

SERIES 301T

nyadinc.
Your Breathing Air Assured!



CARBON DIOXIDE
ANALYZER
OPERATION MANUAL

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NFPA COMPLIANT

The NYAD, Inc. Carbon Dioxide Analyzers meet or exceed CGA Grade-D specifications for air quality as adopted by Federal OSHA.

The NYAD, Inc. Carbon Dioxide Analyzers' quality standards meet or exceed OSHA 1910.134 requirements. When the components are used in accordance with the manufacturer's instructions and recommendations, the "analyzer" meets or exceeds federal regulations presently in force.

NYAD, Inc. Carbon Dioxide Analyzer detection range is 0 - 2,000 ppm and is equipped with alarms when safe levels (400—1,000ppm) are exceeded.



INTRODUCTION

Your CO₂ analyzer is a self-contained unit capable of measuring the concentration of Carbon Dioxide. The range is 0 to 2,000 parts per million by volume (ppmv). The CO₂ analyzer features two adjustable alarm contacts, analog or digital (optional) signals with adjustable zero and span values and in addition to these features, a “One Touch Cal” auto-calibration function.

INSTALLATION

- a) Connect a regulated source of sample air to the 1/8” FNPT connection on the bottom of the enclosure. The inlet pressure should be between 15-20 psig. The recommended sample flow rate should be between .4 and .8 SCFH.
- b) Connect the instrument to a power source; 120/220 VAC 50/60 Hz, or 12VDC
- c) Turn the POWER switch to ON.

Note: Model CO₂A-321T does not have a power switch.

- d) The CO₂ analyzer will cycle through its diagnostic routine followed by current CO concentration value. The analyzer has been factory calibrated but a “bump” test should be performed to ensure accuracy.

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COMING
SOON

THE SENSOR

The CO2 sensor is a NDIR sensor which has a life expectancy of about **10 years** and is essentially maintenance free.

LIFE EXPECTANCY:

APPROXIMATELY 6 MONTHS IN CONTAINER

APPROXIMATELY 3 YEARS IN AIR

RECOMMENDED REPLACEMENT INTERVAL EVERY 5 YEARS

THE ELECTRONICS

The electronics section of the NYAD Series 301T CO2 Analyzers is microprocessor based. The NYAD CO2 sensor produces a digital output which enters the receiver section of the main electronic board which then shapes and amplifies the incoming signal and directs it to the microprocessor. The signal is amplified and converted to engineering units using memory-resident tables containing the relationship between signal and engineering units. The end product of this electronic process is displayed in terms of parts per million by volume (PPMV).

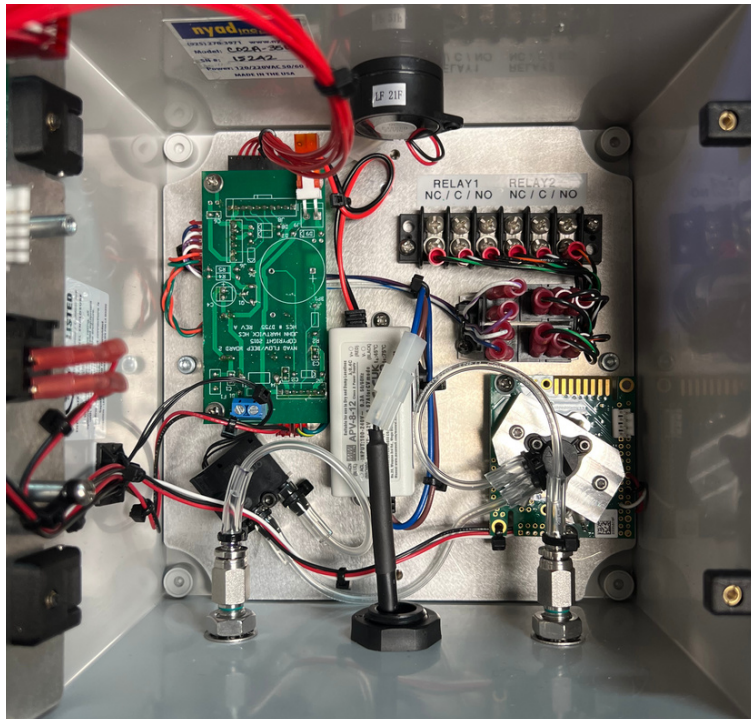
At this point, the processor performs three functions:

- 1) Tests the two adjustable alarm contacts (SPDT relays).
- 2) Verifies Analog or Digital output signals.
- 3) Displays the measured values on a 4-digit LCD display.

Nyad offers two analog outputs:

- 0-5 volt DC or a
- 4-20mA current output

Other analog and digital outputs are available and can be factory set as 0-1VDC, RS232 or RS485. The zero point and span of these outputs are adjustable in the software



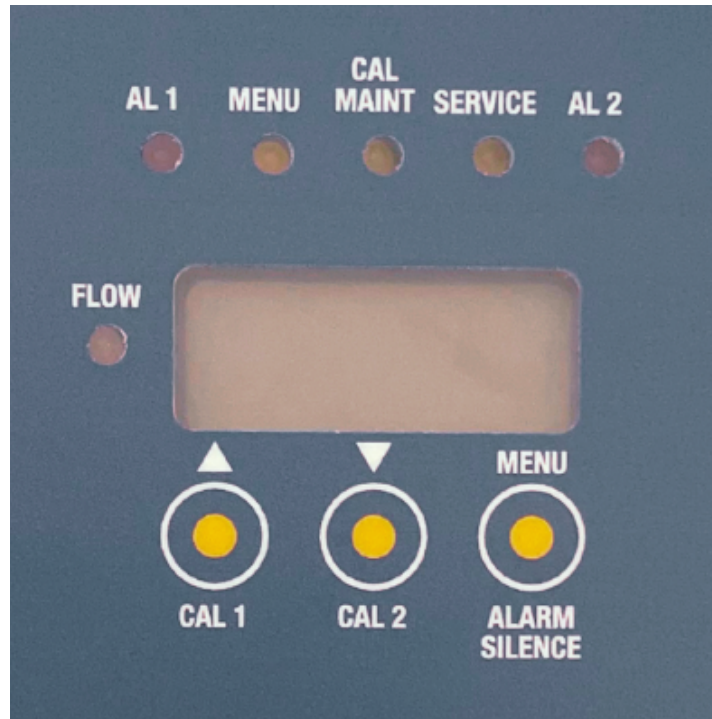
STARTUP ROUTINE

After the analyzer has been installed, all electrical connections have been made and power turned on, the instrument will proceed through its power-up routine with the display and indicators stepping through the following sequence:

- a) Displays all segments ON and all LED indicators ON for one second. This step verifies the operation of those devices.
- b) Displays the word NYAD for one second.
- c) The display indicates the version of the current operating system software.

All LED indicators are off followed by INT and CO2.

The last step in the startup routine is the display of the current CO2 value. In approximately six seconds, any alarm conditions will be shown on AL1 and/or AL2 red LED alarm indicator and the audible alarm will sound.



FRONT PANEL CONTROLS

1) UP Arrow and DOWN Arrow Button

- a) Changes the value of set point, outputs, and constants.
- b) Changes the calibration values.
- c) Changes toggle function "Hi and Lo"

2) **CAL 1** - This button is used during "One Touch Cal" calibration process using 400 ppm CO₂ span gas.

3) **CAL 2** - This button is used during "One Touch Cal" calibration process using 1,000 ppm CO₂ span gas.

4) **MENU** - Pressing the MENU button allows the operator to view the current settings. Pressing and holding the MENU button allows the operator to have access, interrogate, and reset the other major functions incorporated into this analyzer, namely, Alarm 1 and 2, Outputs, Toggles, Factory Codes and Calibration settings.

5) **ALARM SILENCE** - This button is used to temporarily silence the audible alarm. The audible alarm will automatically reactivate in 10 minutes

AL1 Red LED Alarm 1 indicator will illuminate indicating the CO2 value has exceeded Alarm 1 set-point value.

MENU Yellow LED indicator

- Solid Yellow - MENU disabled. Available for viewing current settings only
- Slow Blinking Yellow - "ONE TOUCH CAL" enabled. User in calibration mode.
- Fast Blinking Yellow - MENU enabled. User access available.

CAL MAINT Yellow LED indicator will illuminate indicating calibration is required.

SERVICE Yellow LED indicator will illuminate indicating CO2 sensor replacement is required.

AL2 Red LED Alarm 2 indicator will illuminate indicating the CO2 value has exceeded Alarm 2 set-point value.



FLOWLIGHT

NYAD model **CO2A-301T** is equipped with an internal digital flowmeter which allows the user to visually see the flow status on the front panel via the flow LED.

- Recommended flow rate is between .4 to .8 SCFH.

ACTIVATION MENU

In normal operations, the MENU button is disabled. The user will only be able to view the current settings set by the factory. To change factory settings such as Alarm 1 and Alarm 2 set-points, Outputs Hi and Lo, the “MENU” must be activated by a Certified Technician

To activate the “MENU”

- 1) Press and hold the MENU button for about 10 seconds until CODE is displayed. The MENU LED will begin to blink fast. Press the DOWN arrow button to change the value to 135.
- 2) Press the MENU button to the desired location and use the UP arrow or DOWN arrow button to change settings.

Note: Once changes are made, the display will automatically default in about 10 seconds, flash “CO2” and return to the current CO2 value. Also, once you scroll through the entire menu, the display will automatically default and return to normal operations).



SILENCING AUDIBLE ALARM

To silence the audible alarm, press the “ALARM SILENCE” button once. The audible alarm will be temporarily disabled and will automatically reactivate in 10 minutes.

SETTING ALARM POINTS

This analyzer has two adjustable alarm set points and relays as factory standard. When the measured value of CO₂ concentration exceeds the set point for a sustained period of about 6 seconds, the alarm condition will become activated. The SPDT relay (Alarm 1) is energized as is the red front-panel LED indicator, AL1.

To determine the current setting for ALARM 1, press the MENU button. The display will show AL1 and then default to the current value. If this value is acceptable, the display will automatically default in about 10 seconds and flash "CO₂" and return to the current measured CO₂ value.

To change ALARM 1 (AL1) set-point the "MENU" must be activated by a Certified Technician as described in Section 7.

- a) Press and hold the MENU button for about 10 seconds until CODE is displayed. The MENU LED will begin to blink fast. Press the DOWN arrow button to change the value to 135.
- b) Press the MENU button, AL1 will momentarily display followed by the current Alarm 1 set-point value. Press the UP arrow or DOWN arrow to change Alarm 1 value.

To change ALARM 2 (AL2) set-point, proceed exactly as described above after pressing the MENU button to display AL2 and its current value.

If the measured value of CO₂ concentration is higher than the ALARM 1 or ALARM 2 settings, the corresponding LED will illuminate above the display and energize the alarm relay thus activating any warning devices connected to it.

ALARM TOGGLE POINTS

NYAD Series 301T Analyzers are equipped with a toggle function (AL1t and AL2t). Set these "Hi" when detecting increasing CO₂ and "Lo" when detecting decreasing CO₂

- To view the current setting for AL1t, press the MENU button two times.

FACTORY DEFAULTS

AL 1t	Hi
AL 2t	Hi

- The display will show AL1t followed by Hi or Lo.
- Press the MENU button two or more times, AL2t will displayed followed by Hi or Lo.
- If these settings are acceptable, the display will automatically default in about 10 seconds, flash "CO₂" and return to the current measured CO₂ value.

SETTING ANALOG AND DIGITAL OUTPUTS

The NYAD Series 301T Analyzers features a 0-5 VDC and 4-20mA analog output as factory standard. This signal is linearly proportional to ppm CO₂. To view the current output settings:

- a) Press the MENU button five times. “oPHi” will be displayed. The display will then show the CO₂ concentration (50 ppm default) corresponding to the Hi end (5 VDC) of the analog output scale.
- b) Press the MENU button more one time, the display will now read “oPLo” and then show the CO₂ concentration (0 ppm default) corresponding to the Lo end (0 VDC) of the analog output scale.

To change span values from those set at the factory, the “MENU” must be activated by a Certified Technician as described in Section 7. “Activation Menu”.

a) Press and hold the MENU button for about 10 seconds until CODE is displayed. The MENU LED will begin to blink fast. Press the DOWN arrow button to change the value to 135.

DIGITAL OUTPUT

The NYAD Series 301T Analyzers features an optional digital output port. The user has a choice of format, either RS-232 or RS-485.

The RS-232 option can be accessed from a standard DB-9 connector located on the bottom of the enclosure or rear panel.

The RS-485 option uses a 25' 3 wire cable Red, Green, Black.

A = Red
B = Green
Ground = Black

To activate the digital output, the “MENU” must be activated by a Certified Technician as described in Section 7.

ACTIVATING RS232

- a) Press and hold the MENU button for about 10 seconds until CODE is displayed. The MENU LED will begin to blink fast. Press the UP arrow button to change the value to 159.
- b) Press the MENU button nine times. The display will show PORT. Press the UP or DOWN arrow and select 0232 (RS232) or 0485 (RS4850). Press the MENU seven times. The display will default back to the current measured CO value or in about 10 seconds, the display will automatically default, flash "CO2" and return to the current measured CO2 value.

The digital output is now activated and a constant data stream will be sent every second with the following information:

Data Output format:
\$UNITS, Display_data, Output, ALARM1, ALARM2,
ERROR#1, Line_checksum<CR><LF>

EXAMPLE: \$CO, 1.4, 0.238, 0, 0, 0, 1177<CR><LF>

DEFAULT VALUES

Series 301T Analyzers are preset at the factory with the following standard values:

- Function PPMV
- AL1 400
- AL2 1,000
- Output (oPHi) 50
- Output (oPLo) 00

These settings can be changed to values most suitable for your application.

REFERENCE MENU

AL1	Dry Relay Contact - Alarm 1
AL2	Dry Relay Contact -- Alarm 2
AL1t	Toggle Alarm 1 "Hi or Lo"
AL2t	Toggle Alarm 2 "Hi or Lo"
OpHi	Analog Output "Hi"
OpLo	Analog Output "Lo"
CAL 1	Calibration using 400 ppm span gas
CAL 2	Calibration using 1,000 ppm span gas
CAL	CAL "One Touch Cal" Calibration Mode
No CO2	Sensor not detecting CO2
EroP	Operator Error

CAL MAINTENANCE - “One Touch Cal”



WARNING

High carbon dioxide concentrations are toxic.
Take appropriate ventilation precautions when calibrating with a span gas.

CALIBRATION PROCEDURE

Calibration interval should be carried out regularly per local regulations, NFPA 99 or NFPA 1989 and can be performed by a non-certified technician. The “Cal Maintenance” LED will illuminate indicating calibration is required.

To calibrate the CO₂ sensor use a certified sample 400 ppm or 1,000 ppm CO₂ span gas balanced in air. The calibration gas concentration can be changed in the menu settings if you are using anything other than 400 ppm or 1,000 ppm span gas.

To begin the “One Touch Cal” calibration process:

- 1) Turn sample air off.
- 2) Attach 400 or 1,000 PPM CO₂ span gas to the Calibration Port. Allow the displayed CO₂ value to stabilize to a constant value. Turn on the flow and adjust until the flow light on the front panel is green.

- 3) To activate the “One Touch Cal”, press and hold the MENU button for 5 seconds, “CAL” will momentarily display followed by the current CO2 value.

The MENU LED will start blinking.

- 4) Select “One Touch Cal” CAL 1 or CAL 2. The display will show CAL 1 for 400 ppm or CAL 2 for 1000 ppm.

The MENU LED will stop blinking and the CAL MAINT LED will now turn off.

- 5) Turn off and remove span gas. Allow 5-10 minutes for the CO2 value to return to zero.

To disable “One Touch Cal” while in calibration mode, press and hold the MENU button for 5 seconds. The MENU LED will stop blinking and the analyzer will momentarily default back to the current measured CO2 value.

CALIBRATING WITH OTHER CO2 SPAN GASES:

To use CO2 span gases other than 400 ppm or 1000 ppm, the “MENU” must be activated by a Certified Technician as described in Section 7. “Activation Menu”.

- a) Press and hold the MENU button for about 10 seconds until CODE is displayed. The MENU LED will begin to blink fast. Press the UP arrow button to change the value to 159.
- b) Press the MENU button seven times. The display will show CAL2 followed by 1000. Change the value to the desired gas value by using the UP arrow or DOWN arrow button.
- c) Press the MENU button nine times, the display will default back to the current measured CO2 value or in about 10 seconds, the display will automatically default, flash “CO2” and return to the current measured CO2 value.

Begin the calibration process using “One Touch Cal” CAL 1 or CAL 2 as described in Section 13: “Calibration Procedure”.

REPLACING THE CO2 SENSOR

- 1) Open the plastic cover on model **CO2A-351TS** or chassis cover on models CO2A-531T and CO2A-551T.
- 2) Loosen the front panel (two thumb screws on model **CO2A-351T**).
- 3) Carefully remove the plastic tubing from the flow block for both inlet and outlet. Remove two screws holding sensor to board - be careful to save plastic washers.
- 4) Remove the electronic board from the assembly. Discard the depleted cell and replace it with the new one.
- 5) Reassemble the cell by following the above instructions in reverse.



DANGER

Disconnect power to the unit before performing any maintenance to the control board



WARNING

The CO2 sensor contains corrosive acid. Do not attempt to open.
Before disposing of sensor place it in a polyethylene bag and tie securely.
Dispose of sensor in accordance with all applicable regulations.

“Service” - CO2 SENSOR REPLACEMENT

The Nyad CO2 sensor should be replaced every 5 years and should be performed by a Certified Technician. The “Service” LED will illuminate indicating when the CO2 sensor replacement is required.

After replacing the CO2 sensor, the Service LED indicator must be reset. To reset, the “MENU” must be activated by a Certified Technician as described in Section 7. Activation Menu.

- a) Press and hold the MENU button for about 10 seconds until CODE is displayed. The MENU LED will begin to blink fast. Press the UP arrow button to change the value to 159.
- b) Press the MENU button 10 times, the display will show “SSer”. Press the UP arrow button to change the value to 1.
- c) The “Service” LED will now turn off.
- d) The sensor is now ready for calibration. Refer to Page 14. Calibration Procedure

NOTE: CALIBRATION IS REQUIRED AFTER REPLACING THE CO2 SENSOR.



CARBON DIOXIDE DANGER LEVELS

Levels of Carbon Dioxide are considered dangerous. The chart below shows the health effects of CO₂ exposure.

CO ₂ CONCENTRATION		EFFECTS AND SYMPTOMS
<i>ppm</i>	<i>% vol</i>	
10,000	1	Slight but un-noticeable increase in breathing rate.
20,000	2	Breathing becomes deeper - rate increases to 50% above normal. Prolonged exposure (several hours) may cause headache and exhaustion.
30,000	3	Breathing becomes labored. Hearing ability reduced, headache experienced with increase in blood pressure and pulse rate.
40-50,000	4-5	As above. Signs of intoxication after 30 minutes of exposure and slight choking sensation.
50-100,000	5-10	Characteristic pungent odor noticeable. Breathing extremely labored leading to physical exhaustion. Headache, visual disturbance, ringing in ears, confusion likely leading to loss of consciousness within minutes.
100,000 +	10 +	Rapid loss of consciousness with risk of death from respiratory failure .

SPECIFICATIONS

MODEL NUMBER		CO2A-321T (OEM), CO2A-331T (RACK MOUNT), CO2A-341T (PANEL MOUNT), CO2A-351TS (NEMA 4), CO2A-371T (NEMA-7X)
UNITS		PPM (Parts Per Million)
STANDARD		
	Display	Backlit 4 Digit LCD, 0.5" High
	Alarm	Dual Dry Relay Contacts (SPDT 1A@120V)
	Analog Output	0-5VDC or 4-20mA (Adjustable zero and span)
	Power	120/220VAC 50/60 Hz, 1W Max
	Memory	Non-Volatile Data Memory
	Inlet	1/8" FNPT
	Calibration	"One Touch Cal" Auto Calibration
	Audible Alarm	95 db, frequency 2700 to 3700 Hz
	Mini-Rate Flowmeter	0-1.0 SCFH
OPTIONS		
	Digital Output	RS232, RS485
	Power	12V
SENSOR		
	Response Time	100% in 20 seconds
	Operating Humidity	15 to 90% RH non-condensing
	Inlet Pressure	30-35 lbs MAX
	Operating Temperature	-20°C to +50°C
	Sensor Life in Air	Up to 36 Months at 30°C
	Sensor Shelf Life	2 Years
	Replacement	Every 5 years
	Sensor Warranty	2 Years
	Calibration Gas	CO2 span gas balance air
	Calibration Interval	Regularly per local regulations, NFPA 99 or NFPA 1989
	Sample Flow	Between and .4 and .8 SCFH or 200-500 cc/min

ENCLOSURES

OEM	5.75"W x 6.75"H x 3"D
NEMA-4	7.72"Wx7.72"Hx5.71"D
PANEL	10"W x 6.25"H x 6"D
RACK	19"W x 5.25"H x 6"D
NEMA-7X	8.37"W x 9.87"H x 6.53"D

TROUBLESHOOTING GUIDE

SYMPTOMS	REMEDY
<p>ELECTRONICS</p> <p>Unit will not cycle Startup routine not normal Display is blank with power on Display has missing segments</p>	<p>Please contact NYAD for verbal evaluation. Unit will likely need to be sent to NYAD for further evaluation.</p>
<p>ERROR CODES</p>	
<p>ErOp (Error Operator)</p>	<p>Output out of range. Set output Lo and Hi. See Page 11 Setting Analog & Digital Outputs.</p>
<p>E-Lo</p>	<p>Replace CO2 sensor</p>
<p>No LEL</p>	<p>Sensor not detecting CO2 Gas. Make sure all connections are secure. Replace CO2 sensor</p>

WARRANTY

WARRANTY TERMS

Nyad, Inc. warrants to the original consumer purchaser that all parts used in the construction or fabrication of the Nyad Equipment will be free from defects in materials and factory workmanship under normal use and service for five years from the date of delivery.

Warranty coverage provides the necessary repairs or parts replacement found by Nyad, Inc. to be defective due to bad workmanship or faulty materials.

LIMITATIONS OF WARRANTY

The Nyad Equipment is restricted to inspection (FOB the Factory) before warranty is determined, unless other arrangements have been made by Nyad and the original consumer purchaser.

This warranty does not apply to routine service/maintenance, repairs and routine calibration of the sensor every twelve (12) months in accordance with manufacturer's recommendation, or replacements made necessary by fire or water damage, or accident to or improper installation by others, alteration, misuse or abuse to the Nyad Equipment.

This warranty does not cover labor charges or cost incurred for time and expense by other service agencies or personnel involved in maintaining the Nyad Equipment.

Application of this Warranty is further conditioned upon the following:

Installation. The Nyad Equipment must be properly installed in accordance with Nyad's installation procedures and instructions.

Proper Maintenance and Operation. The Nyad Equipment must be properly maintained and operated in accordance with Nyad's maintenance and operating procedures. All service parts must be acquired from Nyad or its authorized representative.

No Alteration. The Nyad Equipment must not have been modified or altered from its original conditions at the date of delivery or installation.

Failure to comply with any of these conditions will void this Warranty

RETURN POLICY

Before returning any items (except for recalibration service and repairs) you must call 925 270-3971 8:30 a.m. – 5:00 p.m. PST. Monday through Friday for approval.

Product may be returned for a full refund/credit within 30 days from the date that Nyad originally shipped and must be returned in their original new condition. Exceptions for special order. Returns for special orders will have 30% restocking fee and must be approved.

Items returned in damaged or altered conditions which cannot be resold as new will have a minimum 30% restocking fee.

All returned items are subject to inspection for use and damage before credit is issued. Returns may incur additional charges if product is returned in damaged conditions.

Manufacture Warranty/Defective Claims - You may return product to us for rework, exchange and/or request a full refund/credit. Request must be made from the original purchaser. Upon receipt of a returned item, Nyad will evaluate and determine the warranty claim.

Damaged Items – It is your responsibility to inspect your packages for damages/defect on delivery. If product is damaged in transit to you, we must be notified immediately (within 24 hours) so that we can submit a claim to our freight carrier.

Lost Packages – Lost Packages must be reported within 10 days of shipment date and verification from the freight carrier that product has not been delivered.

Please contact or email us for further important instructions on filing a lost or damaged package claim

TECHNICAL SUPPORT

Nyad, Inc. will offer Technical Support via telephone or email. All technical support shall be related to Nyad Equipment only. Any other technical issues involving other products and services to Nyad Equipment will not be the responsibility of Nyad, Inc.; however, our technical support team will offer their best knowledge and support involved in Nyad Equipment.

Warranty/Technical Support:

Ph (925) 270-3971

Contact: Carissa Harrild

Email: sales@nyad.com

www.nyad.com