

100

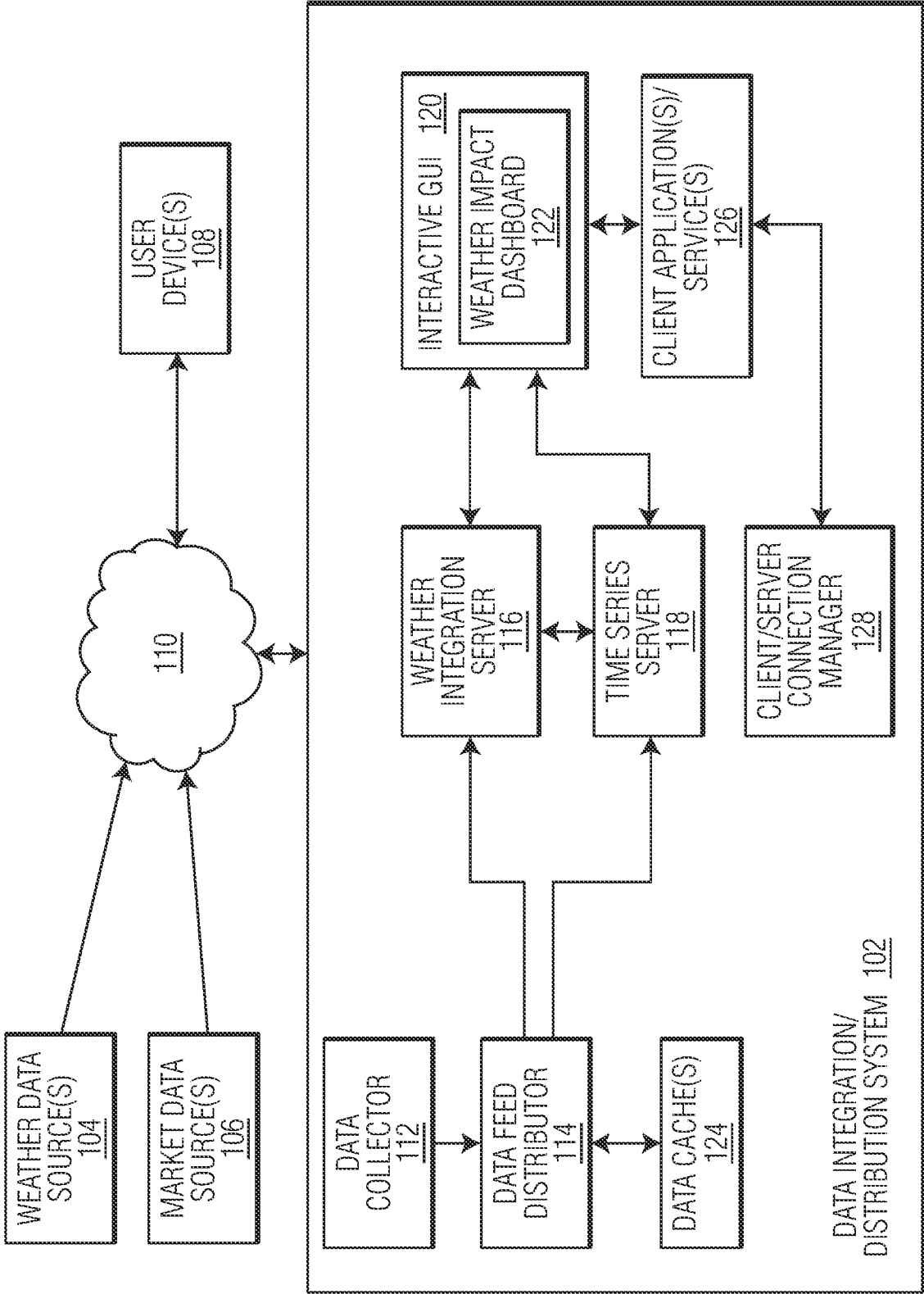


FIG. 1

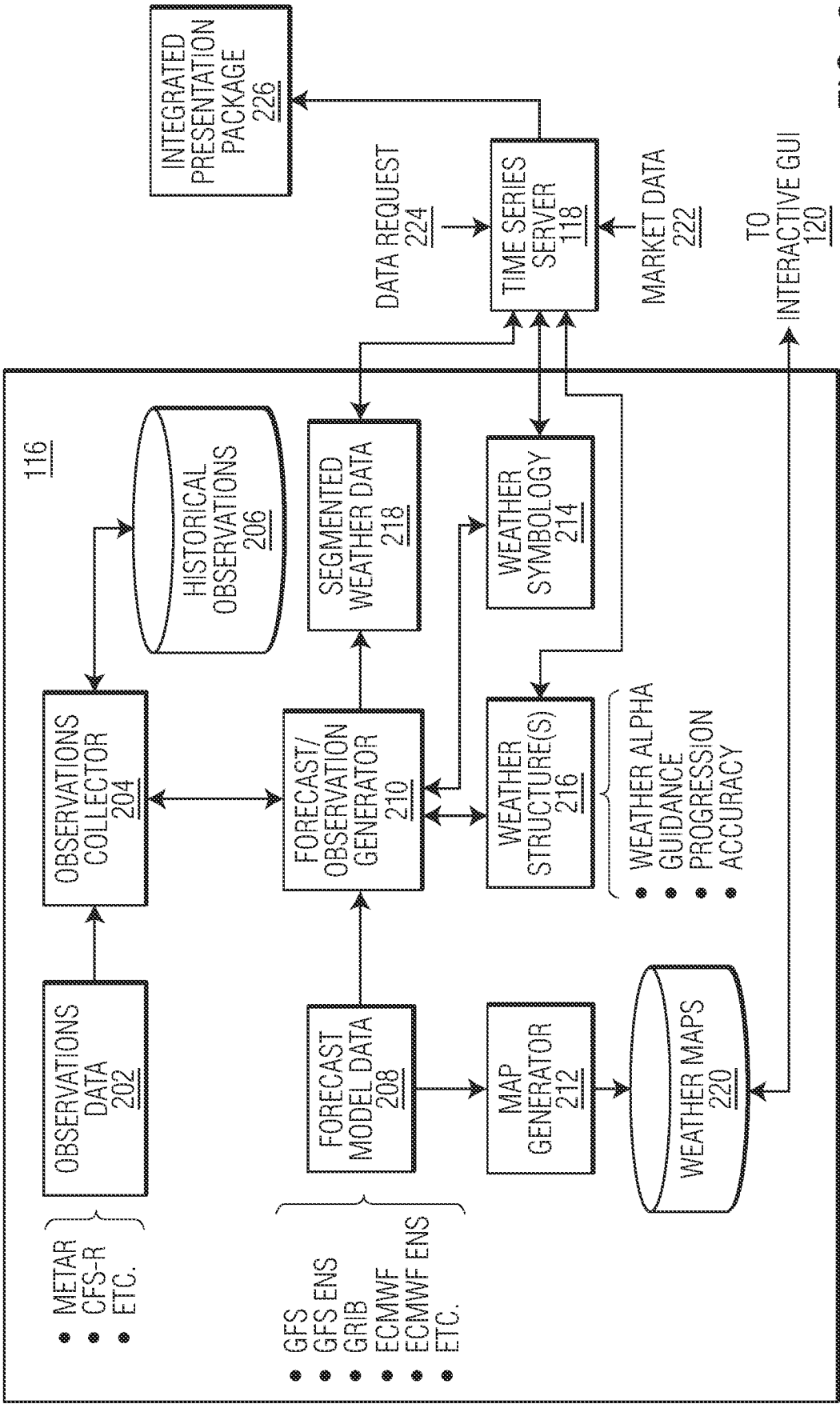
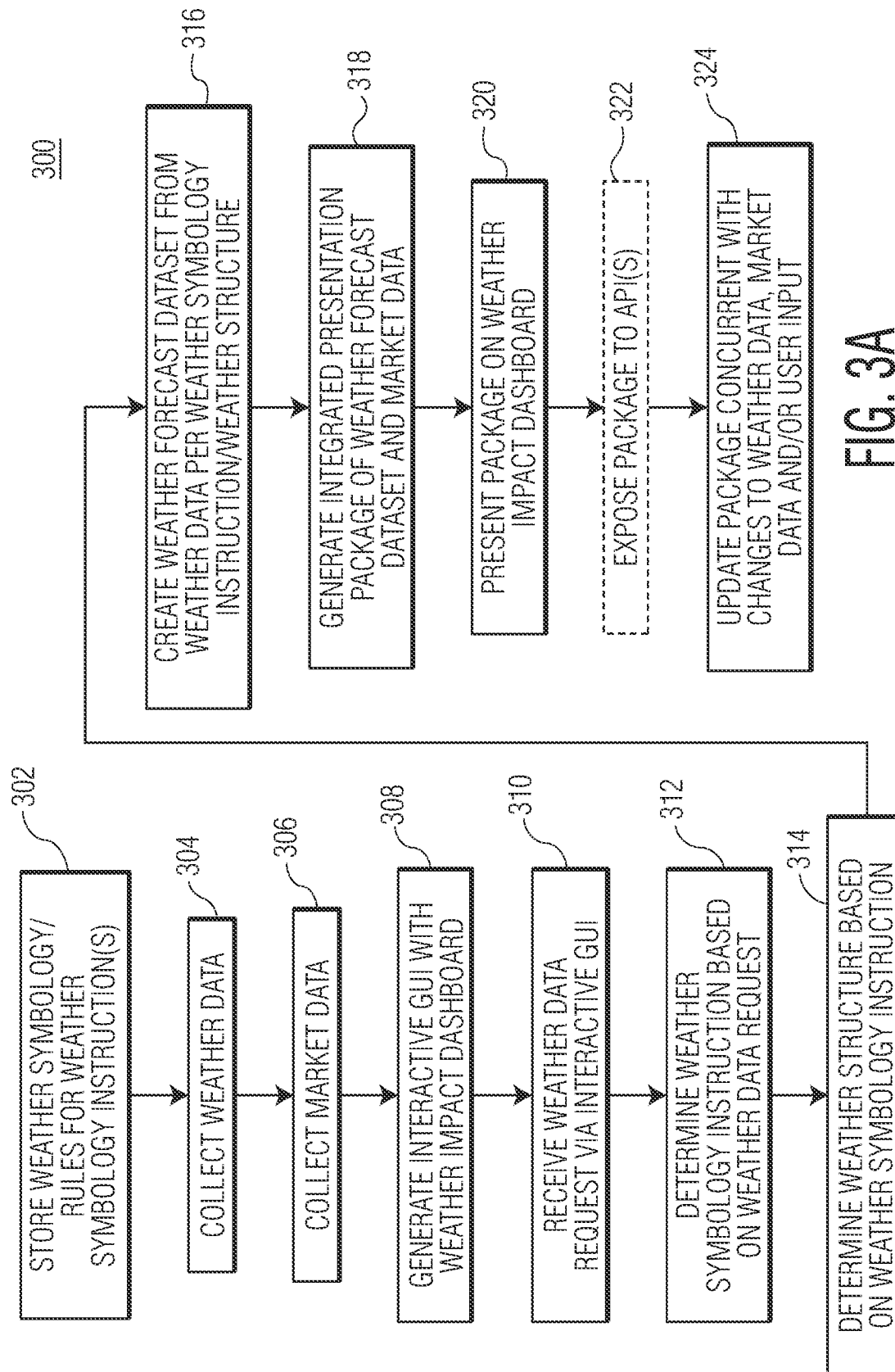


FIG. 2

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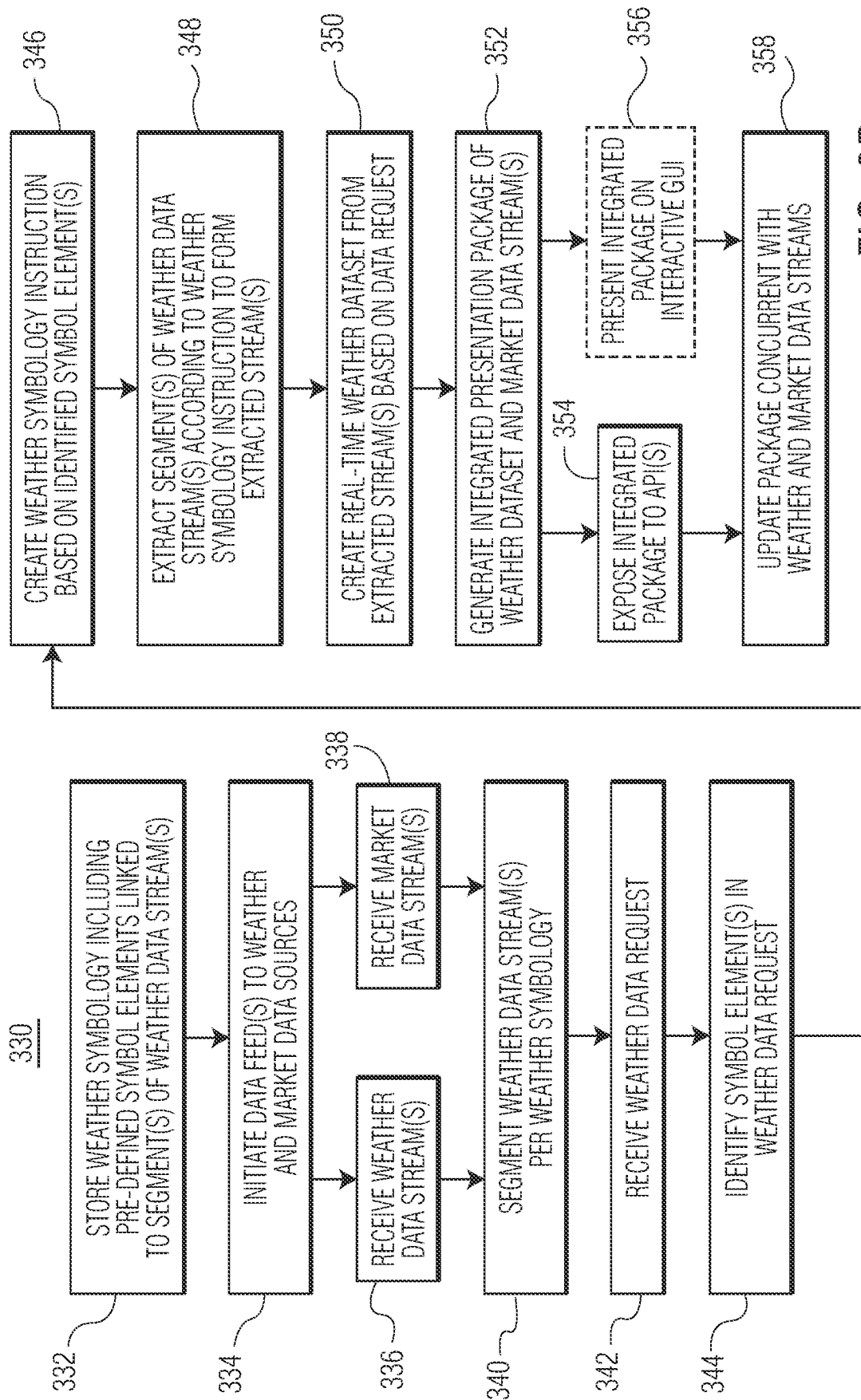
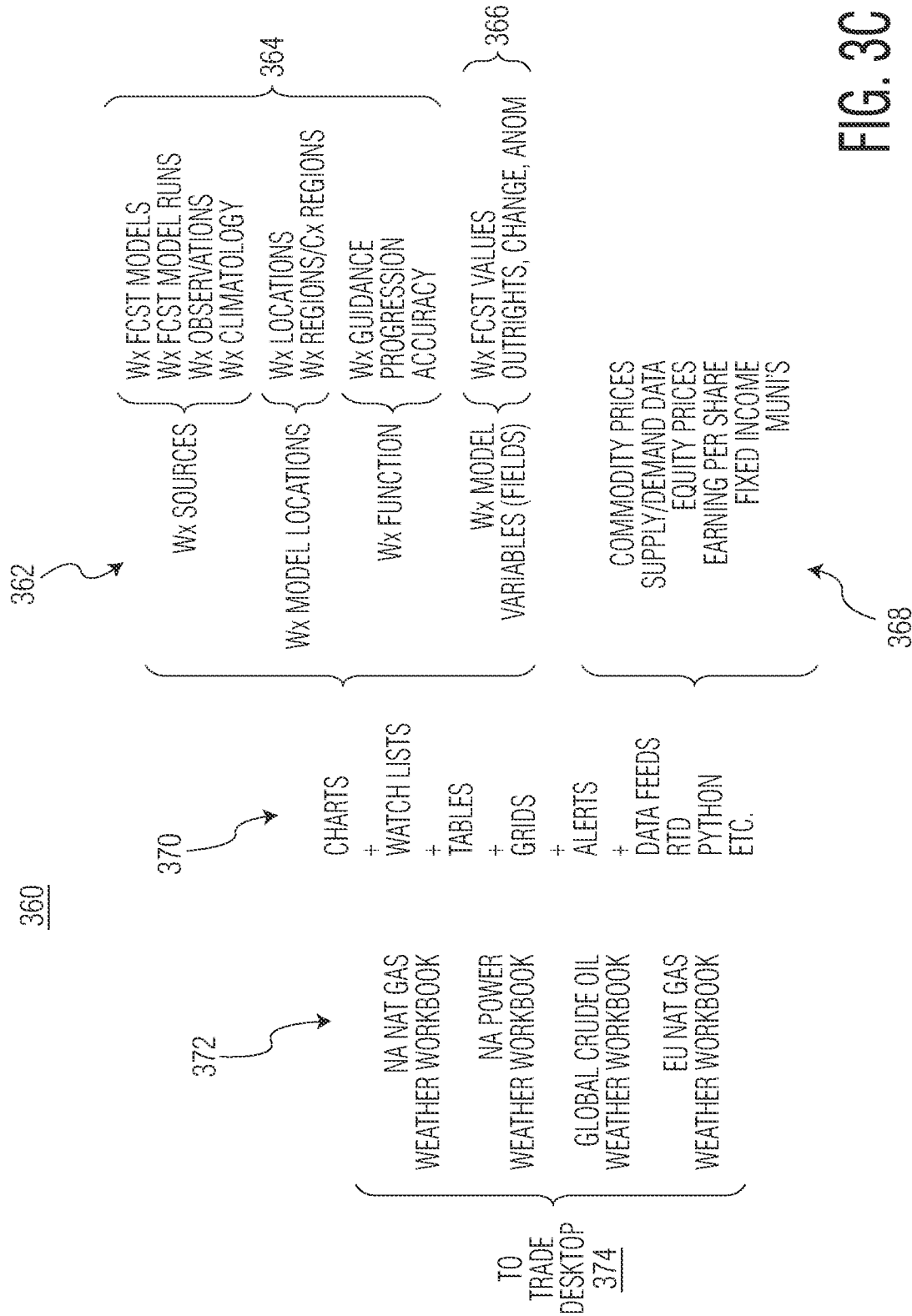


FIG. 3B



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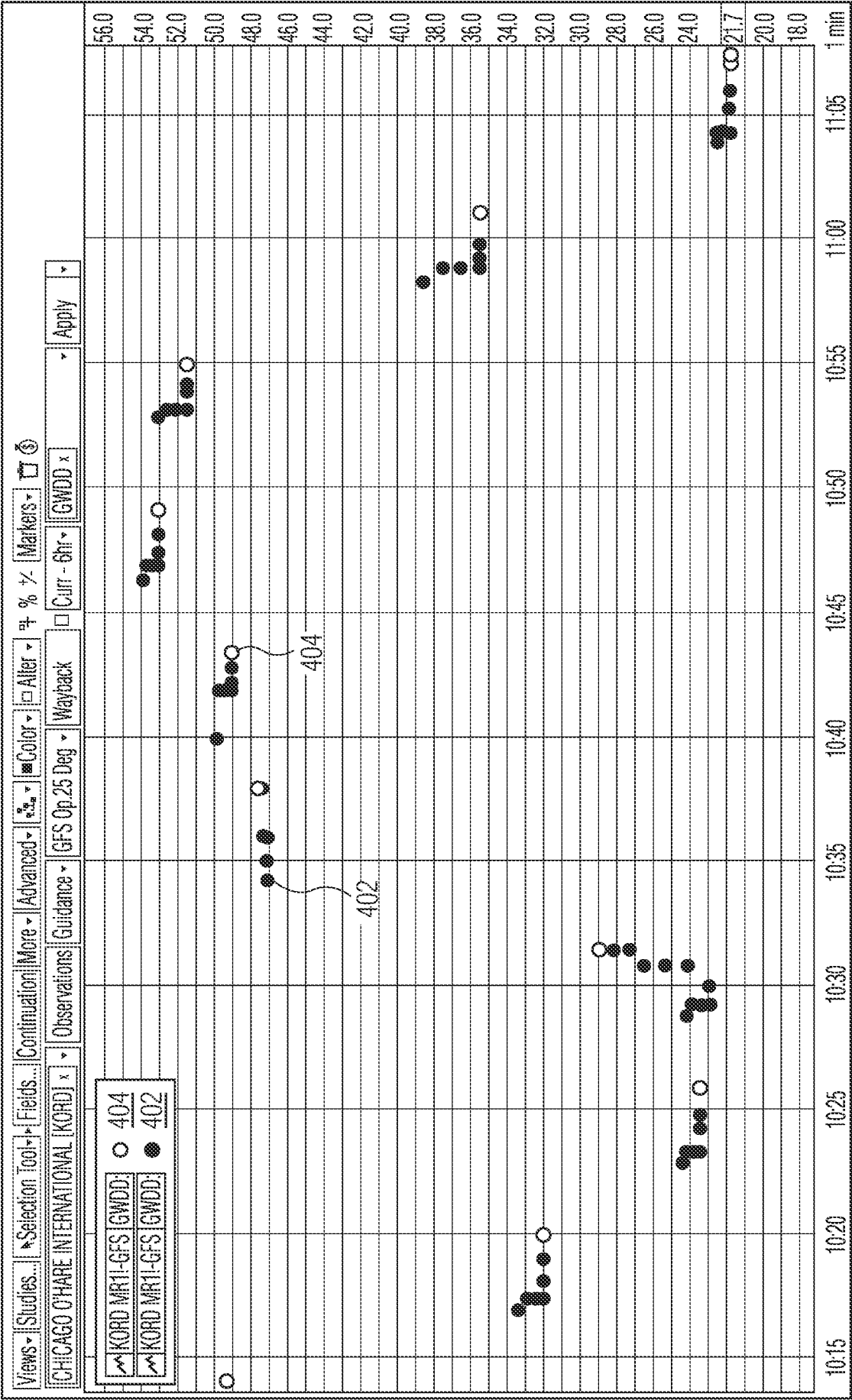


FIG. 4A

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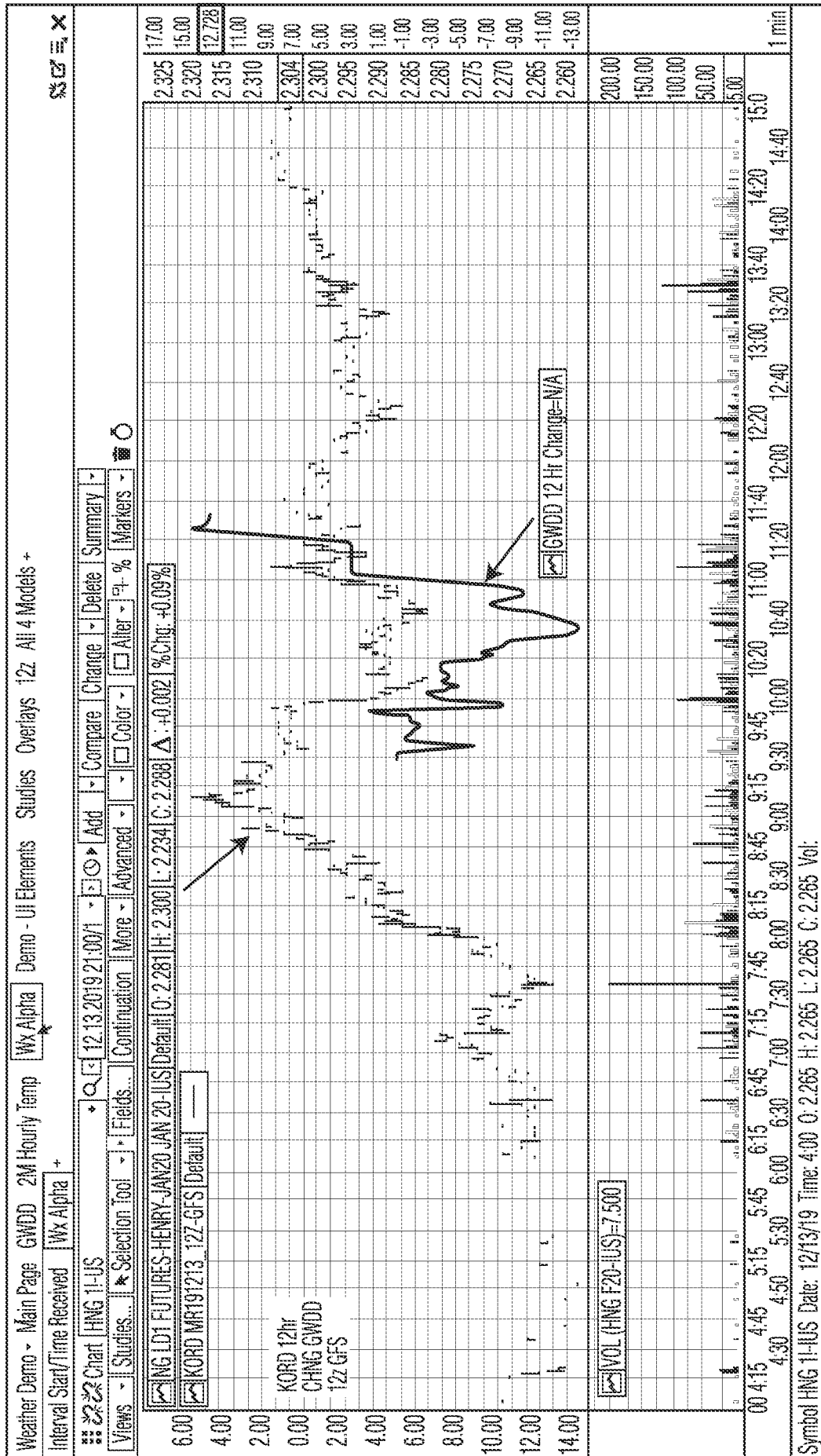


FIG. 4B

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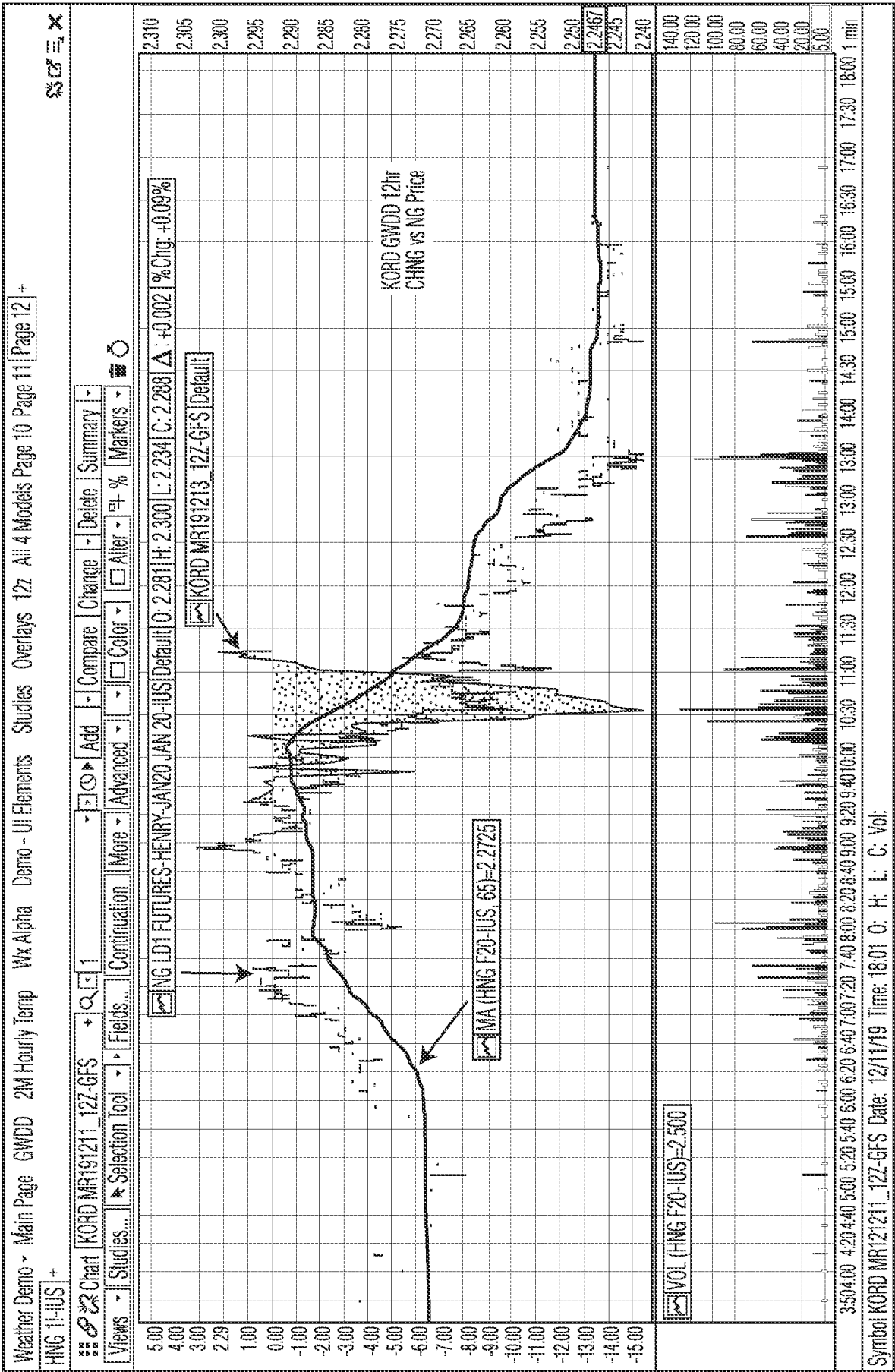
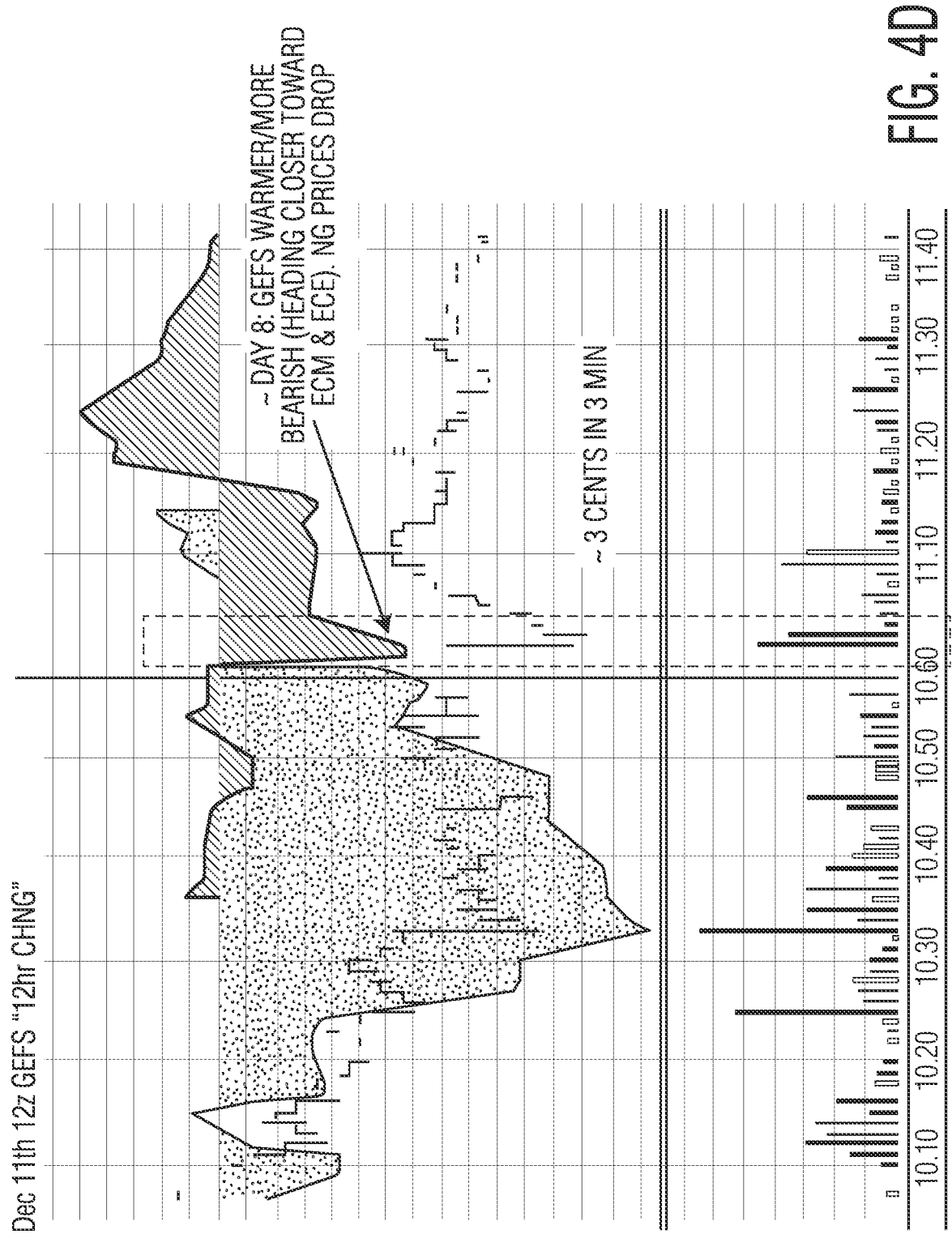
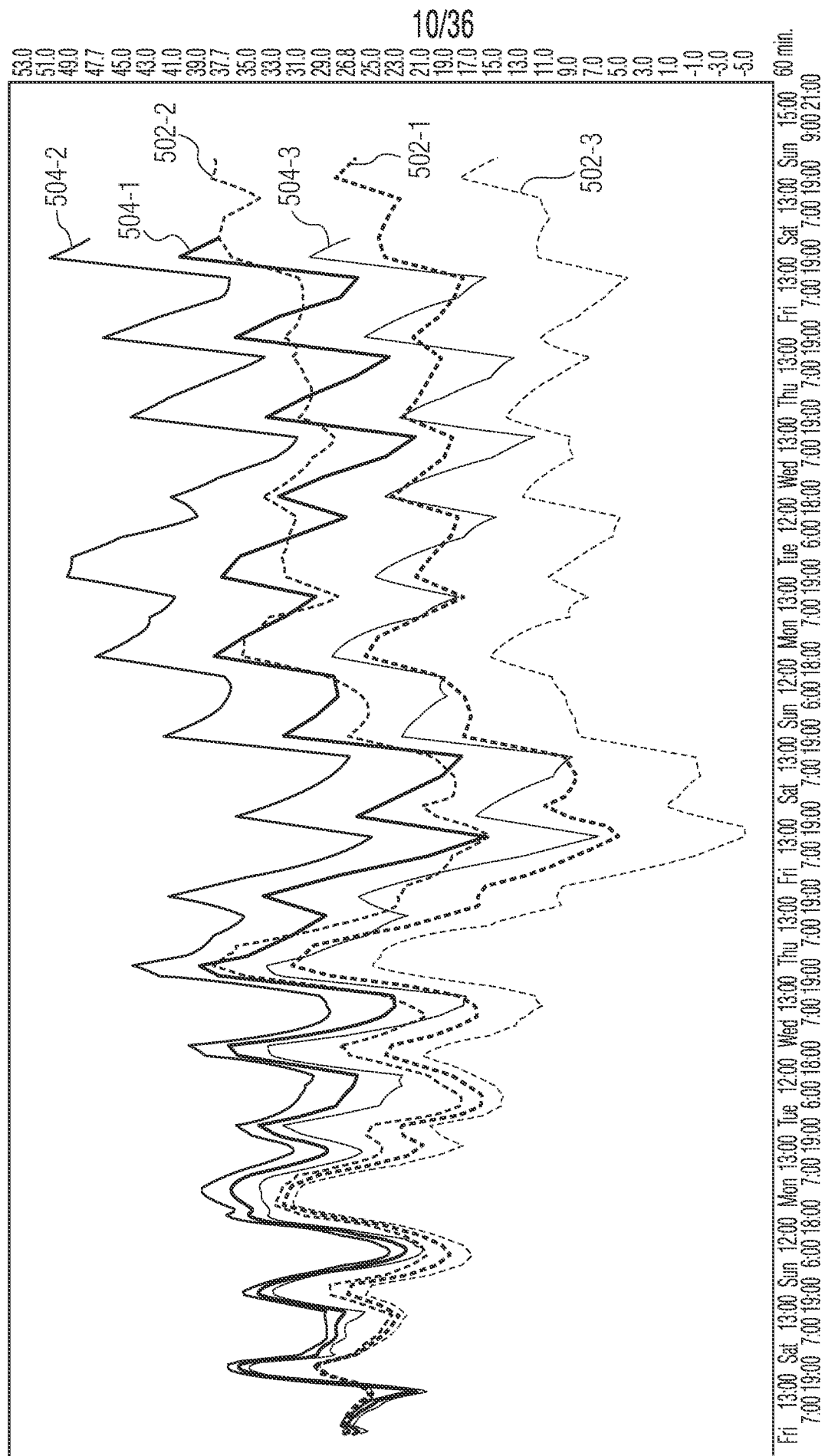


FIG. 4C

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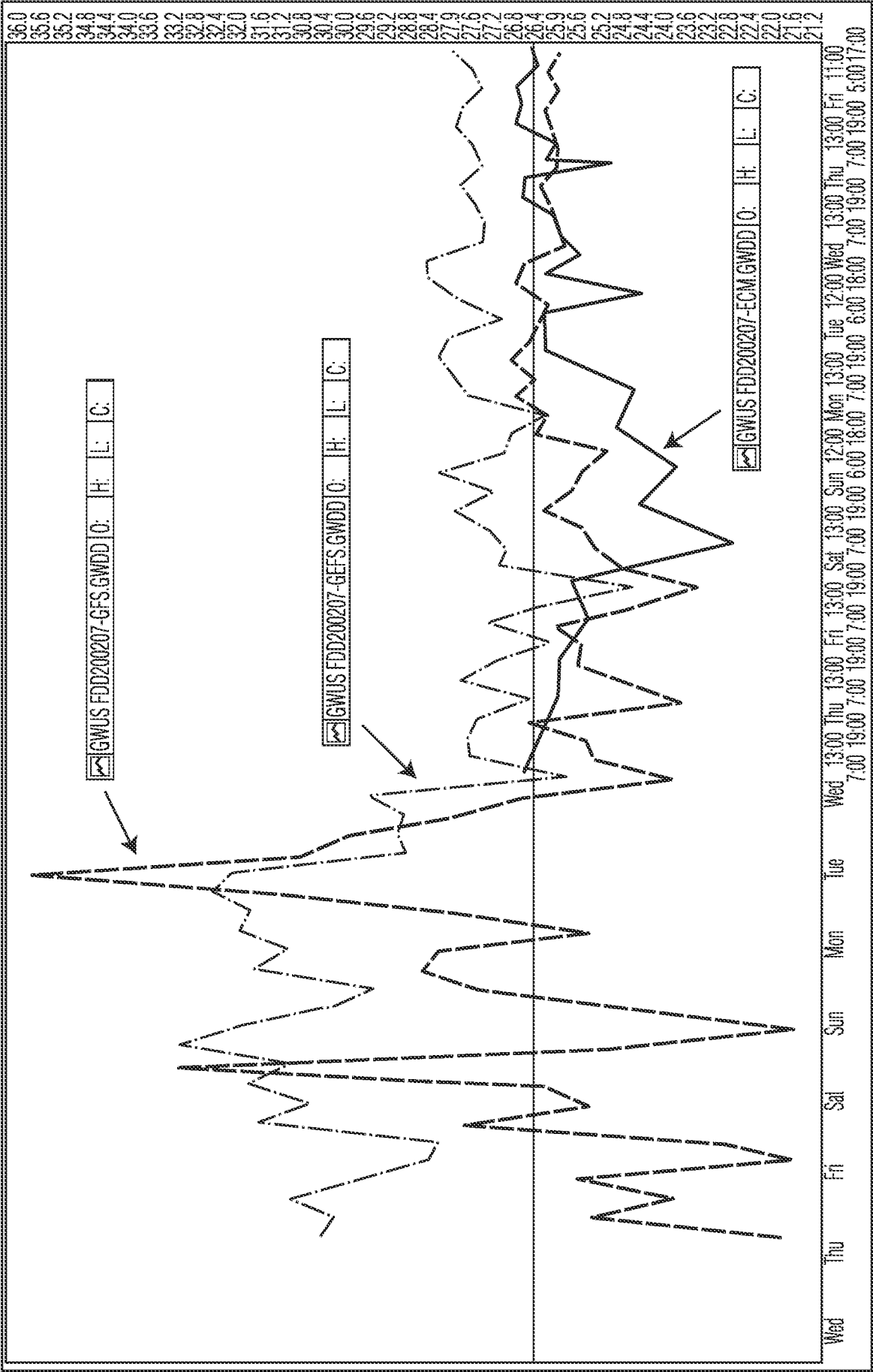


FIG. 6A

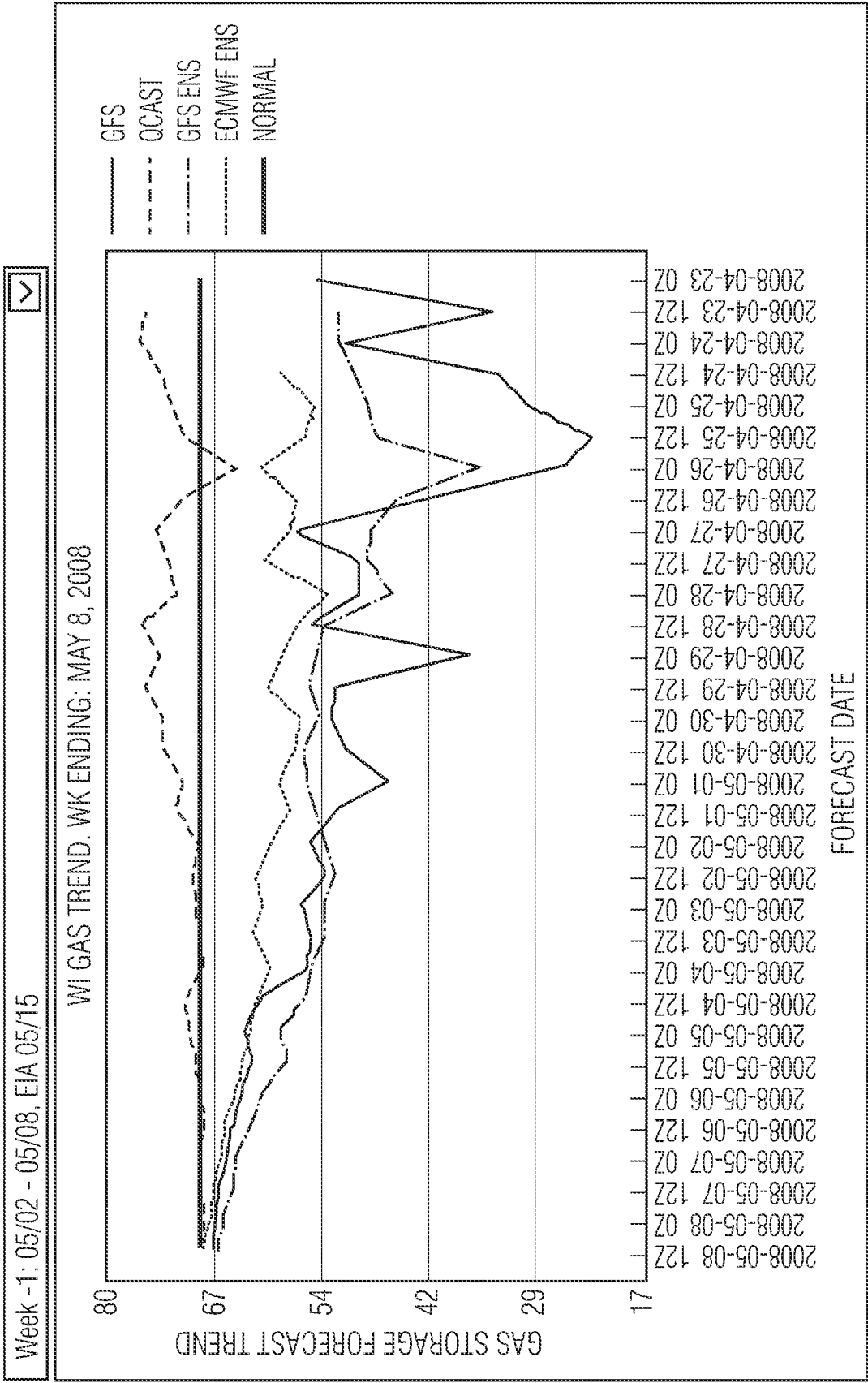


FIG. 6B

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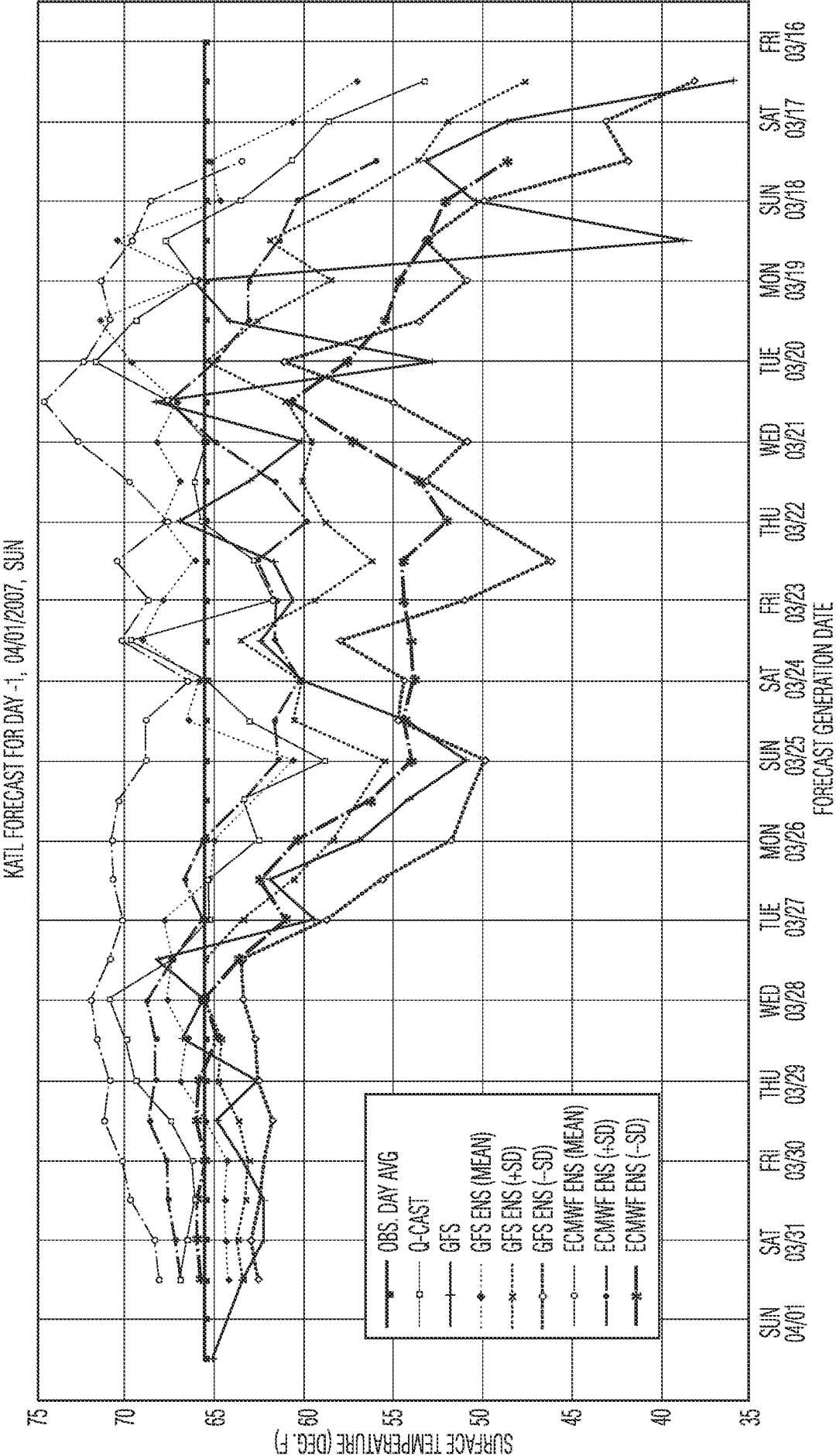


FIG. 6C

Model Name	select multiple																
Model Runs	select multiple																
FV Date/day	Calendar																
Fast Variable	MaxT, MinT, Avg T, GWDD																
Study time	14 days, 7 days, 5 days																
BIAS	14 days																
Models	Runs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
GFS	OZ																
GEFS	OZ																
ECM	OZ																
ECE	OZ																
RMSE	14 days																
Models	Runs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
GFS	OZ																
GEFS	OZ																
ECM	OZ																
ECE	OZ																
ERROR	14 days																
Models	Runs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
GFS	OZ																
GEFS	OZ																
ECM	OZ																
ECE	OZ																
STD OF ERROR	14 days																
Models	Runs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
GFS	OZ																
GEFS	OZ																
ECM	OZ																
ECE	OZ																

FIG. 7A

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Date	FDD	2/20/20	2/19/20	2/18/20	2/17/20	2/16/20	2/15/20	2/14/20	2/13/20	2/12/20	2/11/20	2/10/20	2/9/20	2/8/20	2/7/20	2/6/20	2/5/20	2/4/20
GWESC-METR.GWDD	METR															25.4659	20.6791	10.3266
GWESC FCD1_12Z-GEFS.GWDD	1														26.2	34.465	25.768	12.411
GWESC FCD2_12Z-GEFS.GWDD	2													21.374	27.615	32.101	23.061	12.22
GWESC FCD3_12Z-GEFS.GWDD	3												12.442	22.729	27.582	31.963	24.896	13.528
GWESC FCD4_12Z-GEFS.GWDD	4											15.386	13.084	22.742	27.052	33.589	24.647	13.747
GWESC FCD5_12Z-GEFS.GWDD	5										21.943	17.286	14.756	24.163	26.378	32.353	26.37	12.369
GWESC FCD6_12Z-GEFS.GWDD	6									24.254	21.893	15.858	18.506	24.807	29.189	34.845	21.146	15.091
GWESC FCD7_12Z-GEFS.GWDD	7								23.06	18.299	16.053	14.101	20.382	23.933	30.006	24.951	25.557	16.985
GWESC FCD8_12Z-GEFS.GWDD	8							27.955	19.455	12.05	12.997	14.662	17.667	22.331	25.432	26.349	27.948	17.449
GWESC FCD9_12Z-GEFS.GWDD	9						26.168	29.386	12.041	16.348	13.833	14.516	18.08	21.994	26.572	27.565	26.71	21.061
GWESC FCD10_12Z-GEFS.GWDD	10					19.373	32.39	15.352	21.411	13.655	16.63	14.146	18.221	23.304	24.01	26.828	28.591	23.003
GWESC FCD11_12Z-GEFS.GWDD	11				16.257	27.866	17.228	20.056	16.04	19.377	14.299	15.814	21.911	22.311	23.642	27.907	31.389	21.968
GWESC FCD12_12Z-GEFS.GWDD	12			18.362	24.736	18.718	15.069	15.232	21.119	15.862	18.667	22.231	25.274	22.786	26.01	31.515	30.09	22.735
GWESC FCD13_12Z-GEFS.GWDD	13		21.483	23.276	19.803	15.395	14.592	18.986	15.212	22.414	24.099	29.52	23.54	24.084	27.411	30.884	30.73	24.514
GWESC FCD14_12Z-GEFS.GWDD	14	23.068	25.71	19.322	17.766	13.71	18.616	19.457	25.004	28.853	31.959	21.931	23.073	24.318	26.761	29.739	27.931	21.058

FIG. 7B

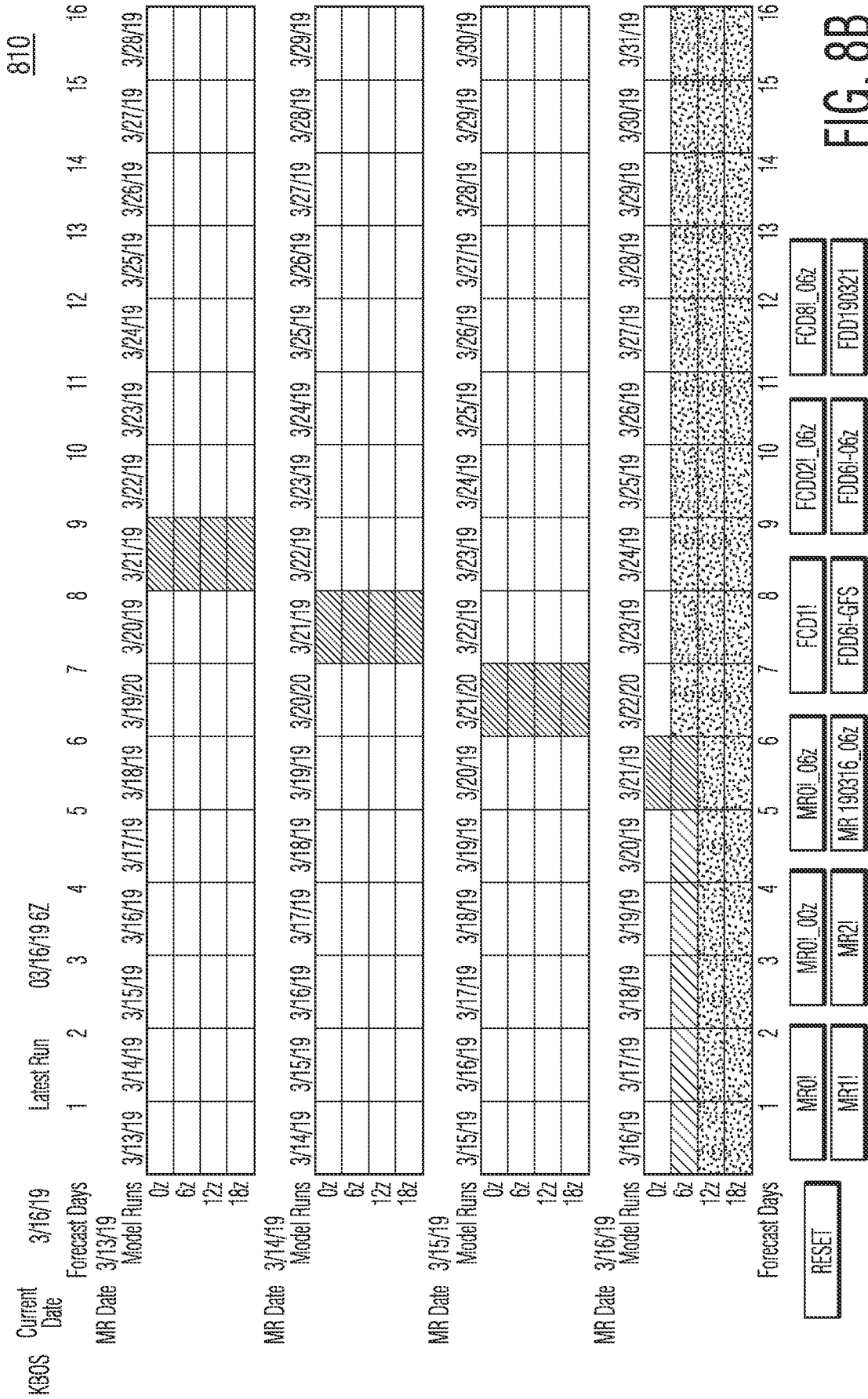


FIG. 8B

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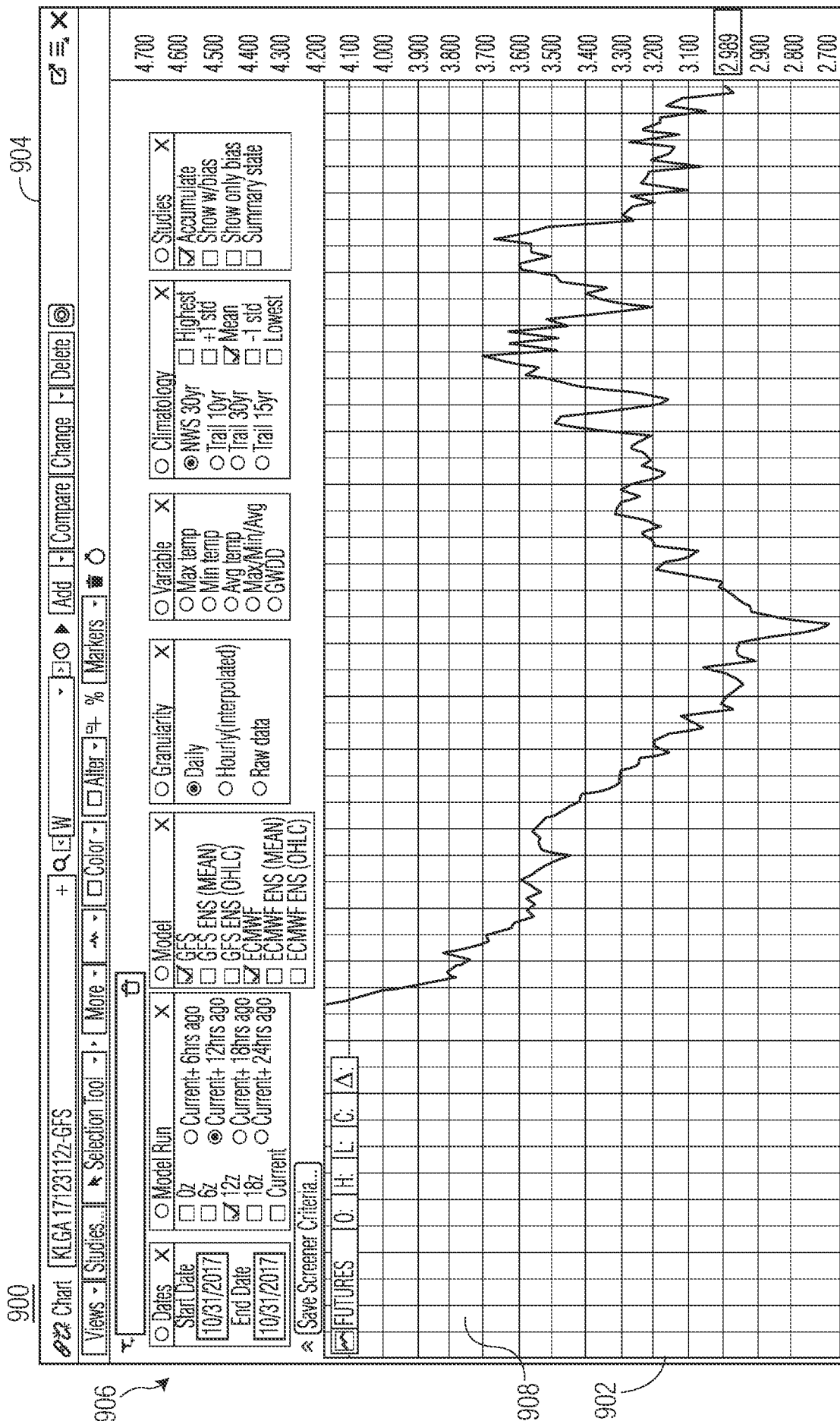


FIG. 9A

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910

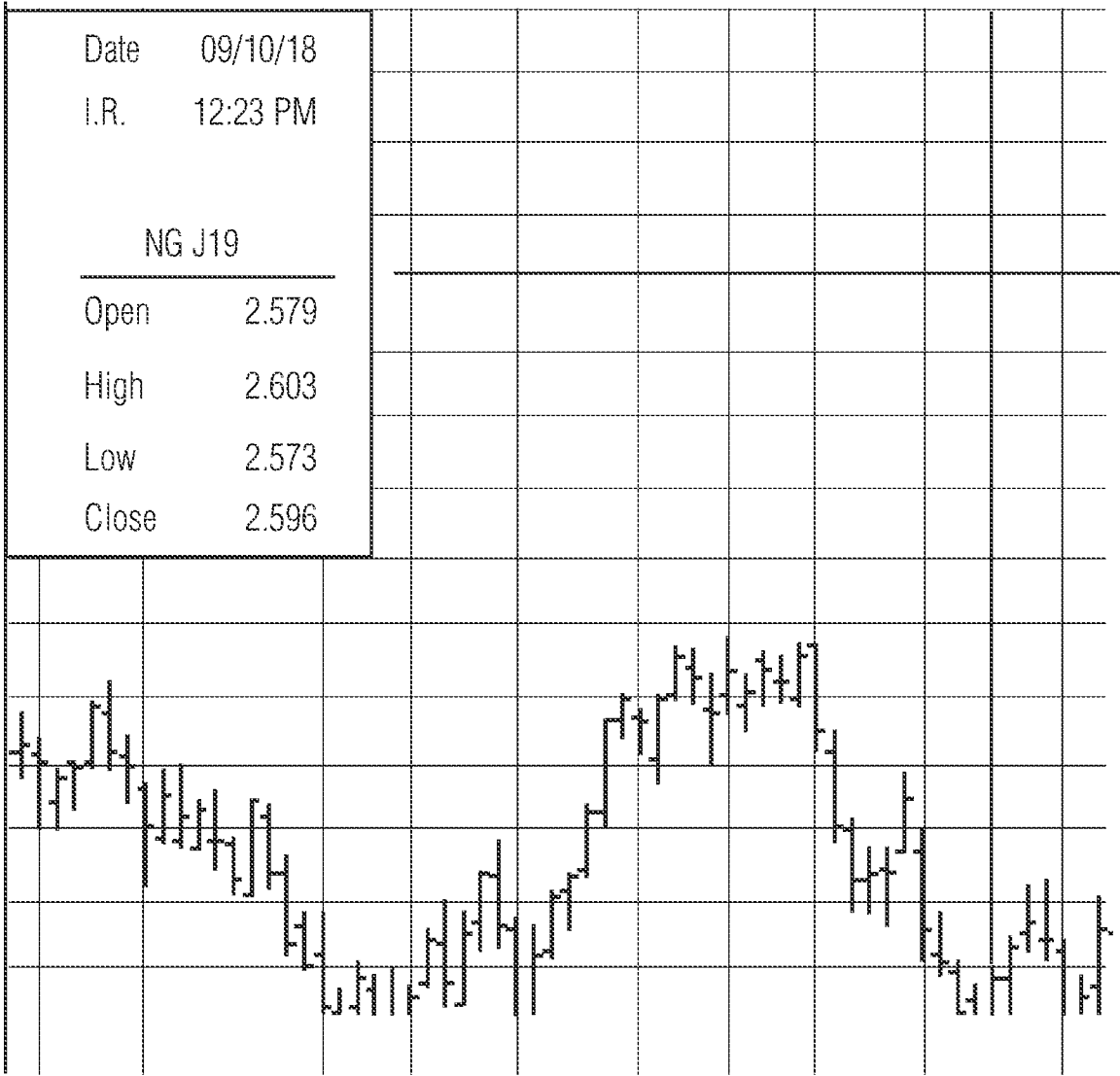


FIG. 9B

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912

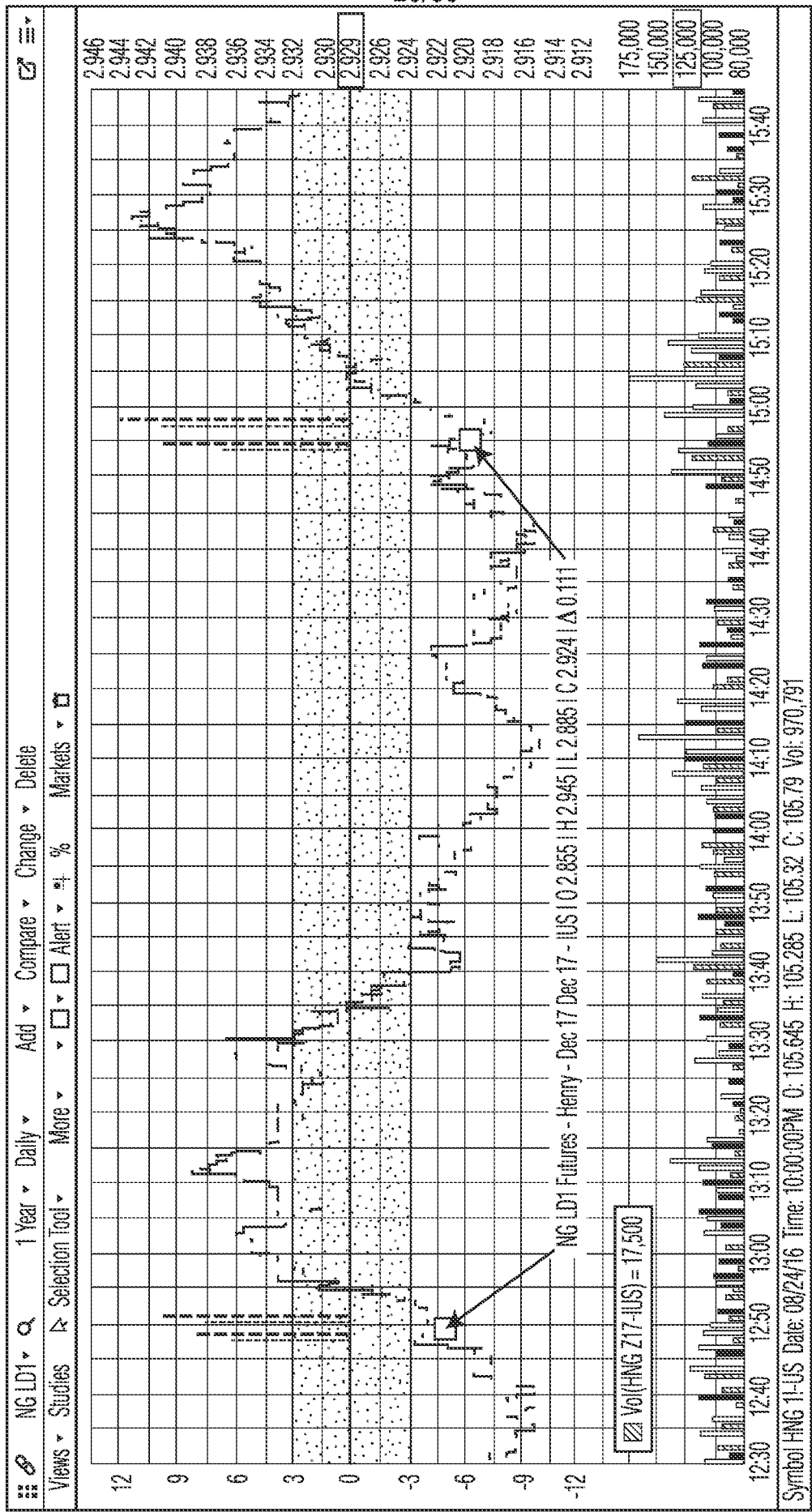


FIG. 9C

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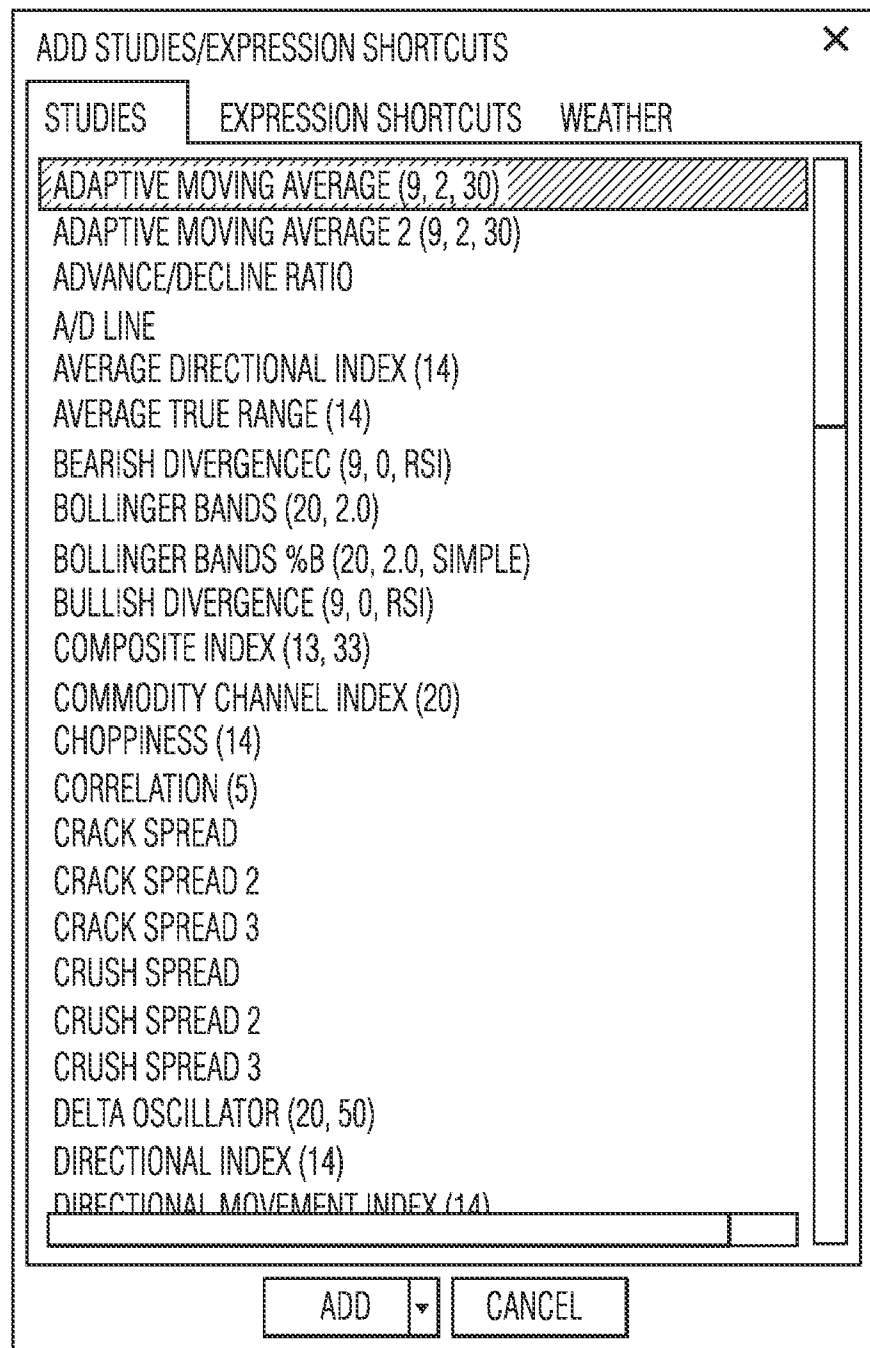
914

FIG. 9D

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916

SYMBOL VALUE MARKER:	ARROW ▾	MARKER LOCATION:	CHART EDGE ▾
STUDY VALUE MARKER:	ARROW ▾	MARKER LOCATION:	PRICE SCALE ▾

FIG. 9E

918

ADD CONDITION ALERTS ✕

EXPRESSION:

COMMENT:

OK

CANCEL

FIG. 9F

920

Chart Views

×

Move Up

Move Down

Rename

Delete

Apply

Close

☒ Apply View with colors

FIG. 9G

24/36

922

GFS 12z				
Model Hr	Model Day	% Comp	Average UTC Time	Local Time
0	0		15:23:41	9:23 AM
3	0		15:26:31	6:02 AM
6	0		15:28:47	6:05 AM
9	0	62.50%	15:30:54	6:07 AM
12	0	75%	15:33:12	6:09 AM
15	0	87.50%	15:34:06	6:10 AM
18	0	100%	15:35:06	6:11 AM
21	1		15:35:55	6:12 AM
14	1		15:36:55	6:13 AM
27	1		15:37:47	6:14 AM
30	1	62.50%	15:38:35	6:14 AM
33	1	75%	15:39:36	6:15 AM
36	1	87.50%	15:40:28	6:16 AM
39	1	100%	15:41:19	6:17 AM
42	2		15:42:13	6:18 AM
45	2		15:43:09	6:19 AM
48	2		15:44:02	6:20 AM
51	2		15:44:58	6:21 AM
54	2	62.50%	15:45:57	6:22 AM
57	2	75%	15:46:51	6:23 AM
60	2	87.50%	15:47:44	6:24 AM
63	2	100%	15:48:40	6:24 AM
66	3		15:49:33	6:25 AM
69	3		15:50:29	6:26 AM
72	3		15:51:26	6:27 AM
75	3		15:52:20	6:28 AM
78	3	62.50%	15:53:19	6:29 AM
81	3	75%	15:54:14	6:30 AM
84	3	87.50%	15:55:04	6:31 AM
87	3	100%	15:56:00	6:32 AM
90	4		15:56:47	6:33 AM
93	4		15:57:47	6:34 AM
96	4		15:58:41	6:35 AM
99	4		15:59:42	6:36 AM
102	4	62.50%	16:00:36	6:36 AM
105	4	75%	16:01:26	6:37 AM
108	4	87.50%	16:02:17	6:38 AM
111	4	100%	16:03:16	6:39 AM
114	5		16:04:21	6:40 AM
117	5		16:05:11	6:41 AM
120	5		16:06:05	6:42 AM
123	5		16:07:10	6:43 AM
126	5	62.50%	16:08:02	6:44 AM
129	5	75%	16:08:53	6:45 AM
132	5	87.50%	16:09:52	6:46 AM
135	5	100%	16:10:26	6:46 AM

FIG. 9H

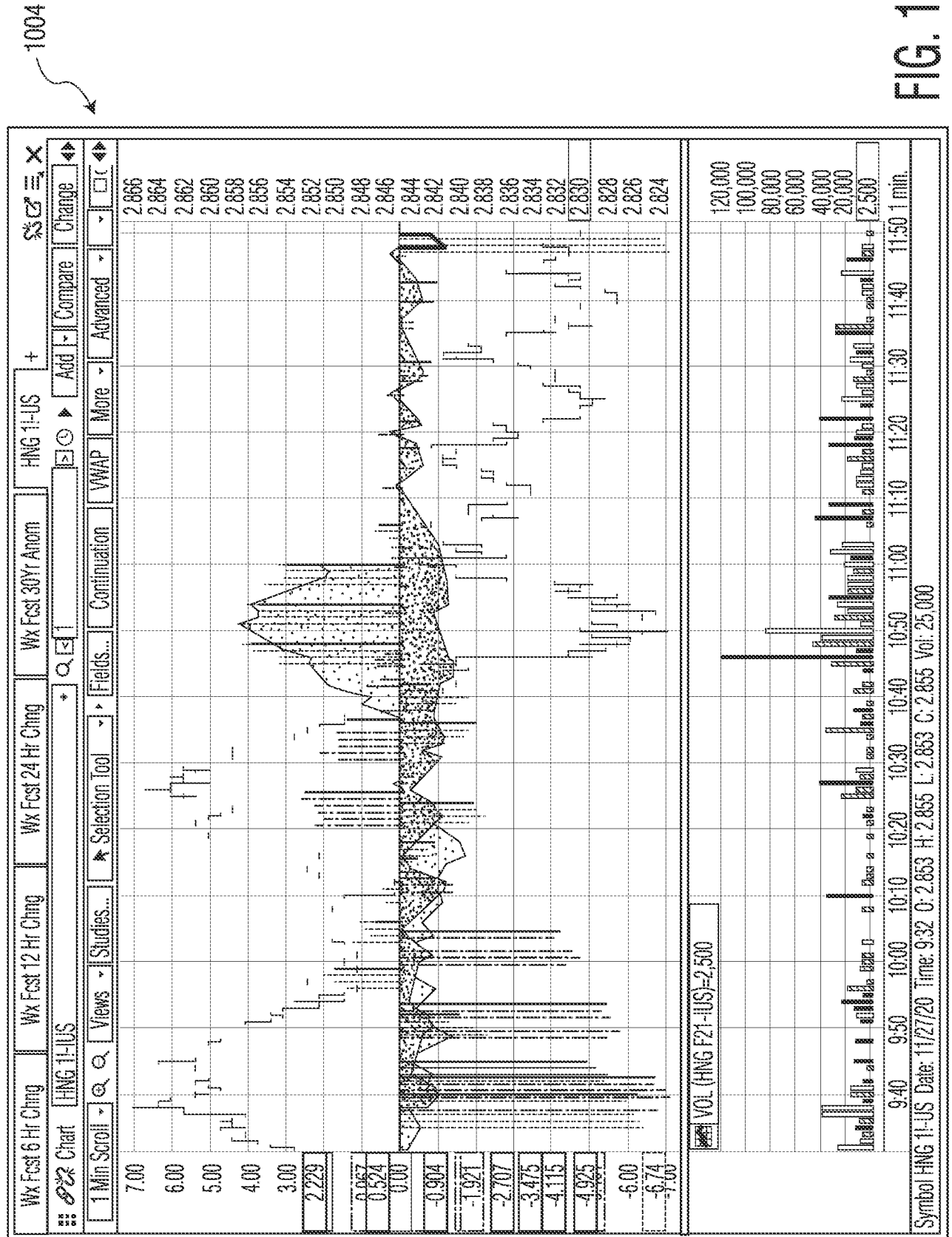


FIG. 10B

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1006

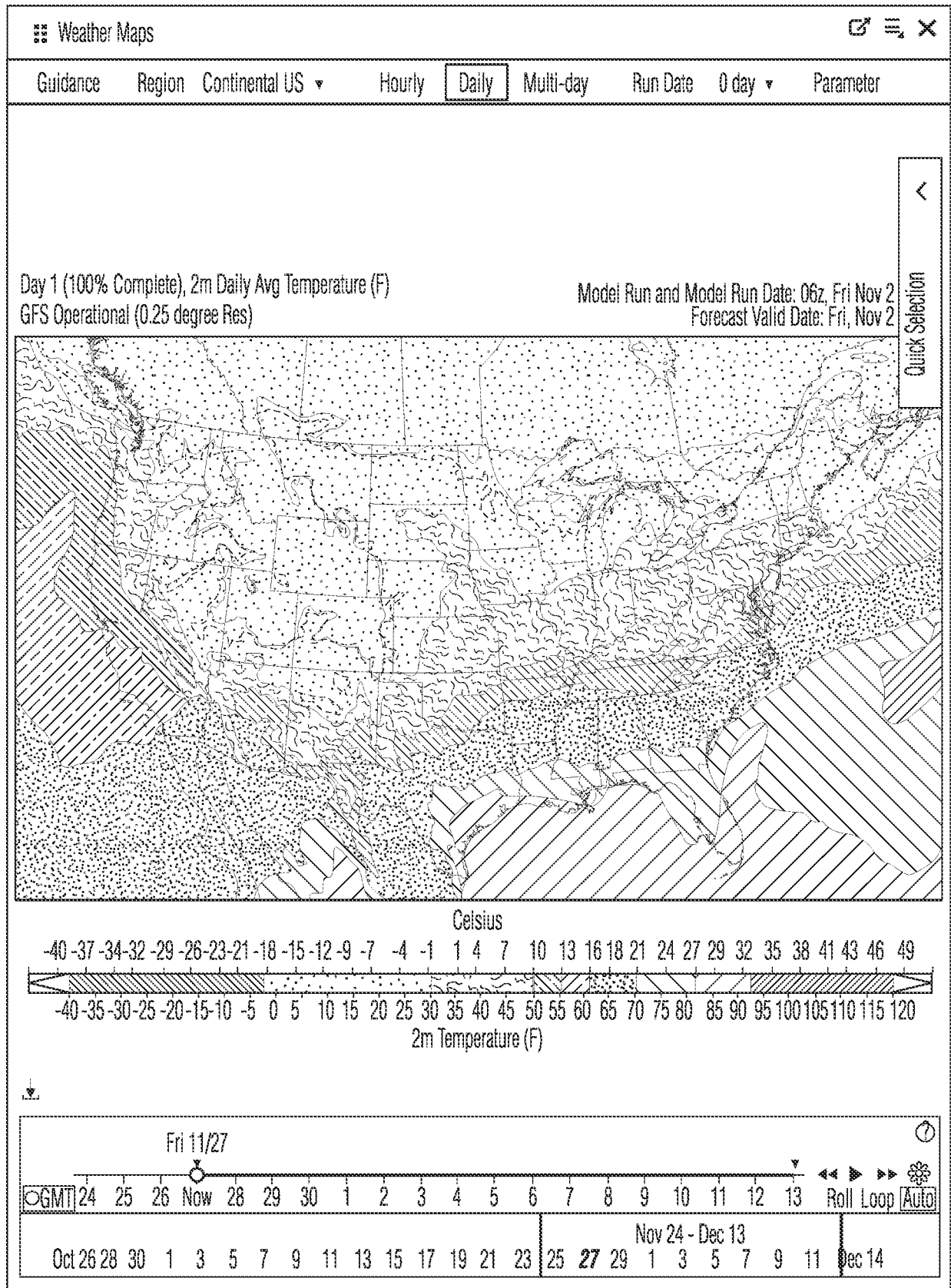


FIG. 10C

1008

Weather Model Status	Real-time status	GFS 12Z	GFS Ens. 12Z	ECMWF 12Z	ECMWF Ens. 6Z	Time Step:	1 hr	3 hr	6 hr	Zulu Offset	0	12am
Model Day	% Complete	Date	Day of Week	3am	6am	9am	12pm	3pm	6pm	9pm		
1	██████████100	11/27/20	Fri				0	3	6	9		12
2	██████████100	11/28/20	Sat	15	18	21	24	27	30	33		36
3	██████████100	11/29/20	Sun	39	42	45	48	51	54	57		60
4	██████████100	11/30/20	Mon	63	66	69	72	75	78	81		84
5	██████████100	12/1/20	Tue	87	90	93	96	99	102	105		108
6	██████████100	12/2/20	Wed	111	114	117	120	123	126	129		132
Green = model hour is complete Yellow = model hour late more than 1 standard deviation Red = model hour is missing												

FIG. 10D

1014

☰ Alerts

Add

Action ▼

Export to CSV

☒ ☰ ✕

Quote Alerts

News Alerts

Condition Alerts

Time Alerts

Weather Alerts

Alert History

Set Date	Fired Date	Location	Condition	Model Name	Model Run	Forecas...	Name
✓ 13:51:36 1...		KORD	2M Daily Avg...	ECMWF, ECM...	12z	1 - 17	KORD 4 and 6...

FIG. 10E

30/36

1010

Regional GWDD		NG Futures Contracts			
Symbol		Description		2...	H... C... 1...
Gas Weighted L-48 - CONUS					
▼ Gas Weighted L-48 - CONUS					
"GWUS" is the code for the lower 48- (a summary of 100 cities) each weig...					
estimated impact on US natural gas consumption					
HDDs + CDDs with adjustments to the traditional degree day formula to...					
GWUS MROI-GFS	*	GWUS CONUS - GFS all runs			
GWUS METR	*	GWUS CONUS - METAR Observation			
Gas Weighted State					
► Gas Weighted State [98]					
Gas Weighted Electricity Region					
► Gas Weighted Electricity Region [28]					
Gas Weighted Census Region					
► Gas Weighted Census Region [18]					
Gas Weighted EIA Storage Region					
► Gas Weighted EIA Storage Region [12]					
Gas Weighted EIA Storage Sub Region					
► Gas Weighted EIA Storage Sub Region [22]					
► Vote to alter list [2]					

1012

Select Natural Gas Contract			
GWUS-METR	HNG 11-IUS ▼	← Select NG Contra	
	12Z ▼		
	GFS ▼		
	MR4I ▼		

FIG. 10F

31/36

1016

Weather Alert ✕

Alert Condition

Alert Name 1018

Location(s) 1020

Forecast Parameters (Hover over digit field for UoM)

2M Daily Avg Temp 12 Hr Change ✕	Greater Than	4.0	Or	✕
2M Daily Avg Temp 12 Hr Change ✕	Less Than	-4.0	And	✕
2M Daily Avg Temp official 30yr Anomaly ✕	Greater Than	6.0	Or	✕
2M Daily Avg Temp official 30yr Anomaly ✕	Less Than	-6.0	Or	✕

Add Parameter Threshold Helper

Note

Commodity

Action

Model Settings

Models

	0z	6z	12z	18z
ECMWF	☐	☐	☒	☐
ECMWF ENS Mean	☐	☐	☒	☐
GFS	☐	☐	☒	☐
GFS ENS Mean	☐	☐	☒	☐

Forecast Periods

☐ Days 1-5 ☐ Days 6-10 ☐ Days 1-17
☐ Next day ☐ Days 1-17 ☐ Forecast day To

Forecast When % Complete

Notification

Day of use

☒ Monday ☒ Tuesday ☒ Wednesday ☒ Thursday 1024
☒ Friday ☐ Saturday ☐ Friday

To change UoM Tools -> Preferences -> Currency and Unit

FIG. 10G

32/36

Add Weather... ✕
1026

Type

Guidance
Accumulation
Progression
Alpha Micro
Alpha Macro

1028

Location(s)

KORD ✕
1030

☐ Plot Average of Selected Locations

Time Interval

Hourly
Daily

1032

Parameter(s)

2M Hourly Temp ✕
1034

Interpolation: Interpolated Data

Preliminary Daily Values:

Model(s)

GFS Op. 25 Deg	GFS ENS Mean	GFS ENS Summary Stats	GFS ENS Percentile Rank
ECMWF	ECMWF ENS Mean	ECMWF ENS Summary Stats	ECMWF ENS Percentile Rank

The ECM, ECE & ECEX data is based on data and products of the European Center for Medium-Range Weather Forecast (ECMWF)

Run(s)

Current	0z	6z	12z	18z
Curr - 6hr	Curr - 12hr	Curr - 18hr	Curr - 24hr	

Climatology

+ 10yr
+ 15yr
+ 30yr
Official 30yr
☐ Add Summary statistics

Observations

☒ Observations Real-time (METAR)
☐ Summary statistics (Convert data to OHLC)
Wayback (Forecast as of): Wayback ☐
1036

Note:
Change Unit of Measure: Tools > Preferences > Currency and Units
Change AM/PM Colors: Chart Display Properties > Text & Colors > Background
Change Wx Model Colors: Chart Display Properties > Plot Colors

Add
Apply
Close

FIG. 10H

33/36

1038

Add Weather...×

Type

Guidance

Accumulation

Progression

Alpha Micro

Alpha Macro

Location(s)

GWUS

×

▼

Parameter(s)

GWDD

×

▼

Model(s)

GFS

Op. 25 Deg

GFS ENS

Mean

ECMWF

ECMWF ENS

Mean

The ECM, ECE & ECEX data is based on data and products of the European Center for Medium-Range Weather Forecast (ECMWF)

Run(s)

Current

0z

6z

12z

18z

Curr - 6hr

Curr - 12hr

Curr - 18hr

Curr - 24hr

Climatology

+ 10yr

+ 15yr

+ 30yr

Official 30yr

Observations

▼

Wayback (Forecast as of):

Wayback

Period:

10/01/2020

 -

10/31/2021

Note:

Change Unit of Measure: Tools > Preferences > Currency and Units

Change AM/PM Colors: Chart Display Properties > Text & Colors > Background

Change Wx Model Colors: Chart Display Properties > Plot Colors

Add

▼

Apply

▼

Close

FIG. 10I

34/36

1040

Add Weather...×

Type

Guidance

Accumulation

Progression

Alpha Micro

Alpha Macro

Location(s)

GWUS ×

▼

☐ Plot Average of Selected Locations

Parameter(s)

GWDD ×

▼

Target Date:

-1 day

▼

☐

Model(s)

GFS
Op. 25 Deg

GFS ENS
Mean

GFS ENS
Summary Stats

GFS ENS
Percentile Rank

ECMWF

ECMWF ENS
Mean

ECMWF ENS
Summary Stats

ECMWF ENS
Percentile Rank

The ECM, ECE & ECEX data is based on data and products of the European Center for Medium-Range Weather Forecast (ECMWF)

Run(s)

Current

0z

6z

12z

18z

☒ Observations Real-time (METAR)

Note:

Change Unit of Measure: Tools > Preferences > Currency and Units

Change AM/PM Colors: Chart Display Properties > Text & Colors > Background

Change Wx Model Colors: Chart Display Properties > Plot Colors

Add ▼

Apply ▼

Close

FIG. 10J

35/36

1042

Add Weather...×

Type

GuidanceAccumulationProgressionAlpha MicroAlpha Macro

Location(s)

GWUS×

Parameter(s)

GWDD 12 Hr Change×GWDD official 30yr Anomaly×GWDD×2M Hourly Temp×

Interpolation:

Interpolated Data

Preliminary Daily Values:

Model(s)

GFS Op. 25 DegGFS ENS MeanECMWFECMWF ENS Mean

The ECM, ECE & ECEX data is based on data and products of the European Center for Medium-Range Weather Forecast (ECMWF)

Run(s)

Current0z6z12z18z
Curr - 6hrCurr - 12hrCurr - 18hrCurr - 24hr

Wayback (Forecast as of):

Wayback

Commodity:

HNG 1!-IUS

+

Q

Note:

AddApplyClose

Change Unit of Measure: Tools > Preferences > Currency and Units
Change AM/PM Colors: Chart Display Properties > Text & Colors > Background
Change Wx Model Colors: Chart Display Properties > Plot Colors

FIG. 10K

36/36

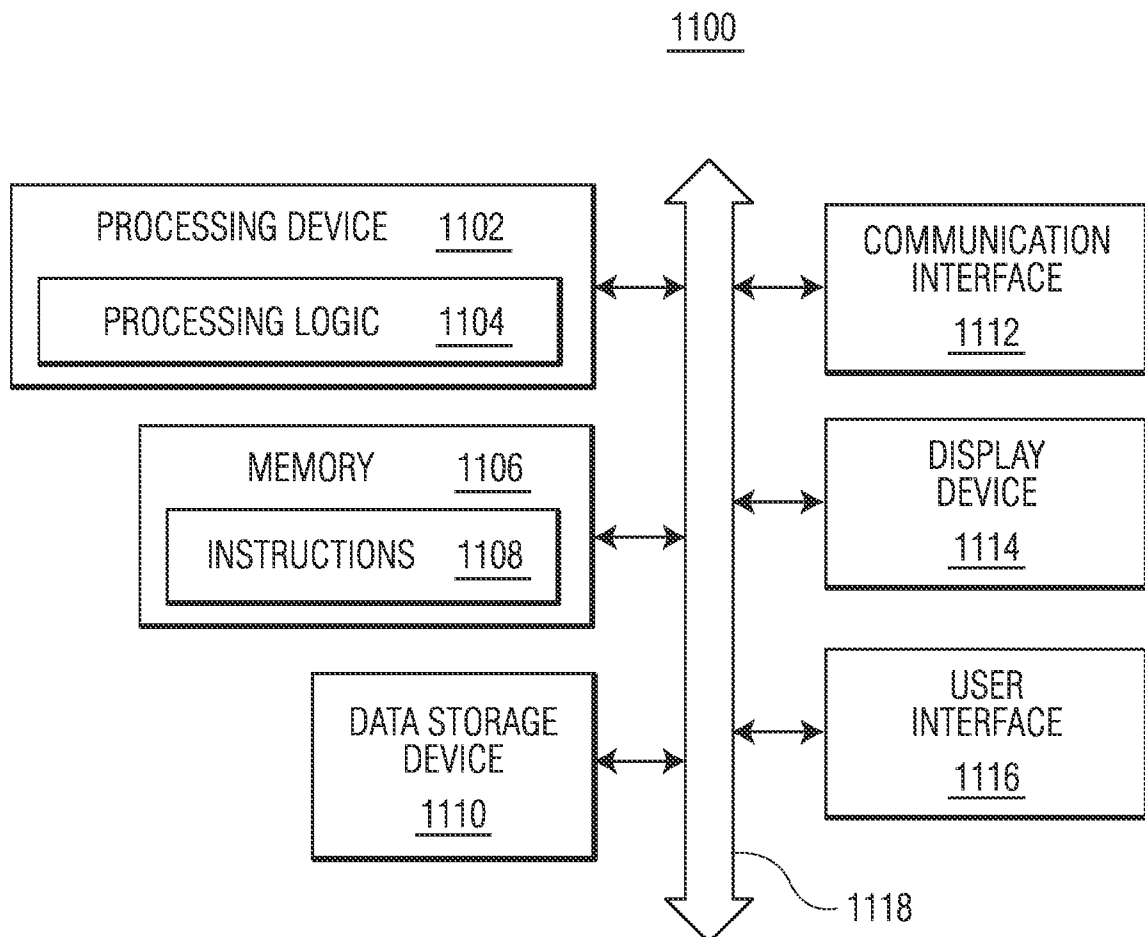


FIG. 11