CN 01363

HEWLETT PACKARD

OPERATING AND SERVICE MANUAL

8012B
PULSE GENERATOR

SERIAL NUMBERS

This manual applies directly to instruments with serial number 1633 G 00491 and higher. Any changes made in instruments having serial numbers higher than the above number will be found in a "Manual Changes" supplement supplied with this manual. Be sure to examine this supplement for any changes which apply to your instrument and record these changes in the manual.

MANUAL PART NO. 08012-90005
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1–1 INTRODUCTION

1–2 The 8012B is an extremely versatile, easy-to-operate pulse generator with a wide range of applications. It has a complete set of variable pulse parameters with a repetition rate of 0–50 MHz and transition times as low as 5ns. This makes it ideal for testing digital logic: RTL, DTL, TTL, some ECL and some MOS can be dynamically tested and noise patterns can be simulated. Any triangular or trapezoidal waveforms can be generated (up to a maximum ratio of 1:100 or 100:1 between leading and trailing edge transitions) over the entire frequency range. The pulse polarity can be set to positive or negative and the pulse output format to symmetrical, normal or complement using front panel switches, without affecting pulse amplitude or offset. The complement format can be used to obtain duty cycles of 100% and symmetrical format provides a means of checking device threshold, driving operational amplifiers and simulating amplifier outputs.

1–3 The 8012B has a selectable source impedance which makes impedance matching to the circuit under test very simple. It also has a square wave facility that is independent of width and delay settings and a double pulse facility that is useful for testing device recovery times and making noise immunity measurements.

1–4 The front panel of the 8012B has been carefully designed to provide a logical layout of the controls; horizontal controls for pulse timing parameters, vertical controls for pulse amplitude parameters. Also, compatible pulse settings are guaranteed as long as that the pulse delay and pulse width controls are either set to the left of the pulse period control or; if set vertically below the period control, that the delay and width verniers are set counterclockwise of the period vernier. This simple, straightforward design enables pulses to be set up extremely quickly and easily.

1–5 The 8012B will operate in three different modes as follows:

Normal Mode: in this mode the internal rate generator determines the repetition rate of the output pulses. The generator can be triggered internally, externally or manually or can be gated. A trigger pulse is generated for each output pulse and the pulse output can be delayed with respect to the trigger output.

RZ Mode: in this mode external signals are applied to the input socket on the rear panel. These signals by-pass the internal rate generator and trigger the delay generator directly, thus determining the repetition rate of the output pulses. All other pulse parameters are determined by the front panel controls. Because the internal rate generator is not used in RZ mode, it is available to provide independent trigger pulses.

External Width Mode: in this mode external pulses applied to the input socket on the rear panel determine the width and repetition rate of the output pulses. In fact the output is a pulse-shaped version of the external input. The pulse available at the trigger output, being derived from the internal rate generator, is independent of the RZ output.

Table 1–1. Specifications

PULSE CHARACTERISTICS

Transition times: 5ns – 0.5s with INT. LOAD switched IN. 6ns – 0.5s with INT. LOAD switched OUT. In four ranges, common for leading and trailing edges. Verniers provide separate control of leading and trailing edges within each range up to a maximum ratio of 100:1 or 1:100.

Linearity: for transition times > 30ns, maximum deviation from a straight line between the 10% and 90% points is lesss than 5% of pulse amplitude.

Overshoot and Ringing: < ± 5% of pulse amplitude unless INT LOAD is switched OUT and amplitude reduced to 0.4V – 4V when it may increase to ± 10%.

Preshoot: < ± 5% of pulse amplitude.

Pulse Width: < 10ns to 1s in four ranges. Vernier provides continuous adjustment within ranges.

Width Jitter: < 0.1% + 50ps on any width setting.

Maximum Duty Cycle: > 75% from 1 Hz to 10 MHz, decreasing to ⩾ 40% at 50 MHz. Up to 100% in COMPL mode.

Maximum Output: With INT LOAD switched IN, output is 5V across 50 ohms, 10V across open circuit. With INT LOAD switched OUT, output is 10V across 50 ohms, Output circuit cannot be damaged by short circuits.

Attenuator: 4-step attenuator reduces output to 0.2V with INT LOAD switched IN, or to 0.4V with INT LOAD switched OUT. Vernier provides continuous adjustment within ranges.

Polarity: positive or negative selectable.

Output Format: symmetrical, normal or complement selectable.

Source Impedance: 50 ohms ± 10% shunted by typically 20pF with INT LOAD switched IN. > 50 ohms shunted by typically 20pF with INT LOAD switched OUT.

DC Offset: With INT LOAD switched IN, offset is ± 2.5V across 50 ohms and is independent of amplitude settings. With INT LOAD switched OUT, offset is automatically switched off.

Pulse Delay: < 35ns to 1s (with respect to trigger output) in four ranges; vernier provides continuous adjustment within ranges.

Delay Jitter: < 0.1% + 50ps on any delay setting.

REPETITION RATE AND TRIGGER

Repetition Rate: 1 Hz to 50 MHz in four ranges, continous adjustment within ranges.

Period Jitter: < 0.1% + 50ps on any rate setting.

Square Wave: 0.5 Hz to 25 MHz in four ranges. Duty cycle 50% ± 5% up to 1 MHz, tolerance increases to ± 15% at 25 MHz.

Double Pulse: up to 25 MHz simulating 50 MHz.

Trigger Output: > +1V across 50Ω, 16ns ± 10ns wide. Suitable for triggering another 8012B/13B.

EXTERNALLY CONTROLLED OPERATION

External Triggering

Repetition Rate: 0 to 50 MHz. For square wave output, frequency is divided by 2.

Trigger input: sinewaves > 1.7V p-p (about zero) or pulses > 0.8V either polarity with a width of > 7ns.

Maximum input amplitude: ± 7V.

Delay: 25ns ± 8ns between leading edge of trigger input and trigger output signals.

Input impedance: 50 ohms ± 10%, dc-coupled.

Manual: front panel pushbutton for single pulse.

Table 1–1. Specifications (cont'd)

Gating

Synchronous gating: gating signal turns generator on. First trigger output pulse is coincident with leading edge of gate pulse. Last output pulse is always generated with normal width even if the gate pulse ends during the generation of the pulse.

Gate input: dc-coupled; voltage at open connector approx. +1.8V. Shorting current ≤ 12mA. Input impedance approx. 160Ω. Gate input signal: voltage > +1.5V or resistor > 1KΩ to ground enables rep. rate generator. Voltage < +0.8V or resistor < 160Ω disables rep. rate generator. Gate input TTL compatible. Maximum input ± 5V.

External Width and RZ Modes

External width: output pulse width determined by the width of the drive input signal. Transition times and amplitude are selectable. Trigger pulses, produced by internal rate generator, are independent of the output pulses.

RZ Mode: external input signal switched directly to delay generator. Output pulse period determined by period of RZ input signal. Transition times, delay, width, amplitude and output formats are selectable. Trigger pulses, produced by internal rate generator, are independent of the output pulses.

Input signal: input impedance 50 ohms, dc-coupled. Signal amplitude > +1V, maximum input ± 5V. Width > 7ns.

GENERAL

Operating temperature range: 0°C to 55°C.

Power: 100/120/220/240V, +5%, −10%, 48 to 400 Hz, 100VA max.

Weight: net 4 kg (8.8 lbs); shipping 6.5 kg (14.6 lbs).

Dimensions: 200mm wide, 142mm high, 330mm deep, (7.9" x 5.6" x 13").

Accessories: 15179A Adapter Frame; rackmount for two units.

Figure 2–1. 8012B and Supplied Accessories

SECTION 2

INSTALLATION

2–1 INITIAL INSPECTION

2–2 Inspect the instrument and accessories for physical damage and if damage is evident refer to paragraphs 2–5 to 2–8 for the recommended claim procedure and repacking information.

2–3 The 8012B is delivered complete with the following items.

ITEM	HP Stock Number
Spare 0.5A fuse for 220/240V operation	2110–0202
Spare 1A fuse for 100/120 and 220/240V operation	2110–0007
Power cord	see below
Manual	08012–90001

2–4 The power cord delivered with the 8012B will be one of the following:

2–5 CLAIMS FOR DAMAGE

2–6 If physical damage is evident or if the instrument does not meet specifications when received, notify the carrier and the nearest Hewlett-Packard Sales/Service Office. The Sales/Service Office will arrange for repair or replacement of the unit without waiting for settlement of the claim against the carrier.

2–7 REPACKING

2–8 If the instrument is to be shipped to a Hewlett-Packard Sales/Service Office, attach a tag showing owner,address, model and serial number and the repair required. The original shipping carton and packing material can be re-used but the Hewlett-Packard Sales/Service Office will also provide information and recommendations on materials to be used if the original packing is not available or re-usable.

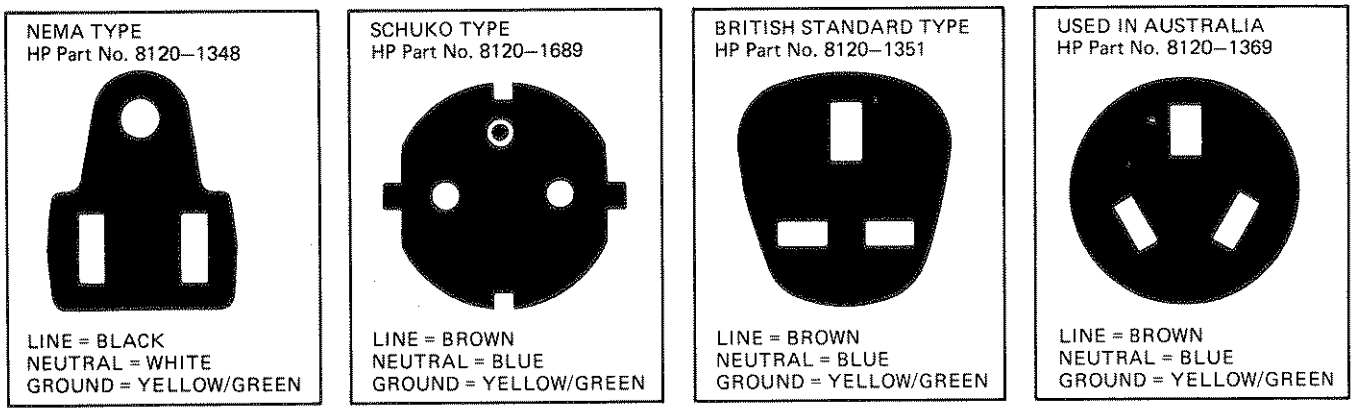


Figure 2–2. Power Cords

2–9 PREPARATION FOR USE

2–10 Power Cord

2–11 The 3-wire power cable supplied with the 8012B when connected to the appropriate power outlet, grounds the instrument cabinet and panels. To preserve this safety feature when operating the instrument from an outlet without a ground connection use an appropriate adapter and connect the ground lead (green/yellow) to an external ground.

2–12 If the plug on the cable does not fit your power outlet then cut the cable at the plug end and connect a suitable plug. The plug should meet local safety requirements and include the following features:

a. Minimum current rating of 2A
b. Ground connection
c. Cable clamp

The colour coding used in the cable will depend on the cable supplied (see Figure 2–2).

2–13 POWER SOURCE REQUIREMENTS

2–14 The model 8012B will operate from nominal ac line supplies of 100V, 120V, 220V or 240V (–10%, +5%) at 48 Hz to 400 Hz. Two switches on the rear panel allow one of the four voltages to be selected.

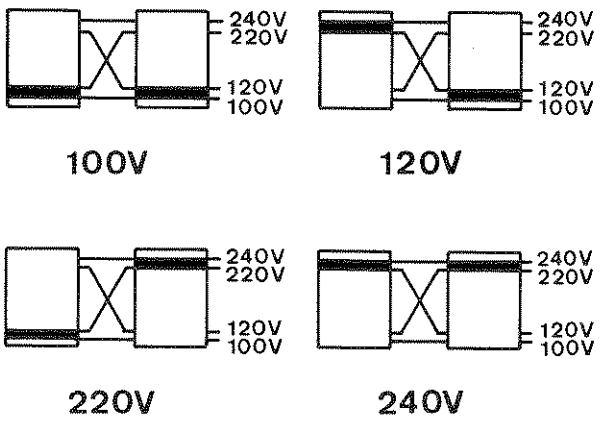


Figure 2–3. Selector settings for the nominal power line voltages.

The power dissipation is 100VA max.

CAUTION

Before applying power to the instrument, check on the rear panel that the 8012B is set in accordance with local supply conditions (see para. 2–14). If not, use a screwdriver to change the voltage selector positions.

WARNING

Remove power cord before removing cover.

2–15 To replace fuses, remove left hand side cover to gain acress to inside of rear panel. Fuse location is shown in Figure 6–1, Page 6–4.

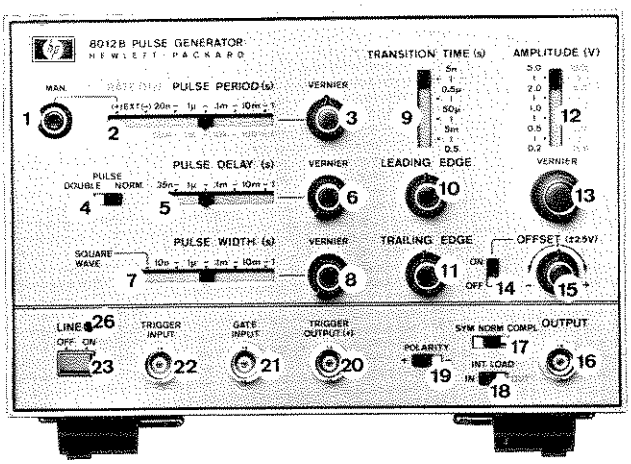
2–16 Connect the power cable to the rear connector.

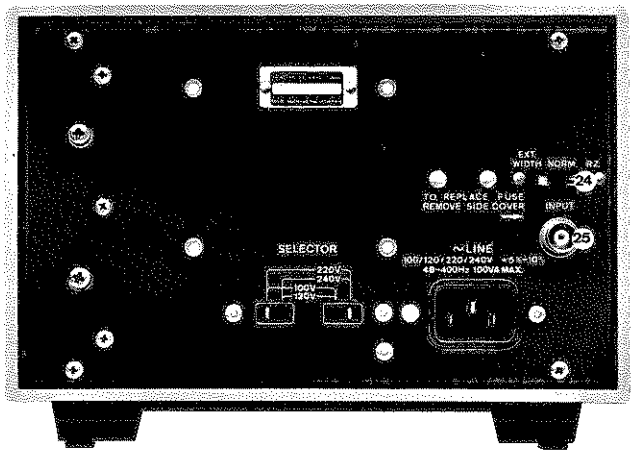
2–17 TEMPERATURE REQUIREMENTS

2–18 The 8012B will operate within specifications when the ambient temperature is between 0°C (32°F). and 55°C (131°F).. It can be stored at temperatures between –40°C (–40°F) and 75°C (167°F).

2–19 RACK MOUNTING

2–20 The 8012B can be mounted in a rack using the 15179A Adapter Frame. This frame has space for mounting either one or two 8012B pulse generators alongside each other in a rack.





(1) MAN pushbutton: push to generate single pulses when the RATE switch is set to EXT (+) or EXT (–).

(2) RATE switch: for selecting the range of pulse rate.

(3) Rate VERNIER: for continuous adjustment of the repetition rate between the limits of the range selected on the RATE switch. Clockwise rotation increases the pulse period (i.e. reduces the rate). In the RZ and EXT WIDTH modes the RATE controls define the frequency of trigger output pulses only.

(4) PULSE DOUBLE/NORMAL switch: in the DOUBLE PULSE position the 8012B delivers two pulses for every trigger pulse – one pulse in phase with the trigger output and one delayed by the amount set on the PULSE DELAY controls. DOUBLE PULSE is not available in the EXT WIDTH mode and is automatically inhibited if selected. In the NORMAL position, for each trigger pulse, the 8012B delivers one pulse which is delayed on the trigger pulse by the amount set on the PULSE DELAY controls.

(5) PULSE DELAY switch: for selecting the range of pulse delay with respect to trigger in all modes except SQUARE and EXT WIDTH.

(6) Pulse delay VERNIER: for continuous adjustment of pulse delay between the limits of the range selected on the PULSE DELAY switch. Clockwise rotation increases the delay.

(7) PULSE WIDTH switch: for selecting the range of pulse width required in all modes except SQUARE and EXT WIDTH.

(8) Pulse width VERNIER: for continuous adjustment of pulse width between the limits of the range set on the PULSE WIDTH switch.

(9) TRANSITION TIME(s) switch: for selecting one of the five pulse transition time ranges.

(10) LEADING EDGE vernier: for continuous adjustment of pulse leading edge transition time between limits of the range selected on the TRANSITION TIME switch. Clockwise rotation increases transition time.

(11) TRAILING EDGE vernier: for continuous adjustment of pulse trailing edge transition times between limits of the range selected on the TRANSITION TIME switch. Clockwise rotation increases transition time.

(12) AMPLITUDE (V) switch: for selecting range of output pulse voltage.

(13) Amplitude VERNIER: for continuous adjustment of output voltage between limits of the range selected on the AMPLITUDE (V) switch. Clockwise rotation increases the output amplitude.

(14) OFFSET switch: for enabling/disabling the offset VERNIER which permits the baseline of the pulse OUTPUT to be adjusted. In the OFF position, the baseline of the pulse OUTPUT is zero volts.

(15) OFFSET vernier: for adjustment of baseline of pulse OUTPUT over the range –2.5V to +2.5V.

(16) OUTPUT connector: BNC connector.

(17) SYM/NORM/COMPL switch: SYM position provides an output that is symmetrical about the pulse baseline. NORM/COMPL reverses the duty cycle of the output; what was the normal output becomes the complement and vice versa.

(18) INT LOAD switch: switches the internal 50 ohm load either IN or OUT. With load OUT, max. amplitude is doubled to 10V.

(19) PULSE POLARITY switch: for selecting pulses of either positive or negative polarity with respect to the baseline.

(20) TRIGGER OUTPUT connector: BNC connector supplies positive trigger output. Trigger output is not related to the input in EXT WIDTH and RZ modes.

(21) GATE INPUT connector: BNC connector to which gate pulses are applied. The pulse output and trigger output are synchronous to the gate signal.

(22) TRIGGER INPUT connector: BNC connector to which trigger pulses are applied when the RATE switch is set to EXT (–) or EXT(+).

(23) LINE ON-OFF switch: press-for-on-press-for-off switch.

(24) EXT WIDTH, NORM, RZ switch: NORM enables synchronous pulse and trigger output. With rate switch set to EXT+ and this switch set to RZ (delay trigger) or EXT WIDTH (width trigger) the trigger output is asynchronous to signals applied to the INPUT connector.

(25) INPUT connector: BNC connector to which RZ or EXT WIDTH trigger pulses are applied. Input disabled when rate switch is set to an internal range.

(26) LINE lamp: glows when LINE ON/OFF switch is ON.

Figure 3–1. 8012B Front and Rear Panels – Control Identification Diagrams

3–1 GENERAL

3–2 This section gives some general notes on the operation of the 8012B together with operating instructions for each of the operating modes:

NORM operating mode
RZ operating mode
EXT WIDTH operating mode

Full setting up instructions are given for normal internal trigger mode. For each successive mode only the changes necessary to the control settings are given. For ease of operation the instructions will refer to Figure 3–1 which shows the controls identified by a reference number in a circle. The same reference numbers are used in the text when each control is mentioned. The control settings shown in Figure 3–1 are the same as the initial settings given for normal internal trigger mode.

3–3 OUTPUT FORMATS

3–4 The voltage polarity of the output pulses can be set to positive or negative using the POLARITY switch (19). This facility provides a simple means of adapting the 8012B to drive circuits with shifted power supplies.

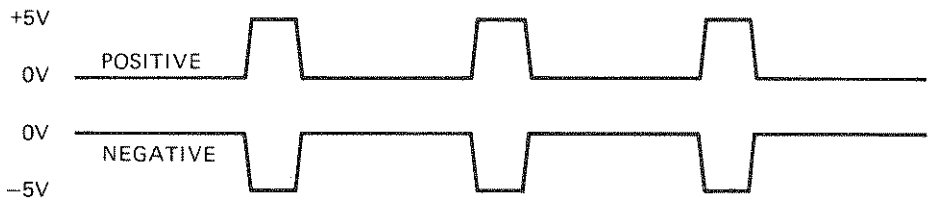


Figure 3–2. Positive and negative pulse outputs

3–5 The output pulse can be set to symmetrical, normal or complement using the SYM/NORM/COMPL switch (17). Thus formats can be changed without having to re-adjust offset or amplitude controls. Symmetrical format provides a very simple means of checking device threshold levels, driving operational amplifiers and simulating amplifier outputs.

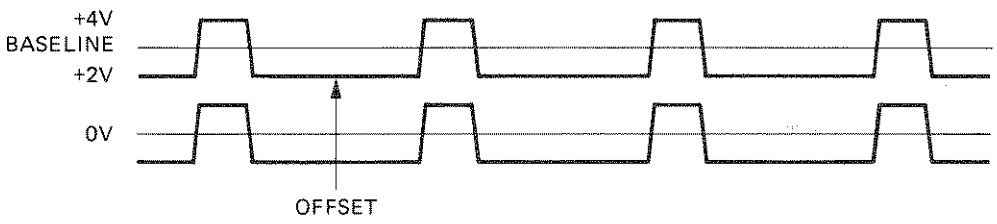


Figure 3–3. Symmetrical Pulse Output

3–6 Normal/Complement pulse switching can be used to provide duty cycles of up to 100% and for rapid switching between logic conventions when testing flip-flop set-up and hold times.

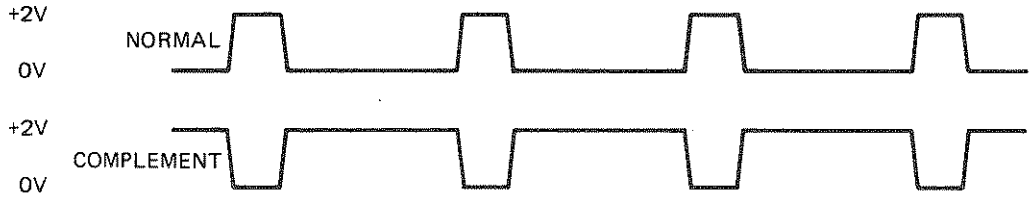


Figure 3–4. Normal and Complement Outputs

3–7 INTERNAL 50 OHM LOAD

3–8 The internal 50 ohm load of the 8012B can be switched in or out using the INT LOAD switch (18). This makes impedance matching to the circuit under test very convenient and also provides a maximum pulse amplitude of ± 10V with the load switched out. When switched in, the output is 5V from 50 ohms into 50 ohms. The DC-offset is automatically switched off when the load is switched out.

3–9 CONTROL LAYOUT

3–10 The front panel of the 8012B has been carefully designed to provide a logical layout of the controls; horizontal controls for pulse timing parameters, vertical controls for pulse amplitude parameters. Thus a particular pulse can be set up extremely easily and quickly. Also, the pulse period, delay and width controls are designed in such a way that incompatible pulse settings will be noticed immediately.

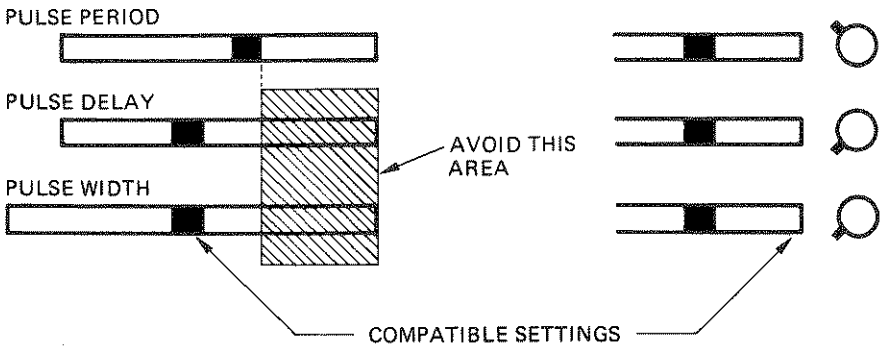


Figure 3–5. Positioning of Controls

3–11 Compatible pulse settings are guaranteed as long as the pulse delay and pulse width controls are either set to the left of the pulse period control or;if set vertically below the period control, that the delay and width verniers are set counter clockwise of the period vernier.

3–12 NORM OPERATING MODE

3–13 There are six ways of operating in the normal mode:

Internal trigger – the repetition rate is determined by the internal rate generator which is internally triggered.

External trigger – the rate generator is disabled and an external signal is used as the trigger source.

Manual trigger – one pulse is produced each time the MAN button is pressed.

Square wave – in each of the above modes a square wave output can be selected (pulse width = pulse period/2) instead of the variable pulse width output. The frequency is divided by two.

Gating – each of the outputs obtained above (except square wave) can be gated using an external input.

Double pulse – this mode can be selected with any of the above outputs except square wave. Two pulses are produced for each trigger pulse. The delay between each pulse in a pair is variable using the delay controls (5) and (6)

All output pulses are preceded by a trigger pulse at the TRIGGER OUTPUT connector (20) In square wave mode the delay between the trigger output and the pulse output is fixed at 25 ± 8ns, but in other modes the delay can be varied using the PULSE DELAY (5) and VERNIER (6) controls.

3–14 Internal Trigger

3–15 In this mode the 8012B requires no external signal to produce an output. Rate, delay, width, transition times, etc. are all adjustable using the front panel controls. The initial control settings (also shown in Figure 3–1) are given to assist someone unfamiliar with the operation of the 8012B. The pulse and trigger outputs should be connected to an oscilloscope using a 50 ohm system (as shown in Figure 3–6). The oscilloscope (an HP 180C mainframe with 1801A and 1821A plug-ins) should be set with the sweep time at 5μs/div and the sensitivity at 2V/div.

PULSE PERIOD (2)	1μ–.1m
VERNIER (3)	Center
PULSE DOUBLE/NORM (4)	NORM
PULSE DELAY (5)	1μ–.1m
VERNIER (6)	CCW
PULSE WIDTH (7)	1μ– .1m
VERNIER (8)	CCW
TRANSITION TIME (9)	5n–0.5μ
LEADING EDGE (10)	Center
TRAILING EDGE (11)	Center
AMPLITUDE (12)	5.0–2.0
VERNIER (13)	CW
POLARITY (19)	+
OFFSET (14)	ON
VERNIER (15)	Center
SYM/NORM/COMPL (17)	NORM
INT LOAD (18)	IN
Mode selector (24)	NORM
LINE (23)	ON

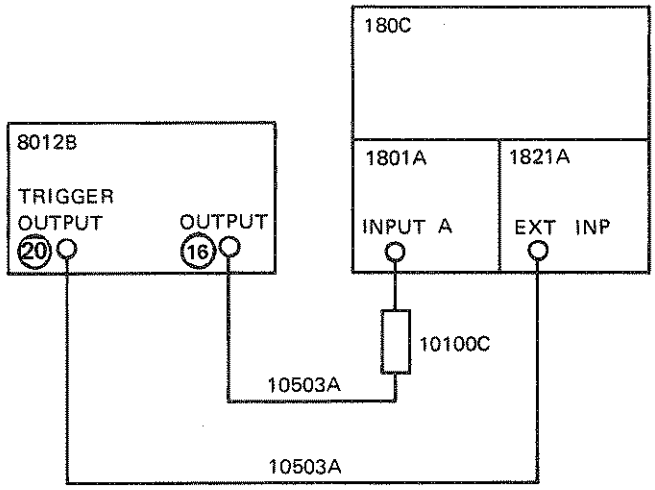


Figure 3–6. Initial control settings and test equipment

3–16 The circuits and controls involved in normal internal trigger mode are shown in Figure 3–7.

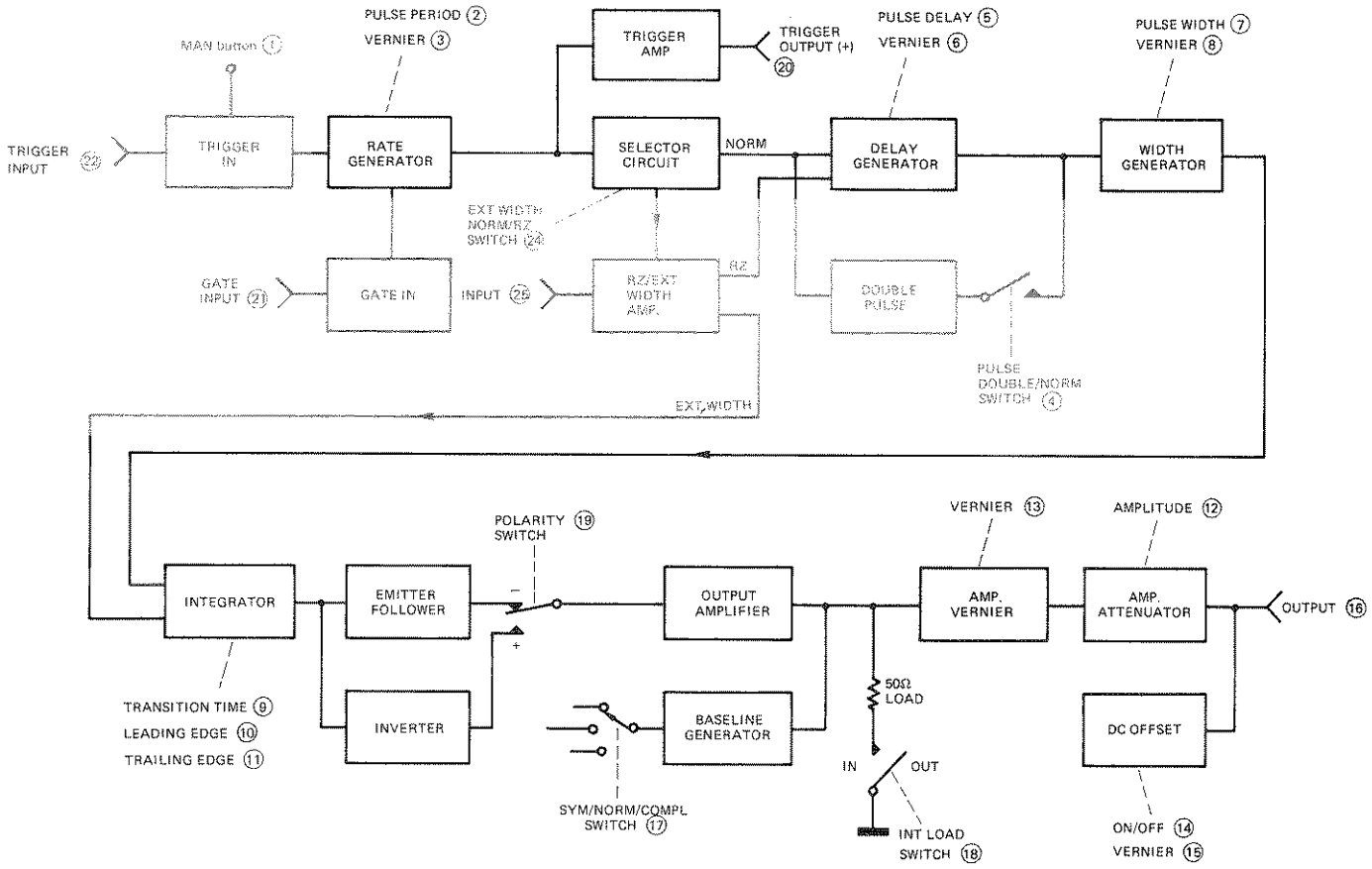


Figure 3–7. Normal Internal Trigger Mode – Block Diagram

3–17 The output pulses should appear at the OUTPUT (16) connector as shown in Figure 3–8 according to the settings of the POLARITY switch (19) and the SYM/NORM/COMPL switch (17) .

3–18 If the INT LOAD switch (18) is set to OUT, the internal 50 ohm load is switched out (this can only be done if the 8013B has an external 50 ohm load), the amplitude of the output pulse doubles and the offset is disabled. All other pulse parameters remain the same.

3–19 External Trigger

3–20 In this mode the repetition rate generator is disabled and each trigger pulse is produced by an external signal which is applied at the TRIGGER INPUT connector (22) . The input signal can be sinewave of > 1.7V p-p (about zero) or pulses > 0.8V amplitude (positive or negative) and at least 7ns wide. The amplitude must not exceed ± 7V.

a. Set the PULSE PERIOD control (2) to EXT (+) to trigger on the positive going slope of the input or to EXT (–) to trigger on the negative going slope.

b. The pulse delay, width, amplitude, transition times, etc. are determined by the front panel controls and can be left at the same settings as for normal internal trigger mode.

3–21 The circuits and controls involved in normal external trigger mode are shown in Figure 3–9.

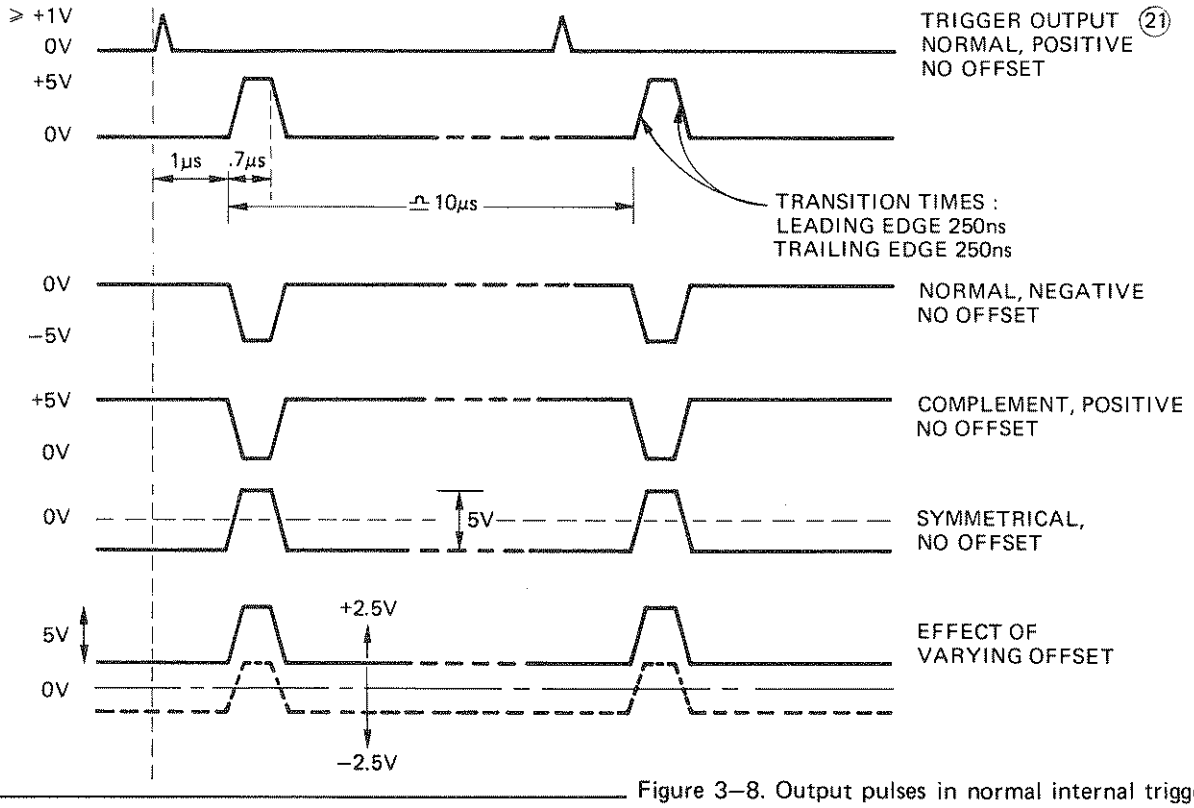


Figure 3–8. Output pulses in normal internal trigger mode

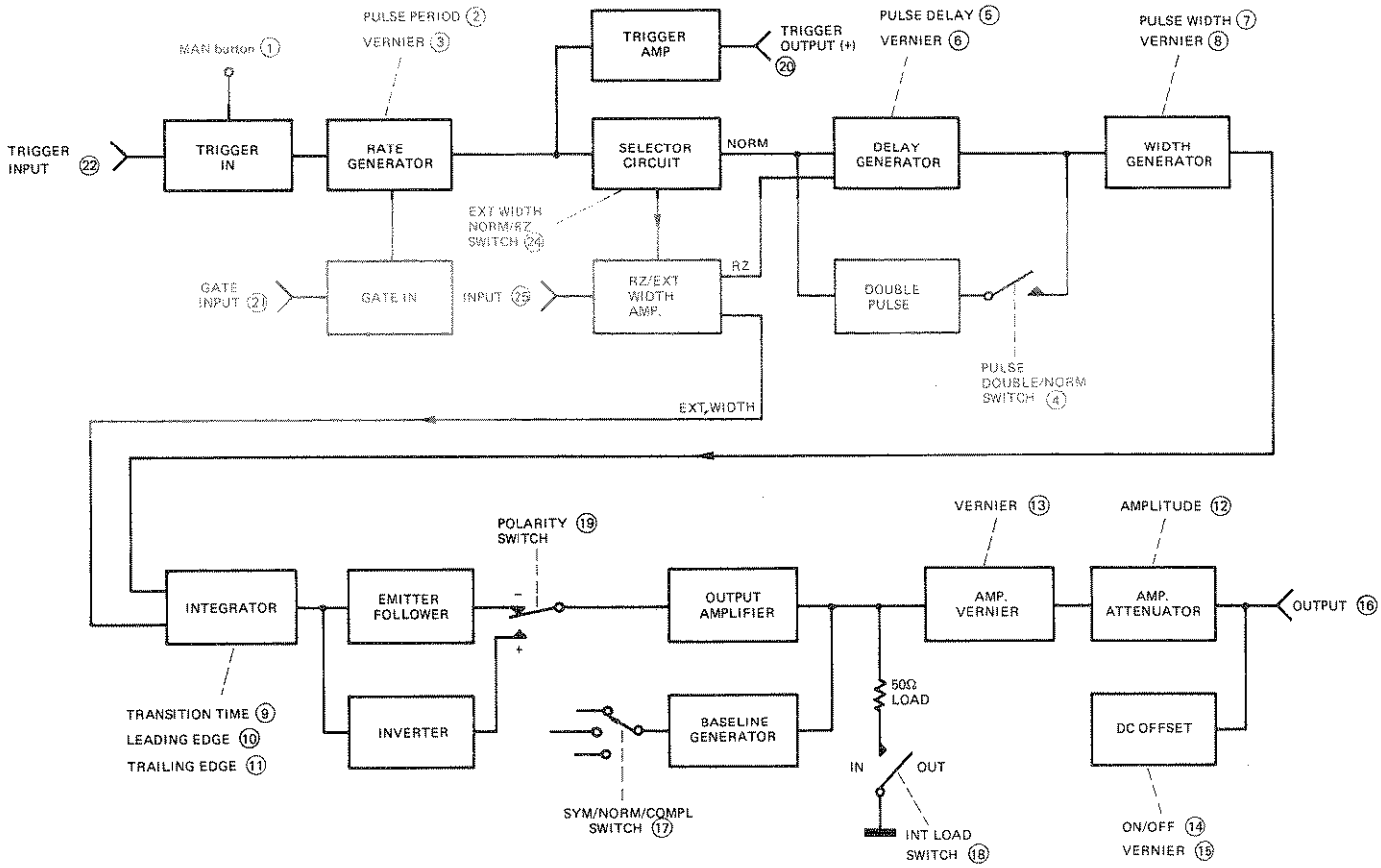


Figure 3–9. Normal External Trigger Mode — Block Diagram

3–22 The output pulses should appear at the TRIGGER OUTPUT (20) and OUTPUT (16) connectors as shown in Figure 3–10 according to the applied trigger and the setting of the PULSE PERIOD control (2) (either EXT+ or EXT–).

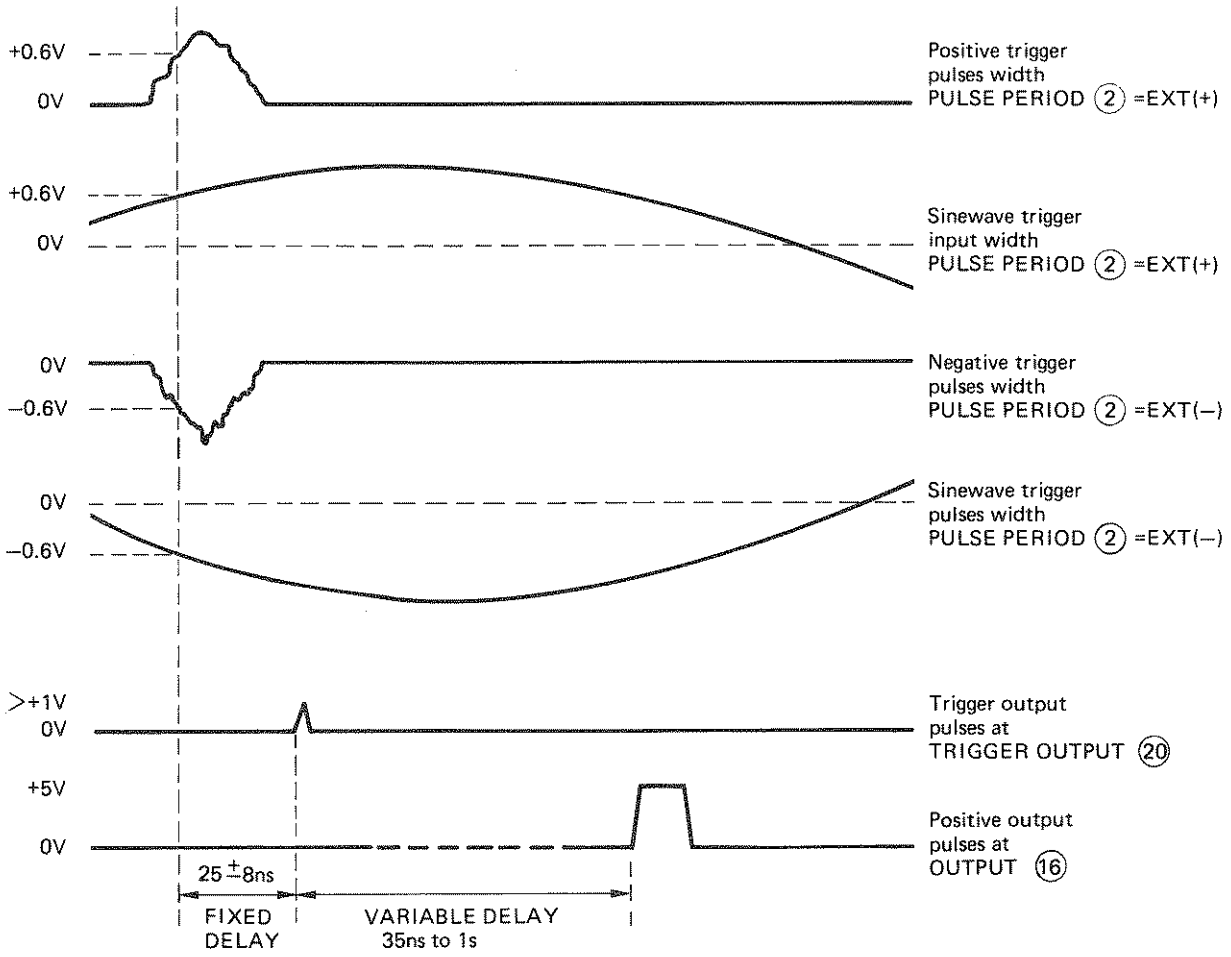


Figure 3–10. Output pulses in normal external trigger mode

3–23 The output pulse parameters and format can be varied using the controls shown in Figure 3–9.

3–24 Manual Trigger

3–25 In this mode the repetition rate generator is again disabled and each trigger pulse is produced by pressing the MAN button (1) once.

a. Set the PULSE PERIOD control (2) to either EXT(+) or EXT(–).

b. The pulse delay, width, amplitude, transition times etc. are determined by the front panel controls and can be left at the same settings as for normal internal trigger mode.

c. Press the MAN button (1) once for each output pulse.

3–26 The circuits and controls involved in normal manual trigger operation are shown in Figure 3–11.

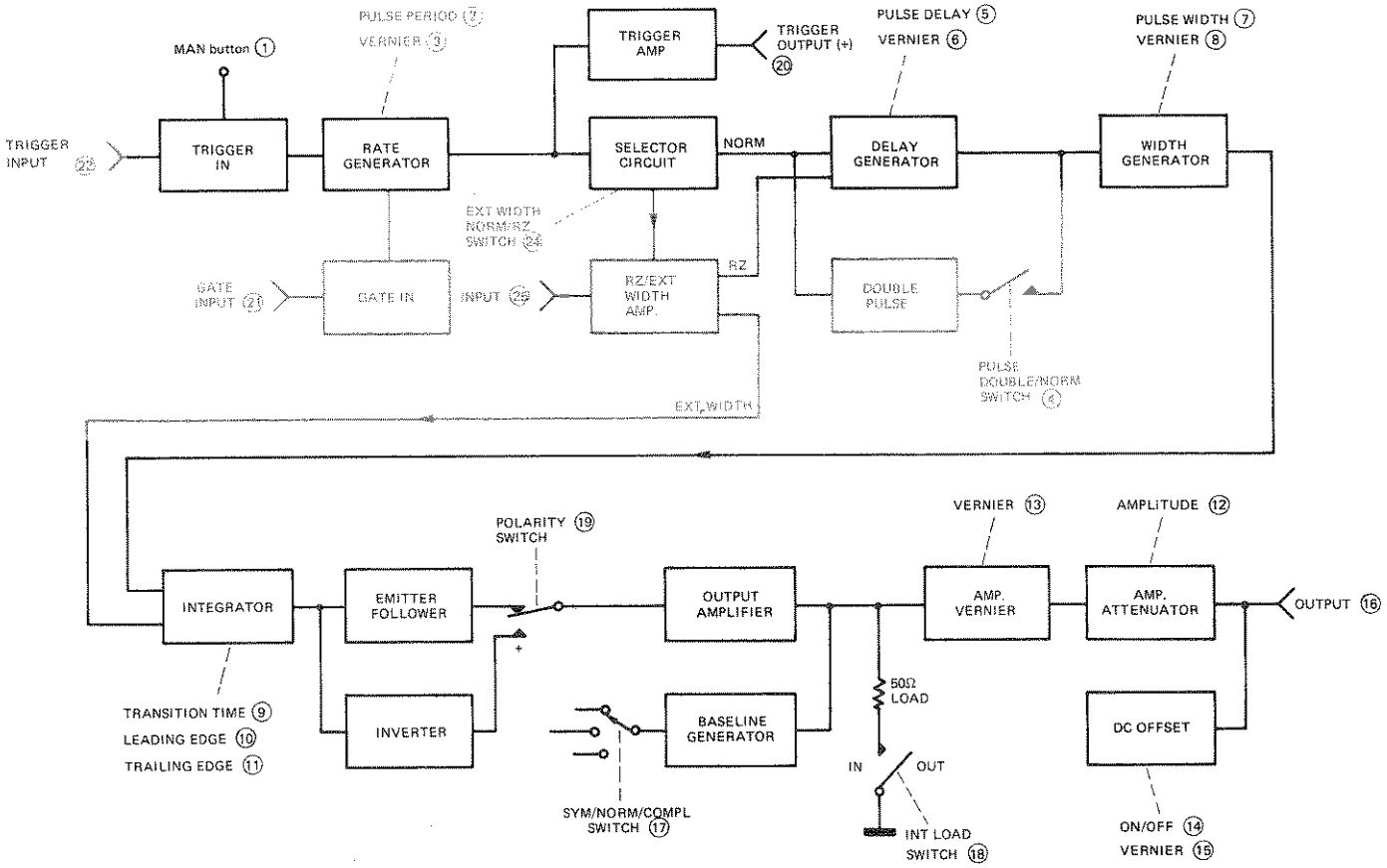


Figure 3–11. Normal Manual Trigger Mode – Block Diagram

3–27 The output pulses should appear at the TRIGGER OUTPUT (20) and OUTPUT (16) connectors as shown in Figure 3–12.

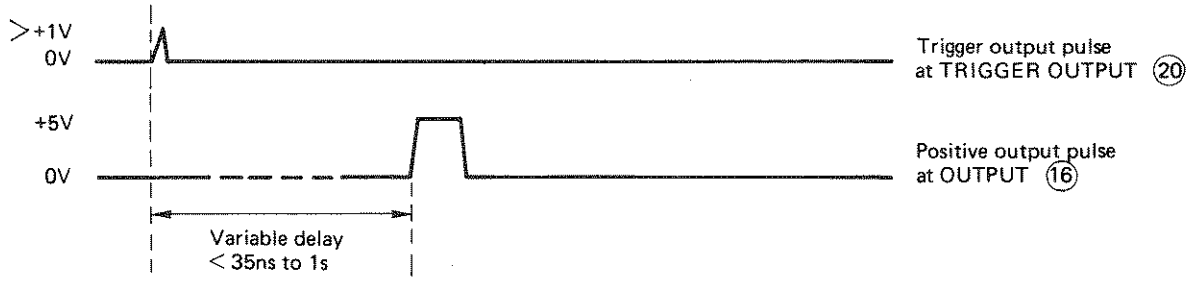


Figure 3–12. Output pulses in normal manual trigger mode

3–28 The output pulse parameters and format can be varied using the controls shown in Figure 3–11.

3–29 Square Wave Mode

3–30 In this mode the pulse width is exactly half the pulse period (50% duty cycle). Pulse period, delay, transition times, amplitude etc. can still be varied using the front panel controls. A square wave output can be selected in any of the preceding operating modes; the following points must, however, be remembered.

a. Output pulse has 50% duty cycle.

b. Output pulse rate is half that of the rate generator (or input trigger pulse).

c. The delay between input trigger pulse and square wave output is fixed.

d. The output pulse is symmetrical above and below the offset level.

e. Square wave output cannot be gated.

3–31 The square wave output can be produced as follows:

a. Set the PULSE PERIOD control (2) to an internal range (as in normal internal trigger mode) or to EXT and apply external trigger pulses at the TRIGGER INPUT connector (22) in order to determine the repetition rate of the output pulses.

b. Set the PULSE WIDTH control (7) to SQUARE WAVE.

c. Set the transition times, amplitude etc of the output pulses as for normal internal trigger mode.

3–32 The circuits and controls involved in square wave mode are shown in Figure 3–13.

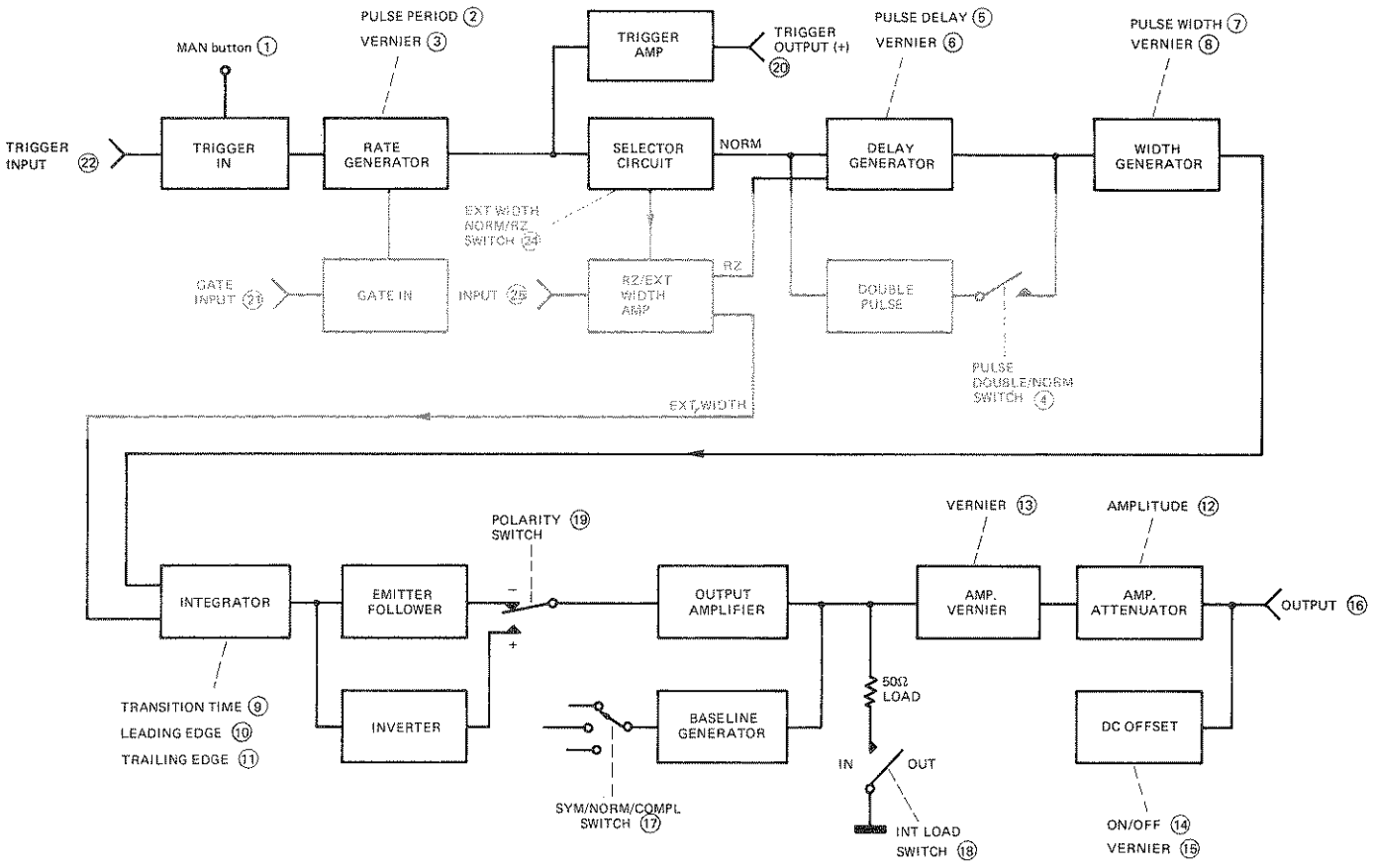


Figure 3–13. Normal square wave mode — block diagram

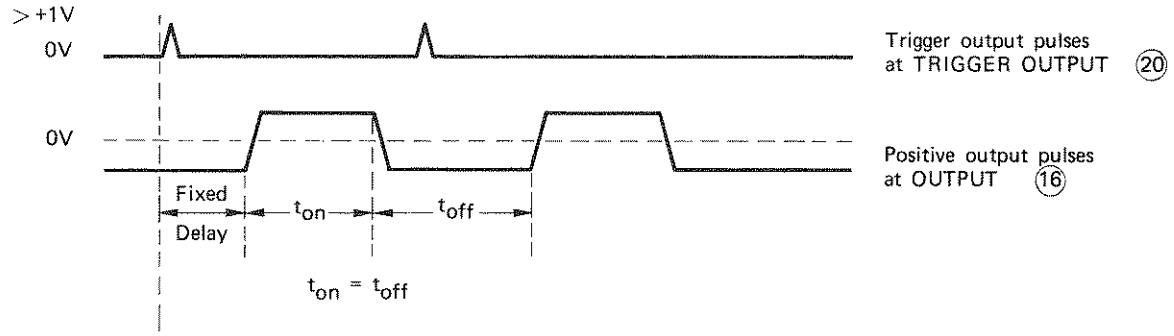


Figure 3–14. Output pulses in square wave mode

3–33 The output pulses should appear at the OUTPUT connector (16) as shown in figure 3–14.

3–34 The output pulse can be switched to negative or normal or complement and the offset and amplitude can be varied.

3–35 Gating Mode

3–35 The output pulses obtained in any of the preceding operating modes can be gated by applying an appropriate pulse to the GATE INPUT (21). If square wave mode is gated, the level of the pulse baseline after the gate has closed depends on the number of pulses during the gate 'on' time (see figure 3–17).

The gate input must meet the following requirements:

to enable the rate generator –
input voltage > +1.5V or resistor > 1KΩ
from gate input to ground.

to disable the rate generator –
input voltage < +0.8V or resistor < 160Ω
from gate input to ground.

The gate input is TTL compatible and the input voltage must not exceed ± 5V.

3–37 The circuits and controls involved in gate mode are shown in Figure 3–15.

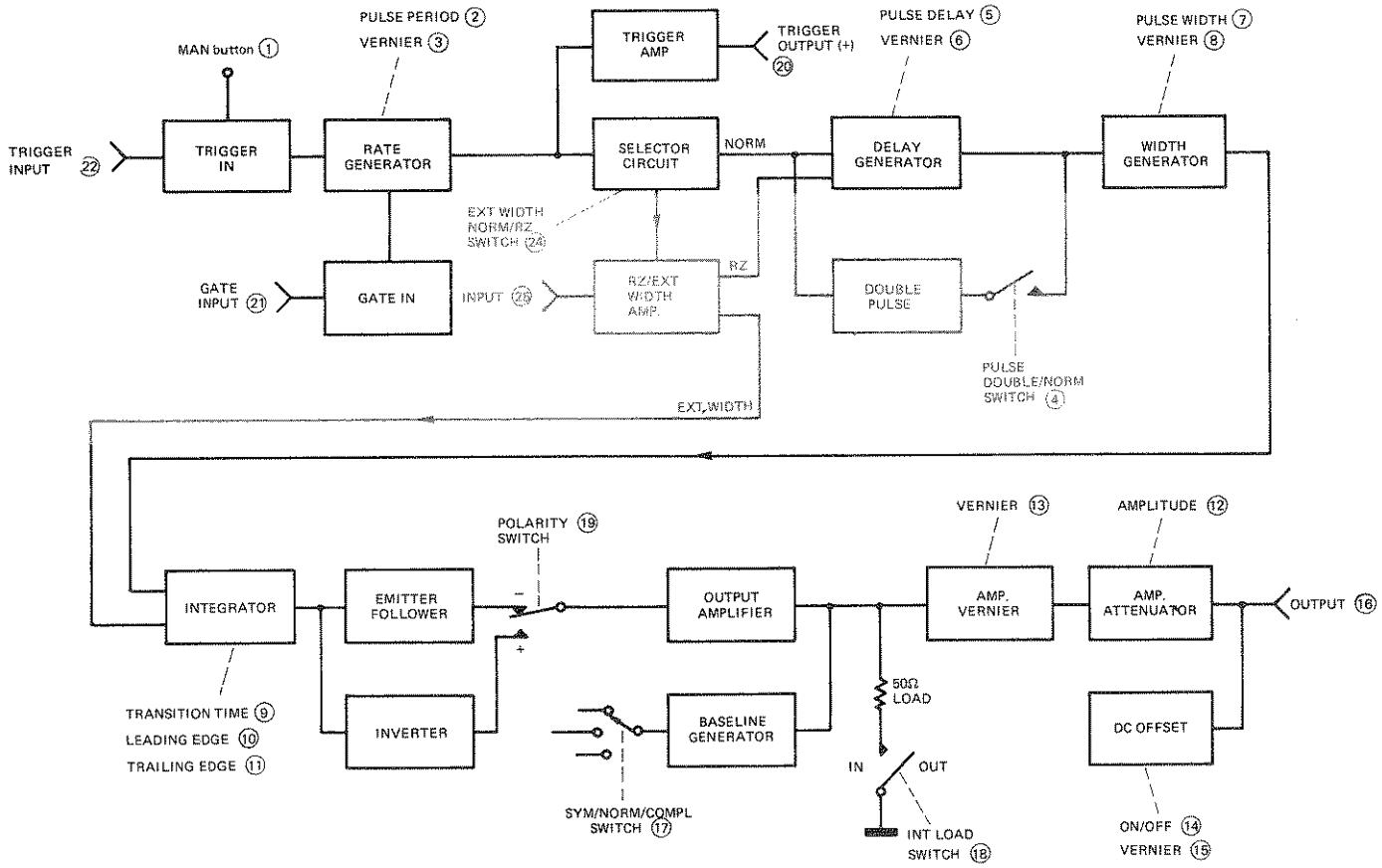


Figure 3–15. Normal gate mode – block diagram

3–38 The output pulses should appear at the TRIGGER OUTPUT (20) and OUTPUT (16) connectors as shown in Figure 3–16.

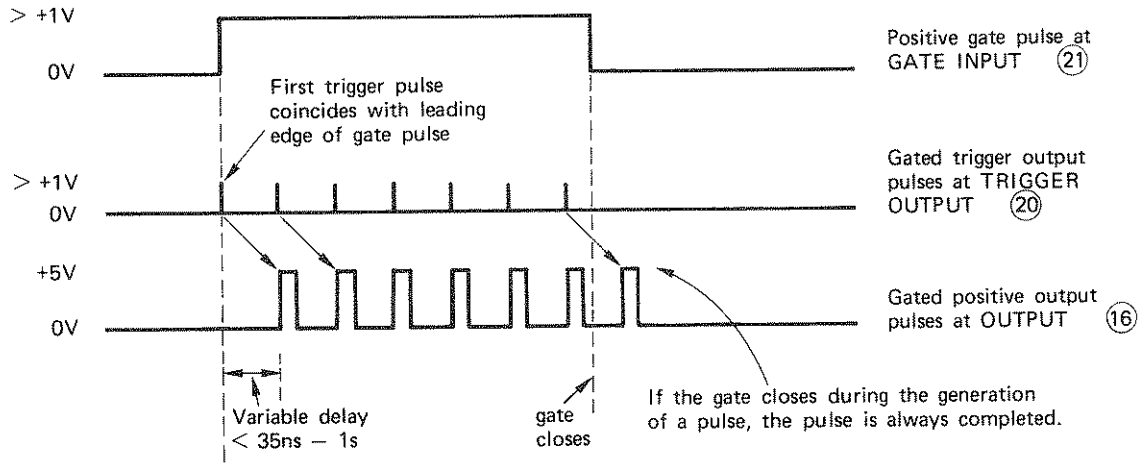
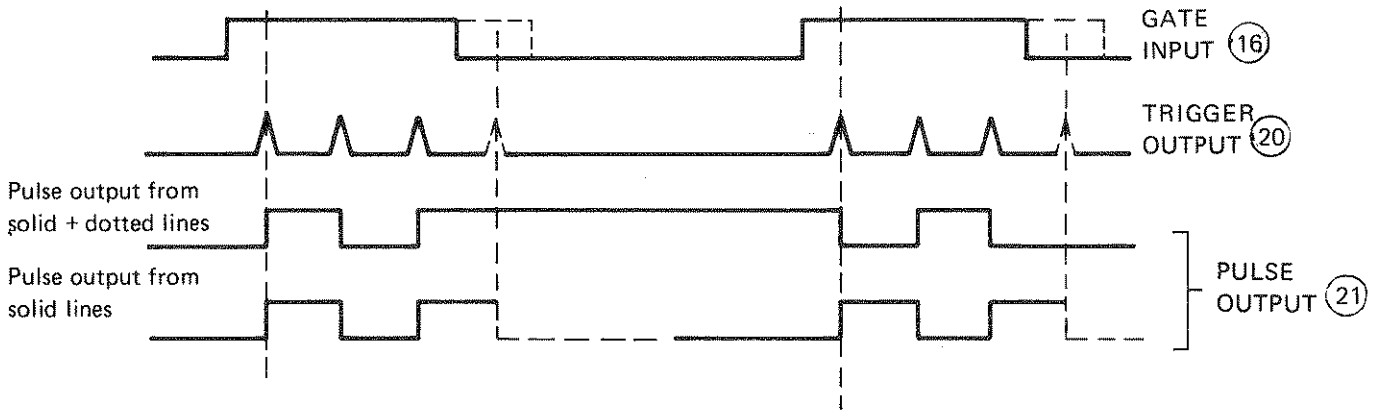


Figure 3–16. Output pulses in gate mode



Note that repetition rate is divided by 2.

Figure 3–17. Gated output in square wave mode

3–39 RZ MODE

3–40 In RZ mode external pulses, applied to the INPUT connector (25) on the 8012B rear panel, trigger the delay generator directly (see figure 3–18). and the shape of the output pulses is determined by the pulse forming circuits following the delay generator. The internal rate generator is not used in RZ mode, thus the trigger output (derived from the rate generator) is independent of the pulse output. The pulse output cannot be gated in RZ mode.

3–41 The circuits and controls involved in RZ mode are shown in Figure 3–18.

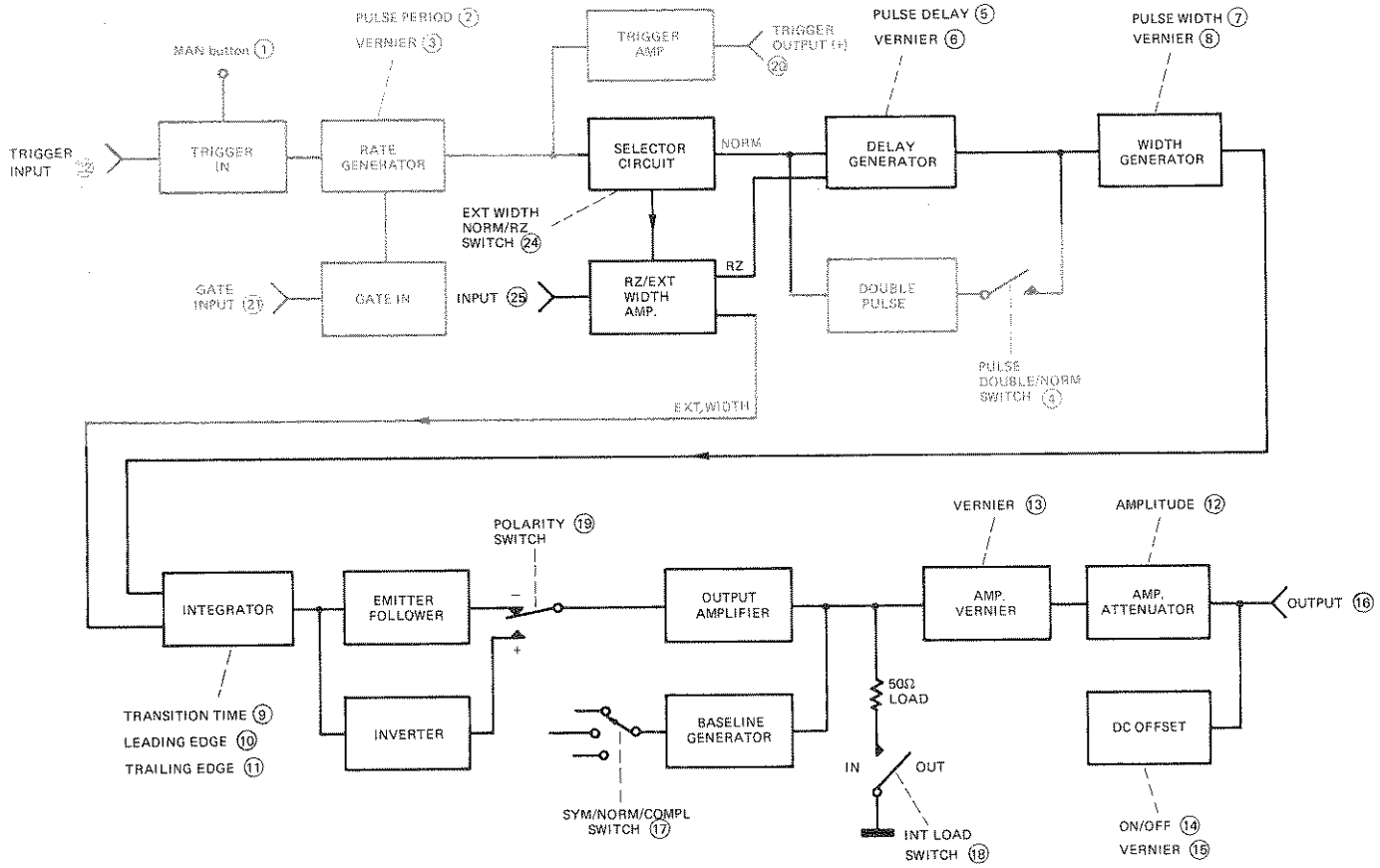


Figure 3–18. RZ mode – block diagram

3–42 The RZ input signal must be > +1V to a maximum of ± 5V in amplitude and must be at least 7ns wide.

3–43 The procedure for obtaining an output in RZ mode is as follows:

a. Connect the external signal to the INPUT connector (25) on the rear panel of the 8012B.

b. Set the Mode Selector switch (24) to RZ.

c. Set the pulse delay, width, transition times, amplitude, offset and output format as required.

3–44 The output pulses should appear at the OUTPUT connector (16) as shown in Figure 3–19.

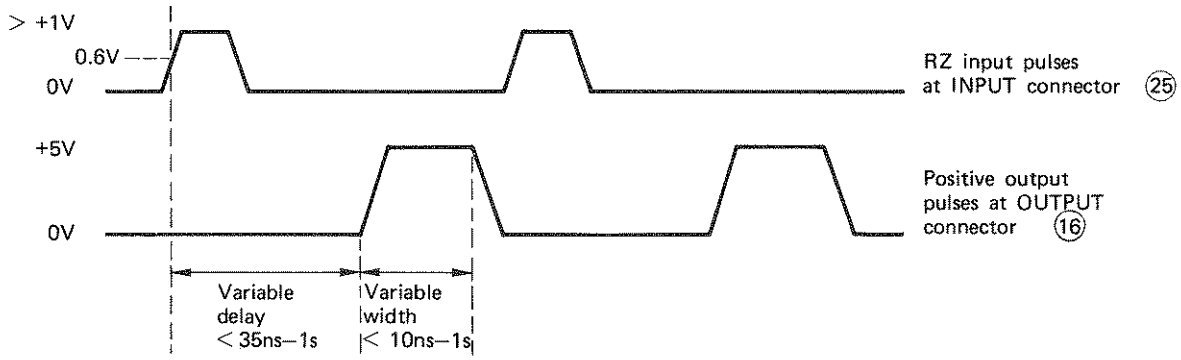


Figure 3–19. Output pulses in RZ mode

3–45 DOUBLE PULSE Mode

3–46 In this mode, the 8012B delivers two pulses at the OUTPUT connector (16) for each trigger pulse. One pulse is in phase with the TRIGGER OUTPUT (20) ; the other pulse is delayed by the time set on the PULSE DELAY controls (5) and (6).

3–47 Double pulse output can be selected in any of the preceding operating modes except square wave.

Double pulse output is produced as follows:

a. Set the PULSE DOUBLE/NORM switch (4) to DOUBLE.

b. The remaining pulse parameters and output format can be set as required.

3–48 The circuits and controls involved in double pulse mode are shown in Figure 3–20.

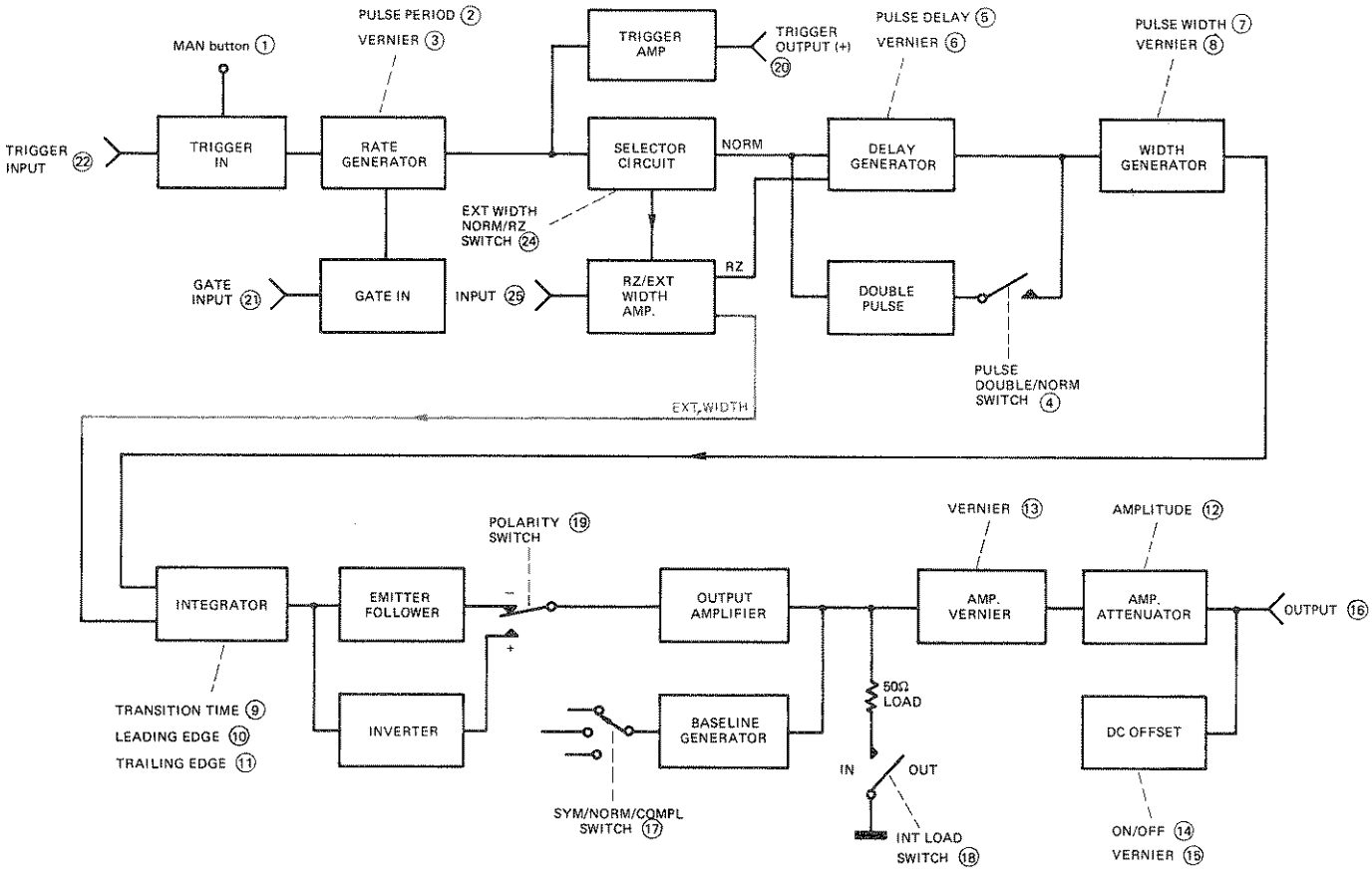


Figure 3–20. Double pulse mode – block diagram

3–49 The trigger and output pulses should appear at the TRIGGER OUTPUT (20) and OUTPUT (16) connectors as shown in Figure 3–21.

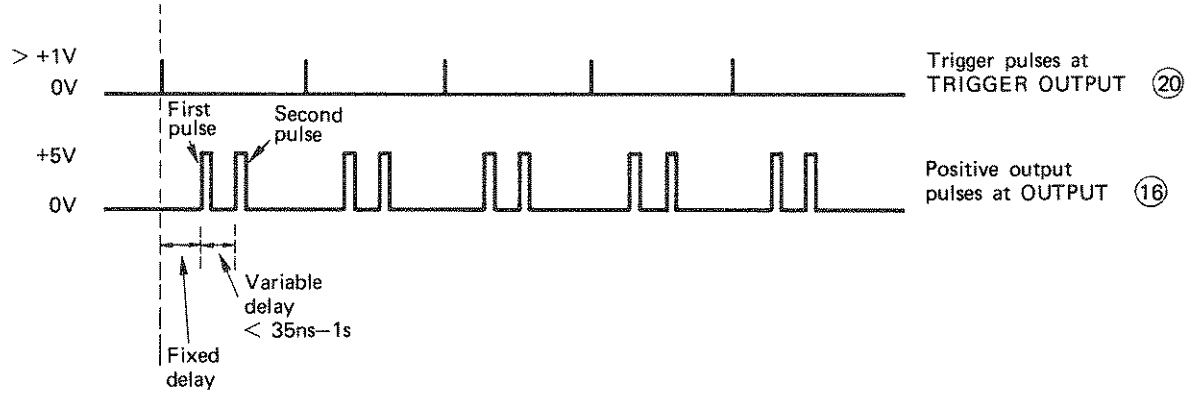


Figure 3–21. Output pulses in double pulse mode

3–50 EXTERNAL WIDTH MODE

3–51 In this mode, external pulses, applied to the INPUT connector (25) on the rear panel, trigger the transition time integrator (see figure 3–22) and cause the output amplifiers to change state at the threshold level of the input signal. Thus the pulse output is a shaped version of the input. It is also independent of the TRIGGER OUTPUT (20) . The external width input signal must be > +1V to a maximum of ± 5V in amplitude and must be at least 7ns wide.

3–52 The circuits and controls involved in external width mode are shown in Figure 3–22.

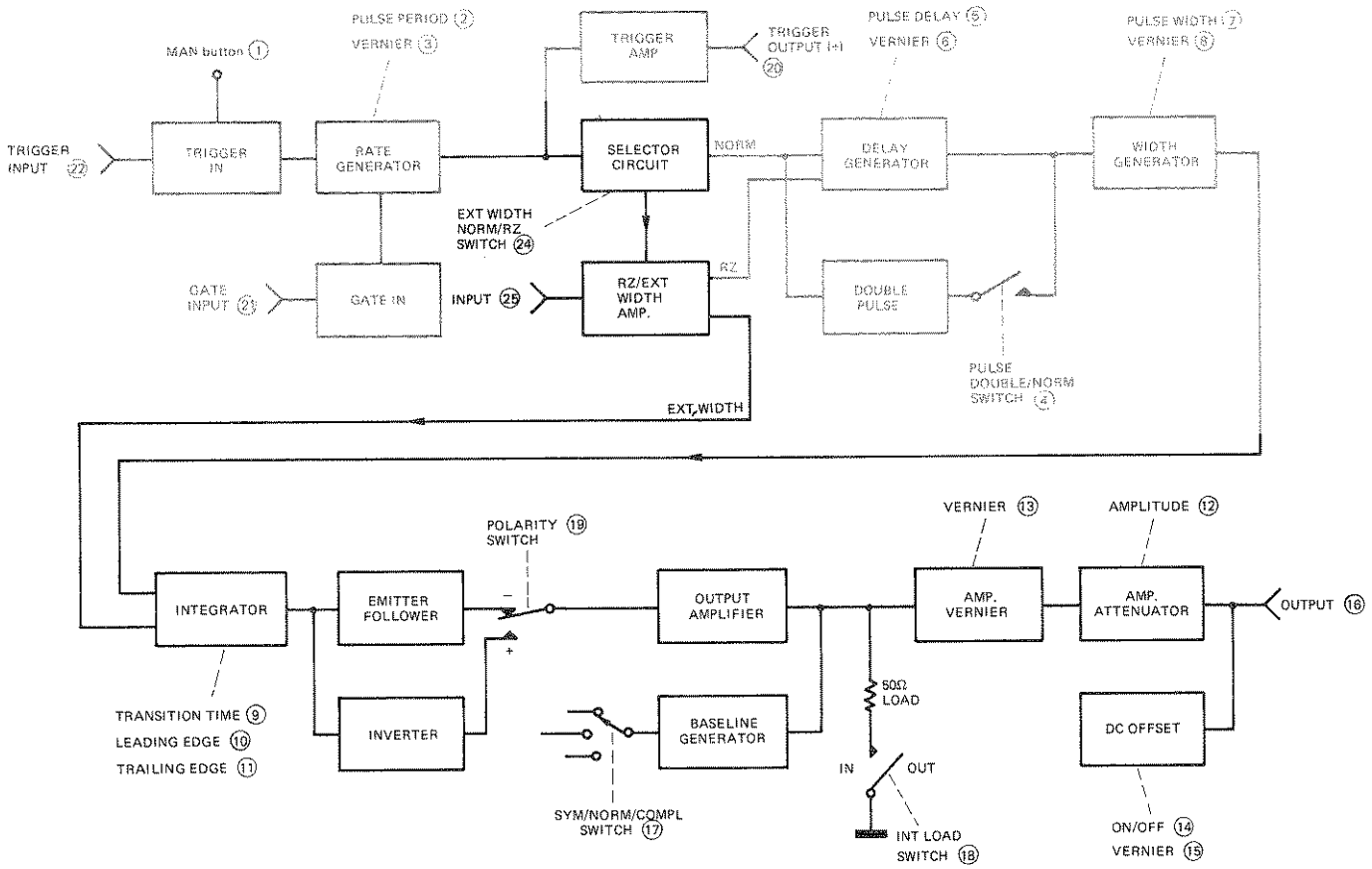


Figure 3–22. External width mode – block diagram

3–53 The procedure for obtaining an output in external width mode is as follows:

a. Connect the external signal to the INPUT connector (25) on the rear panel of the 8012B.

b. Set the Mode Selector switch (24) to EXT WIDTH.

c. Set the pulse transition times, amplitude and output format as required.

3–54 The output pulses should appear at the OUTPUT connector (16) as shown in Figure 3–23.

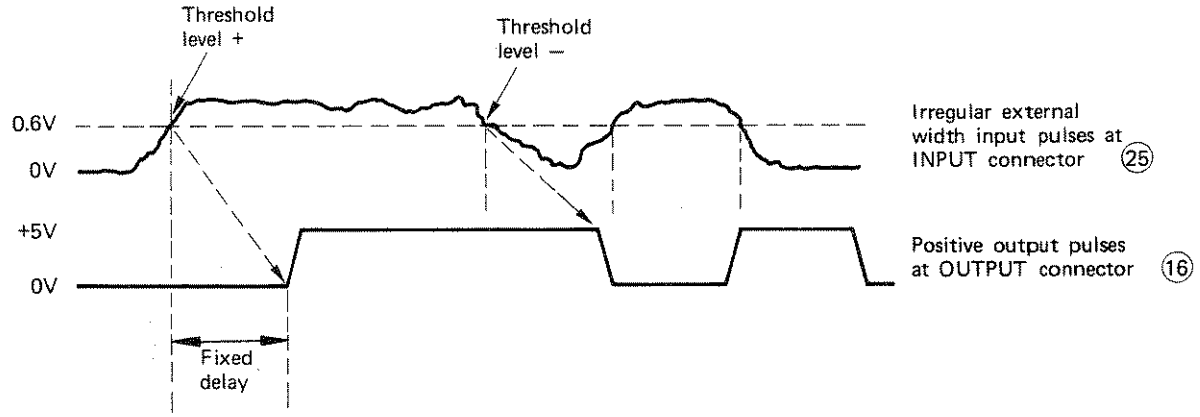


Figure 3–23. Output pulses in external width mode

3–55 ADDITIONAL FACILITIES IN RZ AND EXT WIDTH MODES

3–56 When operating in RZ or EXT WIDTH modes, the internal rate generator is available as an independent clock generator which provides an output at the TRIGGER OUTPUT connector (20). This output can be triggered internally, externally or manually and can also be gated as in the normal operating mode. If this facility is not required, it can be switched off by setting the PULSE PERIOD control (2) to EXT and disconnecting the TRIGGER INPUT (20). The circuits and controls involved in this facility are shown in Figure 3–24.

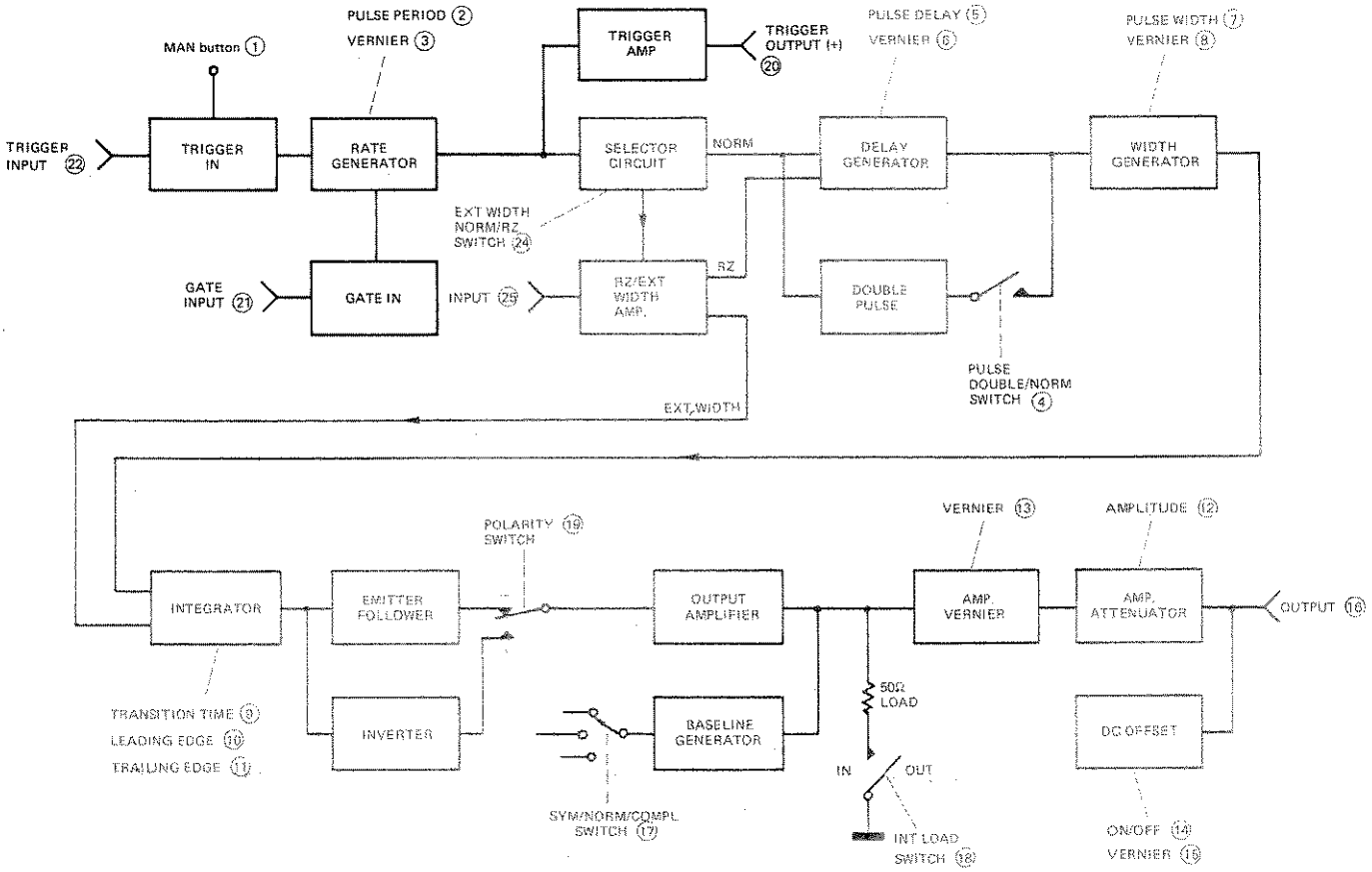


Figure 3–24. Independent clock generator in RZ/EXT WIDTH modes – block diagram