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Preliminary

HD-SD Varitime™ Sync generator, PT 5300

- **Multi-format capability: 21 HD formats in addition to PAL, NTSC and standard definition SDI systems**
- **Master application with internal or external high stability reference**
- **Varitime™ subnanosecond delay compensation**
- **Full genlock capability: 2 fields for SDI; 4/8 fields for NTSC/ PAL**
- **Up to 8 individually timed HD or SD serial digital outputs**
- **Up to 8 individually timed tri-level sync outputs**
- **Backwards compatibility with modules for PT5230 and PT5210**
- **Analogue outputs in combination with SDI outputs**
- **Embedded audio in HD and SD serial digital outputs.**
- **Dual AES/EBU digital audio generator. Separate Word-clock output.**
- **"Lip Sync" moving element in SDI test patterns synchronised to embedded audio "click"**
- **Philips Circle pattern or FuBK test pattern**
- **Programmable text strings in test pattern generators can be placed on the screen where needed**
- **Time and date option for test pattern generators**

solutions in Audio & Video

In today's environment, sync requirements are becoming increasingly diverse, as they need to support multiple production formats. A new flexibility is called for in synchronising systems.

The next generation Sync generator shares the same potential feature set as the modules for PT5210 series of sync generators. Additionally it supports 21 HD formats of tri-level sync and in serial digital interface format.

The PT 5300 HD-SD Varitime™ Sync Generator is specially designed to fit into this new environment all signals needed for synchronisation, fault finding and checking of the entire video chain.

The generator conforms to the relevant ITU, SMPTE, EBU and AES/EBU standards.

PT 5300 Basic Frame
The basic frame consist of a gen-lockable Sync Generator and 2 individually timeable Black Burst outputs.

Modular and Multistandard
Several generators can be added to the basic unit making multiple HD and SD serial digital outputs available and also analogue PAL or NTSC at a time. The configuration may also include several Tri-level or additional Black Burst outputs.
This makes the generator perfect to use in a mixed analog/digital environment.

The modular approach enables multi-format configuration:

- 21 HD formats for serial digital and tri-level outputs.
- SDI 625, SDI 525, and analog composite PAL and NTSC all in the same instrument.

AES/EBU Audio Generators, a Digital Genlock input and a Time Clock input can also be added.

Standard Definition SDI Test Signal and Pattern Generators
The SD serial digital generators work both in 625 and 525 line formats, and there are also various complexities to choose from:

- A Basic Test Signal Generator contains less complex test signals, i.e., colourbars, PLUGE, crosshatch, window, etc.
- An extended Test Pattern Generator has a broad range of test signals plus one complex testpattern: "Philips" Circle Pattern in 625 line, 4:3 format.
- A high-end Test Pattern Generator contains a very wide range of test-signals, like the "Philips" Circle pattern and FuBK test pattern in both 4:3 and 16:9 aspect ratio as well as other complex test patterns.

Digital audio signals are embedded in all SDI outputs.

HD-SD Serial Digital Signal Generator
This generator has four independently controllable outputs. Any output can be configured to give a High Definition or Standard Definition output.
In total there are 21 HD formats and 2 SD formats available.
Each of the outputs can be individually timed.

Tri-level sync generator
The generator has 4 separately controllable Tri-level outputs. For each output any of 21 HD formats can be independently selected. For several HD formats genlocking to the frame rates of SD 525-line and 625-line systems will automatically take place. In this way frame synchronisation is ensured between SD and HD.
Each of the 4 Tri-Level outputs can be individually delayed or advanced with 6.7 ns resolution in phase to each other and the mainframe system sync or genlock input.

Analogue outputs
The analog output module is a dual standard module (PAL or NTSC) which provides test signals and complex test patterns as the “Philips” Circle Pattern and the FuBK pattern for the analogue domain.

Genlock and timing adjustment
The PT 5300 is genlockable to a traditional Black Burst signal, but can also be locked onto continuos wave signals such as subcarrier or other reference frequencies. It can even lock to a 525-lines video signal and still generate PAL and 625-line SDI signals

Besides the same genlock phase adjustment for the entire basic instrument, each generator is also independently timeable (infinite timing over 2 fields for SDI and 4 or 8 fields for respectively NTSC and PAL)

“Lip Sync” Moving Element in Pattern
To reveal that a serial digital video transmission is “live” and not in a “freeze” condition, a moving element can be selected for the some of the complex SDI test patterns. The movement is synchronised with a “click” in the embedded audio signal

Text and clock.
Three lines of text can be superimposed onto the video signals. In the complex test patterns the position of the text is optimized for the black text fields.

Clock (date and time) can also be inserted. Date and clock are either controlled by LTC, VITC or from the internal reference.
Note: Text or clock cannot be added to the Basic SDI Generator signal.

AES/EBU Serial Digital Audio Generators
The Serial Digital Audio Generators supply digital silence and a selection of reference test tones. The unit contains two independent audio generators and separate word-clock outputs. Some of the audio test signals include audible markers that make it possible to identify right and left channels by using a loudspeaker.

Ease of Operation
The main sync generator functions are controlled via separate pushbuttons. A “Compass Key” together with an LCD display guides the user through the menu selections with help of intuitive icons.

Presets
Six complete instrument presets are stored in a non volatile memory. This makes it simple to change the configuration of the outputs for different setups.

Changeover Control
The PT 5300 is the “the New Generation” of the PT 5210 Varitime™ Sync Pulse Generator and they work together in an automatic change over set-up.
Built-in fault detection circuitry determines when to send an error flag to the PT 5211 Varitime™ Changeover unit.

Remote Control
The RS 232 Remote control interface provides full control over all functions of the generator. Parameters for each output may be adjusted remotely and a complete set-up can be copied from one instrument to another.
Instead of the RS 232 control, an internal configuration easily switches the interface to a simple ground closure control, which features a selection of presets and a few basic functions.

PRODUCT DATA

Conforms to the relevant ITU, SMPTE, EBU and AES/EBU specifications.

Master Frequency Reference
- 27 MHz master frequency: better than 0.25 ppm (0-50°C)
- Ageing: < 1 ppm/year

Analog Genlock
Input: 75Ω looped through, or two 75Ω terminated inputs (menu configurable)
- Return Loss: >36 dB to 6 MHz
- Genlock Signal: M-NTSC or G-PAL
- Amplitude Nominal: ± 3 dB
- S/N Ratio required: > 26 dB
- Sc-H Phase Nominal: ±45°
- Pull-in Range: f_{SC} ± 20 Hz
- Burst Lock Jitter: < 0.5°
- Sync Lock Jitter: < 2 ns
- Timing range: ± 4 field (PAL) ± 2 field (NTSC)
- Timing resolution: 0.5° of Subcarrier
- Continuous Freq. Reference: Subcarrier or 5/10 MHz
- Amplitude: 1 V ± 3 dB

Analog Genlock Transparent Channel
The analog genlock signal is transferred directly to a transparent output.
- Output Impedance: 75 Ω
- Return Loss: >36 dB to 6 MHz

Analog Black Burst Output
Number of outputs: 2 with independent timing and formats.
- Connector: BNC
- Output impedance: 75 Ω ± 0.5 Ω
- Return Loss: >36 dB, to 5 MHz
- Sync amplitude: -300mV ±2% (PAL) or -286mV ±2% (NTSC)
- Timing range: ± 4 field (PAL) ± 2 field (NTSC)
- Timing resolution: 0.5° of Subcarrier
- Sc-H phase: Default 0°, adjustment ± 180°, resolution <1°
- S/N Ratio: better than 60dB unweighted to 5 MHz
- Jitter: <± 0.5 ns

Remote Control
The RS-232 remote interface is configurable.
SCPI compliant protocol (1995.0)
- Baud rate: 300 to 9600
- Data bit: 7 or 8
- Parity: None, Odd, Even
- Handshake: XON/XOFF or RTS/CTS

The parallel remote interface enables selection among 6 presets and the gen-lock function via TTL compatible ground closure.

Interface connector: 9 pole female sub-D, internally configured to serial RS232C or parallel ground closure.

OPTIONS

Common characteristics for Standard Definition SDI outputs
Each generator has two outputs.
Format: 270 Mb/s component, complies with ITU-R BT 656 and SMPTE 259M
Data Format::
Scrambled NRZI 270 Mbit/sec
- Output impedance: 75 **Ω**
- Return Loss: >15 dB, 5 to 270 MHz
- Amplitude: 800 mV ±10%
- Jitter: <0.2UI
- Timing Range: ± 1 field
- Resolution: 37.5 ns (one half clock cycle on the 13.5 MHz clock)

PT 8639 Basic SDI Test Signal Generator
Contains the most commonly used testsignals, i.e. Colourbars, PLUGE, SDI checkfield, Staircase, Black, etc..
Output can be configured to include EDH, and embedded audio with a limited selection of testtones/silence and levels.
- Source identification text string: None

Full listing of signals in table 1

PT 8632 SDI Test Pattern Generator, extended

This generator features an extended range of the commonly used test signals compared to the Basic SDI TSG. The PT 8632 Test Pattern generator also contains the complex "Philips" test pattern in 625-lines, 4:3 aspect ratio.
Output can be configured to include EDH, and embedded audio with a selection of testtones/silence and levels.

- Source identification Text String: Three text strings with up to 16 characters can be added to the signal. Position on the screen can be selected to be standard, free or optimised for the black windows in the "Philips" pattern.

Full listing of signals in table 1.

PT 8633 SDI Test Pattern Generator, high end

This generator features even more test signals than the PT 8632 SDI TPG. The PT 8633 Test Pattern generator also contains the complex "Philips" Circle and FuBK test patterns in both 525 and 625-lines, in 4:3 and 16:9 aspect ratio.
Moving element synchronized to to "Click" in the embedded sound, can be selected.
Output can be configured to include EDH, and embedded audio with a selection of testtones/silence and levels.

- Source identification Text String: Three text strings with up to 16 characters can be added to the signal. Position on the screen can be selected to be standard, free or optimised for the black windows in the "Philips" pattern or FuBK patterns.

Full listing of signals in table 1.

PT 8635 Serial Digital AES/EBU Audio Generator.

Two independent serial digital audio generators in one unit, with tone, silence or word-clock. Separate word-clock output is available. A second Word-clock output can be implemented on request.

BNC Outputs: 2

- Single-ended in compliance to AES3 ID
- Output impedance: 75Ω ±20%
- Amplitude: 1.0 V ±10% into 75 Ω

XLR output 1(2[1])

- Balanced in compliance to AES3 1992
- Output impedance: 110Ω ± 20%
- Amplitude: 3 V_{PP} typical into 110Ω
- Rise and Fall Times: 10-30ns
- Jitter: <20ns

[1]) *If PT8637 Time Clock Input is installed only one XLR output is available.*

Signal specification:

- Sampling Frequency: 48 kHz
- Data rate: 3.072 Mbit/s
- Coding: Linear PCM, 20 bit twos complement binary, bi-phase mark coding.
- Levels: Silence, 0, -9, -12, -15, -16, -18, -20 dBFS
- Preemphasis: None
- Outputs signals:
  - ▪Stereo 1 KHz
  - ▪Stereo 800 Hz
  - ▪Stereo 1 kHz with click in Ch A
  - ▪Stereo 1 kHz with normal click in Ch A and long click in Ch B
  - ▪Dual 1 kHz in Ch A and 400Hz in Ch B
  - ▪Mono 1 kHz
  - ▪Mono 1 kHz with click in Ch A and ChB

Word-clock output:

- Single ended BNC.
- Output impedance 75 Ω ±10%
- Levels:
  High >2.3V; Low<0.2V into 75Ω
- TTL compatible if unterminated

Common characteristics for Analog video outputs

- Connector: BNC
- Output impedance: 75 Ω ±0.5 Ω
- Return Loss: >36 dB, to 5 MHz
- Sync amplitude: -300mV ±2% (PAL) or -286mV ±2% (NTSC)
- Video amplitude (100%):
  700mV± 1% (PAL);
  714 mV±1% (NTSC).
- Timing range: ± 4 field (PAL)
  ± 2 field (NTSC)
- Timing resolution: 0.5° of Subcarrier
- Sc-H phase: Default 0°, adjustment ±180°, resolution <1°
- S/N Ratio: better than 60dB unweighted up to 5 MHz
- Jitter: <± 0.5 ns

PT 8631 Analog Test Pattern output

Contains a wide range of most commonly used testsignals in PAL and NTSC, i.e., Colourbars, PLUGE, Multibursts, Multipulse, Ramp, Staircase, Test-lines, Window and Flat field signals.
The generator also contains the complex: "Philips " Circle Pattern in both 525 and 625 lines, in 4:3 and 16:9 aspect ratios. Also the FuBK Pattern is available in 625 lines, 4: and 16:9 aspect ratios.
Source Identification Text string
Three text strings with up to 16 characters can be added to the signal. Position on the screen can be selected to be standard, free or optimised for the black windows in the "Philips" pattern or FuBK patterns.

Full listing of characteristics in table 1

PT 8606 Digital Genlock

SDI digital genlock module with active loop-through

- Connector: BNC
- Input/output impedance: 75 Ω
- Format: 270 Mb/s component. Complies with SMPTE 259M and ITU-R BT.656

PT 8637 Time clock Interface

Reference for the time clock

- VITC in genlock signal
- LTC on separate XLR connector
- Internal video clock reference
- When power is off: XTAL osc. with battery back-up.

The XLR input can be configured for a 1 sec. pulse input.

- LTC Input impedance: > 10kΩ
- LTC Input level: 0.8 - 5 Vpp

- Pulse input impedance:
  1kΩ ±10%
  (selectable internally: 50Ω± 10%)
- Pulse input level: 1.8 - 22 Vpp
- Pulse duration: 18μs - 0.7s

HD Formats:

The PT8611 Tri-level Sync Generator and the PT86XX SD-HD Serial Digital Generator support the following HD formats:

- 1920x1080:
  60P, 59.94P, 50P, 60I, 59.94I, 50I, 30P, 29.97P, 25P, 24P and 23.98P
- 1920x1035:
  60I and 59.94I
- 1280x720:
  60P, 59.94P, 50P, 30P, 29.97P, 25P, 24P and 23.98P

PT8611 HD Tri-level sync output

- Formats supported:
  as stated above in "HD Formats"
- Number of outputs: 4
- Connector: BNC
- Output impedance:75 Ω ±1%
- Return loss: >30dB, up to 30MHz
- Amplitude: 600 mVpp ±2%
- Jitter: <0.5 ns.

PT86xx HD-SD serial digital generator

Four generators individually configurable between HD and SD.

- HD-formats supported:
  as stated above in "HD formats"
- SD formats supported:
  525 lines and 625 lines
- Connectors: BNC, 75 Ohm
- Output resistance:75 Ω ±1%
- Return loss:
  >15dB, up to 1.5 GHz
- Amplitude: 800 mV ±10%
- Jitter: <0.2 UI
- Timing Range: ± 1 field
- Resolution:
  - ▪HD: 6,7 ns (one clock cycle off the HD clock)
  - ▪SD: 37.5 ns

The table and drawing shows the possible combinations of Video Generators that can be installed..

The other options, PT 8606 Digital Genlock, PT 8637 Time Clock Input can be installed independently of the video generators.

If no “Time Code” input, PT8637, is installed, this position is used default as XLR output for the second audio output of the PT 8635 AES/EBU Digital Audio Generator.

Note: in most cases Output 2 has to be used before any of the outputs 3,4 or 5.
PT8632 SDI Test Pattern Generator can always be installed independently of the other modules.

PLEASE NOTE:
This table and rear plate layout may change during the final development stage of the HD Serial Digital generator module.
The table describes the status per Oct. 2004.

Each of the rows represents a viable combination.
Note: in most cases Output 2 has to be used before any of the outputs 3, 4 or 5.
PT 8632 SDI Test Pattern Generator can be installed independently of the other generators.

Output 1	Output 2	Output 3	Output 4	Output 5
PT 8632 TPG	PT 8631 Analog TPG	PT 8639 Basic SDI or PT 8608 Black Burst	PT 8639 Basic SDI or PT 8608 Black Burst	
PT 8632 TPG	PT 8631 Analog TPG			PT 8631 Analog TPG
PT 8632 TPG	PT 8631 Analog TPG			PT 8633 SDI TPG
PT 8632 TPG	PT 8633 SDI TPG	PT 8639 Basic SDI or PT 8608 Black Burst	PT 8639 Basic SDI or PT 8608 Black Burst	
PT 8632 TPG	PT 8633 SDI TPG			PT 8631 Analog TPG
PT 8632 TPG	PT 8633 SDI TPG			PT 8633 SDI TPG
PT 8632 TPG	PT 8639 Basic SDI	PT 8639 Basic SDI or PT 8608 Black Burst	PT 8639 Basic SDI or PT 8608 Black Burst	
PT 8632 TPG	PT8631Analog TPG or PT8633 SDI TPG or PT8639 Basic TPG or PT8608 Black Burst	PT 8639 Basic SDI or PT 8608 Black Burst	*New* PT8611 Tri-level Sync Generator	
PT 8632 TPG	PT8631Analog TPG or PT8633 SDI TPG or PT8639 Basic TPG or PT8608 Black Burst	PT 8639 Basic SDI or PT 8608 Black Burst	*In development* Available 3rd quarter ‘05 PT86xx HD-SD Serial Digital Generator	

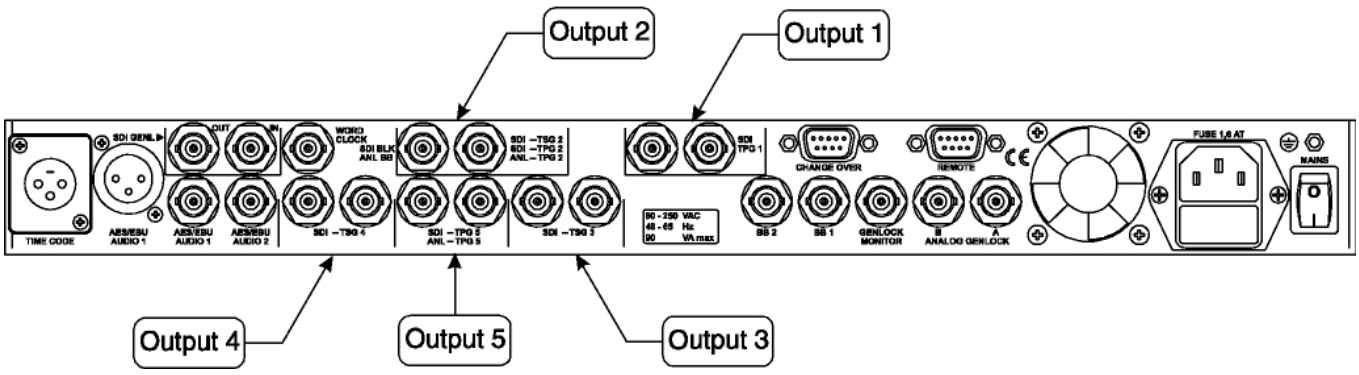

Table 1 - Signals Survey – Standard Definition Signals

Signals	SDI Basic PT 8639	SDI - TPG PT 8632	 8633	Analog TPG PT8631
C.BAR				
SMPTE	M	M	M	M
EBU/FCC colorbar	X	X	X	X
75% colorbar , ITU801	X	X	X	
100% Colorbar	X	X	X	G
75% bar with Grey		G	G	G
75% bar with red	G	G	G	G
Red, 75%	X	X	X	X
M.BURST				
Multiburst in Y,C_R,C_B	X	X	X	
Luminance Sweep			X	X
Y, C_R, C_B sweep			X	
Multipulse		X	X	X
Sinx/x			X	X
CCIR 18			G	G
NTC-7 Combination				M
FCC Multiburst				M
WINDOW/FLAT				
10% window	X	X	X	X
15% window	X	X	X	X
20% window	X	X	X	X
100% window	X	X	X	X
Line square wave 15%/100%	X	X	X	X
50% Flat field				X
Flat 100%			X	X
Black/Black Burst	X	X	X	X
SPECIAL				
Check field ITU-801 # 16	X	X	X	
Timing test		X	X	
Field Delay Test		X	X	
Bow Tie		X	X	
Digital analogue Blanking markers		X	X	
Digital grey ITU-801 #1	X	X	X	
Field square wave		X	X	X
Alternating bl/wh 0.1Hz ITU-801 # 2			X	X
End -of-line pulses ITU-801 # 3			X	
White, end of-line porches ITU-801 # 10			X	
Blue, end-of-line porches ITU-801 # 11			X	
Red, end-of-line porches ITU-801 # 12			X	
Yellow, end-of-line porches ITU-801 # 13			X	
Cyan, end-of-line porches ITU-801 # 14			X	
LINEARITY				
Shallow ramp		X	X	
Luminance Ramp		X	X	X
Limit Ramp ITU-801 # 4		X	X	
Valid ramp		X	X	
Modulated ramp				X
5-step Staircase	X	X	X	X
Modulated stairs, 5-step		X	X	X
10-step Staircase			X	X
Pulse & bar; 2T, 20T, Bar w. inv 2T 2T, 12.5T, Bar w. inv. 2T			 G M	 G M
CCIR 17			G	G
CCIR 330			G	G
CCIR 331			G	G
FCC Composite				M
NTC-7 Composite				M

Signals	SDI Basic PT 8639	SDI - TPG PT 8632	 8633	Analog TPG PT8631
Yellow /Grey ramp ITU-801 #5			X	
Grey/blue ramp ITU-801 #6			X	
Cyan/grey ramp ITU-801 #7			X	
Grey/red ramp ITU-801 #8			X	
C_B, Y, C_R ,Y Ramp ITU-801 #9			X	
PATTERN				
Philips Circle Pattern 4:3		G **Note 1**	X	X
Philips Circle Pattern 16:9			X	X
FuBK 4:3		G **note 1**	G	G
FuBK 16:9			G	G
Cross Hatch 4:3	X	X	X	X
Cross Hatch 16:9				X
Circle 4:3				G
Circle 16:9				G
PLUGE	X	X	X	X
Safe area			X	X
250kHz				X
VMT 01			G	G
Embedded Audio				
Audio Group(s) Fixed Group 1: CH 1-4	X	X		
Selectable groups: 1, 2, 3 or 4.			X	
In all groups, the second stereo pair has continuos tones without click.				
Audio signals: Off	X	X	X	
Stereo: 800Hz		X	X	
Stereo 1kHz	X	X	X	
Stereo EBU 1kHz		X	X	
Stereo BBC 1kHz		X	X	
Mono: EBU 1kHz		X	X	
Mono 1kHz		X	X	
Dual: 1kHz + 400Hz		X	X	
Audio levels: Silence, 0, -9, -15, -18 dB	X	X	X	
-12, -16, -20 dB		X	X	
Text & Clock				
Text Insertion		X	X	X
Clock and date ONLY w. Option PT 8637		X	X	X
Special Functions				
Moving Bar "Lip Sync", moving bar synchronised to click in embedded audio			G	

X: Dual standard 625/525 lines or PAL/NTSC
G: 625-line or PAL only
M: 525-line or NTSC only

Note 1: Only one of either test patterns is avalable:
PT 8632: "Philips" Pattern
PT8632/10: FuBK Pattern

This table will eventually be expanded with HD signals.

General Specifications

Power Supply
- Voltage 90-250VAC
- Frequency 48 - 62 Hz
- Power consumption < 90 W maximum with options

Mechanical Data
19" rack mount cabinet
- Height: 44 mm (1.73")
- Width: 483 mm (19")
- Depth: 490 mm (19.3")
- Weight: 6 kg (13.2 lbs).

Environmental Conditions
- Storage temperature -20 to +70°C (-68° to 158°F)
- Operating temperature +5 to +45°C (41°-113°F)
- Humidity: Non condensing (IEC 721)

Electromagnetic compatibility
- Complies with EN50081-1/1994 (emission) and EN 50082-1/1997 (immunity).
- Complies with FCC Rules & Regulations, Part 15, subpart J, level B (emission).

Safety
- Complying with IEC1010-1

Ordering Information

PT 5300 HD-SD Varitime™ Sync Generator

Basic unit

PT 5300	HD-SD Varitime™Sync Generator	9449 053 30001

Options

PT 8604	Multiple Parallel Black Burst Output	9449 086 04001
PT 8606	Digital genlock	9449 086 06001
PT 8608	Black Burst Generator	9449 086 08001
PT 8611	Tri-Level Sync Generator	9449 086 11001
PT 86xx	HD-SD Serial Digital Generator (Available 3rd quarter '05)	9449 086 xx001
PT 8631	Analog Test Signal Generator	9449 086 31001
PT 8632	SDI Test Pattern Generator, Extended	9449 086 32001
PT 8633	SDI Test Pattern Generator, High end	9449 086 33001
PT 8635	Dual AES/EBU generator	9449 086 35001
PT 8637	Time clock interface	9449 086 37001
PT 8639	SDI Test Signal Generator, Basic signals	9449 086 39001
PM 8552	Slide rail mounting kit	9449 085 52001

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