SERVICE MANUAL

CONNEXITY

90/90 RF SYSTEM WITH FLAT PANEL

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(R012)

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CONNEXITY
SERVICE MANUAL

MODIFICATION HISTORY

Rev.	Date	Description
00	01/2010	First edition. Valid from s/n 006/192
01	04/2011	Introduced modifications in Section 5. Valid from s/n 008/265
02	05/2012	Updated with general reviewing and Integrated Console
03	07/2012	Updated: Technical data (section 2) Error codes For the IEC 60601-1. Third edition release, modified the following chapters : • Warning against radiations • Protection class for applied parts • Standards conformity • Unit identification and warning labels • Appendix 1 • Appendix 2 Added Dose information procedure Added Work station set up picture and details
04	03/2013	Edited Monitor size
05	04/2013	Edited some sections numbers. Added monitor Tecnint and its technical specifications
06	02/2014	Section 2 – edited collimator technical info Section 5: edited Room requirements according to the system shipping modalities Section 8: Replaced screenshots Section 10: Added new collimator cpu drawing Section 11: Set up selection updated Section12 : new collimator firmware download – CPU cable drawing Section 16: new collimator AL type maintenance and calibration
07	05/2014	Edited some screenshots – added new lateral potentiometer replacement and calibration – updated labels
08	02/2015	Edited some screenshots – edited table CAN speed – automatic collimator with filters – trunnion as standard accessory – edited hw jumper settings – collimator labelling Beam alignment – edited sw jumper settings – edited preventive maintenance – edited detector maintenance-edited – added new detector model Pixium RF4343FL – new assembly instructions for Pixium RF4343FL detector – edited detector and AEC chamber mounting – edited tabletop

		mounting – edited lateral potentiometer replacement and calibration – edited lateral tabletop end switches adj. – edited the general part of preventive maintenance (grub screws)
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10	10/2015	Console touch screen calibration – Console SBC Bios configuration – Intercom and tube stand control boards editing - Substituted new collimator CPU jumper settings layout – collimator CPU software download layout - added procedure to mount the webcam – edited end of life – added new error codes – edited manufacturer's name – edited maximum patient's weight – edited maintenance schedule – minor general editing
11	09/2016	Added new console, edited screenshots and icons new detector bucky chamber mounting instructions – edited sw jumper setting section edited intended use edited console cpu jumpers settings and joystick axis lock setting edited error messages section added tomosyntesis layer offset setting Updated CPI interface Added Touch screen software upgrading procedure Edited dose info calibration Edited section 8 – added tomosynthesis information Added footrest adjustment procedure Added max FFD warning
12	03/2018	General editing Updated Firmware upgrade procedure Updated interface circuits for DEIMOS generator Updated tightening torque for collimator mounting

NOTICE

THE INSTRUCTIONS CONTAINED IN THIS MANUAL CONFORMS WITH THE CONFIGURATION OF THE EQUIPMENT AS OF THE DATE OF MANUFACTURE. REVISIONS TO THE EQUIPMENT SUBSEQUENT TO THE DATE OF MANUFACTURE WILL BE ADDRESSED IN USER MANUAL UPDATES DISTRIBUTED BY THE MANUFACTURER'S SERVICE ORGANISATION.

TO THE USER OF THIS MANUAL:

THE USER OF THIS MANUAL IS DIRECTED TO READ AND CAREFULLY REVIEW THE INSTRUCTIONS, WARNINGS AND CAUTIONS CONTAINED HEREIN PRIOR TO BEGINNING THE USE OF THE UNIT.
WHILE YOU MAY HAVE PREVIOUSLY USED EQUIPMENT SIMILAR TO THAT DESCRIBED IN THIS MANUAL, CHANGES IN DESIGN, MANUFACTURE OR PROCEDURE MAY HAVE OCCURRED WHICH SIGNIFICANTLY THE SAFE USE OF THE UNIT.
THE INSTALLATION AND SERVICE OF EQUIPMENT DESCRIBED HEREIN IS TO BE PERFORMED BY AUTHORIZED, QUALIFIED PERSONNEL.
OTHER PERSONNEL NOT EMPLOYED BY NOR DIRECTLY AFFILIATED WITH THE MANUFACTURER'S TECHNICAL SERVICES ARE DIRECTED TO CONTACT THE LOCAL MANUFACTURER'S OFFICE OR DEALER BEFORE ATTEMPTING SERVICE PROCEDURES.
THIS DOCUMENT HAS BEEN ORIGINALLY DRAFTED IN ENGLISH LANGUAGE.

DIAGNOSTIC X-ray SYSTEMS
RADIATION WARNING

X-RAY AND GAMMA-RAYS ARE DANGEROUS TO BOTH OPERATOR AND OTHERS IN THE VICINITY UNLESS ESTABLISHED SAFE EXPOSURE PROCEDURES ARE STRICTLY OBSERVED. THE USEFUL AND SCATTERED BEAMS CAN PRODUCE SERIOUS OR FATAL BODILY INJURIES TO ANY PERSON IN THE SURROUNDING AREA IF USED BY AN UNSKILLED OPERATOR. ADEQUATE PRECAUTIONS MUST ALWAYS BE TAKEN TO AVOID EXPOSURE TO THE USEFUL BEAM, AS WELL AS TO SCATTERED RADIATION RESULTING FROM THE PASSAGE OF RADIATION THROUGH MATTER.
THOSE AUTHORIZED TO OPERATE, PARTICIPATE IN, OR SUPERVISE THE OPERATION OF THE EQUIPMENT MUST BE THOROUGHLY FAMILIAR AND COMPLY COMPLETELY WITH THE CURRENT ESTABILISHED SAFE EXPOSURES FACTORS AND PROCEDURES DESCRIBED IN PUBLICATIONS, SUCH AS: SUBCHAPTER J OF TITLE 21 OF THE CODE OF FEDERAL REGULATIONS, " DIAGNOSTIC X-ray SYSTEMS AND THEIR MAJOR COMPONENTS ", AND IEC 60601 GENERAL AND COLLATERAL STANDARDS AS REVISED OR REPLACED IN THE FUTURE
THOSE RESPONSIBLE FOR THE PLANNING OF X-RAY AND GAMMA-RAY EQUIPMENT INSTALLATIONS MUST BE THOROUGHLY FAMILIAR AND COMPLY COMPLETELY WITH:
NCRP NO. 49 " STRUCTURAL SHIELDING DESIGN AND EVALUATION FOR MEDICAL X-RAYS AND GAMMA-RAYS OF ENERGIES UP TO 10 MEV " AND IEC-407 " RADIATION PROTECTION IN MEDICAL X-RAY EQUIPMENTS 10KV - 400KV " AS REVISED OR REPLACED IN THE FUTURE.
FAILURE TO OBSERVE THESE WARNINGS MAY CAUSE SERIOUS OR FATAL BODILY INJURIES TO THE OPERATOR OR THOSE IN THE AREA.
THE X- RAY RADIATION CAN PRODUCE DETERMINISTIC EFFECT FOR DOSE VALUE HIGHER THAN 1 Gy., IN CASE OF EIDOS RF STANDARD USE, YOU WILL HARDLY REACH THE THRESHOLD VALUE IF YOU ARE WORKING ACCORDING TO WHAT SPECIFIED.
THE QUANTITATIVE INFORMATION RELATED TO THE PATIENT DOSE WITH USUAL APPLICATION ARE SHOWN IN THE APPENDIX 1 AND APPENDIX 2I
IN ORDER TO OPTIMAZE THE IMAGE DOSE THE MANUFACTURER PROVIDES ANATOMICAL PROGRAMME (CLINICAL PROTOCOLS) WITH AEC. THESE PROGRAMS ARE TO BE CONSIDERED AS A STARTING POINT AND MUST BE VALIDATED WITH ADDITIONAL MODIFICATIONS MADE BY THE MEDICAL STAFF IN CHARGE OF THE ORGANIZATION
THE PROGRAMMES ENTRY OR CHANGES MUST BE MADE ONLY BY PERSONNEL AUTHORIZED BY THE MANUFACTURER.

SYSTEM COMPOSITION AND DOCUMENTS REFERENCE

IN THIS MANUAL CHAPTER 2 ARE SHOWN THE POSSIBLE SYSTEMS CONFIGURATION AND IN THE UNIT ATTACHED PACKING LIST IS SHOWN THE SPECIFIC CONFIGURATION OF THE SYSTEM INSTALLED. WHERE ARE INDENTIFIED ALL THE ITEMS AND THE ACCOMPANY DOCUMENTS. DO READ BEFORE APTENTING ANY OPERATION ALL THE DOCUMENTATIONS. THE OPERATOR MUST ALWAYS MAKE REFERENCE TO EACH SINGLE MANUAL COMPONENT. IT IS REQUIRED SPECIFIC PERSONELL TRAINING THAT MUST BE AGREED WITH THE MANUFACTURER OR BY THE MANUFACTURER AUTHORIZED PERSONNEL.
THE ATTENDED TRAINING NAMED CERTIFICATED IS ISSUED BY THE MANUFACTURER OR BY HIS PROXY.

INSTALLATION AND ENVIROMENT

EXCEPT FOR INSTALLATIONS REQUIRING CERTIFICATION BY THE MANUFACTURER PER FEDERAL STANDARDS, SEE THAT A RADIATION PROTECTION SURVEY IS MADE BY A QUALIFIED EXPERT IN ACCORDANCE WITH NCRP 102, SECTION 7 OR IEC RELATED GENERAL AND COLLATERAL STANDARD AS REVISED OR REPLACED IN THE FUTURE.
PERFORM A SURVEY AFTER EVERY CHANGE IN EQUIPMENT, WORKLOAD, OR OPERATING CONDITIONS WHICH MIGHT SIGNIFICANTLY INCREASE THE PROBABILITY OF PERSONS RECEIVING MORE THAN THE MAXIMUM PERMISSIBLE DOSE EQUIVALENT.

DIAGNOSTIC X-ray SYSTEMS
MECHANICAL - ELECTRICAL WARNING

ALL OF THE MOVABLE ASSEMBLIES AND PARTS OF THIS EQUIPMENT SHOULD BE OPERATED WITH CARE AND ROUTINELY INSPECTED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS CONTAINED IN THE EQUIPMENT MANUALS.
ONLY PROPERLY TRAINED AND QUALIFIED PERSONNEL SHOULD BE PERMITTED ACCESS TO ANY INTERNAL PARTS. LIVE ELECTRICAL TERMINALS ARE DEADLY; BE SURE LINE DISCONNECT SWITCHES ARE OPENED AND OTHER APPROPIATE PRECAUTIONS ARE TAKEN BEFORE OPENING ACCESS DOORS, REMOVING ENCLOSURES PANELS, OR ATTACHING ACCESSORIES.
DO NOT REMOVE FLEXIBLE HIGH VOLTAGE CABLES FROM X-RAY TUBE HOUSING OR HIGH TENSION GENERATOR AND/OR ACCESS COVERS FROM GENERATOR UNTIL THE MAIN AND AUXILIARY POWER SUPPLIES HAVE BEEN DISCONNECTED.
FAILURE TO COMPLY WITH THE FOREGOING MAY RESULT IN SERIOUS OR FATAL BODILY INJURIES TO THE OPERATOR OR THOSE IN THE AREA.

THIS DOCUMENT HAS BEEN PREPARED AND DISTRIBUTED BY THE MANUFACTURER'S TECHNICAL PUBLICATIONS DEPARTMENT.

ADDRESS INQUIRES REGARDING THIS DOCUMENT TO THE MANUFACTURER

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A. TYPOGRAPHIC CONVENTIONS

In order to facilitate the reading of the manual, different styles and types were used.

The text identified by bullets indicates:
Instructions to be executed according to the sequence specified.

The following icons are also used:

Important information
It is advisable that extra attention be paid in reading the topics identified with this symbol.

WARNING
The topics identified with this icon regard aspects of safety for the patient and/or operator.

A.1. WARNING SYMBOLS ON THE EQUIPMENT

	Warning symbol that indicates potential generic danger for the equipment or the operator. Invite the operator to check the equipment documentation for further details.
	Hazard symbol that indicates X-ray radiation exposure.
	Warning symbol that indicates electrical components which are sensitive to electrostatic discharge.
	Warning symbol that indicates live electrical parts with a possible risk of electric shock.
	General Prohibition sign and template for constructing a prohibition sign NOTE background colour: white, circular band and slash: red Symbol or text:black
	Pushing prohibited
	Sitting prohibited
	Stepping prohibited
	Template for constructing a mandatory action sign NOTE Background colour: blue Symbol or text: white
	General mandatory action sign
	Refer to instruction manual/booklet Note On ME EQUIPMENT “Follow instruction for use”

	Warning symbol that indicates that fingers may be crushed.
	Emergency stop
	Symbol of earth protection.
	Ground
	Symbol of applied part B type.
	Symbol of filtration
	Symbol that indicates electrical and electronic components which must be collected separately.

A.1.1 FUNCTIONING SUPPLEMENTARY SYMBOLS

	Injector
	Fluoroscopy and radiography foot pedal
Peso massimo 6 kg Weight max. 13.3 lbs	Max. weight.
	Housing side – (Grid insertion orientation)

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1. UNIT DESCRIPTION

The remote tilting system has been designed in order to be fully integrated with the HIRIS RF43 and HIRIS RF 43FL Image Processors and the DEIMOS generators line. Each one of these components covers a specific part of the entire process that finally leads to the production of the Medical Image.
The User's documentation has been structured into two separate volumes:

1. Remote tilting system user manual;
2. Hiris RF43 and Hiris RF43FL image processor user manual and service manual of the TECNINT Monitor

As a matter of fact, the instructions written in this manual must be integrated with the operator imaging processor manual directions or with any other accessory used with the remote tilting table.

The operator must read carefully these manual instructions before starting using the remote tilting table and to avoid any possible patient or equipment hazard.

1.1. INTRODUCTION

The system has been designed so that, during the normal use, the operator cannot modify the beam axis position compared to the centre of the image receptors being integrated into the unit. Basically, once the alignment procedure is carried out during the installation of the unit, it will remain constant during normal operation. Such alignment is ensured also in case of tube inclination

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The SYSTEM is a universal 90/90 remote tilting table system with single end support-table top featured by adjustable height, designed for radiographic and fluoroscopic examinations using detector Pixium RF4343 and Pixium RF4343 FL
The special single end support-table top allows full rear access and easy transfer of the patient from the stretcher to the table top and ensures the efficient execution of all interventional procedures.
The longitudinal displacement of the X-ray tube and of the detector assembly of 160 cm, allows a 203x43 cm patient coverage area, thus eliminating the need of repositioning the patient.

The focal distance variation is motorized and allows positioning the x ray tube assembly from the minimum positioning of 115 cm to the maximum of 180 cm. Furthermore, there is the possibility of an x ray tube stopping in each middle position. The compressor is motorized, with a parking position and double safety device (mechanical and electric) with a possibility of a compressor with different shape.
The automatic collimator with square fields shutter is interlocked to the detector size and to the anatomic program selection and it is complete of manual filter for the beam hardening (upon request motorized filters

The patented "grid auto-focusing" bucky avoids manual replacement of the grid each time the FFD is varied

Particularly, the special carbon fibre can be easily removed to allow dose minus level and the device **"AUTOFOCUSING GRID**" avoid and manual replacement in case of focal distance modification.

1.2. SYSTEM COMPOSITION

The system has two different configurations:

The first configuration is made by only one X-ray tube while the second has the opportunity to use a second X-ray tube.

The configuration one is composed by:
1) Remote table Clisis Exel DRF
Tilting base and table top support to a variable height
Stand for X ray tube support
Detector Bucky for Pixium RF4343 and Pixium RF4343 FL
Automatic square field collimator
Integrated console

2) Deimos Generator

3) Varian Tube

4) Pixium RF4343 and Pixium RF4343 FL digital detectors

5) Images digital processor HIRIS RF43 and HIRIS RF43FL

6) Tecnint EM19TFTI/M-II Monitor

As accessories devices it can be add the following

- Wall stand with or without AEC
- Radiotransparent stretcher

In the configuration with TWO TUBES, in addition with the first configuration devices it is possible to use a ceiling suspension and the following additionally accessories:

- Wall stand with or without AEC and with accessories
- Stretcher
- Manual/synchronized Ceiling suspension
- Manual/automatic collimator
- Varian tube
- Lateral cassette holder for remote table
- Tecnint EM19TFTI/M-II Monitor

1.3. ACCESSORIES

The table has common accessory.
As a matter of fact, the unit is delivered with standard accessories that can be replaced only upon request and with a possible price difference. Additionally, there are few optional accessories that must be ordered

COMMON ACCESSORIES

1) HANDGRIP
2) INTERNAL HANDGRIP
3) MOTORIZED COMPRESSOR WITH AUTOMATIC PARKING

STANDARD ACCESSORIES

PROVIDED WITH THE UNIT	**ONLY UPON REQUEST CAN BE REPLACED WITH THE FOLLOWING**
1) AUTOMATIC COLLIMATOR WITH FILTERS	
2) GENERATOR TOUCH SCREEN CONTROL	
3) FOOT REST	3) CARBON FIBER FOOT REST
4) OVER/UNDER FLOOR PLATE	
5) DAP CHAMBER	
6) TOOLS KIT FOR TRANSPORT AND INSTALLATION	

OPTIONAL ACCESSORIES

1)	FLUOROSCOPY/RADIOGRAPY FOOTSWITCH
2)	COLLIMATOR ROTATION FLANGE
3)	COMPRESSION BAND WITH RATCKET
4)	INFUSION SUPPORT
5)	LEGS SUPPORT
6)	ARM SUPPORT
7)	SHOULDERS REST
8)	LATERAL CASSETTE SUPPORT 35X43CM
9)	JOINTED LATERAL CASETTE 24X30CM
10)	TABLE TOP'S MATRESS
11)	PAPER ROLL SUPPORT
12)	INTERPHONE
13)	WEBCAM

1.4. APPLICATION AND INTENDED USE

The SYSTEM cannot be used for:
Dental applications
Cardio angiography
Interventional neuroradiology

The system is a 90/90 remote tilting system designed for radiographic and fluoroscopic examinations. More specifically:

Standard procedures
1. Upper GI including oesophagus, barium swallow, upper GI series and small bowel series
2. Lower GI including barium enema
3. Abdominal including cholangiogram, ERCP, IVU, Tomography and Cholecystography
4. Urogenital including cystogram and hysterosalpingogram
5. Skeletal examinations
6. Paediatrics

NON vascular interventional
1. Needle biopsies
2. Aspirations
3. Injections
4. Needle localization
5. Lumbar punctures

Special & vascular procedures
1. Arthrography including knee, hip, shoulder, wrist, ankle and temporomandibular joint.
2. Chest fluorography
3. Myelography (limited to 20° Trendelenburg angle) including cervical, thoracic, lumbar spine and discography.
4. Phlebography/Venography
5. Femoral angiography

Extra table procedures
1. Chest exposures on external wall bucky
2. Examination on patient laying on stretcher
3. Exposures with cassettes external to the SFD

Additional capabilities
The system has DSA capability

1.5. SAFETY

The Remote Tilting table must be used by qualified personnel, in accordance with the safety instructions contained into this manual and for the sole purposes for which it has been designed.

Since the Table is used in combination with other units, and in case their use compatibility is not declared in the referred units' documentation, the operator is responsible to verify that no dangerous situations may occur for both patients and personnel.
For this scope it is good practice to contact the manufacturer of such units or an expert.

The unit must not be used in case of fault of the proper circuits or fault of the system which it is a part of. Additionally, the unit must not be used in case any alarm device of the whole system is faulty.

Any modification at the unit or at its safety circuits must be approved by GMM spa before it is introduced into the unit.

The Remote-tilting table as any other medical device, must be carefully used and must be subject to periodical maintenance as specified in the technical documentation

1.6. RESPONSIBILITY DECLARATION

GMM spa is responsible for the safety of its products only when their maintenance, repairing or modification is carried out by GMM spa or by personnel being authorised by GMM spa

GMM spa denies any responsibility for improper operation, damages or dangerous situations directly or indirectly caused by improper use of the system or by failure to respect the maintenance rules.

It is responsibility of the hospital personnel to take the proper actions so that the table is used by qualified personnel only, according to the regulations in force.
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1.7. PROTECTION CLASS

This equipment is not classified as anaesthetic-proof and may ignite inflammable anaesthetics

The table is classified as follows:

TYPE of protection against electrical contacts	CLASS I
GRADE of protection against electrical contacts	TYPE B(*)
AGAINST HARMFUL INGRESS OF WATER	ORDINARY
CLEANING AND DISINFECTION	Please refer to section 19
OPERATION IN PRESENCE OF FLAMMABLE ANAESTHETIC MIXTURE WITH AIR OR WITH OXYGEN OR NITORUS OXIDE	FORBIDDEN
MODE OF OPERATION:	FIXED PERMANENTLY INSTALLED CONTINOUS OPERATION WITH INTERMITTENT LOAD
Medical equipment (Directive 93/42 CEE)	CLASS IIb

(*) The classification refers to the applied parts

- Patient table top
- Compression cone

1.8. ELECTRICAL SAFETY

The x-ray system must not be operated in any situation where an explosion hazard may exists.

This equipment is not classified as anaesthetic-proof and may ignite inflammable anaesthetics.

The protection against electrical shocks has been realised grounding all the metal covers of the unit. Therefore it is imperative to periodically check the proper operation of the grounding system of the examination room where the **system** has been installed.

Flammable agents used for skin cleaning or disinfecting may also produce a possible risk of explosion.

You shall make sure that the unit has been switched off and disconnected from mains before carrying out cleaning or disinfecting operations on the unit.

Make sure not to pour on the system conductive liquids that may penetrate inside the unit and jeopardize its functionality and safety

1.9. SAFETY DEVICE FOR COMPRESSION CONE

The presence of this safety device must not reduce the attention of the operator when using the compression cone. In fact:
in procedures involving compression of the abdomen, the operator must take great care to avoid hurting the patient (for example ribs) while using the compression device; it is suggested to previously inform the patient about the effects induced by the compression device and about the rapid movement of the compression cone.

The compression cone assembly has been designed with a special mechanism allowing a very fast removal of the compression cone in case a dangerous situation occurs.
To remove the compression cone the operator must simply operate the safety knee junction of the compression cone arm as indicated in the following figure:

1.10. EMERGENCY SWITCH

Two emergency switches are located on the control desk and SFD keyboard.
Such switches disable the power circuit of the table. In any dangerous situation, or in case a movement cannot be stopped, the operator must hit immediately one of these switches. The power circuit of the table is immediately switched off, but all other units will continue to operate normally.
The emergency switch must be re-enabled only if the operator is absolutely sure that the danger condition has been removed.

If the system has been switched off by means of the emergency switch, it will not be possible to take x-ray exposures. You shall provide proper back up devices to use in case the table is not functioning. You shall provide a backup unit with fluoroscopic capabilities as necessary (i.e. a surgical C-arm).
THE OPERATOR IS HELD RESPONSIBLE FOR DAILY CHECKING THAT THE EMERGENCY SWITCHES ARE WORKING PROPERLY

1.11. ANTI-COLLISION PROTECTION

The remote tilting table is equipped with a software module **preventing** any collision from occurring between the unit and near architectural structures (wall, ceiling and floor).

In addition, in order to achieve a better exploitation of the room space, the movements are decelerated in proximity of the collision point and the last part of the travel is covered at a low speed.

In collision situation on the console remote and on the console of proximity the LED buttons that allow escaping from collision situation will start blinking. These indications stay red until the operator has manually removed the collision situation.

In addition, the most important movements are protected by double level safety circuits. The first level, when activated, disables the movement while the second level power off the motor driver opening the protection magnetic switch. The operator can try to resume the normal operation carrying out the following procedure:

a) Switch the unit OFF.
b) Enable the magnetic switch.
c) Switch-on the unit.

In case this operation does not restore the normal operation of the unit, the operator must call the Service Organisation and avoid any further action.

To prevent accidental collisions with accidental objects it is a good practice to maintain a clear-area around the unit as suggested in the following figure.

Do not stand at the rear side of the patient table top during scanning movements of the tube stand/detector, during tube angulation movements, during table top lateral movements and during table tilting.

During tomography procedures be sure that the patient's arm is supported and secured by the tomography arm holder support as shown in the following figure

1.12. PROTECTIONS AGAINST RADIATION HAZARD

X-ray equipment regulations must be scrupulously complied in order to avoid patients and equipment user hazard.

The Remote Tilting table of the system, allows, in normal operation, the operator to release exposures from a controlled area and it is classified according with IEC601-1-3 as intended for **TYPE B applications**. In this case the primary shield must be designed in such a way that the Kerma in air never exceeds 150 μG per hour.

Only for special diagnostic purpose, like non vascular IVR and peripheral and abdominal DSA, the exposure can be released from a fluoro/exposure footswitch assembly located into the examination room. Refer to the following room layout for identification of significant zone of occupancy:

It is also suggested that proper intercom systems be installed in the examination room in order to simplify the communication between the patient and the operator.

It is responsibility of the customer to provide the installation of such a screen in the way that personnel could be protected against radiation and could have a large view of the patient and of the examination room.
During exposures, all the personnel not involved in the operation of the equipment must leave the examination room or stay behind the protective screens.

In order to protect the patients, the user and any other person against radiation hazard, the regulations for operating X-rays equipment should be scrupulously complied with it.

KEEP THE DISTANCE FROM X-RAY SOURCE

The dose diminishes by the square of the distance; i.e. at a double distance the dose is 1/4 and at a triple distance the dose is 1/9.

KEEP SHORT EXPOSURE TIMES.

The dose increases according to the exposure time; (i.e. half exposure time gives half the dose).
In radiology the exposure value is given in mAs.

WEAR ANTI-X APRONS

The protection value exponentially increases with the thickness of the protection. I.e. a double equivalent protective thickness reduces dose at 1/4; a triple equivalent protective thickness reduces dose to 1/9.

DO NOT GET EXPOSED TO DIRECT RADIATION.

The dose resulting from a direct radiation is approximately 100 times the dose of a secondary radiation. Exposures are generally made standing behind protective shields. For exposures near genitals, assure the most appropriate protection of gonads and ovaries. Persons that stand near the patients during examinations should wear anti-x aprons. This is also valid for Service Personnel. In case of activity in controlled areas, always wear the personal dosimeter

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During beam incidence it is possible that the size of the irradiated area automatically set by the collimator is greater than the Image receptor size.
In this case the size of the irradiated area is automatically corrected to limit at the maximum the irradiated area exceeding the receptor's size.
The operator, under his responsibility, can still reduce the size of the irradiated area enabling the automatic collimator manual mode. The reduction will remain valid during beam angulation until the irradiated area will not exceed the useful size of the image receptor.

Procedures for which the operator must operate close to the patient require the additional use of individual radiation protection devices.
In the following tables have been detailed the size of the occupancy areas with the related levels of the leakage radiation.
It is under the operator's responsibility to make available and use the protection devices necessary to comply IEC 601-1-1: 1994 regulation.

RADIATION LEAKAGE – VALUES MEASURED WITHOUT PROTECTION DEVICES

NOTE:

- The measured is made with a RADCAL 10X5-180 ionization camera, positioned next to the patient table top edge.
- The PMMA phantom is positioned at the middle of the table.
- The X ray field patient table top level dimensions are 18cm x 18cm

1.13. PROTECTIONS AGAINST EXPLOSION HAZARD

This equipment is not classified as anaesthetic-proof and may ignite inflammable anaesthetics. Flammable agents used for skin cleaning or disinfecting may also provoke an explosion hazard.

1.14. RESIDUAL RISKS & ACCIDENT HAZARD

The following topics regard aspects of safety for the patient and/or operator.

The tilting table has been designed conforming to safety principles. Anyway residual risks may still exist during the use of the unit, especially as far as improper use of the unit is concerned. To limit to the minimum all residual risks the following rules should be observed:
For safety reasons, the operator shall not set the unit into operation unless he is sure that neither the patient nor any other person is exposed to hazards due to the operation of the unit.

- Always use shoulder rest and handgrips for patient safety
- Be sure that any mechanical movements of the table top or associated components will not injure the patient’s extremities. In particular be sure that the patient's hands are insight at all times and do not extend around the sides or ends of the table top. A good way to avoid injury to the patient’s hands is to have the patient using the handgrips.
- In procedures involving compression of abdomen, the operator must take great care to avoid hurting the patient (for example ribs) using the compression device.
- A special attention should be paid while tilting the table as collisions could happen with chairs, small tables mounted on casters, film-changer etc.
- The extreme stop limit positions of the column/SFD assembly may be the cause of finger trapping conditions between the spot film device and supports of the table top lateral movement.
- With the patient seated, the longitudinal displacement of the column may cause the collision between the head of the patient and the X-ray tube/collimator assembly or with the compression device when this one is in working position.
- The mechanical relationship between the tomographic bar and the column could provoke fracture hazard. The hands of the patient and of the operator are in danger, especially in case of change of layer height.

- When the column reaches its maximum inclination towards head side and the compressor is in the parking position there is a collision hazard with the inner hand grip which is normally inserted in the accessory guide.
- Before starting any operation, it is suggested to advice the patient about the effects given by the compression device and about the rapid movement of the compression cone.
- The patient must hold the contrast media glass from its support using always the left hand to avoid to interfere with the compression cone movement from / to the parking position

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2. TECHNICAL DATA

The X ray room must be in compliance with the IEC standard

GENERATOR TYPE	DEIMOS 65R/F
Nominal line frequency	50 – 60 Hz
Nominal line voltage	400V triphase
Line voltage tolerance	± 10 %
Power source impedance @ 400V	0.13 Ω
Nominal line current	125A/phase
Line input reactive power	5 A
Line input active power	65 kW
Generator output power	63A automatic switch
GENERATOR TYPE	**DEIMOS 80R/F**
Nominal line frequency	50 – 60 Hz
Nominal line voltage	400V triphase
Line voltage tolerance	± 10 %
Power source impedance @ 400V	0.13 Ω
Nominal line current	141A / phase
Line input reactive power	5 A
Line input active power	80 kW
Generator output power	63A automatic switch

HEAT DISSIPATION

Console	500 kcal/h
Generator cabinet	930 kcal/h
Tilting unit	1000 l/h

2.1 WEIGHT AND DIMENSION

The DEIMOS R & R/F power circuits are included into a metal cabinet having the following weight and dimensions:

	DEIMOS CABINET		
	BASE	**HEIGHT**	**WEIGHT**
Cabinet with H V transformer	55 x 45 cm.	130 cm	100 kg.

The system is sent following the Packing List attached to each unit.

Unit weight (without patient) Kg. 1.300
Over floor plate weight Kg. 180

The unit dimensions are shown in the following figures:

255
1950
3005
412,5
1620
2460

40°
40°
MIN 520
MAX 1320

650
MIN F.D. 1150
MAX F.D. 1800
93 TBT / DETECTOR
1928

2525
495
100 min
327,5
2115

MAX. 2065
MAX 535
MIN 235
150
732
150
2345 PANEL RADIO TRASPARENT AREA
2435

2.2 TABLE PERFORMANCE CHARACTERISTICS

TABLE	
Dimensions	2435 mm. x 732 mm.
Radio transparent area	2345 mm. x 520 mm
Max. patient's weight (IEC 601-1)	250 kg.
Carbon fibre table top filtration	0.7 mm. Al/eq @ 100 kV
Table top minimum height	520 mm.
Table top vertical travel	800 mm.
Table top – Detector distance	93 mm.
Lateral travel	±150 mm
Transversal travel speed	Stepless from 0 to 30 mm/s
Max table top rear access distance	Max. 520 mm
Max angle of Trendelenburg	-90°
Max angle of tilting	+90°
Tilting speed	4,5 °/s

X-RAY TUBE COLUMN	
Longitudinal travel (tube only)	1950 mm
Longitudinal travel with detector	1620 mm
Useful radiography area	2050 x 822 mm
X-ray tube column longitudinal speed	Stepless from 0 to 150 mm/s
Beam inclination	± 40 °
Focus / Film min distance	1150 mm
Focus / Film max distance	1800 mm
FFD movement speed	35 mm/s.
Beam/floor min distance (tilt= +90))	327,5 mm
Beam/floor max distance (tilt= +90)	2115 mm
Beam/table edge min distance	285 mm
X-Ray tube rotation with 90° detents	± 180 °

COMPRESSION CONE	
Travel range (in field)	26 cm.
Incidence operating range	±20° or ±5° from starting angle
Max compression force	10.0 kg.

DETECTOR BUCKY	
Detector bucky description	Potter bucky for dynamic flat panel detector including GRID Auto- focusing device
Detector model	Trixell Pixium RF4343 and Pixium RF4343 FL
Useful area	43 x 43 cm
Detector cover material	Carbon fibre
Detector cover filtration	< 0,3 mm Al/eq
Grid	Carbon fibre
Ratio	12:1
Lines	80 l/cm
Grid focalization	from 110 to 180 with " AUTO-FOCUSING GRID " device" (automatic grid)
Grid removal possibility	Yes. Manual removal

COLLIMATOR AL	
Maximum H.V.	150 kVp
Square field coverage at FFD=100cm	43 x 43 cm
Operative FFD	100 – 200 cm (of the collimator alone)
Minimum collimation area (IEC 60601-1-3)	< 5 x 5 cm (in the image plane)
Inherent filtration (IEC 60601-1-3)	1.5 mmAl/eq, @75 kVp
Leakage radiation (IEC 60601-1-3)	< 1mGy/h (including tube assembly)
Optional additional filters	0.1 mm Cu + 1mm Al (equivalent filtration 4.5 mm Al at 75kVp) 0.2 mm Cu + 1mm Al (equivalent filtration 7.8 mm Al at 75kVp) 0.3 mm Cu + 2mm Al (equivalent filtration 13.6 mm Al at 75kVp)
Simulation lamp	LED, 5W
Average illumination (IEC 60601-1-3)	> 100 lx FFD =100cm
Light field edge contrast ratio (IEC 60601-1-3)	> 4 FFD =100cm
Light field vs X-ray field accuracy	< 1.8% FFD
X-ray field vs receptor size accuracy	< 2.8% FFD
Indicated field vs X-ray field accuracy	< 1.8% FFD
FFD indication accuracy	< 1.8% FFD

TOMOGRAPHY (OPTIONAL MODULE)	
Tomography type	Parallel plane tomography
Focus /Film distance	1150 mm
Angles	8° - 20° - 30° - 40°
Tomo Exposure times	8° = 0,4 s
	20° = 1,0 s
	30° = 1,5 s
	40° = 2,0 s
Fulcrum adjustment (layer cut)	0 - 300 mm
Adjustment stepS	± 1 mm
Fulcrum automatic increment/decrement sequences .	

TOMOSINTHESIS	
Focus /Film distance	MIN: 1150 mm MAX:1650 mm
Angles	20° - 30° - 40°
Tomosinthesis Exposure times	8 sec
Fulcrum adjustment (layer cut)	0 - 300 mm
Adjustment stepS	± 1 mm

2.3 DEIMOS GENERATOR PERFORMANCE CHARACTERISTICS

DEIMOS 65 - 65 kW– PERFORMANCE CHARACTERISTICS	
Nominal tube voltage	From 40 to 150 kV in 1 kV step
Tube current	For 10 to 800 mA
Maximum output power	65 kW (103 kV, 630 mA) or (81 kV, 800 mA)
Minimum mAs value	0.5 mAs (200 mA, 0.002 sec)
Maximum mAs value	1.000 mAs (Tube dependent)
mA range	From 10 to 800 mA in 20 steps 10, 12,5, 16, 20, 25, 32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 320, 400, 500, 630, 800 mA
Exposure time range	From 1.0 to 6300 ms in 39 steps 1.0, 1.2, 1.6, 2.0, 2.5, 3.2, 4.0, 5.0, 6.3, 8.0, 10.0, 12.5, 16.0, 20, 25, 32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 320, 400, 500, 630, 800, 1.000, 1.250, 1.600, 2.000, 2.500,3.200, 4.000, 5.000, 6.300 ms

DEIMOS 80 – 80 kW– PERFORMANCE CHARACTERISTICS	
Nominal tube voltage	From 40 to 150 kV in 1 kV step
Tube current	For 10 to 1000 mA
Maximum output power	80 kW (100 kV, 800 mA) or (80 kV, 1000 mA)
Minimum mAs value	0.5 mAs (200 mA, 0.002 sec)
Maximum mAs value	1.000 mAs (Tube dependent)
mA range	From 10 to 1000 mA in 21 steps 10, 12,5, 16, 20, 25, 32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 320, 400, 500, 630, 800, 1000 mA
Exposure time range	From 1.0 to 6300 ms in 39 steps 1.0, 1.2, 1.6, 2.0, 2.5, 3.2, 4.0, 5.0, 6.3, 8.0, 10.0, 12.5, 16.0, 20, 25, 32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 320, 400, 500, 630, 800, 1.000, 1.250, 1.600, 2.000, 2.500,3.200, 4.000, 5.000, 6.300 ms

2.4 MONITOR TECNINT PERFORMANCE CHARACTERISTICS

MONITOR TECNINT – PERFORMANCE CHARACTERISTICS	
SCREEN	
Screen type	19” B/N LCD-TFT Panel
Resolution	1280x1024pixel
Viewing angle	H ±85°; V ±85°; CR ≥ 10
Panel Class (UNI EN ISO 13406-2 : 2002 §3.4i3 /ref. ISO 13406-2 :	Class I
2001)	
Viewable area	376 x 301mm
Contrast ratio	900:1 typ.
White temperature	9300°K typ.
SCAN RANGE	
Horizontal frequency	15-81KHz
Vertical frequency	50-120Hz
Preset timings:	640x480 @ 60; 75Hz
all adjustable by user)	800x600 @ 60; 75Hz
	1024x768 @ 60; 75Hz 1280x1024 @60; 75Hz
VIDEO AMPLIFIER	
Inputs	VGA (linear) / DVI (digital) /
Composite/Composite with filter 30MHz	
Input connectors	D-Sub 15p. HD ; DVI-D; 2x BNC (B/N
composite)	
Input sensitivity	700mVB-N(VGA), 1Vpp composite signal
Input impedance	75Ω
HS & VS input	TTL (10KΩ)
Video Bandwidth	330MHz (140MHz max. pixel clock)
Greyscale levels	256 x 3 = 768 (VGA/DVI)
o 256 (opt. Video Composite)	
Loop-through (BNC only - on request)	-
Composite sync (*)	Yes
Sync-On-Video (*)	Yes
(*) V-sync with serration/eq pulses	
POWER SUPPLY	
Mains voltage	110-240V~ 50-60Hz
Power consumption	60W / 115VAmax
Power inlet	CEE22 with 2 fuses
Power switch	“Soft switch”
OTHER FEATURES	
- Controls	Via OSD - (On Screen Display) and front
keyboard	
- Language support	Italiano/Deutsch/English/Français/Русски
- ALC (Ambient Light Compensation)	From OSD
- Light stabilisation	“**Stabilight**” (600 nit)(*)

2.5 STANDARDS COMPLIANCE

The remote tilting table is classified as:

MEDICAL EQUIPMENT CLASS IIb (Directive 93/42 CEE)

The remote tilting table has been designed to comply with the following Standards and Regulations:

EN 60601-1: 2006
EN 60601-1-2: 2007
EN 60601-1-3: 2008
EN 60601-1-6: 2010
EN 60601-2-28: 2010
EN 60601-2-54: 2009
EN 62304: 2006
EN 62366: 2008
EN 60336: 2005
EN 60613: 2010

THE REMOTE TILTING TABLE IS CE CERTIFIED (0051).

2.6 COMPATIBILITY WITH OTHER ACCESSORIES

Should the Table be used in combination with other units, which compatibility is not declared in the relevant unit documentation, the operator will be responsible for verifying that no dangerous situation may occur, involving both patients and personnel. For this purpose, it is good practice to contact the manufacturer of the unit or an expert.

THE X-RAY TUBE AND THE DETECTOR SUPPORTS HAVE BEEN DESIGNED IN ORDER TO ENSURE COMPATIBILITY WITH THE ACCESSORIES LISTED IN THIS SECTION.DO NOT ADD ANY OTHER COMPONENTS THAT INCREASES THE MECHANICAL STRESS OF THE SUPPORTS. PLEASE CONTACT GMM CUSTOMER SUPPORT IN CASE OF TUBE/TUBE HOUSING COMBINATIONS THAT ARE NOT INCLUDED IN THE ABOVE LIST.

The remote tilting table has been designed and tested in order to fully comply with the regulations specified in section 2.6 when connected with the following X-ray sub-systems:

X-RAY TUBES AND TUBE HOUSINGS

Varian → All tubes in B130 Housing
Dunlee →All tubes in PX1400 Housing
GMM →All tubes in C52 Super Housing

X-RAY GENERATORS
GMM DEIMOS RF (All Models)

IMAGE SYSTEMS
HIRIS RF43 and HIRIS RF43 FL DIGITAL IMAGE PROCESSOR
TECNINT MONITOR LCD screen, black and white monitor, 1280x1024 pixel, particularly suitable to be used with medical systems

2.7 ELECTROMAGNETIC COMPATIBILITY

The unit is in compliance with the IEC 60601-1-2:2007 “Medical electrical equipment – Part 1-2: General requirements for safety – Collateral Standard: Electromagnetic compatibility – Requirements and tests” rule

Rule	Date	Title
CISPR 11 Consolidated ed. 1.4	2004	Industrial, scientific and medical (ISM) radio-frequency equipment. Radio disturbance characteristics – Limits and methods of measurement.
CISPR 14-1	2005	Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus. Part 1: Emission – Product family standard.
Cispr 15 A1 A2	2005 2006 2008	Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.
CISPR 22 A1	2005 2005	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement.
IEC 61000-3-2	2005	Electromagnetic compatibility (EMC). Part 3: Limits. Section 2: Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).
IEC 61000-3-3 Consolidated ed. 1.2	2006	Electromagnetic compatibility (EMC) Part 3: Limits Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤16A.
IEC 61000-4-2 A1	2002 2002	Electromagnetic compatibility (EMC) Part 4: Testing and measuring techniques Section 2: Electrostatic discharge immunity test - Basic EMC Publication
IEC 61000-4-3 Consolidated ed. 3.1	2008	Electromagnetic compatibility (EMC) Part 4: Testing and measuring techniques Section 3: Radiated, radio-frequency, electromagnetic field immunity test - Basic EMC Publication
IEC 61000-4-4	2004	Electromagnetic compatibility (EMC) Part 4: Testing and measuring techniques Section 4: Electrical fast transient/burst immunity test - Basic EMC Publication
IEC 61000-4-5 Consolidated ed. 2.0	2005	Electromagnetic compatibility (EMC) Part 4: Testing and measuring techniques Section 5: Surge immunity test - Basic EMC Publication
IEC 61000-4-6 Consolidated ed. 2.2	2006	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques. Section 6: Immunity to conducted disturbances, induced by radiofrequency fields - Basic EMC Publication
IEC 61000-4-8 Consolidated ed. 1.1	2001	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 8: Power frequency magnetic field immunity tests
IEC 61000-4-11	2004	Electromagnetic compatibility (EMC) Part 4: Testing and measuring techniques. Section 11: Voltage dips, short interruptions and voltage variations immunity tests - Basic EMC. Publication
ANSI C63.18	1997	American National Standard Recommended Practice for an On-Site, Ad Hoc Test Method for Estimating Radiated Electromagnetic Immunity of Medical Devices to Specific Radio-Frequency Transmitters

NOTE: in compliance with Annex FFF of EN 60601-1-2:2007 all references are made to the latest edition of the relevant publications.

The **CLISIS EXEL DRF** is intended for use in the electromagnetic environment specified below. The customer or the user of the **CLISIS EXEL DRF** should assure that it is used in such an electromagnetic environment.		
Emissions test	**Compliance**	**Electromagnetic Environment**
RF emissions CISPR 11	Group 1	This **CLISIS EXEL DRF** uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	This **CLISIS EXEL DRF** is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes
Harmonic emissions IEC 61000-3-2	Not applicable	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Not applicable	

The **CLISIS EXEL DRF** is intended for use in the electromagnetic environment specified below. The customer or the user of the **CLISIS EXEL DRF** should assure that it is used in such an environment.			
Immunity Test	**IEC 60601-1-2 Test level**	**Compliance level**	**Electromagnetic Environment**
Electrostatic discharge (ESD) IEC 61000-4-2	6 kV contact 8 kV air	IEC 60601-1-2 Test level	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	2 kV for power supply lines 1 kV for input/output lines > 3 m	IEC 60601-1-2 Test level	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	1/0.5 kV differential mode 2/1/0.5 kV common mode	IEC 60601-1-2 Test level	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	0% U_n for 0.5 cycles 40 % U_n for 5 cycles 70 % U_n for 25 cycles 0 % U_n for 5 s	IEC 60601-1-2 Test level	Mains power quality should be that of a typical commercial or hospital environment. If the user of the **CLISIS EXEL DRF** requires continued operation during power mains interruptions, it is recommended that the **CLISIS EXEL DRF** be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	IEC 60601-1-2 Test level	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Non-LIFE SUPPORTING EQUIPMENT

The **CLISIS EXEL DRF** is intended for use in the electromagnetic environment specified below. The customer or the user of the **CLISIS EXEL DRF** should assure that it is used in such an environment.			
Immunity Test	**IEC 60601-1-2 Test level**	**Compliance level**	**Electromagnetic Environment**
			Portable and mobile RF communications equipment should be used no closer to any part of the **CLISIS EXEL DRF,** including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter **Recommended separation distance**
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m Spot frequencies	$d = 1.2 \times \sqrt{P}$ 80 MHz to 800MHz $d = 2.3 \times \sqrt{P}$ 800 MHz to 2.5GHz
Conducted RF IEC 61000-4-6	3 V 150 kHz to 80 MHz	3 V 150 kHz to 1 GHz	$d = 1.2 \times \sqrt{P}$
			Where *P* is the maximum output rating of the transmitter in watts (W) according to the transmitter manufacturer and *d* is the recommended separation distance in meters (m). Field strengths for fixed RF transmitter, as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range Interference may occur in the vicinity of equipment marked with the following symbol:
NOTE 1: at 80 MHz and 800 MHz, the higher frequency range applies. NOTE 2: these guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people. NOTE 3: according to sub-clause 6.2.3.2.i) of IEC 60601-1-2:2007, in the range 80 MHz to 2.5 GHz at frequencies designated by the ITU for ISM use, testing is performed using the ambient RF sources.			

Recommended Separation Distance for non-LIFE SUPPORTING EQUIPMENT

The **CLISIS EXEL DRF** is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the **CLISIS EXEL DRF** can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the **CLISIS EXEL DRF** as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of the transmitter (W)	**Separation distance according to frequency of transmitter (m)**		
	150KHz to 80MHz $d = 1.2 \times \sqrt{P}$	**80MHz to 800MHz** $d = 1.2 \times \sqrt{P}$	**800MHz to 2.5GHz** $d = 2.3 \times \sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at the maximum output power not listed above, the recommended separation distance *d* in meters (m) can be estimated the equation applicable to the frequency of the transmitter, where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.
NOTE 1: at 80MHz and 800MHz, the separation distance for the higher frequency range applies.
NOTE 2: these guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

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3. UNIT IDENTIFICATION

3.1 IDENTIFICATION & WARNING LABELS

The unit is completely identified as shown in the following figures:

UNIT IDENTIFICATION

TABLE 1 of 2

F1	10.3 x 38 aM 1 A 500 V ~
F2	10.3 x 38 aM 1 A 500 V ~
F3	10.3 x 38 aM 2 A 500 V ~
F4	10.3 x 38 aM 10 A 500 V ~
F5	10.3 x 38 aM 12 A 500 V ~
F6	10.3 x 38 aM 2 A 500 V ~
F7	10.3 x 38 aM 6 A 500 V ~
F8	10.3 x 38 aM 1 A 500 V ~
F9	10.3 x 38 aM 10 A 500 V ~
F10	10.3 x 38 aM 10 A 500 V ~
F11	10.3 x 38 aM 1 A 500 V ~
F12	10.3 x 38 aM 4 A 500 V ~
F13	10.3 x 38 aM 2 A 500 V ~
F14	10.3 x 38 aM 4 A 500 V ~

(*) only with manual filters
(**) with laser option

LEGENDA :

Pos.	Description
1	Brand or distributor's logo
2	Brand or distributor's name and address
3	Manufacturer's name and address
4	Product name (as per EC certificate)
5	Code or name of reference (internal use)
6	Serial number
7	Production date
8	Power supply data
9	Additional data feed and / or product characteristics
10	Space reserved for product certifications
11	Additional data feed and / or product characteristics

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4.3. USE AND CONDITIONS 2

4. STORAGE AND USE

This equipment is not classified as being anesthetic-proof and may ignite inflammable anesthetic.

4.1. PACKING	
The unit is supplied according to the shipping documents delivered with every unit.	
4.2. STORAGE AND SHIPPING CONDITIONS	
STORAGE TEMPERATURE	from -5°C to +60°C
STORAGE HUMIDITY	80% non condensing
ATMOSPHERIC PRESSURE	500 ÷ 1060 hPa
4.3. USE AND CONDITIONS	
ENVIROMENTAL TEMPERATURE	From +15°C to +40°C
ENVIROMENTAL HUMIDITY	80% non condensing
ATMOSPHERIC PRESSURE	500 ÷ 1060 hPa

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5. ROOM PRELIMINARY REQUIREMENTS

5.1. FOREWORD

The remote tilting table can be installed in a room that has been officially approved for the operation of radiological equipment of the same class.

In addition, proper operation of the unit can be achieved only if the environmental characteristics specified in the following sections are strictly observed.

ENSURE THAT THE CONSTRUCTION AND LOAD CAPABILITY OF THE FLOOR ARE SUFFICIENT FOR THE INSTALLATION OF THIS EQUIPMENT.
ENSURE THAT THE CENTRAL GROUND TERMINAL OF THE ROOM HAS A RESISTANCE IN ACCORDANCE WITH THE REGULATIONS IN FORCE.
ENSURE THAT THE ROOM LINE INPUT IS PROTECTED BY MEANS OF A DIFFERENTIAL BREAKER CALIBRATED FOR A MAXIMUM LEAKAGE CURRENT OF 30mA.
ENSURE THAT THE ROOM EMERGENCY CIRCUIT IS PRESENT AND DESIGNED IN ACCORDANCE WITH THE REGULATIONS IN FORCE.
FAILURE TO COMPLY WITH THIS WARNING MAY CAUSE SERIOUS OR FATAL BODILY INJURY AND DEGRADE THE UNIT SAFETY LEVEL

5.2. ACCESSORIES FOR INSTALLATION

In order to properly install the remote tilting table, the use of special accessories for the installation might be necessary. The accessories to be used depend on the room constructions and should be ordered before the installation starts.

- Unit installation dollies
- Unit over floor installation plate
- Unit under floor installation plate
- Unit tube arm self locking nut fixation tool

5.3. ROOM REQUIREMENTS

The unit has been designed to operate in a room respecting the following environmental conditions:

Environment temperature	from +15°C to +40°C
Environment humidity	80% non condensing

In addition to the above, the following rules must be observed:

1. The construction and load capability of the ceiling are sufficient for the installation of the unit.

2. The floor is level or can be compensated

3. Precautionary measures have been taken to prevent scatter radiation from entering other rooms and/or hallways and that all exposed walls are lead-lined.
   In particular the Hospital physicians should approve the room layout before the installation starts.

4. Sufficient consideration has been given to the room layout with respect to minimum clearances between walls and the equipment as specified in the unit manual.

5. Carefully evaluate the best fixation system to be use for the ceiling rails as described in the following layout example.

6. It is good practice to install an intercom system to ease the communication between the patient and the medical staff.

Do always carefully check the **packing list** to verify the unit assemblies boxes that have been sent

The unit can be shipped in a whole lot that can be maneuvered through a 120-cm doorway.

In case of 120-cm doorway the table main frame will require about 1.75-mt. minimum hallway width to allow negotiating turns.

The unit can be divided into few assemblies, in most cases the two major assemblies could be maneuvered through a 100-cm doorway.
The most limiting item is the table main frame will require about 1.85-mt. minimum hallway width to allow negotiating turns.

In case of 120cm doorway in this case the table main frame will require about 1.75-mt. minimum hallway width to allow negotiating turns.

The dimensions and weights of the two assemblies are listed in the following figures:

In case the unit is shipped into two pieces, please find sizes and weight in the following pictures:

WARNING: ROOM HEIGHT REQUIREMENTS

The minimum allowed room height, with standard 20 mm base spacer is 2600 mm as shown in the following figure.

In case the unit must be installed using a different base spacer, the room minimum height requirement must be increased of the same quantity.

2525
495
100 min
327,5
2115

A typical room layout could be the following one:

4850
Place the underfloor plate so that the cables IN is as shown in the drawing.
Cable IN
255
1600
Clisis Support Area. Floor coating free zone.
1600
1550
4850
UNIT WEIGHT = 1300Kg
LOADING AREA = 2.60mq
PLATE WEIGHT = 80Kg
FLOOR LOADING = 500Kg/mq
SEE "B" DETAIL
SP.
(UNDERFLOOR CLISIS PLATE FIXING)
Cable IN
Clisis Exel Support Area. Floor coating free zone.
10
Floor coating free zone.
465
1330
A
A
1600
1600
50
Room floor coating
Floor coating free zone.
Room floor coating
sez. A - A
Clisis Exel underfloor plate at floor level fixed and covered with the same floor material.
Modifiche
Rev
Data
descrizione modifica
Firma
scala
Denominazione
EIDOS RF439 SYSTEM
INSTALLATION EXAMPLE
(UNDERFLOOR CLISIS PLATE FIXING)
offerta:
del:
data
firma
visto
MECALL
Via Negrelli, 55 LISSONE (ITALY)
Tel.(039)483.249-484.884-464.841 Fax 039/464819
disegno n°
Rev

4850
Place the overfloor plate so that the cable IN is as shown in the drawing.
250
Cable IN
1500
1100
1700
UNIT WEIGHT = 1300Kg
PLATE WEIGHT = 180Kg
TOTAL LOAD = 1480Kg
LOADING AREA = 1.90mq
FLOOR LOADING = 780Kg/mq
BOLTS M12x100 CL 8.8
"SLM12" ANCHORS - FISCHER
SEE "C" DETAIL
4850
SP.
(OVERFLOOR CLISIS PLATE FIXING)
Cable IN
12
1100
n° 8 over-floor plate fixing point
1700
"C" DETAIL
Modifiche
Rev
Data
descrizione modifica
Firma
scala
Denominazione
EIDOS RF439 SYSTEM
INSTALLATION EXAMPLE
(OVERFLOOR CLISIS PLATE FIXING)
offerta:
del:
data
firma
visto
MECALL
Via Negrelli, 55 LISSONE (ITALY)
Tel.(039)483.249-484.884-464.841 Fax 039/464819
disegno n°
Rev

5.4. SYSTEM CABLES

The remote tilting table must be completed with a special set of cables that allows the proper operation of the additional accessories.
Because each installation has its own typical layout, in this section are detailed the lengths of the standard cables supplied with the systems, showing also the correct way to route the cables.
In case during the design of the room layout, it is necessary to modify the standard length of a group of cables, it is responsibility of the installer to clearly specify this configuration change.
In this section has been also added the system interconnection diagrams for the most complete configuration supported by the table. Such drawings show all physical connections between the internal parts of the remote tilting table and the system itself with other accessories.
For additional information the installer must refer to section 6 of this manual.

Before starting the installation, it is necessary for the installer verify that all accessories or interface cables are present and delivered in the lengths defined during the room layout design phase.

CABLES LENGTH		
FROM	TO	STANDARD LENGTH
D	B	20 meters – operational lenght 12m
E	B	8 meters
E	D	12 meters
E	A	10.5 meters
A	C	16 meters – operational lenght 4m
E	C	4 meters
F	G	15 meters – operational lenght 11
E	G	3.5 meters
D	H	15 meters – operational lenght 12
D	L	15 meters – operational lenght 12
F	C	15 meters – operational lenght 12
D	C	20 meters – operational lenght 17

INTERCONNECTION
30m
PDB
15m
15m
UPS
1.8m
25m/11m*
GC
16m/4m*
15m/11m*
15m/11m*
20m/12m*
IPC
25m/10m*
25m/14m*
WS
15m/12m*
15m/12m*
TC
MC
PDB Power Distribution Box
UPS Uninterrupted Power Supply
GC Generator Cabinet
IPC Image Processor Cabinet
WS Wall Stand
TC Table console
MC Monitor Cart
.....m - Total length
.....m* - Usable length

5.5. BASE PLATE INSTALLATION

The remote tilting table must be fixed to the floor using three different methods:
Direct fixation of the unit base to the floor

This fixation method is allowed when the floor loading capability is greater than 2170 kg/m² (unit weight = 1300 Kg; patient weight= 250 Kg; loading area = 0,60 m²) and the fixation must be done as detailed in the following figure:

Before starting the installation, it is necessary for the installer verify that all accessories or interface cables are present and delivered in the lengths defined during the room layout design phase.

It is responsibility of the installer to select the fixation method that grants the correct unit anchoring in function of the constructive characteristics of the floor itself.

Use of the under floor installation plate

In case the load capability of the floor is lower than 2300 kg/m² it is possible to use the optional load distribution base p/n XSAB02 that must be ordered with the unit. With this base the floor loading capability must be greater than 620 kg/m² (unit weight = 1300 Kg; patient weight= 250 Kg; loading area = 2,60 m²). In order to correctly the base plate the installer will be responsible to:

1. Remove the upper part of the floor for a minimum area of 2200 x 1700 mm:
2. Make sure that the floor surface on the bottom side of the base plate is rugged enough to grant a proper grip of the concrete.
3. Make sure that the base plate is accurately leveled with the upper plate aligned with the finished surface of the floor as detailed in the following drawing.
4. If required, fix the base plate to the floor using M12 screws as detailed in the following drawing;
5. Insert M12 screws in the unit fixation holes to prevent the possibility that the concrete could obstruct the eight unit fixation holes.
6. Pour the concrete with a ration between cement and sand in a 1:2.5 ratio.

Use of the over floor installation plate

This fixation method is recommended when the floor depth is not enough to allow the installation of the under floor installation plate and/or the floor of the room is not strong enough to bear the entire system weight laying on the table base. In this case the installer must use the optional over floor installation plate p/n XSAB01 to distribute the weight on a larger surface and to offer a better and easier fixation to the floor as detailed in the following figure:

It is responsibility of the installer to grant the correct anchoring of the base plate in function of the constructive characteristics of the floor itself.

5.6. SYSTEM GROUNDING

All the control electronics of the remote tilting table has the 0V grounded.
It is consequently clear that a grounding error in the installation or a ground connection made with a cable of inadequate section may degrade both reliability and safety level of the unit.

The following rules must be observed for a correct grounding:

1. Check that the central ground terminal in the examination room has the characteristics specified in the safety norms of the country. In particular a ground resistance lower than 2 Ω is suggested.

2. Connect the central ground terminal directly to the central ground terminal of the power distribution box by means of a 4 mm² singe conductor if the distance is less than 10 m. The cable section must be increased proportionally in case of higher distances.

3. Connect all ground internal cables only to the central ground terminal of the unit located in the upper side of the power cabinet as shown in the following figure. Make sure that the brass fixation screws has been properly tightened

4. Do not add other ground connections that might involve sections of the system, in order to avoid the possibility to cause ground loops.

I

5.7. INPUT LINE AND EMERGENCY CIRCUIT

The remote tilting table requires the connection to a single-phase line with the following characteristics:

STANDARD INSULATION TRANSFORMER

Line Voltage	380 / 400V 3-phase
Line Voltage tolerance	± 10 % (absolute max. rating)
Line frequency	50 Hz – 60 Hz
Line frequency tolerance	± 2 %
Stand-by power	600 VA
Peak power	4.000 VA

The standard configuration of the units includes the 380 / 400V 3-phase insulation transformer. In case the line voltage is different from the standard one, the installer refer to section 5.8 for further information.

If possible, it is also a good norm to apply the following rules for the line connection:

1. The input line must be totally independent from any other lines that might create interference.
2. The main line cable is laid in conduit separate from the cable conduit.
3. The section of the line cables must be minimum 4.0 mm.
4. In case the input line characteristics does not match the requirements it is a good practice to install a line conditioner.

The input line cable must be connected at the power cabinet line terminals, as detailed in the following figures.

The line voltage selection can be achieved by modifying the wiring of the insulation transformer and of the auxiliary transformer as shown in the figure:

IMPORTANT NOTICE FOR THE INSTALLER:
The table line input must be protected by means of a safety switch, calibrated for a maximum leakage current of 30 mA.

The unit can be disconnected from the input line turning in OFF position the line switch mounted on the front panel of the power cabinet as shown in the following figure:

The room power distribution box must be designed not only to meet the technical requirements previously specified but also to comply with the requirements of the x-ray generator and of the image processor (for more details see the related service documentation). In particular, the general requirements of the room input line is:

Line Voltage	400V 3-phase
Line Voltage tolerance	± 10 % (absolute max. rating)
Line frequency	50 Hz – 60 Hz
Line frequency tolerance	± 2 %
Power source impedance @ 400V	0.20 Ω
Line input reactive power	120 kVA
Line input active power	100 KW
Stand-by power	300 VA
Peak power	2.000 VA

THE ROOM POWER DISTRIBUTION CIRCUIT, DESCRIBED IN THE FOLLOWING PAGES, MUST BE USED BY THE INSTALLER AS GUIDE LINE FOR ANY SITE SPECIFIC DESIGN.
The remote tilting table is also equipped with two emergency switches located on the control desk and SFD keyboard. Such switches can be used to disable the room power circuit or simply power off the table. The selection of the modality must be done by the installer setting the position of the rotary switch SW18 mounted on the unit control board as detailed in the following figure:

In particular the available settings are:

Position1	**Emergency switches by pass.** In this modality, this unit system serial emergency switches contact is forced Normally Closed.
Position 2	**Emergency switches <u>external</u> mode** In this modality, this unit system serial emergency switches contacts is available at **CN106.1** and **CN106.2** terminals. This contact **should be** wired in serial with the room emergency circuit.
Position 3	**Emergency switches <u>internal</u> mode** In this modality this unit system serial emergency switches, when activated, power off only the table itself. In this case **CN106.1** and **CN106.2** terminals the **can not** be wired in serial with the room emergency circuit.

In any dangerous situation, or in case a movement can not be stopped, the operator must hit immediately one of these switches. The power circuit of the table is immediately switched off, but all other units will continue to operate normally.

The emergency switch must be re-enabled only if the operator is absolutely sure that the danger condition has been removed.
The emergency circuit of the room power distribution circuit must be connected to terminals CN106.1 and CN106.2 of the system power cabinet as shown in the following figure:

IMPORTANT NOTICE:
THE EMERGENCY CIRCUIT IS DESIGNED TO BE CONNECTED TO A 24V ac/dc CIRCUIT WITH A MAXIMUM CURRENT FLOW OF 1A. THE CONNECTION OF THE CN106.1 AND CN106.2 TERMINALS WITH AN HIGHER VOLTAGE AND/OR CURRENT FLOW COULD PRODUCE SERIOUS FAULT OF THE CONTROL CIRCUITS
THE INSTALLER IS RESPONSIBLE FOR THE PROPER OPERATION OF THE EMERGENCY SWITCH.

ITEM	IDENTIFICATION			LINE IN MAIN SWITCH		ON/OFF CIRCUIT		INTERNAL POWER		UPS E.P.O.	UPS POWER SUPPLY (DETECTOR / DIGITAL)		ROOM CONTACTOR		ROOM "IN USE" LAMP		X-RAY GENERATOR	
	REFERENCE																	
	TYPE	TOTAL POWER	kW	TT		TT/L1-N		TT/L1-N			TT/L1-N		TT		TT/L1-N		TT	
	POWER kW	Ib	A															
	TEMP. COEFF.	COS Ø																
SWITCH OR MAGNETIC SWITCH	MANUFACTURER			SIEMENS		SIEMENS-LEGRAND		LEGRAND			SIEMENS-LEGRAND		SIEMENS		SIEMENS		SIEMENS	
	TYPE			5TE8 714		5SY6206-7					5SY6216-7 + 5SM2322-6				5SY6206-7 + 5SM2322-6		5SY6463-7+5SM3346-4	
	N° CONTACTS	In	A	4	100	2	6	2	25		2	16			2	6	4	63
	Ith A	Idn	A			6					16	0.03			6	0.03	63	0.03
	Im (o curve) A	Pdi	kA			60	6				160	6			60	6	630	6
FUSE	TYPE			3NW7261		05828 2Px25A		05828										
	VALUE		A	80 aM		2 aM		4 aM										
CONTACTOR	TYPE										3RT1026-1AL20		3RT10 44-1AP04					
	In A	Pn	kW										3x80	45				
ACCESSORY	TYPE																	
	VALUE		V															
POWER LINE	CABLE TYPE			N07G9-K		N07G9-K		N07G9-K		N07G9-K	N07G9-K		N07G9-K		N07G9-K		N07G9-K	
	ASSEMBLING			4x(1x35)		2x(1x1,5)		2x(1x1,5)		2x(1x1)	2x(1x2,5)		4x(1x35)		2x(1x1,5)		4x(1x16)	
	LENGHT		m	1		1		1		1	1		1		1		1	
	Iz		A															
	C.d.T. a In	C.d.T. a Ib	%															
	Zk mê	Zs	mê															
	Ik kA	Ik1	kA															
TERMINAL NUMBER				L1,L2,L3,N						7,8,9	R1N1 - R2N2				R3N3		R4S4T4N4	

Committente/Impianto

MECALL S.R.L. VIA NEGRELLI, 55 - LISSONE (MI)
QUADRO ELETTRICO SALA DIGITALE / TELECOMANDATA

Denominazione

SCHEMA UNIFILARE
QUADRO ELETTRICO SALA DIGITALE / TELECOMANDATA

Dis. N° IMP010

Rev. N° 00

Data Rev. 30/04/2014

SIRCM s.r.l.

Via Cardinal Ferrari n°9
20844 - Triuggio (MB)
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FOGLIO 1

SEGUE 2

CON

ITEM	IDENTIFICATION			MAIN DIFFERENTIAL PROTECTION		REMOTE TILTING TABLE		RADIOGRAPHIC SYSTEM (STANDARD TABLE)		MURAL BUCKY		CEILING SUSPENSION		COLLIMATOR		SPARE	
	REFERENCE																
	TYPE	TOTAL POWER kW		TT		TT		TT/L3-N		TT/L1-N		TT/L2-N		TT/L2-N		TT/L1-N	
	POWER kW	Ib A															
	TEMP. COEF.	COS Ø															
SWITCH OR MAGNETIC SWITCH	MANUFACTURER			SIEMENS		SIEMENS		SIEMENS		SIEMENS		SIEMENS		SIEMENS		SIEMENS	
	TYPE			5SY6432-7+5SM2342-6		5SY6425-7		5SY4220-8		5SY6206-7		5SY6210-7		5SY6206-7		5SY6210-7	
	N. POLI	In A		4	32	4	25	2	20	2	6	2	10	2	6	2	10
	Ith A	Idn A		32	0.03	25		20		6		10		6		10	
	Im (o curve) A	Pdi kA		320	6	250	6	"D" CURVE	6	60	6	100	6	60	6	100	6
FUSE	TYPE																
	VALUE A																
CONTACTOR	TYPE																
	In A	Pn kW															
THERMIC RELAY	TYPE																
	SETTING A																
POWER LINE	CABLE TYPE			N07G9-K		N07G9-K		N07G9-K		N07G9-K		N07G9-K		N07G9-K		N07G9-K	
	ASSEMBLING			4x(1X10)		4x(1x4)		2x(1x2,5)		2x(1x1,5)		2x(1x1,5)		2x(1x1,5)		2x(1x1,5)	
	LENGHT m			1		1		1		1		1		1		1	
	Iz A																
	C.d.T. a In %	C.d.T. a Ib %															
	Zk mê	Zs mê															
	Ik trifase/monof. kA	Ik1 fase/terra kA															
TERMINAL NUMBER						R5S5T5N5		T6N6		R7N7		S8N8		S9N9		R10N10	

NOTE:

Committente/Impianto

MECALL S.R.L. VIA NEGRELLI, 55 - LISSONE (MI)

Denominazione

SCHEMA UNIFILARE

QUADRO ELETTRICO SALA DIGITALE / TELECOMANDATA

Dis. N° IMP010

Rev. N° 00

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FOGLIO 2

SEGUE 3

CC

CIRCUIT REFERENCE	EXPOSURE ON	MAINS " ON" (RESET) CIRCUIT		SET UPS "OFF"	TABLE EMERGENCY CIRCUIT	"IN ROOM" EMERGENCY CIRCUIT	EMERGENCY "OFF" TIMED	SET UPS "ON"	UPS POWER "OFF" INDICATION	ON / OFF CONTROL		MAINS " ON" CIRCUIT	ROOM "OFF" INDICATION	ROOM "ON" INDICATION
PUSHBUTTON & LAMPS									GREEN LIGHT (inside P-EN)	OFF PUSHBUTTON	ON PUSHBUTTON		GREEN LIGHT (inside P-ON)	RED LIGHT (inside P-OFF)
24V AC RELAY	BUFFER RELAY	TIMED RELAY	DRIVER RELAY	SET / RESET RELAY			TIMED RELAY DELAY OFF	SET / RESET RELAY				DRIVER RELAY		
TERMINAL NUMBERS	21,22,23,24				1,2	3,4,5,6				10,11,12,13,14,15				

ROOM MAIN CONTACTOR	UPS POWER CONTACTOR
CONTACTOR 3RT10 44-1AP04 3RT1936-1CD00	CONTACTOR 3RT10 26-1AL20 3RT1936-1CD00

Committente/Impianto

MECALL S.R.L. VIA NEGRELLI, 55 - LISSONE (MI)

Denominazione

SCHEMA FUNZIONALE
QUADRO ELETTRICO SALA DIGITALE / TELECOMANDATA

Dis. N° IMP010

Rev. N° 00

Data Rev. 30/04/2014

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FOGLIO 3

SEGUE 4

CO

Calcolo della sovratemperatura all'interno del quadro secondo CEI 17-43

Quadro : SALA DIGITALE/TELECOMANDATA

Tipo di Quadro : 800X585X300MM

Involucro separato per montaggio a muro, con parte superiore libera

Dimensioni del quadro : Altezza : 800 mm

Larghezza : 585 mm

Profondità : 300 mm

N° Diaframmi: 0

Materiale : Poliestere — K di trasmissione termica : 3.5

Massima potenza radiante dal quadro [W] : 146W — Costante di involucro (k): 0.517

Calcolo della superficie di raffreddamento effettiva

Parete del quadro	Dimensione [mm x mm]	Superficie parete A_0 [m^2]	Fattore di superficie b	Superficie Effettiva $A_0 \times b$ [m^2]
Parte Superiore	585X300	0.18	1.4	0.25
Parte Anteriore	585X800	0.47	0.9	0.42
Parte Posteriore	585X800	0.47	0.5	0.23
Parte Sinistra	300X800	0.24	0.9	0.22
Parte Destra	300X800	0.24	0.9	0.22

Superficie totale Effettiva $Ae = \sum (A_0 \times b)$ = Totale [m^2] 1.33MQ

Dati generali

Dati Temperatura

Temperatura Ambiente	20
Temperatura massima all'interno del quadro	50

Dati Potenza

Potenza Installata [W]	160.30 W
Fattore di utilizzo	0.30
Fattore di contemporaneità	0.60
Pot. effettiva dissipata nel quadro [W]	28.85 W

Risultati di calcolo

Risultati di calcolo : Temperature

Temperatura media nel quadro	27.4
Temperatura massima nel quadro	31.4
Delta Temperatura a metà quadro	3.30K
Delta Temperatura alla sommità del quadro	11.40K

Risultati di calcolo : Raffreddamento

Sezione d'entrata Aria Apertura [cm^2]	
Volume d'aria riciesta per il ventilatore [m^3/h]	
Pot. termica richiesta per lo scambiatore di calore [W/K]	
Pot. raffreddante richiesta per il condizionatore [W]	

Committente/Impianto: *MECALL S.R.L. VIA NEGRELLI, 55 - LISSONE (MI)*	Dis. N° IMP010	SIRAM s.r.l.	FOGLIO 4
Denominazione: *CALCOLO SOVRATEMPERATURA QUADRO ELETTRICO SALA DIGITALE/TELECOMANDATA*	Rev. N° 00	Via Cardinal Ferrari n°9 20844 - Triuggio (MB) Tel. 0362/919700 Fax. 0362/971127	SEGUE /
	Data Rev. 30/04/2014		

5.8. INPUT LINE VOLTAGE SELECTION

In case the line voltage does not match the insulation transformer standard specification it is necessary to install an external adaptation transformer or request that the unit be factory configured ordering one of the following options:

220V ac INSULATION TRANSFORMER OPTION - ORDERING CODE: XSAA04

Line Voltage	220 / 240V 3-phase
Line Voltage tolerance	± 10 % (abs. max. rating)
Line frequency	50 Hz – 60 Hz
Line frequency tolerance	± 2 %
Stand-by power	1.000 VA
Peak power	4.000 VA

415Vac INSULATION TRANSFORMER OPTION - ORDERING CODE: XSAA05

Line Voltage	415 / 440V 3-phase
Line Voltage tolerance	± 10 % (abs. max. rating)
Line frequency	50 Hz – 60 Hz
Line frequency tolerance	± 2 %
Stand-by power	1.000 VA
Peak power	4.000 VA

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Index

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6. INSTALLATION

6.1. TILTING TABLE INSTALLATION

1. Open case n° **1** removing the cover and the side indicated as "**side to open**".

2. Remove all lateral covers of the case. Remove the bolts that fix the tilt assembly to its wood frame.

3. Attach the items of the transportation kit p/n **XSAB03** to the elevation guides of the tilting base using the given **M10** screws as shown in the following figure.

4. Raise the base up using the wheeled jackscrews taking care to keep it relatively level and slide it into the room to the installation point as shown in the following figure.

IMPORTANT NOTICE FOR THE INSTALLER
THE TILT ASSEMBLY HAS OTLINE DIMENSIONS THAT **REQUIRE DOORS MINIMUM 80 cm WIDE** IN ORDER TO ALLOW ITS TRANSPORTATION.
The transportation tools composing the XSAB03 **are not shipped with each unit**.
They must be purchased as separate item by the installer and re used for several units.

---

5. Position the tilt assembly on the base plate (over or under floor) as detailed in section 5 of the manual.
6. Verify for perfect level alignment with the floor using, if necessary, correction spacers.
7. Lock the tilt assembly to the base plate using, if necessary, the additional spacer and the fixation screws kit as shown in the following figure and detailed in section

8. Remove the transportation tools.

6.2. MOUNTING THE MAIN FRAME ASSEMBLY

1. Open case n° **2** removing the cover and the side indicated as "**side to open**".

2. Remove all packing materials, all singled packed parts fixed to the bottom side of the case by means of tie rods, in order to freely access the main frame assembly.

3. Remove the tie rods that fix the main frame to the bottom side of the case. Remove all lateral covers of the case.

4. Attach the transportation kit p/n **XSAB03** to the main frame using the given M10 screws and the square nuts as shown in the following figure.

5. Raise the frame up using the wheeled jackscrews taking care to keep it relatively level and slide it into the room.

IMPORTANT NOTICE FOR THE INSTALLER
THE TILT ASSEMBLY HAS OTLINE DIMENSIONS THAT **REQUIRE DOORS MINIMUM 65 cm WIDE** IN ORDER TO ALLOW ITS TRANSPORTATION.
The transportation tools composing the XSAB03 **are not shipped with each unit**. They must be purchased as separate item by the installer and re used for several units.

---

6. Position the frame assembly in correspondence of the tilting base. Adjust the height of the main frame in the way that the mounting flange of the main frame is in correspondence with the rotation gear of the tilt tower as shown in the following figure:

7. Connect the main frame with the tilt tower using the socket **1**, locking washer **2** and **M14x55** screws **3** as detailed in the previous figure. Tighten the screws in cross sequence with a force not exceeding 10 Kgm. Remove the transportation tools.

8. Route the Image system cables, the generator interface cable and the tube cables set (H.V, rotor, DAP) to the entering point of the unit. Insert all accessories cables inside the external plastic chain and divide them as shown in the following figure:

IMPORTANT NOTICE FOR THE INSTALLER

In case the unit has been already configured in the factory all cables are already routed inside the plastic chain and packed at the rear side of the tilt base. In such case the installer must simply route the cables from the unit to the generator and image processor cabinets.

9. Route the brushless driver cables through the hole created inside the rotation gear and the main frame as shown in the following figure.

10. Route the brushless motors cables through the hole created inside the rotation gear and the main frame as shown in the following figure.

11. Identify the **SFD**, the **image system cables**, the **tabletop motor cables** and route them as detailed in the following figure:

12. Identify <u>and the Tubestand and the X-ray tube driver assembly cables</u> and route them as detailed in the following figure:

CN 601
CN 702
CN 710
CN 705
CN 706
CN 711 (OPTIONAL)
X RAY TUBE CABLES SET
CN 504
CN 510
CN 506
CN 501
CN 514 (OPTIONAL)
CN 504
CN 510
CN 506
CN 501
CN 514 (OPTIONAL)
CN 516 (OPTIONAL)
CN 502
CN 503
CN 504
CN 509
CN 523
TABLE CABLES
X-RAY TUBE CABLES SET

6.3. MOUNTING THE TUBE ARM SUPPORT

1. Insert the arm **1** on the corresponding slot of the tube stand assembly **2**, being careful not to damage bearing **3** as shown in the following figure.
2. At the rear side, gently insert bearing **3**. Fix the tube arm to the tube stand assembly tightening the self locking nut **4** using the special tool GMM p/n **ATTR049**.

6.4. MOUNTING THE SPOT FILM DEVICE

1. Remove the tie rods that fix the SFD pallet to the bottom side of the case.

2. Remove the fixation screws mounted on the SFD supporting plate of the table.

3. Load the SFD assembly on a transpallet as shown in the attached figure and position it on the front side of the table.

4. Lift the assembly up until the SFD fixation holes are aligned with the table mounting plate as shown in the following figure:

5. Insert the eight M8 fixation screws 2 and tighten them with a force not exceeding 3,5 Kgm as shown in the following figure:

6. Insert the four M6 fixation screws 3 and tighten them with a force not exceeding 2 Kgm as shown in the following figure:

7. Mount the four fixation nuts 1 and tighten them slightly to prevent a damage of the grains as shown in the following figure.

8. Drive the transpallet away form the unit and remove the SFD shipping frame 4 taking out screws 5 as shown in the following figure.

9. Remove the SFD back cover and route the SFD interconnection cables as shown in the following figure.

10. Fix all cables connectors to the related mating plug on the SFD control board and the ground cable to SFD central ground terminal as shown in the following figure.

11. Mount the end switches assemblies as shown in the following figure.

6.5. MOUNTING THE COMPRESSOR ASSEMBLY

The compression cone assembly bar must be coupled with the SFD and the tube arm.

The operation is delicate and requires an assistant in addition to the installer.

1. At the SFD side, connect the the compression cone assembly bar **1** to the attachment **7** by means of the four screws **6** as shown in the following figure.

2. Tighten them with a force not exceeding 2 Kgm.

3. At the tube arm assembly, remove cover **4** as shown in the following figure.

4. Mount the compression cone assembly bar **1** to the tube arm attachment by means of the four screws **3**. Tighten them with a force not exceeding 2 Kgm. Re mount cover **4**.

5. Remove the SFD bottom cover **9**. Remove the transportation locks **8** as shown in the following figure.

6. Route the compression cone assembly bar cables as indicated in the following figure.

7. Connect plugs **C702** and **CN710** to the mating connectors as shown in the following figure.

6.6. MOUNTING THE X-RAY TUBE

IMPORTANT NOTICE FOR THE INSTALLER
The table has been designed in order to accept only the x-ray tube assemblies listed in section 2.6. For each tube a specific attachment has been designed and tested. It is installer responsibility to contact GMM support in case the tube assembly that is supposed to be installed on the unit is not present in the compatibility list. Do not install non approved tube assembly if not authorized by GMM support or several units.

1. The tube arm support is delivered with the X-ray tube adaptation block already installed.
2. Remove the Tube fan assembly **4** fixed by means of screws **3**.
3. Open the trunnion ring of the x-ray tube removing the screws **1** that connect the two half-ring **2** and insert the X-ray tube.
4. Insert the x-ray tube into the trunnion ring and mount the two half rings **2**.
5. Verify that the rotation of the x-ray tube inside the trunnion ring is regular and lock screws **1**.
6. Mount back the tube fan assembly **4**.

1
2
3
4
5
19
18
17
16
11
15
14
13
12

6.7. MOUNTING THE COLLIMATOR

During the installation of the tube lower cover the installer must pay attention that wings **19** of the tube support pass trough the slots of the cover and that the cover itself is correctly fixed to its support and to the x-ray tube.

THE COLLIMATOR CONE HAS BEEN DESIGNED TO PERFECTLY MATCH THE X-RAY TUBES APPROVED FOR THE TABLE. THEREFORE NO ADDITIONAL SPACERS MUST BE INSERTED BETWEEN THE TUBE OUTPUT PORT AND THE MOUNTING CONE FOR ANY REASON.

1. Mount the tube lower cover that is fixed to the tube support by means of screws **11** and to the tube arm cover by means of screws **5**.

2. Mount the collimator cone **15** to the tube output port using screws **14**.

3. Unscrew the 4 socket head screws **13**, which control the adapter seal tongues using a 3-mm hexagon key **12.**

4. Place the collimator on the cone and lock screws **13** (tightening torque = 1Nm) in the way to fix the collimator in a position mechanically centred with the cone.

5. Mount the tube rotation handle **18** taking care that cables **17** is routed through the air slot of the tube lower cover. Using screws **16** connect the handle to the x-ray tube support wings **19**.

6. Remove the column top cover and route the collimator cable as shown in the following figure. Connect plug **CN601** at the collimator rear side and plug **CN510** on the tube stand control board.

7. If the unit is equipped with the optional Dose are meter system, the measuring chamber must be mounted as indicated in the following figure. Also the special interconnection cable must be routed as indicated in the same figure.

6.8. MOUNTING THE WEBCAM

1. Fix the Webcam with screws A to the back cover of the collimator and connect the cable to its extension, as shown in figure

2. After loosening the screws B, turn the webcam to position it properly.

3. Tighten the screws B to fix the webcam position.

6.9. MOUNTING THE PIXIUM DETECTOR AND THE AEC CHAMBER

1. Remove the front cover and the keyboard assembly located at the front side of the detector bucky as shown in the following figure:

2. Extract the grid assembly from the detector bucky as shown in the following figure:

3. Remove the upper and lower covers as shown in the following figure:

4. Fix the detector to the bucky frame using the four M5x14 screws **12**
5. Remove the AEC detector fixation brackets
6. Carefully center the AEC detector on the active area of the Pixium detector. Once find the correct position, gently push the fixation brackets and lock the fixation nuts

7. Mount the AEC chamber preamplifier at the bottom side of the detector bucky and fix the connecting cable. Route the AEC preamplifier and the detector cables from the bottom side of the digital bucky and connect them as detailed in the following figures.

8. Insert the grid assembly and mount back the detector bucky covers and the front keyboard assembly repeating in the reverse order the instructions from step 3 to step 1.

6.10. MOUNTING THE TABLETOP

1. Insert the square nuts **3** in the main beam slots. Mount the tabletop right support **1** using the ten M6 fixations screws **2**; insert support **4** in the internal side of the main beam and fix it using the three M10 screws **5**, as shown in the following figure. Align the external edge of the support with the edge of the main beam and tighten all screws.

2. Mount the tabletop assembly to the supporting arms **1** using the three M10 screws **2** as shown in the following figure. **Do not** tighten the fixation screws **2**.

3. Slide the linear bearing **1** along the tabletop rails **2** and fix them to the SFD support **3** by means of screws **4** as shown in the following figure.
4. Align the tabletop and tighten the screws with a force not exceeding 1,5 Kgm. At the tabletop supporting arm side tighten screw **2** as shown in the figure of step 2.

5. Connect the motor plugs to the mating connectors as shown in the following figure

6. Mount the three covers 1-2-3 with the 16 screws M4

6.11. CONTROL DESK INSTALLATION

1. Position the control desk in the control room.

2. Route the console cable, the I/O safety cable, the ground cable and the power supply/emergency cable up to the control desk.

3. At the control desk side, connect:

The Console cable to plug **CN1005**;
The I/O safety cable to plug **CN1004**;
The power supply/emergency cable to plug **CN1022**;
The ground cable to the console ground terminal

As shown in the following figure:

4. At the control desk connect the fluoro foot switch cable to plug **CN1001**.

5. At the unit main control board side, connect:

The Console cable to plug **CN128**
The I/O safety cable to plug **CN129**

6. At the Table cabinet side connect the console ground cable to the ground terminals block and the power supply/emergency cable to plug **CN105** as described in the following figures:

6.12. MOUNTING THE COVERS

Mount all unit covers as described in the following figures.

6.13. FOOTREST ADJUSTMENT PROCEDURE

1. POSITIONING AND SECURING THE DEVICE
   Put the tabletop in a horizontal position at a reasonable height.

2. FOOTREST EXTRACTION
   If mounted on the table, extract the footrest acting on the table safety locks.

3. LOOSENING THE SCREWS

Loosen the four screws in position 11 and the eight screws in position 15 on both sides without removing them.

The parts in position 3, 16 and 10 must move smoothly with respect to plane 17.

1. REINSERTION OF THE FOOTREST
   Carefully reinsert the footrest in the tabletop.

2. TIGHTENING THE SCREWS
   Tighten the six screws pos. 15 on both sides, securing the profiles pos. 3 and pos. 16.
   Do not tighten the two screws that secure the blocks pos. 10.

3. SLIDING CHECK
   Check the sliding of the platform by using the release levers. The movement should be smooth and the action on the levers must be sufficiently soft.
   If it is not, re-loosen the screws pos. 15, move the footrest, tighten the screws and re-check the movement.
   Get hold of the tabletop pos. 17 and, by acting forcefully, check the tightness of the footrest.

4. TIGHTENING THE SCREWS
   Tighten the two screws pos. 15 securing the blocks pos. 10.

5. FINAL TIGHTENING OF THE SCREWS
   Pull out the footrest and tighten the screws pos. 11 securing the blocks pos. 10, on both sides.

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7 INTERFACE CIRCUIT

7.1 INTRODUCTION

BEFORE TO CHANGING THE INTERNAL INTERFACE CIRCUIT THE INSTALLER MUST BE SURE THAT THE 24V DC JUMPERS HAVE BEEN PROPERLY SET TO AVOID SHORT CIRCUITS AMONG THE DIFFERENT ACCESSORIES POWER SUPPLIES.
DO NOT ATTEMPT TO INTERFACE ANY EXTERNAL ACCESSORY IF SECTION 2.5 OF THE PRESENT MANUAL HAS NOT BEEN CAREFULLY READ.

This section of the manual describes the HW interconnections and the security lines among the different components of the system.
It must be underlined that the interface circuit described in this section represents only the physical interconnections between the single components and not the entire interfacing possibility.
The installer can find complete and detailed information in the technical documentation of the single components.

In the table all input signal are insulated by means of an photo-coupler and have been factory configured to accept 24V dc-input signals.
The diode of the input photo coupler can be supplied using the on board 24V DC or an external one by means of proper jumpers.

All outputs have open collector configuration; as common return the External I/O Interface board GND must be used.
The maximum current sink for each single output is 30 mA - 40V.

7.2 INTERFACE CIRCUIT DESCRIPTION

All interface signals are available at DB connectors **CN170, CN164** and **CN169** located on the UNIT main control board and they are divided in the following groups:

TECHNIQUE SELECTION INPUTS
By means of these input signals it is possible to select the UNIT operative mode; usually this input are driven by the x-ray generator in the way that the selection of a particular working station at the generator console automatically force a specific mode of the UNIT table. In particular:

Technique # 1 -CN170.16 - CN164.16 - CN169.21

In this modality, the Unit control circuits enables the automatic Spot Film Device or the Image Intensifier as sole image receptor with he following consequences:

The exposure sequence is interlock by the SFD status.
The exposure release is synchronized with the position of the oscillating grid.
In case the unit is interfaced with a supported digital image processor, the continuous or pulsed fluoro exposure is controlled by the image processor in order to use its LIH and noise suppression features.
The collimator enters in auto mode.
Tomography exposures are allowed.

Technique # 2 - CN170.35 - CN164.35 - CN169.19
In this modality, the **Unit** control circuits enables the **solid state detector** as sole image receptor with he following consequences:

The radiographic exposure is released under the control of the Image processor once the cassette reaches the parking position.
The continuous or pulsed fluoro exposure is released under the control of the Image processor.
The collimator enters in auto mode.
Tomography exposures are allowed. Because the Image Intensifier input plane is lower than the cassette plane the Unit control, circuit automatically corrects the tomo layer setting.
The oscillation of the grid can be disabled if necessary ti improve the image quality.

Technique # 3 - CN170.17 - CN164.17 - CN169.20

In this modality, the control circuits disables both the use of the **solid state detector** and the tables operates a simple x-ray tube support with the following consequences:

The continuous or pulsed fluoro exposure is disabled.
The radiographic exposure is not interlock by the unit and its is switched under the direct control of the X-ray generator.
The tomography mode is disabled.
The collimator automatically enters in full manual mode.

Technique # 4 - CN170.18 - CN164.18 - CN169.18

In this modality the remote tilting table behaves as described for Technique # 3.

Technique # 5 - CN170.23 - CN164.23 - CN169.17

In this modality the remote tilting table behaves as described for Technique # 3.

7.3 GENERATOR INTERFACE SIGNALS

By means of these signals is possible to synchronize the generator exposure with the UNIT status. In particular:

Preparation - CN170.10 - CN164.10 - CN169.2

When active transfer the preparation command to the X-ray generator.

Grafia (2nd step) - CN170.28 - CN164.28

When active transfer the "second step" command to the CASTOR X-ray generator. Only after that this signal is received the generator enables the Ready output at the end of the preparation sequence. This signal <u>is not required</u> for other generators.

Exposure - CN170.29 - CN164.29 - CN169.3

When active transfer the exposure release command to the X-ray generator.

Fluoro - CN170.11 - CN164.11 - CN169.4

When active requests the start of continuous (or pulsed) exposure to the X-ray generator.

Gen. Ready - - CN170.37 - CN164.36 - CN169.22
When active indicates that the generator has correctly ended the preparation sequence and it is ready to expose. This signal can be an active low input referred to the system gnd or referred to the generator 24Vdc. In this case it is necessary to connect the generator 24Vdc power supply to **CN170.36 - CN169.24** and chose the correct setting of jumper **SW3**.

In case the table is interface with an X-RAY generator in which the Ge. Ready (bucky start) signal is a 110/220V ac output, the installer must use only the input terminals of connector CN173.

XRay - On - CN170.30 - CN164.30 - CN169.23

When active indicates that the generator is releasing the exposure.
The transition low / high transition of this input indicates the end of the exposure and cause the cassette tray to move one step ahead.
This signal can be an active low input referred to the unit gnd or referred to the generator 24Vdc. In this case it is necessary to connect the generator 24Vdc power supply to **CN170.36 - CN169.24** and chose the correct setting of jumper **SW2**.

7.4 TOMOGRAPHY INTERFACE SIGNALS

Tomo - CN170.4 - CN164.4 -20

When active indicates that the system is working in tomography mode.

Tomo code D0 - CN170.40 - CN164.21

Tomo code D1 - CN170.41 - CN164.22

The configuration of these two outputs indicates the tomography angle selected by the operator. In particular:

Output name	Tomo angle = **8°**	Tomo angle = **20°**	Tomo angle = **30°**	Tomo angle = **40°**
TOMO CODE D0	**ON**	**OFF**	**ON**	**OFF**
TOMO CODE D1	**ON**	**ON**	**OFF**	**OFF**

Where:
ON = output low
OFF = output O.C.

The interface circuits also includes specific output that indicates the selection of each tomography angle. In particular:

Time D0 - CN170.38 - Active low when tomo 8° selected;
Time D1 - CN170.22 - Active low when tomo 20° selected;
Time D2 - CN170.21 - Active low when tomo 30° selected;
Time D3 - CN170.20 - Active low when tomo 40° selected;

SPECIAL INTERFACE SIGNALS

Subdiv sel - CN170.42 - CN169.33

When active indicates that the SFD near film shutters cover the central field of the AEC detector. This signal can be used to switch of the AEC system.

Collim centered - CN169.8

When active indicates that the collimator is not aligned with the SFD center.

Beam Filter #1 - CN169.10

When active indicates that the 0,1 mm Cu filter is inserted. This output is active only if the collimator is equipped with the motorized beam hardening filters.

Beam Filter #2 - CN169.11

When active indicates that the 0,2 mm Cu filter is inserted. This output is active only if the collimator is equipped with the motorized beam hardening filters.

Esi sel - CN170.31 - CN164.31 - CN169.5

This output is set low by the system control electronic when the digital mode has been enabled. This signal can be used to enable/disable the spot acquisition mode of the Digital image processor.

Step - CN170.43 - CN164.19

When active force the table to move the SFD/TUBE assembly one step ahead if the digital stepping module is enabled.

7.5 SAFETY INTERFACE SIGNALS

This set of inputs must be used to limit the movements in case the unit is installed in a room with other accessories that could create collision situation with the table or in case there are architectural limits that can not be considered by the anti collision software.
The external safety detectors must be wired as **clean NC contacts** at terminal block **CN172**

Film Changer - CN172.8 - CN172.7
When active disables the tilt movement once the table has reached the horizontal position.
Usually this input is used when special accessories are placed under the tabletop.

CTM Park - CN172.10 - CN172.9
When active disables all unit movements.
Usually this input is activated when a ceiling suspension installed on the room is moved out of its parking position.

Right Limit - CN172.4 - CN172.3
When active stops all unit movements in the **right direction**.
Usually this input is activated when, during the movement, one component of the unit comes close to a collision point with an architectural limit of the room.

Left Limit - CN172.6 - CN172.5
When active stops all unit movements in the **left direction**.
Usually this input is activated when, during the movement, one component of the unit comes close to a collision point with an architectural limit of the room.

Ceiling Limit - CN172.2 - CN172.1
When active stops all unit movements in the **ceiling direction**.
Usually this input is activated when, during the movement, one component of the unit comes close to a collision point with an architectural limit of the room.

EXTERNAL EXPOSURE CONTROLS

This set of inputs must be used to connect an external fluoro/exposure foot pedal when the operator needs to control the exposure release when working at the table side (i.e during interventional procedures). The external foot pedal must be wired as **clean NO contacts** at terminal block **CN174.**

Ext - Fluoro - CN174.8 - CN174.7

When active starts the **fluoroscopy exposure** release as previously described.

Ext - Prep - CN174.4 - CN174.3

When active starts the **exposure preparation** as previously described.

Ext - Exp - CN174.6 - CN174.5

When active starts the **exposure release** as previously described

7.6 HIRIS RF43 IMAGE PROCESSORS SYSTEM INTERFACE

The following chapters are just an indication of the possible equipment use, please do make always reference to the Hiris RF43 technical manual latest revision.

The HIRIS RF43 image processor is connected to the Castor generator and to the **CONNEXITY** trough the CAN bus and a set of HW lines.
In addition the Hiris processor is directly connected to the touch screen console by means of the Hiris can bus cable p/n 002500.376 as detailed in the in the system interface drawings of **section 7.1**

In particular it receives from the system collimator the actual SID and set the size of the irradiated area specified by the user in the anatomic program folder. In case a communication or a general fault is detected the Image processor displays a collimator error and inhibits the exposure release.

The Hiris Rad image processor transmits to the Touch screen console the exposure factors specified by the user in each anatomical program folder and receives back the real exposure data and the dose detected by the dose/area meter. In case an error condition is detected (i.e. tube overload or wrong exposure time) an error message is displayed on the touch screen console.

The Hiris Rad also receives from the touch screen console the status of the grid and the focalisation position (115 cm of 180 cm SID); such information as well as the selected detector magnification and the H/V rev. are managed by the table console CPU and transmitted to the Tocuh screen console via CAN bus.

The system table can be interfaced with a HIRIS RF43 Digital Image Processor only if the **CASTOR R or HF** generator is equipped with the optional interface kit ref. **GNA21**.
In particular the system interface circuit must be connected with the HIRIS interface board of the Castor HF generator that is included in the GNA21 kit. The interconnection between the **system** table and the CASTOR HF generator must be realized using the optional interface cable ref. **002500.185-A**

It is also necessary that the installer set the configuration switches **SW6**, **SW2** and **SW3** and detailed in the following figure:

WORKING STATION 2 MODE

This working station enables the the HIRIS RF43 Image processor. If the Hiris system is equipped with the DSA package, the contrast media injector can be triggered by the Hiris CPU and the generator interlocks the exposure considering the actual status of the injector and the modality selected by the operator on the Hiris menu. In particular, the different modalities supported in this working station are the following:

Continuous fluoro

Fluoro request arrives from the system Table by means of signal **FLUORO** (Led DL19 and COM.Rx DL18) and it is transferred to Hiris processor as signal **PFL**. Hiris processor makes active sinal **OFL+** (Led DL38) that, through U1, enters the generator as **IFS** (Led DL3). The Generator starts the fluoro exposure and exposure time is given by OFT signal (Led DL31) which is coming through U1 to the Hiris system as **EXON** (led DL17).

Pulsed fluoro

Before fluoro starts, Hiris must enable signal **PHCF** (Led DL33). Fluoro request comes from the system table as **FLUORO** (Led DL19 e COM.Rx DL18) and U1 IC activates signal **IFS** (Led DL3). At the end of preparation generator activates **OBS** signal (Led LD45) that comes, through U1, to Hiris on **GEN.READY** (LedDL16). When Hiris is ready to acquire the images drives low the potter reply **OEXP+** (Led DL36) and **IRP** signals (Led DL4); every active potter reply signal lets generator to expose and feedback using **OPT** (Led DL32) which is translated by U1 in **EXON** (led DL17).

SPOT MODE (RADIO & ANGIOGRAPHIC SEQUENCES)

In spot mode, the images can be acquired under three different modalities:

1. Standard spot mode.
2. Angiographic sequence. The operator has selected a pre-programmed sequence in which the operator has defined the trigger conditions for the contrast media injector (Injector enabled/disabled, injector start (delayed or anticipated from the first exposure)

The CASTOR HF CPU interlocks the exposures releases with the status of the injector, if the use of the injector has been enabled by the HIRIS processor via the **INJ.ENA** (Led DL37) signal (active=enabled). In particular:

Injetor Disabled (Led DL37 off):

Radio request enters the generator via **I_ST signal** (Led DL43), that is transformed by U1 in **IPR** (Led DL1) and in **P_PREP_G** (Led DL20) and in **COM.rx** (Led DL18).
Second Step enters directly on **ISR** (Led DL2). At the end of preparation generator activates **OBS** signal (Led DL45) that is sent to the HIRIS processor on **RAD** (Led DL15). The HIRIS processor, when ready, activates signal **OEXP+** (Led DL36) that is transformed by U1 on **IRP** (Led DL4). During exposure time generator activates signal **ORT** (Led DL30) which is transformed by U1 in E**XON** (Led DL17).

Injector Enabled (Led DL37 on):

The HIRIS processor enables the injector via **INJ.ENA** (Led DL37).
Radio request enters the generator via **I_ST signal** (Led DL43), that is transformed by U1 in **IPR** (Led DL1). Second Step enters directly on **ISR** (Led DL2) and in **P_PREP_G** (Led DL20) and in **COM.rx** (Led DL18) only in case the **INJ.ARM** (active high) or **ARM_0** (ac tive Low) signals are active.
At the end of preparation generator activates **OBS** signal (Led DL45) that is sent to the HIRIS processor on **RAD** (Led DL15). The HIRIS processor, when ready, activates signal **OEXP+** (Led DL36) that is transformed by U1 on **IRP** (Led DL4). During exposure time generator activates signal **ORT** (Led DL30) which is transformed by U1 in E**XON** (Led DL17).
During the exposures sequence, if the injector has been switched in manual trigger mode (**AUT/MAN =**active high or **MAN_0 =**active low) **and** signal **STR/MAN** is active high or siganl **STR_0** is active low, U1 allows the injector to start via signal **STR_INJ** (Led DL49).
if the injector has been switched in automatic trigger mode (**AUT/MAN =**active low or **MAN_0 =**active high) the injector start signal **INJ.START** (LED DL46) generated by the HIRIS processor allows the injector to start via signal **STR_INJ** (Led DL49).

TOMOGRAPHY

The tomo mode is enabled by the operator at the console and this selection is transferred to the CASTOR HF generator via **TOMO** signal (Led DL45) that is transformed by U1 in **TOMO_C** (Led DL14) for the HIRIS processor. In the same time and signals **PBx** (Led DL5) **ITA**, **ITS**, **ITF** are generated by the interface logic for the CASTOR HF CPU. When the signal T_On (ITA) is active, the generator automatically sets the exposure back_up time depending on the status of signals ITS and ITF as indicated in the following table:

Max. Radio Time	TC 1	TC2
Disable	Disable	2.500 s.
Able	Disable	2.000 s
Disable	Able	1.600 s.
Able	Able	0.600 s.

WORKING STATION 3

It must be associated with the system DIRECT mode. Selecting this working station fluoroscopy is disabled and the operator can release exposures using a film cassette external to the SFD.

Radiography

Radio request enters the generator via **I_ST signal** (Led DL43), that is transformed by U1 in **IPR** (Led DL1). Second Step enters directly on **ISR** (Led DL2). At the end of preparation generator activates **OBS** signal (Led DL45) that, through U1, is sent back to **IRP** (Led DL4).

NO.	SIGNAL NAME	sqmm	FROM: CABLE END "A" CASTOR-I/F PCB CM1				TO: CABLE END "B" CLISIS - CN170			
			LEAD LGTH	STRIP LGTH	TERMINATION	DESTINATION	LEAD LGTH	STRIP LGTH	TERMINATION	DESTINATION
1	KV+	0,34	30	3	002331.062	1	30	3	002331.064	
2	KV-					2				
3	KV MAN					3				19
4	TOMO SELECT					4,20				4
5	STOP 3					5				
7	V REV. NO1					7				7
8	H REV. NO1					8				8
9	PREP I I STEP I					10				10
10	FLUORO					11				11
11	PHCF					12				12
12	+24V 164					6,9,13				6,9,13
13	GND					14				14
14	GND					15				15
15	TECH. 1					16				16
16	TECH. 3					17				17
17	TECH. 2 IHIRISI					18				35
18	STEP					19				43
19	TOMO CODE D0					21				40
20	TOMO CODE D1					22				41
21	TECH. 5					23				23
22	ANGIO STEP					24				24
23	ZOOM 3					25				25
24	ZOOM 2					26				26
25	ZOOM 1					27				27
26	GRAFIA I II STI					28				28
27	RX GEN					29				29
28	RX ON					30				30
29	ESI SELECT.					31				31
30	KV POT. CW					32				32
31	KV POT. C					33				33
32	KV POT. CCW					34				34
33	TECH. 4					35				18
34	BUCKY START+					36				37
35	BUCKY START-	0,34	30	3	002331.062	37	30	3	002331.064	

ITEM	PART NO.	QTY	DESCRIPTION
7	001791.181	1	CABLE, 37 CONDUCTOR 0.34 sqmm
6	003145.001	2	CABLE IDENTIFICATION LABEL
5	002227.015	1	SHELL 50P
4	002331.064	1	AMP CANN. F. 50P SNAP-IN
3	002227.002	1	SHELL 37P
2	001740.006	67	AMP CANNON FEMALE PIN
1	002331.062	1	AMP CANN. F. 37P SNAP-IN

Tolleranze Generali				
	DIMENSIONI	< 0.5 mt	0.5 - 2 mt	> 2 mt
	TOLLERANZE	-0/+0.5 cm	-0/+1 cm/mt	-0/+4 cm/mt

NOTE : IN THE ORDERING CODE PLEASE SUBSTITUTE __LLL__ WITH THE CABLE LENGHT | mt |

trattamento					scala
	data	modifica			
finitura					
data 13/7/2005					
firma L.M.L.		CABINET	1	1 di 1	CLISIS
visto	n. dis.	gruppo	Q.ta'	n. dis.	apparecchio
MECALL	denominazione CLISIS - HIRIS SYSTEM INTERFACE CABLE				CODICE 002500.185 - A

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7.7. INTERFACE CIRCUIT FOR DEIMOS R/F GENERATORS

The table can be equipped with the generators of the **DEIMOS** family as described in the following system interconnection drawing.

The table must be connected to the **DEIMOS** generator using the special interface cable GMM p/n **002500.436** (see attached drawing).

It is also necessary that the installer set the configuration switches SW6, SW2 and SW3 and detailed in the following figure:

The table can be interfaced with a HIRIS RF43 Digital Image Processor only if the **DEIMOS** generator is equipped with the optional ATS HIRIS interface with the CPI interface adapter GMM p/n 166014B (see attached drawings). The installer must verify that the configuration jumpers are set as described in the following figure:

HIRIS RF43 CABINET
IMAGE MONITORS
VIDEO SIGNAL
230V ac
REFERENCE MONITORS
230V ac
RFPS 00 BOARD
CM1
CM2
TR1
POWER SUPPLY ON/OFF
TB1
TB3
CP12
CP10
CP9
CP13
RGBC BOARD
CM2
CM1
21V ac
PU4343
230V ac
Data link
+24V in
+24V out
B1-C1
Net.1
B6-C2
PID RF43
B11-C2
B11-C1
B9-C1
230V ac
Extender
B11-C4
B13 - C2
B11-C3
B2 - C1
B10-C1
B10 - C2
B5 - C2
CM15
CM20
TO DICOM-3 NETWORK
Infrared remote receiver
CM10
CM20
CM15
MAIN CONTROLLER
CM23
230V ac
CM24
CM21
CM6
120 Ohm
CM5
CM8
CM4
DVD RECORDER
PWS
Receiver
KEYBOARD
MOUSE
PRINTER cable cod. 002500.214
PRINTER
COM#1
COM#2
TOUCH SCREEN CONSOLE
24V dc in
USB#1
USB#2
Hiris CAN bus - USB converter
Clisis CAN bus - USB converter
SERVICE (RS232)
CN1010
CN1021
CN1003
CLISIS CONSOLE
CN1001
CN1002
CN1005
CN1004
CN1022
Ground cable
Optional Prep / Exp pushbutton
RF43 - GENERATOR Interface cable p/n 002500.438
RF43 - GENERATOR Interface cable p/n 002500.437
DEIMOS-ADV Console serial cable p/n 002500.434
DEIMOS GENERATOR
CPU BOARD 73457302 B
J2
J1
DAP BOARD 75599200 B
J4
J1
J2
TDI BOARDS INTERFACE 006050.185 o 166014B
XCN170
XCM6
XJ3
XCM8
XJ2
J2
J1
J3
J5
TDI BOARD 73689400
J13
J6
J4
INTERFACE BOARD 732177-06
TB11
TB8
TB2
ROOM INTERFACE BOARD 73318400 E
TB2
HR CPI BOARD 7703100-02
H.V. cables
FAN & Thermal safety
Anode cable
Tube ground cable
Service port (RS232)
Vacutec DAP cable p/n 002500.155
Kit RTA79
Clisis Exel DRF/Deimos Interface cable p/n 002500.436
Clisis/Deimos Consolle cable p/n 002500.435
CN170
CN127
CN174
CN128
CN129
CN106
CN130
ROOM
EXAMINATION ROOM FLUORO-EXPOSURE FOOTPEDAL
Consolle cable cod. 002500.329
X-ray Interlock cable cod. 002500.330
Door and emergency cable cod. 002500.331
Ground cable
CLISIS - HIRIS CAN bus cable cod. 002500.376
Pixium AEC detector cable
Pixium optical link cable
Pixium PWS cable
Detector 24h PWS cable
Generator PWS cable cod. 002500.149
Hiris power supply cable
Clisis power supply cable
Clisis ground cable
400V 3-PHASE LINE IN
NEUTRAL LINE IN
GROUND
DOOR SAFETY SWITCH
ROOM EMERGENCY SWITCH
ROOM POWER DISTRIBUTION BOX
MECALL P/N IMP06
(OR ANY EQUIVALENT)
Tolleranze Generali
ANGOLARI E LINEARI
UNI ISO 2768/1 - Classe Toll. = m
GEOMETRICHE
UNI ISO 2768/1 - Classe Toll. = K
trattamento
scala
data
modifica
finitura
data 11/2016
firma L.M.L.
visto
1
1 di 1
CLISIS EXEL DRF
n. dis.
gruppo
Q.ta'
n. dis.
apparecchio
MECALL
denominazione
CLISIS EXEL DRF - DEIMOS GENERATOR INTERCONNECTIONS
CODICE
CSA00S6701
Questo disegno e' di propieta' della MECALL s.r.l. Ogni riproduzione o concessione a terzi ne e' pertanto interdetta a termini di legge.

NO.	SIGNAL NAME	sqmm	FROM: CABLE END "A" PCB 006050.185 XCN170 o PCB166014B XCN170				TO: CABLE END "B" CLISIS - CN170			
			LEAD LGTH	STRIP LGTH	TERMINATION	DESTINATION	LEAD LGTH	STRIP LGTH	TERMINATION	DESTINATION
1	TOMO SELECT	0,34	30	3	002331.063	4	30	3	002331.064	4
2	I.I. ZOOM N					5				5
3	I.I. ZOOM COM					6				6
4	PREPARATION					10				10
5	FLUORO					11				11
6	+24V CLISIS					13				13
7	GND					14				14
8	GND					15				15
9	TECH #1					16				16
10	TECH #3					17				17
11	TECH #4					18				18
12	ORDER EXP.					23				23
13	I.I. ZOOM 3					25				25
14	I.I. ZOOM 2					26				26
15	I.I. ZOOM 1					27				27
16	GRAFIA					28				28
17	EXPOSURE					29				29
18	XRAY ON					30				30
19	ESI SELECT					31				31
20	TECH #2					35				35
21	+24V CLISIS					36				36
22	GEN READY					37				37
23	KV MANUAL					39				39
24	T. CODE D0					40				40
25	T. CODE D1					41				41
26	SUBDIV SEL					42				42
27	+24V CLISIS	0,34	30	3	002331.063	44	30	3	002331.064	44

ITEM	PART NO.	QTY	DESCRIPTION
7	001791.181	1	CABLE, 37 x 0.34 sqmm
6	003145.001	2	CABLE IDENTIFICATION LABEL
5	001740.005	1	AMP CANNON MALE CONTACT
4	002331.063	1	AMP CANNON MALE 50P SNAP-IN CONNECTOR
3	002227.015	1	SHELL 50P
2	001740.006	67	AMP CANNON FEMALE CONTACT
1	002331.064	1	AMP CANNON FEMALE 50P SNAP-IN CONNECTOR

Tolleranze Generali	DIMENSIONI	< 0.5 mt	0.5 - 2 mt	> 2 mt
	TOLLERANZE	-0/+0.5 cm	-0/+1 cm/mt	-0/+4 cm/mt

Modifiche	Rev	Data	descrizione modifica	Firma

trattamento		RIF: GMM: 97050		finitura	scala
data	24/11/2016				
firma	D. CERVINI	ARMADIO	1	1di1	CLISIS EXEL "DRF" doppio MOTORE
visto		n. dis.	gruppo	Q.ta'	n. dis.	apparecchio
MECALL	Denominazione	CLISIS EXEL "DRF" - DEIMOS INTERFACE CABLE		disegno n° 002500.436	Rev

Questo disegno e' di propieta' della MECALL s.r.l. Ogni riproduzione o concessione a terzi ne e' pertanto interdetta a termini di legge.

Apice	Numero Modifica	Annulla e Sost.	Descrizione della modifica	Data	Disegn.	Control.	Approv.
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—

	Disegnato	Controllato	Approvato	Descrizione disegno	Foglio: 1/5	Scala: ___
Data	21/10/2016	—	—	CLISIS - TDI BOARDS ADAPTER	Disegno n°	
Firma	Luciei M.	—	—		166014B	

GMM S.p.A. 24058 Sarezzo-BS-ITALIA

QUESTO DISEGNO NON PUO' ESSERE RIPRODOTTO, USATO E RESO NOTO A TERZI SENZA L'AUTORIZZAZIONE DELLA GMM CON RISERVA DI AGIRE A TERMINI DI LEGG

TBLPREPREQ
TBLXRAYREQ
TBLFLUOROREQ
SELTOMO
REQ RAD
SPAREIN1
MAG0
TOMO_TIME0
TOMO_TIME1
TOMO_TIME2
AECCENTER
PREPARATION
EXPOSURE
FLUORO
TOMO_SELECT
GRAFIA
FLUORO kV MAN
I.I. ZOOM N
TOMO CODE D0
TOMO CODE D1
SUBDIV SEL
I.I. ZOOM COM1
I.I. ZOOM1 NO1
I.I. ZOOM2 NO1
I.I. ZOOM3 NO1
TOMO BACK UP TIMES
TOMO CODE D0 TOMO CODE D1
0 BACKUP TIME SET AT 2500 mS
0 1 BACKUP TIME SET AT 1250 mS
1 BACKUP TIME SET AT 2000 mS
1 1 BACKUP TIME SET AT 500 mS
Apice
Numero Modifica
Annulla e Sost.
Descrizione della modifica
Data
Disegn.
Control.
Approv.
Disegnato
Controllato
Approvato
Descrizione disegno
Foglio: 2/5
Scala:
Data 21/10/2016
Firma
CLISIS - TDI BOARDS ADAPTER
Disegno n°
166014B
GMM S.p.A.
24068 Seriate-BG-ITALIA
QUESTO DISEGNO NON PUO' ESSERE RIPRODOTTO, USATO E RESO NOTO A TERZI SENZA L'AUTORIZZAZIONE DELLA GMM CON RISERVA DI AGIRE A TERMINI DI LEGGE

—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Apice	Numero Modifica	Annulla e Sost.	Descrizione della modifica	Data	Disegn.	Control.	Approv.

	Disegnato	Controllato	Approvato	Descrizione disegno	Foglio: 3/5	Scala: ____
Data	21/10/2016	—	—	CLISIS - TDI BOARDS ADAPTER	Disegno n°	
Firma	Lucini M.	—	—		166014B	

GMM S.p.A. 24068 Seriate-BG-ITALIA

QUESTO DISEGNO NON PUO' ESSERE RIPRODOTTO, USATO E RESO NOTO A TERZI SENZA L'AUTORIZZAZIONE DELLA GMM CON RISERVA DI AGIRE A TERMINI DI LEGGE

Apice	Numero Modifica	Annulla e Sost.	Descrizione della modifica	Data	Disegn.	Control.	Approv.
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—

	Disegnato	Controllato	Approvato	Descrizione disegno	Foglio: 4/5	Scala: ____
Data	21/10/2016	—	—	CLISIS - TDI BOARDS ADAPTER	Disegno n°	
Firma	Lucini M.	—	—		166014B	

GMM S.p.A. 24058 Sarlato-BG-ITALIA

QUESTO DISEGNO NON PUO' ESSERE RIPRODOTTO, USATO E RESO NOTO A TERZI SENZA L'AUTORIZZAZIONE DELLA GMM CON RISERVA DI AGIRE A TERMINI DI LEGGE

JUMPER SETTINGS

	SW1	XJ16 PREP. & EXP. out ENABLE
	SW2	DET.1 FORCE SEL.DIG.RAD.
	SW3	DET.2 FORCE SEL.DIG.RAD.
1 2	SW4	TABLE PREP. REQUEST to GEN.
1 2	SW4	DIGITAL PREP. REQUEST to GEN.
1 2	SW5	POWER SUPPLY from GENERATOR
1 2	SW5	POWER SUPPLY from TABLE
	SW6	DIGITAL SELECT from TABLE
1 2	SW7	ESI SELECT DETECTOR1
1 2	SW7	ESI SELECT DETECTOR2
1 2	SW8	TECH.#4 SELECT DETECTOR1
1 2	SW8	TECH.#4 SELECT DETECTOR2
1 2	SW9	TECH.#3 SELECT DETECTOR1
1 2	SW9	TECH.#3 SELECT DETECTOR2
1 2	SW10	TECH.#2 SELECT DETECTOR1
1 2	SW10	TECH.#2 SELECT DETECTOR2
1 2	SW11	TECH.#1 SELECT DETECTOR1
1 2	SW11	TECH.#1 SELECT DETECTOR2
	SW12	RESERVED

LED FUNCTIONS LIST

LD1	DETECTOR 1 ENABLED	LD9	II ZOOM NORMAL
LD2	DIGITAL REQUEST	LD10	FLUORO Kv MAN.
LD3	DETECTOR 2 ENABLED	LD11	TOMO SELECT
LD4	POWER SUPPLY +24V	LD12	TOMO TIME 2
LD5	PREPERATION REQ.	LD13	TOMO CODE 1
LD6	EXPOSURE REQUEST	LD14	TOMO CODE 0
LD7	RAD REQUEST	LD15	SUBDIV SEL
LD8	FLUORO REQUEST		

TEST POINT LIST

TP1	GND
TP2	II ZOOM 3
TP3	RESERVED

Apice	Numero Modifica	Annulla e Sost.	Descrizione della modifica	Data	Disegn.	Control.	Approv.
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—

	Disegnato	Controllato	Approvato	Descrizione disegno	Foglio: 5/5	Scala: ____
Data	21/10/2016	—	—	TDI BOARDS ADAPTER- Jumper Settings	Disegno n°	
Firma	Luciani M.	—	—		166014B	

GMM S.p.A. 24068 Seriate-BG-ITALIA

QUESTO DISEGNO NON PUO' ESSERE RIPRODOTTO, USATO E RESO NOTO A TERZI SENZA L'AUTORIZZAZIONE DELLA GMM CON RISERVA DI AGIRE A TERMINI DI LEGGE

It is also necessary that the installer verifies the following jumpers configuration in the DEIMOS generator:

Generator Interface Board:

JW22 jumpered pins **2-3** (external sync signal)
JW21 jumpered pins **1-2** (external ABS signal)
JW24 jumpered pins **1-2**
JW25 no jumper
JW23 no jumper
JW4 no jumper

Generator CPU Board:

JW3 jumpered pins **2-3.**

In addition, it is important to set the following parameter in the configuration windows of the receptor associated to the Digital mode:

AEC = Channel 1;

INTERFACE OPTION = 31.

Intentionally left blank

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8. UNIT START-UP & SOFTWARE CALIBRATIONS

8.1. UNIT FUNCTIONAL CHECK

Before appreciable operation of the system, the following items should be performed:

1. Check that the line cable has been properly routed and that each single conductor has been properly connected to the line terminals.

2. Check that the unit has been properly connected to ground.

3. Check that all end of the travel micro switches are properly wired and mounted and adjust them, if necessary, as described in **section 14.3** of the manual.

4. Check the proper mechanical coupling of each potentiometer and adjust all potentiometer sensing circuits as described in **section 14.2** of the manual.

5. Check that the x-ray tube and the Image intensifier are firmly mounted on their supports as described in **section 6** of the manual.

6. Verify that the minimum elevation end switches assembly is placed in the position complaint with the physical dimensions of the Image system as detailed in **section 6.8**

7. Verify that the radiographic and fluoroscopic exposures can be correctly released via the exposure pushbuttons of the **Unit** console in all techniques.

8. Carry out the DRF MODE software configuration of the unit as described in **section 8.2**.

9. Align the x-ray beam as described in **section 9** of the manual.

10. Check the collimator calibration and correct the factory default (if necessary) as described in **section 16** of the manual.

11. Check that the tomo layer setting and correct the factory default (if necessary) as described in **section 8.3.11** of the manual.

8.2. ENTERING THE CONFIGURATION MODE

The remote tilting table is equipped with a software package that allows the service personnel to set various configurations and calibration parameters, that are stored into the 3-phase CPU serial eeprom. To run the service software is necessary to enter the unit maintenance mode carrying out the following procedure:

1. Open the control desk to access the touch screen assembly.

2. Insert the GMM USB service license key in the USB connector of the touch screen CPU board as described in the following figure

The remote tilting table is equipped with self-diagnostic software that monitors the status of the electronics circuits. The behavior of the diagnostic module depends on the operative status of the unit, and in particular:

Once the service USB is inserted in the system, the device enters the configuration mode.

Then any configuration can be made by selecting each item.
In case of scroll down menu, select the chosen item and click confirm

Each field can be modified. Once chosen the correct value, confirm by touching icon .

The numeric fields can be modified by setting the value in the fields

Then confirm the choice by touching icon or cancel by touching icon .

Clicking on the workstation icons a menu displays, in which the related function can be selected.

The same selection mode can be applied to all items chosen:

Console Setup
Environment
Generator
Digital
Table
Air Kerma
Webcam
Printer
Remote Control
Table type
Exel
Table CAN speed
250
Table Autopositioning
On
Collimator filters
Off
Tomosynthesis: focal length
Minimum [cm]
115
Maximum [cm]
165

Console Setup
Environment
Generator
Digital
Table
Air Kerma
Webcam
Printer
Remote Control
Image receptor - patient table distance [mm]
WS 1
100
WS 2
100
WS 3
100
WS 4
100
WS 5
100
WS 6
100
SID [mm]
WS 1
1150
WS 2
1150
WS 3
1150
WS 4
1150
WS 5
1150
WS 6
1150
Xray on in HCF [ms]
10

Consolle Setup
Environment
Generator
Digital
Table
Air Kerma
Webcam
Printer
Remote Control
Rotation (-90°)
Off
Mirroring mode
Xor
Horizontal mirroring
Off
Vertical mirroring
Off
FPS
24

Consolle Setup
Environment
Generator
Digital
Table
Air Kerma
Webcam
Printer
Remote Control
Printer type
Epson
COM port
Off

In order to save the selections made, touch icon and the following screen will display:

To exit the configuration mode, touch icon and the following screen will display, allowing different choices.

Touch icon to run table calibration mode

8.3. ENTERING THE CALIBRATION MODE

When the unit enters the calibration mode, the most of the safety controls are disabled.
In particular:
1. The Anti collision routine is disabled;
2. All safety controls related with potentiometers and encoders sensing circuits are disabled;
3. All movements can be operated by the service personnel only at the control desk side. Only the end of the travel micro switches can stop the movements;
4. The feedback signals from all power drivers are ignored;
5. The movements speed can be modified only by the sensing potentiometer value (low speed close to travel limits)
FOR SUCH REASONS SERVICE PERSONNEL IS REQUESTED TO OPERATE THE UNIT BEING VERY CAREFULL NOT TO PRODUCE DAMAGES TO THE UNIT AND/OR INJURY ANY OTHER PERSON PRESENTS IN THE ROOM.

In order to enter the calibration mode, select the service icon and wait for the service menu to appear on the touch screen display.

8.3.1. 0° TILT STOP SETTING

Using the following procedure it is possible to record the position of the horizontal stop for tilting movement.

1. Enter the unit maintenance mode as indicted in section 8.3.

2. Touch TILT icon and wait for the tilt menu to appear on the touch screen display as shown in the following figure.

3. Using the tilting joystick **37** drive the unit to its horizontal position.

4. Touch icon **0°** to store the actual potentiometer value.

5. Using joystick **37** to tilt the unit to the **+90°** position.

6. Adjust the Zero value of the potentiometer sensing circuit touching icon AUTO of the zero calibration row on the touch screen display as shown in the previous figure. The unit main CPU will automatically calibrate the potentiometer sensing circuit and store the minimum value (Zero) into the serial eeprom.

7. Using joystick 37 tilt the unit to the -90° position.

8. Adjust the Gain value of the potentiometer sensing circuit touching icon AUTO of the gain calibration row on the touch screen display as shown in the previous figure. The unit main CPU will automatically calibrate the potentiometer sensing circuit and store the maximum value into the serial eeprom.

In case the value is not considered valid by the Unit CPU a specific error message will appear on the touch screen display.

9. Exit the TILT service menu touching the exit icon .

8.3.2. ELEVATION

Using the following procedure it is possible to record the table elevation

1. Enter the unit maintenance mode as indicted in section 8.3.

2. Touch ELEVATION icon and wait for the tilt menu to appear on the touch screen display.

3. Using joystick **37** drive the tabletop to the **lowest** limit position. In case of need, combine the elevation movement with the tilting movement to reach the required position.

4. Adjust the Zero value of the potentiometer sensing circuit touching icon AUTO of the zero calibration row on the touch screen display as shown in the previous figure. The unit main CPU will automatically calibrate the potentiometer sensing circuit and store the minimum value (Zero) into the serial eeprom.

5. Using joystick 37 drive the tabletop to its highest limit stop. In case of need combine the elevation movement with the tilting movement to reach the required position.

6. Adjust the Gain value of the potentiometer sensing circuit touching icon AUTO of the gain calibration row on the touch screen display as shown in the previous figure. The unit main CPU will automatically calibrate the potentiometer sensing circuit and store the maximum value into the serial eeprom.

7. Exit the ELEVATION service menu touching icon .

8.3.3. COLUMN CALIBRATION

Using the following procedure, it is possible to record the column calibration:

1. Enter the unit maintenance mode as described in **section 8.3**

2. Touch **COLUMN** icon and wait for the column menu to appear on the touch screen display as shown in the following figure.

3. Using Joystick 40, tilt the tube of about -25° counterclockwise.

4. Using joystick 44 drive the tube stand to its left limit stop. Make sure that the end of the travel micro switch is activated. In the negative an error message will appear on the touch screen display.

5. Adjust the Zero value of the potentiometer sensing circuit touching icon AUTO of the zero calibration row on the touch screen display as shown in the previous figure. The main CPU will automatically calibrate the potentiometer sensing circuit and store the minimum value (Zero) into the serial eeprom.

6. Using Joystick 40, tilt the tube of about +25° clockwise.

7. Using joystick 44 drive the tube stand to its right limit stop. Make sure that the end of the travel micro switch is activated. In the negative an error message will appear on the touch screen display.

8. Adjust the Gain value of the potentiometer sensing circuit touching icon AUTO of the gain calibration row on the touch screen display as shown in the previous figure. The main CPU will automatically calibrate the potentiometer sensing circuit and store the maximum value into the serial eeprom.

9. Exit the COLUMN service menu touching icon .

8.3.4. SETTING THE SFD

Using the following procedure, it is possible to set the SFD

1. Enter the unit maintenance mode as indicted in **section 8.3.**

2. Touch **SFD** icon and wait for the incidence menu to appear on the touch screen display as shown in the picture.

3. Drive the tube incidence to its **0°** position with joystick **40.**

4. Using joystick **44** to drive the Detector to its left limit stop and make sure that the end of the travel micro switch is activated. In the negative an error message will appear on the touch screen display.

5. Adjust the Zero value of the potentiometer sensing circuit touching icon AUTO of the zero calibration row on the touch screen display as shown in the previous figure. The Unit main CPU will automatically calibrate the potentiometer sensing circuit and store the minimum value (Zero) into the serial eeprom.

6. Using joystick 44 drive the Detector to its right limit stop. Make sure that the end of the travel micro switch is activated.

7. Adjust the Gain value of the potentiometer sensing circuit touching icon AUTO of the gain calibration row on the touch screen display as shown in the previous figure. The Table main CPU will automatically calibrate the potentiometer sensing circuit and store the maximum value into the serial eeprom.

8. Exit the SFD service menu touching icon .

8.3.5. 0° COLUMN INCIDENCE STOP SETTING

Using the following procedure, it is possible to record the position of the vertical stop for the tube incidence movement.

1. Enter the unit maintenance mode as indicted in **section 8.3**.

2. Touch **INCIDENCE** icon and wait for the incidence menu to appear on the touch screen display as shown in the following figure.

3. Using the tilting joystick **40** drive the tube stand to its vertical position.

4. Touch icon **0°** to store the actual potentiometer value.

In case the value is not considered valid by the Unit CPU a specific error message will appear on the touch screen display.

5. Exit the TILT service menu touching icon .

8.3.6. SETTING FFD

Using the following procedure, it is possible to record the position of the vertical stop for the tube incidence movement.

1. Enter the unit maintenance mode as indicted in **section 8.3**.

2. Touch **FFD** icon and wait for the incidence menu to appear on the touch screen display as shown in the following figure.

3. Using button **42** drive the FFD movement to its minimum limit stop (FFD= 115 cm).

4. Adjust the Zero value of the potentiometer sensing circuit touching icon MIN of the zero calibration row on the touch screen display as shown in the previous figure. The main CPU will automatically calibrate the potentiometer sensing circuit and store the minimum value (Zero) into the serial eeprom.

5. Using button 43 drive the FFD movement to its maximum limit stop (FFD=150 or 180 cm).

6. Adjust the Gain value of the potentiometer sensing circuit touching icon MAX of the gain calibration row on the touch screen display as shown in the previous figure. The table main CPU will automatically calibrate the potentiometer sensing circuit and store the maximum value into the serial eeprom.

7. Exit the FFD service menu touching icon .

8.3.7. LATERAL

Using the following procedure, it is possible to record the position of the vertical stop for the tube incidence movement.

1. Enter the unit maintenance mode as indicted in **section 8.3**.

2. Touch **LATERAL** icon and wait for the incidence menu to appear on the touch screen display as shown in the following figure.

3. Using joystick **44**, move the tabletop towards the internal position, until the tabletop reaches the end of the stroke.

4. Click on the “AUTO” icon near the “ZERO” bar.

5. Using joystick **44**, move the tabletop towards the operator position, until the tabletop reaches the end of the stroke.

6. Click on the “AUTO” icon near the “GAIN” bar.

7. Using joystick **44** move the tabletop until half way of its stroke and click on icon .

8. Exit the LATERAL service menu touching icon .

8.3.8. SETTING THE TUBE JOYSTICK ORIENTATION

It is possible to simulate a CW rotation of the tube and TBT movement joystick to match the user habits or particular application using the following procedure:

1. Enter the unit maintenance mode as indicated in **section 8.3**.

2. Touch **JOYSTICK** icon and wait for the incidence menu to appear on the touch screen display as shown in the following figure.

3. Select the desired tube joystick orientation keeping in mind that:

   a. **X** = identifies the tube/Detector longitudinal movement;

   b. **Y** = identifies the tabletop lateral movement

It is possible to set different dynamics response of the tube joystick to match the user habits.

4. Save the new setting touching icon .

It is now possible to verify the correct joystick orientation by moving it in the different directions

5. Exit the service menu touching icon .

8.3.9. EEPROM INIT

Please refer to Section **12.7** for instructions.

8.3.10. TOMOGRAPHY AND TOMOSYNTHESIS HIRIS CODE SETTING

The following chart shows the Hiris code setting for TOMOGRAPHY and TOMOSYNTHESIS exams generation.

	Focal Length	**Anatomic Part**	**Card Name**			
TOMOSYNTHESIS 20°	Minimum	57	5-9	25-29	45-49	
	Maximum	57	65-69			
TOMOSYNTHESIS 30°	Minimum	57	10-14	30-34	50-54	
	Maximum	57	70-74			
TOMOSYNTHESIS 40°	Minimum	57	15-19	35-39	55-59	
	Maximum	57	75-79			
TOMOGRAPHY 8°		56	0-4	20-24	40-44	60-64
TOMOGRAPHY 20°		56	5-9	25-29	45-49	65-69
TOMOGRAPHY 30°		56	10-14	30-34	50-54	70-74
TOMOGRAPHY 40°		56	15-19	35-39	55-59	75-79

In order to set minimum and maximum focal lengths for Tomosynthesis, please follow the procedure described in **Section 11.6**.

8.3.11. DIGITAL TOMOGRAPHY AND TOMOSYNTHESIS LAYER OFFSET SETTING

a) TOMOGRAPHY

Using the following procedure, it is possible to correct the tomography layer setting.

1. Use a tomography tool to make a tomo exposure with the tomo layer set at 100 mm.

2. Determine the difference between the layer read on the film and the unit actual value indicated on the display (pay attention that the value may differ of some millimeters). This difference (or tomo layer offset) can be either positive or negative.

3. Enter the unit maintenance mode as indicated in **section 8.3**.

4. Touch **OPTIONS** icon and wait for the menu to appear on the touch screen display as shown in the following figure.

5. Enable the tomography switch.

6. On the **Tomo offset II (mm)** row touch icon to enable the use of a numeric keypad. The same remains valid both for tomography and tomosynthesis.

7. Set the tomo offset value and touch icon ENTER on the numeric pad to insert the value.

8. Save the new setting touching icon .

9. Exit the service menu touching icon .

b) TOMOSYNTHESIS

Using the following procedure, it is possible to correct the tomography layer setting.

1. Use a tomosynthesis tool to determine the difference between the layer read on the film and the unit actual value indicated on the display (pay attention that the value may differ of some millimeters). This difference can be either positive or negative.

2. Enter the unit maintenance mode as indicated in **section 8.3**.

3. Touch **OPTIONS** icon and wait for the menu to appear on the touch screen display as shown in the following figure.

4. Enable the tomosynthesis switch.

5. On the **Tomo offset II (mm)** row touch icon to enable the use of a numeric keypad. The same remains valid for both tomography and tomosynthesis.

6. Set the tomo offset value and touch icon ENTER on the numeric pad to insert the value.

7. Save the new setting touching icon .

8. Exit the service menu touching icon .

8.3.12. SETTING THE ROOM CEILING HEIGHT

Important information
The software module has been designed to allow the use of the unit in a room with a minimum ceiling height of 260 cm. Therefore, it is not possible to operate the system in case the ceiling is lower than such value.

The Unit remote tilting table is equipped with an anti collision software module that is capable to prevent the collision of any unit part with the room ceiling.
By means of this procedure is possible to record into the 3-phase CPU serial eeprom the actual height of the room ceiling.

1. Enter the unit maintenance mode as indicted in **Section 8.3**.

2. Touch OPTIONS icon and wait for the menu to appear on the touch screen display as shown in the following figure.

3. To set this parameter, do press the **Celing height** icon to enable the use of a numeric keypad.

4. Set the actual ceiling height and touch icon ENTER on the numeric pad to insert the value.

5. Save the new setting touching icon .

6. Exit the service menu touching icon .

8.3.13. SETTING THE LEFT WALL DISTANCE

The Unit remote tilting table is equipped with an anti collision software module that is capable to prevent the collision of any unit part with the room wall at the left side of the unit.
By means of this procedure is possible to record into the 3-phase CPU serial eeprom the actual distance of the left wall from the tilting tower vertical axis (tilting pivot).

1. Enter the unit maintenance mode as indicted in **Section 8.3**.

2. Touch OPTIONS icon and wait for the menu to appear on the touch screen display as shown in the following figure.

3. Press the **Left wall** icon to enable the use of a numeric keypad.

4. Set the actual left wall and touch icon ENTER on the numeric pad to insert the value.

5. Save the new setting touching icon .

6. Exit the service menu touching icon .

8.3.14. SETTING THE RIGHT WALL DISTANCE

The Unit remote tilting table system is equipped with an anti collision software module that is capable to prevent the collision of any unit part with the room wall at the right side of the unit. By means of this procedure is possible to record into the 3-phase CPU serial eeprom the actual distance of the right wall from the tilting tower vertical axis (tilting pivot).

1. Enter the unit maintenance mode as indicted in **Section 8.3**.

2. Touch OPTIONS icon and wait for the menu to appear on the touch screen display as shown in the following figure.

3. Press the **Right wall** icon to enable the use of a numeric keypad.

4. Set the actual right wall and touch icon ENTER on the numeric pad to insert the value.

5. Save the new setting touching icon .

6. Exit the service menu touching icon .

8.3.15. TOMO OFFSET [mm]

Using the following procedure, it is possible to set the tomographic layer.

1. Enter the unit maintenance mode as indicted in **Section 8.3**.

2. Touch **OPTIONS** icon and wait for the menu to appear on the touch screen display as shown in the following figure.

3. On the **Tomo offset [mm]** touch icon to enable the use of a numeric keypad.

4. Set the numeric pad to insert the value.

5. Save the new setting touching icon .

6. Exit the service menu touching icon .

7. **TOMO OFFSET II [mm]**
   In case of a digital Tomo, do follow this previous procedure just make the setting to the offset II [mm] row.

8.3.16. FFD STITCHING [cm]

FFD stitching cm is an option to be set in case the standard stitching focal distance of 150cm needs to be changed, up to 170 cm.

8.3.17. ERROR LOG

8.4. DOSE INFORMATION CALIBRATION

The “Dose indication” functionality calibration requires following a proper procedure.

The operator has to make the unit calibration by performing the X-ray exposures at different kVs and with each possible set-up in function of the additional collimator filtration.

The measured Air Kerma values are recorded in the configuration file and the values are used by the software to calculate the cumulated Air Kerma and the Air Kerma rate in all possible configurations of modes of operation (radiography, continuous fluoroscopy and pulsed fluoroscopy), loading factors and collimator filtration.

The unit calibration must be performed as described in the following steps:

1. Before starting the calibration, check that all the available workstations have been correctly set up, as indicated in section 11. In particular, it is crucial that the distance between the image receptor and patient support is correctly set up for each workstation.

2. Enter the unit maintenance mode as described in section 8 of the Service Manual.

3. Exit the service menu by touching the exit icon (1) and launch the console application touching “Run Consolle”(2), as shown in the following figure.

4. In the console application, select the Direct Mode for the first X-ray tube.

5. Set the SID to 1150mm.

6. Tilt the X-ray beam column and change the tube angulation so that the X-ray beam is perpendicular to the table-top but, the X-ray field is outside the digital detector.

7. Collimate the X-ray field to have an area of about 30x30cm^2 on the tabletop.

8. Place the dosimeter on the tabletop, at the center of the X-ray field.

9. Touch icon

and the calibration menu displays as shown in the following figure.

The dose calibration menu will be displayed at the screen center.

By default, the menu shows the additional collimator filtration possible different settings but the operator is not allowed to edit them.

At the top menu line are selected the workstations for which the currently displayed calibration is valid.

In the second line are indicated the additional collimator possible settings.

Furthermore, if the collimator is provided with manual filters, only the first three settings are available, in case the collimator is provided with motorized filters all the combinations are available.

For each additional filter are shown the calibration parameters, for instance:

- the mAs value at which the calibration is performed;
- the air Kerma values for each kV step from 40kV to 140kV;
- the fit paramters A,B,C and the goodness of fit R^2.

In the bottom line it's provided the "Dosimeter thickness" field and three icons, whose functionality are summarized in the following table:

Button	Functionality	Description
	Edit/create	When the icon turn into orange it is possible to edit the calibration or create a new one if none exists.
	Save	When this icon is pressed, all calibrations are saved and the menu is exited.
	Exit	When this icon is pressed, the AK calibration menu is exited.

10. Press the Edit/create icon to start the calibration.

11. In the "Dosimeter thickness" field insert the thickness of the dosimeter in mm.

12. Select all the workstations for which the current calibration is valid.

13. Select the first filter combination: "No filter". Deselect the additional filters from the touchscreen, as indicated in the following figure:
    A filter is deselected when the icon background color turns grey.
    NOTE: this operation must be performed both with manual and motorized filters.

14. Set the current time product value to 10mAs (suggested values are 100mA, 0.1s) in the generator and record the value in the “mA” field of the calibration menu: press the mA button and digit the value in the keyboard displayed, then confirm by pressing the “Enter” icon, as shown in the following figure.

15. Set the first kV value (40kV) in the generator with the console control.

16. Perform an x-ray exposure and record the measured dose in the correspondent field of the calibration menu. Press the icon in the kV column and digit the Kerma value in the keyboard, do confirm it by pressing the “Enter” icon.

17. Repeat steps 15 and 16 for the other kV values.

18. Check that the value R^2 is greater than 0.99. In positive case, the calibration of the first filter setting has been completed successfully.

19. Repeat the procedure described in the steps 13 to 18 for the other filter settings.

20. Save the calibration by touching the “Save” icon in the AK calibration menu.

21. Repeat all the calibration for the second tube, if present.

NOTE: according to standard IEC 60601-2-54, the indication of the dose operator is mandatory only for the workstations where fluoroscopy and/or serial radiography are enabled. For all other workstations is not mandatory, even though the dose indication functionality is provided for all workstations.

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9. BEAM ALIGNMENT

THE OPERATIONS DESCRIBED HEREAFTER REQUIRE THE USE OF X--RADIATION. CONSEQUENTLY, THE OPERATORS ARE REQUESTED TO TAKE ALL THE NECESSARY PRECAUTIONS IN ORDER TO AVOID ANY TYPE OF EXPOSURE WHETHER DIRECT OR INDIRECT.

THE PROCEDURES DESCRIBED IN THE FOLLOWING SECTIONS MUST BE CONSIDERED AS SUGGESTED.
DIFFERENT ALIGNMENT PROCEDURES CAN BE VALID AND APPLICABLE AS WELL

In this section will be described all the calibration procedures that must be carried out during the installation/replacement of the collimator.

These operations include the alignment of the x-ray beam with image receptor.
Some operations have been already executed in the factory during the final test of the unit and should not be repeated.

Anyway, it is a good norm to repeat these calibrations at the installation site to check the full operation of the unit.

9.1. COLLIMATOR LIGHT FIELD / X-RAY FIELD ADJUSTMENT

The procedures hereinafter described must be considered as suggested. Different alignment procedures can be valid and applicable as well.

Before beginning the adjustments indicated in the following sections, verify that the collimator has been correctly configured and calibrated. Refer to the correspondent sections of this manual for a detailed description of collimator calibration procedures.

The collimators "type AL" are equipped with a light field system including a LED source. The light group doesn't have any more the possibility to move the light source, which is mechanically centered in factory. Among the others, LED sources provide longer lifetime than halogen lamps and rarely have to be replaced. In case this happens, refer to the corresponding section of the corrective maintenance.
The following procedure describes how to align the x-ray field with the simulation light field.
The idea is to move the collimator on its flange until misalignment requirements are met.

1. Mount the collimator approximately centered on the flange, by equally tightening the four fixing screws. This step is important to reduce the time loss to achieve correct alignment.
   Particular attention must be paid to avoid damaging extra-focal blades by crashing them against x-ray tube output cone.

2. Position the tube at minimum FFD. Set the collimator for manual operation and project an illuminated field of about 30x30 cm^2.

3. Put the radio opaque markers (similar to small coins) on the border of the light field, as showed in the figure below.

4. Set convenient exposure data and acquire the X-ray image.

5. Check the misalignment of the light field Vs the X-ray field using the following formulas:

F1 → | a + b | < 1% SID

F2 → | c + d | < 1% SID

6. The limits of step 5 are GMM internal limits and are usually achievable on most GMM systems. These limits are more severe than those required by applicable IEC standards,

imposing that the misalignment between x-ray and light fields must be less than 2% of the SID. Normally GMM internal limits are achievable and applied; however, in some cases they may not be achievable, due to mechanical tolerances between parts of different units. In these cases IEC standard limits must be applied and fulfilled.

7. In case F1 **and/or** F2 conditions **are not verified**, adjust the position of the collimator on the flange by acting on the screws as showed in the following figure:

In particular, to move the collimator in one direction, loosen the screws on the opposite direction and tighten the screws of that direction. For example, to move the collimator towards head direction on the table, loosen the two screws on the foot-side and tighten the two head-side screws.

As a practical example, consider a situation where light and x-ray fields are as on the above figure, where “a” and “b” directions are respectively head and feet directions, and “c” and “d” directions are respectively “out” and “in” directions.

In this case, x-ray field is shifted with respect to light field in “b/feet” and “c/out” directions. To properly align x-ray and light fields it’s necessary to move the collimator in directions “a/head” and “d/in” directions.

AS A GENERAL RULE, WHEN X-RAY FIELD IS SHIFTED IN DIRECTION “D” WITH RESPECT TO THE LIGHT FIELD, THE COLLIMATOR HAS TO BE MOVED IN THE DIRECTION OPPOSITE TO “D” (ALIAS “-D”) TO CORRECT ALIGNMENT.

---

8. At the end of the alignment operations, ensure that all screws are properly tightened and the collimator is well fixed on the flange.

WHENEVER ACTING ON FLANGE SCREWS, AT THE END OF OPERATIONS IT IS MANDATORY TO CHECK THAT ALL THE FOUR SCREWS ARE CORRECTLY TIGHTENED TO AVOID THE RISK OF THE COLLIMATOR TO FALL OFF THE FLANGE, CAUSING SERIOUS INJURY TO PATIENT AND/OR OPERATOR.
IN CASE OF NEED, ROTATING FLANGE IS OPTIONALLY AVAILABLE.

9.2. X-RAY FIELD PERPENDICULARITY CHECK

1. Place the table in horizontal position and the tube at minimum FFD.
2. Set the collimator for manual operation and project an illuminated field of 30x30 cm^2.
3. Set convenient exposure data and acquire the image.
4. Position the tube at the maximum reachable FFD.
5. Set convenient exposure data and acquire and save the image.

6. In case of evident misalignment, mechanical adjustment of x-ray tube position on the fixation group has to be performed. Please refer to sections **9.2.1** and **9.2.2** for detailed procedures.

9.2.1. **TUBE ANGULATION ADJUSTMENT**

1. Loosen the fixing nut **1**.
2. Adjust the off-center nut **2** until the x-ray tube rotates, around the tube arm axis, up to the desired angle.
3. Lock off center nut **2** and tighten the fixing nut **1**.

9.2.2. **TUBE ROTATION ADJUSTMENT**

1. Loosen the 4 fixing screws **7**.
2. Rotate the x-ray tube in the trunnion ring until it reaches the desired angle.
3. Firmly keep in position the x-ray tube and tighten screws **7**.

10
11
12
3
2
1
7
8
9
4
5
6

9.3. ALIGNMENT OF THE X-RAY BEAM WITH THE DETECTOR CENTER

In this section it's described the procedure to check the alignment between x-ray field and image receptor centers. In case the misalignment exceeds the limits, a calibration of the synchronization between ceiling suspension and image receptor, both in the patient support table and in the wall stand.

1. Position the tube at minimum FFD.

2. Set the collimator for manual operation and project an illuminated field of 35x35 cm^2.

3. Set convenient exposure data and acquire and save the image.

Verify that the distance **cc^1 < 1% SID.**
In the negative, adjust the mechanical alignment following the procedures below:

9.3.1. **TRANSVERSE ADJUSTMENT**

THE **CONNEXITY** REMOTE TILTING TABLE IS FACTORY PRESET WITH THE SPACERS NECESSSARY TO ALIGN THE BEAM WITH THE CENTER OF THE SPOT FILM DEVICE.
THEREFORE THIS ADJUSTMENT PROCEDURE IS NOT NORMALLY REQUIRED. IN CASE IT IS NECESSARY TO MODIFY THE FACTORY ALIGNMENT THE FOLLOWING PROCEDURE MUST BE CARRIED OUT.

1. Remove the cooling fan mounted on the trunnion ring with screws **3**.
2. Determine how many shims **8** must be removed from the block that supports the x-ray tube in order to bring the center of the beam on the longitudinal axis of the spot film device (each shim corresponds to a displacement of 2 mm.).
3. Loosen the fixing nuts **4 and 9** and remove or add as many shims as necessary.
4. Tighten the fixing nuts **4 and 9**.
5. Mount the tube cooling fan.

9.3.2. **LONGITUDINAL ADJUSTMENT**

1. Loosen the 4 grub screws **9** located on the sides of the fixing block of the trunnion ring.
2. Loosen the fixing nuts **4 and 6**.
3. Move the x-ray tube along the horizontal direction until the center of the beam gets on the center of the spot film device.
4. Tighten the 4 lateral contrast grub screws **9**.
5. Tighten the fixing nuts **4 and 6**.

9.4. ALIGNMENT AND CHECK OF THE COLLIMATOR CROSS

The collimator cross is printed on the Plexiglas plate fixed to the collimator external cover.
Once x-ray and light fields are properly aligned, it's sufficient to check that the collimator cross is centered with collimator blades in both directions, as indicated in the following procedure.

Position the tube at minimum FFD. Set the collimator for manual operation and project an illuminated field of 30x30 cm^2.

Switch on the simulation light and verify that the distance

$a \cong b$ and $c \cong d$

In other words, verify that the lines of the cross are centered with the light fields.

In the negative, adjust the position of the cross reference as described in **section 16.**

9.5. COLLIMATOR CALIBRATION CHECK

1. Drive the table in the horizontal position and set the FFD at minimum value.
2. At the image processor, select an anatomical program in which an exposure area of 43x43 cm has been pre-programmed.
3. Acquire an image and check that all the detector active area is correctly irradiated. Check also the error of the irradiated area and record it.
4. Drive the table in the +90° position and set the FFD at maximum value.
5. At the image processor, select an anatomical program in which an exposure area of 43x43 cm has been pre-programmed.
6. Acquire an image and check that all the detector active area is correctly irradiated. Check also the error of the irradiated area and record it.

Check that the errors of the irradiated area are acceptable and, in the negative, correct the collimator calibration as described in **section 16**.

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10. CONTROL CIRCUITS & HW JUMPER SETTING

The control electronics of the remote tilting table has been designed in order to control the different movements of the unit as well as to give to the operator the possibility to manually control the unit.

The unit calibration is carried out by means of the SW utilities the small touch panel (with LCD display) on the tube side control keyboard and accessing to the GMM Integrated PC touch panel.

The unit is always operating using the detector with the only exception of the “free technique” were the operator can use a standard radiographic cassette.

Please note that the descriptions beside the switches are only valid if the related switch is in **ON** position.

10.1. CIRCUIT DESCRIPTION

The **Unit** control system is composed of four separate CPU boards connected by means of a serial link. The Remote Control Desk CPU acts as system manager and main user interface.

The serial link protocol adopted is a standard ISO CAN.
A hardware controller in accordance with ISO standard ensures proper error free data transmission.
In particular, for error detection, every transmitter is monitored by its own receiver.

All nodes carry out a cyclic redundancy check (15 bit CRC).
They observe the bit stuffing rule and the message format.
A message failure is also generated when no acknowledge is returned by a node.

Together these functions guarantee a humming distance of 6 and a probability of a residual errors of < 10 (-13) per transmission.

Control Desk CPU BOARD:

It is the main user interface (keyboard and display) control.
This board is responsible for the can bus (communication link) control.

MAIN CPU BOARD:

It directly controls all the main motions of the unit with the exclusion of the inherent SFD and collimator functions that are controlled from dedicated CPU cards.
This card act also as Interface control with the external world (X-Ray generator, TV chain, etc). The related I/O signals are optically and/or galvanically insulated (opto-couplers and/or relay).
On this Card are also located the unit On/Off control circuit, these last commanded from the corresponding pushbuttons are present on the Main Control Desk keyboard.

SFD CPU BOARD:

It directly controls all the function of the SFD. It is responsible for the correct X-Ray cassette positioning as well as for the near film shutter positioning and the X-Ray Grid control.
This card is also managing the SFD control desk (Operator table side interface). The commands generated from this last keyboard are sent to the Control Desk CPU for a correct management (all the actions are commanded from the Control Desk CPU).

Collimator CPU BOARD:

It directly controls all the Collimator shutters positioning.

10.2. HW JUMPERS SETTINGS

There are some jumpers/dip switches that allow the service engineer to disable safety interlocks of the unit.
Such switches have the main porpoise to easy the trouble shooting operation of field engineers, but can also dramatically reduce the safety level of the unit if enabled during normal operation.
IS THEREFORE RESPONSABILITY OF THE FIELD ENGINEER THAT SUCH SWITCHES ARE NOT LEFT ENABLED IF NOT FOR THE TIME STRICTLY NECESSARY FOR THE TROUBLESHOOTING OPERATIONS.

In the current section the use of the jumpers and/or dip switches mounted on the different electronic boards composing the **System** control system will be carefully described.
It must be underlined that the function of such switches might be related with the firmware version installed on the unit.
For this reason is a good practice to check all service notes released after the distribution of this manual to be sure that the jumpers still conserve the original function.

10.3. CONSOLE CPU JUMPERS SETTINGS

10.4. MAIN CPU BOARD JUMPERS SETTINGS

MECALL Srl Clisis MAIN CPU Rev.A
006050.181.001
SW11
JP4
JP3
JP1
JP2
SW2
CN104
TILT PW FEEDBACK
ACTIVE LOW
SW2
TILT PW FEEDBACK
ACTIVE HIGH
CN141 CAN LINE
ENABLED
JP1
JP2
CN141 CAN LINE
BY-PASS
JP1
JP2
JP3
GENERATOR OFF
PRIORITY DISABLE
JP4
GENERATOR OFF
COMMAND IS A PULSE
JP3
GENERATOR OFF
PRIORITY ENABLE
JP4
GENERATOR OFF
COMMAND IS A STATUS
SW11
CAN LINE TERMINATOR
DISABLED
CN133
CAN LINK DISABLED
SW1.4
SW1.3
SW1.6
SW1.5
SW11
CAN LINE TERMINATOR
ENABLED
CN133
CAN LINK ENABLED
SW1.4
SW1.3
SW1.6
SW1.5

SW16
CPU RESET
CPU PERMANENT RESET
MECALL Srl Clisis MAIN CPU Rev.A
006050.181
SW13
SW10
SW9
SW6
SW1
SW15
4 Mbit RAM SELECTION
SW15
1 Mbit RAM SELECTION
JP5
BOOTSTRAP LOADER
ENABLE AT POWER ON
SW12
CN140.3
OUTPUT
SW12
CN140.3
GROUND
SW8
CLISIS
EXEL
SW8
CLISIS
STD/ACCESS
SW5
NTILT FSEC
INTERLOCK ON
SW5
NTILT FSEC
INTERLOCK
BYPASS

10.5. MAIN INTERFACE BOARD JUMPERS SETTINGS

10.6. SFD CPU JUMPERS SETTINGS

10.7. COLLIMATOR CPU JUMPERS SETTINGS

Collimator AL - CPU

10.8. TUBESTAND CONTROL BOARD JUMPERS SETTINGS

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11. SW JUMPERS SETTING

The **Unit** control firmware includes a set of software switches whose function is to enable or disable optional components of the table or skip some parts of the safety chain.
Such switches are **accessible in service mode** via a specific configuration menu as detailed in the following paragraphs of this section.

It must be underlined that the function of such switches might be related with the firmware version installed on the unit. For this reason is a good practice to check all service notes released after the distribution of this manual to be sure that the jumpers still conserve the original function.

There are some software switches that allow the service engineer to disable safety interlocks of the unit. Such switches have the main porpoise to easy the trouble shooting operation of field engineers, but can also dramatically reduce the safety level of the unit if enabled during normal operation.
IS THEREFORE RESPONSABILITY OF THE FIELD ENGINEER THAT SUCH SWITCHES ARE NOT LEFT ENABLED IF NOT FOR THE TIME STRICTLY NECESSARY FOR THE TROUBLESHOOTING OPERATIONS.

11.1. SET UP SELECTION

Using the following chapter procedure it is possible to enable/disable each function of the chart functions listed below.
Please note that the white button on the picture is the selector (for example: all selections on the picture below are “OFF”).

Interface Icon	INSTALLER SET UP CONNECTION	FUNCTIONS
System Inch mm	System inch/mm	Non-active option
Low speed cassette Off On	Low speed cassette on/off	Move in the check box value to OFF for standard speed or ON to low speed
Grid Park exclusion Off On	Grid Park exclusion on/off	Move in the check box value to grid parking ON to disable the parking
Collimator Iris disable Off On	Collimator iris Disable	Set onto ON to disable the Iris shutters of the automatic collimator
SFD light cell disable Off On	SFD safety light cell disable on/off	Set onto ON to disable the light cell
Incidence detent mode Off On	Incident Detent mode	Set onto ON to stop automatically the tube column at the 0° position
Incidence det. power-on Off On	Incident det. Power-on	Set onto ON to activate the tube column automatic stop at 0° position at the unit start up. The function can be set only if the installer has previously set the INCIDENT DETENT MODE
Tilt detent mode Off On	Tilt detent mode	Set onto ON to stop automatically the table tilting movement at the 0° position
Tilt detent at power-on Off On	Tilt det mode (TILT 0 STATUS AT POWER ON)	Set onto ON to stop automatically the table tilting movement at the 0° position The function can be set only if the installer has previously set the TILT DETENT MODE

Interface Icon	INSTALLER SET UP CONNECTION	FUNCTIONS
Collimator Mode Off On	Collimator mode	If set onto ON = the Collimator remains in manual mode when Image processor set a new area. If set onto OFF = the Collimator enters in auto mode when Image processor set a new area
Exclude grid rotation in Acc.1 Off On	Exclude Grid rotation in acc. 1	It is set onto ON as a Standard
Enable grid rotation in Acc.2 Off On	Exclude Grid rotation in acc. 2	It is set onto OFF as a Standard
Reverse V at power-on Off On	Reverse V power ON	Set onto ON to automatically enable the V-rev output at power on.
Reverse H at power-on Off On	Reverse H power ON	Set onto ON to automatically enable the H-rev output at power on.
Tomography Off On	Tomography	It is set onto ON when THE TOMOGRAPHY function is present (option)
Trixel present Off On	Trixel present	In function of the configuration: set onto ON if the Trixel is present
CPI generator Off On	CPI generator	Set onto ON in case using CPI generator. Please do make reference to chapter Generator type selection (section 11.2)
Access Off On	Access	Set onto ON to enable the ACCESS (single-end suspended tabletop) mode.
Collimator AL Off On	Collimator AL	Set onto ON to enable the collimator type AL. If set to OFF, collimator type CT
Intercom disable Off On	Intercom disable	To disable the intercom option move the selection to ON
Stitching direction reverse Off On	Stitching direction reverse	Set onto ON to reverse the stitching mode direction

Interface Icon	INSTALLER SET UP CONNECTION	FUNCTIONS
Max FFD [cm] 150 180	Max FFD cm	Move in the check box value to 150 or 180 in function of the FFD installed (see end of section warning)
Lateral panel potentiometer Off On	Lateral Panel potentiometer	Virtual scan (Set onto ON if this option is installed)
Static Detector wiith II Off On	Static detector with II	System config. option
Static Detector wiith SFD & Pidrad Off On	Static Detector with SFD & Pidrad	System config. option
Tomosintesys enable Off On	Tomosynthesis enable	If set onto ON, it sets the Tomosynthesis technique.

1. Enter the unit maintenance mode as indicated in **section 8.3**.

2. Touch **OPTIONS** icon and wait for the menu to appear on the touch screen display as shown in the following figure.

3. Move the selection switch to the option to be performed make reference to the previous chart “installer set up selection”.

4. Save the new setting touching icon .

5. Exit the service menu touching icon .

WARNING
When setting “Max FFD (cm)” to 150, the end-stroke microswitch shall be moved to its lower position, as shown in the following picture**.**

11.2. GENERATOR TYPE SELECTION

In case of **Deimos generator**, must set up onto ON the CPI generator switch box, and change the following generator “console set up mask” into CPI.

In case using other generators types, as for instance Castor, after entering the unit maintenance mode (**section 8.3**) make reference to the following procedure:

1. Touch **OPTION** icon and wait for the menu to appear on the touch screen display as shown in the following figure.

2. Move the selection switch of the CPI GENERATOR option onto OFF position.

3. Select the proper generator type on the console setup mode.

4. Save the new setting touching icon .

5. Exit the service menu touching icon .

11.3. JOYSTICK AXIS LOCK SETTING

Using the following procedure is possible to enable/disable the contemporary movements of the control desk joysticks.

1. Enter the unit maintenance mode as indicated in **section 8.3**.

2. Touch **JOYSTICK** icon and wait for the incidence menu to appear on the touch screen display as shown in the following figure.

3. Move the selection switch of the MOVEMENT EXCLUSION option to the ON position to disable the contemporary movements controlled by the joysticks.

4. Save the new setting touching icon .

Now it is possible to verify the correct selection by moving the joystick in each position.

5. Exit the service menu touching icon .

11.4. COLLIMATOR AUTOMATIC MODALITY SELECTION

Using the following procedure is possible to select the working modality of the automatic collimator.

1. Enter the unit maintenance mode as indicated in **section 8.3**.

2. Touch **OPTIONS** icon and wait for the menu to appear on the touch screen display as shown in the following figure.

3. Move the selection switch of the COLLIMATOR MODE option to:

ON = Collimator remains in manual mode when Image processor set new area

OFF = Collimator enters auto mode when Image processor set new area

4. Save the new setting touching icon .

5. Exit the service menu touching icon

11.5. PATIENT LOADING POSITION TABLETOP HEIGHT

By means of this procedure is possible to record into the 3-phase CPU serial eeprom the height that the patient tabletop must reach during the patient loading sequence.

1. Enter the unit maintenance mode as indicted in **section 8.3**.

2. Touch **ELEVATION** icon and wait for the menu to appear on the touch screen display as shown in the following figure.

3. On the **Tabletop height** row touch the cursor to set table height.

4. Set the default height that the tabletop must reach during the patient loading procedure.

5. Save the new setting touching icon .

6. Exit the service menu touching icon .

11.6. TOUCH SCREEN CONSOLE CONFIGURATION

WARNING
Any modification will be saved only if the writing protection of the CFast (system disk) is opportunely disabled. Please remember that it is mandatory that the CFast protection is re-enabled as soon as the calibration phase is finished. Any power interruption when the Cfast writing protection is disabled may cause the corruption of its operative system

Using the following procedure is possible to enable / disable specific options and/or working modality of the touch screen console.

1. Enter the unit maintenance mode as indicated in **section 8.3**

2. On the touch screen display will appear the main service menu divided in several configuration windows having the following meaning:

- **ENVIRONMENT**

Language: The installer can choose the user interface language among the supported languages.

- **GENERATOR**

Type: The installer can enable the specific generator model.

WS Symbol: The installer can choose the IEC symbol that appear on each Working Station (accessory) selection icon.

"Common" section

Max fluoro time: The installer can set the expiration time of the fluoroscopy timer.

View 'post data': The installer can set the duration of the real exposure data on display.

View Rad data after fluoro: The installer can set the duration of the real exposure data on display.

"CPI" section

COM port: The installer can set COM port used by touchscreen for connection with CPI generator cabinet.

.

DAP 1: The installer can enable/disable the DAP chamber for tube 1.

DAP 2: The installer can enable/disable the DAP chamber for tube 2.

Xfer on Ws x: This setting has no impact for DRF.

Example for 'Max fluoro time setting"

Example for IEC symbol selection

- **DIGITAL**

System: The installer can choose the digital system. For DRF is HirisRF43.

Workstation enabled: The installer can choose the Working Station used.

"RF43" section

AirKerma Report: The installer can enable/disable the forwarding of AirKerma data to digital system.

Fluoro Calibration: This field is automatically on for the installer, and enable the fluoro calibration.

Tomosynt.XRay time: The installer can set the duration of X-ray emission during tomosynthesis (normally 10 milliseconds).

"Detector" section

Backup time: The installer can set the backup time for the detector in use.

Wireless: The installer can enable/disable the presence of wireless detector.

"Virtual Scan (RF43)" section

Rotation: The installer can exchange lateral motion data with longitudinal motion data.

Mirror Lateral: The installer can mirror lateral motion direction data.

Mirror Longit: The installer can mirror longitudinal motion direction data.

Lateral displac.: The installer can set a displacement for lateral motion data.

Longit. displac.: The installer can set a displacement for longitudinal motion data.

"Stitching" section

Enable: The installer can enable/disable a Stitching modality. *(This setting requires also the GMM license key to be effective.)*

Protocol: The installer can select a protocol type for Stitching modality. (For RF43 is 'New')

- **TABLE**

Table type: The installer can enable the specific table model. For instance for **CLISIS EXEL** system this parameter must be set to **EXEL**.

Table CAN speed: The installer can enable specific Can communication speed. For **table** system this parameter must be set according to the actual software version.

Table Autopositioning: The installer can enable/disable the autoposition feature for the table, based on code set in anatomic program on RF43.

Collimator filters: The installer can set the presence or not of the collimator filters.

"Tomosynthesis: focal length" section

Minimum: The installer can set low focal distance for tomosynthesis procedure.

Maximum: The installer can set high focal distance for tomosynthesis procedure.

- **AIR KERMA**

Image receptor – patient table distance

It contains a list of the distances between the image receptor and the plane of the patient support for each workstation. The values are expressed in mm.

- If the workstation is associated to the image receptor (film or detector) inside the spot film device, the value must be set equal to the dimensions specified in the drawing of section 2.3 “Weight and Dimensions” and indicated as “TBT (table top)/detector” distance or “distance film/panel”.

- If the workstation is associated to a direct mode, set the value to 0.

If the workstation is associated to a bucky, set the value equal to the distance between the detector (or film) and the top plane of the cover.

SID

It contains a list of the distances between the image receptor and the tube focus for each workstation. The values are expressed in mm.

Xray on in HCF **Do not change !**

- **WEBCAM**

Rotation: If ‘on’, the webcam image is rotated by -90 degrees.

Mirroring mode: Do not change!

Horizontal mirroring: The installer can select if mirror the image horizontally.

Vertical mirroring: The installer can select if mirror the image vertically.

FPS: The installer can select the number of frame per second for the webcam.

- **PRINTER**

Printer: The installer can select the printer used to print exposure ticket.

COM port: The installer can select the COM port used by touchscreen for connection with the printer used to print exposure ticket. (Valid only for Epson. For SLP printer set 'Off').

- **REMOTE CONTROL**

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12. TABLE FIRMWARE DOWNLOAD AND FACTORY DEFAULT PARAMETERS LOADING

12.1. UNIT FIRMWARE DOWNLOAD

The Unit control firmware is contained on the flash EPROM mounted on the console CPU on the main CPU, on the Console CPU, on the SFD CPU, and on the Collimator CPU boards.
The operator can upgrade the unit to the latest FW version using the GMM Flash EPROM programmer utility delivered with each unit.
The utility has been designed to run under a standard Windows environment and can be installed on any PC or laptop computer.
The connection between the laptop computer and the Unit CPU boards requires a standard null modem cable (female – female) unless the collimator CPU that requires one of the following collimator service cables:

- P/N 97731 (or 002500.588) for ALxxx Collimator (schematics on the next pages);
- P/N 97192 (or 002500.218) for CTxxx Collimator (schematics on the next pages).

WARNING
It is of fundamental importance to remove the covers of the two drivers located on both sides of the tube column, before starting the upgrade.

IMPORTANT INFORMATION
In order to access all CPUs easily, position the system as in the following picture and preferably orient the collimator upwards.

NO.	SIGNAL NAME	sqmm	FROM CABLE END "A" 06050.199 CN17				TO: COMPUTER RS232			
			LEAD LGTH	STRIP LGTH	TERMINATION	DESTINATION	LEAD LGTH	STRIP LGTH	TERMINATION	DESTINATION
1	RS232 - Tx	0,5	50	3	002331.132	3	20	3	002331.178	3
2	RS232 - Rx	0,5	50	3	002331.132	2	20	3	002331.178	2
3	GND	0,5	50	3	002331.132	4	20	3	002331.178	5

ITEM	PART NO	QTY	DESCRIPTION
8	002067.550	1	TUBING, HEATSHRINK
7	001740.003	3	AMP MODU FEMALE
6	002331.132	1	AMP MODU 4P
5	003145.001	2	CABLE IDENTIFICATION LABEL
4	001791.xxx	1	CABLE, 3x 0.25 sqmm
3	002227.004	1	SHELL 9P
2	001740.006	3	AMP CANNON FEMALE PIN
1	002331.178	1	AMP CANNON FEMALE 9P SNAP IN

GMM s.p.a.
31 LUG. 2015
PROG. M. FIRMA

GMM 87731

Tolleranze Generali	DIMENSIONI	< 0.5 mt	0.5 - 2 mt	> 2 mt
	TOLLERANZE	-0/+0.5 cm	-0/+1 cm/mt	-0/+4 cm/mt

MODIFICHE	Rev	Data	descrizione modifica	Firma

date 07/01/2014	Rif. GMM =			Collimatore serie "AL"
firma D. CERVINI		1	1di1	
visto	n. dis.	progr.	n. di	apparecchio
MECALL	Denominazione COLLIMATOR "AL" series SERVICE CABLE			disegno n° 002500.588 Rev

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GMM s.p.a.
/ 6 NOV. 2012
PROG. M. FIRMA

97192

NO.	SIGNAL NAME	sqmm	FROM: CABLE END "A" 06050.153 CN528				TO: COMPUTER			
			LEAD LGTH	STRIP LGTH	TERMINATION	DESTINATION	LEAD LGTH	STRIP LGTH	TERMINATION	DESTINATION
1	RS232 - Tx	0,5	50	3	002331.132	2	20	3	002331.178	3
2	RS232 - Rx	0,5	50	3	002331.132	3	20	3	002331.178	2
3	GND	0,5	50	3	002331.132	4	20	3	002331.178	5

ITEM	PART NO.	QTY	DESCRIPTION
8	002067.850	1	TUBING, HEATSHRINK
7	001749.003	3	AMP MODU FEMALE
6	002331.132	1	AMP MODU 4P
5	003145.001	2	CABLE IDENTIFICATION LABEL
4	001791.040	1	CABLE, 4 CONDUCTOR 0.5 sqmm
3	002227.004	1	SHELL 9P
2	001749.006	3	AMP CANNON FEMALE PIN
1	002331.178	1	AMP CANNON FEMALE 9P SNAP-IN

Tolleranze Generali	DIMENSIONI	< 0.5 mt	0.5 - 2 mt	> 2 mt
	TOLLERANZE	-0/+0.5 cm	-0/+1 cm/mt	-0/+4 cm/mt

NOTE : IN THE ORDERING CODE PLEASE SUBSTITUTE _LLL_ WITH THE CABLE LENGHT (mt)

data 22/7/2001
firma L.M.L.
RIF. GMM 97192
1 | 1 di 1 | TSH
MECALL
denominazione: ARGOSTAT SERVICE CABLE
CODICE 002500.218

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12.2. UNIT MAIN CPU SOFTWARE DOWNLOAD

The Main board CPU is located on back-left side (frontal view).

Programming of Main board CPU Flash EPROM (software download) can be performed by following procedure below:

1. Switch the system on by pressing the starting button on the console.
2. Connect the null modem cable to plug **CN131** on the Main CPU board as shown in the following figure and to the serial port of the laptop computer (use a serial-USB adapter if your laptop is not provided with a serial port).
3. Set the CPU in Bootstrap mode by mounting jumper **JP5** as shown in the following figure.

4. Start **Flash.exe** service utility. Wait for the main menu to appear on the screen as shown in figure:

5. Press **SAAB_167** button and wait for the FW uploading window to appear on the screen as shown in figure:

6. Select the suitable COM port, press **SEND** button and load **trirom_exel_AKD_touch.H86** firmware (*01_Table → Firmware_Tavolo_touch_GE_v x.x*) that must be downloaded to the main CPU:

7. Reset the CPU board by pressing button **SW17** for about three seconds, and press the **OK** button on the Flash EPROM programmer menu. Wait for the Flash EPROM tool to load the firmware until the operation is successfully ended.

8. Click on the OK button and quit the Flash EPROM programmer utility.

WARNING
At the end of this procedure, set the jumper **JP5** back to its original position and unplug the null modem cable from **CN131**.

12.3. CONSOLE CPU SOFTWARE DOWNLOAD

The Console board CPU is located within the touchscreen console itself.

Programming of Console board CPU Flash EPROM (software download) can be performed by following procedure below:

1. Connect the null modem cable to plug **CN1003** on the console CPU board as shown in the following figure and to the serial port of the laptop computer (use a serial-USB adapter if your laptop is not provided with a serial port).
2. Set the CPU in Bootstrap mode by mounting jumper **SW7** in position **2-3** as shown in the following figure.

3. Repeat the same procedure as in Section 12.2 (instructions from 4 to 8), but now load **Consrom_exel_touch.H86** firmware (*01_Table → Firmware_Tavolo_touch_GE_v x.x*) and use **SW5** for CPU board reset.

WARNING
At the end of this procedure, set the jumper **SW7** back to its original position and unplug the null modem cable from **CN1003**.

12.4. SFD CPU SOFTWARE DOWNLOAD

The SFD board CPU is located within the Spot Film Device cover, under the table panel.

Programming of Spot Film Device board CPU Flash EPROM (software download) can be performed by following procedure below:

1. Connect the null modem cable to plug **CN413** on the SFD CPU board as shown in the following figure and to the serial port of the laptop computer (use a serial-USB adapter if your laptop is not provided with a serial port).
2. Set the CPU in Bootstrap mode by mounting jumper **SW5** in position **2-1** as shown in the following figure.

3. Repeat the same procedure as in Section 12.2 (instructions from 4 to 8), but now load **serrom_exel_touch.H86** firmware (*01_Table → Firmware_Tavolo_touch_GE_v x.x*) and use **SW6** for CPU board reset.

WARNING
At the end of this procedure, set the jumper **SW5** back to its original position and unplug the null modem cable from **CN413**.

12.5. COLLIMATOR CPU SOFTWARE DOWNLOAD

Collimator CPU software download procedure depends on collimator type; two different methods for two different collimators are showed below.
In order to recognize collimator type, check the label on its rear side.

IMPORTANT INFORMATION
Refer to Section 12.5.1 if your system is provided with CT series collimator.
Refer to Section 12.5.2 if your system is provided with AL series collimator.

12.5.1. COLLIMATOR CT

Programming of Collimator board CPU Flash EPROM (software download) can be performed by following procedure below:

1. Remove the collimator covers to access the CPU board, located behind the frontal cover.
2. Connect the collimator service cable P/N 97192 to plug **CN621** on the collimator CPU as shown in the following figure and to the serial port of the laptop computer (use a serial-USB adapter if your laptop is not provided with a serial port).
3. Set the CPU in Bootstrap mode by moving switch **SW1** as shown in the following figure.

4. Repeat the same procedure as in Section 12.2 (instructions from 4 to 8), but now load **Colrom_exel_touch.H86** firmware (*01_Table → Firmware_Tavolo_touch_GE_v x.x*) and use **SW2** for CPU board reset.

WARNING
At the end of this procedure, set the switch **SW1** back to its original position and unplug the collimator service cable from **CN621**.

12.5.2. COLLIMATOR AL

Programming of Collimator board CPU Flash EPROM (software download) can be performed by following procedure below:

1. Remove the collimator covers to access the CPU board, located behind the frontal cover.
2. Connect the collimator service cable P/N 97731 to plug **CN17** on the collimator CPU as shown in the following figure and to the serial port of the laptop computer (use a serial-USB adapter if your laptop is not provided with a serial port).
3. Set the CPU in Bootstrap mode by putting jumper **JMP1** in position BOOT0 (pins **1-2**) as shown in the following figure.

4. Start GMM Flash service utility and wait for the main menu to appear on the screen as shown in figure:

5. Press **STM_32_F4** button and wait for the FW uploading window to appear on the screen as shown in figure:

6. Select the suitable COM port and press **SEND** button and load **New_Collimator_Exel_touch_logo_MECALL_v x.x.hex** firmware (*01_Table → Firmware_Tavolo_touch_GE_v x.x*) that must be downloaded to the main CPU:

7. Reset the CPU board by pressing button **PL1** and press the **OK** button on the Flash EPROM programmer menu. Wait for the Flash EPROM tool to load the firmware until the operation is successfully ended.

8. Click on the OK button and quit the Flash EPROM programmer utility.

WARNING
At the end of this procedure, set the jumper **JMP1** back to its original position and unplug the collimator service cable from **CN17**.

12.6. SERIAL EEPROM ERASE AND DEFAULT PARAMETER LOADING

The EQUIPMENT calibration and setting data are permanently stored in the serial EEPROM mounted one each CPU board.
In case of need it is possible to force a total erase of the stored data by means of a specific menu of the EQUIPMENT service routine.

At the end of the erase process, the serial EEPROM will be automatically loaded with factory default configuration/calibration parameters.
It must be underlined that an incorrect use of such utility will cause the loss of the unit site calibration data with the consequent need to perform a new unit calibration.

In case, for any reason, it is not possible to force software erasure of the serial EEPROM, it is possible to force a total reset, setting, on each board, the specific jumper as described in **section 10** of this manual.

The serial EEPROM store the value of software switches that allow the service engineer to disable safety interlocks of the unit.
Such switches have the main purpose to ease field engineers' trouble shooting operations. If enabled during normal operation, they can also dramatically reduce the safety level of the unit.
IT IS THEREFORE RESPONSIBILITY OF THE FIELD ENGINEER TO RESTORE THE CORRECT SETTING OF SUCH SWITCHES ONCE ERASED THE SERIAL EEPROM.

12.7. ERASURE OF THE EQUIPMENT MAIN CPU SERIAL EEPROM AND LOADING OF THE DEFAULT PARAMETERS

1. Enter the unit maintenance mode, as indicated in **section 8.3**

2. Touch **EEPROM INIT** icon and wait for the tilt menu to appear on the touch screen display as shown in the following figure.

3. Touch **THREEPHASE** icon.
   The system will automatically erase the data contained into the main CPU serial EEPROM and then load the default calibration/configuration data.

4. Exit the service menu touching icon .

12.8. ERASURE OF THE CONSOLLE CPU SERIAL EEPROM AND LOADING OF THE DEFAULT PARAMETERS

1. Enter the unit maintenance mode as indicated in **section 8.3**

2. Touch **EEPROM INIT** icon and wait for the tilt menu to appear on the touch screen display as shown in the following figure.

3. Touch icon **CONSOLLE**.
   The system will automatically erase the data contained into the main CPU serial EEPROM and then load the default calibration/configuration data.

4. 4Exit the service menu touching icon **.**

12.9. ERASURE OF THE SFD CPU SERIAL EEPROM AND LOADING OF THE DEFAULT PARAMETERS

1. Enter the unit maintenance mode as indicated in **section 8.3**

2. Touch **EEPROM INIT** icon and wait for the tilt menu to appear on the touch screen display as shown in the following figure.

3. Touch **SFD** icon.
   The system will automatically erase the data contained into the main CPU serial EEPROM and then load the default calibration/configuration data.

4. Exit the service menu touching icon

12.10. ERASURE OF THE COLLIMATOR CPU SERIAL EEPROM AND LOADING OF THE DEFAULT PARAMETERS

1. Enter the unit maintenance mode as indicated in **section 8.3**
2. Touch **EEPROM INIT** icon and wait for the tilt menu to appear on the touch screen display as shown in the following figure.

3. Touch the **COLLIMATOR** icon.
   The system will automatically erase the data contained into the main CPU serial EEPROM and then load the default calibration/configuration data.

4. Exit the service menu touching icon .

12.11. HOW TO UPGRADE THE TOUCHSCREEN SOFTWARE

Before upgrading Console Touchscreen Software, it is necessary to unlock the CompactFlash (if your system runs on WindowsXP) or CFast (if your system runs on Windows 7), by following the procedure below.

12.11.1. UNLOCKING AND LOCKING THE COMPACT FLASH – WINDOWS XP

HOW TO UNLOCK THE COMPACT FLASH

1. Switch the system off and remove the dongle USB key.
2. Plug your USB service key and the service USB keyboard.
3. Switch the system on.
4. Click on the icon and select “Exit to Windows”.
5. Enter in the path C:\FBWF_settings.
6. Launch the file “Reset_Prot” and press any key to continue.
7. From the Windows start menu select: Start → Turn Off Computer… → Restart.
8. After reboot, the system is unlocked.

WARNING
It is not safe to switch the system off by using the console switch off button when the system is unlocked.

HOW TO CHECK THE COMPACT FLASH PROTECTION

1. Launch the file “Disk protection query”: “filter state: enabled” means that the CompactFlash is locked.

HOW TO LOCK THE COMPACT FLASH

1. From the desktop launch the file “Set_Disk Protection” and press any key to continue.
2. From the Windows start menu select: Start → Turn Off Computer… → Turn Off.
3. Switch the system on. After the boot, the system is locked.

12.11.2. UNLOCKING AND LOCKING THE CFAST – WINDOWS 7

HOW TO UNLOCK THE CFAST

1. Switch the system off and remove the dongle USB key.
2. Plug your USB service key and the service USB keyboard.
3. Switch the system on.
4. Click on the icon and select “Exit to Windows”.
5. Double-click on the padlock that is on the right side of the Windows Menu Bar.
6. Click on “Configure…”.

7. The option “Filter state enabled” must be checked.
8. Select the volume C: and click on “Unprotect”.

9. Click on “Apply” and “OK”.
10. From the Windows start menu select: Start → Restart.

11. After reboot, the system is unlocked.

WARNING
It is not safe to switch the system off by using the console switch off button when the system is unlocked.

HOW TO LOCK THE CFAST

1. Click on the padlock that is on the right side of the Windows Menu Bar.
2. Click on “Configure…”
3. The option “Filter state enabled” must be checked.
4. Select the volume C: and click on “Protect”.

5. Click on “Apply” and “OK”.
6. From the Windows start menu select: Start → Shut down.
7. Switch the system on. After the boot, the system is locked.

12.11.3. CONSOLE TOUCHSCREEN SOFTWARE UPGRADE

In order to upgrade console touchscreen software, it is enough to replace CompactFlash (for OS WindowsXP) or CFast (for OS Windows 7) by following the procedure below.

1. Switch the system off and remove the local dongle USB key.
2. Plug your USB service key, the service USB keyboard, and the USB key containing the software to be upgraded.
3. Switch the system on and unlock it by following the procedure in previous section.
4. Click on the icon and select “Exit to Windows”.
5. Open the folder C:\ConsIntegrCfgFiles.

6. Copy/paste the file “Ambiente.ini” on your USB key and rename it as “Ambiente_old.ini”: this is a backup you need to reload the current system configuration.
7. Close the folder C:\ConsIntegrCfgFiles.
8. Open the Windows Control Panel and uninstall the program “CONNEXITY”.

9. Close the Windows Control Panel.
10. Copy/paste the upgrade folder "**NuovaConsolleIntegrata x.xxx XX YYYY_MM_DD**" from your USB key to the desktop.
11. Open the folder "**NuovaConsolleIntegrata x.xxx XX YYYY_MM_DD**" and double click on "setup".

12. Step by step click on Next, without changing any option/value.
13. Delete the folder “**NuovaConsolleIntegrata x.xxx XX YYYY_MM_DD**” from the desktop.
14. Open the folder C:\ConsIntergCfgFiles.
15. Cut/paste the file “Ambiente.ini” on your USB key.
16. Remove safely your USB key.
17. On your laptop, open both “Ambiente_old.ini” and “Ambiente.ini” from your USB key, by using Notepad.
18. Modify manually the “Ambiente.ini” file. Each option must be set accordingly with the old configuration file “Ambiente_old.ini”.

IMPORTANT INFORMATION
The new file “Ambiente.ini” is expected to have few more new options. Do not change them. Do not add/remove any line in the “Ambiente.ini”file.

---

19. Save the “Ambiente.ini” file. Close the files and safely remove the USB stick from your laptop.
20. Plug again your USB key in the console and copy/paste the “Ambiente.ini” file from the USB key to the folder C:\ConsIntergCfgFiles.
21. Lock the system by following the procedure in previous section.
22. Turn Windows off, and then remove both service key and your USB key.
23. Plug the local dongle USB key and switch the system on.

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13. PREVENTIVE MAINTENANCE

The expected lifetime of the table is **10 years** when maintenance is properly carried out following the instructions contained in this section and in the Unit Service Documentation.

The system remote tilting table, as any other technical apparatus, must be carefully used and needs periodical maintenance as specified in the technical documentation.
GMM spa is responsible for the safety of its products only in case their maintenance, repairing or modification is carried out by GMM spa or by personnel authorized by GMM spa.

GMM spa denies any responsibility for improper operation, damages or dangerous situations caused directly or indirectly by non-respect of maintenance schedules.

13.1. USER MAINTENANCE

It is a good practice to survey on the following items:

Handgrips:

They are intended to keep the patient's hands away from potentially dangerous positions.
It's a good practice to leave them in place, and adjust and fix them for each patient.

Miscellany:

The operator must daily check that all the security and signaling circuits are fully operative.

The protection against electrical shocks has been realized grounding all the metal covers of the unit.

Therefore it is imperative to check periodically the proper operation of the grounding system of the examination room in which the remote tilting table has been installed according with the regulations in force.

13.2. CLEANING AND DISINFECTION

GMM spa is responsible for the safety of its products only in case their maintenance, repairing or modification is carried out by GMM spaor by personnel authorized by GMM spa.

Make sure that the table is completely disconnected and that the emergency switches have been activated, before starting any cleaning operations.

Make sure that no liquid can get into the unit.

Do not use water.
Water can short-circuit the electrical installation and cause corrosion to mechanical parts.

Painted parts can be cleaned with rags and products for cleaning plastic materials; after cleaning give a finishing touch with a dry rag in whole.

Do not use acid or abrasive products.

Clean chrome-plated parts only with a dry rag in whole.
Use a wax that can be found on the market.

All the unit parts, including accessories and connection cables, should be disinfected only in surface using a gaseous disinfectant.

For safety reasons **do not use** spray disinfectants.

In case of disinfecting of the whole examination room, take care to cover the unit using plastic sheets.

In case of use of disinfectants, follow **carefully** the instructions reported for operations in explosion hazard.

13.3. PREVENTIVE MAINTENANCE – SCHEDULE

In order to ensure the maximum safety level for the patient and the operator it is absolute necessary that the unit is periodically checked by a GMM spa Authorized Service team in order to maintain unchanged the original level of safety.

Mechanical parts such as chains, wires, ball bearings, etc. make part of this type of equipment, which need regular inspections.
It is recommended to check frequently the conditions of the wires and in any way not to exceed 1 year between checks.
Checks should be made at shorter time intervals in case the equipment is intensively used.
Special modifications or maintenance must be made exclusively by the manufacturer or by expressly authorized personnel.

Table 13.1 list minimum preventive maintenance requirements to be performed by a qualified technician or engineer.

The actual maintenance schedule at one particular site may deviate from the schedule given here depending on equipment operating conditions. Please consult with your service representative.

Table 13.1

AFTER 15000 EXPOSURES OR 1/YEAR *	AFTER 60000 EXPOSURES OR 1/YEAR *
Service procedure see **13.5**	Service procedure see **13.9.4**
Service procedure see **13.6**	Service procedure see **13.9.5**
Service procedure see **13.7**	Service procedure see **13.9.6**
Service procedure see **13.8**	Service procedure see **13.9.7**
Service procedure see **13.9**	Service procedure see **13.9.8**
Service procedure see **13.9.1**	Service procedure see **13.9.9**
Service procedure see **13.9.2**	
Service procedure see **13.9.3**	

It is also a good norm that the deputy engineer using the form of the following page records each maintenance operation.

13.4. PREVENTIVE MAINTENANCE – INSPECTION

THE OPERATIONS DESCRIBED HEREAFTER MIGHT REQUIRE THE USE OF X-RADIATION.
IN SUCH A CASE THE OPERATORS ARE REQUESTED TO TAKE ALL THE NECESSARY PRECAUTIONS IN ORDER TO AVOID ANY TYPE OF EXPOSURE WHETHER DIRECT OR INDIRECT.

13.5. GENERAL

1. Check for external damage; investigate if necessary.

2. Operate all unit movement; investigate any strange noise (squealing, scraping,) emanating from the system.

3. Remove the rear cover of the unit tilting assembly and check that there no oil leakage from the gearbox assembly.

4. Check that the bolts fix the unit to the floor or to the base plate are tightened. In the negative tighten them.

5. Check that the DETECTOR BUCKY mounting screws are properly tightened as described in **section 6.8**

6. Check that the tube arm mounting screws are properly tightened as described in **section 6.3** of the manual.

7. Check that the collimator fixation grains **13** (see **section 6.7**) are properly tightened.

8. Check that the trunnion rings screws **1** (see **section 6.6**) are properly tightened**.**

9. Check that the x-ray tube fixation nuts **4** (see **section 6.3**) are properly tightened**.**

10. Check that the two pinion mounting grub screws of the tabletop lateral movement are adequately tightened

13.6. END SWITCHES

1. Operate all table movements and check that the motor stops on the end of the travel micro switches.

2. In the negative, replace and/or adjust the faulty micro switch as described in **section 14.5** of the manual.

13.7. MOVEMENTS DECELERATION AREA CHECK

From the remote console, operate the tilt movement at the maximum speed.

1. From the remote console, operate the tilt movement at the maximum speed.

2. Check that the movement automatically decelerates before touching the +90°/-90° limit switch.

3. In the negative check the tilt and elevation potentiometers and sensing circuit calibrations as described in **sections 14.3 and 14.4.**

4. From the remote console, operate the tube/detector longitudinal movement at the maximum speed.

5. Check that the movement automatically decelerates before touching the limit switches.

6. In the negative check the column and digital bucky potentiometers and sensing circuits calibration as described in **sections 14.4.1** and **14.4.2**.

7. From the remote console, operate the tube incidence movement at the maximum speed.

8. Check that the movement automatically decelerates before reaching the ± 40° limit positions.

13.8. SAFETY GROUND CONNECTION CHECK

1. Access table line input terminals.

2. Check that the line cable is firmly fixed by the related fixation clamps.

3. Check that the ground cable is firmly connected to the ground terminal.

13.9. TBT ELEVATION MOVEMENT SAFETY BRAKE CHECK

Operate the TBT elevation movement and check that the safety brake is properly released and enabled.
In the negative, adjust the brake 24V dc power supply as described in **section 14.1**.
In case it is necessary the replacement of this brake, use the following instructions:

1. Disconnect the power supply plug **4** as shown in the following figure;

2. Remove the entire brakes assembly from the ball screw nut removing screws **1** as shown in the following figure;

3. Remove screws **3** and replace the brakes with new ones.

13.9.1. COLLIMATOR LIGHT FIELD/X-RAY FIELD ACCURACY CHECK

1 Put a cassette loaded with a 24x30 cm film on the tabletop and select the Direct mode.

2 Set the focus-film distance at 100 cm and project an illuminated field of 20x20 cm (measured on the cassette).

3 Expose and develop the film.

4 Measure, on the film, the error on both direction and verify that each error is lower than 1,7 cm. In the negative, correct the alignment between the light field and the x-ray field as described in **section 9.2**

13.9.2. BEAM ALIGNMENT CHECK

1. Switch the collimator lamp on and set the FFD at the minimum value.

2. On the tabletop mark the center of the collimator cross.

3. Move the FFD to the maximum value and check that the collimator cross remains aligned with the previous mark. In the negative correct the tube alignment as described in **section 9.3**.

4. At the image processor, select an anatomical program in which an exposure area of 24x30 cm has been pre-programmed. Place over the tabletop a target (i.e. a washer) in the center of the collimator cross.

5. Acquire an image and check that the used target appears in the center of the image. In the negative correct the alignment of the beam with the detector center as described in **section 9.3**.

13.9.3. COLLIMATOR ACCURACY CHECK

1. Drive the table in the horizontal position and set the FFD at 115 cm.

2. At the image processor, select an anatomical program in which an exposure area of 43x43 cm has been pre-programmed.

3. Acquire an image and check that all the detector active area is correctly irradiated. Check also the error of the irradiated area and record it.

4. Drive the table in the +90° position and set the FFD at 180 cm.

5. At the image processor, select an anatomical program in which an exposure area of 43x43 cm has been pre-programmed.

6. Acquire an image and check that all the detector active area is correctly irradiated. Check also the error of the irradiated area and record it.

Check that the errors of the irradiated area are acceptable and, in the negative, correct the collimator calibration as described in **section 16**.

13.9.4. TBT ELEVATION SCREW INSPECTION AND LUBRICATION

1. Remove the tilting base covers to freely access the elevation screw.
2. Tilt the table from the horizontal to the +90° limit stop and check the proper lubrication of the ball screw.
3. If necessary, clean the elevation ball screw using a soft rag. If necessary, lubricate the screw as hereinafter described:

   3.1 Remove the nut cap **1** as shown in the following figure;

   3.2 Insert the grease in the main nut using a pump as shown in the following figure; The recommended lubricant is **KLUBER - MICROLUBE GB00.**

   3.3 Insert the nut cap 1 and operate the tabletop vertical movement (tilting the unit) to check that the screw is correctly lubricated.
4. Mount back the table covers.

13.9.5. TUBESTAND CHAIN INSPECTION AND LUBRICATION

1. Remove the tube stand covers **1** and **2** and the rear cover **3** to freely access the tube stand chain as shown in the following figure.

2. Check the tube stand chain tilting the table from the horizontal to the +90° limit stop. If necessary, lightly grease as shown in the following figure. Wipe off excess of grease. The recommended lubricant is ESSO Cazar K (R310-2026M).

NEVER OVER-LUBRICATE.
LUBRICANTS ARE STICKY AND SO TEND TO COLLECT DUST AND DIRT.

3. Move the tube stand along the entire travel in both direction and check that the chain is well tensioned. In the negative, correct the tension of the chain as hereinafter described:

4. Remove screws **4** to disconnect the stand assembly from the transmission chain as shown in the following figure.

5. Slide the stand assembly away to freely access the chain bracket. Remove screws **6** to remove the fixation bracket **5** from the transmission chain as shown in the following figures:

6. Correct the chain tension acting on the central nut using a dynamometric wrench set for **12 Nm maximum torque** as shown in the following figure.

13.9.6. DETECTOR BUCKY CHAIN INSPECTION AND LUBRICATION

1. Remove front covers **1** to freely access the detector bucky chain as shown in the following figure.

2. Check the chain and, if necessary, lightly grease as shown in the following figure. Wipe off excess of grease. The recommended lubricant is ESSO Cazar K (R310-2026M).

NEVER OVER-LUBRICATE.
LUBRICANTS ARE STICKY AND SO TEND TO COLLECT DUST AND DIRT.

3. Move detector bucky along the entire travel in both direction and check that the chain is well tensioned. In the negative, correct the tension of the chain as hereinafter described:
4. Remove screws **3** to disconnect the detector bucky from the chain as shown in the following figure.

5. Slide the detector bucky assembly to freely access the chain tensioning nuts as shown in the following figure:

6. Correct the chain tension acting on the central nut using a dynamometric wrench set for **12 Nm maximum torque** as shown in the following figure.

13.9.7. TBT ELEVATION POLY-V WARE-OUT AND BELT TENSION CHECK

1. Remove the tilt base upper cover to access the elevation movement transmission belt as shown in the following figure.
2. Drive the elevation movement in the middle of its travel.
3. Move the elevation movement in both direction and check belts wear; check that the belt runs smoothly. Switch the unit off.
4. Check the tension of the belt using a belt tension meter (such as TENS-SIT from SIT spa). Position the probe of the meter in the middle of the pulleys at the rear right side of the tower and hit the pulley as described in the user manual 4 or 5 times. The correct tensioning is achieved when the average of the measurements is about 165 Hz.
5. In the negative, correct the tension of the belt as hereinafter described:
   - 5.1 Loosen the motor support fixation screws **1**.
   - 5.2 Correct the belt tension acting on nut **2** as shown in the figure.
   - 5.3 Tighten the motor support fixation screws **1.**

13.9.8. MAXIMUM COMPRESSION LIMIT SWITCH CHECK

1. From the SFD keyboard, drive the collimator in the field

2. Check the correct operation of the compression cone verifying that micro switches FC28 and FC42 stop the movement when the compression force specified in the following figure is applied.

3. In the negative, replace or adjust the limit switch as described in section 14.3.

13.9.9. COMPRESSION CONE SAFETY LOCK OPERATION CHECK

1. From the SFD keyboard, drive the collimator in the field

2. Position a wood block under the collimator cone.

3. Drive the compression downward until the max. pressure limit switch stops the movement.

4. Check that it is possible to release with a finger the compression cone safety lock as shown in the following figure.

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14. TABLE CORRECTIVE MAINTENANCE

14.1. TILT BRAKE 24V DC ADJUSTMENT

The coils of the magnetic brake mounted on the tilt motor shaft is supplied by means of a switching power supply that allows an independent voltage regulation.
The suggested adjustment procedure is the following:

1. Using the buttons located on the remote console, enable the Tilt movement and check if the brake is correctly released and engaged.
2. In the negative, remove the side cover to access the main electronics board and correct the dc voltage power supply by means of trimmer **PT3**, as shown in the following figure.
3. Repeat the test until the optimum calibration has been found.

14.2. POTENTIOMETERS REPLACEMENT & ADJUSTMENT

14.2.1. INTRODUCTION

The software calibration procedure described in **section 8** of this manual are valid if the analogue sensing circuits of the multi-turns potentiometer used as position detectors of the remote tilting table movements have been adjusted.

In order to get the optimum dynamic range from the potentiometer signals it is necessary that the potentiometer itself be mechanically coupled to the movement and that the end of the travel micro switches be properly adjusted as described in the present section of the manual.

14.2.2. TABLE ELEVATION POTENTIOMETER REPLACEMENT & ADJUSTMENT

Do not tight too much the nut that lock the potentiometer to the supporting bracket in order to prevent damages to the potentiometer itself.

1. Remove the front covers to access the elevation potentiometer as shown in the following figure. Register the correspondence between wire color and the potentiometer terminal.

2. Enter the unit maintenance mode as described in **section 8.3**.

3. Touch **ELEVATION** icon and wait for the elevation menu to appear on the touch screen display as shown in the following figure.

4. Using joystick **37** drive the tabletop to the **lowest** limit position. In case of need, combine the elevation movement with the tilting movement to reach the required position.

5. Remove the nut **1** that fix the translator wire.

6. Remove screws **2** and replace the translator with a new one.

7. Tension the translator wire rope and fix it by means of nut **1**.

8. Resume the replacement procedure from step **3.**

9. Adjust the Zero value of the potentiometer sensing circuit touching icon AUTO of the zero calibration row on the touch screen display as shown in the previous figure. The unit main CPU will automatically calibrate the potentiometer sensing circuit and store the minimum value (Zero) into the serial eeprom.

10. Using joystick 37 drive the tabletop to its highest limit stop. In case of need combine the elevation movement with the tilting movement to reach the required position.

11. Adjust the Gain value of the potentiometer sensing circuit touching icon AUTO of the gain calibration row on the touch screen display as shown in the previous figure. The unit main CPU will automatically calibrate the potentiometer sensing circuit and store the maximum value into the serial eeprom.

12. Exit the elevation service menu touching icon

14.2.3. TABLE TILT POTENTIOMETER REPLACEMENT & ADJUSTMENT

1. Remove the front covers to access the tilt potentiometer as shown in the following figure. Register the correspondence between wire color and the potentiometer terminal.

2. Enter the unit maintenance mode as described in **section 8.3**.

3. Touch **TILT** icon and wait for the elevation menu to appear on the touch screen display as shown in the following figure.

4. Using joystick **37** to tilt the unit to the **+90°** position. Do position the carriage in order to make visible the potentiometer for an easier access to the potentiometer assembly.

5. Release spring **6** and loosen grain **2** to remove gear **3** from the potentiometer shaft, by pushing the potentiometer support away from the transmission gear **1.**

6. Remove nut **4** and replace the old potentiometer with a new **1K-10 turns potentiometer**.

7. Connect the wires to the potentiometer terminals as previously noted.

Do not tight too much the nut that lock the potentiometer to the supporting bracket in order to prevent damages to the potentiometer itself.

---

8. Rotate the potentiometer anticlockwise and do rotate again a quarter of the turn clockwise

9. Adjust the Zero value of the potentiometer sensing circuit touching icon AUTO of the zero calibration row on the touch screen display as shown in the previous figure. The unit main CPU will automatically calibrate the potentiometer sensing circuit and store the minimum value (Zero) into the serial eeprom.

10. Using joystick 37 tilt the unit to the -90° position.

11. Adjust the Gain value of the potentiometer sensing circuit touching icon AUTO of the gain calibration row on the touch screen display as shown in the previous figure. The unit main CPU will automatically calibrate the potentiometer sensing circuit and store the maximum value into the serial eeprom.

12. Store the position of the horizontal stop for tilting movement as described in section 8.4

13. Exit the tilting service menu touching icon .

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14.2.4. COLUMN LONGITUDINAL POTENTIOMETER REPLACEMENT & ADJUSTMENT

1. Remove the **Unit** main frame right rear cover to access the column position sensing potentiometer as shown in the following figure. Register the correspondence between wire colour and the potentiometer terminal.

2. Enter the unit maintenance mode as described in **section 8.3**.

3. Touch **COLUMN** icon and wait for the column menu to appear on the touch screen display as shown in the following figure.

4. Using Joystick 40, tilt the tube of about -25° counter-clockwise.

5. Using joystick **44** drive the tube stand to its left limit stop. Make sure that the end of the travel micro switch is activated. In the negative an error message will appear on the touch screen display.

6. Remove screws **1** and the entire potentiometer supporting bracket.

7. Loosen grain **3** to remove gear **4** from the potentiometer shaft, by pushing the potentiometer support away from the reduction gear.

8. Remove nut **5** and replace the old potentiometer with a new **1K-10 turns potentiometer**. Connect the wires to the potentiometer terminals as previously noted.

Do not tight too much the nut that lock the potentiometer to the supporting bracket in order to prevent damages to the potentiometer itself.

---

9. Rotate the potentiometer shaft **CW** to the end of its travel and go back by 1/4 of turn

10. Mount the potentiometer bracket and couple the reduction gear with the transmission gear.

11. Tighten screws **1** when the correct coupling is achieved.

The correct coupling of the reduction gear with the transmission gear is achieved when it is possible to detect a small float between the two gears. A tight coupling of the two gears could damage the potentiometer bushing.

---

12. Adjust the Zero value of the potentiometer sensing circuit touching icon AUTO of the zero calibration row on the touch screen display as shown in the previous figure. The main CPU will automatically calibrate the potentiometer sensing circuit and store the minimum value (Zero) into the serial eeprom.

13. Using Joystick 40, tilt the tube of about +25° clockwise

14. Using joystick 44 drive the tube stand to its right limit stop. Make sure that the end of the travel micro switch is activated. In the negative an error message will appear on the touch screen display.

15. Adjust the Gain value of the potentiometer sensing circuit touching icon AUTO of the gain calibration row on the touch screen display as shown in the previous figure. The main CPU will automatically calibrate the potentiometer sensing circuit and store the maximum value into the serial eeprom.

16. Exit the column service menu touching icon .

14.2.5. DETECTOR POTENTIOMETER REPLACEMENT & ADJUSTMENT

1. Remove the **Unit** main frame left front cover to access the bucky position sensing potentiometer as shown in the following figure. Register the correspondence between wire colour and the potentiometer terminal.

2. Enter the unit maintenance mode as indicted in **section 8.3**.

3. Touch **SFD** icon and wait for the detector menu to appear on the touch screen display as shown in the following figure.

4. Drive the tube incidence to its **0°** position with joystick **40.**

5. Using joystick **44** to drive the Detector to its left limit stop and make sure that the end of the travel micro switch is activated. In the negative an error message will appear on the touch screen display.

6. Remove screws **1** and the entire potentiometer supporting bracket.

7. Loosen grain **3** to remove gear **4** from the potentiometer shaft, by pushing the potentiometer support away from the reduction gear.

8. Remove nut **5** and replace the old potentiometer with a new **1K-10 turns potentiometer**. Connect the wires to the potentiometer terminals as previously noted.

Do not tight too much the nut that lock the potentiometer to the supporting bracket in order to prevent damages to the potentiometer itself.

---

9. Rotate the potentiometer shaft **CW** to the end of its travel and go back by 1/4 of turn.

10. Mount the potentiometer bracket and couple the reduction gear with the transmission gear. Tighten screws **1** when the correct coupling is achieved.

The correct coupling of the reduction gear with the transmission gear is achieved when it is possible to detect a small float between the two gears. A tight coupling of the two gears could damage the potentiometer bushing.

11. Adjust the Zero value of the potentiometer sensing circuit touching icon AUTO of the zero calibration row on the touch screen display as shown in the previous figure. The Unit main CPU will automatically calibrate the potentiometer sensing circuit and store the minimum value (Zero) into the serial eeprom.

12. Using joystick 44 drive the Detector to its right limit stop. Make sure that the end of the travel micro switch is activated.

13. Adjust the Gain value of the potentiometer sensing circuit touching icon AUTO of the gain calibration row on the touch screen display as shown in the previous figure. The Table main CPU will automatically calibrate the potentiometer sensing circuit and store the maximum value into the serial eeprom.

14. Exit the detector bucky service menu touching icon
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14.2.6. FFD POTENTIOMETER REPLACEMENT & ADJUSTMENT

Do not tight too much the nut that lock the potentiometer to the supporting bracket in order to prevent damages to the potentiometer itself.

1. Remove the **table** tube stand cover to access the FFD potentiometer assembly as shown in the following figure. Register the correspondence between wire color and the potentiometer terminal.

2. Enter the unit maintenance mode as indicted in **section 8.3.1**
3. Touch **FFD** icon and wait for the FFD menu to appear on the touch screen display as shown in the following figure.

4. Using button **42** drive the FFD movement to its minimum limit stop (FFD= 115 cm)

In order to remove and replace the potentiometer/translator 1K-10 turns, follow the steps written below:

Remove the first CN506 PIN of the four one)

Figure 1

1. Loose the translator wire stand upper nut **(1)** and remove the two fixing translator screws (2) as shown in Figure 2.

2. Replace the translator with the new one

3. Tension the translator wire rope and fix it to the column wire bar in its upper part (1) (Figure 2)

5. Adjust the Zero value of the potentiometer sensing circuit touching icon MIN of the zero calibration row on the touch screen display as shown in the previous figure. The main CPU will automatically calibrate the potentiometer sensing circuit and store the minimum value (Zero) into the serial eeprom.

6. Using button 43 drive the FFD movement to its maximum limit stop (FFD=150 or 180 cm).

7. Adjust the Gain value of the potentiometer sensing circuit touching icon MAX of the gain calibration row on the touch screen display as shown in the previous figure. The table main CPU will automatically calibrate the potentiometer sensing circuit and store the maximum value into the serial eeprom.

8. .Using button **42** drive the FFD movement to its minimum limit stop (FFD= 115 cm)

9. Exit the FFD service menu touching icon .

14.2.7. LATERAL POTENTIOMETER REPLACEMENT AND CALIBRATION

The following procedure allows replacing the potentiometer:

1. Bring the tabletop to its external stroke end to access the potentiometer and remove the inside covers.

2. Remove nut A unlocking the potentiometer wire.

3. Remove screws B and C from the potentiometer support and take the potentiometer off its bracket

4. Unplug cable CM 343 and cut the plastic ties D

5. Replace the potentiometer with a new one, screwing it to its support
6. Reposition the cables and plug them
7. Screw the support to the arm
8. Screw the wire nut and relock the potentiometer wire
9. Reposition the covers

The following procedure allows **calibrating** the lateral movements:

1. Enter the unit maintenance mode as described in section **8.3**.
2. Select the **lateral** icon on the right and wait for the calibration window to display (see the following picture):

3. Using joystick **44**, move the tabletop towards the internal position, until the tabletop reaches the end of the stroke
4. Click on the “AUTO” icon near the “ZERO” red bar
5. Using joystick **44**, move the tabletop towards the operator position, until the tabletop reaches the end of the stroke
6. Click on the “AUTO” icon near the “GAIN” red bar
7. Using joystick **44** move the tabletop until half way of its stroke and click on icon on the screen to exit the calibration window

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14.3. END SWITCHES REPLACEMENT & ADJUSTMENT

14.3.1. INTRODUCTION

The calibration procedure described in **section 14.2** of this manual mainly consists in the adjustment of the analogue sensing circuits of the multi-turns potentiometer used as position detectors of the remote tilting table movements.
In order to get the optimum dynamic range from the potentiometer signals it is necessary that the end of the travel micro switches be properly adjusted as described in the present section of the manual.

14.3.2. TABLE ELEVATION END SWITCHES ADJUSTMENT

1. Remove the **system** base covers to access the elevation end switches assemblies as shown in the following figure.

2. In case of faulty micro switch replace it with a new one by removing the fixation nuts **3 and 5**.

3. Enter the unit maintenance mode as indicted in **section 8.3** and drive the unit to the lower limit position.

4. Release screws **6** that lock the entire micro switches assembly and adjust it in order to activate micro switch **FC38**. In case of need adjust the transverse position of the micro switch by releasing the fixation nuts **5**. Tighten screws **6**.

5. Drive the unit to the upper limit position.

6. Release screws **1** that lock the entire micro switches assembly and adjust it in order to activate micro switch **FC37**. In case of need adjust the transverse position of the micro switch by releasing the fixation nuts **3**. Tighten screws **1**.

7. Adjust the elevation potentiometer sensing circuit as described in **section 14.2.2** of the manual.

14.3.3. TABLE TILT END SWITCHES ADJUSTMENT

1. Remove the towers cover to access the TILT end switches as shown in the following figure.

2. In case of faulty micro switch replace it with a new one by removing the fixation nuts.

3. Enter the unit maintenance mode as indicted in **section 8.3** and tilt the unit to the -20° limit angle.

4. Release screws **2** that lock the entire micro switches assembly and adjust it in order to activate micro switch **FC2**. In case of need adjust the transverse position of the micro switch by releasing the fixation nuts. Tighten screws **2**.

5. Tilt the unit to the +90° limit angle.

6. Release screws **4** that lock the entire micro switches assembly and adjust it in order to activate micro switch **FC1**. In case of need adjust the transverse position of the micro switch by releasing the fixation nuts. Tighten screws **4**.

7. Adjust the TILT potentiometer sensing circuit as described in **section 14.2** of the manual.

14.3.4. TUBESTAND LONGITUDINAL TRAVEL END SWITCHES ADJUSTMENT

1. Remove the **UNIT** tube stand covers **1** and **2** access the tube stand end switches as shown in the following figure.

2. In case of faulty micro switch replace it with a new one by removing the fixation screws **3**.

3. Drive the tube stand to its left limit position.

4. Release screws **3** hat lock the micro switch **FC33** on the bracket. Adjust its vertical position in the way that the micro switch is activated by the end of the travel cam **10**
5. Tighten screws **3**

6. Drive the tube stand to its right limit position.

7. Release screws **3** hat lock the micro switch **FC34** on the bracket. Adjust its vertical position in the way that the micro switch is activated by the end of the travel cam **10**
8. Tighten screws **3**

9. Adjust the tube stand potentiometer sensing circuit as described in **section 14.2** of the manual.

14.3.5. DETECTOR AND SWITCHES ADJUSTMENT

1. Remove the **DETECTOR** bottom cover **2** to access the SFD end switches as shown in the following figure.

2. In case of faulty micro switch replace it with a new one by removing the fixation screws

3. Drive the Detector to its left limit position.

4. Release screws **4** that lock the micro switch **FC13** on the bracket. Adjust its vertical position in the way that the micro switch is activated by the end of the travel cam **9**.

5. Tighten screws **4**.

6. Drive the Detector to its right limit position.

7. Release screws **4** that lock the micro switch **FC12** on the bracket. Adjust its vertical position in the way that the micro switch is activated by the end of the travel cam **9**.

8. Tighten screws **4**.

9. Adjust the Detector potentiometer sensing circuit as described in **section 14.2** of the manual.

14.3.6. TUBE FFD END SWITCHES ADJUSTMENT

1. Remove the **Unit** tube stand cover to access the FFD end switches as shown in the following figure.

2. In case of faulty micro switch replace it with a new one.
3. Drive the FFD to the lower limit position (FFD = 115 cm).

4. Release screws **4** that lock the entire micro switches assembly and adjust it in order to activate micro switch **3 (FC22)**. Tighten screws **4**.

5. Drive the telescopes to the upper limit position (FFD = 150 cm or 180 cm).

6. Release screws **1** that lock the entire micro switches assembly and adjust it in order to activate micro switch **2 (FC23)**. Tighten screws **1**.

7. Adjust the FFD potentiometer sensing circuit as described in **section 14.2** of the manual.

14.3.7. TUBE ROTATION SENSE SWITCH ADJUSTMENT

1. Remove the **table** tube cover **2** to access the rotation sense switch as shown in the following figure.

2. Remove the tube fan support **7** and the cables holder **5**. Remove screw **8** and loosen screw **9** as shown in the following figure.

3. Tilt the rotation switch support **10** and remove the fixation nut **11**. Replace the sense switch **13** (FC24) with a new one as shown in the following figure.

4. Adjust the vertical position of the switch 13 in the way that the switch is activated when the x-ray tube is aligned with the SFD center. Lock the fixation nut 11.

14.3.8. TABLETOP LATERAL TRAVEL END SWITCHES ADJUSTMENT

1. Remove the arm covers **11-12** located on the external and internal side of the tabletop support arm as shown in the following figure.

2. Untighten screws 1 (2 screws) and 7 (two screws) to adjust micro 6 (keeping the tabletop to end run); after finding the right position, tighten the screws 1 and 7

3. Untighten screws 13 (2 screws) to adjust micro 3(keeping the tabletop on the external position) After finding the right position, tighten the screws 13

4. Remount the covers

14.3.9. COMPRESSOR: PARKING MOVEMENT END SWITCHES ADJUSTMENT

1. Remove the compression cone assembly 4 after having loosen screws 3, and cover 6 to access the maximum pressure sense switch as shown in the following figure. Remove also the bottom cover to better access the end switches assembly.

2. In case of faulty micro switch replace it with a new one.

3. Drive the compression cone in the parking position.

4. Release screws **2** that lock the support of the micro switch (FC27) **3**. Adjust its position in the way that the micro switch is activated by the end of the travel cam. Tighten screws **2**.
5. In case of need, loosen the switch fixations crews and correct the position of the switch in respect with its supporting bracket.
6. Drive the compression cone in the field.

7. Release screws **2** that lock support of the micro switch (FC26) **4**. Adjust its position in the way that the micro switch is activated by the end of the travel cam . Tighten screws **2**.
8. In case of need, loosen the switch fixations crews and correct the position of the switch in respect with its supporting bracket.

1
2
3
4
5
6
7
2

14.3.10. COMPRESSOR: VERTICAL MOVEMENT END SWITCHES ADJUSTMENT

1. Remove the compression cone assembly 4 after having loosen screws 3, and cover 6 to access the maximum pressure sense switch as shown in the following figure.

2. In case of faulty micro switch replace it with a new one removing the fixation screws **2**.

3. Drive the compression cone up (FC30) and down (FC29) to check the proper operation of both end switches. In case of need correct the position of the end of the travel cams by loosening screws **1** and **5**.

14.3.11. COMPRESSOR: MAX. PRESSURE SENSE SWITCHES ADJUSTMENT

1. Remove the compression cone assembly 4 after having loosen screws 3, and cover 6 to access the maximum pressure sense switch as shown in the following figure.

2. In case of faulty micro switch replace it with a new one, removing screws **3** as shown in the following figures.

3. Check the correct operation of the compression cone verifying that micro switches FC28 and FC42 stop the movement when the compression force specified in the following figure is applied.

4. In the negative, modify the activation force adjusting the position of the supporting bracket loosening nuts 1 and 2 as shown in the previous figures.

14.3.12. TOMOGRAPHY BAR: END SWITCHES ADJUSTMENT

1. Remove screws 1 to access the end of the travel and emergency end switches as shown in the following figure.

2. In case of faulty micro switch replace it with a new one.

3. Check that, even in case of simultaneous activation of several movements, the end of the travel cam **6** never activate the emergency switch **5 (FC35)**. In the negative, slightly correct the position of cam **6**.

14.4. COMPRESSION CONE FORCE CALIBRATION

The calibration of the compression cone maximum pressure sensing circuit, must be carried out as hereinafter described:

1. Turn trimmer **R40** completely CCW

2. Turn trimmer **R52** to obtain between pin1 and pin2 of C67 a voltage equal 29V (speed up/dw)

3. Turn trimmer **R51** to obtain between pin1 and pin2 of C65 a voltage equal 29V (speed in/out compressor)

4. Turn trimmer **R88** to obtain between pin1 and pin2 of C92 a voltage equal 2V (current limit compressor-down)

TURN R40 TOTALLY CCW
TURN R51 TO OBTAIN 29V
BETWEEN C65.1 &C65.2
TURN R52 TO OBTAIN 29V
BETWEEN C67.1 &C67.2
TURN R88 TO OBTAIN 2,0V
BETWEEN C92.1 &C92.2
CN501
CN502
CN503
CN504
CN505
CN506
CN509
CN510
CN511
TUBE STAND CONTROL
006050167.003

14.5 TOUCHSCREEN CALIBRATION

WARNING
Any modification will be saved only if the writing protection of the CFast (system disk) is opportunely disabled. Please remember that it is mandatory that the CFast protection is re-enabled as soon as the calibration phase is finished. Any power interruption when the Cfast writing protection is disabled may cause the corruption of its operative system

Connect the USB keyboard supplied with the SUB COMPACT BOARD.
Remove the compact flash protection.
When Seven has finished initializing the various services and programs, by pressing the Windows key, the Windows task bar will display. On the right side of the screen select the program: **PenMount Control Panel...**

..... the configuration panel will open. In the tab **Device**, press **Configure**

In the tab **Advanced Mode** select **9** then, press **Advanced Calibration** and proceed to calibration, following the instructions

Touch the red point

Save and check the correct calibration. Then, protect the **Compact Flash**.

14.6 CONSOLE SBC BIOS CONFIGURATION

The following points describe how to configure the BIOS

At power-up, repetitively press the **DELETE** key on your keyboard.....

..... until the **BIOS** window displays

Update the date and time in the **Main** window, using the keys listed in the legend to the right of the screen

Select the item **North Bridge** in the menu **Chipset**, and press **Enter**

In the submenu, select **IGD – LCD Control**

Then find **LVDS Enable/Disable** and press **Enter**

In the overlay window highlight **Enable** and press **Enter**

To choose the type of display to go to **Flat Panel** and press **Enter**

In the overlay window, go to format **800*600** and press **Enter**

The display selection is now complete

In the **Boot** menu it is necessary to set the operative system used

Select in **Boot** menu the item **OS Selection** and press **Enter**
In the overlay window, select **Windows 7** and press **Enter**

The selection of the operative system is now complete

At the end, in the menu **Save & Exit** select the item **Save Changes and Reset**, press **Enter.....**

..... and answer **Yes**

Intentionally left blank

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15. DETECTOR CORRECTIVE MAINTENANCE

15.1 FOREWORD

The remote tilting table Detector Bucky Device is equipped with a software package that simplifies the service and test procedures.
To run the service software is necessary to enter the unit maintenance mode carrying out the following procedure:

1. Open the control desk to access the touch screen assembly.

Insert the GMM USB service license key in the USB connector of the touch screen CPU board as described in the following figure

2. Switch the system on and wait for the service menu to appear on the touch screen that it will be displayed as shown in the following figure.

3. Touch service tools icon and wait for the service menu to appear on the touch screen display as shown in the following figure.

When the unit enters the maintenance mode, the most of the safety controls are disabled. In particular:

1. The Anti collision routine is disabled;
2. All safety controls related with potentiometers and encoders sensing circuits are disabled;
3. All movements can be operated by the service personnel only at the control desk side.
Only the end of the travel micro switches can stop the movements;
4. The feedback signals from all power drivers are ignored;
5. The movements speed can be modified only by the sensing potentiometer value (low speed close to travel limits)

FOR SUCH REASONS SERVICE PERSONNELL IS REQUESTED TO OPERATE THE UNIT BEING VERY CAREFULL NOT TO PRODUCE DAMAGES TO THE UNIT AND/OR INJURY ANY OTHER PERSON PRESENTS IN THE ROOM.

In maintenance mode the Detector Bucky Device keyboard buttons have a different meaning, and in particular:
Pressing button **10** the motor of the grid auto focusing device will move to the **180 cm SID** direction and will automatically stop when the end of travel switch is pressed.

Pressing button **8** the motor of the grid auto focusing device will move to the **115 cm SID** direction and will automatically stop when the end of travel switch is pressed.

15.2 AUTO-FOCUSING BUCKY WIRE ROPE ADJUSTMENT AND REPLACEMENT

The following calibration procedure describes how to tension the Auto focusing bucky wire rope and adjust the end of the travel micro switches.
The installer must be very careful not to over load the wire rope tensioning gearbox in order to avoid important damages to gearbox itself.

1. Enter the digital bucky service mode as described in **section 15.**
   Remove the patient tabletop using the instructions of **section 6.10** and remove the upper cover in order to access the auto focusing bucky assembly.

2. Using buttons **10** and **8** of the bucky front keyboard activate the motor until it is possible to access the wire rope fixation screw as shown in the following figure:

3. Remove screw **C** to replace wire rope **A** in case is necessary. Loosen grains **D** to free the end switches activation cam **E** as shown in the following figure.

4. Route the new wire rope cable as shown in the following figures

5. Tension the wire rope symmetrically in respect with the two sides **D** and **E** as shown in the following figure in the way that the four pressure clips are equally pushed on the upper side of the frame. Lock the wire rope using screw **C** and washer **B** when the correct position is reached.

6. Adjust the end switches activation cam **E** in the way to activate end switch **FC10** and lock the position tightening grains **D** as shown in the following figure.

15.3 AUTO-FOCUSING BUCKY END SWITCHES ADJUSTMENT AND REPLACEMENT

The GMM Auto focusing bucky is equipped with two micro switches, wired in serial to detect the correct position of the grid.
In particular the first micro switch detects that the grid frame is inserted in the bucky while the second one detects that the grid frame is in the correct position.
In case one of the micro switches is not activated the image processor must inhibit the exposure and generate an error message.

<u>Grid present micro switch adjustment</u>

1. Insert the grid frame pushing it inside the bucky until the holding clips lock the grid in the correct position

2. Check that the grid present micro switch is correctly pressed. In the negative adjust the position of the micro switch releasing screws **A** and correcting the position of the metal bracket **B** that support the micro switch as shown in the following figure:

Grid position micro switch adjustment

1. Insert the grid frame pushing it inside the bucky until the holding clips lock the grid in the correct position
2. Check that the grid position micro switch is correctly pressed. In the negative adjust the position of the micro switch releasing screws **C** and correcting the position of the metal bracket **D** that support the micro switch as shown in the following figure:

15.4 AUTO-FOCUSING BUCKY GRID REPLACEMENT

The following calibration procedure describes how to remove/replace the carbon fiber grid of the auto focusing device.

1. Extract the grid frame from the bucky and place it on a table. Loosen screws **1** and remove screws **2** from the grid frame assembly. Tilt downward the frame handle as shown in the following figure.

2. Insert / remove the grid into / from the frame assembly sliding it inside slots **3** as shown in the following figure.

3. Pay attention that the grid passes over plates **4** and align it with the center of the frame as shown in the following figure.

4. Tilt downward the frame handle; Mount screws **5** and tighten screws **6** as shown in the following figure.

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16. COLLIMATOR MAINTENANCE AND CALIBRATION

16.1 COLLIMATOR MAINTENANCE

The **table** collimator is equipped with a software package that allows the service personnel to set various configurations and calibration parameters, which are stored into the collimator CPU serial eeprom. To run the service software it is necessary to enter the unit maintenance mode carrying out the following procedure:

1. Open the control desk to access the touch screen assembly. Insert the GMM USB service license key in the USB connector of the touch screen CPU board as described in the following figure.

2. Switch the system on and wait for the service menu to appear on the touch screen display as shown in the following figure.

3. Touch the service tool icon and wait for the service menu to appear on the touch screen display as shown in the following figure.

WARNING:
In maintenance mode the collimator keyboard buttons have a different meaning. So be sure to touch only the buttons specified in each single procedure**.**

DO ALWAYS MAKE REFERENCE TO THE PREVIOUS JUMPER SETTINGS BEFORE ANY FURTHERMORE ADJUSTMENTS

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4. At this point it is possible to perform the unit setup by touching the touch "**OPTIONS**". Please refer to chapter 11 for possible setup.

16.2 OPTICAL SWITCHES REPLACEMENT

In order to correctly operate the collimator, the optical switches that prevent the shutters from reaching the complete end of the run must be correctly adjusted. In case of malfunctioning of one of these switches, proceed to replacement as follows.

16.2.1 X AXIS OPTICAL SWITCH REPLACEMENT

To replace the collimator **X axis optical switch:**

1. Switch off the collimator.
2. Remove the collimator covers and loosen the front cover with the board and connectors by removing the screws **A), B), C), and D)** and cut the plastic cable tie **E)** in fig.**1**

Fig **1**

3. Disconnect the switch connector **CN2** from the board; remove the screws n.**6** as shown in fig. **2** and move aside the front plate n. **22**.

Fig **2**

4. Remove screw **A)** indicated by the red arrow in **fig. 3** and cut the plastic cable tie.

Fig **3**

5. Remove screw **B)**, loosening the support and remove the optical switch from its support.

6. After replacing the switch, proceed in reverse, assembling all the parts previously removed. Reposition the plate and reconnect connector **CN2** to the board. Replace the plastic cable tie.

Note: when reassembling the covers, remember to insert cable **AL00C001** in its guide rail as shown in the following figure:

Fig **4**

16.2.2 Y AXIS OPTICAL SWITCH REPLACEMENT

To replace the collimator **Y axis optical switch**:

1. Switch off the collimator.
2. Remove the collimator covers and loosen the front cover with the board and connectors by removing the screws **A), B), C), and D)** in fig.**1**

Fig **1**

3. Disconnect the switch connector **CN10** from the board.
4. Remove the screws **A**), cut the plastic cable tie
5. Remove screw **B**) shown in **fig.2**, and take off the optical switches to be replaced by unscrewing it from its support.

Fig **2**

6. After replacing the switch, proceed in reverse, assembling all the parts previously removed and reconnect connector **CN10** to the board. Replace the plastic cable tie.

Note: when reassembling the covers, remember to insert cable **AL00C001** in its guide rail as shown in the following figure:

Fig **3**

16.2.3 IRIS OPTICAL SWITCH REPLACEMENT

To replace the collimator **IRIS optical switch:**

1. Switch off the collimator.
2. Remove the collimator covers and loosen the front cover with the board and connectors by removing the screws **A), B), C), and D)** in fig.**1**

Fig **1**

3. Disconnect the switch connector **CN11** from the board.
4. As shown in fig. 2, remove screw **A**) and screw **B**). Then, cut the plastic cable tie **C**).

Fig **2**

5. Remove the optical switch.
6. Put the screws back in their original position and reconnect connector **CN11** to the board. Replace the plastic cable tie.

Note: when reassembling the covers, remember to insert cable **AL00C001** in its guide rail as shown in the following figure:

Fig **3**

16.2.4 REPLACEMENT OF THE MANUAL FILTER GROUP OPTICAL SWITCHES

To replace the collimator **Manual filter group optical switches**

1. Switch off the collimator.
2. Remove the collimator covers and loosen the front cover with the board and connectors by removing the screws **A), B), C), and D)** in fig.**1**

Fig **1**

3. Disconnect all four connectors (**CN 4-7-5-8**). Loosen the screws **A**) and **B**), and remove the cable case **C**).Then, remove screw **D**) and cut the plastic cable tie **E**) as shown in fig. **2**

Fig **2**

4. Remove screws n.**7** shown in fig. **3**

Fig **3**

5. Pull off the whole assembly.
6. Take off the damaged optical switch by removing the screw from group **A** or **B** as in fig.**4** , and position the new one

Fig **4**

7. Reposition the filter unit in the collimator and put back the screws and cables.

8. Reconnect the connectors to the board and replace the plastic cable tie.

Note: when reassembling the covers, remember to insert cable **AL00C001** in its guide rail as shown in the following figure:

Fig **5**

16.2.5 REPLACEMENT OF THE MOTORIZED FILTERS OPTICAL SWITCHES

To replace the collimator **optical switches of the motorized filters**:

1. Switch off the collimator.
2. Remove the collimator covers and loosen the front cover with the board and connectors by removing the screws **A), B), C), and D)** in fig.**1**

Fig 1

3. Disconnect all four connectors (**CN 4, 7, 5, and 8)** of the optical switches and the motor unit connectors **CN3** and **CN6**. Loosen the screws **A**) and **B**), remove the cable case **C**) Then, remove screw **D**) and cut the plastic cable tie **E**) as shown in fig. **2**

Fig **2**

4. Remove screws n.**7** shown in fig. **3**

Fig **3**

5. Pull off the whole assembly
6. Remove the damaged optical switch removing screws **A**) or **B**) as in figure 4, take off the switch and position the new one.

Fig **4**

7. Reposition the filter unit in the collimator and put back the screws and cables.
8. Reconnect the connectors to the board and replace the plastic cable tie

Note: when reassembling the covers, remember to insert cable **AL00C001** in its guide rail as shown in the following figure:

Fig **5**

16.3 COLLIMATOR LED REPLACEMENT

Procedure to be followed for the replacement of the collimator led:

1. Switch off the collimator.
2. Remove the collimator covers and loosen the front cover with the board and connectors by removing the screws **A), B), C), and D)** in fig.**1**

Fig **1**

3. Disconnect connector **CN13** and **CN22**. Remove screws **6** and take off the front plate n.**21** as shown in fig.**2**

Fig **2**

4. Remove screw **A**) as shown in fig.**3**

Fig **3**

5. Take off the led assembly Fig. **4**

Fig **4**

6. Replace the led assembly with the spare part and reposition the screw.
7. Remount the plate and reconnect connector **CN13** and **CN22.**

Note: when reassembling the covers, remember to insert cable **AL00C001** in its guide rail as shown in the following figure:

Fig **5**

16.4 PLEXIGLASS CROSS CENTERING

The cross in the Plexiglas should be perfectly centered with respect to x and y axis shutter light, following this procedure.

1. Loosen the four screws **A), B), C), and D)** supporting the Plexiglas frame as shown in fig.**1**

Fig **1**

2. Center the cross drawn on the Plexiglas moving it with respect to the collimator light of X and Y axis.
3. Tighten the screws back.

16.5 MOTOR UNIT REPLACEMENT

16.5.1 REPLACEMENT OF THE FILTER GROUP MOTOR UNIT

In case it is necessary to replace one of the motor units **A**) shown in fig. **1**, the procedure is the following:

Fig **1**

1. Switch off the collimator.
2. Remove the collimator covers and loosen the front cover with the board and connectors by removing the screws **A), B), C), and D)** in fig.**2**

Fig **2**

3. Disconnect all four connectors (**CN 4, 7, 5, and 6**) of the optical switches and the two motor unit connectors **CN6** and **CN3**. Loosen the screws **A**) and **B**), remove the cable case **C**) and cut the plastic cable tie **D**) as shown in fig.**3**

Fig **3**

4. Remove screws n.**7** shown in fig.**4**

Fig **4**

5. Pull off the whole assembly

6. Loosen the headless screws that hold the gears of the motor unit to be replaced **A**) or **B**) as in fig.**5**

Fig **5**

7. Remove the screws **A**) and **B**) that fix the motor unit to be substituted to its support as in fig.**6**

Fig **6**

8. Pull off the motor unit from its support and replace it with a new one.
9. Proceed in reverse, assembling all the parts previously removed. Remount the screws and the filter group in the collimator. Reconnect the connectors to the board.

   Note: when reassembling the covers, remember to insert cable **AL00C001** in its guide rail as shown in the following figure:

Fig **7**

16.5.2 REPLACEMENT OF THE X AND Y AXIS MOTOR UNITS

To replace the motor units of the collimator X and Y axis, proceed as follows:

1. Switch off the collimator.
2. Remove the collimator covers and loosen the front cover with the board and connectors by removing the screws **A), B), C), and D)** in fig.**1**

Fig **1**

3. Disconnect the ground wire **A**) shown in fig. **2**

Fig **2**

4. Remove the front cover with the board, disconnecting all connectors.

5. Remove the plastic cable tie **A**) shown in fig**. 3**

Fig **3**

6. Remove the front and rear black plates **21** and **22** removing the screws **6**

Fig **4**

7. Loosen the idler pulley screw **A**)or **B**) (depending on the motor to be replaced), as shown in fig. **5**, thus loosening the belt

Fig **5**

8. Remove screw **A**) and cut the plastic cable tie **B**) as shown in fig. **6**

Fig **6**

9. Remove the three screws **A**), **B**) and **C**) and take off the motor unit from its support as shown in fig.**7**

Fig **7**

10. Loosen the two headless screws **A**) and **B**) that support the motor unit gear as shown in fig. **8**

Fig **8**

11. Replace the motor unit with a new one and proceed in mounting back the pieces.
12. Adequately adjust the belt tension.

Note: when reassembling the covers, remember to insert cable **AL00C001** in its guide rail as shown in the following figure:

Fig **9**

16.5.3 REPLACEMENT OF THE IRIS MOTOR UNIT

1. Switch off the collimator.
2. Remove the collimator covers and loosen the front cover with the board and connectors by removing the screws **A), B), C), and D)** in fig.**1**

Fig **1**

3. Disconnect connector **C11** and the Iris motor unit connector from the board
4. Loosen the screws **A**) and **B**) as shown in fig.**2**, and loosen the cable case **C**) as shown in fig.**2**.

Fig **2**

5. Remove the screws **A**), **B**) and **C**) that fix the Iris unit to the support plate as shown in fig.**3**

Fig **3**

6. Take off the Iris unit. Fig. **4**:

Fig **4**

7. Loosen the idler pulley screw **A**) as shown in fig.**5**, thus loosening the belt

Fig **5**

8. Remove the screws **A**), **B**), **C**), and **D**) that fix the motor unit. Fig.**6** and take off the motor unit from its support

Fig **6**

9. Loosen the two headless screws **A**) and **B**) , removing the motor unit gear as shown in fig. **7**

Fig **7**

10. Replace the motor unit with a new one and proceed in mounting back the pieces.
11. Adequately adjust the belt tension.

Note: when reassembling the covers, remember to insert cable **AL00C001** in its guide rail as shown in the following figure:

Fig **8**

16.5.4 LASER REPLACEMENT

To replace the collimator laser, proceed as follows:

1. Switch off the collimator.
2. Remove the collimator covers and loosen the front cover with the board and connectors by removing the screws **A), B), C), and D)** in fig.**1**

Fig **1**

3. Disconnect connector **CN22** from the board.
4. Unscrew the headless screw **A**), in order to free the laser head shown in fig.**2**

Fig **2**

5. Take off the laser head and replace it with a new one.
6. Reconnect the connector.
7. Center the laser positioning the laser light at the center of the **X axis** shutters light.
8. Proceed reassembling the covers.

Note: when reassembling the covers, remember to insert cable **AL00C001** in its guide rail as shown in the following figure:

Fig **3**

16.6 COLLIMATOR CALIBRATION

The collimator display shows the following menu:

Fig.1

16.6.1 COLLIMATOR DEFAULT PARAMETERS

Please note that when the parameters are set, the buttons turn pink.

Touch D allows memorizing the default parameters if touched for 5 seconds.

Pay attention not <u>to push this touch accidentally.</u>

If the **iris option** is selected, the collimator should be restarted.

The buttons P N, available only on some models, set the measurement in inches (P) or millimeters (N); the buttons I and 0 set the collimator with or without iris, while the buttons O A M set the collimator filters for beam hardness, absent, automatic or manual. The same should be done when selecting the motorized filters.

To move to the following menu, touch the right arrow; to go backward, touch the left arrow.

16.7 CALIBRATION OF THE COLLIMATOR SHUTTERS

Fig.1

Fig.2

In case there is no Iris, see fig.n.3 and 4. This menus perform the optional calibration **without IRIS**
To move to the next menu, touch the right arrow or the left arrow to go back.

Fig.3

Fig.4

When the shutters reach the limit position, the color of the number display turns yellow. In case of error, this number turns red.

16.7.1 LATERAL SHUTTERS CALIBRATION

Please note that the buttons are differentiated by capital and small letters.

1. Go to the minimum DFF (Fig.1 or 3). With buttons and , first select 5 cm to calibrate the shutters with button x, touched for at least 5 seconds. Then, select 43 cm to calibrate the shutters format with button X, touched for at least 5 seconds.

   To move to the next menu, touch the right arrow or the left arrow to go back.

As the detector plane is covered by the tabletop and consequently not reachable, the measurement may be done on tabletop plane. In this case, modify the shutters opening up to measure 4.65 cm (corresponding to 5 cm on detector plane) and 40 cm (corresponding to 43 cm on detector plane).

2. **Optional calibration** (Fig.2 or 4) Once the collimator is calibrated, and in case the formats are not correct at the maximum DFF, it is necessary to perform a further calibration. Select the maximum DFF by pressing the DFF key, choose an opening of 43 cm and touch button x, touched for at least 5 seconds .

As the detector plane is covered by the tabletop and consequently not reachable, the measurement may be done on tabletop plane. In this case, modify the shutters opening up to measure 41 cm (corresponding to 43 cm on detector plane).

Button R resets the previous settings of all shutters.

To move to the next menu, touch the right arrow or the left arrow to go back.

16.7.2 LONGITUDINAL SHUTTERS CALIBRATION

1. Go to the minimum DFF (Fig.1 or 3). With buttons , select 5 cm to calibrate the shutters with button y,touched for at least 5 seconds.Then, select 43 cm to calibrate the shutters format with button Y, touched for at least 5 seconds .
   To move to the next menu, touch the right arrow or the left arrow to go back.

As the detector plane is covered by the tabletop and consequently not reachable, the measurement may be done on tabletop plane. In this case, modify the shutters opening up to measure 4.65 cm (corresponding to 5 cm on detector plane) and 40 cm (corresponding to 43 cm on detector plane).

---

2. **Optional calibration** (Fig.2 or 4). Once the collimator is calibrated, and in case the formats are not correct at the maximum DFF, it is necessary to perform a further calibration. Select the maximum DFF by pressing the DFF key, choose an opening of 43 cm with button y, touched for at least 5 seconds.

As the detector plane is covered by the tabletop and consequently not reachable, the measurement may be done on tabletop plane. In this case, modify the shutters opening up to measure 41 cm (corresponding to 43 cm on detector plane).

Button R resets the previous settings of all shutters.To move to the next menu, touch the right arrow or the left arrow to go back.

16.7.3 IRIS SHUTTERS CALIBRATION

1. Go to the minimum DFF (Fig.1). With buttons , select 11 cm to calibrate the shutters with button i, touched for at least 5 seconds.Then, select 43 cm to calibrate the shutters format with button I, touched for at least 5 seconds.

   To move to the next menu, touch the right arrow or the left arrow to go back.

2. **Optional calibration** (Fig.2). Once the collimator is calibrated, and in case the formats are not correct at the maximum DFF, it is necessary to perform a further calibration. Select the maximum DFF by pressing the DFF key, choose an opening of 11 cm and touch buttons i, touched for at least 5 seconds.

   Button R resets the previous settings of all shutters.

   To move to the next menu, touch the right arrow or the left arrow to go back.

16.7.4 IB FORMAT SETTINGS

This setting is done only on collimators with Iris.

The setting of the needed IB format with buttons 1, 2, 3 and 4, recalling the previous settings. Buttons and control the iris opening and closing. Buttons 1, 2, 3 and 4, touched for at least 5 seconds, allow storing the information.

16.7.5 SETTING SQUARE AND ROUND SIZES

Fig.1

1. This menu allows visualizing the square and round formats. The row of numbers at the bottom visualizes the square formats, the one above the round ones. To verify the sizes of the various formats with different DFF, touch the DFF button, choosing between 1 1 5, 1 5 0, or 1 8 0.
   To move to the next menu, touch the right arrow or the left arrow to go back.

Fig.2

2. This menu (Fig.2) has the same function as that in Fig. 1, but without iris.
   To move to the next menu, touch the right arrow; touch the left arrow to go back.

16.7.6 MANUAL AND MOTORIZED FILTERS TEST

Fig.1

1. This menu is used with motorized filters. Button I allows inserting the filter, and button O allows disinserting it. In case of error, the buttons turn red.

   To move to the next menu, touch the right arrow; touch the left arrow to go back.

Fig.2

2. This menu displays if the manual filters are used. The two icons I show the filter status. Manually move the filters to check the operation of the limit switches.

   To move to the next menu, touch the right arrow; touch the left arrow to go back.

   If the filters are inserted, the buttons are green; if they are half way, the buttons turn red to report an error condition; if the filters are not inserted, the buttons are white.

16.7.7 LIGHT TIMING

Fig.1

1. This Menu sets the the timing of the light. The settable timings are multiple of 30 seconds. Button 1 keeps the light on for 30 seconds, and the seconds increase until button 6, which allows the light on for 180 seconds.

   To move to the next menu, touch the right arrow; touch the left arrow to go back.

16.7.8 SHUTTERS SPEED

Fig.1

This Menu sets the speed of the shutters in manual mode. Button 1 sets the lowest speed and button 6 sets the highest. Buttons and allow to immediately check the set speed.

To move to the next menu, touch the right arrow; touch the left arrow to go back.

16.7.9 SHUTTERS TEST

Fig.2

1. This menu performs a cyclic test on all shutters. To start the test, touch button S, to stop the test, touch button E.

   To move to the next menu, touch the right arrow; touch the left arrow to go back.

Fig.3

2. This starts the cyclic test on shutters **x** and **y** only.

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17. ERROR MESSAGES

17.1. TABLE - ERROR SITUATION MANAGEMENT

The **CONNEXITY** remote tilting table is equipped with self-diagnostic software that monitors the status of the electronics circuits. The behaviour of the diagnostic module depends on the operative status of the unit and in particular:

UNIT START UP PHASE

At the unit start-up, an automatic self-test routine is executed in order to check the main electronic circuits and the connected devices. In particular, the touch screen console executes the generator initialization and establishes the serial link communication.

If the touch screen console detects an error condition, on the color TFT display the following figure will appear:

As soon as the user touches button the system is ready to start the normal operation; the CONNEXITY table control desk CPU starts executing the keyboard test to verify that the joysticks and the buttons that control the main unit movements are not faulty.

In case no errors are detected, the table CPU starts the slaves CPU diagnostics;

In case of assistance request it is important that the operator minutely describes to the Service team the error messages displayed and the actual status of the unit.
That will allow the service team to reduce at the minimum the service time.

17.2. UNIT NORMAL OPERATIVE PHASE

The unit control firmware includes a self-diagnostic module that continuously monitors the conditions of the electronics circuits. In case a fault condition is detected, a specific Error message appears on touch screen display as detailed in the following figure:

The circuit that has generated the error is set out of order.

The user can try to clear the error touching icon

The system will try to recover the error condition. In the negative the user must switch the system **OFF** and contact the Service team.

The user can also try to clear the error by switching the unit OFF, wait for about 20 seconds and switch it ON. In case the error is not cleared he must contact the Service team.

In case the errors queue list contains more than 1 error, as soon as the operator clears the error

touching icon

In case of assistance request it is important that the operator minutely describes to the Service team the error messages displayed and the actual status of the unit.
That will allow the service team to reduce at the minimum the Service time.

The unit must not be used in case of fault of the proper circuits or of fault of the system in which it is a part. Identically the unit must not be used in case any alarm device of the whole system is faulty.

17.3. TABLE - ERROR MESSAGES

17.3.1. CLISIS/EXEL "DRIVER" (MsgDriverErr) 7.XX

Error codes for driver elevation errors start from 6000 to 6211 for drivers with firmware version 7.xx
Error codes for longitudinal movement driver start from 6300 to 6511
Error codes for spot film device driver start from 6600 to 6811
Error codes for tilting movement driver start from 6900 to 7111

6000. "ERROR: Emergency error free",",
6001. "ERROR: General Warning",
6002. "ERROR: General Error",
6003. "ERROR: DC Bus link over voltage FPGA",
6004. "ERROR: DC Bus link voltage exceed allowed thresholds",
6005. "ERROR: DC Bus link capacitor overload",
6006. "WARNING: DC Bus link capacitor overload",
6007. "ERROR: DC Bus link over voltage",
6008. "ERROR: DC Bus link under voltage",
6009. "WARNING: DC Bus link under voltage",
6010. "WARNING: dynamic braking I^2T",
6011. "ERROR: Regen short circuit",
6012. "WARNING: DC Bus link over voltage",
6013. "ERROR: Excess temperature device control board",
6014. "ERROR: Excess temperature drive heat sink",
6015. "WARNING: power temperature sensor 2 high",
6016. "WARNING: power temperature sensor 3 high",
6017. "ERROR: Power board over temperature",
6018. "WARNING: control temperature sensor 1 high",
6019. "WARNING: power temperature sensor 1 high",
6020. "WARNING: power temperature sensor 2 high",
6021. "WARNING: power temperature sensor 3 high",
6022. "WARNING: control temperature sensor 1 low",
6023. "WARNING: power temperature sensor 1 low",
6024. "WARNING: power temperature sensor 2 low",
6025. "WARNING: power temperature sensor 3 low",
6026. "ERROR: Control temperature sensor 1 low",
6027. "ERROR: Power temperature sensor 1 low",
6028. "ERROR: Power temperature sensor 2 low",
6029. "ERROR: Power temperature sensor 3 low",
6030. "ERROR: Low supply voltage +5v",
6031. "ERROR: Low supply voltage +1.2v",
6032. "ERROR: Low supply voltage +2.5v",
6033. "ERROR: Low supply voltage +3.3v",
6034. "ERROR: Low supply voltage +12v",
6035. "ERROR: Low supply voltage -12v",
6036. "ERROR: Low supply voltage +3.3v analog",
6037. "ERROR: Overvoltage supply voltage +1.2v",

6038. "ERROR: Overvoltage supply voltage +2.5v",
6039. "ERROR: Overvoltage supply voltage +3.3v",
6040. "ERROR: Overvoltage supply voltage +5v",
6041. "ERROR: Overvoltage supply voltage +12v",
6042. "ERROR: Overvoltage supply voltage -12v",
6043. "ERROR: Overvoltage supply voltage +3.3v analog",
6044. "ERROR: Hardware memory non volatile memory stamp invalid",
6045. "ERROR: Hardware memory non volatile memory data",
6046. "ERROR: Control board EEPROM read failed",
6047. "ERROR: Control board EEPROM corrupted serial num stamp",
6048. "ERROR: Control board EEPROM corrupted serial num data",
6049. "ERROR: Control board EEPROM corrupted serial parameter stamp",
6050. "ERROR: Control board EEPROM corrupted serial parameter data",
6051. "ERROR: Control board EEPROM write failed",
6052. "ERROR: Power board EEPROM read failed",
6053. "ERROR: Power board EEPROM corrupted serial num stamp",
6054. "ERROR: Power board EEPROM corrupted serial num data",
6055. "ERROR: Power board EEPROM corrupted serial parameter stamp",
6056. "ERROR: Power board EEPROM corrupted serial parameter data",
6057. "ERROR: Power board EEPROM write failed",
6058. "ERROR: Power board EEPROM invalid data",
6059. "ERROR: Option board EEPROM corrupted",
6060. "ERROR: Option board upstream checksum",
6061. "ERROR: Option board WDT",
6062. "ERROR: Firmware and option board FPGA types are not compatible",
6063. "ERROR: Firmware and option board FPGA versions are not compatible",
6064. "ERROR: Control board CRC fault",
6065. "ERROR: Power board CRC fault",
6066. "ERROR: Power board WDT fault",
6067. "ERROR: Power board communication fault",
6068. "ERROR: Power board FPGA not configured",
6069. "ERROR: Control board WDT fault",
6070. "WARNING: resident FPGA",
6071. "WARNING: operational FPGA",
6072. "ERROR: Drive motor parameters setup incomplete",
6073. "ERROR: Motor overheat",
6074. "ERROR: Motor brake open circuit",
6075. "ERROR: Motor brake short circuit",
6076. "ERROR: Motor brake applied during enable state",
6077. "ERROR: EnDAT overheated",
6078. "WARNING: Motor overheated",
6079. "ERROR: Voltage exceeds motor rating",
6080. "ERROR: Regen near capacity, could not prevent over voltage",
6081. "ERROR: Brake released when it should be applied",
6082. "ERROR: Feedback 1 broken wire",
6083. "ERROR: Feedback 1 analog signal amplitude fault",
6084. "ERROR: Feedback 1 EnDat communication fault",

6085. "ERROR: Feedback 1 illegal hall state",
6086. "ERROR: Feedback 1 BiSS watchdog",
6087. "ERROR: Feedback 1 BiSS multi cycle",
6088. "ERROR: Feedback 1 BiSS sensor",
6089. "ERROR: Feedback 1 SFD configuration",
6090. "ERROR: Feedback 1 SFD UART overrun",
6091. "ERROR: Feedback 1 SFD UART frame",
6092. "ERROR: Feedback 1 SFD UART parity",
6093. "ERROR: Feedback 1 SFD transfert timeout",
6094. "ERROR: Feedback 1 SFD corrupt position",
6095. "ERROR: Feedback 1 SFD transfert incomplete",
6096. "ERROR: Feedback 1 power supply fault",
6097. "ERROR: Feedback 1 failed to set feedback",
6098. "WARNING: SFD single corrupted position",
6099. "ERROR: Encoder init procedure failed",
6100. "ERROR: Failed to read motor parameters from feedback device",
6101. "ERROR: SFD position sensor fault",
6102. "ERROR: Tamagawa encoder overheat",
6103. "WARNING: Tamagawa encoder battery",
6104. "WARNING: non volatile memory error",
6105. "ERROR: Homing is needed",
6106. "ERROR: FB2 source not set",
6107. "ERROR: B1 ENCRES is not power of two",
6108. "ERROR: Non volatile memory error",
6109. "ERROR: Hiperface DSL fault",
6110. "ERROR: Multiturn overflow not supported with this feedback",
6111. "ERROR: Excessive shock detectedby feedback device",
6112. "ERROR: Tamagawa encoder communication timeout",
6113. "ERROR: Tamagawa encoder communication transfer incomplete",
6114. "ERROR: Tamagawa encoder communication CRC",
6115. "ERROR: Tamagawa encoder communication start timeout",
6116. "ERROR: Tamagawa encoder communication UART overrun",
6117. "ERROR: Tamagawa encoder communication UART framing",
6118. "ERROR: Tamagawa encoder over speed",
6119. "ERROR: Tamagawa encoder countoring error",
6120. "ERROR: Tamagawa encoder conting overflow",
6121. "ERROR: Tamagawa encoder multiturn error",
6122. "ERROR: Tamagawa encoder battery",
6123. "ERROR: Motor velocity exceeds emulated encoder maximum speed",
6124. "ERROR: FB3 EnDAT communication fault",
6125. "ERROR: Whake and Shake insufficient movement",
6126. "ERROR: Whake and Shake Excessive movement",
6127. "ERROR: Whake and Shake fine coarse delta too large",
6128. "ERROR: Whake and Shake overspeed",
6129. "ERROR: Whake and Shake Loop angle delta too large",
6130. "ERROR: Commutation not initialized",
6131. "ERROR: Motor U phase missing",

6132. "ERROR: Motor V phase missing",
6133. "ERROR: Motor W phase missing",
6134. "ERROR: "WARNING: Whake and Shake overspeed",
6135. "ERROR: Whake and Shake validating positive movement failed",
6136. "ERROR: Whake and Shake validating negative movement failed",
6137. "ERROR: Whake and Shake validating commutation angle time out",
6138. "ERROR: Whake and Shake validating commutation angle moved too far",
6139. "ERROR: Whake and Shake validating commutation angle required",
6140. "ERROR: Invalid commutation detected motor accelerates in wrong direction",
6141. "ERROR: Life Guard Error or HeartBeat Error",
6142. "WARNING: Fieldbus communication lost",
6143. "WARNING: Modbus data rate is too high",
6144. "ERROR: Drive foldback",
6145. "ERROR: Motor foldback",
6146. "WARNING: Drive foldback",
6147. "WARNING: Motor foldback",
6148. "WARNING: Motor I^2T load",
6149. "WARNING: using derivate of position when using sensorless feedback type in position mode",
6150. "WARNING: zero velocity when using induction sensorless feedback type in position mode",
6151. "ERROR: Over speed",
6152. "ERROR: Emergency timeout occurred while axis should disable",
6153. "ERROR: Fieldbus command velocity too high",
6154. "ERROR: Fieldbus command velocity too low",
6155. "WARNING: positive software position limit is exceeded",
6156. "WARNING: negative software position limit is exceeded",
6157. "WARNING: PVT buffer overflow",
6158. "WARNING: PVT buffer underflow",
6159. "WARNING: scale factor of PVT velocity command over range",
6160. "ERROR: Following error (user)",
6161. "ERROR: Instability during autotune",
6162. "WARNING: not enough distance to move motion exception",
6163. "WARNING: not enough distance to move following motion exception",
6164. "WARNING: velocity limit violation exceeding max limit",
6165. "WARNING: following motion failed check motion parameters",
6166. "WARNING: target position crossed due to stop command",
6167. "WARNING: Homing index pulse not found",
6168. "WARNING: Homing reference switch not found",
6169. "WARNING: Failed to set motion task parameters",
6170. "WARNING: Motion task activation failed",
6171. "WARNING: Homing procedure failed",
6172. "ERROR: Target position over short due to invalid motion task activation",
6173. "WARNING: MT.NUM exceeds limit",
6174. "WARNING: motion task is not initialized",
6175. "WARNING: motion task target position is out",
6176. "WARNING: software limit switch taversed",
6177. "WARNING: invalid bit combination in the motion task control word",
6178. "WARNING: 1:1 profile cannot be triggered on the fly",

6179. "WARNING: customer profile table is not initialized",
6180. "WARNING: motion task activation is currently pending",
6181. "WARNING: Homing is needed",
6182. "WARNING: Homing maximum distance exceeded",
6183. "ERROR: Following error (numeric)",
6184. "ERROR: Fieldbus synchronization lost",
6185. "WARNING: Fieldbus synchronization lost",
6186. "WARNING: Homing and feedback mismatch",
6187. "ERROR: Fieldbus runtime fault",
6188. "ERROR: Fieldbus communication lost",
6189. "ERROR: Lu current offset limit exceeded",
6190. "ERROR: Lv current offset limit exceeded",
6191. "ERROR: Regen over power",
6192. "ERROR: Output over current",
6193. "ERROR: Current sensor short circuit",
6194. "ERROR: MPOLES/FPOLES not an integer",
6195. "ERROR: Power stage fault",
6196. "ERROR: Safe torque off",
6197. "ERROR: Feedback 2 A/B line break",
6198. "ERROR: Feedback 2 supply over current",
6199. "ERROR: Feedback 2 illegal state",
6200. "ERROR: External fault",
6201. "ERROR: Firmware and FPGA versions are not compatible",
6202. "ERROR: Firmware type mismatch",
6203. "WARNING: Following error (user)",
6204. "WARNING: Following error (numeric)",
6205. "WARNING: operational FPGA is not a default FPGA",
6206. "WARNING: the FPGA is a laboratory FPGA",
6207. "WARNING: Safe torque off",
6208. "ERROR: Feedback 2 Z line break",
6209. "WARNING: OPMODE incompatible with CMDSOURCE",
6210. "WARNING: EMUEMODE incompatible with DRV.HANDWHEELSRC",
6211. "ERROR: unknown error",

17.3.2. CLISIS/EXEL "TRIFASE" (MsgTrifaseErr) 7.XXX

Error codes for triphase errors start from 3000 to 3097 for drivers with firmware version 7.xx

3000. "WARNING : Elevation driver not inizialized",
3001. "WARNING : Column driver not inizialized",
3002. "WARNING : Sfd driver not inizialized",
3003. "ERROR : wrong CRC in potentiometer",
3004. "ERROR : wrong CRC in digital potmeter",
3005. "ERROR : wrong CRC in encoders",
3006. "WARNING : movement aborted",
3007. "ERROR : movement not reconized",
3008. "ERROR : feedback column can guard lost",
3009. "ERROR : feedback elev. can guard lost",

3010. "ERROR : feedback sfd can guard lost",
3011. "ERROR : I2c bus communication error",
3012. "ERROR : Timeout can ciclic message",
3013. "ERROR : Column driver wrong init",
3014. "ERROR : Sfd driver wrong init",
3015. "ERROR : Elevation driver wrong init",
3016. "WARNING : Unexpected RESET from 3fase CPU",
3017. "WARNING : Default column resolution",
3018. "WARNING : Default sfd resolution",
3019. "WARNING : Default elevation resolution",
3020. "ERROR : Tilting - elevation power lost",
3021. "ERROR : Fault tilting driver",
3022. "ERROR : No motor on from tilting driver",
3023. "ERROR : Tilting driver not ready",
3024. "ERROR : Elevation either EOT engaged",
3025. "ERROR : Elevation analog <=> EOT (min)",
3026. "ERROR : Elevation analog <=> EOT (max)",
3027. "ERROR : No brake on from tilting driver",
3028. "ERROR : Elevation msw setting",
3029. "ERROR : Axis distance too big",
3030. "WARNING : Axis drivers off line",
3031. "WARNING : All drivers off line",
3032. "ERROR : Table Top lateral power lost",
3033. "ERROR : FFD power lost",
3034. "ERROR : SFD - column power lost",
3035. "WARNING : Column fw driver not syncronized",
3036. "WARNING : Sfd fw driver not syncronized",
3037. "WARNING : Elev. fw driver not syncronized",
3038. "WARNING : Compressor in field",
3039. "ERROR : ",
3040. "ERROR : Timeout Xray on",
3041. "ERROR : Griglia not ready",
3042. "ERROR : Cassetta not ready",
3043. "ERROR : Generator not in prep",
3044. "ERROR : Trifase not blocked",
3045. "ERROR : Generator not ready",
3046. "ERROR : SFD busy",
3047. "ERROR : Timeout rx off",
3048. "ERROR : Collimator busy",
3049. "ERROR : Fulcro not ready",
3050. "ERROR : Grid stopped",
3051. "ERROR : Tomo not ready",
3052. "ERROR : Hiris not ready",
3053. "ERROR : ",
3054. "ERROR : ",
3055. "ERROR : ",
3056. "ERROR : ",

```
"ERROR   : ",
"ERROR   : ",
"ERROR   : ",
"WARNING : column pot-encoder mismatch",
"WARNING : elevation pot-encoder mismatch",
"WARNING : sfd pot-encoder mismatch",
"ERROR   : ",
"ERROR   : ",
"ERROR   : ",
"ERROR   : ",
"ERROR   : ",
"ERROR   : ",
"ERROR   : ",
"ERROR   : External Fluoro enabled",
"ERROR   : External Preparation enabled",
"ERROR   : External Exposure enabled",
"ERROR   : ",
"ERROR   : ",
"ERROR   : ",
"ERROR   : ",
"ERROR   : ",
"ERROR   : ",
"ERROR   : ",
"ERROR   : configuration not supported",
"ERROR   : long cannot enter homing mode",
"ERROR   : sfd cannot enter homing mode",
"ERROR   : elevation cannot enter homing mode",
"ERROR   : long cannot set reference point",
"ERROR   : sfd cannot set reference point",
"ERROR   : elevation cannot set reference point",
"ERROR   : long cannot enter operative mode",
"ERROR   : sfd cannot enter operative mode",
"ERROR   : elevation cannot enter operative mode",
"ERROR   : sfd cannot change digital 1",
"ERROR   : sfd cannot execute script",
"ERROR   : long timeout",
"ERROR   : sfd timeout",
"ERROR   : elevation timeout",
"ERROR   : long is moving while is off",
"ERROR   : sfd is moving while is off",
"ERROR   : elevation is moving while is off",
```

17.3.3. CLISIS/EXEL "SFD" (MsgSeriogErr)

Error codes for triphase errors start from 2000 to 2003 for drivers with firmware version 7.xx

2000. "ERROR : Unexpected reset from sfd CPU",
2001. "ERROR : sfd key button pressed at startup",
2002. "ERROR : SFD CPU WDT error",
2003. "ERROR : SFD CRC eeprom error",

17.3.4. MESSAGGI CLISIS/EXEL "REMOTE KEYBOARD" (MsgRemKeyErr)

Error codes for sfd keyboard errors start from 0 to 03 for drivers with firmware version 7.xx

0. "ERROR : Unexpected reset from remkey CPU",
1. "ERROR : key button pressed at startup",
2. "ERROR : remkey CPU WDT error",
3. "ERROR : remkey CRC eeprom error",

17.3.5. CLISIS/EXEL "COLLIMATOR" (MsgCollimErr)

Error codes for collimator errors start from 4000 to 4006 for drivers with firmware version 7.xx

4000. "ERROR : Collimator X-axis shutter msw error",
4001. "ERROR : Collimator Y-axis shutter msw error",
4002. "ERROR : Collimator iris shutter msw error",
4003. "ERROR : collimator cpu CRC eeprom error",
4004. "ERROR : Unexpected reset from collim CPU",
4005. "ERROR : Collim CPU WDT error",
4006. "ERROR : collim key button pressed at startup",

17.3.6. CLISIS/EXEL "JOYSTICK/BUTTONS" (MsgConsolleErr)

Error codes for console and joystick errors start from 1000 to 1051 for drivers with firmware version 7.xx

1000. "ERROR : wrong CRC in consolle eeprom",
1001. "ERROR : wrong CRC in configuration data",
1002. "ERROR : ",
1003. "ERROR : ",
1004. "ERROR : ",
1005. "ERROR : ",
1006. "ERROR : ",
1007. "ERROR : ",
1008. "ERROR : ",
1009. "ERROR : ",
1010. "ERROR : ",
1011. "ERROR : Joistick channel 1 - +5V",
1012. "ERROR : Joistick channel 2 - +5V",
1013. "ERROR : Joistick channel 3 - +5V",
1014. "ERROR : Joistick channel 4 - +5V",
1015. "ERROR : Joistick channel 1 - +0V",

1016. "ERROR : Joistick channel 2 - +0V",
1017. "ERROR : Joistick channel 3 - +0V",
1018. "ERROR : Joistick channel 4 - +0V",
1019. "ERROR : ",
1020. "ERROR : console keys pressed at startup",
1021. "ERROR : ",
1022. "ERROR : ",
1023. "ERROR : ",
1024. "ERROR : ",
1025. "ERROR : ",
1026. "ERROR : ",
1027. "ERROR : ",
1028. "ERROR : ",
1029. "ERROR : ",
1030. "ERROR : Can bus off",
1031. "WARNING : broken can link with 3phase cpu",
1032. "WARNING : broken can link with collim cpu",
1033. "WARNING : broken can link with sfd cpu",
1034. "WARNING : broken can link with remkey cpu",
1035. "ERROR : ",
1036. "ERROR : ",
1037. "ERROR : ",
1038. "ERROR : ",
1039. "ERROR : ",
1040. "ERROR : Keyboard error",
1041. "ERROR : button found pressed",
1042. "ERROR : Keyboard not recognized",
1043. "ERROR : Joystick active",
1044. "WARNING : 3fase not responding",
1045. "ERROR : 3fase wrong software",
1046. "WARNING : Collim not responding",
1047. "ERROR : Collim wrong software",
1048. "WARNING : SFD not responding",
1049. "ERROR : SFD wrong software",
1050. "ERROR : ** Firmware version not synchronized **",
1051. "ERROR : Remkey wrong software",

17.4. GENERATOR – ERROR SITUATION MANAGEMENT

The generator is equipped with self-diagnostic software that continuously monitors the conditions of the electronics circuits and grants a safe operation of the x-ray tube.
In case a fault condition is detected, a specific Error message appears on touch screen display as detailed in the following figure:

Warning messages are cleared automatically after they have been displayed for several seconds.
The Unit is immediately out of service and the error code memorized in the non volatile memory can be seen by the technical service on the display.

The user can try to clear the error touching icon

In case the errors queue list contains more than 1 error, as soon as the operator clears the error touching icon the touch screen display the following error memorized.

In case of assistance request it is important that the operator minutely describes to the Service team the error messages displayed and the actual status of the unit. That will allow the service team to reduce at the minimum the service time.

The unit must not be used in case of fault of the proper circuits or of fault of the system in which it is a part. Identically the unit must not be used in case any alarm device of the whole system is faulty.

17.5. DEIMOS GENERATOR - OPERATOR AND LIMIT MESSAGES

The following error messages are inserted by way of information only. For any insights and further details please refer to the manual provided with the generator

17.5.1. OPERATOR MESSAGES

MESSAGE	DESCRIPTION
INITIALIZATION	Displayed during power up sequence.
SPINNING ROTOR	Displayed when prep state is active.
X-RAY READY	Displayed when generator is ready to expose
X-RAY ON	Displayed during both a rad and fluoro exposure.
DAP NOT READY	The optional DAP is in its “warm up” state, and not ready to make DAP measurements.

17.5.2. LIMIT MESSAGES

These messages indicate that an exposure has been requested that exceeds one or more limits.

MESSAGE	PROBLEM	ACTION
AEC DENSITY LIM	Requested density not programmed.	Select another density or request those steps be programmed. Consult your service representative for this.
ANODE HEAT WARN	Anode has exceeded programmed warning level.	Wait for anode to cool.
CAL LIMIT	Requested parameter not calibrated.	Consult your service representative.
DAP ACCUM WARN	The accumulated DAP value has reached the programmed DAP limit.	Reset the DAP.
DAP RATE WARN	The current DAP rate exceeds the programmed DAP rate limit.	Reduce the dose.
FL TIMER WARN	Fluoro interval timer ≥ 5.0 mins.	Reset fluoro timer.
MESSAGE	PROBLEM	ACTION
GEN DUTY WARNING	The X-Ray generator has reached its duty warning limit.	Re-evaluate technique factors. Allow generator to cool if possible. If exposures are continued, serious generator damage may result due to overheating.
GEN KV LIMIT	Requested kV not allowed as generator kV limit has been reached.	None.
GEN MA LIMIT	Requested mA not allowed as generator mA limit has been reached.	None.
GEN MAS LIMIT	Requested mAs not allowed as	None.

MESSAGE	PROBLEM	ACTION
	generator mAs limit has been reached.	
GEN MS LIMIT	Requested ms not allowed as generator ms limit has been reached.	None.
GEN KW LIMIT	Requested parameter not allowed as generator kW limit has been reached.	None.
GEN. PPS LIMIT	PPS limit has been reached.	None.
INVALID PARAM	Generator detected invalid parameter within received message, message ignored.	Select valid parameter.
LABEL JAMMED	The labels are jammed.	Clear the paper jam.
OUT OF LABELS	The printer is out of labels.	Load more labels.
PLATEN OPEN	The paper platen is not positioned properly.	Check the platen position.
PRINTER COMM ERROR	The printer has reported a communication error.	Try printing again.
PRINTER ERROR	The printer self-diagnostics have reported a printer problem.	Refer to the printer manual.
PRINTER OFF-LINE	The printer is off-line.	Put the printer on-line.
TUBE KW LIMIT	Requested parameter not allowed as tube kW limit has been reached.	None.
TUBE KV LIMIT	Requested kV not allowed as tube kV limit has been reached.	None.
TUBE MA LIMIT	Requested mA not allowed as tube mA limit has been reached.	None.
TUBE MAS LIMIT	Requested mAs not allowed as tube mAs limit has been reached.	None.

17.6. DEIMOS GENERATOR - ERROR MESSAGES

These messages indicate that an error has occurred.

ERROR CODE	MESSAGE	PROBLEM	ACTION
E001	GEN EPROM ERR		Consult your service representative.
E003	GEN NVRAM ERR		Consult your service representative.
E004	GEN RTC ERROR	Generator CPU real time clock is not functioning.	Reset time and date. Consult your service representative.
E005	PS CONTACT ERR		Consult your service representative.
E006	ROTOR FAULT		Power unit off and retry rotor start. Consult your service representative.
E007	FILAMENT FAULT		Consult your service representative.
E008	MA FAULT		Consult your service representative.
E009	PS NOT READY	Power supply is not ready to make an exposure.	Retry exposure. Consult your service representative.
E011	HIGH MA FAULT		Consult your service representative.
E012	LOW MA FAULT		Consult your service representative.
E013	MANUAL TERMIN	Operator released exposure switch during exposure.	Re-take exposure if necessary. Consult your service representative.
E014	AEC BUT ERROR	AEC exposure exceeded allowed back up time.	Check exposure technique settings. Consult your service representative.
E015	AEC BU MAS ERR	AEC exposure exceeded allowed back up mAs.	Check exposure technique settings. Consult your service representative.
E016	TOMO BUT ERROR	Tomo exposure exceeded back up time.	1. Check exposure technique settings. 2. Increase tomo back up time if necessary.
E017	NOT CALIBRATED		Consult your service representative.
E018	PREP TIMEOUT	Generator has been in prep state too long.	Reduce length of time in prep state.

ERROR CODE	MESSAGE	PROBLEM	ACTION
E019	ANODE HEAT LIMIT	Selected parameters will cause X-Ray tube to exceed its programmed anode heat limit.	Reduce parameters or wait for tube to cool.
E020	THERMAL INT #1	X-Ray tube # 1 too hot and its thermal switch has opened.	Wait for X-Ray tube # 1 to cool.
E021	THERMAL INT #2	X-Ray tube # 2 too hot and its thermal switch has opened.	Wait for X-Ray tube # 2 to cool.
E022	DOOR INTERLOCK	Door is open.	Close door.
E023	COLLIMATOR ERR	Collimator is not ready.	Check collimator.
E024	CASSETTE ERROR	Cassette is not ready.	Check cassette.
E025	II SAFETY INT	II safety is not ready.	Check II safety.
E026	SPARE INT	Spare input is not ready.	Consult your service representative.
E028	PREP SW CLOSED		Consult your service representative.
E029	X-RAY SW CLOSED		Consult your service representative.
E030	FLUORO SW CLOSED		Consult your service representative.
E031	REMOTE COMM ERR	Communication error detected with remote fluoro control unit.	Turn power off and then on to Reset Generator. Consult your service representative.
E032	CONSOLE COMM ERR	Generator has detected error in communication to console.	Turn power off and then on to reset generator. Consult your service representative.
E033	GEN BATTERY LOW		Consult your service representative.
E034	+12VDC ERROR		Consult your service representative.
E035	-12VDC ERROR		Consult your service representative.
E036	+15VDC ERROR		Consult your service representative.
E037	-15VDC ERROR		Consult your service representative.
E038	CAL DATA ERROR		Consult your service representative.
E039	AEC DATA ERROR		Consult your service representative.
E040	FLUORO DATA ERROR		Consult your service representative.
E041	REC DATA ERROR		Consult your service representative.
E042	TUBE DATA ERR		Consult your service representative..
E043	KV ERROR		Switch OFF generator. Prevent further use of generator, then. consult your service

ERROR CODE	MESSAGE	PROBLEM	ACTION
			representative.
E044	COMM ERROR	Received communication message not valid and ignored.	Reset error.
E045	NOT SUPPORTED	Received message valid, but not supported by this system.	Reset error.
E046	MODE INHIBITED	Received message valid, but not allowed during present state.	Reset error.
E047	FL TIMER LIMIT	Fluoro Timer has exceeded time limit.	Reset Fluoro timer.
E048	FOCUS MISMATCH		Consult your service representative.
E049	NOT ENABLED	Requested function has not been programmed to be enabled.	Consult your service representative.
E050	GEN DATA ERROR		Consult your service representative.
E051	AEC DEVICE ERR	Generator has detected no feedback signal from AEC device.	Check that X-Ray tube is pointing at correct AEC device. Consult your service representative.
E052	HIGH SF CURRENT		Consult your service representative.
E053	HIGH LF CURRENT		Consult your service representative.
E054	AEC OUT OF RANGE		Consult your service representative.
E055	NO FIELDS ACTIVE	AEC enabled but no fields are selected.	Select AEC field(s).
E056	NO TUBE SELECTED		Consult your service representative.
E057	AEC STOP ERROR		Consult your service representative.
E058	CONSOLE BUT ERR		Consult your service representative.
E059	HOUSE HEAT LIMIT	X-Ray tube housing has exceeded limit.	Wait for tube to cool.
E060	EXP KV HIGH		Consult your service representative.
E061	EXP KV LOW		Consult your service representative.
E062	EXP_ SW ERROR		Consult your service representative.
E063	FACTORY DEFAULTS		Consult your service representative.
E066	NO SYNC PULSE		Consult your service representative.
E070	SOFTWARE KEY ERR		Consult your service representative.
E071	DAP OVERFLOW	The accumulated DAP value exceeds the	Reset the DAP.

ERROR CODE	MESSAGE	PROBLEM	ACTION
		display limit.	
E072	DAP DEVICE ERROR	The DAP device is not functional.	Consult your service representative.
E073	DAP DATA ERROR		Consult service representative.

17.7. DEIMOS GENERATOR EXPOSURE TABLES

The following Table 1 **shows mAs values resulting from preselected mA and ms values (3 point operation). This table also shows the range and interrelation of these loading factors.**

For example, if in AEC operation it is known that the preset backup mAs limit is 50 mAs and 100 mA is chosen for that technique, then the maximum length of exposure possible (at which time the backup mAs limit is reached) is 500 ms.

In the above example, read down the 100 mA column to the 50 mAs value.
Then read across to the left side of the page to the 500 ms value, this will be the maximum time allowed for the stated conditions.

IEC standard requires that this information be provided in a form suitable to be displayed at a prominent location on or near the control console of the generator.

TECHNIQUE SELECTION
(3 Point Selection: mA/TIME & mAs per IEC)

Time	**mA Selected**																
(ms)	10	12.5	16	20	25	32	40	50	63	80	100	125	160	200	250	320	400
1.0																	
1.2																	.5
1.6																.5	.63
2															.5	.63	.8
2.5														.5	.63	.8	1.0
3.2													.5	.63	.8	1.0	1.25
4												.5	.63	.8	1.0	1.25	1.6
5											.5	.63	.8	1.0	1.25	1.6	2.0
6.3										.5	.63	.8	1.0	1.25	1.6	2.0	2.5
8									.5	.63	.8	1.0	1.25	1.6	2.0	2.5	3.2
10								.5	.63	.8	1.0	1.25	1.6	2.0	2.5	3.2	4.0
12.5							.5	.63	.8	1.0	1.25	1.6	2.0	2.5	3.2	4.0	5.0
16						.5	.63	.8	1.0	1.25	1.6	2.0	2.5	3.2	4.0	5.0	6.3
20					.5	.63	.8	1.0	1.25	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0
25				.5	.63	.8	1.0	1.25	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10
32			.5	.63	.8	1.0	1.25	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	12.5
40		.5	.63	.8	1.0	1.25	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	12.5	16
50	.5	.63	.8	1.0	1.25	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	12.5	16	20
63	.63	.8	1.0	1.25	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	12.5	16	20	25
80	.8	1.0	1.25	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	12.5	16	20	25	32
100	1.0	1.25	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	12.5	16	20	25	32	40
125	1.25	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	12.5	16	20	25	32	40	50
160	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	12.5	16	20	25	32	40	50	63
200	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	12.5	16	20	25	32	40	50	63	80
250	2.5	3.2	4.0	5.0	6.3	8.0	10	12.5	16	20	25	32	40	50	63	80	100
320	3.2	4.0	5.0	6.3	8.0	10	12.5	16	20	25	32	40	50	63	80	100	125
400	4.0	5.0	6.3	8.0	10	12.5	16	20	25	32	40	50	63	80	100	125	160
500	5.0	6.3	8.0	10	12.5	16	20	25	32	40	50	63	80	100	125	160	200

Table 1: mAs values vs. mA & time selected

Table 1 continued on next page

Time	**mA Selected**																
(ms)	500	630	800	1000													
1.0	.5	.63	.8	1.0													
1.2	.63	.8	1.0	1.2													
1.6	.8	1.0	1.2	1.6													
2	1.0	1.25	1.6	2.0													
2.5	1.25	1.6	2.0	2.5													
3.2	1.6	2.0	2.5	3.2													
4	2.0	2.5	3.2	4.0													
5	2.5	3.2	4.0	5.0													
6.3	3.2	4.0	5.0	6.3													
8	4.0	5.0	6.3	8.0													
10	5.0	6.3	8.0	10													
12.5	6.3	8.0	10	12.5													
16	8.0	10	12.5	16													
20	10	12.5	16	20													
25	12.5	16	20	25													
32	16	20	25	32													
40	20	25	32	40													
50	25	32	40	50													
63	32	40	50	63													
80	40	50	63	80													
100	50	63	80	100													
125	63	80	100	125													
160	80	100	125	160													
200	100	125	160	200													
250	125	160	200	250													
320	160	200	250	320													
400	200	250	320	400													
500	250	320	400	500													

Table 1 (Cont): mAs values vs. mA & time selected

Table 1 continued on next page

Time (ms)	mA Selected 10	12.5	16	20	25	32	40	50	63	80	100	125	160	200	250	320	400
630	6.3	8.0	10	12.5	16	20	25	32	40	50	63	80	100	125	160	200	250
800	8.0	10	12.5	16	20	25	32	40	50	63	80	100	125	160	200	250	320
1000	10	12.5	16	20	25	32	40	50	63	80	100	125	160	200	250	320	400
1250	12.5	16	20	25	32	40	50	63	80	100	125	160	200	250	320	400	500
1600	16	20	25	32	40	50	63	80	100	125	160	200	250	320	400	500	630
2000	20	25	32	40	50	63	80	100	125	160	200	250	320	400	500	630	800
2500	25	32	40	50	63	80	100	125	160	200	250	320	400	500	630	800	1000
3200	32	40	50	63	80	100	125	160	200	250	320	400	500	630	800	1000	
4000	40	50	63	80	100	125	160	200	250	320	400	500	630	800	1000		
5000	50	63	80	100	125	160	200	250	320	400	500	630	800	1000			
6300	63	80	100	125	160	200	250	320	400	500	630	800	1000				

Time (ms)	mA Selected 500	630	800	1000													
630	320	400	500	630													
800	400	500	630	800													
1000	500	630	800	1000													
1250	630	800	1000														
1600	800	1000															
2000	1000																
2500																	
3200																	
4000																	
5000																	
6300																	

Table 1 (Cont): mAs values vs. mA & time selected

Note: 65 kW Generators Maximum mA = 800

80 kW Generators Maximum mA = 1000

Note:1)mA/TIME values are tube rating dependent. For certain tubes, some mA/TIME selections are not available at higher kV selections.

2)The maximum power output of this family of generators is 32 kW, 40 kW, 50 kW, 65 kW, 80 kW, or 100 kW respectively. The generator software does not allow a kV and mA combination to be selected that exceeds these maximum values.

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18. UNIT INTERCOM CIRCUIT

18.1. INTERCOM SYSTEM DESCRIPTION

The Intercom system is basically composed of two similar stages, integrated on the **control desk CPU** and on the **tube stand control boards**.

The speakers and microphones at the operator and patient side are directly connected at these boards. To achieve the proper functionality of the intercom system, also the cable code **002500.430** must be included.

The intercom circuit is supplied by the 30Vdc bus of the unit trough switching step down converters to ± 12V.
The voice transfer from the two stages of the intercom circuit is achieved using differential analog line drivers and receivers.

The intercom system is controlled by means of 2 buttons that are located at the left-bottom side of the unit keyboard. Such buttons are merged into the keys matrix and scanned by the console CPU.

In the actual version, the system is set to offer the following operative modes:

a) **Disabled**

In this mode the system is completely disabled.

b) **Listen**

In this mode the operator can listen to the patient voice from the remote console.

c) **Talk**

In this mode the patient can hear the remote console operator's voice.

The operator can select the operative modes **a**, **b**, **c**, using the control buttons integrated in the Unit keyboard. In particular:

The selected operative mode is indicated to the operator by means of the Intercom controls buttons signaling led as detailed in the following table:

Listen pushbutton led:

Off ==> Listen disabled.
On ==> Listen enabled.

Talk pushbutton led:

Off ==> Talk disabled.
On ==> Talk enabled.

18.2. INTERCOM SYSTEM OPERATION

For a better understanding of the following explanations, it is suggested to use as reference the console CPU board electrical drawing ref. CSA00S5706

The complete system is composed by two similar circuits; the operator side is set to be controlled by the external buttons, while the patient side one is in a fixed bi-directional configuration (no control provided).

Each card is essentially composed of the following functional blocks

We can now take in analysis the single blocks as seen on the above block diagram.

a) Operator side Signal transmission block

The microphone signal enters in the pre-amplification block that amplifies the analog signal.
The pre-amplification stage also supplies the necessary power for the microphone.

The analog TX control block controls the signal intensity to transmit in Talk by means of the trimmer **PT9**,
The transmission block analog TX driver transforms the single ended analog signal in a differential one (analog differential + and - signals). This differential analog signal enters in the differential receiver block of the other card.

The analog differential transmission gives a high immunity to the common mode noise injected on the interconnection cable.

b) Operator side Signal receiving and amplifying block

The analog differential signal coming from the patient side card is re-converted in a single ended one by the circuit contained in the RX buffer functional block. The signal in output from this stage enters in the analog RX control circuit.

The listening volume could be adjusted by means of the trimmer **PT6**. An additional tone control could be made using the trimmer **PT4**.

At the output of the analog RX control is connected the final amplifying stage at which output (CN1015) is connected the speaker. The connector CN1016 is only predisposed for an auxiliary secondary speaker or for another use of the audio signal.

The power supply block using the 30 Volt DC generates the +12 Volt DC and -12 Volt DC voltages.

The Intercom functions are controlled by the console micro-controller that provides the correct analog switches enable signals (of the analog control blocks), according to the operator commands.

c) Patient side Signal transmission block

The microphone signal enters in the pre-amplification block that amplifies the analog signal.
The pre-amplification stage also supplies the necessary power for the two microphones.

The TX analog control block is mainly composed by a volume control circuit that, by means of the trimmer **PT1**, controls the signal intensity to transmit to the operator side circuit.
The transmission block TX analog transformer transforms the single ended analog signal in a differential one (analog differential + and - signals). This differential analog signal enters in the differential receiver block of the other card.

The analog differential transmission gives a high immunity to the common mode noise injected on the interconnection cable.

d) Patient side Signal receiving and amplifying block

The analog differential signal coming from the operator side card is re-converted in a single ended one by the circuit contained in the RX buffer functional block. The signal in output from this stage enters in the analog RX control circuit.

The RX analog control block is essentially composed by a volume control circuit that, by means of the trimmer PT2, controls the patient listening volume. An additional tone control could be made using the trimmer PT3.

At the output of the analog RX control is connected the final amplifying stage at which output (CN514) is connected the speaker. The connector CN515 is only predisposed for an auxiliary secondary speaker or for another use of the audio signal.

The power supply block using the 30 Volt DC generates the +12 Volt DC and -12 Volt DC voltages.

The commands that enable/disable the different working mode are the following:

Enable to button:

The “enable to” command, activate / deactivate (toggle function) the voice channel from the operator side to the patient side. The volume on this channel is controlled by **PT9** on the operator side card. The status “activated” is signalled by the LED of the button.

Enable from button:

The “enable from” command, activate / deactivate (toggle function) the voice channel from the patient side to the operator side. The volume on this channel is controlled, on the operator side card, by PT6 (if internal volume control is selected). The status “activated” is signalled by the LED of the button.

18.3. INTERCOM SYSTEM CALIBRATION

The intercom calibration procedure must be carried out in two different steps:

a) Jumper setting and trimmer pre-calibration

b) Additional intercom system calibrations (if is necessary).

Jumper setting and trimmer pre-calibration at control desk side:

Set the jumpers and the trimmers mounted on the Console CPU board as hereinafter indicated:

SW8 jumper 1-2
SW9 jumper 1-2

PT4 Max. CCW
PT5 Max CCW
PT6 5 TURNS CW from the CCW end of travel
PT7 Max CCW
PT8 Max CCW
PT9 5 turns CW from the CCW end of travel

Trimmer pre-calibration at the patient side:

PT1 max. CW
PT2 max. CW
PT3 max. CCW

Additional intercom system calibrations

Once the jumpers have been properly set and the trimmers have been pre-adjusted, additional calibrations of the Intercom circuit might be required.
IN THIS CASE SUCH CALIBRATIONS MUST BE CARRIED OUT ON THE INTERCOM INTERFACE BOARD MOUNTED INTO THE CONTROL DESK.
DO NOT MODIFY THE CALIBRATION OF THE INTERCOM SYSTEM PCB AT THE PATIENT SIDE.

Listen mode - operator side speaker volume adjusting:

The volume related to the operator side speaker is controlled by means of the trimmer PT6; Acting CW on PT6 the volume increases.

Pay also attention that the patient side microphone might detect the sound signal generated by the console side speaker. In this case the system could enter in a close loop auto oscillation and the only way to eliminate this effect is to reduce the amplification level.
Therefor is suggested to be sure that only the Listen mode is enabled and that the talk mode is disabled before attempting this adjustment.

Talk mode - patient side speaker volume adjusting:

The volume related to the patient side speaker is controlled by means of the trimmer PT9; Acting CW on PT9 the volume increases.

Pay also attention that the console microphone might detect the sound signal generated by the patient side speaker. In this case the system could enter in a close loop auto oscillation and the only way to eliminate this effect is to reduce the amplification level.
Therefor is suggested to be sure that only the Talk mode is enabled and that the Listen mode is disabled before attempting this adjustment.

Tone adjusting:

The tone adjusting by means of the trimmer PT4 is considered not necessary. For this reason please, leaves the trimmer PT4 in the factory position (full CCW).

CN1015 - SPEAKER CONNECTOR
CN1016 - AUX SPEAKER CONNECTOR
SW8
SW9
DEFAULT
CONFIGURATION
AUX MICROPHONE
CONNECTOR
CN1013
MICROPHONE
CONNECTOR
CN1012
PT4 - TONE ADJ.
PT5 - EXTERNAL LISTEN VOLUME LIMITER
PT6 - BOOST LISTEN VOLUME
PT7 - LISTEN VOLUME
PT8 - TALK VOLUME
PT9 - BOOST TALK VOLUME

CN514 - SPEAKER CONNECTOR
CN515 - AUX SPEAKER CONNECTOR
PT1 -TALK VOLUME
PT2 - LISTEN VOLUME
PT3 - TONE ADJ.
CN512 - MICROPHONE CONNECTOR
CN513 - MICROPHONE CONNECTOR

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19. END OF LIFE 2

19. END OF LIFE

IMPORTANT INFORMATION FOR MEDICAL EQUIPMENT PROFESSIONAL USERS

***Under article 13 of Legislative Decree of the 25 July 2005, n. 151 "Fulfilment of the Directives 2002/95/EC, 2002/96/EC and 2003/108/EC,* on the restriction of the use of certain hazardous substances in electrical and electronic equipment and waste disposal**

The symbol positioned on the equipment or on its packing box indicates that at the equipment end of working life must be separately collected from normal urban solid waste. In details, the waste collection of the equipment components end of working life has to be organized in the following way:

a) Directly from the user, in case he will decide to get rid of the equipment components without replacing the equipment with a new equivalent and the same functions one.

b) From the manufacturing point of view, referring to the first who introduced and sold it in Italy or sold the equipment with its manufacture brand name. In case the user decided to get rid of the equipment and buy in concomitance a same functions new equipment, the user will have the opportunity to require to the producer to pick up the old equipment within 15 days starting from the delivery date of new one.

The proper separated waste collection in order to start the recycle and do proper treatment in compatible environmental disposal, contribute to avoid possible negative effects on the environmental and on the human health and aid the reinvestment and/or the recycle of the equipment materials. The operator equipment components operator abusive disposal material will involve the imposition of the penalty under the current provisions of law

Registration reference in A.E.E. N°: IT08020000001514

This unit falls under the WEEE directive (2002/96/EC) and the national law transposing the directive

The following instructions are directed to the operator directly involved in disposal and treatment of waste components inside the unit for environmental protection.

This equipment must not be disposed of as normal urban solid waste: it must be taken to an expert waste disposal centre or returned to the dealer, would you wish to replace it with a new model

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When disposing the device, special care must be taken when handling the following components as these can be hazardous:

The Image intensifier contains **sparking material** (Thallium-doped Cesium Iodide); it also contains **lead** which must be considered as a toxic material.

- The LCD monitor contains a **vacuum input screen** which, should it break, can send shards of glass flying and disperse powder and gas that may be toxic.
- The lead used to shield some parts of the table (i.e. collimator and SFD) is a toxic material and must be treated as such.
- The equipment contains **printed circuit boards** which contain a certain amount of **lead**: this is a toxic material and must be treated as such.

When disposing the device, special care must be taken when handling the control circuit and all components detailed in the following figure:

The unit must be disassembled and displaced by qualified personnel in order to prevent the possibility of hazard situations.

Other parts of the equipment are composed of:

- Ferrous material (frames etc.).
- Plastic component (guards etc.).
- Wiring.

All parts should be disposed of in accordance with the prevailing regulations in each country **at the moment of removal from operation**

In order to access the different parts detailed in the previous figure, it is necessary to remove the unit covers as described in the unit service manual.