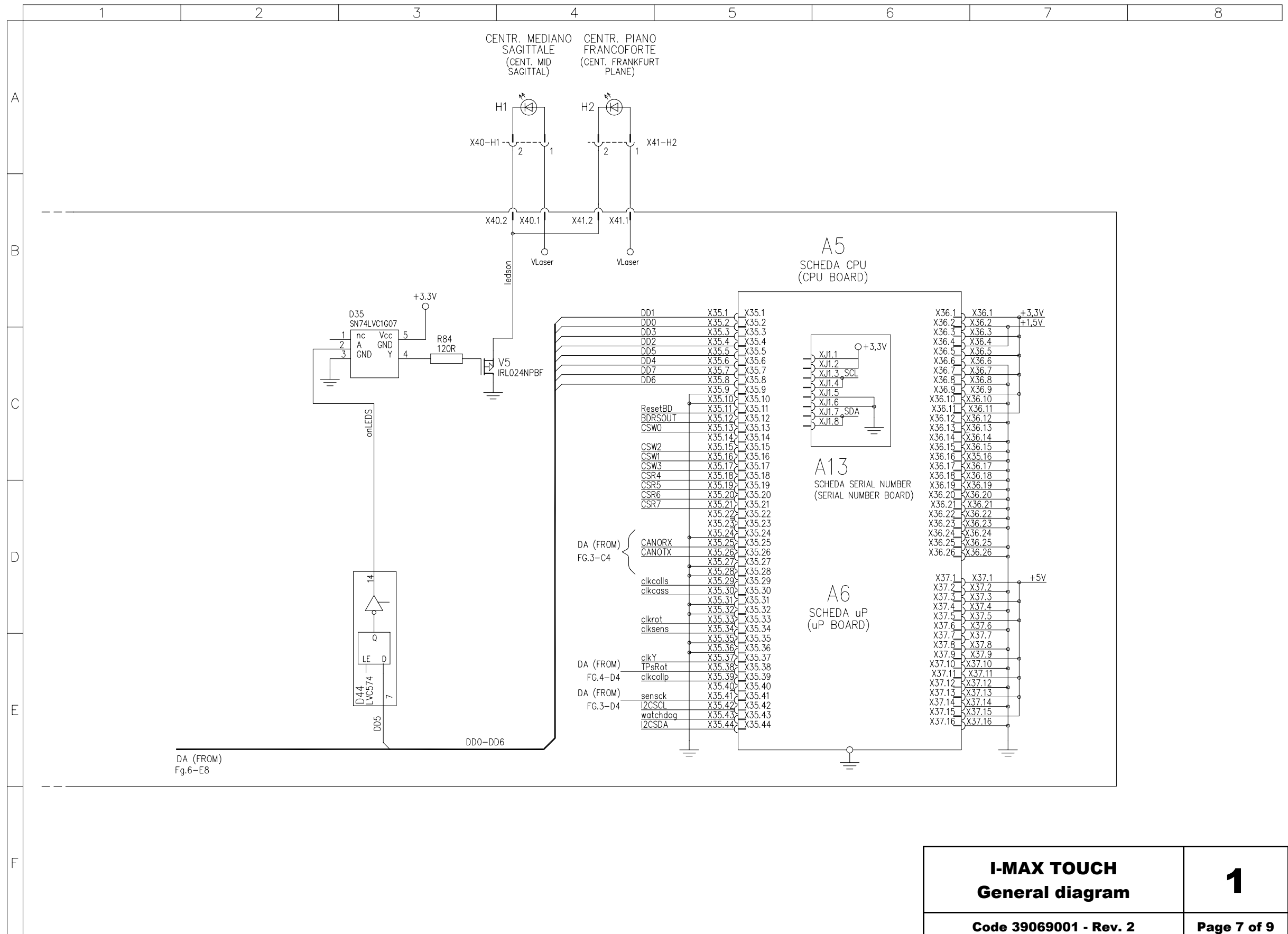
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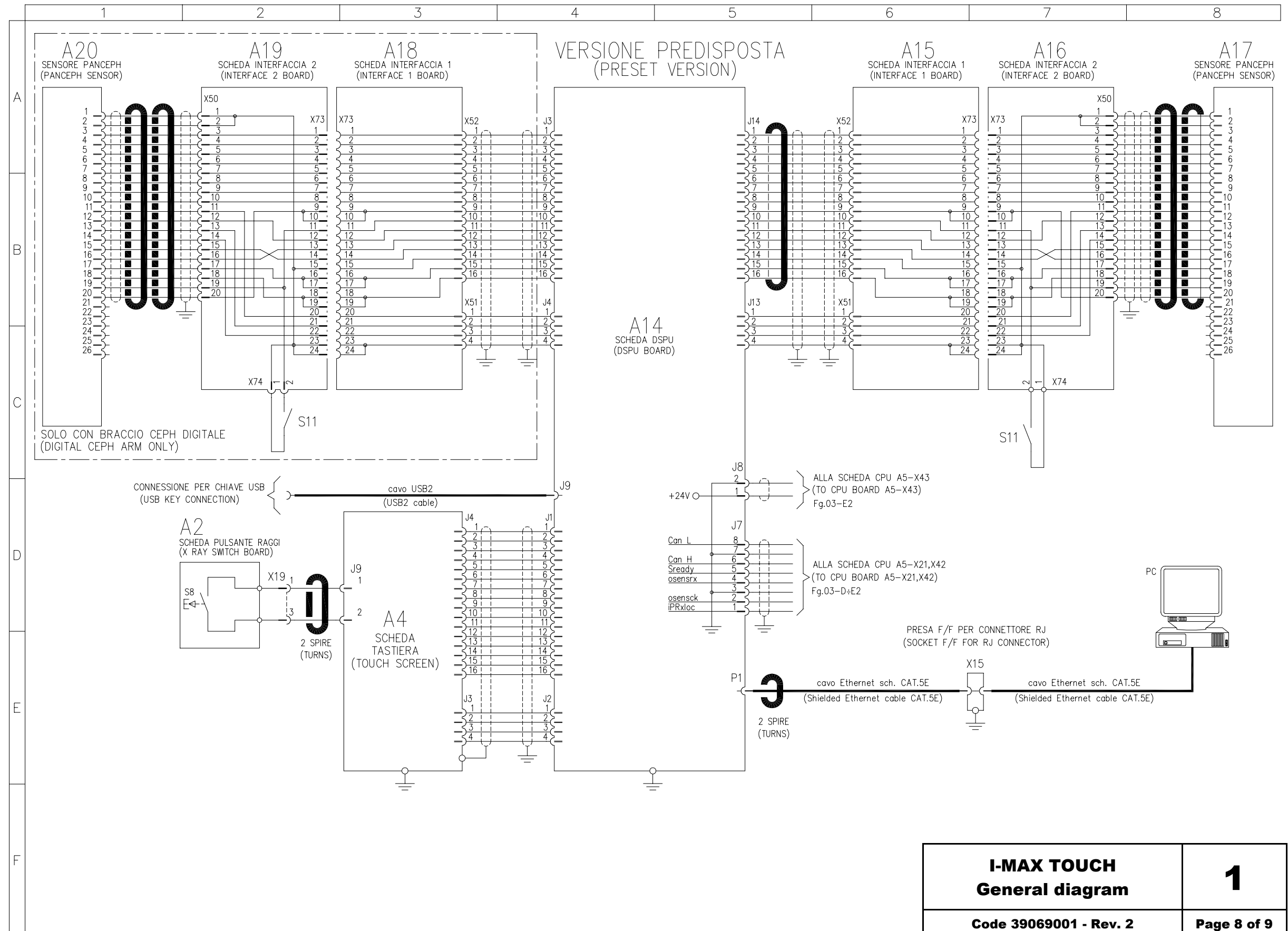
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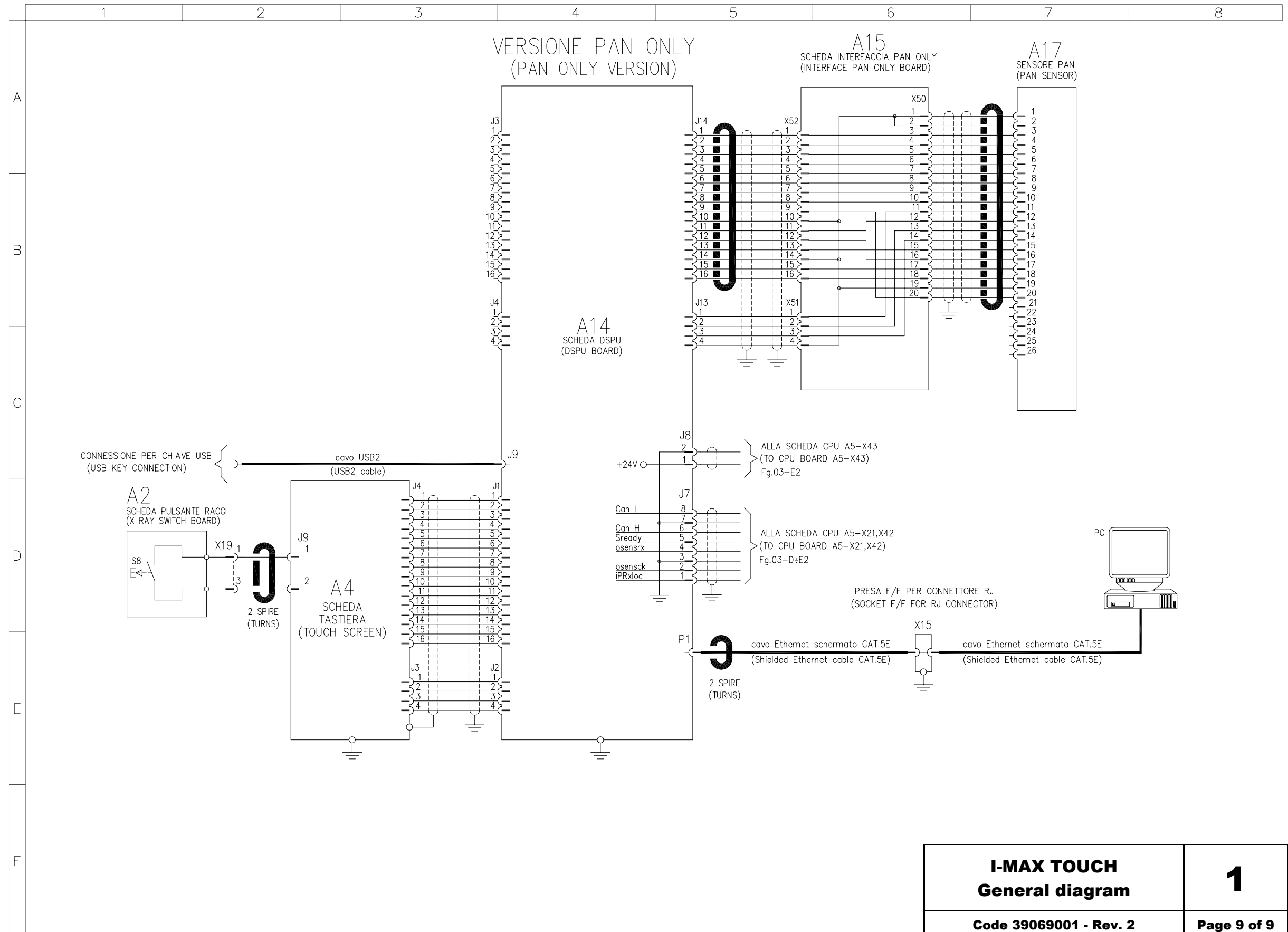
<b>I-MAX TOUCH</b> <b>General diagram</b>	<b>1</b>
Code 39069001 - Rev. 2	Page 5 of 9



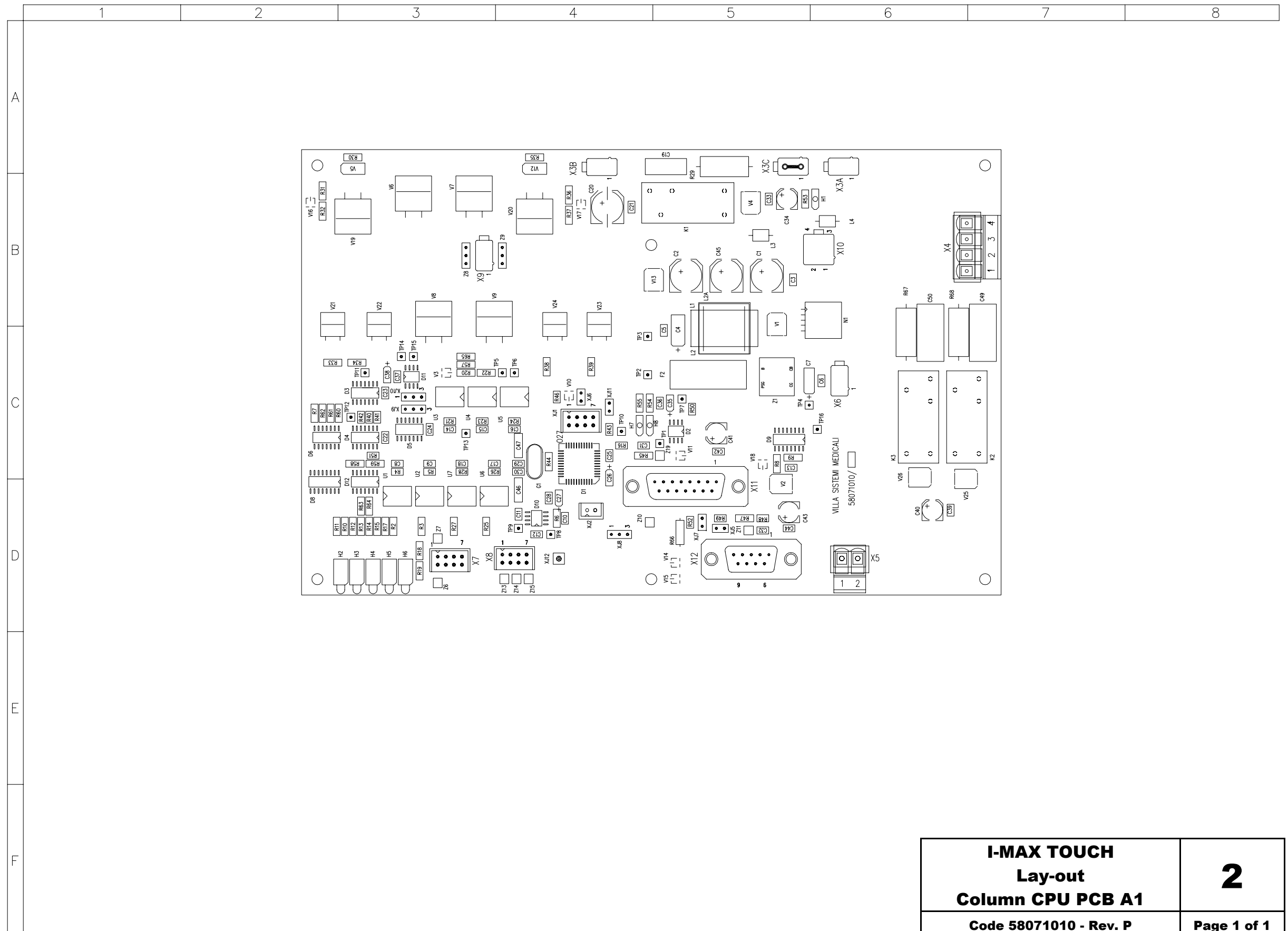


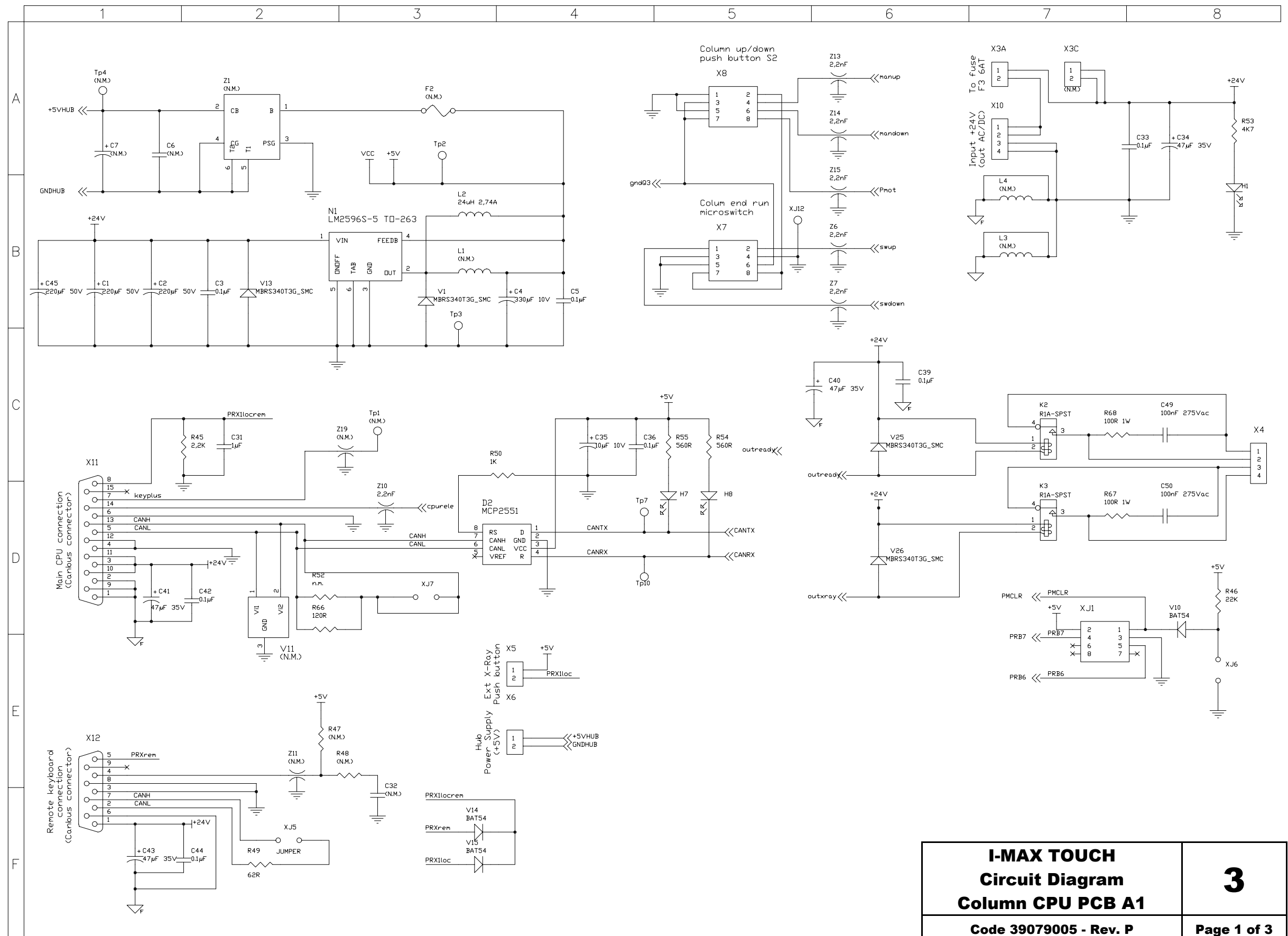




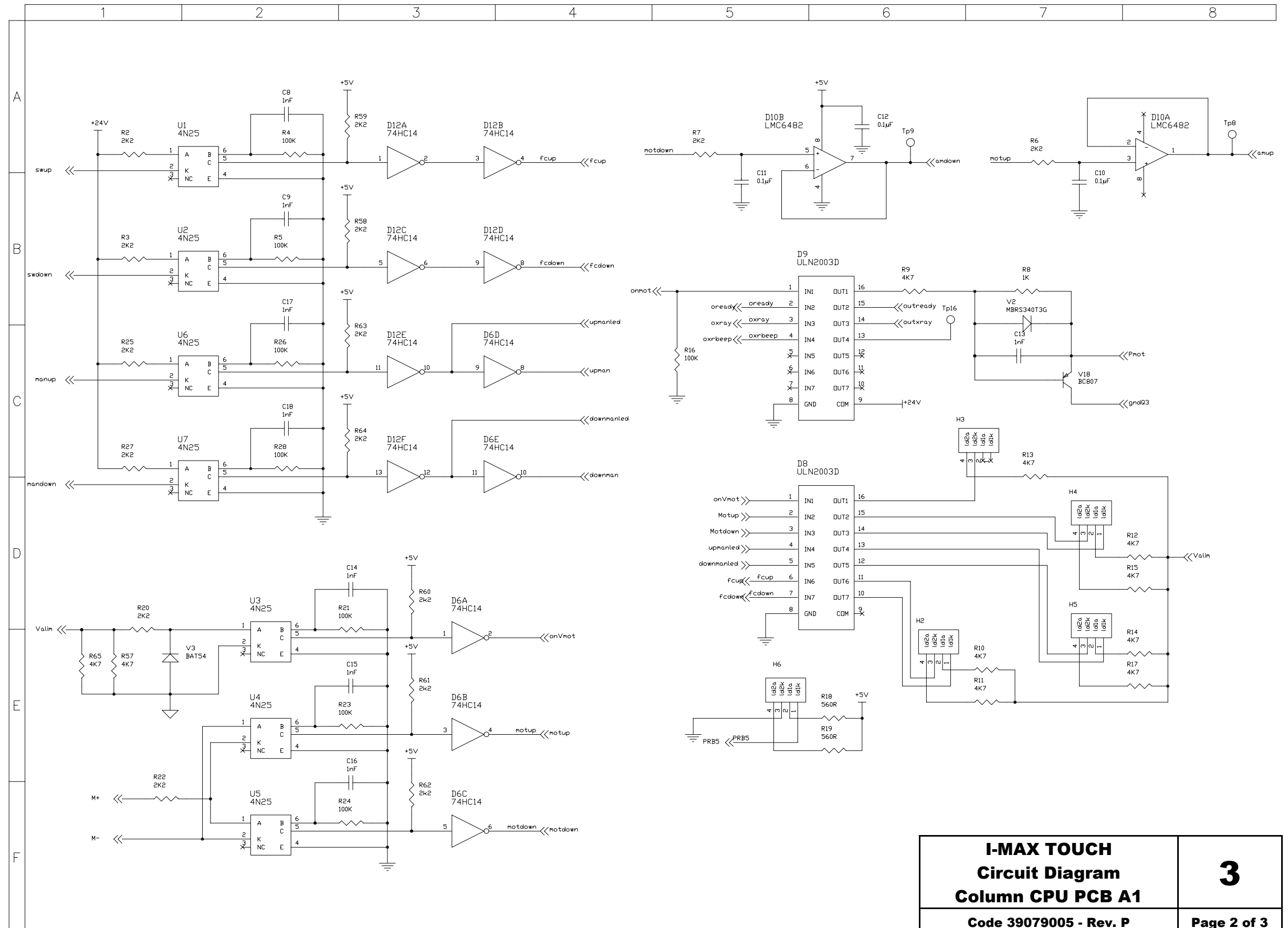


<b>I-MAX TOUCH</b> <b>General diagram</b>	<b>1</b>
<b>Code 39069001 - Rev. 2</b>	<b>Page 9 of 9</b>

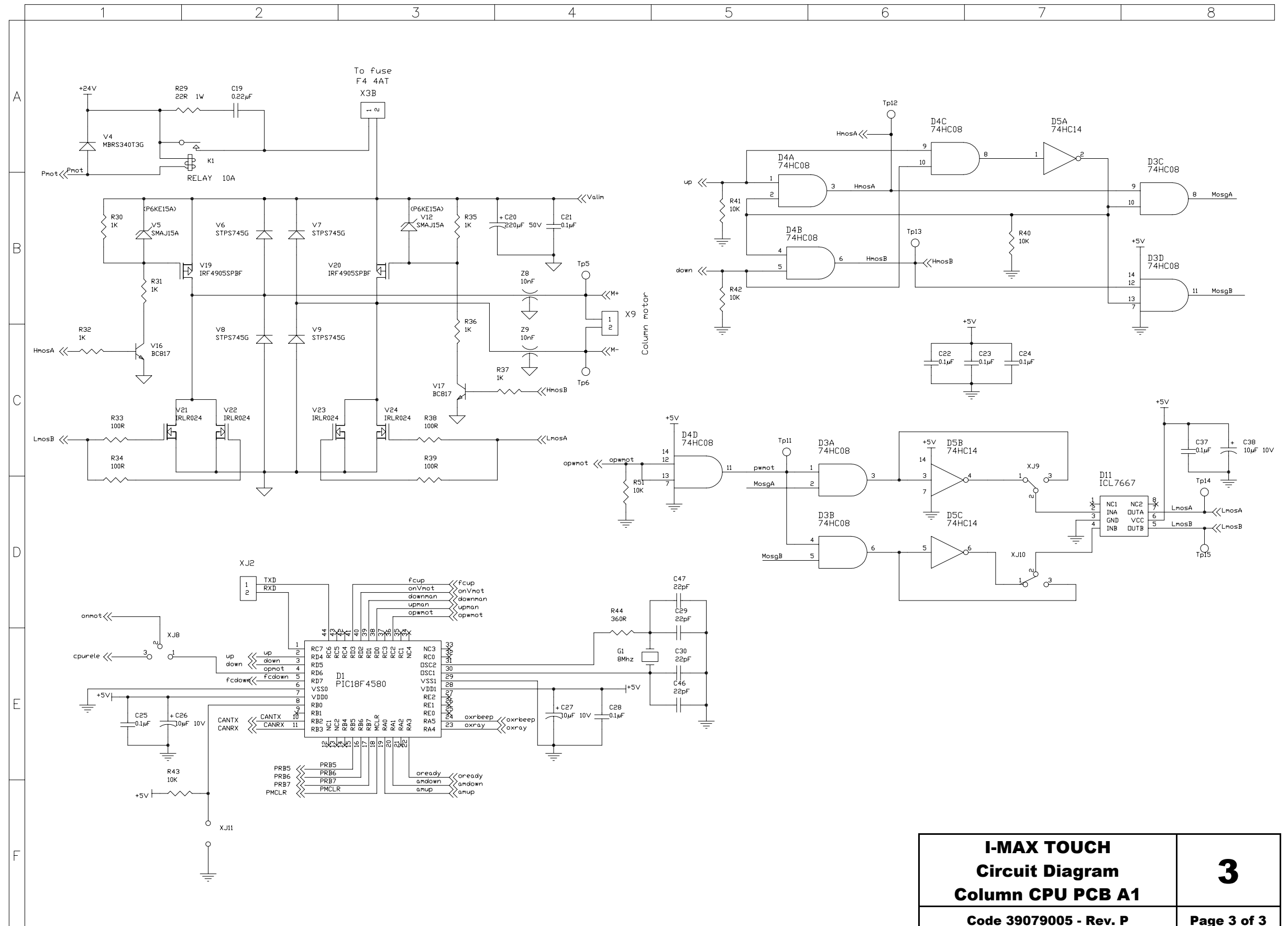




<b>I-MAX TOUCH Circuit Diagram Column CPU PCB A1</b>	<b>3</b>
Code 39079005 - Rev. P	Page 1 of 3

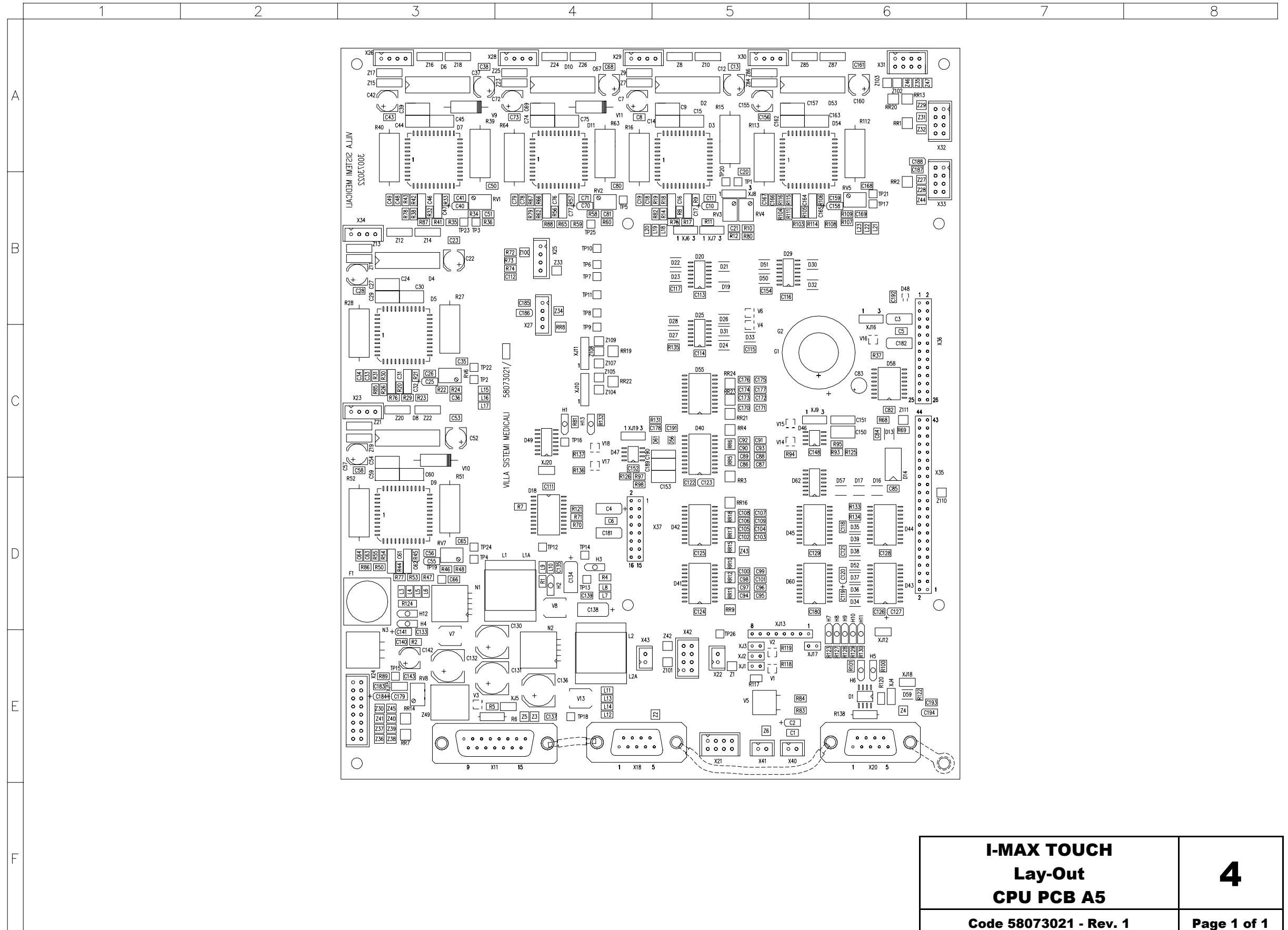


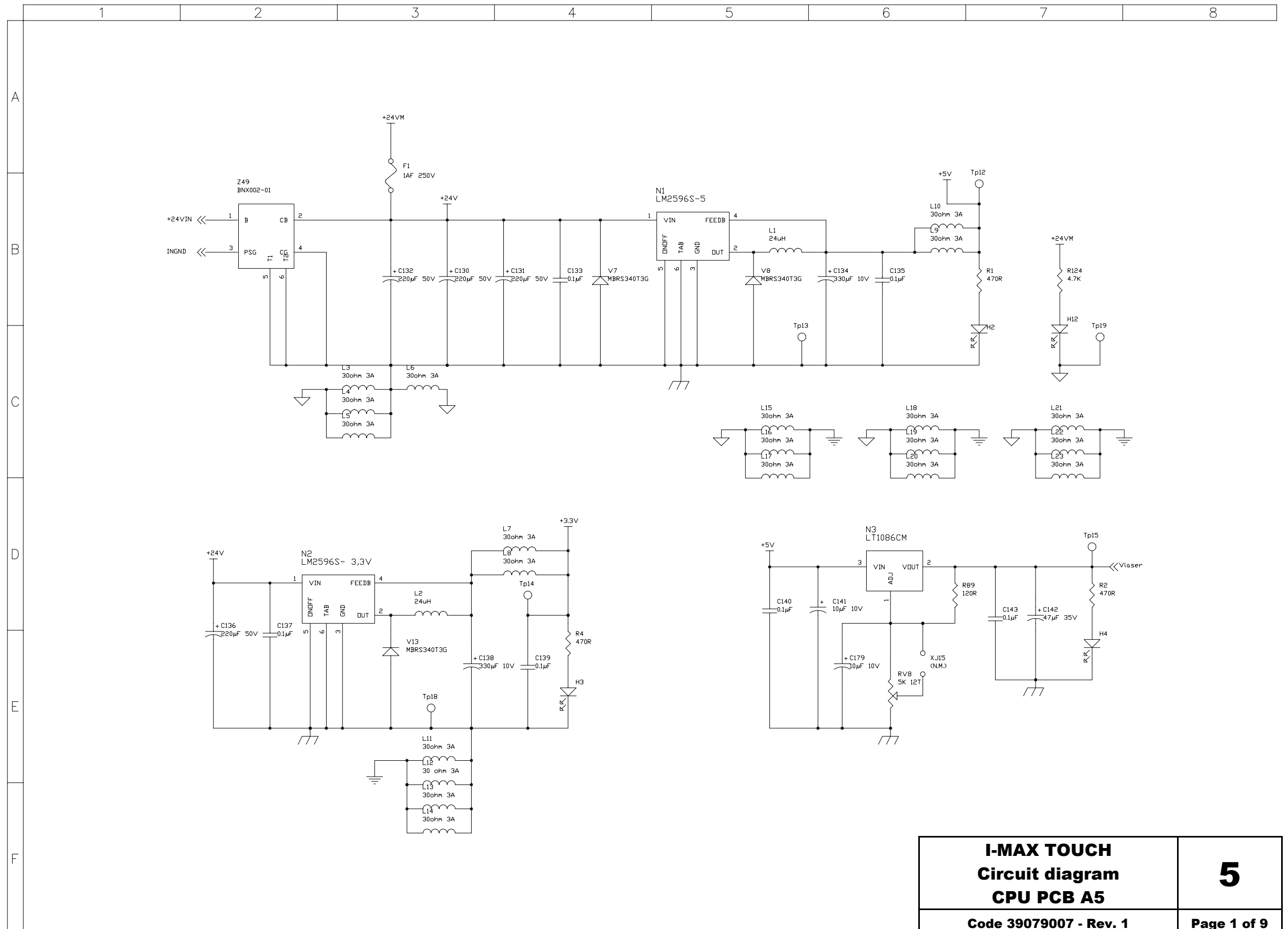
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Code 39079005 - Rev. P	Page 2 of 3



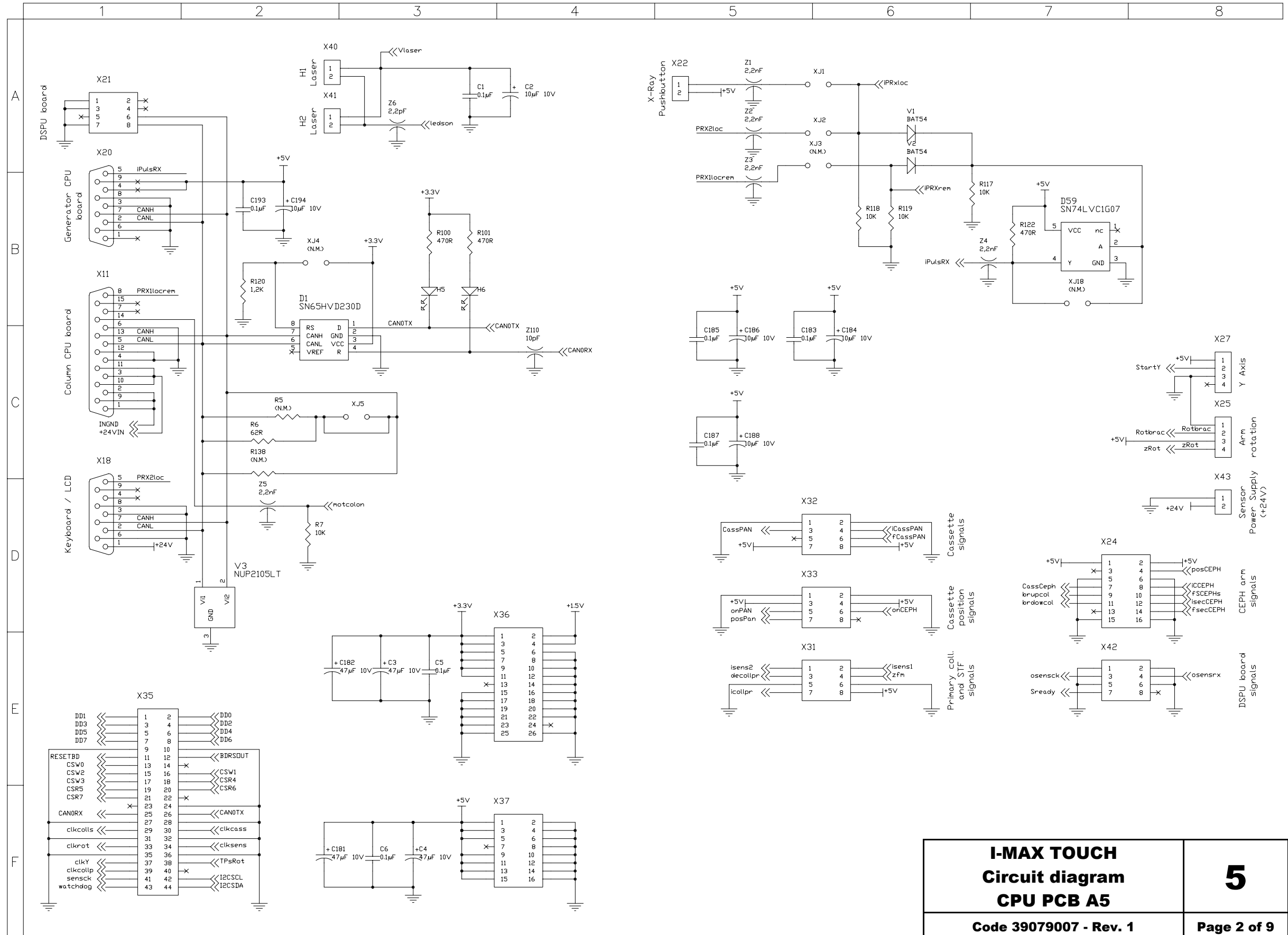
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Code 39079005 - Rev. P	Page 3 of 3

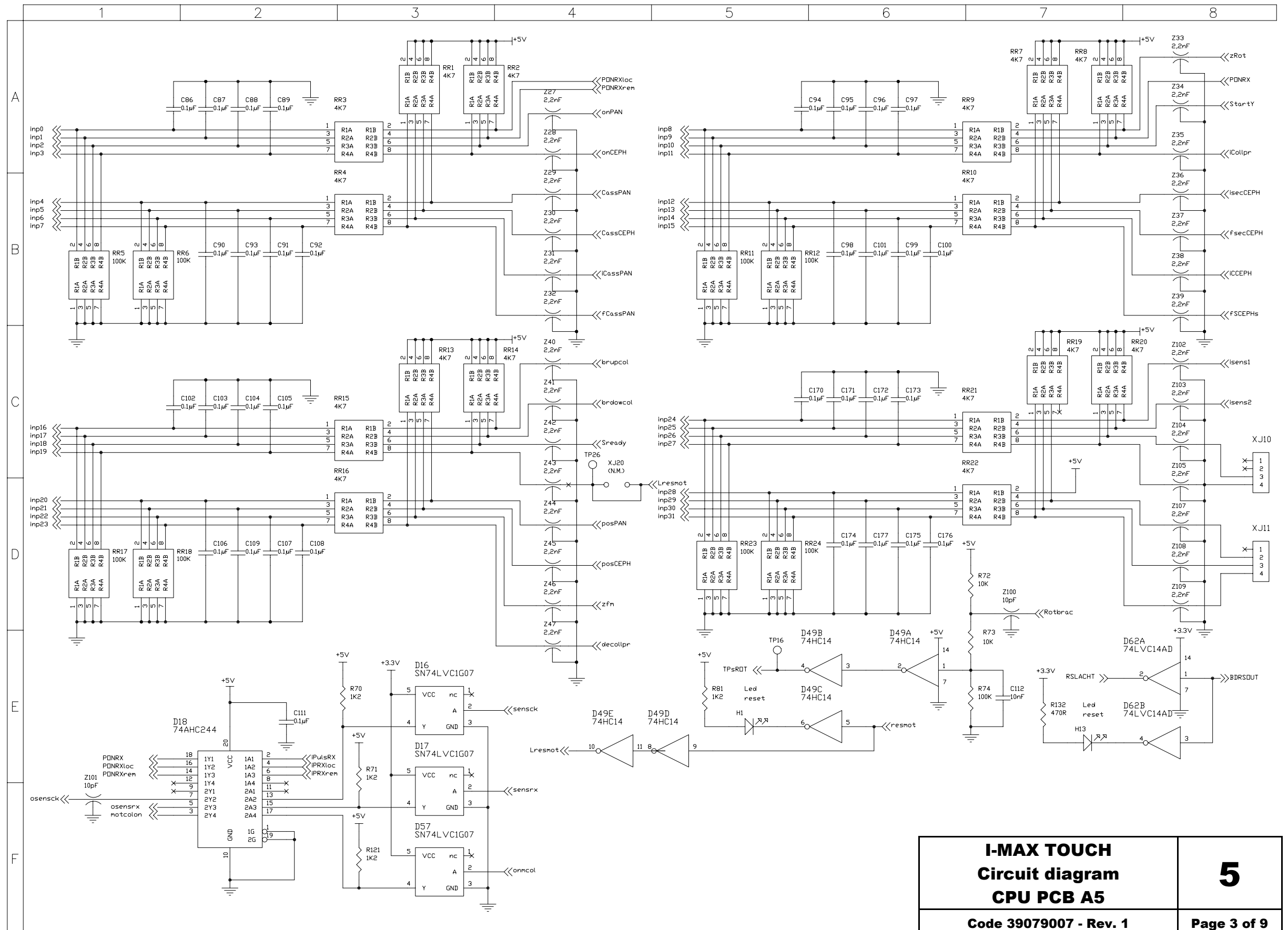




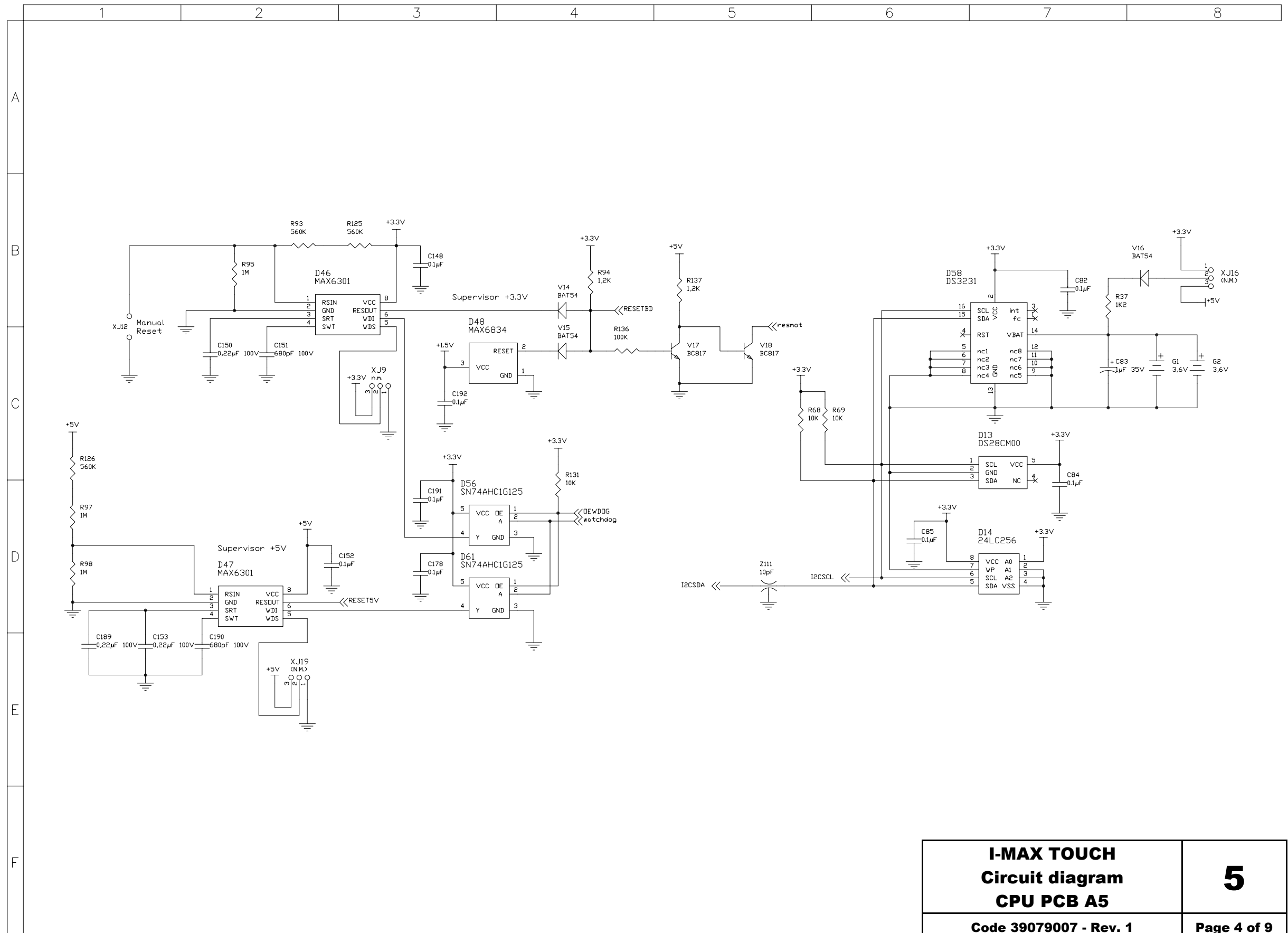


<b>I-MAX TOUCH Circuit diagram CPU PCB A5</b>	<b>5</b>
Code 39079007 - Rev. 1	Page 1 of 9

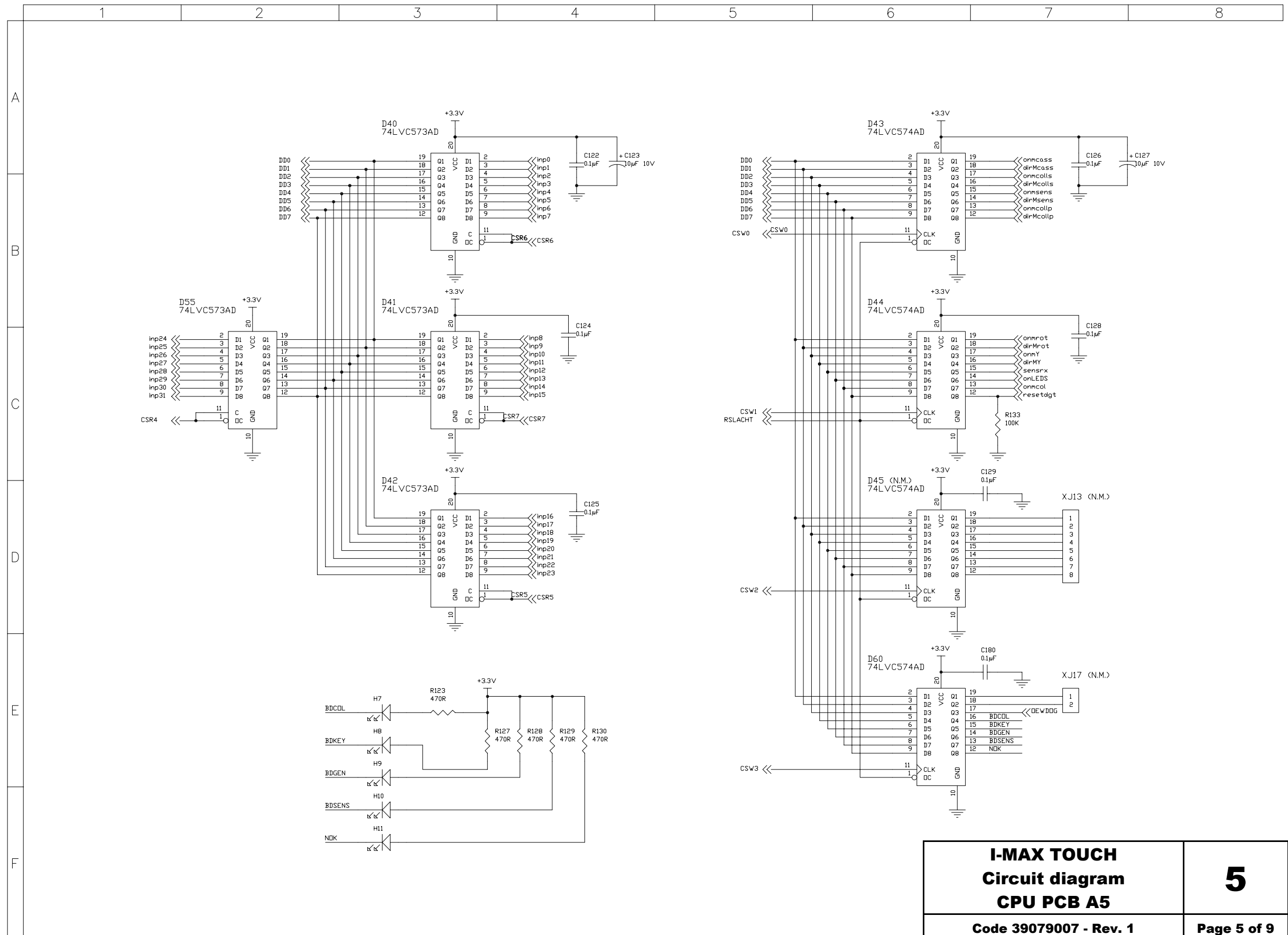




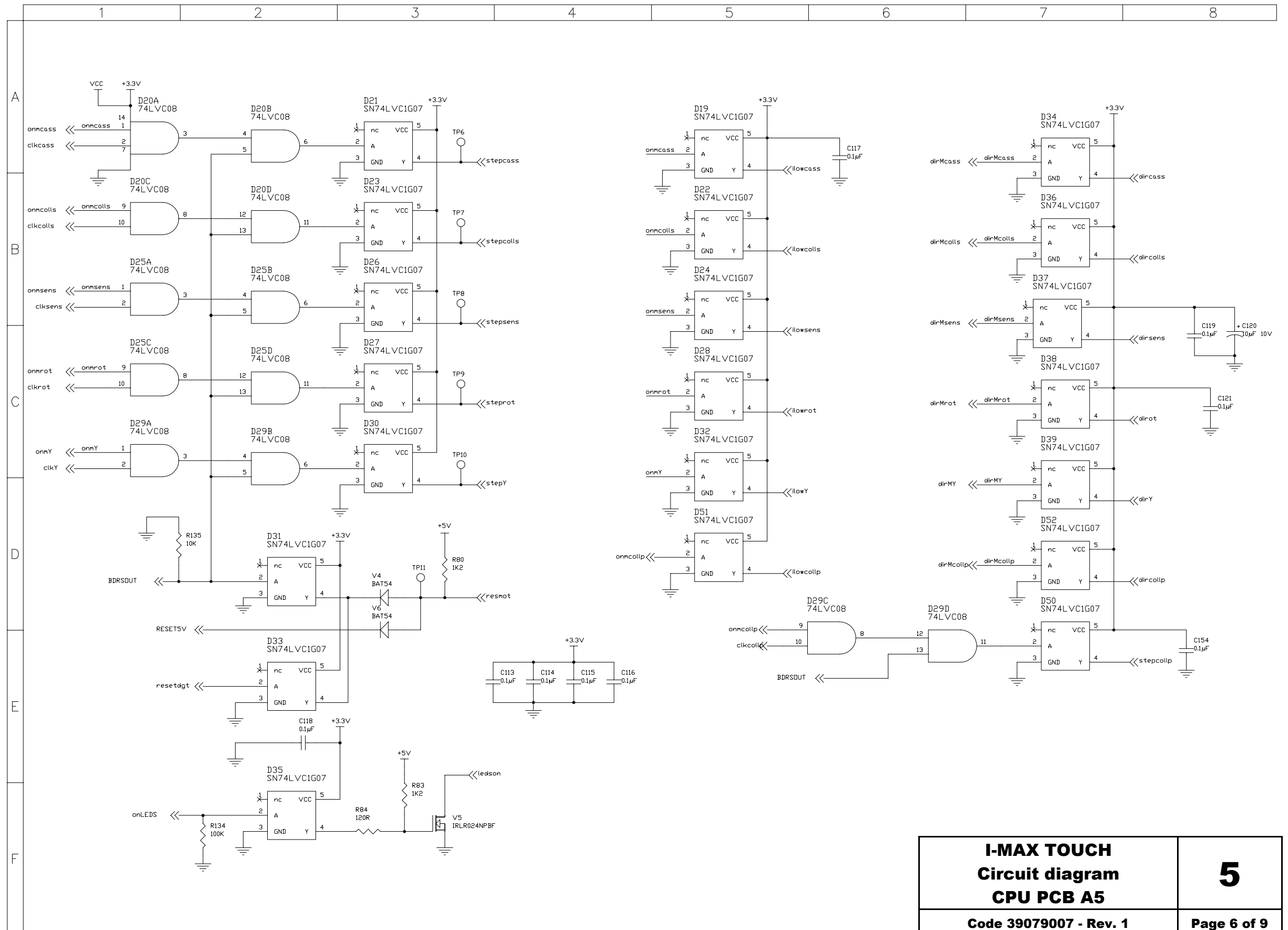
<p><b>I-MAX TOUCH</b> <b>Circuit diagram</b> <b>CPU PCB A5</b></p>	<p>5</p>
<p>Code 39079007 - Rev. 1</p>	<p>Page 3 of 9</p>



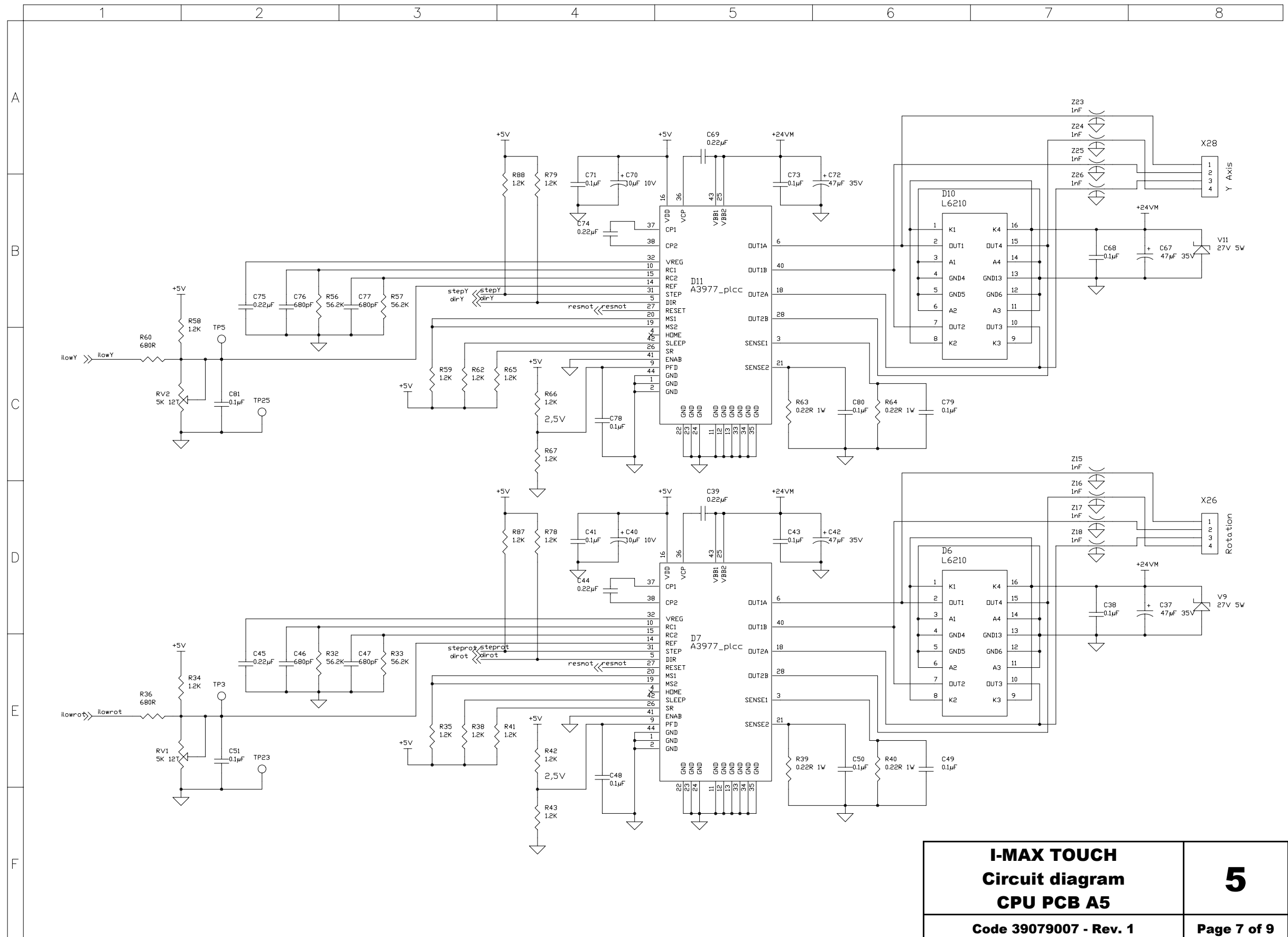
<b>I-MAX TOUCH</b> <b>Circuit diagram</b> <b>CPU PCB A5</b>	5
Code 39079007 - Rev. 1	Page 4 of 9



<b>I-MAX TOUCH</b> <b>Circuit diagram</b> <b>CPU PCB A5</b>	<b>5</b>
Code 39079007 - Rev. 1	Page 5 of 9

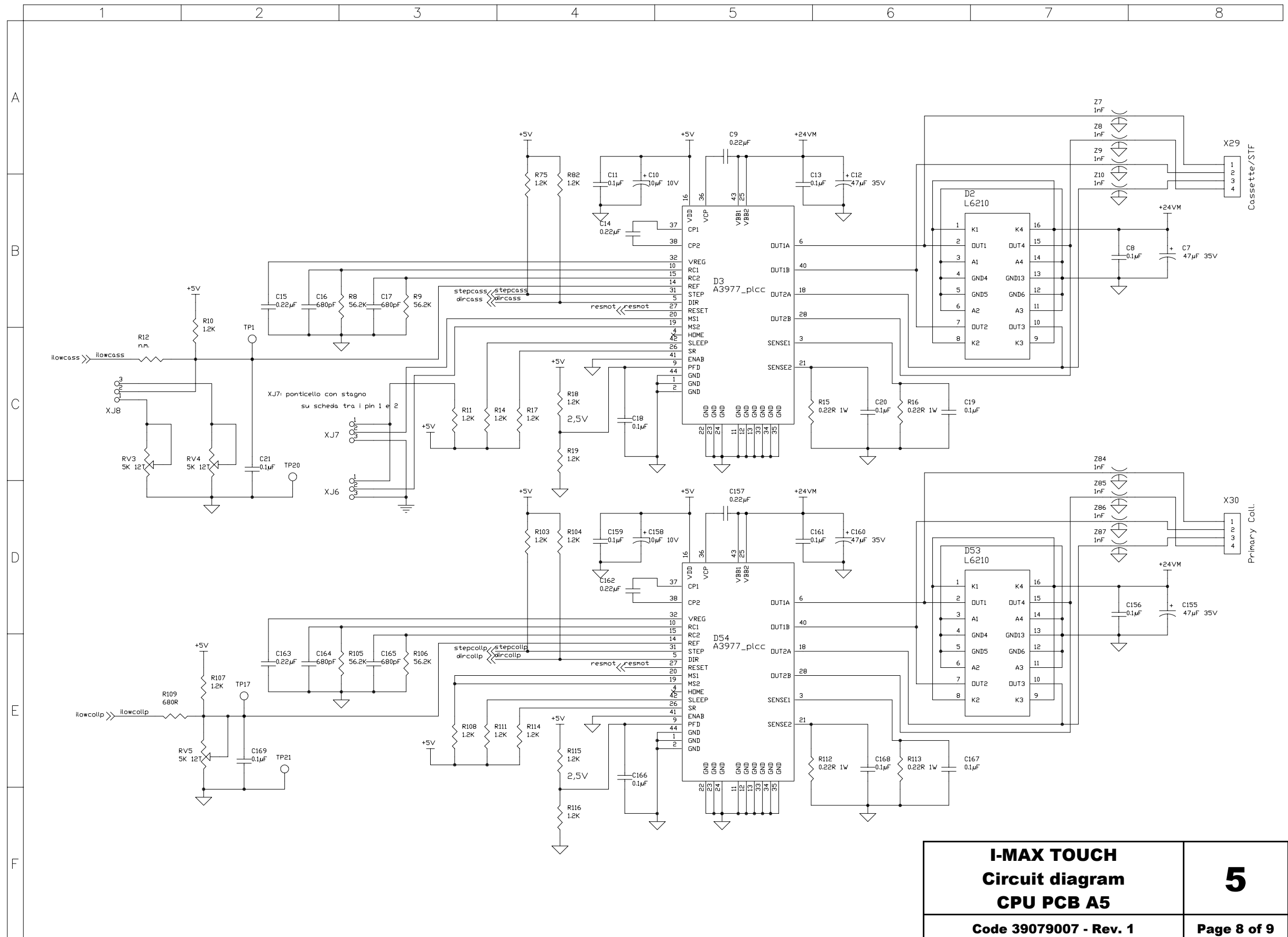


<b>I-MAX TOUCH Circuit diagram CPU PCB A5</b>	<b>5</b>
Code 39079007 - Rev. 1	Page 6 of 9

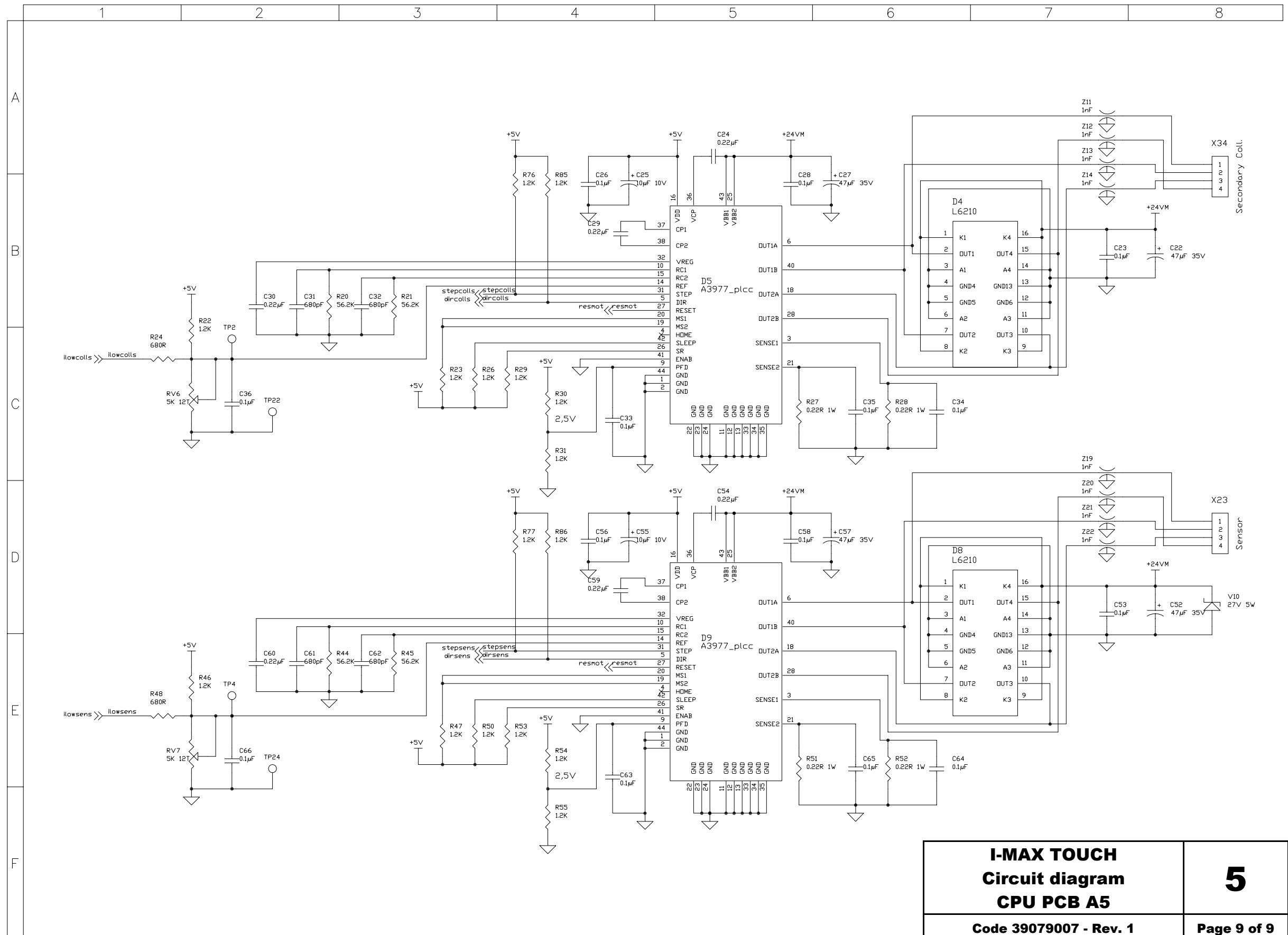


<b>I-MAX TOUCH</b> <b>Circuit diagram</b> <b>CPU PCB A5</b>	5
Code 39079007 - Rev. 1	Page 7 of 9

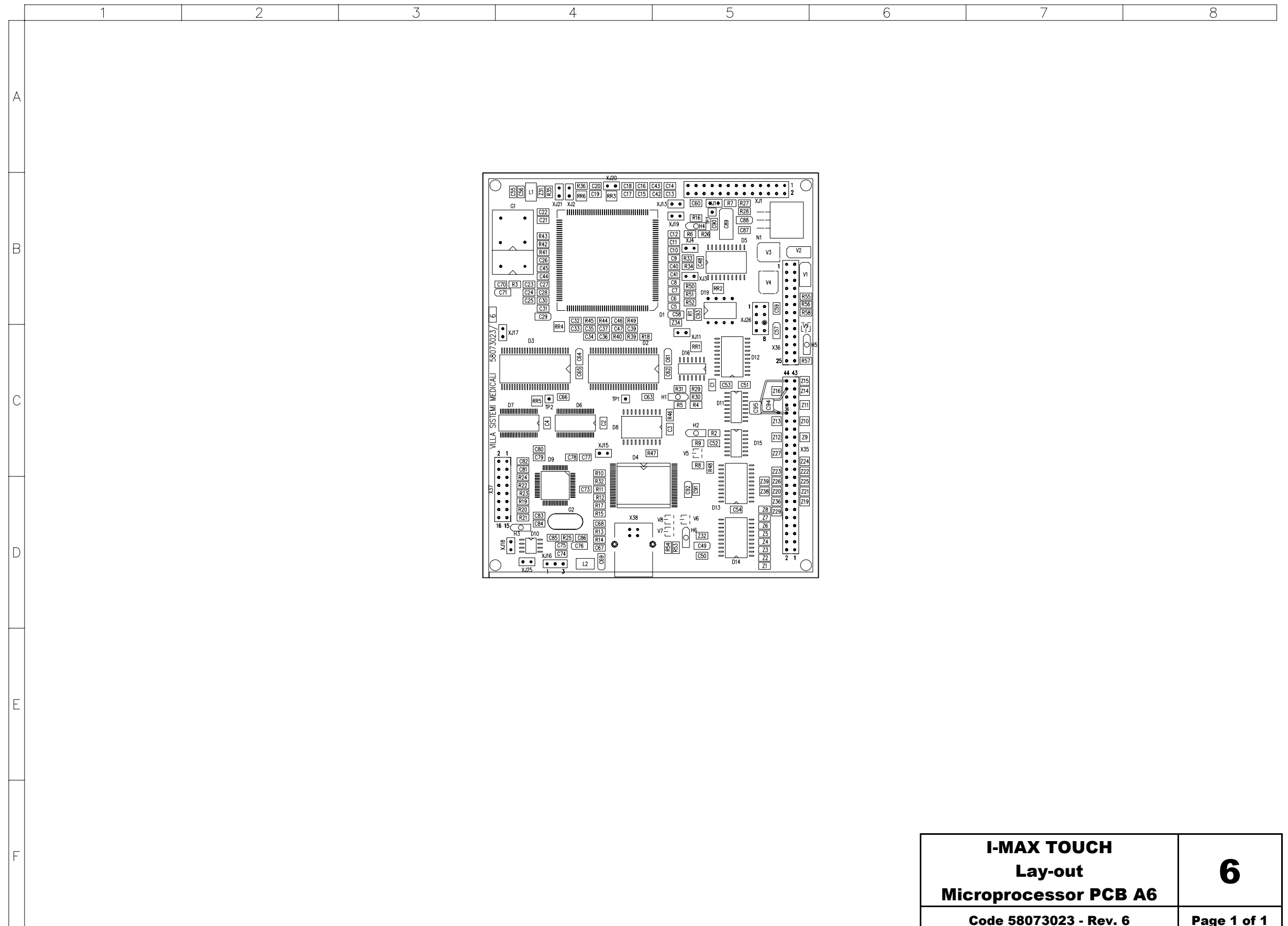




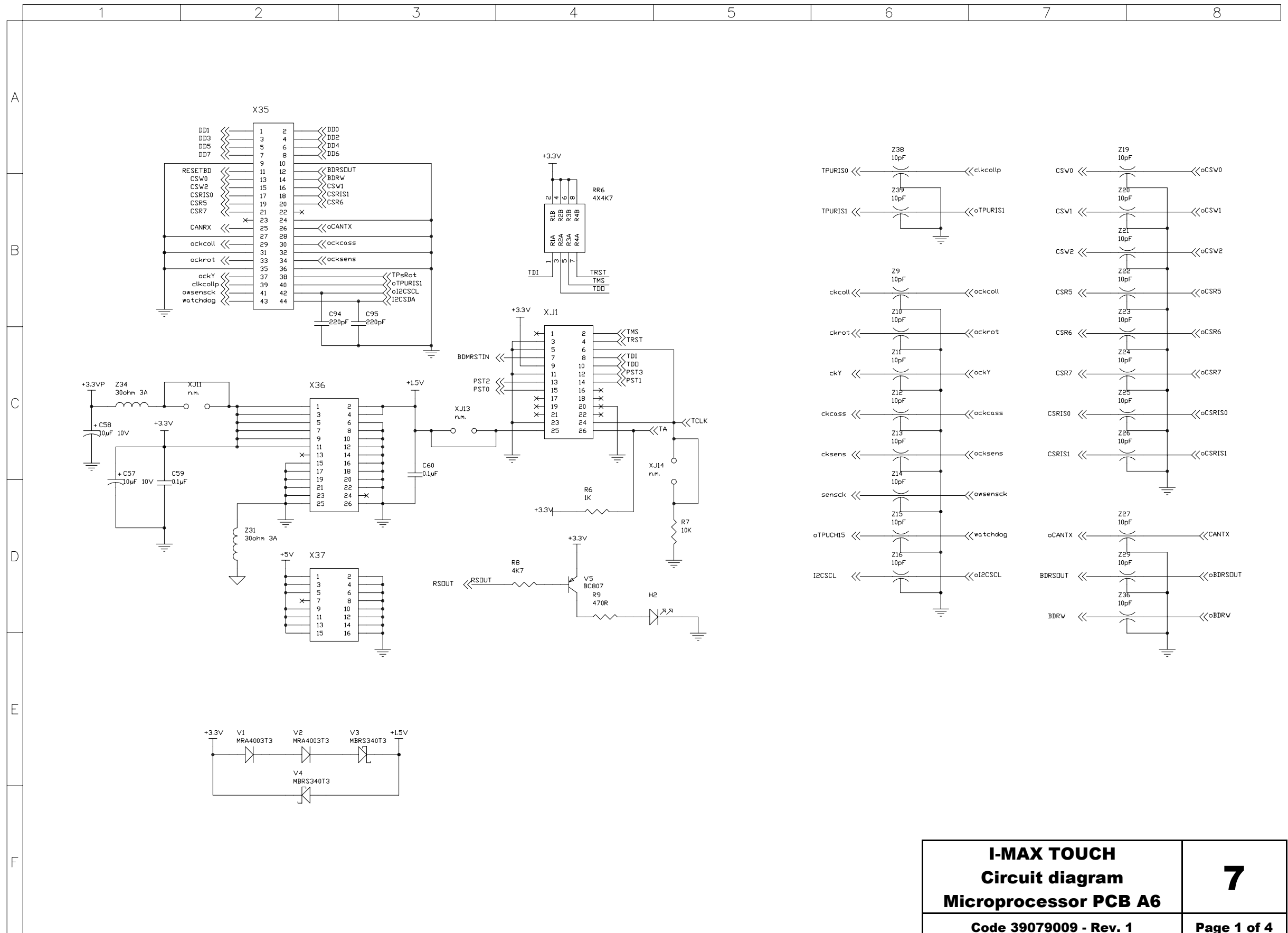
<b>I-MAX TOUCH</b> <b>Circuit diagram</b> <b>CPU PCB A5</b>	5
Code 39079007 - Rev. 1	Page 8 of 9



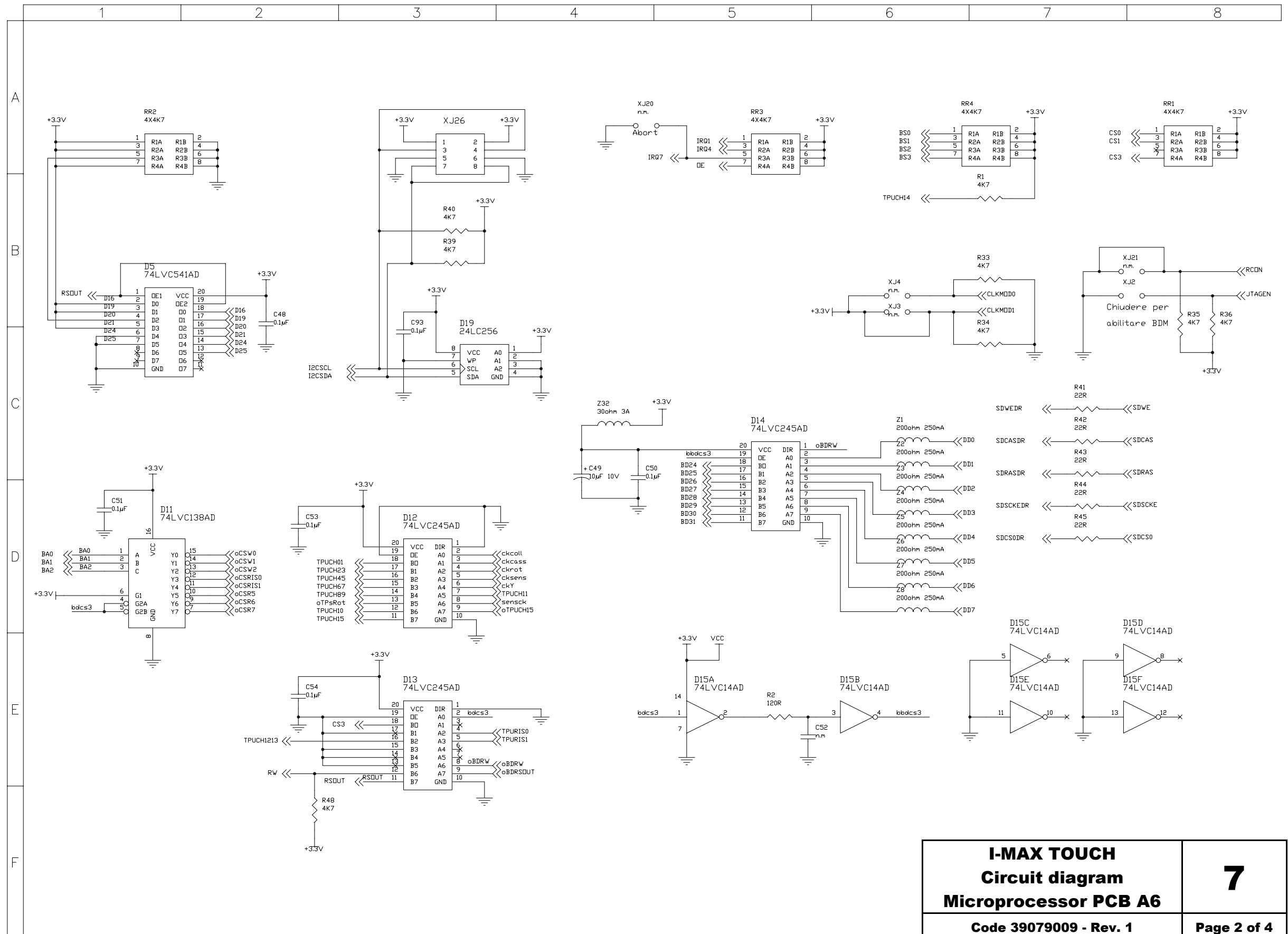
<b>I-MAX TOUCH</b> <b>Circuit diagram</b> <b>CPU PCB A5</b>	5
Code 39079007 - Rev. 1	Page 9 of 9



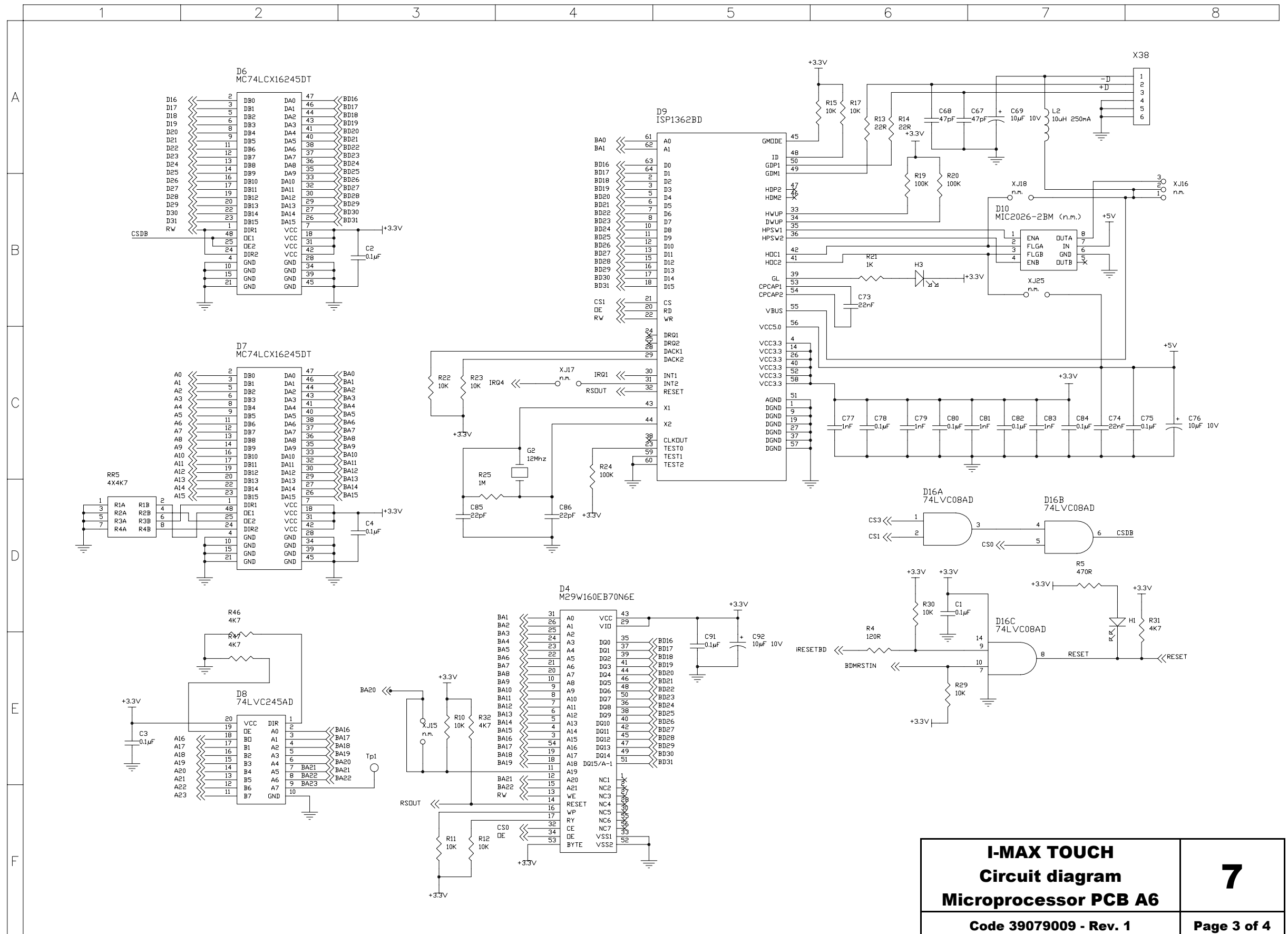
<b>I-MAX TOUCH Lay-out Microprocessor PCB A6</b>	<b>6</b>
Code 58073023 - Rev. 6	Page 1 of 1



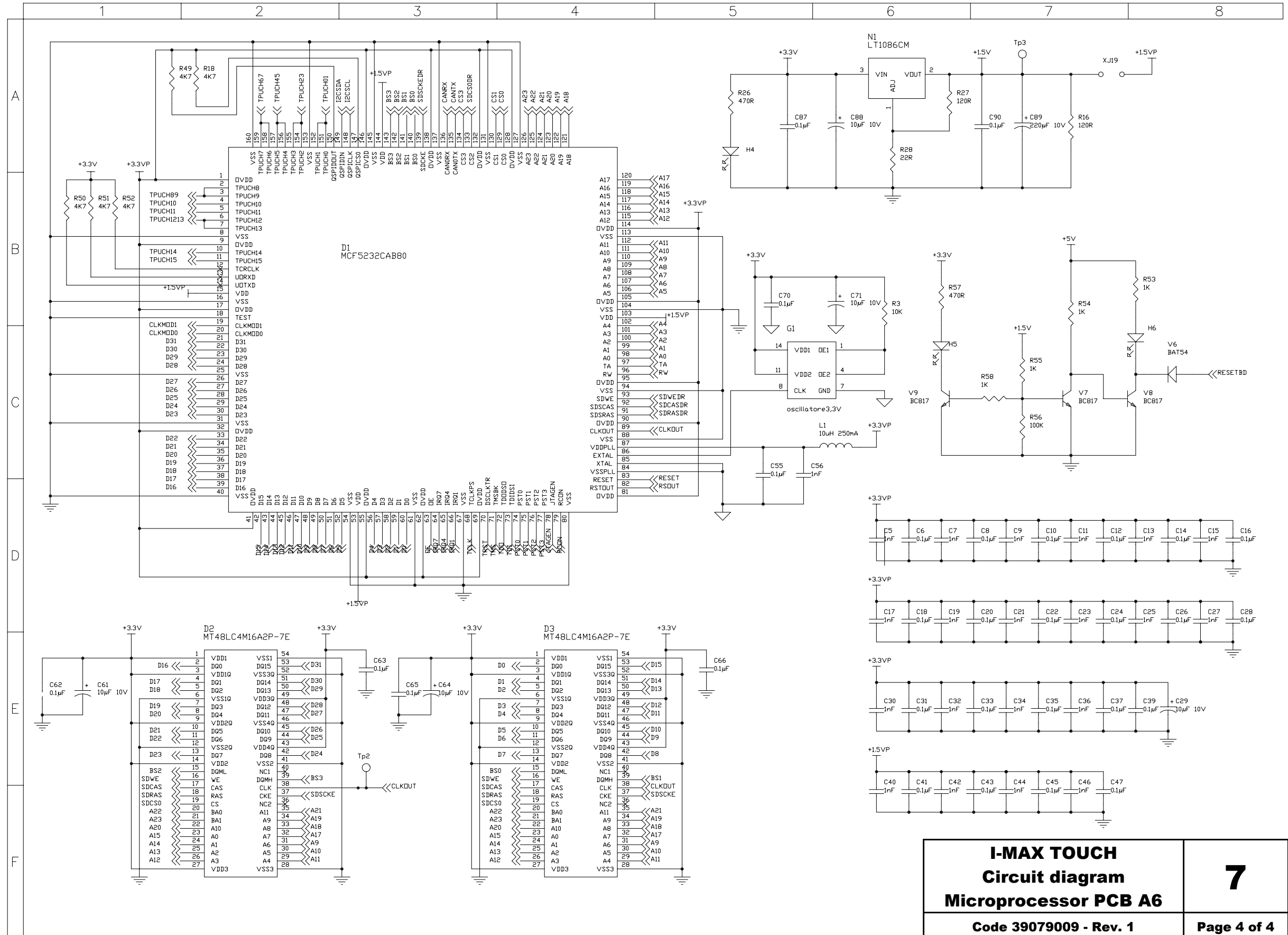
<b>I-MAX TOUCH</b> <b>Circuit diagram</b> <b>Microprocessor PCB A6</b>	<b>7</b>
Code 39079009 - Rev. 1	Page 1 of 4



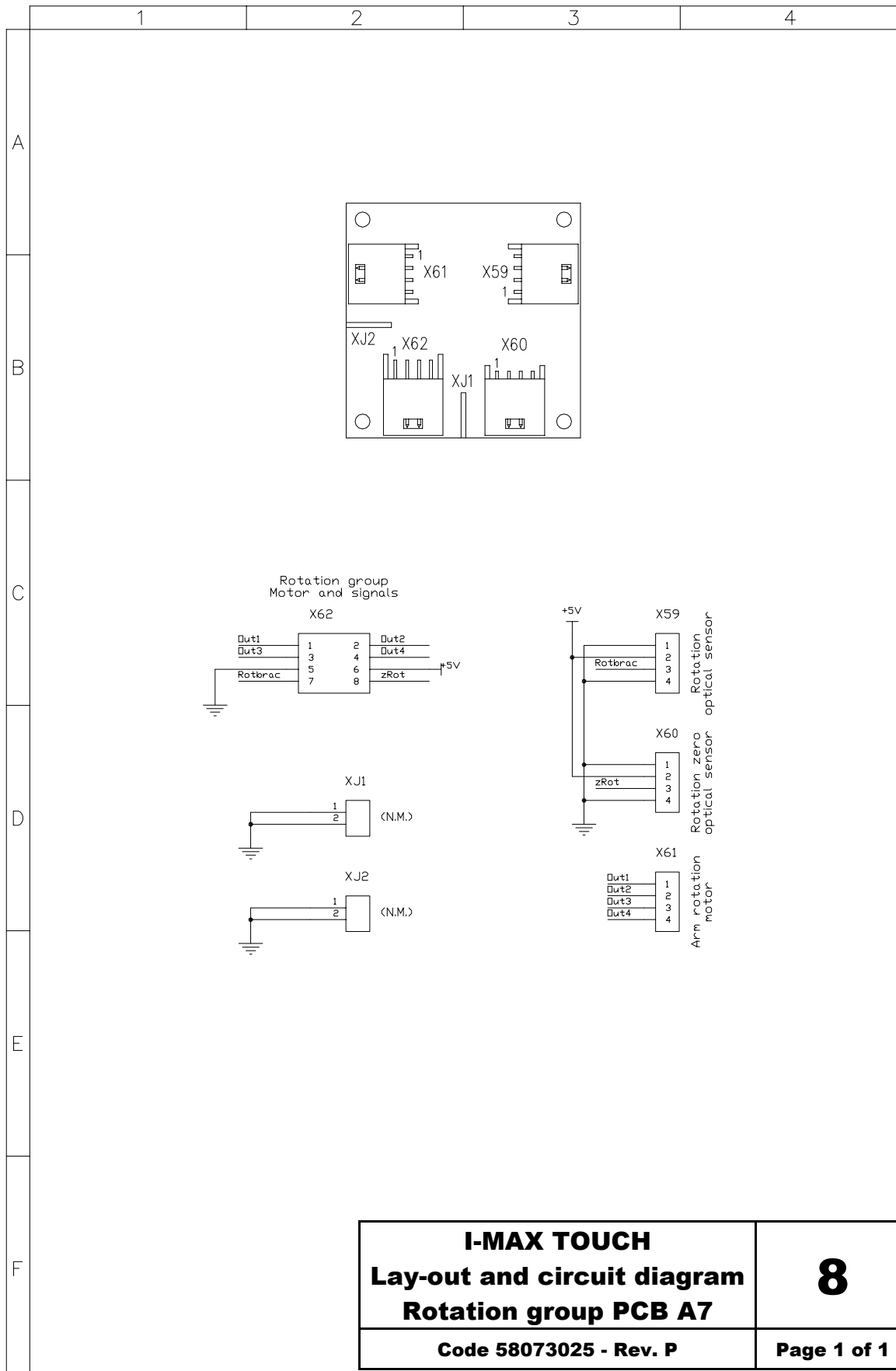
<b>I-MAX TOUCH</b> <b>Circuit diagram</b> <b>Microprocessor PCB A6</b>	7
Code 39079009 - Rev. 1	Page 2 of 4



<b>I-MAX TOUCH</b> <b>Circuit diagram</b> <b>Microprocessor PCB A6</b>	7
Code 39079009 - Rev. 1	Page 3 of 4

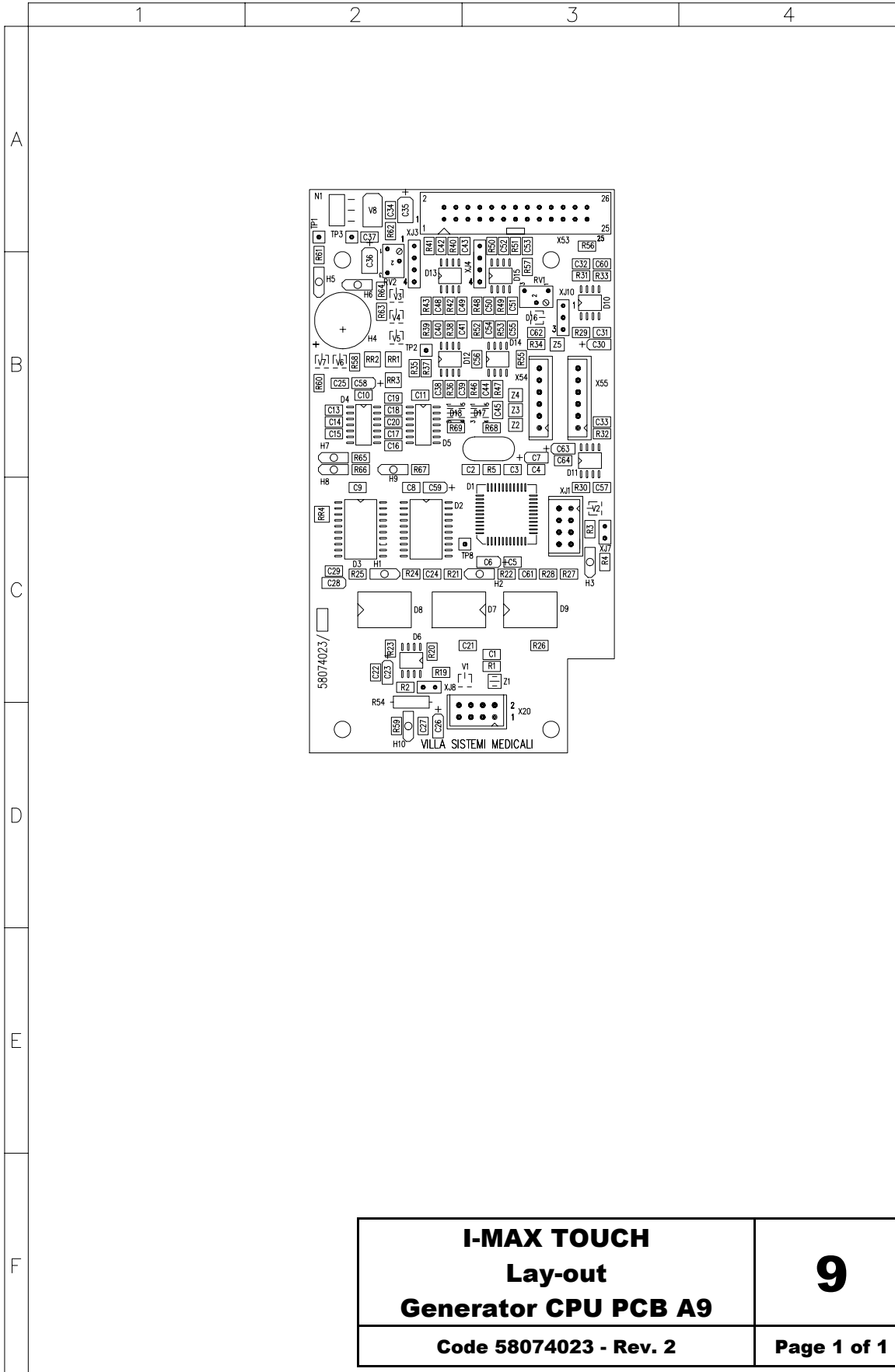


**I-MAX TOUCH**  
**Circuit diagram**  
**Microprocessor PCB A6**  
Code 39079009 - Rev. 1 **7**  
Page 4 of 4

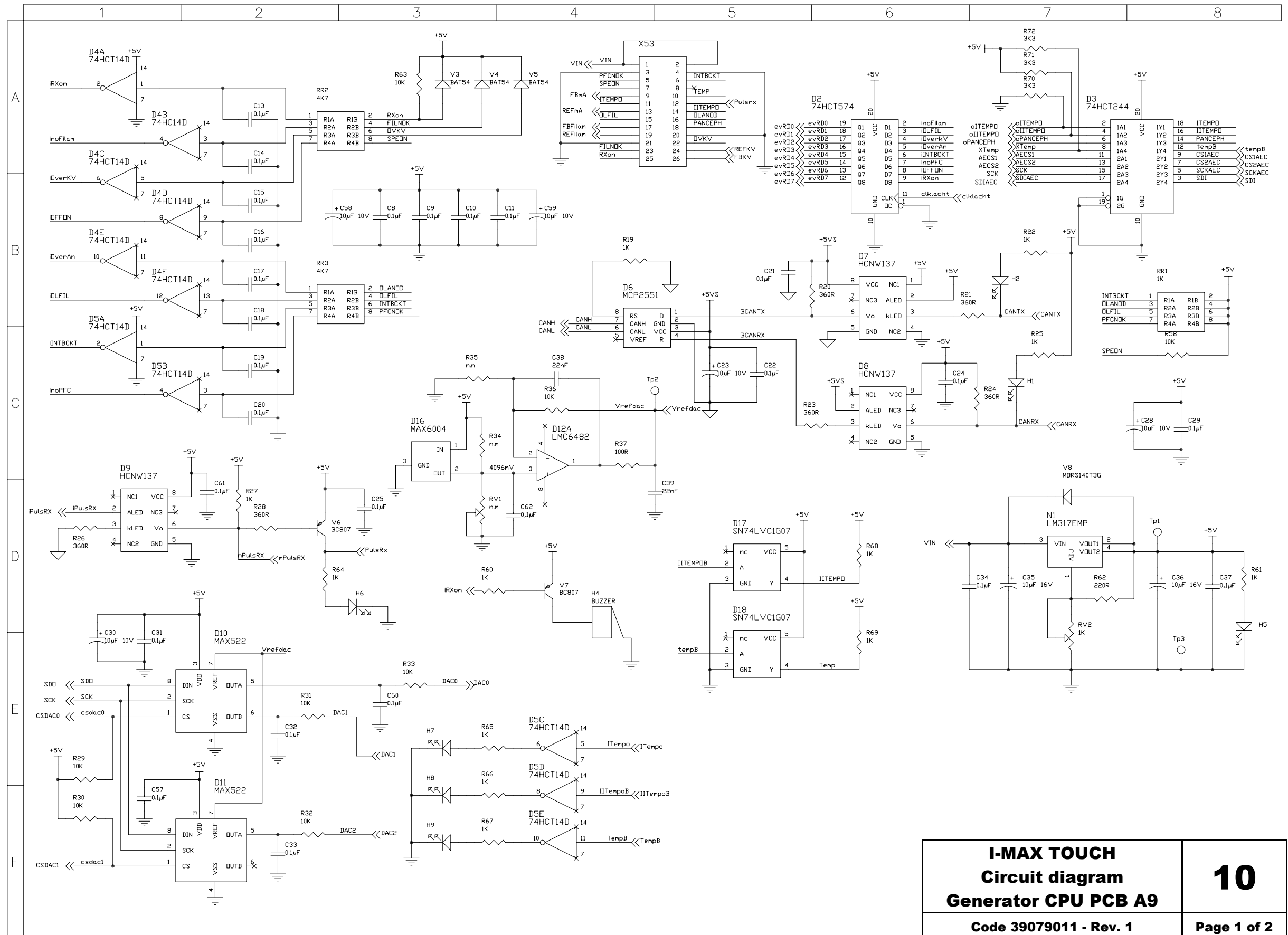


<b>I-MAX TOUCH</b> <b>Lay-out and circuit diagram</b> <b>Rotation group PCB A7</b>	8
Code 58073025 - Rev. P	Page 1 of 1

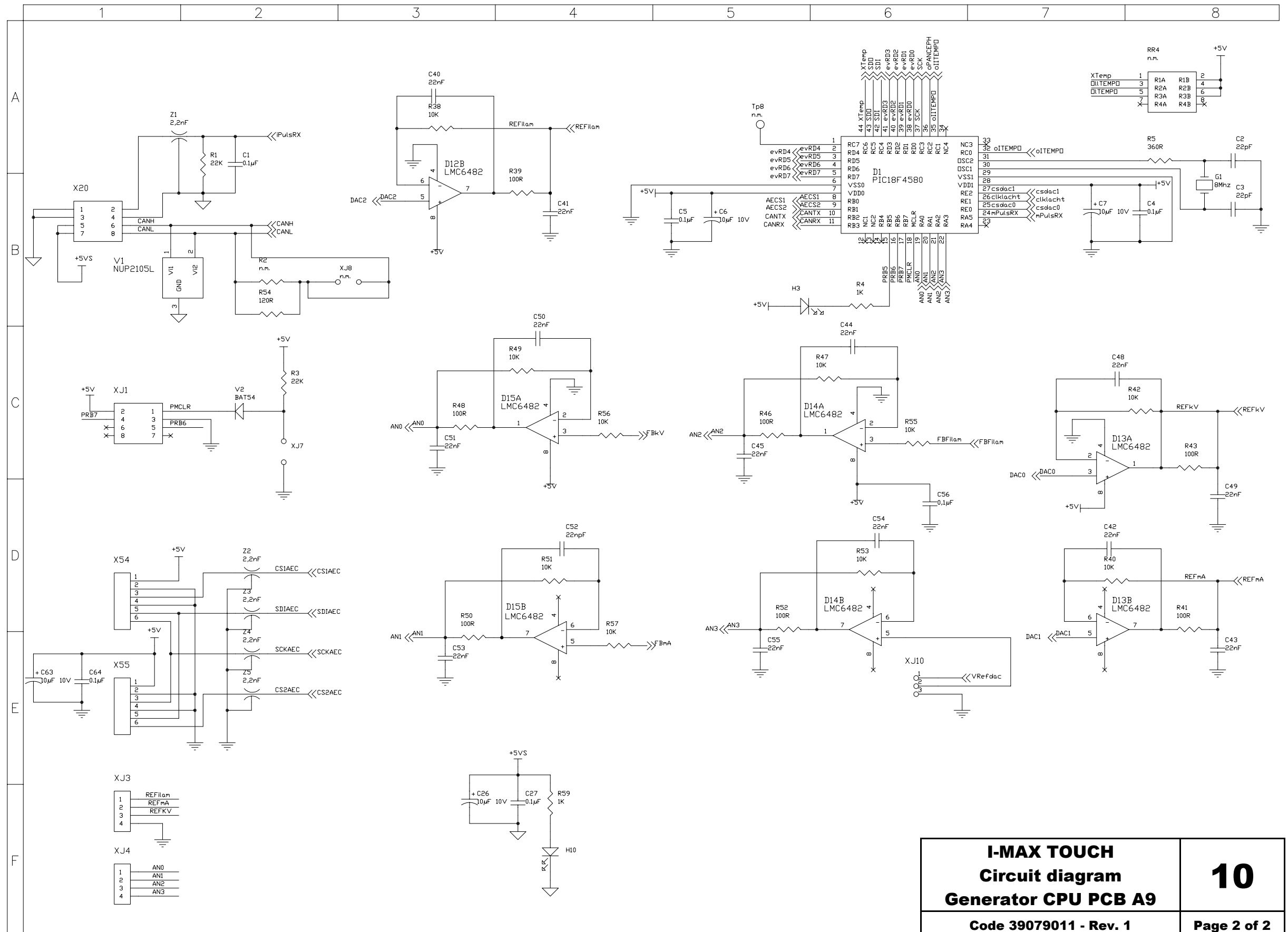




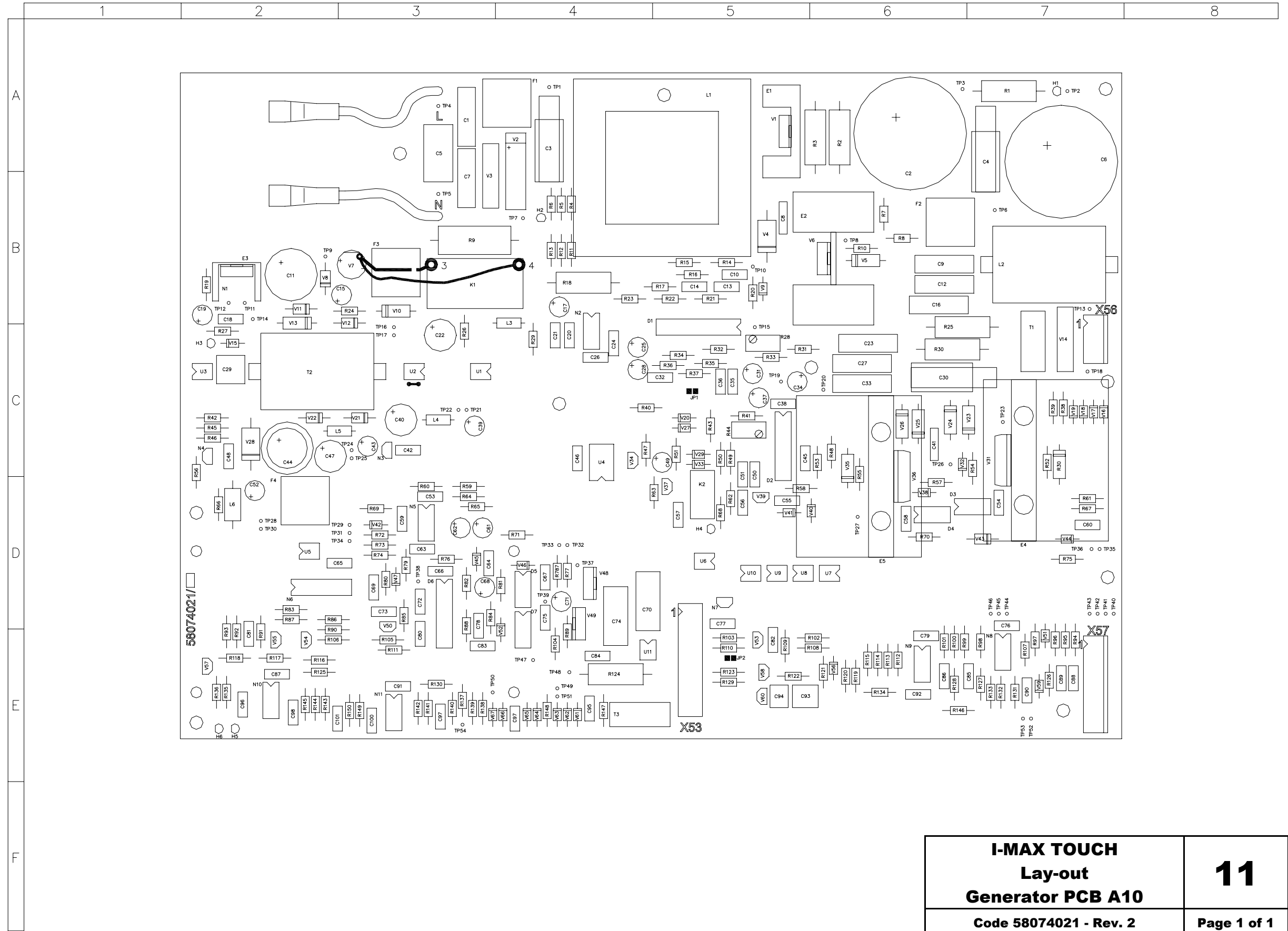
<p><b>I-MAX TOUCH</b> <b>Lay-out</b> <b>Generator CPU PCB A9</b></p>	9
Code 58074023 - Rev. 2	Page 1 of 1



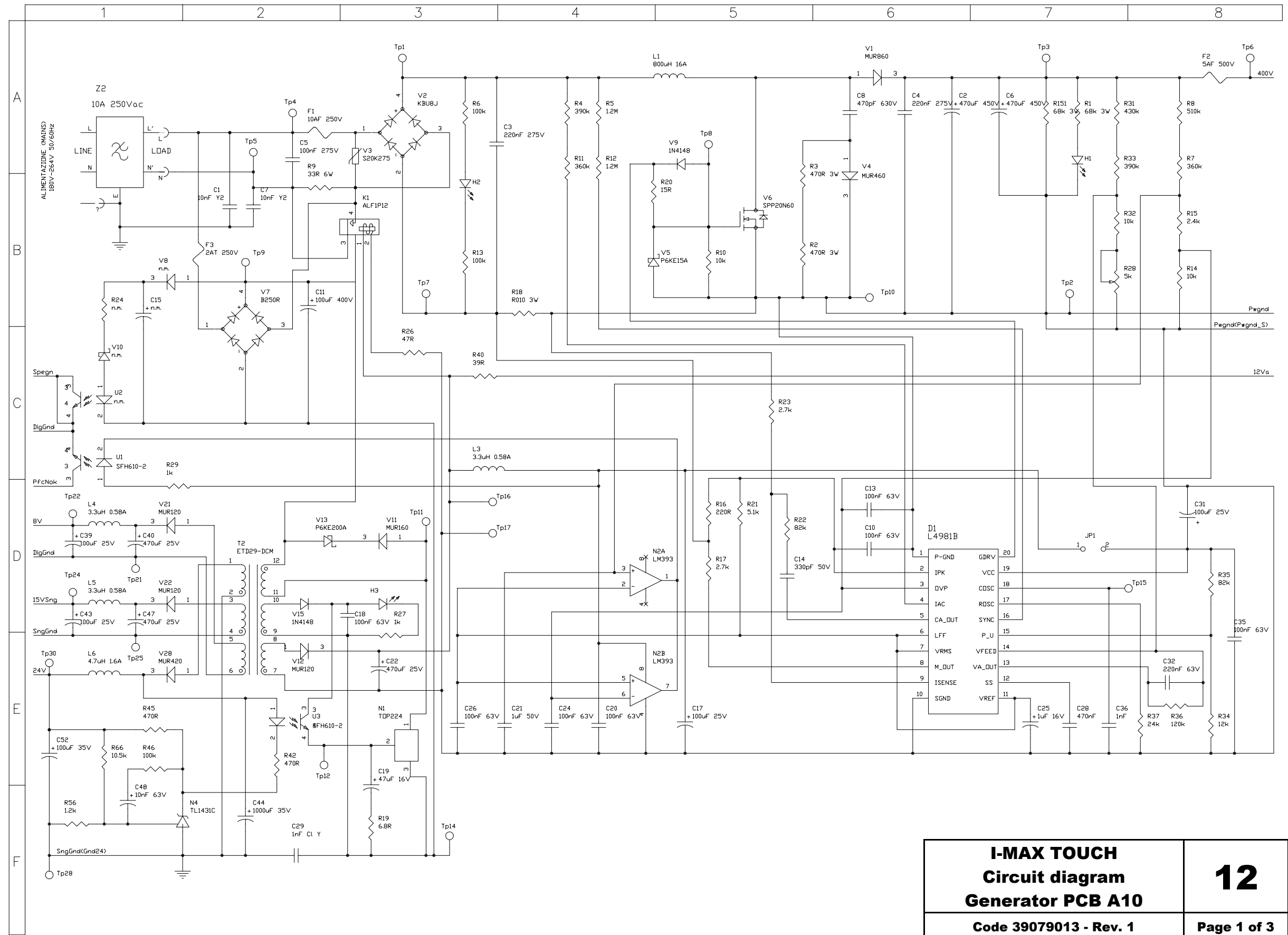
<b>I-MAX TOUCH</b> <b>Circuit diagram</b> <b>Generator CPU PCB A9</b>	10
Code 39079011 - Rev. 1	Page 1 of 2



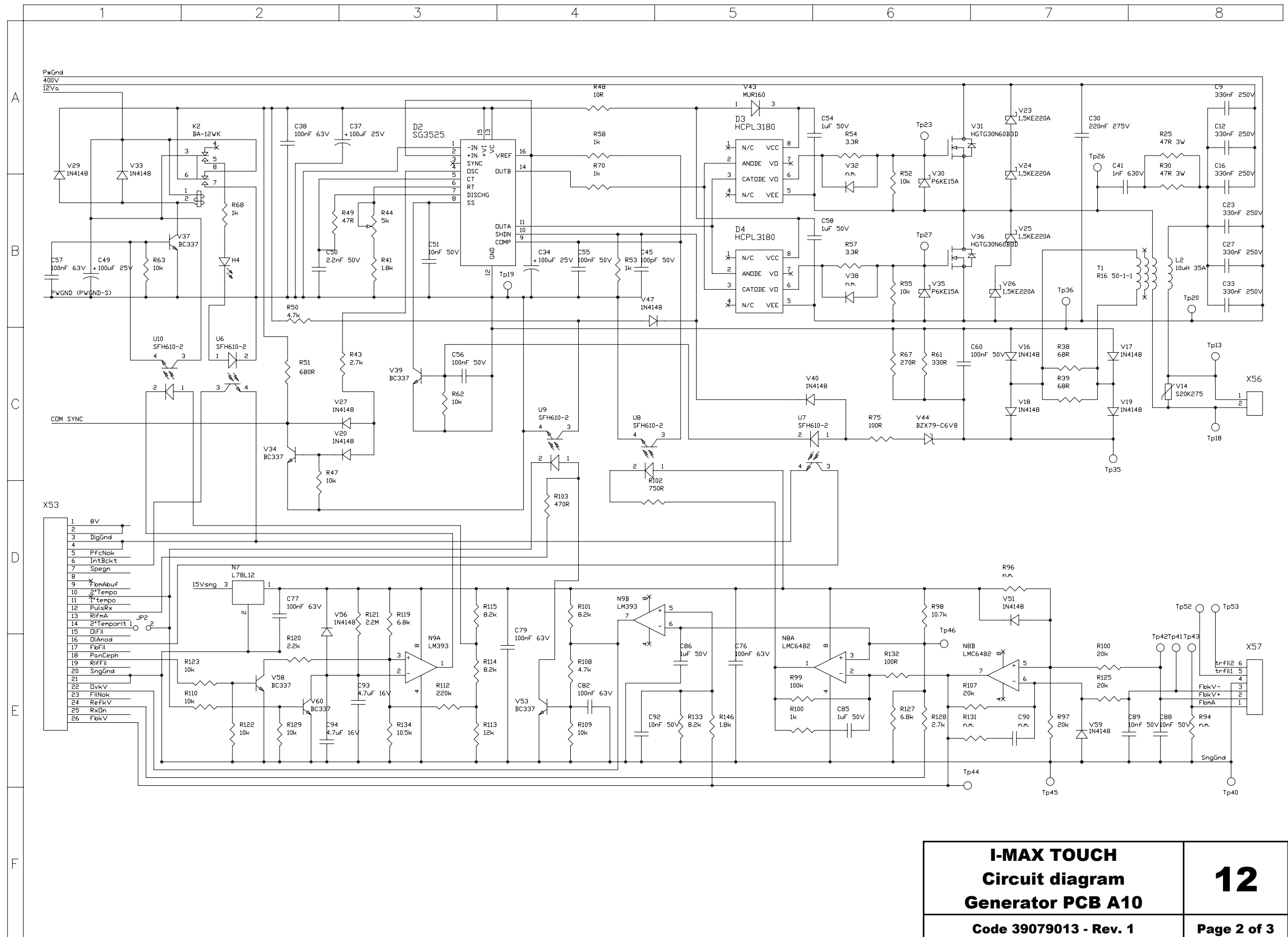
<b>I-MAX TOUCH</b> <b>Circuit diagram</b> <b>Generator CPU PCB A9</b>	10
Code 39079011 - Rev. 1	Page 2 of 2



<p align="center"><b>I-MAX TOUCH</b> <b>Lay-out</b> <b>Generator PCB A10</b></p>	<p align="center"><b>11</b></p>
<p align="center">Code 58074021 - Rev. 2</p>	<p align="center">Page 1 of 1</p>

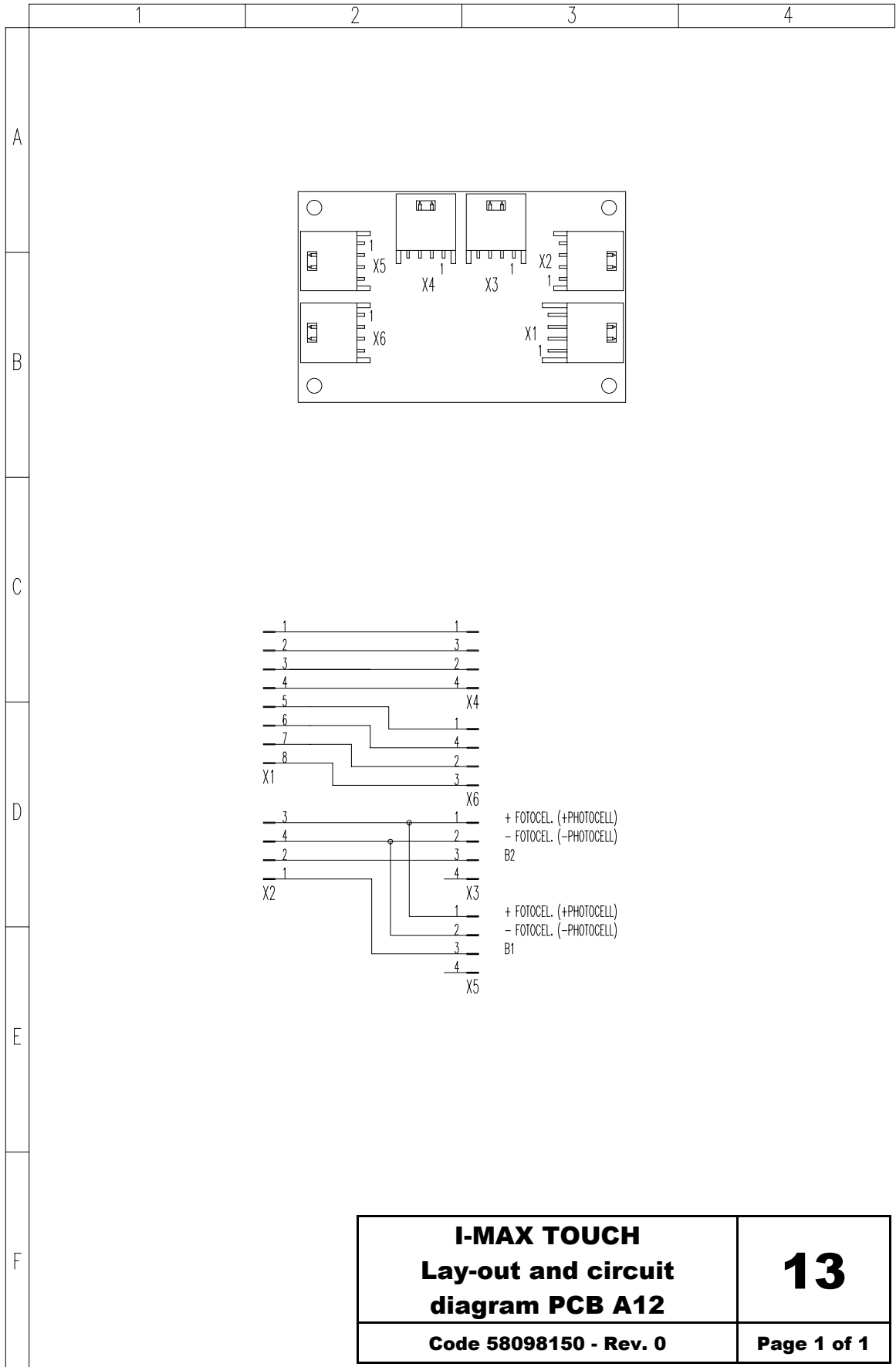


<b>I-MAX TOUCH</b> <b>Circuit diagram</b> <b>Generator PCB A10</b>	12
Code 39079013 - Rev. 1	Page 1 of 3



<b>I-MAX TOUCH</b> <b>Circuit diagram</b> <b>Generator PCB A10</b>	12
Code 39079013 - Rev. 1	Page 2 of 3







## **10. SPARE PARTS**

### **1 - COLUMN**

### **2 - UPPER MOVEMENT ASSY**

**Electrical and mechanical parts**

**Cables**

### **3 - ROTATION ARM**

### **4 - CEPH DEVICE**

### **5 - COVERS**

### **6 - ACCESSORIES AND SERVICE TOOLS**

**1 - COLUMN**

<b>Rif.</b>	<b>Order code</b>	<b>Description</b>	<b>Note</b>
1	6207090700	Column end travel microswitches with cable	
	4291309700	Microswitch	
2	6607091800	Column actuator M1	
3	4291415900	Mains switch	
4	6207090200	Up / Down column switch S2	
5	4492823000	+24V switch mode power supply	
6	6607090200	Fuses kit	220-240V version
	6607090300	Fuses kit	110-120V version
7	5807101000	Column CPU board A1	
8	4192212200	Line filter Z1	
9	6207091200	General supply cable	
10	6207091300	Ground cable #1	
11	6207091900	Generator board A10 power supply cable X2-X70	
12	6207092200	DSPU board – Touch screen connection cable J1-J2 / J3-J4	
13	6207090600	CanBus cable X11	
14	6207092000	Ethernet cable	
15	5007090200	USB2 cable	
16	4591845200	RJ45 connector	
17	6606160500	X-ray push button with cable	
18	5406160100	Console SX overlay keyboard	
19	5406160200	Console DX overlay keyboard	
20	6607098300	Frankfurt plane laser	
21	6607098400	Mid Sagittal plane laser	
22	6607098600	Mirror	
	5106094100	Mirror I-Max Touch logo	
23	5106094300	Column lateral I-Max Touch logo	
24	5106094000	Column front Owandy logo	
25	2100440200	Column base grub screw cap diam. 12.7 mm (1x)	
26	2100440200	Column base grub screw cap diam. 4.8 mm (1x)	
27	4492822900	Transformer T1	only for 110-120V version

## **2 - UPPER MOVEMENT ASSY**

### **Electrical and mechanical parts**

<b>Ref.</b>	<b>Order code</b>	<b>Description</b>	<b>Note</b>
1	6107035000	M2 Y-Axis stepper motor assy	
2	6107025000	M3 rotation stepper motor assy	
3	4990802300	Carriage belt model HTD 843-3M-15	
4	5807303000	CPU board assy	
	5807302100	CPU board A5	
	5807302300	Microprocessor board A6	
5	5807302500	Rotation group board A7	
6	5807302900	Optical sersor board B2 / B3	

### Cables

<b>Ref.</b>	<b>Order code</b>	<b>Description</b>	<b>Note</b>
1	6207040100	Rotation group motor and signals cable X25 / X26 – X62	
2	6207040200	Y-axis signal cable X27 – B1	
3	6207040600	CanBus cable X20	
4	6207040700	Ground cable # 2	
5	6207040900	Collimator optical sensor cable X70 – Z2	
6	6207041000	Collimator motor power supply cable X29 / X30 – X64 / X65	
7	6207041300	Sensor holder position signal cable X33 – B6 / B7	
8	6207041400	DSPU board – PAN sensor holder cable J13 / J14 – X51 / X52	
9	6207041500	Generator board A10 power supply cable X70 – Z2	
10	6207080900	Ground cable # 3	

### **3 - ROTATION ARM**

<b>Ref.</b>	<b>Order code</b>	<b>Description</b>	<b>Note</b>
1	8407000000	HF Tubehead	
2	5807402100	Generator board A10	
3	5807402300	Generator CPU board A9	
4	4192212300	Line filter Z2	
5	5807302900	Optical sensor board B6 / B7 / B8 / B9	
6	6607120200	Soft Tissue Filter motor M6	
7	6607120100	Primary collimator motor M5	
8	6607403100	Sensor holder connector plate (female)	
9	6607010600	Temple clamp assy	
10	5407012008	Temple clasps (1x)	
11	5207010705	Temple clasps release knob (1x)	
12	6606070300	Mobile sensor covers kit	
13	6606070400	PAN only sensor covers kit	

**4 – CEPH DEVICE**

<b>Ref.</b>	<b>Order code</b>	<b>Description</b>	<b>Note</b>
1	5807302900	Optical sensor board B10 / B11	
2	5207081800	Motor joint	
3	6209815600	Secondary collimator motor M8	
4	5809815000	Interconnection board A12	
5	6207080700	Ceph arm motor and signals cable X23 / X24 / X34 – X1 / X2	
6	6209815500	Ceph Sensor motor M9	
7	6207080800	Ceph arm cable J3 / J4 – X51 / X52	
8	6207080900	Ground cable # 3	
9	6607403100	Sensor holder connector plate (female)	
10	6607087208	Rod for Ceph centering device (1x)	
11	6606080700	Nose-rest rod assy	
12	6607080600	Secondary collimator movement assy	
13	6607080700	Sensor movement assy	

## 5 - COVERS

<b>Ref.</b>	<b>Order code</b>	<b>Description</b>	<b>Note</b>
1	6606040205	Upper cover	
2	5406201005	Tubehead cover	
3	6607201205	Generator board A10 cover	
	5106094200	Generator board A10 cover I-Max Touch logo	
4	5407201105	Rotation arm lower cover	
5	5407011905	Temple clamp cover	
6	6606070005	PAN / CEPH Sensor holder internal cover	
7	6606160600	Console covers (upper + lower)	
	5106094400	Console Owandy logo	
8	6606160700	Console arm (DX + SX)	
9	6606140205	Base cover	
	6606140105	Base cover (free standing base version)	
10	5407086605	Ceph device upper cover	
11	5407086905	Ceph device lower cover	
12	5407087005	Ceph centring device lower cover	
13	5407086705	Ceph arm lower cover	
14	5407086805	Ceph arm upper cover	

## 6 - ACCESSORIES AND SERVICE TOOLS

<b>Ref.</b>	<b>Order code</b>	<b>Description</b>	<b>Note</b>
1	6607090100	PAN centring bite (50 pcs)	
2	6107110200	Disposable bite protective sleeves (100x)	
2	6607080200	Ceph ear pivot (50 pcs)	
3	6606090108	Panoramic standard chin support	
4	5407098108	Edentulous patients appendix	
5	6606090208	SINUS/TMJ chin support	
6	6107900100	Laser centring tool	
7	6107900200	Symmetry ceck tool	
8	5209900900	Digital sensor centring tool	
9	5607900800	Copper filter for digital sensor	
10	6607900200	Adjustment and calibration tools kit	



## 11. APPENDIX

### 11.1. Appendix A: Setup parameters table

The following table lists those adjustment parameters stored in the unit during factory testing and that must be re-entered into the non-volatile memory in case of replacement of the main CPU board (A5). This is due to the fact that the new CPU board, provided as a spare part, has been factory tested from the functional point of view, but contains only default parameters which are not related to the unit where it will be installed. Entering of the listed parameters can be performed through the service programs (passwords).



**NOTE:**

The information listed in the table is the technical parameters set during factory testing. Preferences set by the user (e.g. exposure parameters different than the default ones) are not listed.

The table also has columns with blank cells. These cells must be filled in when, during installation or during the life of the unit, any of the listed parameters have been modified (e.g. after replacing a motor or a positioning sensor).

## I-Max Touch

**Unit code:** \_\_\_\_\_

**Unit S/N:** \_\_\_\_\_

**U.I.C.:** \_\_\_\_\_

Parameter	Factory setting	New setting	New setting	New setting	New setting
Date					
Y axis motor offset					
Rotation axis motor offset					
PAN only (ON/OFF)					
Sensor Handling					
Digital Ceph status (OFF=disabled; ON=enabled)					
Primary collimator motor offset					
Secondary collimator motor offset					
Digital Ceph sensor offset					
Soft Tissue Filter (STF) motor offset					
Digital Ceph rotation offset					
Language (English, Italian, French, German, Spanish, Portuguese, Dutch)					
Tubehead pre-heating values	6mA				
	7mA				
	8mA				
	9mA				
	10mA				
	11mA				
	12mA				



Code 6906910503\_Rev.2



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