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Miniature Time Code Generators

Datum 9150-3053 & 9150-3059

Operating Manual

9150-3053 & 9150-3059



Timing, Test & Measurement



Miniature Time Code Generators

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Chapter One

INTRODUCTION/PRODUCT OVERVIEW

This Operator Manual contains procedures and descriptive information for proper installation and operation of the Datum 9150-3053 and 9150-3059 Miniature Time Code Generator. Both instruments are very similar in design and construction, so most of the information in this Operator Manual applies equally to both.



NOTE ...

Where there are differences between the two instruments, a note will be provided to highlight and explain the differences.

OPERATING MANUAL SUMMARY

This Operating Manual is divided into the following chapters:

A. CHAPTER ONE – INTRODUCTION/PRODUCT OVERVIEW

This chapter includes a general description of the two 9150 Time Code Generators and provides some basic product information.

B. CHAPTER TWO – INSTALLATION

Describes initial inspection, preparation for use, and installation.

C. CHAPTER THREE - OPERATION

Describes the use and function of all operator controls and indicators.

D. CHAPTER FOUR – SPECIFICATIONS

Provides detailed specifications for all aspects of both instruments.



PURPOSE OF EQUIPMENT

These Miniature Time Code Generators are designed to provide a source of IRIG B serial time code (modulated on a 1 kHz sine wave carrier). Both units can be powered by standard airborne DC power (+28 VDC) or by a standard automotive battery (+12 VDC). The units also include an internal nickel-cadmium (NiCd) battery if external power is not available. See Chapter Four for complete specifications.

PHYSICAL DESCRIPTION

Datum 9150-3053

The Datum 9150-3053 outputs IRIG B serial time code (via a BNC connector) and IRIG B DC Level Shift (DCLS) code via a pin in the POWER connector. The unit also outputs parallel BCD time with a resolution of one millisecond (days, hours, minutes, seconds and milliseconds). The unit can be manually started by pressing the SYNC/START button on the front panel. Alternatively, an external TTL low pulse or a contact closure to ground can be used (input via a pin in the POWER connector). An internal NiCd battery provides full operation for up to twelve hours on a full charge.

FIGURE 1-1. 9150-3053 FRONT PANEL

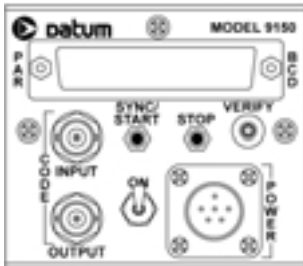
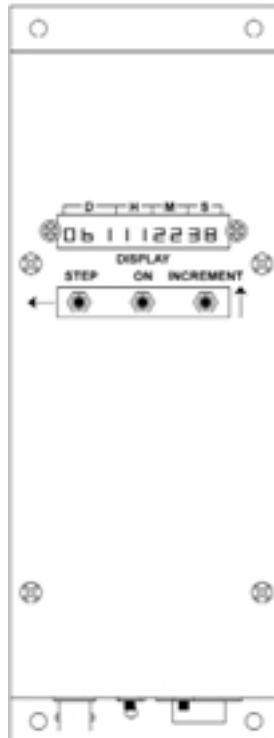


FIGURE 1-2. 9150-3053 TOP VIEW



Please see notes on the following page.



DATUM 9150-3059

The Datum 9150-3059 outputs IRIG B serial time code (via a BNC connector). The unit can be manually started by pressing the SYNC/START button on the front panel. An internal NiCd battery provides full operation for up to four hours on a full charge. See Chapter Four for complete specifications.

FIGURE 1-3. 9150-3059 FRONT PANEL

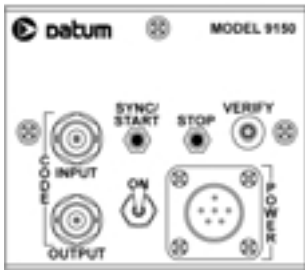
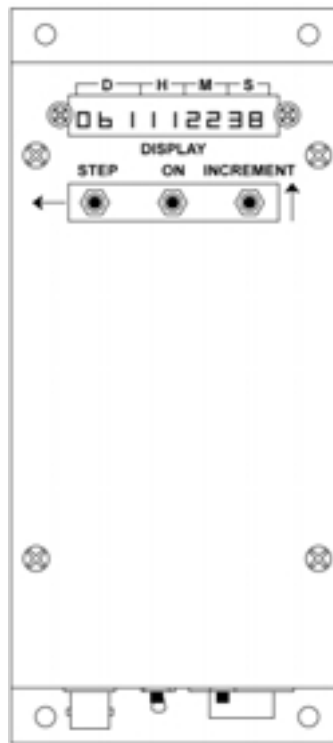


FIGURE 1-4. 9150-3059 TOP VIEW



NOTE ...

An IRIG B DCLS signal is output by the 9150-3053 via a pin in the POWER connector. This output is not available on the 9150-3059.



NOTE ...

An External Start pulse can be input to the 9150-3053 through a pin in the POWER connector. This input is not implemented in the 9150-3059.



NOTE ...

The internal battery of the 9150-3053 will sustain operation for up to 12 hours with a full charge. The internal battery of the 9150-3059 will sustain operation for up to 4 hours on a full charge.



NOTE ...

The 9150-3053 outputs BCD time (D-mS). The 9150-3059 does not.

TYPOGRAPHICAL AND OTHER CONVENTIONS

This Operating Manual uses the following conventions:

Acronyms and Abbreviations – Terms are spelled out the first time they appear in this Operating Manual. Thereafter, only the acronym or abbreviation is used. In addition, the glossary defines the acronyms and abbreviations.

Table 1-1 describes the typographical conventions that this Operating Manual uses to distinguish between the different types of information according to how they are used.

TABLE 1-1. TYPOGRAPHICAL CONVENTIONS

WHEN TEXT APPEARS THIS WAY...	IT MEANS...
9150-3053 & 9150-3059 Operating Manual	The title of a document or the name of a product
CRITICAL PORT-1 J1	An operating mode, alarm state, status, or chassis label.
Press the Enter key. Press the Print Scrn key.	An named keyboard key. The key name is shown as it appears on the keyboard. An explanation of the key's acronym or function immediately follows the first reference to the key, if required.
A re-timing application...	A term or a word being emphasized.
Datum does not recommend...	A word or term given special emphasis so that you do not miss the idea being presented.

WARNINGS, CAUTIONS, RECOMMENDATIONS, AND NOTES

Warnings, Cautions, Recommendations, and Notes attract attention to essential or critical information in this Operating Manual. The types of information included in each are explained as follows:



WARNING ...

All warnings have this symbol. Do not disregard warnings. They are installation, operation, or maintenance procedures, practices, or statements that if not strictly observed, may result in personal injury or loss of life.



ELECTRICAL SHOCK HAZARD ...

All electrical shock hazard warnings have this symbol. To avoid serious personal injury or death, do not disregard electrical shock hazard warnings. They are installation, operation, or maintenance procedures, practices, or statements that if not strictly observed, may result in personal injury or loss of life.



CAUTION ...

All cautions have this symbol. Do not disregard cautions. They are installation, operation, or maintenance procedures, practices, conditions, or statements that if not strictly observed, may result in damage to or destruction of equipment or may cause a long-term health hazard.



CAUTION ...

All Electrostatic Discharge (ESD) cautions have this symbol. They are installation, operation, or maintenance procedures, practices, conditions, or statements that if not strictly observed, may result in electrostatic discharge damage to, or destruction of, static sensitive components of the equipment.



RECOMMENDATION ...

All recommendations have this symbol. Recommendations indicate manufacturer-tested methods or known functionality. They contain installation, operation, or maintenance procedures, practices, conditions, or statements that provide you with important information for optimum performance results.



NOTE ...

All notes have this symbol. Notes contain installation, operation, or maintenance procedures, practices, conditions, or statements that alert you to important information which may make your task easier or increase your understanding.



9150-3053 & 9150-3059

WHERE TO FIND ANSWERS TO PRODUCT AND DOCUMENT QUESTIONS

If you believe that this product is not performing as expected, or if you have comments about this Operating Manual, please contact your Datum representative or sales office.

We appreciate your suggestions on ways to improve this Operating Manual. Please mark or write your suggestions on a copy of the page and mail or fax it to ...

Datum – Timing, Test & Measurement
34 Tozer Road
Beverly, MA 01915-5510
US Toll Free: 1-800-544-0233
Phone: +1-978-927-8220
Fax: +1-978-927-4099
E-mail: ttmsales@datum.com

Thank you for providing the information.



NOTE ...

Datum offers a number of applicable training courses designed to enhance product usability. Contact your Datum representative or sales office for a complete list of courses and outlines.



Chapter Two

INSTALLATION

INTRODUCTION

This section describes the unpacking, inspection, and installation of the Datum 9150-3053 and 9150-3059 Time Code Generators.

UNPACKING AND INSPECTION

The Time Code Generator is packaged in one shipping container. Inspect the unit for visible damage (scratches, dents, etc.). If the instrument is damaged, immediately notify both Datum and the responsible carrier. Keep the shipping container and packing material for the carrier's inspection.



NOTE ...

When communicating with either Datum or the responsible carrier regarding shipping damage, refer to the serial number. This number is located on the top panel of the TCG.

INSTALLATION CONSIDERATIONS

General Cautions/Hazards to be considered when installing the TCG into an equipment rack:

TMRA — The maximum recommended ambient temperature (TMRA) that this equipment is specified to operate in is 60°C.

ELEVATED OPERATING AMBIENT TEMPERATURE — If installed in a closed compartment, the operating ambient temperature inside the compartment may be greater than the temperature outside the compartment. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum rated ambient temperature (TMRA).

REDUCED AIR FLOW — The equipment has no cooling fans and depends on convection for cooling. Installation in an instrument compartment may cause an excessive heat rise if sufficient air flow is not available. Installation should be such that the amount of air flow required for safe operation of the equipment is not compromised.

CIRCUIT OVERLOADING — Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of circuits might have on over current protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.

RELIABLE GROUNDING — Reliable grounding of equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g., use power strips).



CONNECTIONS

PRIMARY POWER CONNECTION

Connect the Front Panel 6-pin MS connector to a source of +12 VDC or +28 VDC power. Refer to Table 4-1 or 4-2 in Chapter Four for pin assignments.

CODE INPUT - BNC

For purposes of initial time setting, connect this front panel BNC to a reliable source of IRIG B time code.

CODE OUTPUT - BNC

Connect the IRIG B122 output as required.

PARALLEL BCD – 50 PIN D CONNECTOR (9150-3053 ONLY)

Connect the Parallel BCD output (days - milliseconds) as required. See Table 4-3 in Chapter Four for pin assignments.

Because the Parallel BCD time output has a resolution of one millisecond, the output changes every millisecond. The internal BCD counter has a short period of ambiguity for a few microseconds every millisecond when the time value is advanced. To ensure that the user can always get an unambiguous time value, a signal (sample time/) is output on pin 29 of the 50- pin PAR BCD connector (see Table 4-3 in Chapter Four). This signal is normally TTL high, indicating that a valid time sample is being output. When the time value is being updated, the term sample time/ goes low, and remains low for a period of approximately 25 microseconds. While this signal is low, the outputs on the PAR BCD pins are in transition. When the signals are once again stable, the sample time/ signal returns to the high state.

Datum recommends that the positive-going edge of sample time/ (which occurs at the end of the time value update period) be used as a trigger to clock time data into the user's equipment, thus ensuring that every time sample is valid.



NOTE ...

The 9150-3053 outputs BCD time (D-mS). The 9150-3059 does not..



Chapter Three

OPERATION

OPERATING PROCEDURES

Apply DC Power by setting the power switch to the ON position.

This instrument uses a "Power-On Reset" circuit to create a starting point stopped mode. Unusual input power conditions (such as a slow turn on) can cause an invalid operating mode. If this occurs, turn the power switch off for approximately ten seconds, then turn back on.



NOTE ...

The power switch must be on to permit operation on battery or battery charging. Charging a fully discharged battery takes approximately twenty-four hours.

To enter the time into the unit manually, if an external IRIG B source is not available, proceed as follows:

- Press the STOP switch located on the front panel of the unit as the time may only be preset into the unit when it is stopped.
- Press and hold the DISPLAY ON button and observe that the LED display illuminates with one of the digits blinking.
- Observe that pressing the STEP button causes the blinking digit to move to the left. Use the STEP button to cause the rightmost, Units of Seconds digit to blink, then release it.
- Press the INCREMENT button and observe the blinking digit increments. Hold the INCREMENT button down until the desired digit appears, then release it.
- Use the STEP and INCREMENT buttons as described above to enter the desired time, seconds through hundreds of days.
- When the time has been entered press the SYNC/START switch, which will cause the unit to start generating time.
- The DISPLAY ON button may be used to verify that the time has been preset correctly.



NOTE ...

Time is set from right to left (least value to greatest). This is to avoid the unintentional incrementing of a digit already set. For example, if the seconds value is "48" and you want to set seconds to "00," incrementing the units of seconds digit from 8 to 9 to 0 would 'carry' to the left, adding one to the tens of seconds digit. If you were to set the time from left to right, this would introduce an error in the time setting. However, since time is set from right to left, the carry is not significant, since the digit affected has not yet been set.



To enter the time from an external IRIG B source proceed as follows:

- Connect the external IRIG B source to the CODE INPUT connector (BNC).
- Momentarily pressing the SYNC/START switch causes the time to be set to the external IRIG B source. The VERIFY LED will illuminate for a few seconds then extinguish.



NOTE ...

For the 9150-3053, momentarily grounding pin E of the POWER connector causes the same effect as pressing the SYNC/START button. The 9150-3059 is not equipped with this function.

- The DISPLAY ON button may be used to verify that the time has been preset correctly.

OSCILLATOR ADJUSTMENT

Adjustments are normally required only to set the frequency. This is easily accomplished through a hole in the oscillator cover.



CAUTION ...

Care should be used in handling CMOS integrated circuits. Users must remember that CMOS devices can be seriously damaged if subjected to high electrical fields in the gate oxide regions. Such stress voltages can sometimes be caused by improper testing methods. However, very likely sources are random electrical charges. Possible damage from such static charges can be avoided by implementing the following handling procedures:

- All package leads should be shorted together whenever the device is handled or stored. The devices are shipped this way.
- Personnel handling CMOS devices should wear anti-static clothing and be electrically grounded when handling packaged units. This is standard procedure on most CMOS assembly lines.
- Your equipment which comes in contact with finished units should be properly grounded to prevent random voltage spikes.



Chapter Four

SPECIFICATIONS

TIME BASE

Oscillator Type	Temperature Compensated Crystal Oscillator (TCXO)
Oscillator Output	1 MHz square wave
Oscillator Settability	$\pm 1 \times 10^{-7}$
Oscillator Aging	1×10^{-6} /year

TIME CODE INPUT

Serial Code	IRIG B (modulated)
Carrier Frequency	1 kHz sine wave
Carrier Amplitude	1 to 3 V P-P at the marks
Modulation Ratio	2:1 to 6:1
Input Impedance	>10K
Connector	BNC

TIME CODE OUTPUT

Serial Code	IRIG B122 (modulated)
Carrier Frequency	1 kHz sine wave
Carrier Amplitude	3 V P-P nominal at the marks
Modulation Ratio	3:1 nominal
Source Impedance	600 Ω
Connector	BNC

INPUT POWER

Voltage	+12 VDC $\pm 10\%$ or 28 ± 4 VDC (user selectable by connector pin – see Tables 4-2 & 4-3)	
Current:	9150-3053	See Table 4-1
	9150-3059	See Table 4-2
Internal Charger:	Approximately 5 mA operating current (included in the total current above)	
Mating Connector	Cannon KPT06F10-98S, or equivalent	
Battery Life:	9150-3053	8-12 hours on a full charge
	9150-3059	2-4 hours on a full charge



TABLE 4-1. 9150-3053 POWER CONNECTOR

Pin Number	Description
A	Signal Ground (Power Return)
B	+28 V \pm 4 VDC (27 mA Operating Plus 51 mA for Display On)
C	DCLS (IRIG B002) HCMOS Compatible, Sink 4 mA
D	+12 V \pm 10% (22 mA Operating Plus 45 mA for Display On)
E	External Start (Logic zero or closure to ground)
F	Chassis Ground

TABLE 4-2. 9150-3059 POWER CONNECTOR

Pin Number	Description
A	Signal Ground (Power Return)
B	+28 V \pm 4 VDC (27 mA Operating Plus 51 mA for Display On)
C	Not Used
D	+12 V \pm 10% (22 mA Operating Plus 45 mA for Display On)
E	Not Used
F	Chassis Ground



PARALLEL BCD TIME OUTPUT

The 9150-3053 Parallel BCD Time Output connector pin assignments are shown in Table 4-3. The mating connector is AMP 205212-1 or equivalent.

TABLE 4-3. 9150-3053 PARALLEL BCD OUTPUT CONNECTOR

Pin	Term	Pin	Term
1	H10	26	mS10
2	M4	27	mS40
3	H1	28	S8
4	H4	29	sample time/
5	S40	30	mS2
6	S10	31	D80
7	mS400	32	D10
8	mS100	33	GND
9	S2	34	H20
10	mS20	35	M1
11	mS80	36	M10
12	S4	37	M20
13	mS4	38	M40
14	mS1	39	N/U
15	D40	40	N/U
16	D20	41	N/U
17	GND	42	D100
18	M2	43	D200
19	M8	44	D400
20	H2	45	D800
21	H8	46	D1
22	S20	47	D4
23	mS800	48	D8
24	mS200	49	D2
25	S1	50	mS8

LOGIC TERM DEFINITIONS

- D1 – D8 Units of Days
- D10 – D80 Tens of Days
- D100 – D800 Hundreds of Days
- H1 – H8 Units of Hours
- H10 – H20 Tens of Hours
- M1 – M8 Units of Minutes
- M10 – M40 Tens of Minutes
- S1 – S8 Units of Seconds
- S10 – S40 Tens of Seconds
- mS1 – mS8 Units of Milliseconds
- mS10 – mS80 Tens of Milliseconds
- mS100 – mS800 Hundreds of Milliseconds
- sample time/ Sample Time strobe

The sample time/ signal is normally TTL high, indicating that a valid time sample is being output. When the time value is being updated, the term sample time/ goes low, and remains low for a period of approximately 25 microseconds. While this signal is low, the Parallel BCD outputs are in transition. When the signals are once again stable, the sample time/ signal returns to the high state.

Datum recommends that the positive-going edge of sample time/ (which occurs at the end of the time value update period) be used as a trigger to clock time data into the user's equipment, thus ensuring that every time sample is valid.



NOTE ...

The 9150-3053 outputs BCD time (D-mS). The 9150-3059 does not.



NOTE ...

One millisecond after the time reaches 365:23:59:59.999, the time output rolls over to 001:00:00:00.000 (days:hours:minutes:seconds.milliseconds).



9150-3053 & 9150-3059

ENVIRONMENTAL

Operating Temperature	-20 °C to +60 °C
Storage Temperature	-60 °C to +85 °C
Operating Humidity	0 to 95% relative (noncondensing)
Storage Humidity	0 to 100% relative
Altitude	Sea level to 100,000 feet
Shock & Vibration	Designed to meet MIL-E-5400 Curve II (9150-3053) Curve III (9150-3059)
RFI/EMI	Designed to meet MIL-STD-826, Class C

PHYSICAL

Case Size:	9150-3053	2.75" H x 3" W x 7.0" D
	9150-3059	2.75" H x 3" W x 5.75" D
Weight	Less than 1.5 pounds	
Mounting	External flanges (one on each end)	



NOTE ...

See Figure 4-1 and 4-2 for chassis dimensions and mounting hole locations for the 9150-3053 and 9150-3059 respectively.



NOTE ...

To be CE compliant, the Parallel BCD cable that connects to the 9150-3053 should be constructed with 50-conductor shielded cable. The shield should be attached to the connector shell and provide a good connection to chassis ground.

Cable Specification

UL2464 shielded multi-conductor computer cable
Rated 300V, 80 °C, and have a CM flammability rating.

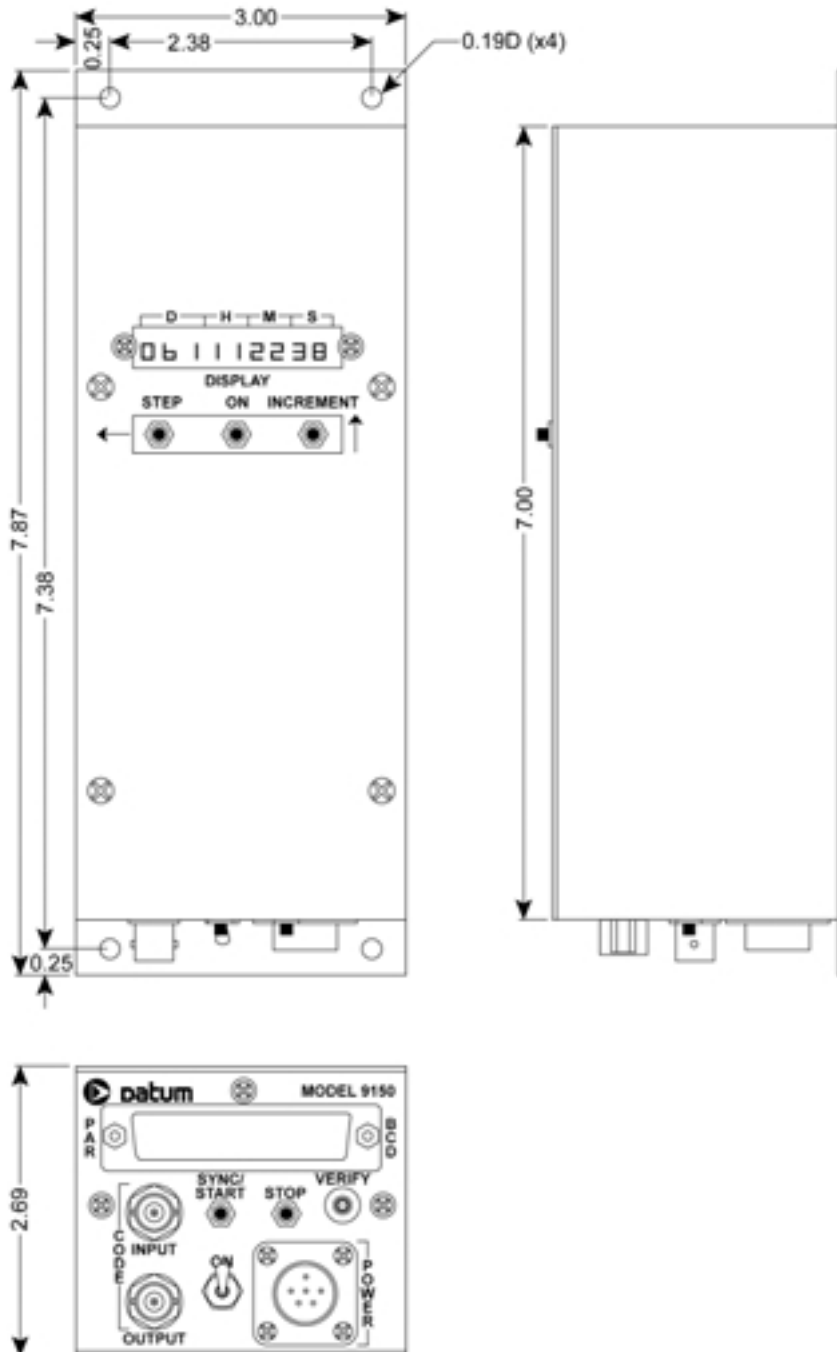
Recommended sources:

Belden 9950
Alpha Wire 5101/50C



9150-3053 & 9150-3059

FIGURE 4-1. DATUM 9150-3053 DIMENSIONS





9150-3053 & 9150-3059

FIGURE 4-2. DATUM 9150-3059 DIMENSIONS

