FACTORY CALIBRATION PROCEDURE

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INTRODUCTION:

283

This is the guide for calibrating brand-new instruments, it therefore, calls out many procedures and adjustments that are rarely required for subsequent recalibration. *This procedure is company confidential.* In this procedure, all front panel control labels or Tektronix equipment names are in capital letters (VOLTS/DIV, etc.) internal adjustment labels are capitalized only (Gain Adj, etc.).

Tek form number:

0-391
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For all serial numbers.

FACTORY TEST LIMITS:

We initially calibrate the instrument to Factory Test Limits. These limits are often more stringent than advertised performance requirements. This helps insure that the instrument will meet advertised requirements after shipment, allows for inaccuracies of test equipment used, and may allow for changes in environmental conditions.

QUALIFICATION:

Factory test limits are qualified by the conditions specified in the main body of the calibration procedure. The numbers and letters to the left of the limits correspond to the factory calibration procedure steps where the check or adjustment is made. Instruments may not meet factory test limits if calibration or check-out methods and test equipment differ substantially from those in this procedure.

ABBREVIATIONS:

Abbreviations in this procedure will be found listed in TEKTRONIX STANDARD A-100.

CHANGE INFORMATION:

This procedure has been prepared by Product Manufacturing Staff Engineering. For information on changes that have been made to this procedure, to make suggestions for changing this procedure, or to order additional copies: please contact PMSE, 47-261. (DA)

EQUIPMENT REQUIRED:

The following equipment is necessary to complete this procedure:

a. TEKTRONIX Instruments

1	TYPE 530/540 A or B SERIES OSCILLOSCOPE with
1	TYPE CA DUAL TRACE PLUG-IN UNIT and
1	TYPE P6006 10X PROBE (test scope)
1	TYPE 567 OSCILLOSCOPE
1	TYPE 3S76 DUAL TRACE SAMPLING UNIT
1	TYPE 3T4 PROGRAMMABLE SAMPLING SWEEP
1	TYPE 6R1A DIGITAL UNIT
1	TYPE 262 PROGRAMMER
* 1	TYPE 184 TIME MARK GENERATOR
1	TYPE 106 SQUARE WAVE GENERATOR

b. Test Fixtures and Accessories

1	LF Sinewave Generator (067-0542-99)
2	50Ω cables, BNC (012-0057-00)
1	Remote Program Cable (012-0101-00)
1	Cable for vertical and clock signals (012-0103-00)
1	T Adapter, BNC (103-0030-00)
8	Auxiliary Programming cards (see PMPE dwg. #1518-A through 1525-A)
1	Remote Program cable (262) (012-0109-00)
1	X10 Attenuator (017-0078-00)
1	50Ω Termination (011-0049-00)
1	X5 Attenuator (017-0079-00)

* This equipment must be traceable to NBS for instrument certification.

Substitute test equipment may be used. The Plant Staff Engineer must approve any substitutions. All equipment listed must perform within its manufacturer's specifications, unless otherwise stated.

It is assumed that all equipment is provided with BNC connectors; if equipment used has other than BNC connectors, adapters, not listed, may be needed.

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QUALIFICATION

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1. PRELIMINARY INSPECTION

2. PRESETS

3. SETUP

4. 12.2 VOLTS

* 5. 1 MHz CLOCK ±.01%, max

6. 100 kHz SCALER

7. 10 kHz SCALER

8. 1 kHz SCALER

9. CLOCK PULSE STANDARDIZER OUTPUT

b. Check Clock Pulse Standardizer Amplitude 200mV ±50%

10. TRIGGER SENSITIVITY

a. Check INT DC 0.4 div max 1.0 kHz
b. Check INT AC 0.4 div max 1.0 kHz
c. Check EXT (AC ONLY) .4V P to P max 1.0 kHz
d. Check FREE RUN

11. TRIGGER LEVEL RANGE

a. Check INT + & - 8 divisions
b. Check EXT + & - .7V

12. SINGLE SWEEP

13. REMOTE EXTERNAL PROGRAM

14. CHECK CHANNEL B TRIGGER

THE END

* Indicates measurement characteristic; test equipment used must be traceable to NBS for instrument certification.

1. PRELIMINARY INSPECTION

Check for unsoldered joints, rosin joints, poor lead dress and long leads. Check for loose hardware and protruding parts. Check controls for smooth mechanical operation, proper indexing and knob spacing from front panel. Correct all defects found.

2. PRESETS

a. Preset TYPE 283

REAL TIME/DIV	1mSEC
DISPLAY	NORMAL
EXT PROGRAM	ON
TRIGGER LEVEL	midr
CHANNEL	A
MODE	INT DC
SLOPE	+
TRIGGER SOURCE DC LEVEL	3S76-3S3
All internal adjustments	midr

b. Preset TYPE 3T4

TIME/DIV	REMOTE PROGRAM
VARIABLE	CALIB (detent)
DISPLAY MAG	X1
SWEEP MODE	NORM
TRIGGER	+EXT

c. Preset TYPE 3S76

MODE	A ONLY
SMOOTH-NORMAL	SMOOTH
MV/DIV	200
NORMAL-INVERT	NORMAL
INTERNAL TRIGGER	OFF

d. Preset TYPE 262

EXT SCAN	IN
PRESET LIMIT LOWER LIMIT	OFF
PRESET LIMIT MID ZONE	OFF
PRESET LIMIT UPPER LIMIT	OFF

e. Preset test scope

TIME/CM	10mSEC
TRIGGER MODE	+INT
TRIGGER SLOPE	AC

2. (cont'd)

f. Preset TYPE CA

MODE	ADD
CHANNEL A VOLTS/CM	.5
CHANNEL B VOLTS/CM	.2
CHANNEL A & B AC-DC	AC
CHANNEL A POLARITY	NORMAL
CHANNEL B POLARITY	INVERTED

g. Preset TYPE 6R1

MODE	TIME
MEMORY ZONES	OFF
START TO STOP	OFF
RESOLUTION	AVERAGE OF TEN SWEEP HI

3. SETUP

Connect vert and clock signal cable from J201 of TYPE 283 to TYPE 3T4 TRIGGER EXT INPUT. Connect banana plug with white lead to TYPE 3S76 A OUT and banana plug with yellow lead to TYPE 3S76 B OUT.

Connect Remote Program cable from J250 of TYPE 283 to REMOTE PROGRAM of TYPE 3T4.

Connect TYPE 262 Remote Program cable from J260 of TYPE 283 to J301 of TYPE 262.

4. -12.2V

Check for approx 0V at C245 and L245 junction with multimeter. Switch EXT PROGRAM to OFF. Check for approx -12.2V at C245 and L245 junction.

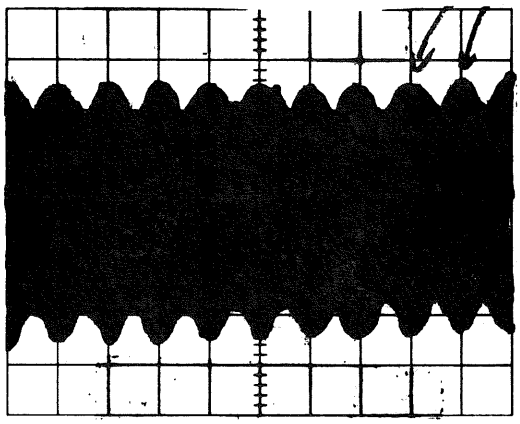
5. 1 MHz CLOCK ±.01%, max

Connect 1μS time marks from output of TYPE 184 to TYPE CA CHANNEL A. Connect X10 probe from TYPE CA CHANNEL B to TP14 and trigger test scope for stable display. Check for a difference frequency of no more than 10 cycles in 10cm.

CALIBRATION

NOTES

5. (cont'd)



Disconnect TYPE 184 from TYPE CA CHANNEL A.

6. 100 kHz SCALER

Set test scope as follows:

TIME/CM	10μSEC
CHANNEL B VOLTS/CM	.2
MODE	B ONLY
CHANNEL B POLARITY	NORMAL

Connect X10 probe to TP45. Trigger test scope for stable display. Adjust R30 for 1 mark/cm.

7. 10 kHz SCALER

Set test scope TIME/CM to .1mSEC. Connect X10 probe to TP65. Trigger test scope for stable display. Adjust R50 for 1 mark/cm.

8. 1 kHz SCALER

Set test scope TIME/CM to 1mSEC. Connect X10 probe to TP85. Trigger test scope for stable display. Adjust R70 for 1 mark/cm. Remove X10 probe from TP85.

6., 7., 8.

The 100kHz, 10kHz and 1kHz frequencies are sub-multiples of the 1mHz, crystal frequency and there for traceable to the 1mHz clock when properly adjusted. Set R30, R50, R70 halfway between 9:1 scaling rate and 11:1 scaling rate.

9. CLOCK PULSE STANDARDIZER OUTPUT

a. Setup

Remove the clock signal cable from the TYPE 3T4 TRIGGER EXT INPUT. Connect clock signal cable thru 50Ω Termination to TYPE CA CHANNEL A. Set TYPE CA MODE switch to A ONLY and CHANNEL A VOLTS/CM to .1.

b. Check Clock Pulse Standardizer Amplitude 200mV ±50%

Check trigger pulses displayed on test scope for 200mV ±100mV as TYPE 283 REAL TIME/DIV is rotated from 1mSEC to 1 SEC. Change test scope TIME/CM to correspond to TYPE 283 REAL TIME/DIV switch. Disconnect clock signal cable from TYPE CA and 50Ω Termination. Connect clock signal cable to TYPE 3T4 TRIGGER EXT INPUT.

10. TRIGGER SENSITIVITY

a. Check INT DC 0.4 div at 1.0 kHz

Set TYPE CA MODE to B ONLY, CHANNEL B VOLTS/CM to .5. Set test scope TIME/CM to 1mSEC. Connect X10 probe to pin F of TYPE 283 etched circuit board.

Connect LF Sine Wave Generator to TYPE 3S76 INPUT A. Set LF Sine Wave Generator frequency to 1.0 kHz. Set amplitude for 0.4div of signal displayed on TYPE 567 CRT. Adjust TYPE 283 TRIGGER LEVEL for stable display. Display on test scope should be 1.0 kHz square wave. Switch TYPE 283 SLOPE to - and repeat above check.

b. Check EXT (AC ONLY) 400mV & 1.0 kHz

Set TYPE CA CHANNEL B VOLTS/CM to .05. Set TYPE 283 MODE to EXT (AC ONLY). Set test scope TIME/CM to 1mSEC. Set LF Sine Wave Generator to 1.1 kHz. Connect LF Sine Wave Generator to TYPE 283 EXT REAL TIME TRIGGER INPUT. Connect X10 probe to the junction of R218 and R219, adjust LF Sine Wave Generator for 0.8cm (400mV) of 1.0 kHz signal displayed on test scope. Remove X10 probe from R218-R219 junction. Connect X10 probe to pin f of TYPE 283 etched circuit board. Set TYPE CA CHANNEL B VOLTS/CM to .5. Display on test scope should be 1.0 kHz square wave, with adjustment of TYPE 283 TRIGGER LEVEL.

10b. (cont'd)

Switch TYPE 283 SLOPE to + and check for 1.0 kHz square wave display on test scope.

c. Check FREE RUN

Switch TYPE 283 MODE to FREE RUN. Trace should be displayed on TYPE 567 throughout range of TYPE 283 TRIGGER LEVEL range.

11. TRIGGER LEVEL RANGE

a. Check INT range + & - 8 div, min

Set TYPE 3S76 MV/DIV to 200, TYPE 283 REAL TIME/DIV to 1mSEC. Set TYPE 283 MODE to DC INT. Set LF Sine Wave Generator frequency to 1.1 kHz. Connect OUTPUT of LF Sine Wave Generator to TYPE 3S76 INPUT A and adjust LF Sine Wave Generator for 8 divisions of 1.1 kHz sine wave displayed on TYPE 567. Set TYPE 3S76 MV/DIV to 100. Rotate TYPE 283 TRIGGER LEVEL through its range. Check for no display (triggers cutoff) at the cw and ccw extremes of TRIGGER LEVEL control. Switch TYPE 283 SLOPE to - and repeat check. Disconnect LF Sine Wave Generator and return the TYPE 3S76 MV/DIV to 200.

b. Check EXT range: + & - 0.7V, min

Connect TYPE 106 as follows:

TYPE 106 OUTPUT -- X10 Atten -- 50Ω cable BNC T -- TYPE 3S76 INPUT A
-- TYPE 283 EXT REAL TIME TRIGGER INPUT

Set TYPE 106 REPETITION RATE RANGE to 1 kHz, MULTIPLIER to 1, HI AMPLITUDE-FAST RISE to HI AMPLITUDE. Adjust TYPE 106 AMPLITUDE for 7 divisions of DISPLAY on TYPE 567. Rotate TYPE 283 TRIGGER LEVEL through its range. Check for no display at the cw and ccw extremes of the TRIGGER LEVEL control. Switch TYPE 283 SLOPE to + and repeat check. Remove TYPE 106.

12. SINGLE SWEEP

Set TYPE 283 as follows:

REAL TIME/DIV	1mSEC
DISPLAY	SINGLE

12. (cont'd)

Connect 1ms markers from TYPE 184 to TYPE 3S76 INPUT A and TYPE 283 EXT EQUIV TIME TRIGGER INPUT as illustrated.

TYPE 184 OUTPUT -- 50Ω cable BNC T----------TYPE 3S76 INPUT A
--X5 ATTEN--TYPE 283 EXT EQUIV TIME TRIGGER INPUT

Press START switch on TYPE 283. One sweep should be displayed on TYPE 567.

12. Sweep will not coincide with a triggered sweep.

13. REMOTE EXTERNAL PROGRAM

Install program boards in the TYPE 262 AUX program connectors as follows:

AUX program slot	program board (PMPE Dwg. No.)	function
1	1518-A	switch check
2	1523-A	1mSEC real time
3	1521-A	2mSEC real time
4	1520-A	20mSEC real time
5	1522-A	1 SEC real time
6	1524-A	2nSEC equiv time
7	1525-A	.2mSEC equiv time
8	1519-A	1μSEC equiv time

Set TYPE 283 DISPLAY to NORMAL, EXT PROGRAM to ON, MODE to INT AC. Set TYPE 262 MANUAL PROGRAM SELECTION 1 to IN. Adjust TYPE 283 TRIGGER LEVEL for stable display. Check marker display, decimal and unit.

13. The time marks displayed are traceable back to the scalers and the 1 MHz clock. The amount of error displayed will be the 1 MHz clock error plus the TYPE 3T4 dot error.

TYPE 283 REAL TIME/DIV	TYPE 184	TYPE 567 display	TYPE 6R1A DECIMAL (read from left to right)	TYPE 6R1A NIXIE
1mSEC	1mS	1 mark/div	2nd	MS
2mSEC	1mS	2 mark/div	3rd	MS
5mSEC	5mS	1 mark/div	3rd	MS
10mSEC	10mS	1 mark/div	3rd	MS
20mSEC	10mS	2 mark/div	1st	S
50mSEC	50mS	1 mark/div	1st	S
.1 SEC	.1 S	1 mark/div	1st	S
.2 SEC	.1 S	2 mark/div	2nd	S
.5 SEC	.5 S	1 mark/div	2nd	S
1 SEC	1 S	1 mark/div	2nd	S

13. (cont'd)

The following are Remote Program Card sweeps:

TYPE 262 MANUAL-PROGRAM SELECTION	Program Card function	TYPE 184	TYPE 567 display	TYPE 6R1A Decimal	TYPE 6R1A NIXIE
2	1mSEC real time	1mS	1 mark/div	2nd	MS
3	2mSEC real time	1mS	2 mark/div	3rd	MS
4	20mSEC real time	10mS	2 mark/div	1st	S
5	1 SEC real time	1 S	1 mark/div	2nd	S
6	2nSEC equiv time	10nS	1 sine wave/ 5 div	3rd	NS
7	.2mSEC equiv time	.1mS	2 mark/div	2nd	NS
8	1μSEC equiv time	1μS	1 mark/div	2nd	μS

14. CHECK CHANNEL B TRIGGER

Change TYPE 283 MODE to CHANNEL B. Disconnect TYPE 184 to TYPE 3S76 INPUT B and set TYPE 3S76 MODE to B ONLY. Set TYPE 262 MANUAL-PROGRAM selection 2 in. Set TYPE 184 for 1mS markers. Adjust TYPE 283 TRIGGER LEVEL and check for triggered display.

THE END