CQF9000
FIXED RADIO STATION
CO-CHANNEL APPENDIX

Service Coordination

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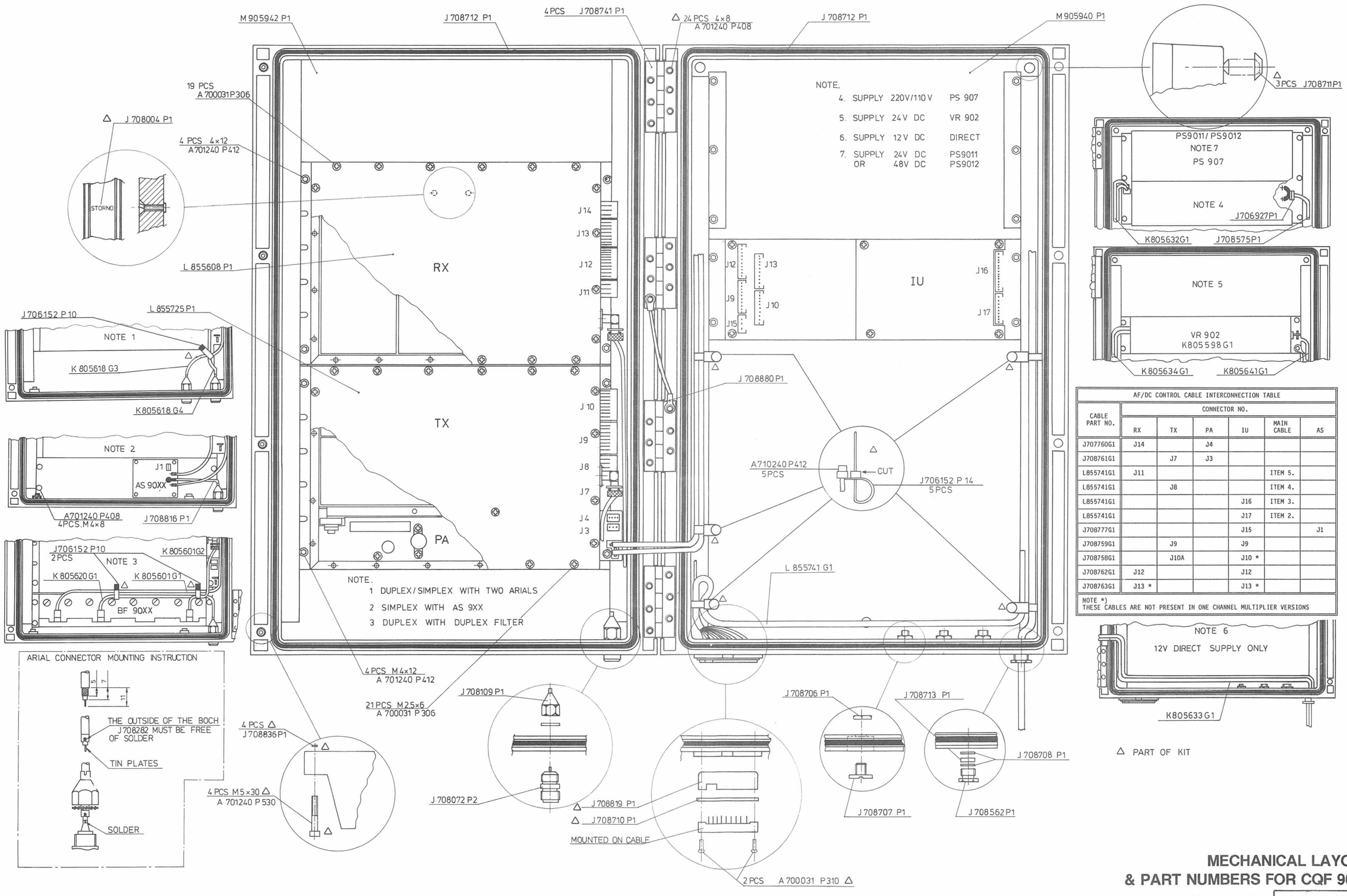
CQF9000
FIXED RADIO STATION
CO-CHANNEL APPENDIX

APPENDIX:
GRAPHICAL SYMBOLS
COLOUR CODE

ADDITIONAL MANUALS:
CQF9000 BASIC RADIO MANUAL
CQF9XXX MODULE MANUALS



△ PART OF KIT

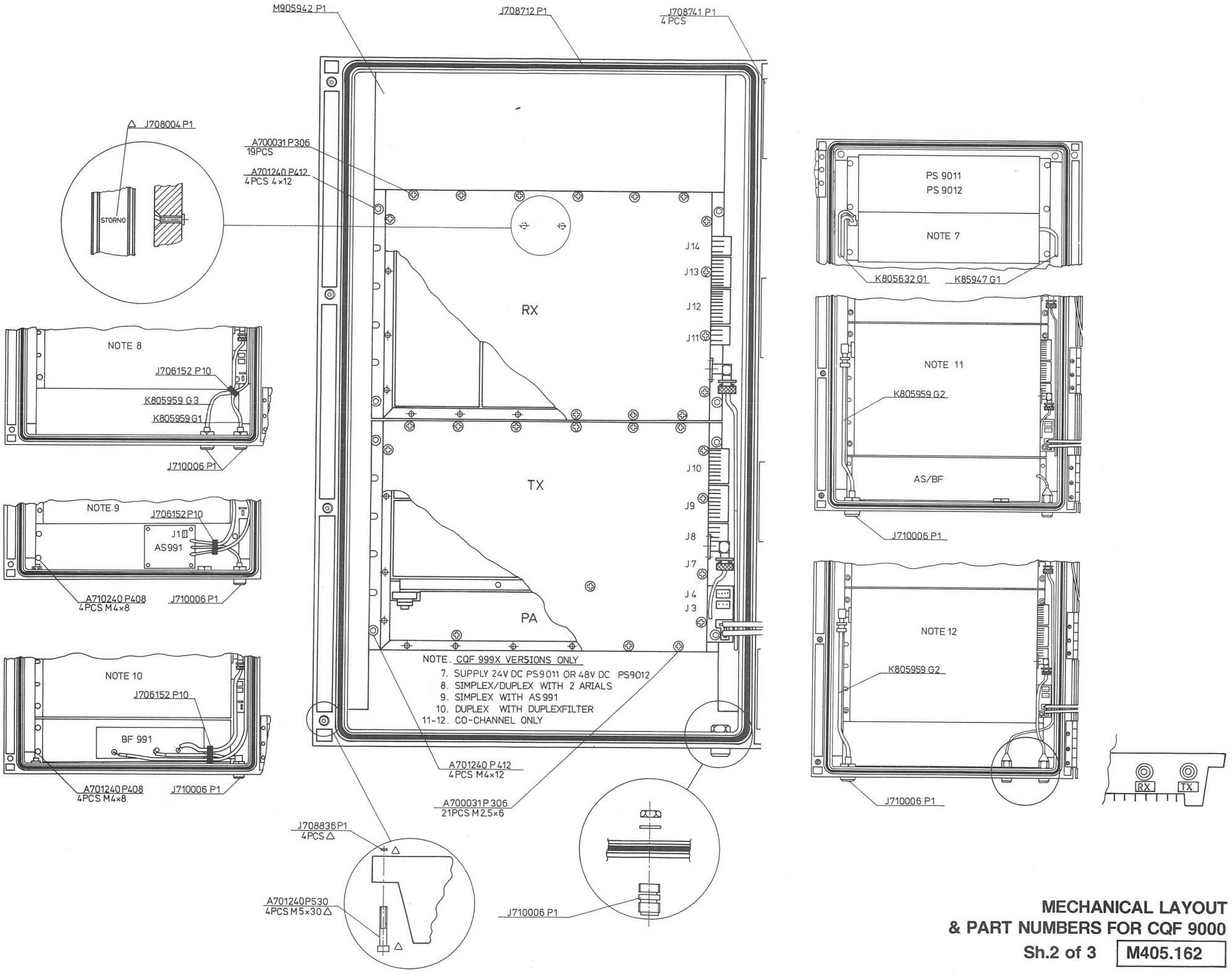
AF/DC CONTROL CABLE INTERCONNECTION TABLE

CABLE PART NO.	CONNECTOR NO.					
	RX	TX	PA	IU	MAIN CABLE	AS
J707760G1	J14		J4			
J708761G1		J7	J3			
L855741G1	J11				ITEM 5.	
L855741G1		J8			ITEM 4.	
L855741G1				J16	ITEM 3.	
L855741G1				J17	ITEM 2.	
J708777G1				J15		J1
J708759G1		J9		J9		
J708758G1		J10A		J10 *		
J708762G1	J12			J12		
J708763G1	J13 *			J13 *		

NOTE *)
THESE CABLES ARE NOT PRESENT IN ONE CHANNEL MULTIPLIER VERSIONS

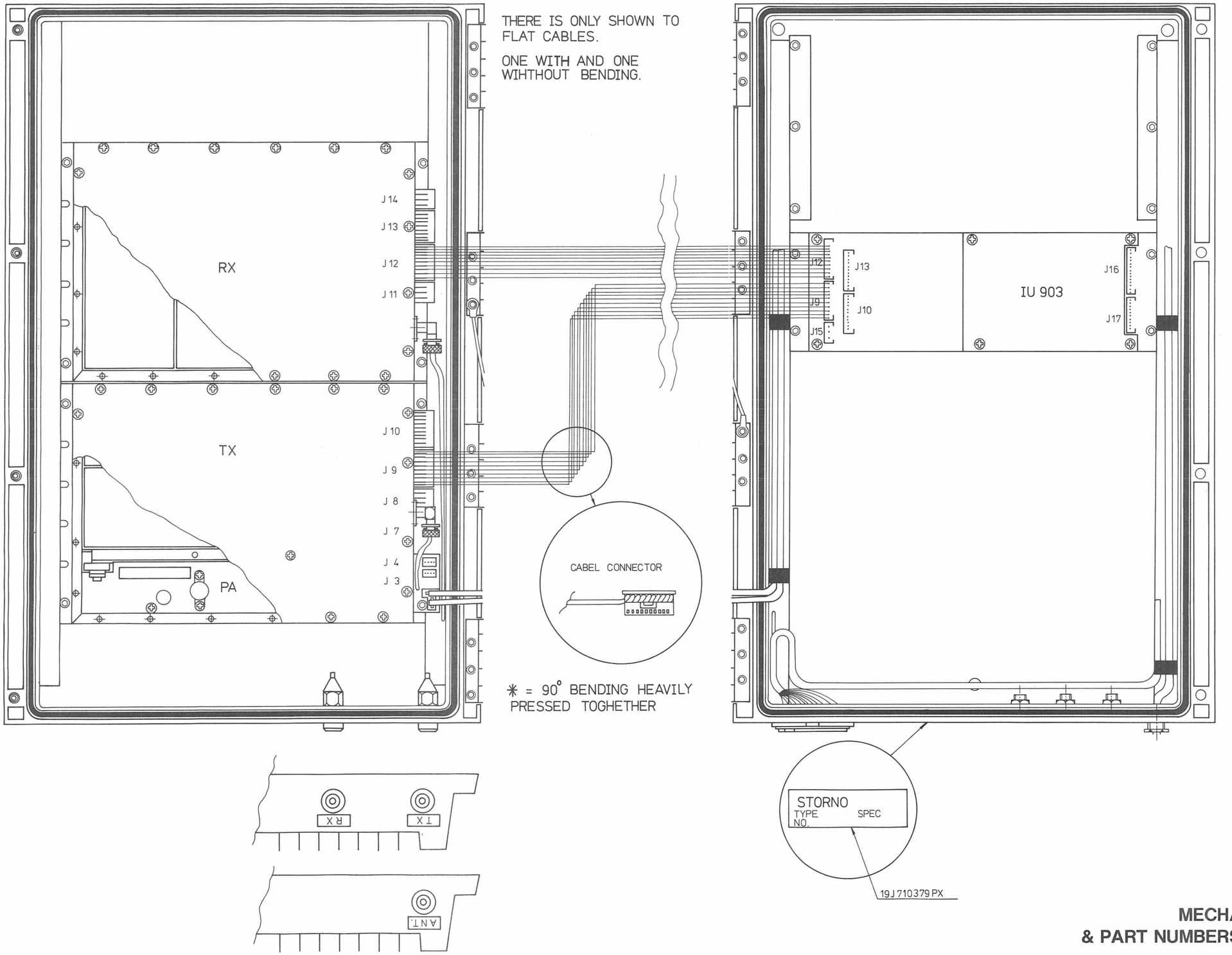
MECHANICAL LAYOUT & PART NUMBERS FOR CQF 9000

Sh.1 of 3 **M405.162/6**



MECHANICAL LAYOUT & PART NUMBERS FOR CQF 9000

Sh.2 of 3 **M405.162**

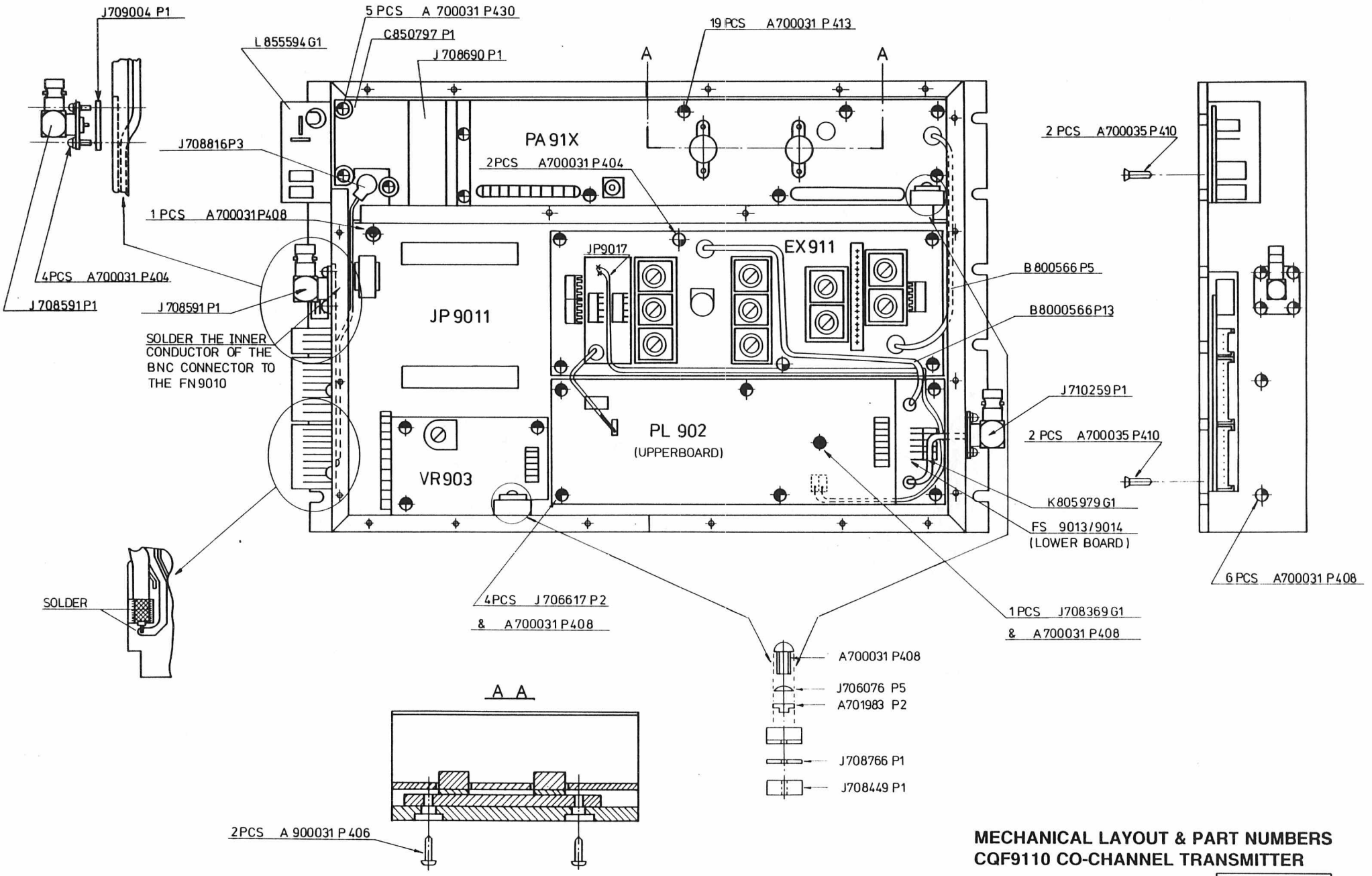


MECHANICAL LAYOUT
& PART NUMBERS FOR CQF 9000

Sh.3 of 3 | **M405.162**

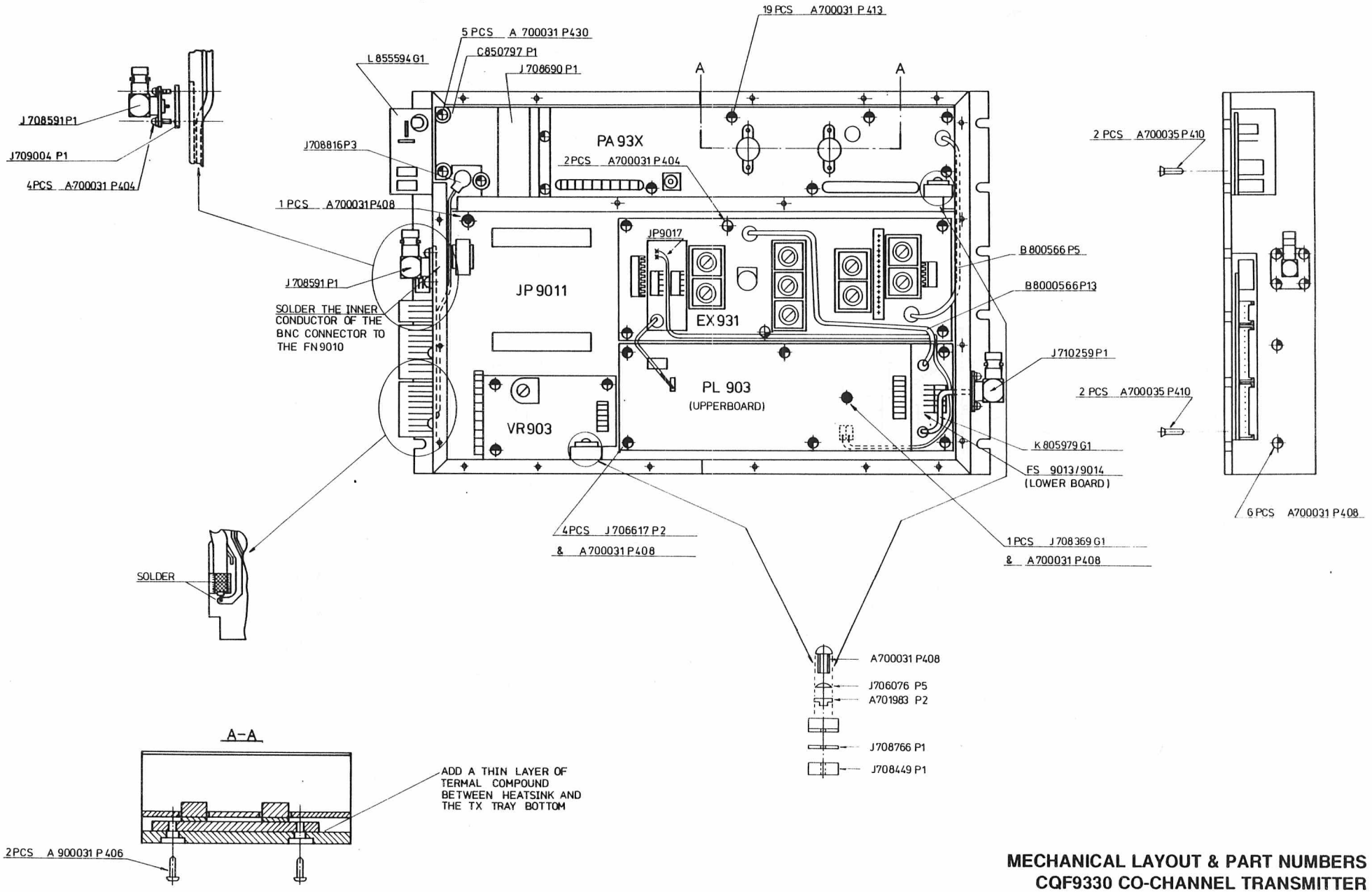
CHAPTER
CHAPITRE
KAPITEL

2



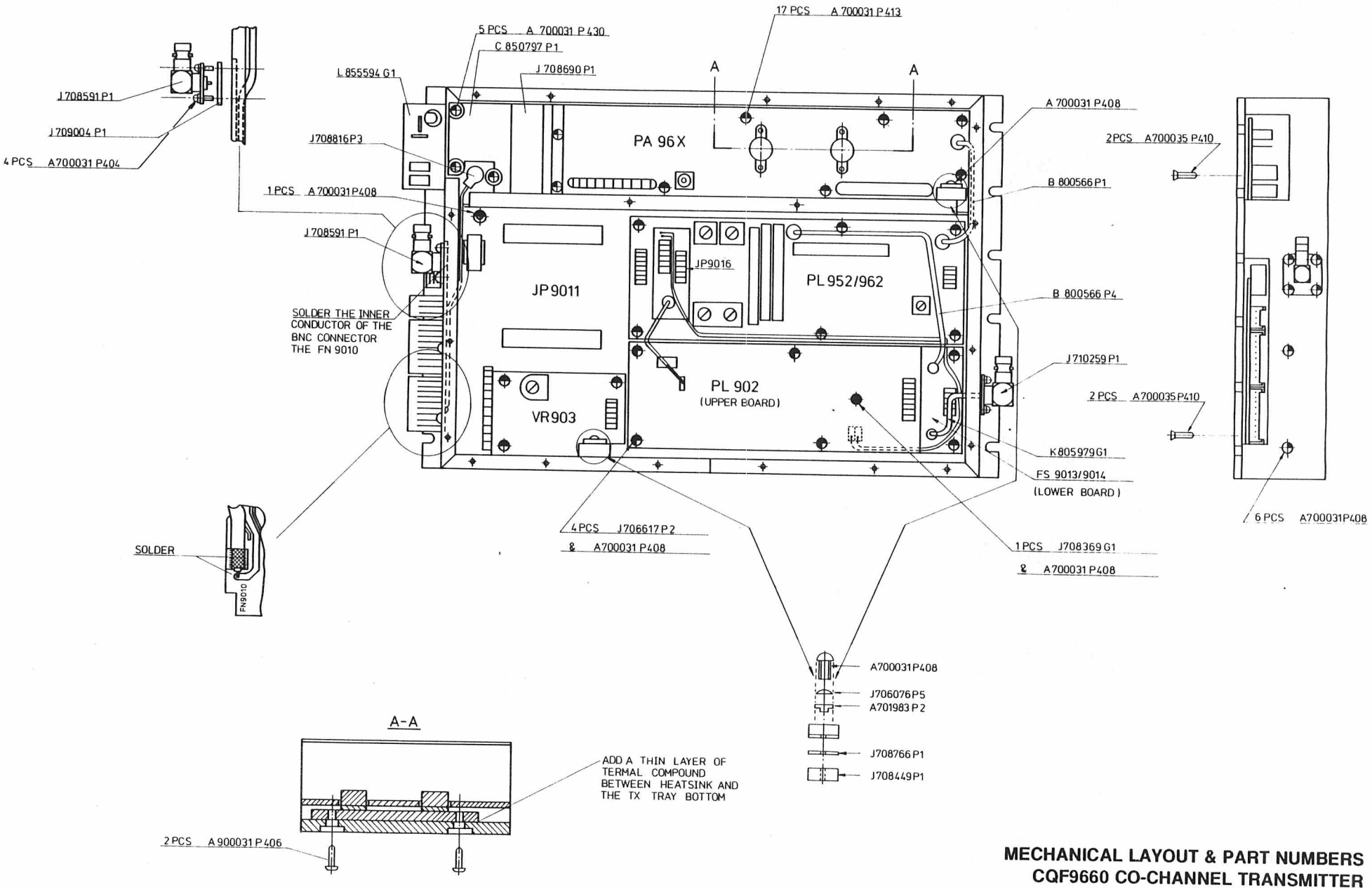
MECHANICAL LAYOUT & PART NUMBERS
CQF9110 CO-CHANNEL TRANSMITTER

M405.413



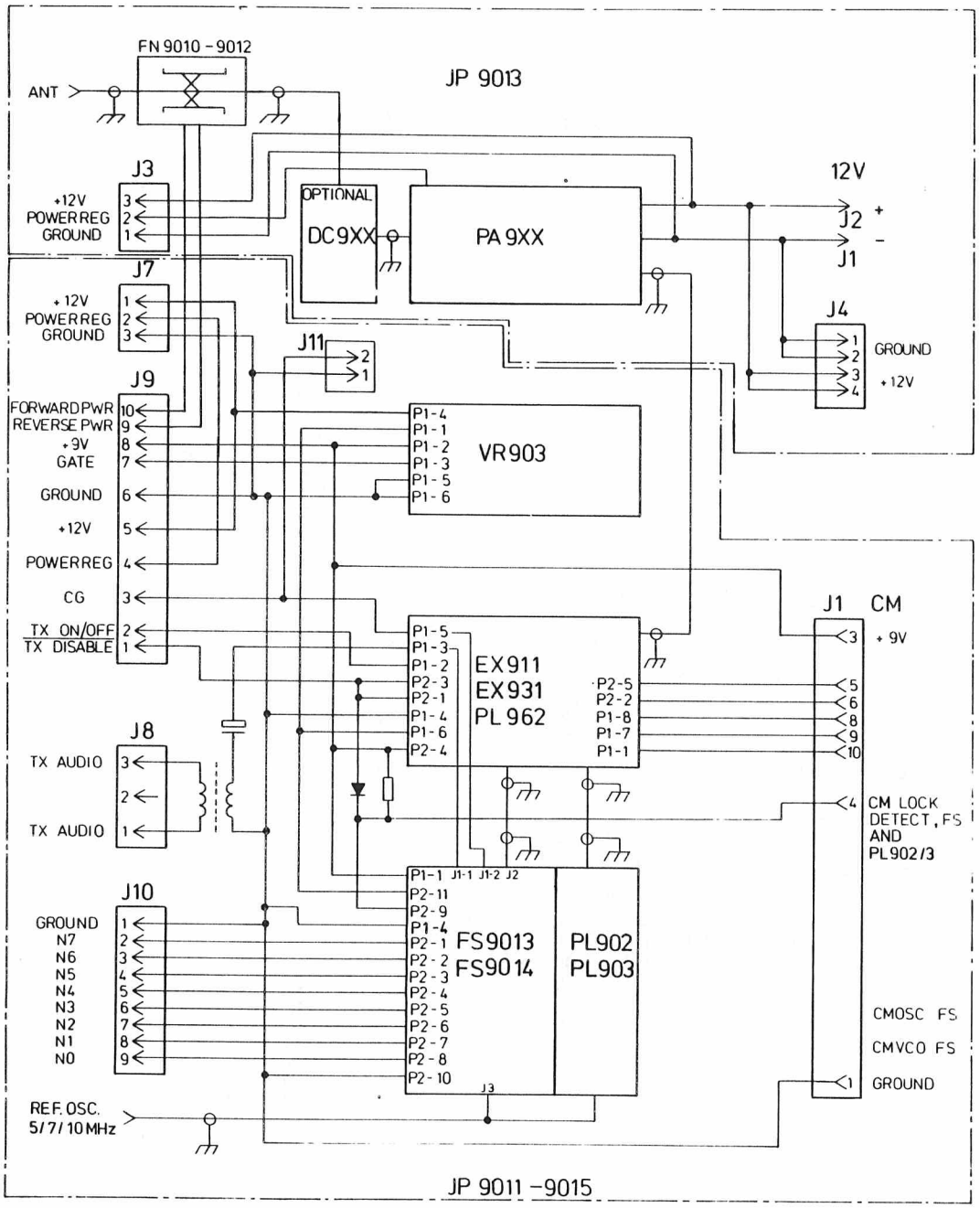
MECHANICAL LAYOUT & PART NUMBERS
CQF9330 CO-CHANNEL TRANSMITTER

M405.493



MECHANICAL LAYOUT & PART NUMBERS
CQF9660 CO-CHANNEL TRANSMITTER

M405.494



NOTE: J3 IN JP9013 IS CONNECTED TO J7 IN JP9011-JP9015 BY EXTERNAL CABLE.

JP9013

J1	12V IN 12 Amp (40W PAs)
J2	12V IN 12 Amp (40W PAs)
J4 3-4	12V 400mAmp TO RX TRAY

JP9011-JP9015

J1 4	CM LOOK DETECT FS AND PL902/3
J7 1	12V IN 550mAmp
J8 1-3	TX AUDIO 100mv RMS FOR 60% ΔF MAX LOAD IMPEDANCE 600ohm FLOATING
J9 1	TX DISABLE "1" 5V "0" <0,4V
J9 2	TX ON/OFF "1" OPEN COLLECTOR "0" <0,4V (INTERNAL PULL UP 10 Kohm)
J9 3	CG 200 TO 400mv RMS
J9 4	POWER REG. EXTERNAL POTENTIOMETER TO GROUND
J9 5	12V 1.2 Amp TO IU903
J9 7	VR GATE "1" OPEN COLLECTOR VR ACTIVE "0" < 3V VR INACTIVE (INTERNAL 5,6 PULL UP)
J9 8	+9V OUT 50mAmp MAX
J9 9	REVERSE POWER OUT 0,8 TO 6V
J9 10	FORWARD POWER OUT 0,8 TO 6V
J10 2-9	"1" OPEN COLLECTOR "0" < 0,4V (INTERNAL 22K PULL UP)

CM					
PIN	5	6	8	9	10
EX931	BP1	BP2	NC	MIXER	OSC
E911	BP1	BP2	NC	MIXER	OSC
PL952 PL962	TX STATUS	TUNE	FILTER	TRIPLER	OSC
PL971	TX STATUS	TUNE	FILTER	NC	OSC

INTERCONNECTION DIAGRAM CQF9XXX
TRANSMITTER WITH CO-CHANNEL

D405.100

CHAPTER
CHAPITRE
KAPITEL

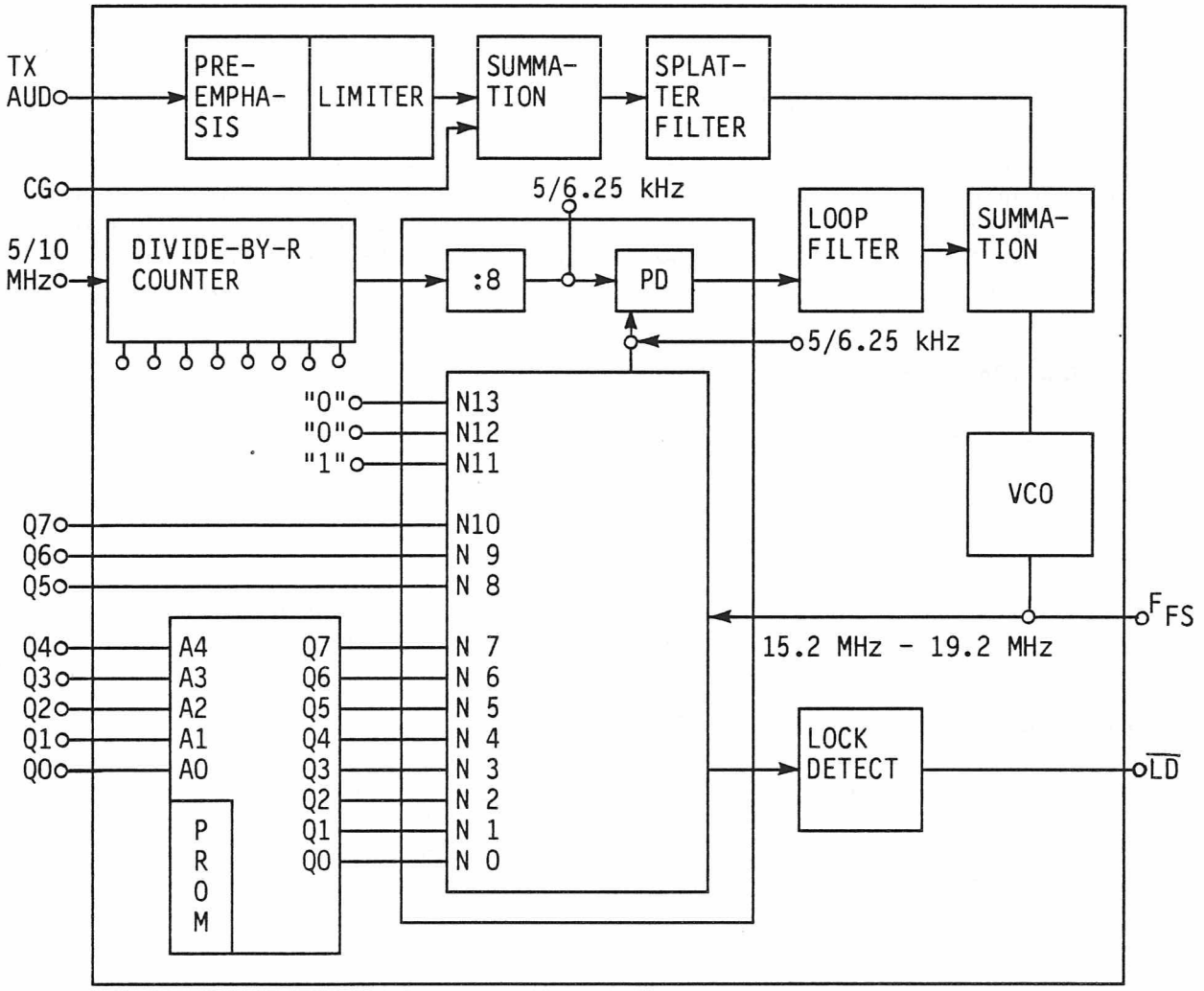
3

FS9013/FS9014

FREQUENCY SYNTHESIZER

The frequency synthesizer module FS9013/9014 is used together with PL902/903 in the co-channel version of the CQF9000 radio. The two modules replace the standard frequency synthesizer module FS906, 907 .. 9011 and the two micromodules XO9xx and AA901/902 in the transmitter part of the radio. The receiver is the standard CQF9000 version.
The FS9013/9014 and PL902/903 are placed upon each other instead of the standard frequency synthesizer module. The PL902 module is used for the frequency ranges 146 - 174 MHz and 400 - 470 MHz, and the PL903 is used in conjunction with the frequency range 66 - 88 MHz.
The FS9013 module is used in radios with 25 kHz and 20 kHz channel spacing and the FS9014 in radios with 12.5 kHz channel spacing. The difference between the two modules lies entirely in the splatter filter which reduces the interference signals in the adjacent channels.

FUNCTIONAL DESCRIPTION



FS9013/9014 BLOCK DIAGRAM

An external, high stability crystal oscillator is used with a long term stability of approximately 10-9 ppm per year. The frequency of the oscillator is divided down to 40/50 kHz by an 8 bit programmable divide-by-r counter. The reference counter in the ISC then divides the frequency by 8 and the two frequencies, which are fed to the phase detector (PD), are 5/6.25 kHz. This means that the reference frequency (Fr) will always be 5.0 kHz or 6.25 kHz, and that the frequency step, which the synthesizer module is able to make, will always be a multiple of either 5.0 kHz or 6.25 kHz.

The PD is a digital-phase detector whose output pulses low if the frequency exceeds Fr or if the phase is leading. The output pulses high if the frequency is less than Fr or the phase is lagging. If the two frequencies are equal and the phases coincide the output will be three-stated, which again reduces the reference spurious in the VCO output.

The 14-bit programmable divide-by-n counter in the ISC divides the VCO frequency down to the reference frequency which is locked to the other reference frequency. The latter is divided down from the external, high stability crystal ocsillator.

The channel spacing in PL902/903 is 1.25 MHz, which means that the resultant bandwidth, which you can freely choose, is only 25 kHz. A 256 bit PROM is therefore used to expand the addressing facility of the 14 bit counter to 11 bits.

CIRCUIT DESCRIPTION

PRE-EMPHASIS AND LIMITER

The pre-emphasis and limiter circuit is realised with a single operational amplifier (op-amp). The pre-emphasis is a first order high-pass filter with a cut off frequency of about 7.0 kHz, and the output of the op-amp is used as limiter. The op-amp is a CMOS-IC (MC 14573) the output of which is able to fluctuate within the full power supply range. It is therefore possible to get a very symmetrical limiter.

SUMMATION CIRCUIT

The two summation circuits are realised in a straight forward manner with an operational amplifier.

SPLATTER FILTER

The splatter filter is realised as a cascade of two third-order sections. Each section uses a single operational amplifier to make a third order Chebyshev filter with a 0.1 dB ripple.

DIVIDE-BY-R COUNTER

The frequency of the external, high stability crystal ocsillator is divided down to a proper frequency which fits he internal reference divider of the ISC by means of the 8-bit programmable divide-by-r counter. The counter is able to divide by any integer from 1 to 256, which in fact means, that the counter divides by a value that is one higher than the programmed value.

INTEGRATED SYNTHESIZER CIRCUIT (ISC)

ISC consists of a reference divider, a digital-phase detector (PD), and a 14-bit programmable divide-by-n counter. The reference divider counts down from eight. The used PD has a single-ended output which is three-stated when the loop is in both frequency and phase lock. The 14-bit programmable divide-by-n counter has pull-up resistors, so that inputs left open remain at a logic one.

LOCK DETECTOR CIRCUIT

The ISC has a lock detect output which pulses low when the loop is out of lock. This signal is used as input signal to the lock detector circuit consisting of an op-amp which is used as inverting comparator. The output signal is low when in lock.

LOOP FILTER

The loop filter is a first order filter with a loop frequency of 20-30 Hz. The low loop frequency is used for two reasons. First, to get a sufficient supression of the reference frequency of 5.0 kHz and 6.25 kHz, and second, to avoid that the loop will try compensating for the modulation added in the loop.

VOLTAGE CONTROLLED OSCILLATOR (VCO)

The VCO is a Hartley oscillator with a JFET transistor as the active element. The VCO is tuned by capacitance diodes and an adjustable coil.

SPECIFICATIONS

Voltage Supply
9.0 ±0.01 V

Current Consumption
120 ±20 mA

Temperature Range (T amb.)
-25°C to +65°C

Board Dimensions L x W x H
160 x 48 x 19 mm

RF INPUT J3
Frequency
5, 7, or 10 MHz

Input Level
-7 dBm ±3.0 dB

RF OUTPUT J2
Frequency Range
15.2 - 19.2 MHz

Output Level
2 dBm ±3.0 dB

AUDIO INPUT J1, PIN 1
Nominal Input Level
100 mV (RMS)

Input Impedance
600 Ohm

ADJUSTMENT PROCEDURE

TEST OF SUPPLY CURRENT

Check that the current of the power supply is 120 ±20 mA.

TUNING THE VCO

Set the top of the core of L3 in level with the can.
Connect the multimeter to pin 1 of U5.
With an output frequency of 16.0 MHz, now turn the core down until the DC-voltage is 4.75 ±0.05 V.

TUNING OF THE MAXIMUM DEVIATION

Connect the audio oscillator to pin 1 of J1. Set the frequency to 100 Hz and the input level on pin 1 of J1 to 1 V (RMS).
Set the modulation analyzer (fam) to measure FM, peak deviation. The filter should be a Bessel filter. If the modulation analyzer does not have a Bessel filter, you must use the filter which contributes the least possible to maximum deviation.
Changing the input frequency from 100 Hz to 3.0 kHz, adjust the maximum deviation by RG1 to just less than a fifth of the channel spacing. This must be valid for all input frequencies from 100 Hz to 3 kHz.
Set the input frequency to 1.0 kHz and check that the plus and minus maximum deviation is equal within ±30 Hz.

TUNING OF THE NOMINAL DEVIATION

Set the frequency of the audio oscillator to 1.0 ±0.01 kHz and the input level so that you have 100 ±1 mV (RMS) on pin 1 of J1. Check it.
The modulation analyzer (fam) must measure FM, peak deviation. The filter should be from 30 Hz to 20 kHz.
Adjust the deviation by R70 to ±1% (60% of maximum deviation).
Check that the distorsion is less than 1%.

TEST OF THE FREQUENCY CHARACTERISTIC

The modulation analyzer (fam) must measure FM, peak deviation. The filter should be from 30 Hz to 20 kHz.
The frequency of the audio oscillator must be 1.0 kHz, and the input level must be reduced by about 10 dB, so that the deviation is only a fifth of the maximum deviation. Set the modulation analyser to measure FM and use this value as reference value.

By changing the frequency of the audio oscillator, you must now check that the deviation is within the following limits: (see table below)

FREQ./kHz	FS9013	FS9014
0.3	+1dB, -3dB	+1dB, -3dB
0.4	+1dB, -1.5dB	+1dB, -3dB
0.5	+1dB, -1.5dB	+1dB, -3dB
1.0	+1dB, -1.5dB	+1dB, -3dB
1.5	+1dB, -1.5dB	+1dB, -3dB
2.0	+1dB, -1.5dB	+1dB, -3dB
2.55	+1dB, -1.5dB	+1dB, -3dB
2.7	+1dB, -1.5dB	
3.0	+1dB, -3dB	

FS9012/FS9014 CODING

5 MHz EXTERNAL REFERENCE OSCILLATOR

Channel Spacing: 5 kHz, 10 kHz, and 20 kHz.
Dividing Value: 125.
Set up value: 124_{10} = 01111100 = R7, R6, ... R0.

SW1	1	2	3	4	5	6	7	8
On			X	X	X	X	X	
Off	X	X						X

Channel Spacing: 6.25 kHz, 12.5 kHz, and 25 kHz.
Dividing Value: 100.
Set up value: 99_{10} = 01100011 = R7, R6, ... R0.

SW1	1	2	3	4	5	6	7	8
On	X	X				X	X	
Off			X	X	X			X

10 MHz EXTERNAL REFERENCE OSCILLATOR

Channel Spacing: 5 kHz, 10 kHz, and 20 kHz.
Dividing Value: 250.
Set up value: 249_{10} = 11111001 = R7, R6, ... R0.

SW1	1	2	3	4	5	6	7	8
On	X			X	X	X	X	X
Off		X	X					

Channel Spacing: 6.25 kHz, 12.5 kHz, and 25 kHz.
Dividing Value: 200.
Set up value: 199_{10} = 11000111 = R7, R6, ... R0

SW1	1	2	3	4	5	6	7	8
On	X	X	X				X	X
Off				X	X	X		

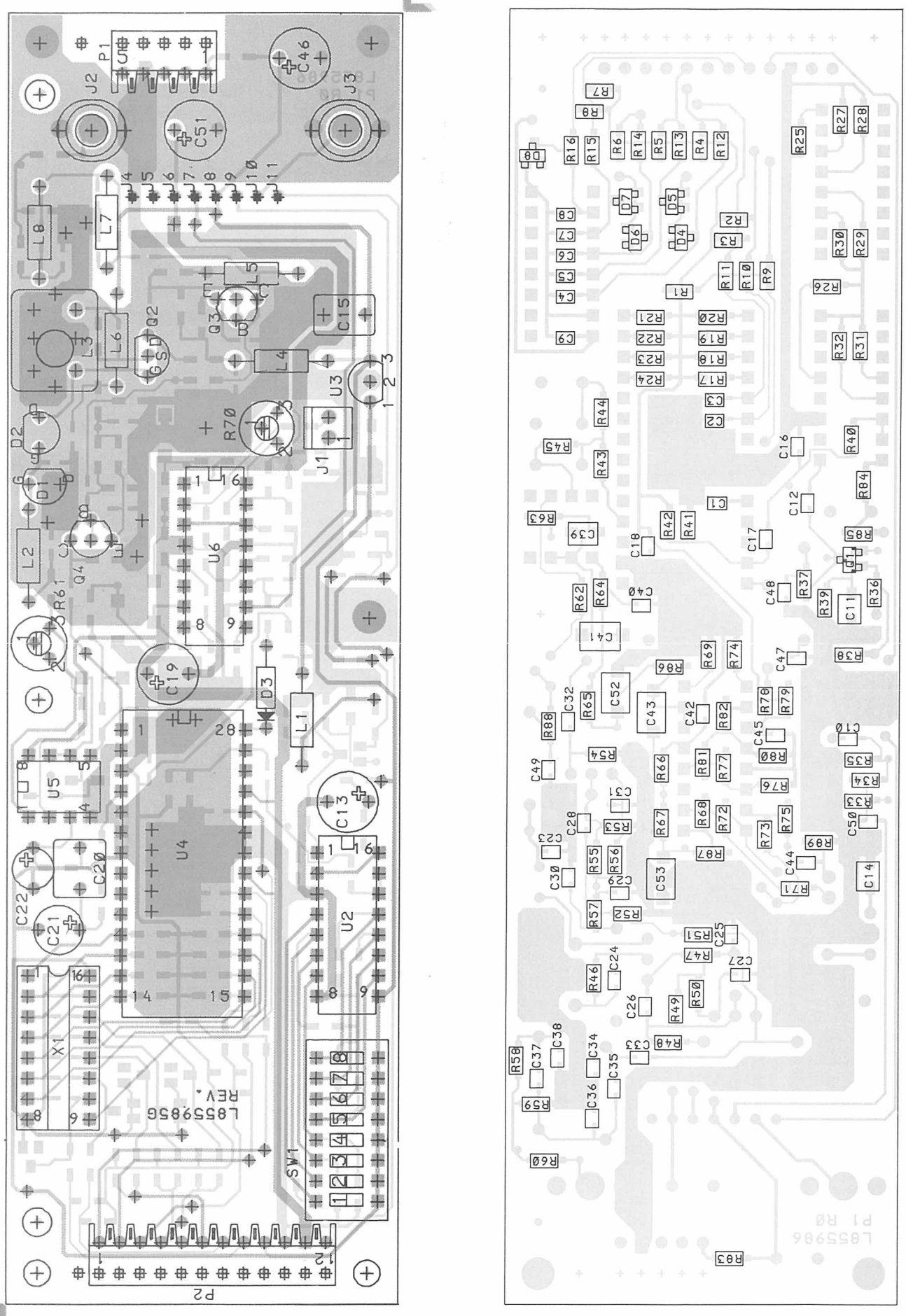
7 MHz EXTERNAL REFERENCE OSCILLATOR

Channel Spacing: 5 kHz, 10 kHz, and 20 kHz.
Dividing Value: 175.
Set up value: 174_{10} = 10101110 = R7, R6, ... R0.

SW1	1	2	3	4	5	6	7	8
On		X	X	X		X		X
Off	X				X		X	X

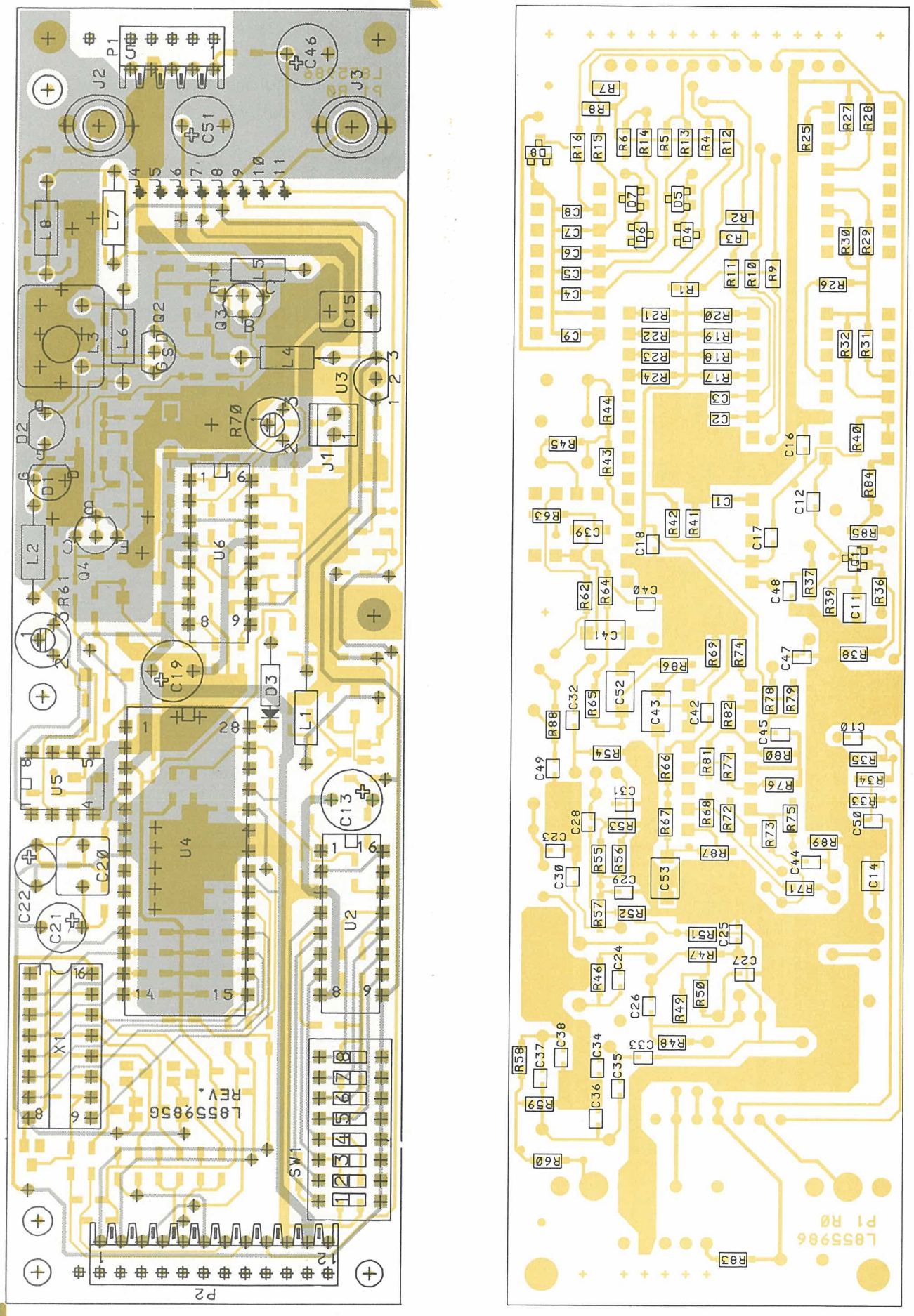
Channel Spacing: 6.25 kHz, 12.5 kHz, and 25 kHz.
Dividing Value: 140.
Set up value: 193_{10} = 10001011 = R7, R6, ... R0.

SW1	1	2	3	4	5	6	7	8
On	X	X		X				X
Off			X		X	X	X	



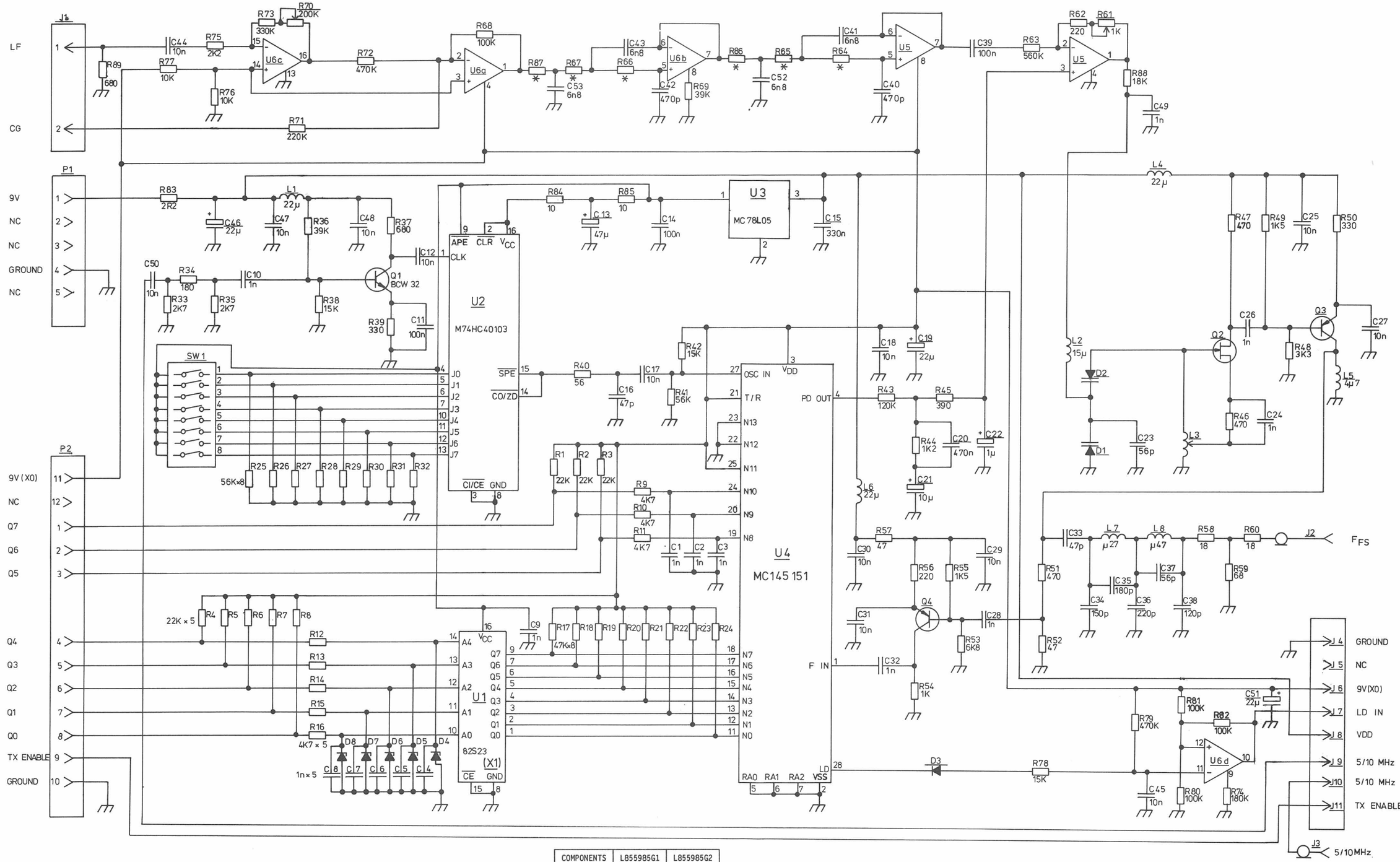
FREQUENCY SYNTHESIZER BOARD FS9013/FS9014
COMPONENT LAYOUT

D404.827 **CODE NO.L855985G1/G2**



FREQUENCY SYNTHESIZER BOARD FS9013/FS9014
COMPONENT LAYOUT

D404.827 CODE NO.L855985G1/G2



COMPONENTS MARKED	L855985G1 FS9013	L855985G2 FS9014
R64	22K1	26K7
R65	26K7	33K2
R66	22K1	26K7
R67	26K7	33K2
R86	10K	12K1
R87	10K	12K1

COMPONENTS MARKED RXXX ARE PLACED ON COMPONENT SIDE.

FREQUENCY SYNTHESIZER BOARD FS9013/FS9014

CODE NO.L855985G1/G2 **D404.826**

PARTS LIST FOR FREQUENCY SYNTHESIZER BOARD FS9013/FS9014 : CODE NO.L855985G1/G2

Pos	Code No.	Description	Qt
	L855985G1	FS9013 CHANN.SPACING 25/20kHz	
	L855985G2	FS9014 CHANN.SPACING 12.kHz	
	---	---	
C001	J707438P5	CAP CER CL2 1N 10%	1
C002	J707438P5	CAP CER CL2 1N 10%	1
C003	J707438P5	CAP CER CL2 1N 10%	1
C004	J707438P5	CAP CER CL2 1N 10%	1
C005	J707438P5	CAP CER CL2 1N 10%	1
C006	J707438P5	CAP CER CL2 1N 10%	1
C007	J707438P5	CAP CER CL2 1N. 10%	1
C008	J707438P5	CAP CER CL2 1N 10%	1
C009	J707438P5	CAP CER CL2 1N 10%	1
C010	J707438P5	CAP CER CL2 1N 10%	1
C011	J707438P26	CAP CER CL2 100N 10%	1
C012	J707438P14	CAP CER CL2 10N 10%	1
C013	J707444P17	CAP TA SOL 47U 10V	1
C014	J707438P26	CAP CER CL2 100N 10%	1
C015	J707412P12	CAP PYES 330N 10%	1
C016	J707436P45	CAP CER NPO 47P 5%	1
C017	J707438P14	CAP CER CL2 10N 10%	1
C018	J707438P14	CAP CER CL2 10N 10%	1
C019	J707444P8	CAP TA SOL 22U 16V	1
C020	J707412P13	CAP PYES 470N 10%	1
C021	J707444P7	CAP TA SOL 10U 16V	1
C022	J707444P4	CAP TA SOL 1U 35V	1
C023	J707436P49	CAP CER NPO 56P 5%	1
C024	J707438P5	CAP CER CL2 1N 10%	1
C025	J707438P14	CAP CER CL2 10N 10%	1
C026	J707438P5	CAP CER CL2 1N 10%	1
C027	J707438P14	CAP CER CL2 10N 10%	1
C028	J707438P5	CAP CER CL2 1N 10%	1
C029	J707438P14	CAP CER CL2 10N 10%	1
C030	J707438P14	CAP CER CL2 10N 10%	1
C031	J707438P14	CAP CER CL2 10N 10%	1
C032	J707438P5	CAP CER CL2 1N 10%	1
C033	J707436P45	CAP CER NPO 47P 5%	1
C034	J707436P65	CAP CER NPO 150P 5%	1
C035	J707436P67	CAP CER NPO 180P 5%	1
C036	J707436P69	CAP CER NPO 220P 5%	1
C037	J707436P49	CAP CER NPO 56P 5%	1
C038	J707436P63	CAP CER NPO 120P 5%	1
C039	J707438P26	CAP CER CL2 100N 10%	1
C040	J707363P7	CAP CER NPO 470P 2%	1
C041	J707349P9	CAP CER NPO 6N8 2%	1
C042	J707363P7	CAP CER NPO 470P 2%	1
C043	J707349P9	CAP CER NPO 6N8 2%	1
C044	J707438P114	CAP CER CL2 10N 5%	1
C045	J707438P14	CAP CER CL2 10N 10%	1
C046	J707444P8	CAP TA SOL 22U 16V	1
C047	J707438P14	CAP CER CL2 10N 10%	1
C048	J707438P14	CAP CER CL2 10N 10%	1
C049	J707438P5	CAP CER CL2 1N 10%	1
C050	J707438P14	CAP CER CL2 10N 10%	1
C051	J707444P8	CAP TA SOL 22U 16V	1
C052	J707349P9	CAP CER NPO 6N8 2%	1
C053	J707349P9	CAP CER NPO 6N8 2%	1
D001	A701276P2	DIO SI CAP MVAM 108	1
D002	A701276P2	DIO SI CAP MVAM 108	1
D003	A700028P1	DIO SI SIG 1N4148	1
D004	J707459P1	DIO SI ZENR 4V7 5% 0.2W	1
D005	J707459P1	DIO SI ZENR 4V7 5% 0.2W	1
D006	J707459P1	DIO SI ZENR 4V7 5% 0.2W	1
D007	J707459P1	DIO SI ZENR 4V7 5% 0.2W	1
D008	J707459P1	DIO SI ZENR 4V7 5% 0.2W	1
J001	A700072P28	CONN PWB MALE 02-CKT	1
J002	A700171P2	CONN PWB FEM	1
J003	A700171P2	CONN PWB FEM	1
J004	J708925P11	CONN PT PIN L21.10MM	1
J005	J708925P11	CONN PT PIN L21.10MM	1
J006	J708925P11	CONN PT PIN L21.10MM	1
J007	J708925P11	CONN PT PIN L21.10MM	1
J008	J708925P11	CONN PT PIN L21.10MM	1
J009	J708925P11	CONN PT PIN L21.10MM	1
J010	J708925P11	CONN PT PIN L21.10MM	1
J011	J708925P11	CONN PT PIN L21.10MM	1
L001	A700024P29	COIL RF FIX 22UH 10%	1
L002	A700024P27	COIL RF FIX 15UH 10%	1
L003	J708224G1	COIL ASM	1
L004	A700024P29	COIL RF FIX 22UH 10%	1
L005	A700024P21	COIL RF FIX 4.7UH 10%	1
L006	A700024P29	COIL RF FIX 22UH 10%	1
L007	A700024P6	COIL RF FIX 0.27UH 10%	1
L008	A700024P9	COIL RF FIX 0.47UH 10%	1
P001	A700041P4	CONN PWB FEM 05-CKT	1
P002	A700041P11	CONN PWB FEM 12-CKT	1
Q001	J707386P1	TSTR NPN SI BCW 32	1
Q002	A700060P3	TSTR JFET SI J310	1
Q003	A700022P2	TSTR PNP SI 2N3906	1
Q004	A700022P2	TSTR PNP SI 2N3906	1
R001	J707385P223	RES MFLM 1/8W 22K 5%	1
R002	J707385P223	RES MFLM 1/8W 22K 5%	1
R003	J707385P223	RES MFLM 1/8W 22K 5%	1
R004	J707385P223	RES MFLM 1/8W 22K 5%	1
R005	J707385P223	RES MFLM 1/8W 22K 5%	1
R006	J707385P223	RES MFLM 1/8W 22K 5%	1
R007	J707385P223	RES MFLM 1/8W 22K 5%	1
R008	J707385P223	RES MFLM 1/8W 22K 5%	1
R009	J707385P472	RES MFLM 1/8W 4K7 5%	1
R010	J707385P472	RES MFLM 1/8W 4K7 5%	1
R011	J707385P472	RES MFLM 1/8W 4K7 5%	1
R012	J707385P472	RES MFLM 1/8W 4K7 5%	1
R013	J707385P472	RES MFLM 1/8W 4K7 5%	1
R014	J707385P472	RES MFLM 1/8W 4K7 5%	1
R015	J707385P472	RES MFLM 1/8W 4K7 5%	1
R016	J707385P472	RES MFLM 1/8W 4K7 5%	1
R017	J707385P473	RES MFLM 1/8W 47K 5%	1
R018	J707385P473	RES MFLM 1/8W 47K 5%	1
R019	J707385P473	RES MFLM 1/8W 47K 5%	1
R020	J707385P473	RES MFLM 1/8W 47K 5%	1
R021	J707385P473	RES MFLM 1/8W 47K 5%	1
R022	J707385P473	RES MFLM 1/8W 47K 5%	1
R023	J707385P473	RES MFLM 1/8W 47K 5%	1
R024	J707385P473	RES MFLM 1/8W 47K 5%	1
R025	J707385P563	RES MFLM 1/8W 56K 5%	1
R026	J707385P563	RES MFLM 1/8W 56K 5%	1
R027	J707385P563	RES MFLM 1/8W 56K 5%	1
R028	J707385P563	RES MFLM 1/8W 56K 5%	1
R029	J707385P563	RES MFLM 1/8W 56K 5%	1

PARTS LIST FOR FREQUENCY SYNTHESIZER BOARD FS9013/FS9014 : CODE NO.L855985G1/G2

Pos	Code No.	Description	Qt
R030	J707385P563	RES MFLM 1/8W 56K 5%	1
R031	J707385P563	RES MFLM 1/8W 56K 5%	1
R032	J707385P563	RES MFLM 1/8W 56K 5%	1
R033	J707385P272	RES MFLM 1/8W 2K7 5%	1
R034	J707385P181	RES MFLM 1/8W 180R 5%	1
R035	J707385P272	RES MFLM 1/8W 2K7 5%	1
R036	J707385P393	RES MFLM 1/8W 39K 5%	1
R037	J707385P681	RES MFLM 1/8W 680R 5%	1
R038	J707385P153	RES MFLM 1/8W 15K 5%	1
R039	J707385P331	RES MFLM 1/8W 330R 5%	1
R040	J707385P560	RES MFLM 1/8W 56R 5%	1
R041	J707385P563	RES MFLM 1/8W 56K 5%	1
R042	J707385P153	RES MFLM 1/8W 15K 5%	1
R043	J707385P124	RES MFLM 1/8W 120K 5%	1
R044	J707385P122	RES MFLM 1/8W 1K2 5%	1
R045	J707385P391	RES MFLM 1/8W 390R 5%	1
R046	J707385P471	RES MFLM 1/8W 470R 5%	1
R047	J707385P471	RES MFLM 1/8W 470R 5%	1
R048	J707385P332	RES MFLM 1/8W 3K3 5%	1
R049	J707385P152	RES MFLM 1/8W 1K5 5%	1
R050	J707385P331	RES MFLM 1/8W 330R 5%	1
R051	J707385P471	RES MFLM 1/8W 470R 5%	1
R052	J707385P470	RES MFLM 1/8W 47R 5%	1
R053	J707385P682	RES MFLM 1/8W 6K8 5%	1
R054	J707385P102	RES MFLM 1/8W 1K0 5%	1
R055	J707385P152	RES MFLM 1/8W 1K5 5%	1
R056	J707385P221	RES MFLM 1/8W 220R 5%	1
R057	J707385P470	RES MFLM 1/8W 47R 5%	1
R058	J707385P180	RES MFLM 1/8W 18R 5%	1
R059	J707385P680	RES MFLM 1/8W 68R 5%	1
R060	J707385P180	RES MFLM 1/8W 18R 5%	1
R061	A700016P1	RES VAR CERM 1K0 10%	1
R062	J707385P221	RES MFLM 1/8W 220R 5%	1
R063	J707385P564	RES MFLM 1/8W 560K 5%	1
R064	J709328P334	RES MFLM 1/8W 22K1 1% G1	1
R064	J709328P342	RES MFLM 1/8W 26K7 1% G2	1
R065	J709328P342	RES MFLM 1/8W 26K7 1% G1	1
R065	J709328P351	RES MFLM 1/8W 33K2 1% G2	1
R066	J709328P334	RES MFLM 1/8W 22K1 1% G1	1
R066	J709328P342	RES MFLM 1/8W 26K7 1% G2	1
R067	J709328P342	RES MFLM 1/8W 26K7 1% G1	1
R067	J709328P351	RES MFLM 1/8W 33K2 1% G2	1
R068	J707385P104	RES MFLM 1/8W 100K 5%	1
R069	J707385P393	RES MFLM 1/8W 39K 5%	1
R070	A700016P8	RES VAR CERM 200K 10%	1
R071	J707385P224	RES MFLM 1/8W 220K 5%	1
R072	J707385P474	RES MFLM 1/8W 470K 5%	1
R073	J707385P334	RES MFLM 1/8W 330K 5%	1
R074	J707385P184	RES MFLM 1/8W 180K 5%	1
R075	J707385P222	RES MFLM 1/8W 2K2 5%	1
R076	J709328P301	RES MFLM 1/8W 10K 1%	1
R077	J709328P301	RES MFLM 1/8W 10K 1%	1
R078	J707385P153	RES MFLM 1/8W 15K 5%	1
R079	J707385P474	RES MFLM 1/8W 470K 5%	1
R080	J707385P104	RES MFLM 1/8W 100K 5%	1
R081	J707385P104	RES MFLM 1/8W 100K 5%	1
R082	J707385P104	RES MFLM 1/8W 100K 5%	1
R083	J707385P922	RES MFLM 1/8W 2R2 20%	1
R084	J707385P100	RES MFLM 1/8W 10R 5%	1
R085	J707385P100	RES MFLM 1/8W 10R 5%	1
R086	J709328P301	RES MFLM 1/8W 10K 1% G1	1
R086	J709328P309	RES MFLM 1/8W 12K1 1% G2	1
R087	J709328P301	RES MFLM 1/8W 10K 1% G1	1
R087	J709328P309	RES MFLM 1/8W 12K1 1% G2	1
R088	J707385P183	RES MFLM 1/8W 18K 5%	1
R089	J707385P681	RES MFLM 1/8W 680R 5%	1
SW01	J708539P1	SW DIP 08-CKT	1
U002	J708342P6	IC DIG CNTR 74HC40103	1
U003	J706031P1	IC LIN VR FIX 78L05	1
U004	J708256P1	IC PLL SYN 145151	1
U005	J710440P1	IC LIN OP-AMP 3240	1
U006	J707229P1	IC LIN OP-AMP 14573	1
X001	A700156P9	SOC IC L-PRF 16 CKT	1
	L855986P1R0	BD PW	1

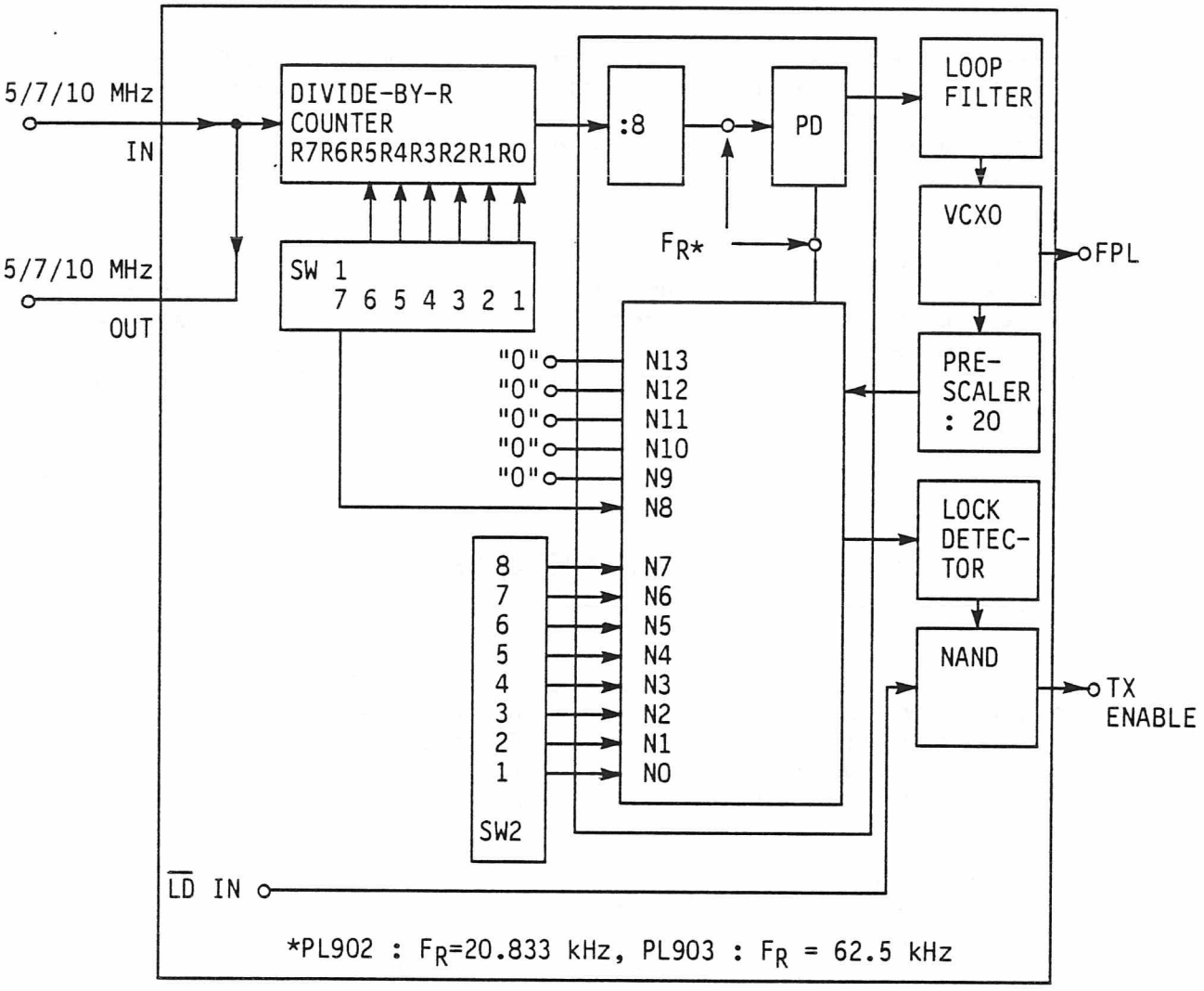
CHAPTER
CHAPITRE
KAPITEL

4

PL902/PL903

PHASE-LOCKED LOOP MODULE

The phase-locked loop module PL902 903 is, together with the frequency synthesizer module FS9013/9014, used in the co-channel version of the CQF9000 radio. The two modules are only used in the transmitter of the radio - the receiver is the standard CQF9000 version. They substitute the standard frequency synthesizer module FS9xx and the two micromodules XO9xx and AA901/902. The AA-module is placed on the synthesizer board and the XO9xx on the phase-locked loop module. The two PL modules are placed upon each other instead of the standard FS-module. The PL902 module is used for the frequency ranges 146 - 174 MHz and 400 - 470 MHz and the PL903 is used for the frequency range 66 - 88 MHz.



PL902/903 BLOCK DIAGRAM

FUNCTIONAL DESCRIPTION

The module is built around the same integrated synthesizer circuit (ISC) which is used in the frequency synthesizer module FS9013/9014.

In a co-channel system the transmitter sends with a carrier frequency difference of about 15 Hz. Therefore, it is necessary to have an external, high stability crystal oscillator with a long term stability of approximately 0.001 ppm per year.

The frequency of the oscillator is then divided down to the reference frequency (Fr) by means of an 8 bit programmable divide-by-r counter and the reference counter in the ISC, which always counts down from eight. The reference frequencies of the PL902 and PL903 modules are always 20.833 kHz and 63.5 kHz respectively.

The phase detector (PD) is a digital PD, the output of which pulses low if the frequency exceeds Fr or if the phase is leading. The phase detector pulses high if the frequency is less than Fr or if the phase is lagging. The output signal of the PD is fed through the loop-filter to the voltage controlled crystal oscillator (VCXO). The output frequency of the VCXO on the PL902 module is 122.5 MHz to 155 MHz, and the frequency of the VCXO on the PL903 module is 85 MHz to 103.75 MHz.

With a fast prescaler, fixed-ratio divide-by-20 counter, the frequency of the VCXO is divided down to a frequency which is handled by the 14-bit programmable divide-by-n counter of the ISC. The use of a prescaler has the disadvantage that the least frequency step of the VCXO is twenty times larger than the reference frequency of the PD. With the PL902 module the frequency step of the VCXO is thus 416.667 kHz.

In a UHF-radio the output signal of the VCXO is fed to the PL962 module which triples the frequency when the frequency of the synthesizer module is added. This means that the frequency step of the transmitter is 1.25 MHz. In a radio with a frequency range of 146 - 174 MHz, the frequency is not tripled and there is, in fact, a frequency step of 416.667 kHz. In the PL903 module the reference frequency is 62.5 kHz, the output frequency step of the VCXO is thus 1.25 MHz.

CIRCUIT DESCRIPTION

The ISC consists of a reference counter, a digital phase detector (PD), a 14-bit programmable divide-by-n counter, and some other features which are not used in this application. The reference counter counts down from eight. The used PD has a single-ended output which is three-stated when the loop is in both frequency and phase lock. The 14-bit programmable divide-by-n counter has pull up resistors so that inputs left open remain at a logic one.

DIVIDE-BY-R COUNTER

The frequency of the crystal oscillator is divided down to a frequency which fits to the internal reference counter of the ISC by means of the 8-bit programmable divide-by-r counter. The counter divides by a value which is one higher than the programmed value.

LOOP FILTER

The loop filter is a first order filter with a loop frequency of about 3 Hz in PL902 and a frequency of about 10 Hz in PL903. The low loop frequency is caused by the low VCXO gain constant, which also means that the loop needs a relatively long time to achieve lock condition.

VOLTAGE CONTROLLED CRYSTAL OSCILLATOR (VCXO)

The VCXO is a modification of the micromodule XO9xx which is a Colpitts configuration with a quartz crystal, a bipolar-transistor as the active element, and a buffer-transistor. In the PL902 module the oscillator operates in the third overtone mode and in the second overtone mode in the PL903 module.

PRESCALER

The prescaler is a fixed-ratio divide-by-20 counter with an open collector output stage. It is capable of operating at frequencies up to 200 MHz.

LOCK DETECTOR CIRCUIT

The ISC has a lock detect output which pulses low when the loop is out of lock. This signal is used as input signal to the lock detector circuit which consists of an inverting comparator and followed by one more inverting comparator, used as a logical nand-gate. This means that both the frequency synthesizer module and the phase-locked loop module must be in lock before the open collector output will go high and indicate that the system is in lock.

SPECIFICATIONS

Voltage supply
9.0 ±0.01 V

Current consumption
< 65 mA

Temperature range
-25°C to +65°C

Board dimensions, L x W x H
140 x 48 x 19 mm

ADJUSTMENT PROCEDURE

PRE-TUNING THE VCO

The VCO is tuned by means of the two cores of the coils L9 and L10.
Set the top of the cores in level with the cans of the two coils.
Slowly turn down the core of L9 until maximum voltage on the multimeter: > 8.8 V is obtained.
The loop should now be in lock, which means that the voltmeter connected to the "TX enable" should be a logical "1", 9 V.
When the loop is in lock, turn down the core of L10 until maximum output level on the instrument connected to the "Fpl out".

CHECK OF POWER SUPPLY AND FREQUENCY

Check that the power supply voltage is within 9.0 ± 0.01 V.
Check that the power supply current is less than 65 mA.
Check that the frequency of the signal generator is within 0.1 ppm, or that the output frequency of the PL module is within 0.1 ppm.

TUNING THE VCO

Now carefully adjust the core of L9 until maximu voltage on the voltmeter, which is connected to the "TPx" testpoint.
The maximum voltage must be > 8.92 V.

TEST OF 5 TO 10 MHz AMPLIFIERS

Reduce the input level of the signal generator by 20 dB to -13 dBm.
The "TX enable" must still be a logical high.
Turn off the power supply.
Turn on the power supply again, and check that "TX enable" goes high.
Set back the input level to + 7 dBm.

TEST OF LOCK DETECTOR CIRCUIT

Step up the frequency of the signal generator until "TX enable" goes low.
The frequency step should be inside + 14 ± 3 ppm.
Step down the frequency until the "TX enable" goes high.
The frequency step must be inside + 12 ± 3 ppm.
Step down the frequency, below the center frequency, until "TX enable" goes low.
The frequency step must be inside -14 ± 3 ppm.
Step up the frequency until "TX enable" goes high.
The frequency step must be inside -12 ± 3 ppm.
Step up the frequency to the center frequency.
The "TX enable" must be high.
Set the switch on the test jig in the "FS out of lock" position.
The "TX enable" should now be low.
Return the switch to the "FS in lock" position.
The "TX enable" must be high again.

PL902 CODING

5 MHz reference oscillator (div. value = 30).
Set up value: 29 = 011101 = R5, R4, R3, R2, R1, R0.

SW1	1	2	3	4	5	6	7	8
On	X		X	X	X			
Off		X				X	X	X

Dip 8 is on/off for the int. osc.

10 MHz reference oscillator (div. value = 60).
Set up value: 59 = 111011 = R5, R4, R3, R2, R1, R0.

SW1	1	2	3	4	5	6	7	8
On	X	X		X	X	X		
Off			X				X	X

Dip 8 is on/off for the int. osc.

7 MHz reference oscillator (div. value = 42).
Set up value: 41 = 101001 = R5, R4, R3, R2, R1, R0.

SW1	1	2	3	4	5	6	7	8
On	X			X		X		
Off		X	X		X		X	X

Dip 8 is on/off for the int. osc.

The following scheme shows the set-up of the dip switches of SW2.
Please notice: X = XXXXX.....
fy2 = the frequency of the crystal Y2.

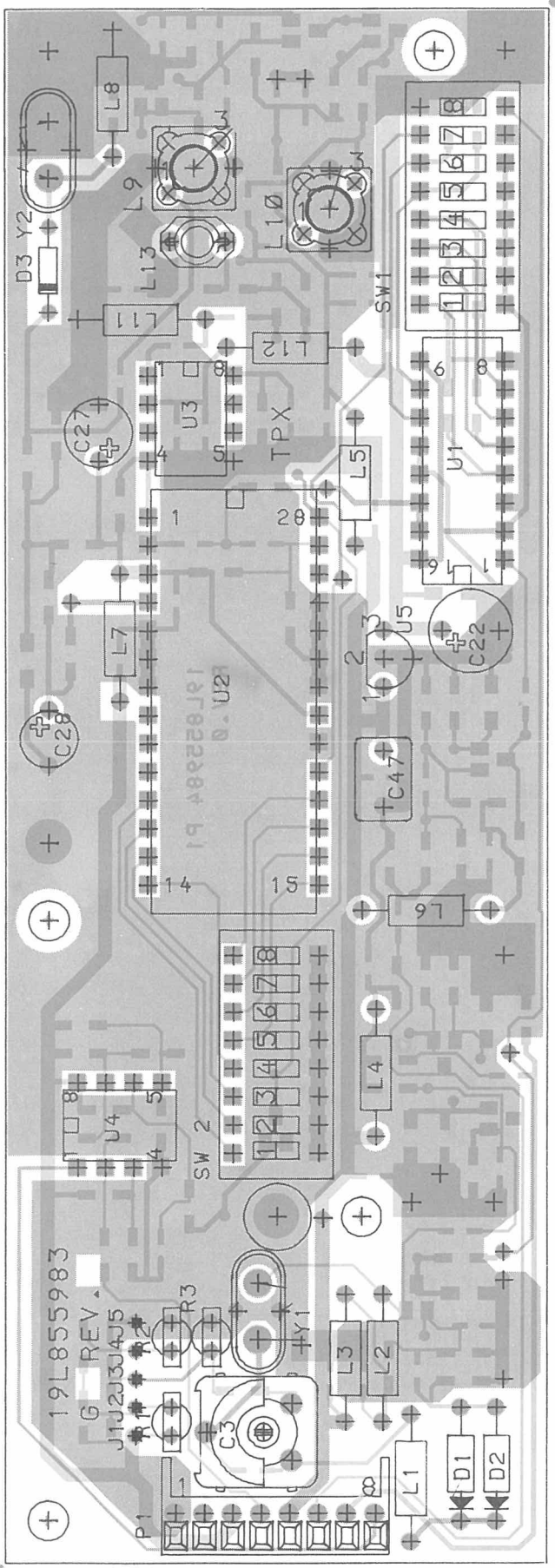
fy2/MHz	SW2 1	2	3	4	5	6	7	8	fy2/MHz	SW2 1	2	3	4	5	6	7	8
40.833	1	0	0	1	1	0	1	1	44.166	1	0	0	0	0	0	1	1
41.250	0	1	1	0	1	0	1	1	44.305	0	0	0	0	0	0	1	1
41.666	1	1	0	0	1	0	1	1	44.444	1	1	1	1	1	1	0	1
42.083	0	0	0	0	1	0	1	1	44.583	0	1	1	1	1	1	0	1
42.500	1	0	1	1	0	0	1	1	44.722	1	0	1	1	1	1	0	1
42.916	0	1	0	1	0	0	1	1	44.861	0	0	1	1	1	1	0	1
43.055	1	0	0	1	0	0	1	1	45.000	1	1	0	1	1	1	0	1
43.194	0	0	0	1	0	0	1	1	45.138	0	1	0	1	1	1	0	1
43.333	1	1	1	0	0	0	1	1	45.277	1	0	0	1	1	1	0	1
43.472	0	1	1	0	0	0	1	1	45.416	0	0	0	1	1	1	0	1
43.611	1	0	1	0	0	0	1	1	45.555	1	1	1	0	1	1	0	1
43.750	0	0	1	0	0	0	1	1	45.694	0	1	1	0	1	1	0	1
43.888	1	1	0	0	0	0	1	1	45.833	1	0	1	0	1	1	0	1
44.027	0	1	0	0	0	0	1	1	45.972	0	0	1	0	1	1	0	1

fy2/MHz	SW2 1	2	3	4	5	6	7	8	fy2/MHz	SW2 1	2	3	4	5	6	7	8
46.111	1	1	0	0	1	1	0	1	48.472	0	1	0	0	0	1	0	1
46.250	0	1	0	0	1	1	0	1	48.611	1	0	0	0	0	1	0	1
46.388	1	0	0	0	1	1	0	1	48.750	0	0	0	0	0	1	0	1
46.527	0	0	0	0	1	1	0	1	48.888	1	1	1	1	1	0	0	1
46.666	1	1	1	1	0	1	0	1	49.027	0	1	1	1	1	0	0	1
46.805	0	1	1	1	0	1	0	1	49.166	1	0	1	1	1	0	0	1
46.944	1	0	1	1	0	1	0	1	49.305	0	0	1	1	1	0	0	1
47.083	0	0	1	1	0	1	0	1	49.444	1	1	0	1	1	0	0	1
47.222	1	1	0	1	0	1	0	1	49.583	0	1	0	1	1	0	0	1
47.361	0	1	0	1	0	1	0	1	49.722	1	0	0	1	1	0	0	1
47.500	1	0	0	1	0	1	0	1	49.861	0	0	0	1	1	0	0	1
47.638	0	0	0	1	0	1	0	1	50.000	1	1	1	0	1	0	0	1
47.777	1	1	1	0	0	1	0	1	50.138	0	1	1	0	1	0	0	1
47.916	0	1	1	0	0	1	0	1	50.416	0	0	1	0	1	0	0	1
48.055	1	0	1	0	0	1	0	1	50.833	1	0	0	0	1	0	0	1
48.194	0	0	1	0	0	1	0	1	51.250	0	1	1	1	0	0	0	1
48.333	1	1	0	0	0	1	0	1	51.666	1	1	0	1	0	0	0	1

PL903 CODING

The following scheme shows the set-up of the dip switches of SW2.
fy = The frequency of the crystal Y2.
N = The value of the divide-by-n counter.

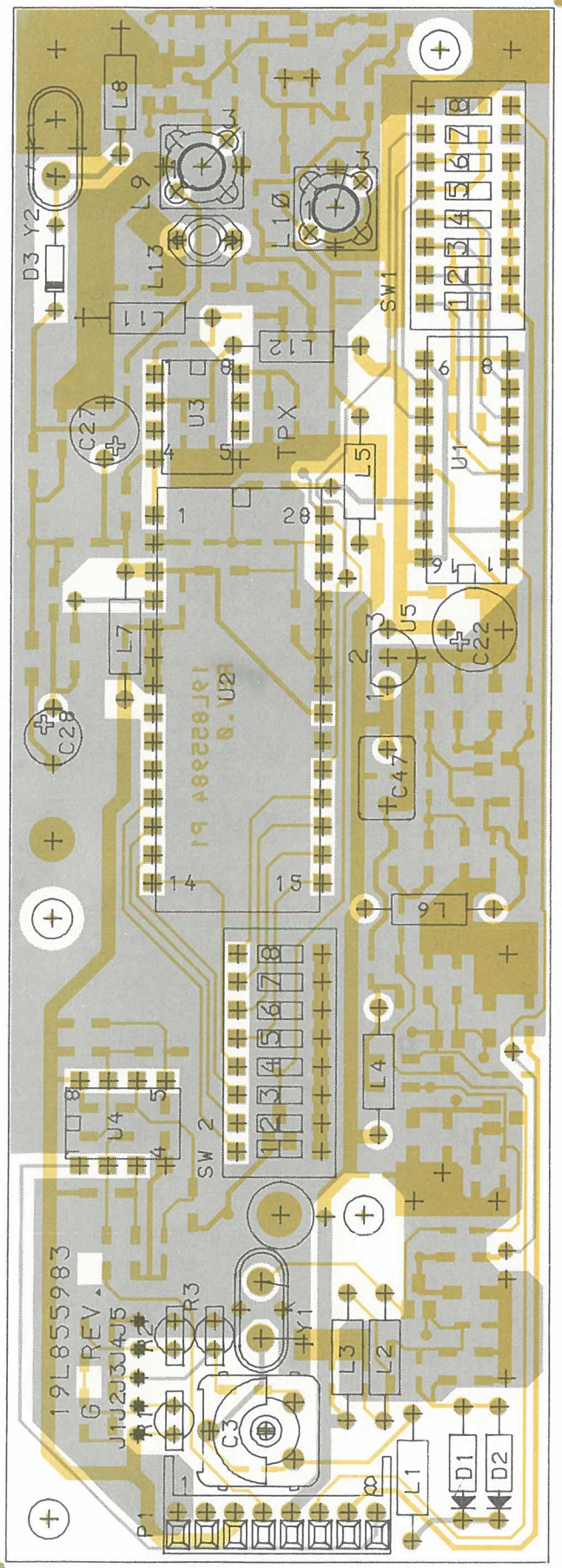
fy2/MHz	N	Dip switches of SW2 1	2	3	4	5	6	7	8
42.500	68	1	1	0	1	1	1	0	1
43.125	69	0	1	0	1	1	1	0	1
43.750	70	1	0	0	1	1	1	0	1
44.375	71	0	0	0	1	1	1	0	1
45.000	72	1	1	1	0	1	1	0	1
45.625	73	0	1	1	0	1	1	0	1
46.250	74	1	0	1	0	1	1	0	1
46.875	75	0	0	1	0	1	1	0	1
47.500	76	1	1	0	0	1	1	0	1
48.125	77	0	1	0	0	1	1	0	1
48.750	78	1	0	0	0	1	1	0	1
49.375	79	0	0	0	0	1	1	0	1
50.000	80	1	1	1	1	0	1	0	1
50.625	81	0	1	1	1	0	1	0	1
51.250	82	1	0	1	1	0	1	0	1
51.875	83	0	0	1	1	0	1	0	1



PHASE LOCKED LOOP BOARD PL902/PL903
COMPONENT LAYOUT

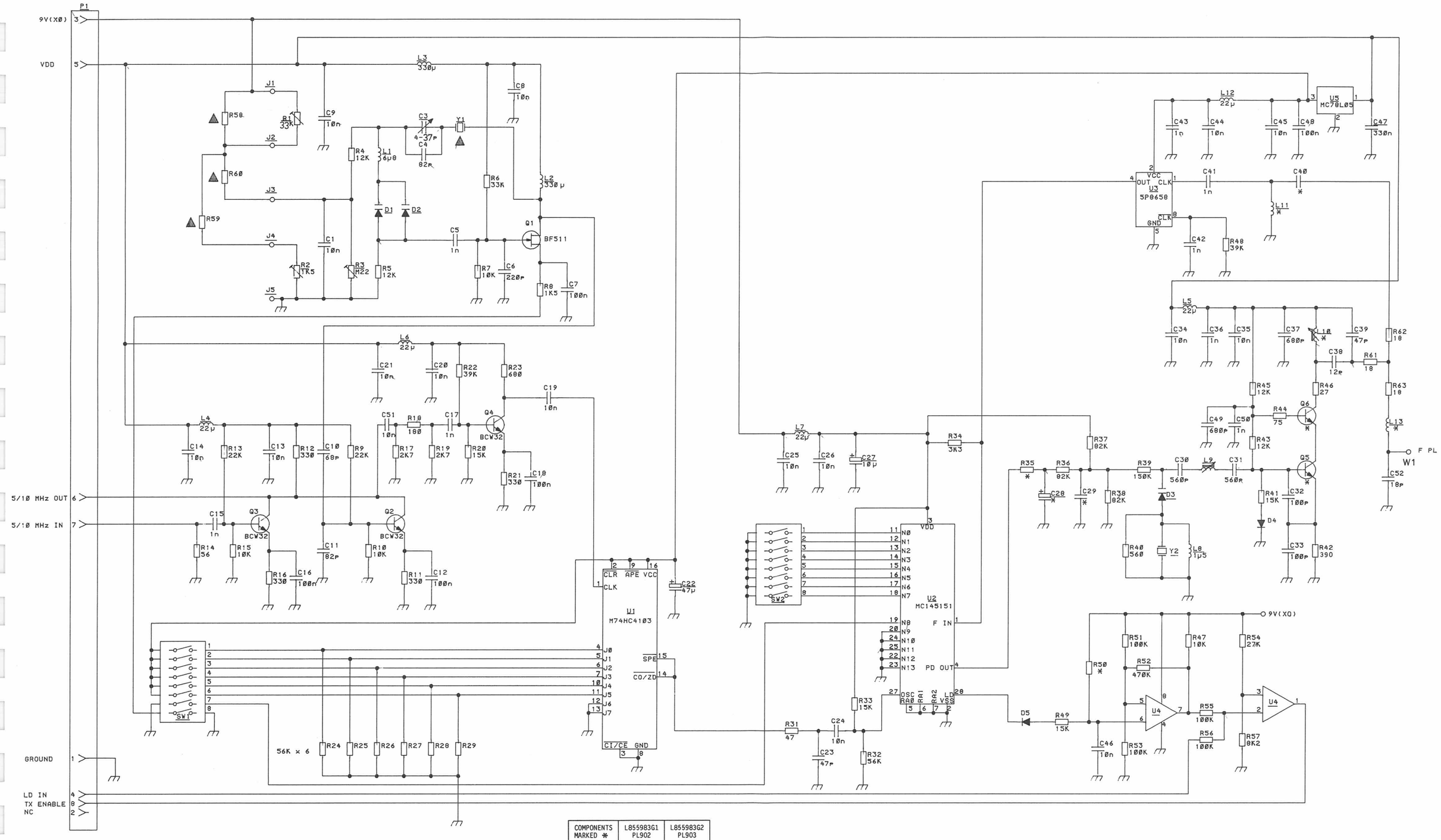
D404.833

CODE NO.L855983G1/G2



PHASE LOCKED LOOP BOARD PL902/PL903
COMPONENT LAYOUT

D404.833 CODE NO.L855983G1/G2



COMPONENTS MARKED *	L855983G1 PL902	L855983G2 PL903
C28	1µ	µ47
C29	100µ	33n
C40	27pF	56p
L10	4.5 T.	7.5 T.
L11	µ12Ø	µ18Ø
L13	5.5 T.	6.5 T.
Q5	BFS17	BFS20
Q6	BFS17	BFS20
R35	27k	10k
R50	82k	220k

COMPONENTS MARKED RXXX ARE PLACED ON COMPONENT SIDE.

COMPONENTS MARKED ⚠ ARE ONLY USED IN THE G3 AND G4 VERSION.

PHASE LOCKED LOOP BOARD PL902/PL903

CODE NO.L855983G1/G2 REV.A D404.832

PARTS LIST FOR PHASE LOCKED LOCKED LOOP BOARD PL902/PL903 : L855983G1/G2

Pos	Code No.	Description		Qt
	L855983G1	PL902 VHF (138-174MHz) AND UHF (403-470MHz) ONLY		
	L855983G2	PL903 VHF (66-88MHz) ONLY		
	---	---		
C001	21R13741M45	CAP CHIP REEL X7R 10.000		1
C003	J706080P2	CAP,VAR,FILM 4.0/37 PF		1
C004	21R13740A53	CAP,CER,NPO 82P , 5%		1
C005	21R13741M21	CAP CHIP REEL X7R 1000		1
C006	21R13740A63	CAP,CER,NPO 220P , 5%		1
C007	21R13741C17	CAP,CER,CL2 100N , 5%		1
C008	21R13741M45	CAP CHIP REEL X7R 10.000		1
C009	21R13741M45	CAP CHIP REEL X7R 10.000		1
C010	21R13740A51	CAP,CER,NPO 68P , 5%		1
C011	21R13740A53	CAP,CER,NPO 82P , 5%		1
C012	21R13741C17	CAP,CER,CL2 100N , 5%		1
C013	21R13741M45	CAP CHIP REEL X7R 10.000		1
C014	21R13741M45	CAP CHIP REEL X7R 10.000		1
C015	21R13741M21	CAP CHIP REEL X7R 1000		1
C016	21R13741C17	CAP,CER,CL2 100N , 5%		1
C017	21R13741M21	CAP CHIP REEL X7R 1000		1
C018	21R13741C17	CAP,CER,CL2 100N , 5%		1
C019	21R13741M45	CAP CHIP REEL X7R 10.000		1
C020	21R13741M45	CAP CHIP REEL X7R 10.000		1
C021	21R13741M45	CAP CHIP REEL X7R 10.000		1
C022	J707444P17	CAP,TA,SOL 47U , 10V		1
C023	21R13740A46	CAP,CER,NPO 47P , 5%		1
C024	21R13741M45	CAP CHIP REEL X7R 10.000		1
C025	21R13741M45	CAP CHIP REEL X7R 10.000		1
C026	21R13741M45	CAP CHIP REEL X7R 10.000		1
C027	J707444P7	CAP,TA,SOL 10U , 16V		1
C028	J707444P4	CAP,TA,SOL 1U , 35V	G1	1
C028	J707444P3	CAP,TA,SOL 0U47, 35V	G2	1
C029	21R13741C17	CAP,CER,CL2 100N , 5%	G1	1
C029	21R13741C05	CAP,CER,CL2 33N , 5%	G2	1
C030	21R13740A73	CAP,CER,NPO 560P , 5%		1
C031	21R13740A73	CAP,CER,NPO 560P , 5%		1
C032	21R13740A55	CAP,CER,NPO 100P , 5%		1
C033	21R13740A55	CAP,CER,NPO 100P , 5%		1
C034	21R13741M45	CAP CHIP REEL X7R 10.000		1
C035	21R13741M45	CAP CHIP REEL X7R 10.000		1
C036	21R13741M21	CAP CHIP REEL X7R 1000		1
C037	21R13741M25	CAP CHIP REEL X7R 1500		1
C038	21R13740A31	CAP,CER,NPO 12P , 5%		1
C039	21R13740A46	CAP,CER,NPO 47P , 5%		1
C040	21R13740A39	CAP,CER,NPO 27P , 5%	G1	1
C040	21R13740A49	CAP,CER,NPO 56P , 5%	G2	1
C041	21R13741M21	CAP CHIP REEL X7R 1000		1
C042	21R13741M21	CAP CHIP REEL X7R 1000		1
C043	21R13741M21	CAP CHIP REEL X7R 1000		1
C044	21R13741M45	CAP CHIP REEL X7R 10.000		1
C045	21R13741M45	CAP CHIP REEL X7R 10.000		1
C046	21R13741M45	CAP CHIP REEL X7R 10.000		1
C047	J707412P12	CAP,PYES 330N , 10%		1
C048	21R13741C17	CAP,CER,CL2 100N , 5%		1
C049	21R13741M25	CAP CHIP REEL X7R 1500		1
C050	21R13741M21	CAP CHIP REEL X7R 1000		1
C051	21R13741M45	CAP CHIP REEL X7R 10.000		1
C052	21R13740A35	CAP,CER,NPO 18P , 5%		1
D001	J707928P1	DIO,SI,CAP BB 409		1

Pos	Code No.	Description		Qt
D002	J707928P1	DIO,SI,CAP BB 409		1
D003	J706262P1	DIO,SI,CAP BB117/D035		1
D004	J707391P1	DIO,SI,SIG BAT 18		1
D005	J707391P1	DIO,SI,SIG BAT 18		1
J001	J708925P2	CONN PT,PIN L11.70MM		1
J002	J708925P2	CONN PT,PIN L11.70MM		1
J003	J708925P2	CONN PT,PIN L11.70MM		1
J004	J708925P2	CONN PT,PIN L11.70MM		1
J005	J708925P2	CONN PT,PIN L11.70MM		1
L001	A700024P23	COIL,RF,FIX 6.8UH , 10%		1
L002	A700024P43	COIL,RF,FIX 330UH , 10%		1
L003	A700024P43	COIL,RF,FIX 330UH , 10%		1
L004	A700024P29	COIL,RF,FIX 22UH , 10%		1
L005	A700024P29	COIL,RF,FIX 22UH , 10%		1
L006	A700024P29	COIL,RF,FIX 22UH , 10%		1
L007	A700024P29	COIL,RF,FIX 22UH , 10%		1
L008	A700024P15	COIL,RF,FIX 1.5UH , 10%		1
L009	J710193P1	COIL,RF,VAR 15-1/2T		1
L010	J707422P2	COIL,RF,VAR 4-1/2T	G1	1
L010	J707422P5	COIL,RF,VAR 7-1/2T	G2	1
L011	A700024P2	COIL,RF,FIX 0.12UH, 10%	G1	1
L011	A700024P4	COIL,RF,FIX 0.18UH, 10%	G2	1
L012	A700024P29	COIL,RF,FIX 22UH , 10%		1
L013	K805653G5	COIL ASM 5 1/2T	G1	1
L013	K805653G6	COIL ASM 6 1/2T	G2	1
P001	A700041P57	CONN,PWB,FEM 08-CKT		1
Q001	J707419P1	TSTR,JFET,SI BF511		1
Q002	J707386P1	TSTR,NPN,SI BCW 32		1
Q003	J707386P1	TSTR,NPN,SI BCW 32		1
Q004	J707386P1	TSTR,NPN,SI BCW 32		1
Q005	J707418P1	TSTR,NPN,SI BFS 17	G1	1
Q005	J708418P1	TSTR,NPN,SI BFS 20	G2	1
Q006	J707418P1	TSTR,NPN,SI BFS 17		1
Q006	J708418P1	TSTR,NPN,SI BFS 20		1
R001	J707406P14	RES,THERM,NTC 33K , 5%		1
R002	J707406P10	RES,THERM,NTC 1K5 , 5%		1
R003	J707406P12	RES,THERM,NTC 220K , 5%		1
R004	J707385P123	RES,MFLM,1/8W 12K , 5%		1
R005	J707385P123	RES,MFLM,1/8W 12K , 5%		1
R006	J707385P333	RES,MFLM,1/8W 33K , 5%		1
R007	J707385P103	RES,MFLM,1/8W 10K , 5%		1
R008	J707385P152	RES,MFLM,1/8W 1K5 , 5%		1
R009	J707385P223	RES,MFLM,1/8W 22K , 5%		1
R010	J707385P103	RES,MFLM,1/8W 10K , 5%		1
R011	J707385P331	RES,MFLM,1/8W 330R , 5%		1
R012	J707385P331	RES,MFLM,1/8W 330R , 5%		1
R013	J707385P223	RES,MFLM,1/8W 22K , 5%		1
R014	J707385P560	RES,MFLM,1/8W 56R , 5%		1
R015	J707385P103	RES,MFLM,1/8W 10K , 5%		1
R016	J707385P331	RES,MFLM,1/8W 330R , 5%		1
R017	J707385P272	RES,MFLM,1/8W 2K7 , 5%		1
R018	J707385P181	RES,MFLM,1/8W 180R , 5%		1
R019	J707385P272	RES,MFLM,1/8W 2K7 , 5%		1
R020	J707385P153	RES,MFLM,1/8W 15K , 5%		1
R021	J707385P331	RES,MFLM,1/8W 330R , 5%		1
R022	J707385P393	RES,MFLM,1/8W 39K , 5%		1
R023	J707385P681	RES,MFLM,1/8W 680R , 5%		1
R024	J707385P563	RES,MFLM,1/8W 56K , 5%		1
R025	J707385P563	RES,MFLM,1/8W 56K , 5%		1

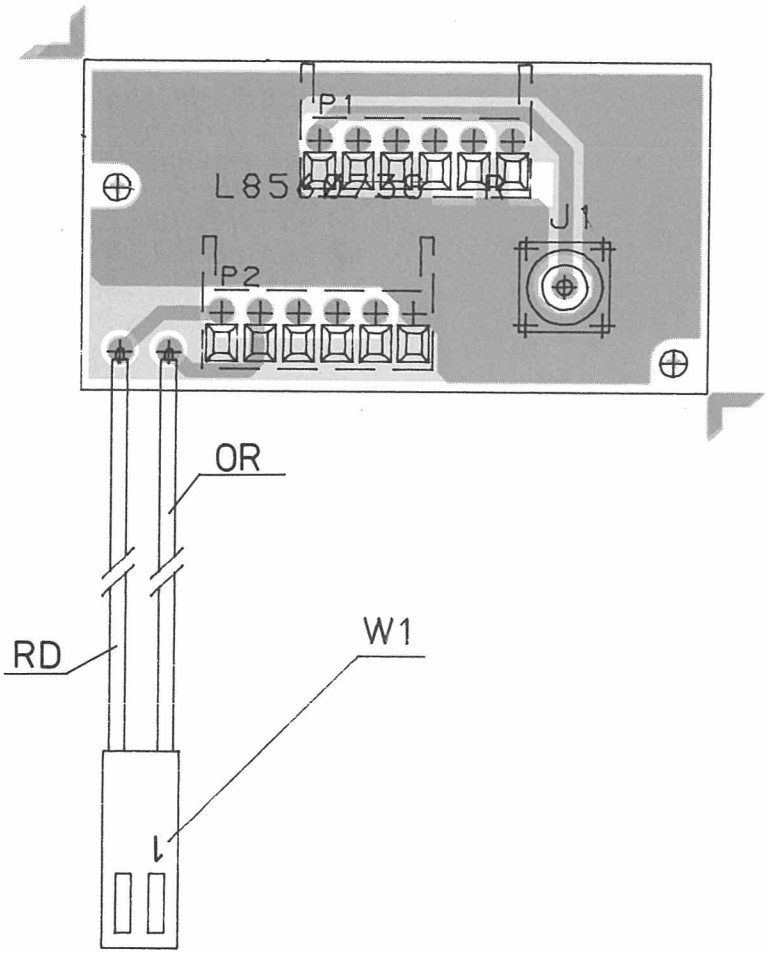
PARTS LIST FOR PHASE LOCKED LOCKED LOOP BOARD PL902/PL903 : L855983G1/G2

Pos	Code No.	Description	Qt
R026	J707385P563	RES,MFLM,1/8W 56K , 5%	1
R027	J707385P563	RES,MFLM,1/8W 56K , 5%	1
R028	J707385P563	RES,MFLM,1/8W 56K , 5%	1
R029	J707385P563	RES,MFLM,1/8W 56K , 5%	1
R031	J707385P470	RES,MFLM,1/8W 47R , 5%	1
R032	J707385P563	RES,MFLM,1/8W 56K , 5%	1
R033	J707385P153	RES,MFLM,1/8W 15K , 5%	1
R034	J707385P332	RES,MFLM,1/8W 3K3 , 5%	1
R035	J707385P273	RES,MFLM,1/8W 27K , 5% G1	1
R035	J707385P183	RES,MFLM,1/8W 18K , 5% G2	1
R036	J707385P823	RES,MFLM,1/8W 82K , 5%	1
R037	J707385P823	RES,MFLM,1/8W 82K , 5%	1
R038	J707385P823	RES,MFLM,1/8W 82K , 5%	1
R039	J707385P154	RES,MFLM,1/8W 150K , 5%	1
R040	J707385P561	RES,MFLM,1/8W 560R , 5%	1
R041	J707385P153	RES,MFLM,1/8W 15K , 5%	1
R042	J707385P391	RES,MFLM,1/8W 390R , 5%	1
R043	J707385P123	RES,MFLM,1/8W 12K , 5%	1
R044	J707385P750	RES,MFLM,1/8W 75R , 5%	1
R045	J707385P123	RES,MFLM,1/8W 12K , 5%	1
R046	J707385P270	RES,MFLM,1/8W 27R , 5%	1
R047	J707385P103	RES,MFLM,1/8W 10K , 5%	1
R048	J707385P393	RES,MFLM,1/8W 39K , 5%	1
R049	J707385P153	RES,MFLM,1/8W 15K , 5%	1
R050	J707385P823	RES,MFLM,1/8W 82K , 5% G1	1
R050	J707385P224	RES,MFLM,1/8W 220K , 5% G2	1
R051	J707385P104	RES,MFLM,1/8W 100K , 5%	1
R052	J707385P474	RES,MFLM,1/8W 470K , 5%	1
R053	J707385P104	RES,MFLM,1/8W 100K , 5%	1
R054	J707385P273	RES,MFLM,1/8W 27K , 5%	1
R055	J707385P104	RES,MFLM,1/8W 100K , 5%	1
R056	J707385P104	RES,MFLM,1/8W 100K , 5%	1
R057	J707385P822	RES,MFLM,1/8W 8K2 , 5%	1
R061	J707385P180	RES,MFLM,1/8W 18R , 5%	1
R062	J707385P180	RES,MFLM,1/8W 18R , 5%	1
R063	J707385P180	RES,MFLM,1/8W 18R , 5%	1
SW01	J708539P1	SW,DIP 08-CKT	1
SW02	J708539P1	SW,DIP 08-CKT	1
U001	J708342P6	IC,DIG,CNTR 74HC40103	1
U002	J708256P1	IC,PLL,SYN 145151	1
U003	J710258P1	IC,PLL,PRESC 8658	1
U004	J709446P1	IC,LIN,CMPAR 2903	1
U005	J706031P1	IC,LIN,VR,FIX 78L05	1
W001	K805994P1	CABLE ASM	1
	L855984P1R0	BD PW	1
		NON REFERENCED ITEMS:	
	J706232P1	CONN JACK	4
	J706275P1	SPG XTAL	2
	J706527P1	CAN	2
	J706281P7	CORE,SCREW FERR, U 25	2
	J707566P5	CRYSTAL UNIT	1

Pos	Code No.	Description	Qt

CHAPTER
CHAPITRE
KAPITEL

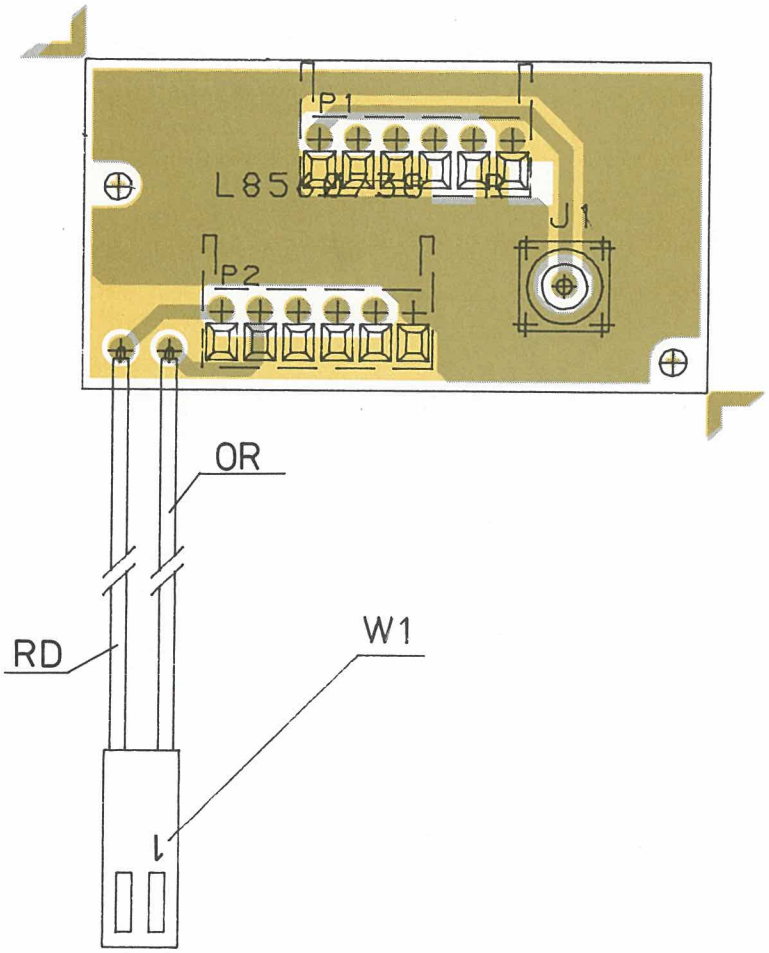
5



POS.	CODE NO.	DESCRIPTION	QT.
J001	J710002P1	CONN COAX MCX RECP	1
P001	A700041P55	CONN PWB FEM 06-CKT	1
P002	A700041P55	CONN PWB FEM 06-CKT	1
W001	J710532G1	CABLE ASM	1
	L856074P1R0	BD PW JP9016	1

JUNCTION PANEL JP9016
COMPONENT LAYOUT

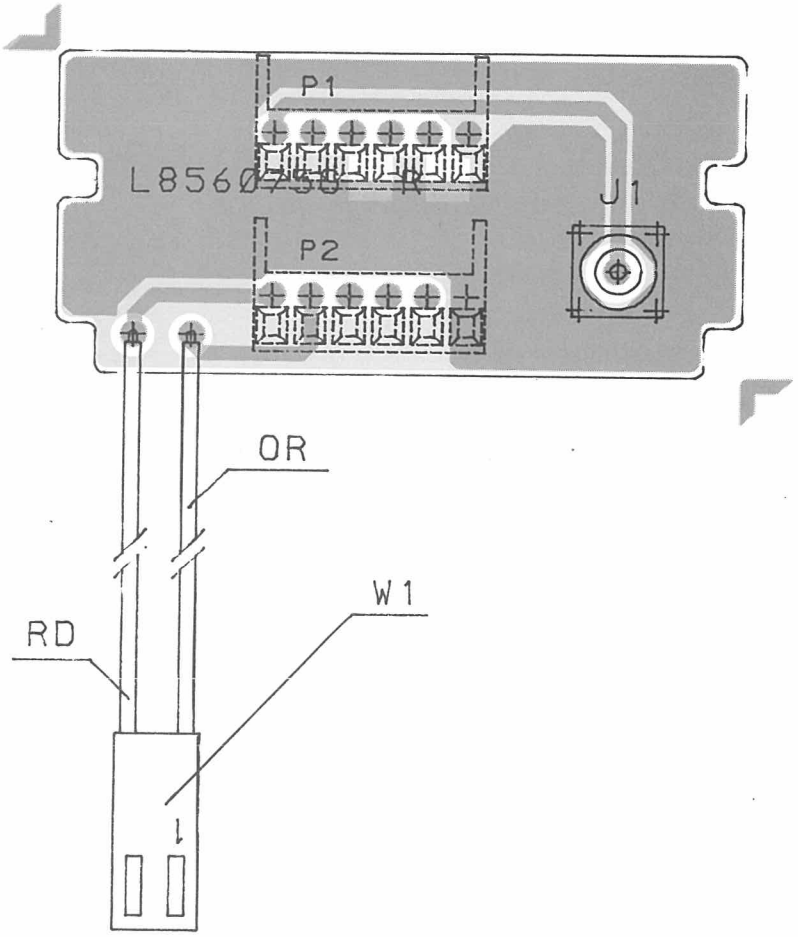
D405.388 **CODE NO.L856073G1**



POS.	CODE NO.	DESCRIPTION	QT.
J001	J710002P1	CONN COAX MCX RECP	1
P001	A700041P55	CONN PWB FEM 06-CKT	1
P002	A700041P55	CONN PWB FEM 06-CKT	1
W001	J710532G1	CABLE ASM	1
	L856074P1R0	BD PW JP9016	1

JUNCTION PANEL JP9016
COMPONENT LAYOUT

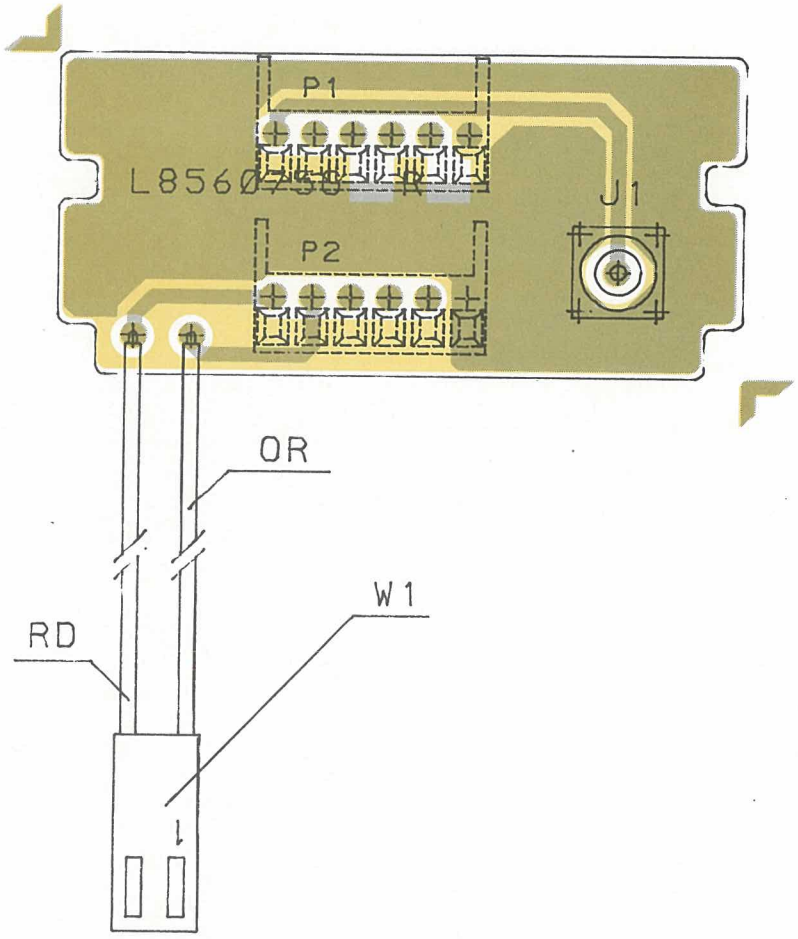
D405.388 **CODE NO.L856073G1**



POS.	CODE NO.	DESCRIPTION	QT.
J001	J710002P1	CONN COAX MCX RECP	1
P001	A700041P55	CONN PWB FEM 06-CKT	1
P002	A700041P55	CONN PWB FEM 06-CKT	1
W001	J710532G1	CABLE ASM	1
	L856076P1R1	BD PW JP9017	1

JUNCTION PANEL JP9017
COMPONENT LAYOUT

D404.835 **REV.1 CODE NO.L856073G1**



POS.	CODE NO.	DESCRIPTION	QT.
J001	J710002P1	CONN COAX MCX RECP	1
P001	A700041P55	CONN PWB FEM 06-CKT	1
P002	A700041P55	CONN PWB FEM 06-CKT	1
W001	J710532G1	CABLE ASM	1
	L856076P1R1	BD PW JP9017	1

JUNCTION PANEL JP9017
COMPONENT LAYOUT

D404.835 **REV.1 CODE NO.L856073G1**